Education
School Infrastructure

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NARRABEEN EDUCATION PRECINCT – NARRABEEN SPORTS HIGH SCHOOL

DEVELOPMENT APPLICATION CIVIL ENGINEERING REPORT

Prepared for: School Infrastructure NSW (SINSW)
By: **en**struct group pty ltd
December 2022

NARRABEEN EDUCATION PRECINCT – NARRABEEN SPORT HIGH SCHOOL

DEVELOPMENT APPLICATION CIVIL DESIGN REPORT

ISSUE AUTHORISATION

PROJECT: Narrabeen Education Precinct
Project No: 6683

Rev	Date	Purpose of Issue / Nature of Revision	Prepared by	Reviewed by	Issue Authorised by
A	13/08/22	DRAFT Review	MZV	PAL	PAL
B	19/08/22	Issue for DA	MZV	KEH	PAL
C	05/09/22	Issue for DA	MZV	KEH	PAL
D	15/12/22	Reissue for DA	MZV	PAL	PAL

Executive Summary

enstruct have been engaged by School Infrastructure NSW to provide civil engineering consultancy and design for the works at Narrabeen Sports High School. This report relates to the civil engineering elements of the works, and will discuss items such as site composition, stormwater, flooding, earthworks, and erosion and sediment control.

The key items include:

- Onsite Stormwater Detention (OSD)
- Water Sensitive Urban Design (WSUD)
- Flooding
- Stormwater Overland Flow
- Earthworks
- Erosion and Sediment control

Contents

1 Introduction

The proposed Narrabeen Education Precinct development includes redevelopment of Narrabeen North Public School (NNPS) and Narrabeen Sports High School (NSHS). The Public School and High School have been identified by the NSW Department of Education (DoE) as requiring upgrade works.

The works at NNPS upgrade the school including demolition of existing buildings (Blocks H and J), construction of three (3) new buildings with refurbishment of three (3) existing buildings (Blocks B, K and V).

The works at NSHS upgrade the school including addition of new two (2) storey extension to Building A, construction of new single storey amenities building and refurbishment of four (4) existing buildings (Buildings A, B, C and K).

This Development Application (DA) will seek consent for the following works at NNPS & NSHS:

The works the subject of the Development Application (DA) at NNPS comprise:

- Construction of a new two (2) storey building containing administration facilities, multi-purpose hall and out-of-school-hours care (OSHC) facility on the ground floor with staff facilities and amenities on the first floor; and
- New Covered Outdoor Learning Area (COLA).

The works the subject of the DA at NSHS comprise:

- Alterations and additions to Building A (Gymnasium) to create new stage for gymnasium and new two (2) storey addition comprising canteen, boys and girls changing rooms and staff room on the ground floor; and movement studio and two (2) new General Learning Spaces (GLS) on the first floor.

Other development works are occurring on the site under separate planning pathways including:

- Development without consent (REF); and
- Exempt development

The proposed development does not seek to increase staff or student numbers.

1.1 Site Description

The subject sites are located at 6 and 10 Namona Street, North Narrabeen (referred to as the Narrabeen Education Precinct) and falls within the local government area of Northern Beaches Council. The Narrabeen Education Precinct has a total area of 9.84 hectares.

Narrabeen North Primary School (NNPS) is located on the northern side of Namona Street, North Narrabeen and is legally described as Lot 3 Deposited Plan (DP) 1018621. NNPS is surrounded by residential dwellings to the east, grassed sporting fields (Warriewood Valley Sportsground) to the north and Northern Beaches Indoor Sports Centre to the west. NNPS contains two (2) Binishell domes (Block A and Block B) which are identified as a local heritage item under the Pittwater Local Environmental Plan 2014. The two (2) Binishell Domes are listed as State significant on DoE's Section 170 Heritage and Conservation Register. The Double Binishell Dome (Block B) is listed on the State Heritage Register (SHR). Furthermore, the site lies along the banks of Mullet Creek.

Figure 1: Site Figure (Source: Johnstaff 220628_NEP DA Preamble_V3)

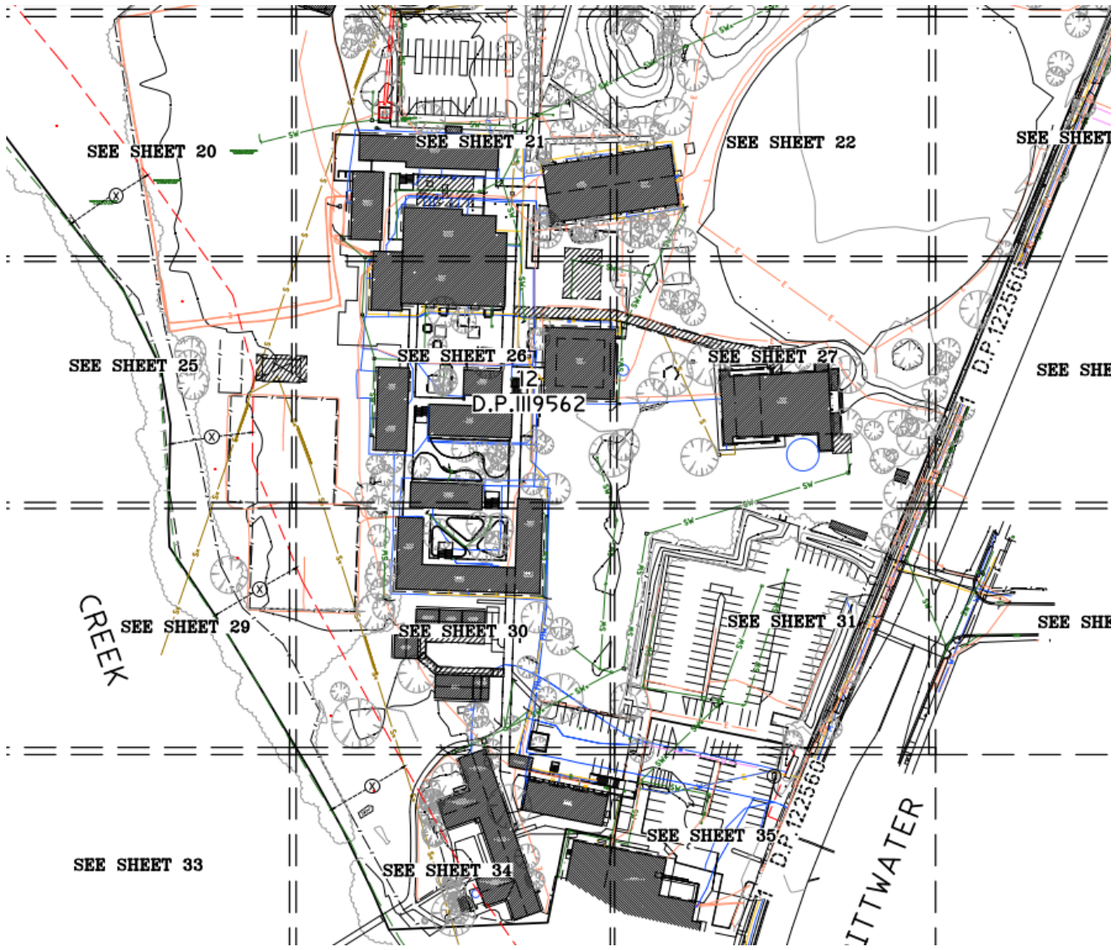

Figure 2: Site Survey: Narrabeen Sports High School (C.M.S Surveyors)

1.2 *Existing Stormwater*

The site has several stormwater lines draining various parts of the site. The stormwater pipes predominantly run parallel to Namona Street along the northern boundary. The Stormwater pipes range from 150mm, 525mm and 600mm diameter with multiple stormwater pits located along the pipes within the site. The system within the site deposits to three external stormwater pits at the cul-de-sac of Namona Street and at the intersection of Oak Street (**Figure 3**). Furthermore, the stormwater flows south-west to Garden Street across Mullet Creek.

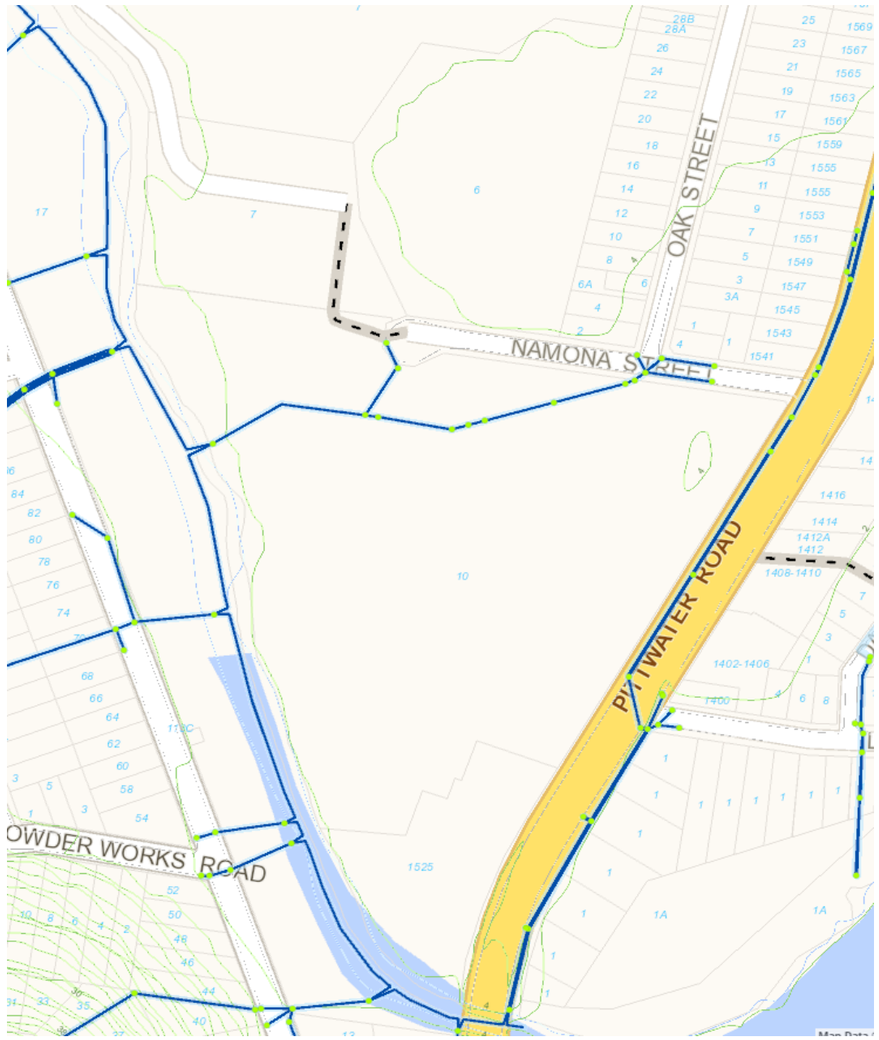

Figure 3: Stormwater system (Source: NBC Stormwater Map)

1.3 *Existing Geotechnical Conditions*

A geotechnical investigation was undertaken by Douglas Partners in June 2022 (reference 86973.00.R.002.Rev0), which included twenty-two shallow boreholes and twenty-two test pits across the precinct, of which eight shallow boreholes and 12 test pits in the NSHS.

Refer to Geotechnical Report prepared by Douglas Partners for details regarding the maximum slope for temporary and permanent batters, types of soils found, CBR, water table among other parameters.

2 Proposed Development

For the current submission, the proposed development will include the alterations and additions to Building A (Gymnasium) to create new stage for the gymnasium as well as the two-storey extension comprising of a canteen, boys and girls changing rooms and staff room on the ground floor; and a movement studio and two new General Learning Spaces (GLS) on the first floor.

Figure 4:Proposed Site Plan NSHS (Design Inc)

2.1 Standards list

2.1.1 Educational Facilities Standards & Guidelines

- Design Guide
  - DG95 Stormwater
  - DG96 Civil Works
- Specification Guide
  - SG221 Preparation & Ground Work - Site Management
  - SG222 Preparation & Ground Work - Earthwork
  - SG221 Preparation & Ground Work - Service Trenching
  - SG272 Pavement - Asphaltic Concrete
  - SG277 Pavement - Pavement Ancillaries
  - SG274 Pavement - Concrete Pavement
  - SG272 Pavement - Roadwork Ancillaries
  - SG311 Concrete - Formwork
  - SG311 Concrete - In Situ
  - SG821 Stormwater
- Drawings
  - SG611-3 Stormwater Drains Downpipe Connections (included in typical details sheet)

2.1.2 Civil Engineering Design Standards

- Australian Rainfall & Runoff 2019
- Austroads: Guide to Pavement Technology
- AS1428.1 Design for Access & Mobility
- AS3500.3 Plumbing and Drainage: Stormwater Drainage
- Northern Beaches Council's Development Control Plan (DCP)

2.1.3 Drainage Design Standards

- AS 3500.3-1990 National Plumbing and Drainage Code - Stormwater drainage.
- Managing Urban Stormwater: Soils and Construction, "The Blue Book" – 4th edition 2004.
- Concrete Pipe Selection and Installation - Concrete Pipe Association 1990.
- Northern Beaches Council's Development Control Plan (DCP)

3 Stormwater Design

The stormwater design must be in accordance with Australian Standards, Northern Beaches Council Water Management for Developments Policy, Northern Beaches Council Onsite Stormwater Detention Technical Specification, Australian Rainfall and Runoff (2019), and School Infrastructure NSW's EFSG Section DG95 Stormwater.

In general, drainage is to be designed to ensure that site facilities are available for students use in all weather conditions up to a 1% AEP storm event. All new roof stormwater will be collected in roof gutters and downpipes and conveyed to the in-ground pipe system. Surface stormwater will be collected in pits. The in-ground stormwater will be connected to water quality controls.

Pipes and pits will need to be designed to satisfy the minimum provisions of AS 3500.3. They must 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 to be less than 0.4m^2/s.

Prior to stormwater pipeline design, enstruct will confirm soil classification from the geotechnical report. Pipeline design will provide minimum cover relevant to selected material. Minimum Pipe sizes shall be in accordance with EFSG Section 95.08.01 Pipework requirements as follows:

- DN 100 for subsoil drainage
- DN 225 downstream of any grated pit
- DN 225 downstream of any side entry pit

Class B pits are to be used in accordance with AS 3996.

3.1 Onsite Stormwater Detention (OSD)

NSHS is located within a Council established 1% AEP flood plain, and it can be demonstrated that lesser storm events will also flood the site. Hence, as per the NBC Water Management for Development Policy, no OSD is required for the site.

3.2 Flooding

Most of the site is identified as low-risk flood prone, however the outermost west and southern edges of the campus reach medium risk (Figures 5 & 6). Furthermore, the site is identified as a "Vulnerable & Critical" land-use as per the NBC DCP.

The NBC Water Management for Development Policy requires that habitable floor levels are to be at or above the Probable Maximum Flood (PMF) level or Flood Planning Level, whichever is higher. The Policy also requires all new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event. In the case of NSPS, the following must be adhered to:

(a) The underfloor area of the dwelling below the 1% AEP flood level is to be designed and constructed to allow clear passage of floodwaters, considering the potential for small openings to block; and

(b) At least 50% of the perimeter of the underfloor area is of an open design from the natural ground level up to the 1% AEP flood level; and

(c) No solid areas of the perimeter of the underfloor area would be permitted in a floodway.

Flood modelling has been undertaken by BMT to assess the impacts of the new development on the existing catchment with respect to flood storage, depth of water and velocity. It is assessed that there are no adverse impacts in the 1% AEP flood and minimal impacts are predicted in the PMF. The floor level requirement assessed by BMT is a minimum Finished Floor Level (FFL) of 4.87mAHD. The lowest FFL of the proposed development at NSHS is a ground level FFL of 2.55mAHD which is not compliant, however, the floor level is governed by functional requirements to connect to existing Building A. It is assessed that the Level 1 6m+AHD FFL of the Building A extension would provide suitable flood refuge above the PMF level. Further information can be viewed in the NEP Flood Management Report (reference R.A12029.001.00) by BMT.

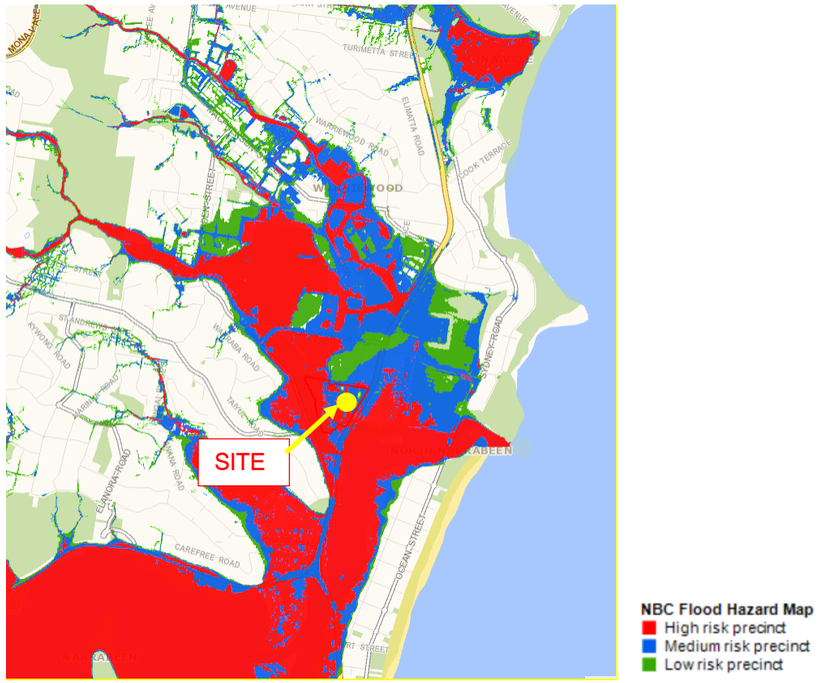

Figure 5: NBC Flood Hazard Map (Source: NBC Water Management for Developments Policy)

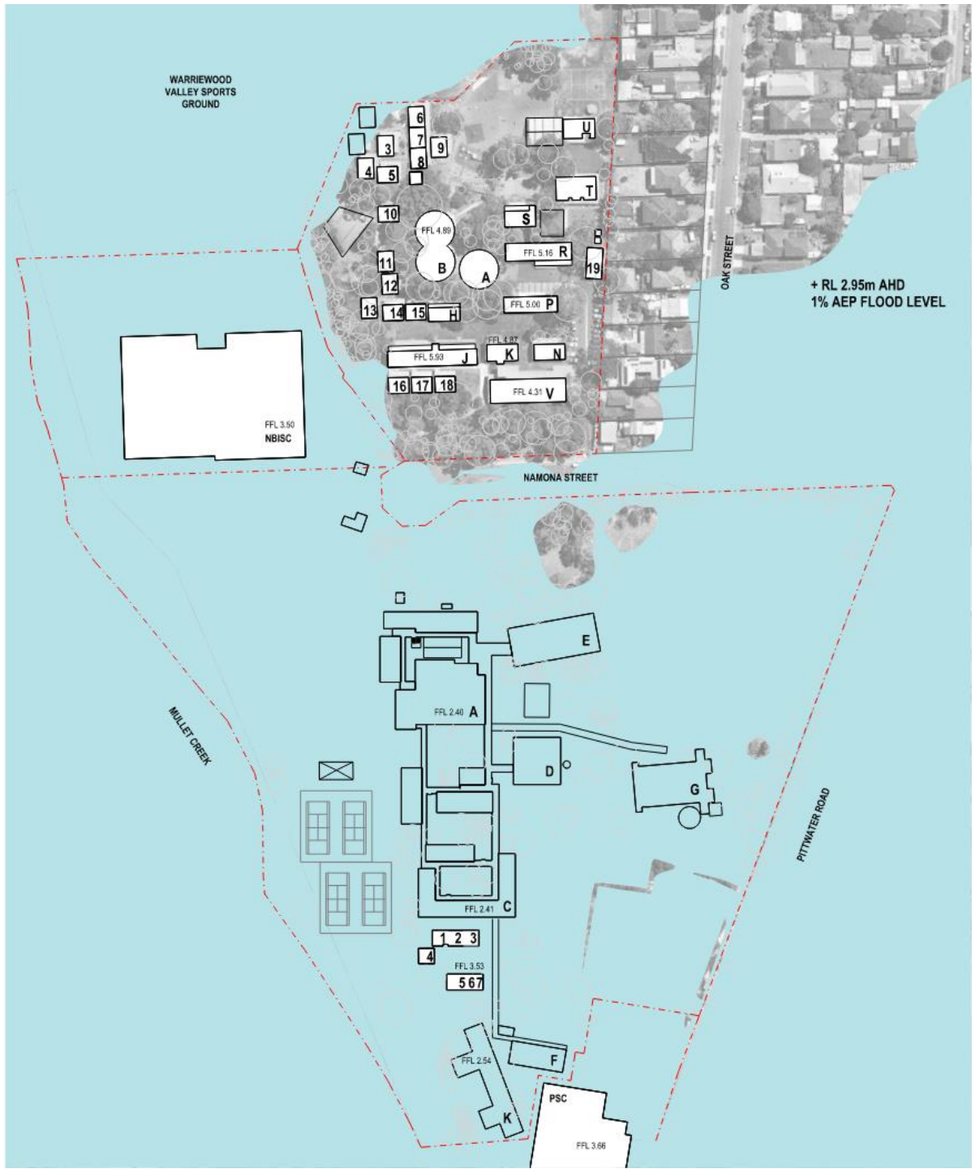

Figure 6: NBC Flood Hazard Map (Source: Design Inc)

3.3 Overland Flow Paths

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 site's boundary.

Overland flow paths will be sized to accommodate the 1% AEP storm flows and not exceed safe Depth x Velocity products of 0.4m^2/s for pedestrians and vehicles.

4 Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design typically includes water reuse, pollutant removal via natural systems, and the minimisation of hard structures to control stormwater and improve aesthetic and recreational appeal.

Where open space exists, above-ground WSUD principles should be incorporated into the stormwater design. Although, as standing water poses waterborne health risk, careful attention to the WSUD type and how it is incorporated is required.

4.1 Stormwater Quality

The NBC Water Management for Developments Policy sets out the requirements for treatment of the stormwater prior to discharge into the Council system. The site is not located within an NBC High Quality Catchment (**Figure 7**). In addition, it is important to note the subject site land type is categorised as "land adjacent to estuarine habitat and areas" in **Figure 8**, and hence will follow the stormwater quality objectives as categorised in **Figure 9**. To ensure stormwater collected at the site is treated to a satisfactory level, the general stormwater pollutants targets will also be utilised in the design, as per **Figure 10**.

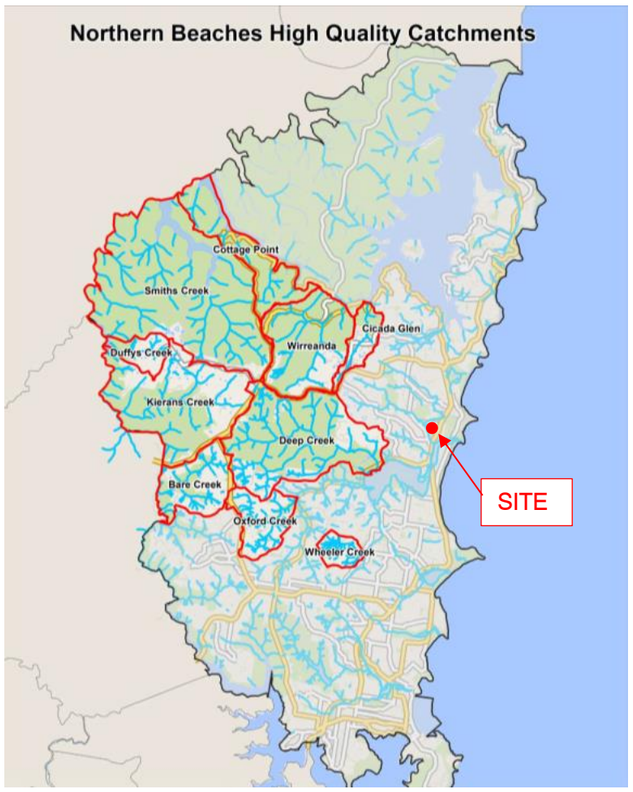

Figure 7: Northern beaches High Quality Catchments Map (Source: NBC Water Management for Developments Policy)

Table 3 – Site/Development Characteristics (more than one requirement may apply)

Land Type	Controls which apply
Undeveloped land[i] within a high quality Catchment[ii].	Table 4 – Stormwater Quality Objectives
Land containing or adjoining wetlands, bushland and saltmarsh endangered ecological communities, and land adjacent to estuarine habitat and areas containing seagrass, and land within the riparian buffer of a Coastal Upland Swamp in the Sydney Basin Bioregion Endangered Ecological Community[iii]	
Land subject to Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005	Please refer to Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 and the RMS' Stormwater disposal into Sydney Harbour
Land that is not identified above that is single lot residential development, residential flat buildings, multi-residential dwelling houses, commercial, mixed use and industrial lots with a site area less than 1000m^2 that propose to increase impervious area by more than 50m^2 that is not a subdivision	Must install a filtration device that removes organic matter and coarse sediments from stormwater prior to discharge from the land. All stormwater treatment measures must make provision for convenient and safe regular inspection, periodic cleaning, and maintenance.
All other land not identified above	Table 5 – General Stormwater Quality Requirements

Notes:

i. Refer to the Definitions Section 2.0 in this Policy for definitions for "Undeveloped Land".
ii. High quality catchments are identified using Map 1
iii. To determine if the development is within any of the above noted land areas refer to the following: Section 10.7 Planning Certificate, Protection of Waterways and Riparian Land Policy, and Waterways and Riparian Lands Map.

Figure 8: Site Development Characteristics (Source: NBC Water Management for Developments Policy)

Table 4 – Stormwater Quality Objectives

Criteria	Objectives
Stormwater Quality	Stormwater quality (temperature, salinity, chemical makeup and sediment loads) discharging from the development shall not impact the receiving waters. Reference shall be made to local data if available, including the Warringah Creek Management Study and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC), or other widely accepted guidelines. Stormwater and other drainage shall not be discharged into saltmarsh.
Sediment	Disturbance to stream and wetland sediments is to be minimised by regulated discharge of stormwater and dissipation of flows at discharge locations. Runoff from the development must be retained at natural discharge rates and sediments controlled at the source.
Hydrology	Stormwater and groundwater flow is to mimic natural conditions and ensure a dispersed pattern of flow, avoiding centralised or concentrated discharge points into the wetland or waterway. Natural flow regimes must be retained. The reduction or increase in flows, alteration in seasonality of flows, changes to the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels must be avoided.

Figure 9: Stormwater Quality Objectives (Source: NBC Water Management for Developments Policy)

Pollutant	Performance Requirements
Total Phosphorous	65% reduction in the post development mean annual load[1]
Total Nitrogen	45% reduction in the post development mean annual load[1]
Total Suspended Solids	85% reduction in the post development mean annual load[1]
Gross Pollutants	90% reduction in the post development mean annual load[1] (for pollutants greater than 5mm in diameter)
pH	6.5 - 8.5
Hydrology	The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 50% AEP

Figure 10: General Stormwater quality requirements (Source: NBC Water Management for Developments Policy)

The ESFG notes the preference for open and absorption storage systems, this is equivalent to a fenced pond. If utilised, aesthetics must be considered when designing the fencing and signage of the pond. Additionally, the safety to the school population needs to be considered. An absorption system may be utilised in combination with mechanical pollutant removal devices to remove gross pollutants, suspended solids, reduce nutrient runoff including nitrogen and phosphorous.

The pollution control devices will require on-going maintenance. Pollutant removal devices will require 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. It is expected that the devices will include litter screens in all pits and an end of line treatment device to remove nitrogen & phosphorus contaminants etc. This system is preferred as it will be able to achieve pollutant reductions required, is easily maintained, and does not require large open areas or pose safety risk to the school population.

The ESFG notes that stormwater is to be treated to remove foreign matter and ensure minimal impact. Pollutant removal rates as required by Council are to be in accordance with best practice. The removal rates will be 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

4.3 *MUSIC Model*

A A MUSIC model has been developed to indicate the suitability of the proposed WSUD measures on the site. The model was developed in accordance with NBC's WSUD & MUSIC Modelling Guidelines. **Appendix B** indicates a potential WSUD design for the proposed the site, analysed through MUSIC.

The proposed development will utilise a 10m bio-retention swale for filtration and dispersion of the collected stormwater from the proposed development. Furthermore, a minimum of one Ocean Protect OceanGuard Pit Insert will be inserted into a proposed stormwater pit.

The bio-retention swale will filter the stormwater and reduce the Total Suspended Solids, Gross Pollutants, Total Nitrogen and Total Phosphorous concentration. **Table 1** highlights the reduction percentage from the MUSIC model compared to council requirements.

Treatment	Northern Beaches Council Requirement	Reduction Result
Total Suspended Solids (kg/yr)	85%	93.4%
Total Phosphorous (kg/yr)	65%	75.1%
Total Nitrogen (kg/yr)	45%	50.5%
Gross Pollutants (kg/yr)	90%	99.9%

Table 1: MUSIC Model Results

4.3.1 *Bio-retention Swale*

The Bioswale is to be a minimum of 0.6m wide (excluding batters) and 10m long. The filter area will require at least 8 plants per square metre to assist in pollutant removal. The filter trench will consist of 75mm of mulch and 500mm of sandy loam filter media which will provide most of the pollutant removal. The surface of the swale will include 300mm of extended detention depth to temporarily store stormwater before filtration. All proposed batters will be stabilised to limit erosion.

Refer to **Figure 11** for a preliminary Bioswale design; the final design will be in accordance with WaterByDesign's Bioretention Technical Design Guidelines.

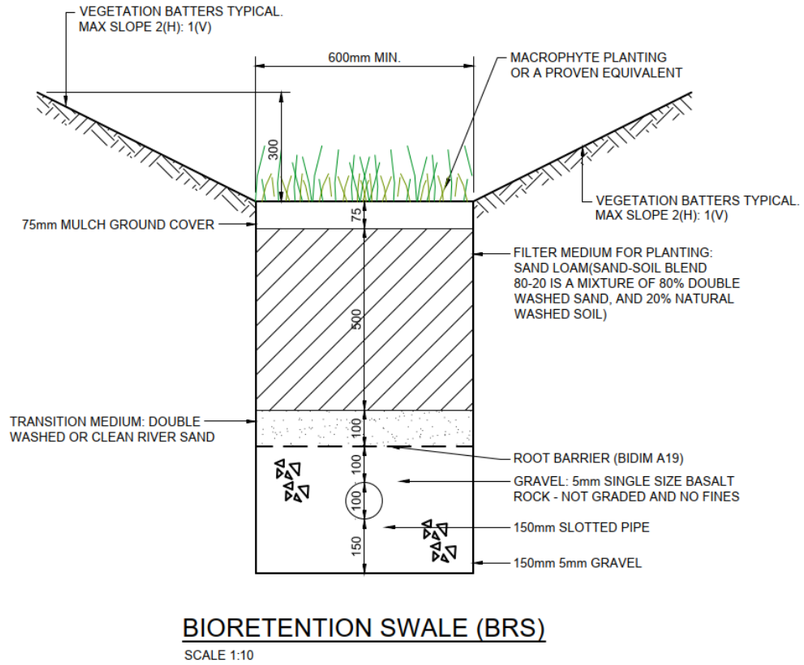

Figure 11: Bio-retention Swale Detail

5 *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 likely to be incorporated are silt removal fences, hay bales, catch drains, and water flow dissipation and discharge control devices such as sandbags, pollution mattresses, and basins.

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

Erosion and sediment controls are to be designed, constructed, and installed in accordance with Managing Urban Stormwater: Soils and construction - Volume 1 and maintained until the site is fully stabilised to prevent pollution of the receiving environment. An erosion and sediment control plan will be provided in the civil drawing set.

6 Civil Design

6.1 Earthworks

As the buildings are planned to be raised suspended structures, there are minor earthworks across the site. The earthworks required on the school site to construct the building foundations are cut only. Total earthworks volumes are as follows:

Building A Extension 105m^3

It is expected that excavations would be carried out through mostly fill and natural sands. There is also the presence of ground water at low levels (Douglas Partners Report on Geotechnical Investigation dated June 2022). The excavations should be readily achieved using conventional earthmoving equipment such as tracked excavators.

The excavation supports the vertical excavations within the fill and sand will not be stable. Temporary batters of 1.5H:1V (Horizontal: Vertical) of flatter could be used for the sides of the excavations above the water table, for slopes up to 3 m high. Permanent batters for excavations and embankments should be no steeper than 2H:1V and generally flatter where vegetation maintenance is required or in situations where structures or loading will be applied at the top or crest of the batter. Erosion protection should be provided for all permanent batters. Further advice should be sought if planning excavations below the water table.

The EFSG requires 4:1 (Horizontal: Vertical) batters where no landscaping is provided. Where landscaping is provided, batters can be 3:1.

Emphasis will be given to reducing the impact of the earthworks on existing trees on the site by achieving minimum acceptable batter extents. Refer to **Appendix A** for the bulk earthworks masterplan showing earthworks levels, building footprint and batter extents.

6.2 Pavements

Pavement design is to meet the requirements of the geotechnical investigation provided by Douglas Partners, dated June 2022. A California Bearing Ratio (CBR) of 5% is to be adopted in the pavement design. The value should be confirmed by undertaking CBR tests in accordance with AS1289.6.1.1. Pavement will also be designed to the requirements of 'AUSTROADS Guide to Pavement Technology.' The EFSG Pavement requirements will also be met. The following items are applicable:

- All pavements to be designed for a 25-year life
- For other vehicular traffic areas design for 1.0 x 10^5 repetitions of a standard axle load, as defined by AUSTROADS.
- Allow for movements in the foundations caused by moisture variations and mine subsidence.
- Design rigid pavements so there is no vertical differential movement between panels at joints.
- For truck turning areas pavements shall be rigid in construction and finished with a reinforced concrete surface.
- For other areas pavements may be either flexible or rigid in construction. For flexible construction finish with a surface coat of asphaltic concrete.
- Breccia or dolerite is not to be used in road base or concrete mix.
- Non-skid finish for vehicular trafficked pavements
- Non-slip finish for pedestrian trafficked pavements, including carpark
- AC for roads and parking to be AC10 and have minimum thickness of 40mm or greater as the design requires.
- AC for games courts to be AC5 and have minimum thickness of 25mm levelling course plus 25mm surface course or greater as the design requires.
- Limit fly ash content to 20% of cementitious content of mix by weight.
- For roads and parking areas concrete shall have minimum 32 MPa characteristic compressive strength.
- For rigid method of construction finish with a reinforced concrete surface.
- Concrete pavements for vehicles shall be a minimum 150mm thick and reinforced with not less than SL92 mesh at top and 100 mm thick road base.
- Other concrete pavements shall be a minimum 100mm thick and reinforced with no less than SL72 mesh at top.
- Provide a thicker pavement and heavier mesh as the design requires and to meet durability requirements for minimum cover to reinforcement.
- For flexible construction finish with a surface coat of asphaltic concrete.
- Paving is so fall away from the buildings and covered areas.
- Finished vertical grades to be limited to < 1 in 10. Provide vertical curves where change of grade exceeds 3%. Provide cross-falls, as required.

6.3 Contamination

As part of the Geotechnical Investigation undertaken by Douglas Partners, it was noted that Acid Sulphate Soils (ASS) are expected to be below the groundwater table and an appropriate management plan and controls will be required. Further comments on ASS are provided in the contamination assessment report (reference 86973.04.R.002.Rev0).

Refer to the Douglas Partners Acid Sulphate Management Plan (reference 86973.04.R.004.Rev0) for the treatment and management of ASS which is to be undertaken as a part of early works for this project.

7 Conclusion

The civil works associated with the upgrades of Narrabeen North Public School will be carried out in accordance with normal engineering practice and will meet the requirements of relevant standards.

The subject site lies within a developed land stormwater quality requirements as set out in the NBC Water Management for Developments Policy. Therefore, the existing site has no OSD requirement and is to follow general stormwater quality requirements.

The NBC Water Management for Development Policy requires that habitable floor levels are to have a minimum Finished Floor Level (FFL) of 4.87mAHD, as analysed by BMT. The FFL of the Building A extension does not meet this requirement. However, the proposed development is analysed to be suitable as the floor level is governed by functional requirements to connect to existing Building A and level 1 of the extension provides suitable flood refuge above the PMF level.

The site will utilise a 10m bio-retention swale as well as a minimum of one OceanGuard Ocean Protect pit insert to filter and disperse collected stormwater from the proposed development.

Total preliminary earthworks volume, requiring only cut, is 105m^3 to create a flat platform of 2.20mAHD for the Building A extension. Based on a geotechnical investigation report, most of the site is underlain by fill and natural sands.

Erosion and sediment control measures are to be in place during construction to prevent contamination of the downstream stormwater system and tracking of grit and sediment onto the roadway.

APPENDIX A

CIVIL DRAWINGS

enstruct

CIVIL ENGINEERING WORKS

NARRABEEN EDUCATION PRECINCT

NARRABEEN SPORTS HIGH SCHOOL

10 NAMONA STREET, NORTH NARRABEEN

TO BE PRINTED IN FULL COLOUR

CIVIL ENGINEERING WORKS DRAWING LIST:

6683-CV-0001	COVER SHEET
6683-CV-0002	NOTES SHEET
6683-CV-1001	EROSION AND SEDIMENT CONTROL PLAN
6683-CV-1101	EROSION AND SEDIMENT CONTROL DETAIL SHEET
6683-CV-3001	BULK EARTHWORKS PLAN
6683-CV-4001	STORMWATER DRAINAGE PLAN
6683-CV-4301	STORMWATER DRAINAGE DETAIL SHEET

NOT FOR CONSTRUCTION

rev	date	description	drn	ch'k
01	19/08/22	ISSUE FOR DA	MZV	PAL

rev	date	description	drn	ch'k

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enstruct

project: NARRABEEN EDUCATION PRECINCT

NAMONA STREET STREET, NORTH NARRABEEN, NSW, 2101

drawing title: NARRABEEN SPORTS HIGH SCHOOL COVER SHEET

status: DEVELOPMENT APPLICATION

scale at A1	drawn	checked	approved
	MZV	PAL	PAL

project no.	sheet	rev.
6683	6683-CV-0001	01

A1

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on enstruct drawing's have been based from information received from: C.M.S. SURVEYORS 18830.A.

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.

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.

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.

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.
8. The approval of a substation shall be sought from the superintendant but is not an authorisation of a cost variation. The superintendant must approve any cost variation before any work starts

CONCRETE 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

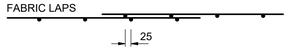
2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on drawings.

Footings - 50 top, 50 bottom, 50 sides.

Walls - 30 generally.
- 30 when cast in forms but later exposed to weather or ground.
- .. 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.

FABRIC LAPS



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

SURVEY AND SERVICES INFORMATION

SURVEY

Origin of levels : SSM 40541
Datum of levels : A.H.D. AUSTRALIAN HEIGHT DATUM
Coordinate system : MGA (GDA 2020)
Survey prepared by : C.M.S. SURVEYORS PTY LTD.
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 = 271 mm/hr
5% AEP = 203 mm/hr
(C) Rainfall losses -
Impervious areas: IL= 1.0 mm , CL = 0 mm/hr
Pervious areas: IL= 41mm , CL = 1.8 mm/hr

2. Pipes 300 dia and larger to be reinforced concrete Class "2" approved spigot and socket with rubber ring joints U.N.O. Pipes in public roadways (including public domain) to be class 4 reinforced concrete.
3. Pipes up to 300 dia may be sewer grade uPVC with solvent welded joints, subject to approval by the engineer
4. Equivalent strength VCP or FRP pipes may be used subject to approval.
5. Pits in roadways (including public domain) are to be insitu to council details.
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 downpipe connections are to be 150mm DIA or the same size as the downpipe (whichever is larger) laid at 1% minimum fall connection to the nearest pit. Minimum cover 450mm in landscaped areas.
12. Subsoil drains to be slotted flexible uPVC U.N.O.
13. Adopt invert levels for pipe installation (grades shown are only nominal).

DBYD SERVICES NOTE

"Public Service Utility information shown on plan has been complied from information received from Dial Before You Dig inquiry, reference Number **31037191**, which was obtained on 07/12/21. 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."

STORMWATER PIT SCHEDULE

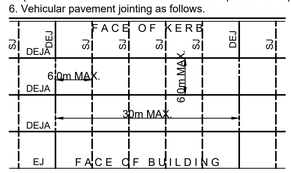
Note: Grate size does not necessarily reflect pit size, refer pit type details, shown on detail sheets - CV4301
Final internal pit dimensions are to comply with AS3500

Type	Description	Size	Class	Water Quality	Material	Number
B	Surface inlet pit	600x 900	D	Litter basket	Galvanised mild steel grate hinged to frame	B1, B2, B3, B4, B5, B6, B7, B8
C	Junction pit	600x 900	D		Cast iron cover with concrete infill	C1
D	Existing pit to be demolished and removed					D1, D2
E	Existing pit to remain					E1, E2, E3

JOINTING NOTES

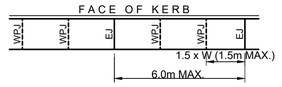
Vehicular Pavement Jointing

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).



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	S20	80	20
Pavements	S32	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. For all falls in slab, drip grooves, reglets, chamfers etc. refer to Architects drawings and specifications.
5. Unless shown on the drawings, the location of all construction joints shall be submitted to Engineer for review.
6. No holes or chases shall be made in the slab without the approval of the Engineer.
7. Conduits and pipes are to be fixed to the underside of the top reinforcement layer.
8. Slurry used to lubricate concrete pump lines is not to be used in any structural members.
9. 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.

KERBING NOTES

Includes all kerbs, gutters, dish drains, crossings and edges.

1. All kerbs, gutters, dish drains and crossings to be constructed on minimum 75mm granular basecourse compacted to minimum 98% modified maximum dry density in accordance with AS 1289 5.2.1.
2. Expansion joints (EJ) to be formed from 10mm compressible cork filler board for the full depth of the section and cut to profile. Expansion joints to be located at drainage pits, on tangent points of curves and elsewhere at 12m centres except for integral kerbs where the expansion joints are to match the joint locations in slabs.
3. Weakened plane joints to be min 3mm wide and located at 3m centres except for integral kerbs where weakened plane joints are to match the joint locations in slabs.
4. Broomed finished to all ramped and vehicular crossings, all other kerbing or dish drains to be steel float finished.
5. In the replacement of kerbs - Existing road pavement is to be sawcut 900mm from: Lip of gutter, invert of kerb, or edge of dish drain. Upon completion of new kerbs, new basecourse and surface is to be laid 900mm wide to match existing materials and thicknesses.
6. Existing allotment drainage pipes are to be built into the new kerb with a 100mm dia hole.
7. Existing kerbs are to be completely removed where new kerbs are shown.

SAFETY IN DESIGN

Contractor to refer to the Civil Risk and Solutions Register.

EXISTING SERVICES

Contractor to be aware existing services are located within the site. Location of all services to be verified by the Contractor prior to commencing works. Contractor to confirm with relevant authority regarding measures to be taken to ensure services are protected or procedures are in place to demolish and/or relocate.

EXISTING STRUCTURES

Contractor to be aware existing structures may exist within the site. To prevent damage to existing structure(s) and/or personnel, site works to be carried out as far as practicably possible from existing structure(s).

EXISTING TREES

Contractor to be aware existing trees exist within the site which need to be protected. To prevent damage to trees and/or personnel, site works to be carried out as far as practicably possible from existing trees. Advice needs to be sought from Arborist and/or Landscape Architect on measures required to protect trees.

GROUNDWATER

Contractor to be aware ground water levels are close to existing surface level. Temporary de-watering may be required during construction works.

EXCAVATIONS

Deep excavations due to stormwater drainage works is required. Contractor to ensure safe working procedures are in place for works. All excavations to be fenced off and batters adequately supported to approval of Geotechnical Engineer.

GROUND CONDITIONS

Contractor to be aware of the site geotechnical conditions. Refer to geotechnical report by Douglas Partners for details.

HAZARDOUS MATERIALS

Existing asbestos products & contaminated material may be present on site. Contractor to ensure all hazardous materials are identified prior to commencing works. Safe working practices as per relevant authority to be adopted and appropriate PPE to be used when handling all hazardous materials. Refer to geotechnical/environmental report by Douglas Partners for details.

CONFINED SPACES

Contractor to be aware of potential hazards due to working in confined spaces such as stormwater pits, trenches and/or tanks. Contractor to provide safe working methods and use appropriate PPE when entering confined spaces.

MANUAL HANDLING

Contractor to be aware manual handling may be required during construction. Contractor to take appropriate measures to ensure manual handling procedures and assessments are in place prior to commencing works.

WATER POLLUTION

Contractor to ensure appropriate measures are taken to prevent pollutants from construction works contaminating the surrounding environment.

SITE ACCESS/EGRESS

Contractor to be aware site works occur in close proximity to footpaths and roadways. Contractor to erect appropriate barriers and signage to protect site personnel and public.

VEHICLE MOVEMENT

Contractor to supply and comply with traffic management plan and provide adequate site traffic control including a certified traffic marshall to supervise vehicle movements where necessary.

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

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project
NARRABEEN EDUCATION PRECINCT

NAMONA STREET STREET, NORTH
NARRABEEN, NSW, 2101

drawing title
NARRABEEN SPORTS HIGH SCHOOL
NOTES SHEET

status
DEVELOPMENT APPLICATION

scale at A1	drawn	checked	approved
NTS	MZV	PAL	PAL

project no.	sheet	rev.
6683	6683-CV-0002	02

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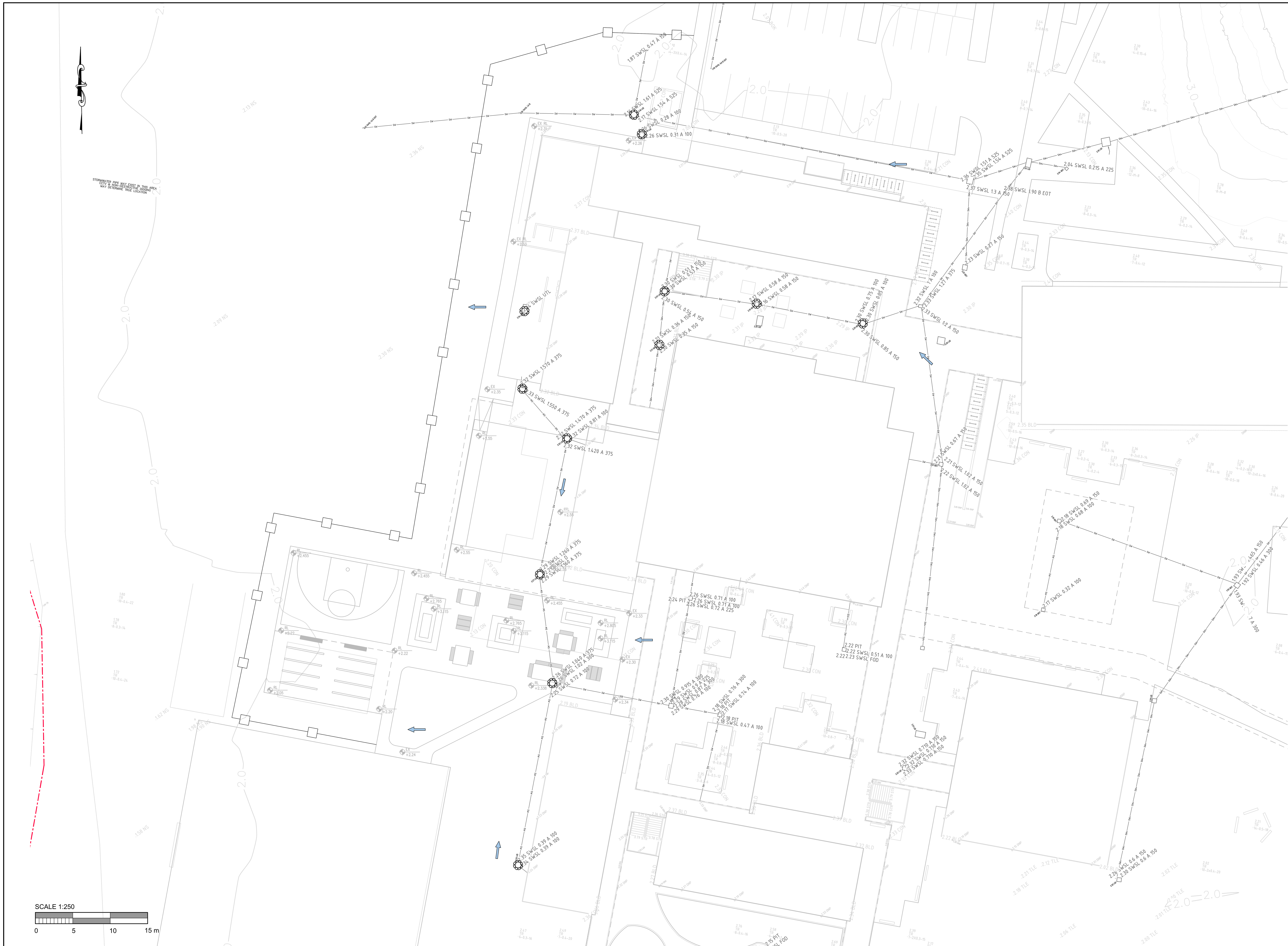

LEGEND

- Siltation Fence
- Sandbag Sediment Trap
- Overland Flow Path

EROSION AND SEDIMENT CONTROL NOTES

1. All work shall be generally carried out in accordance with
   (A) Local authority requirements,
   (B) EPA - Pollution control manual for urban stormwater,
   (C) LANDCOM NSW - Managing Urban Stormwater: Soils and Construction ("Blue Book").
2. Erosion and sediment control drawings and notes are provided for the whole of the works. Should the Contractor stage these works then the design may be required to be modified. Variation to these details may require approval by the relevant authorities.
   The erosion and sediment control plan shall be implemented and adapted to meet the varying situations as work on site progresses.
3. Maintain all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
4. When stormwater pits are constructed prevent site runoff entering the pits unless silt fences are erected around pits.
5. Minimise the area of site being disturbed at any one time.
6. Protect all stockpiles of materials from scour and erosion. Do not stockpile loose material in roadways, near drainage pits or in watercourses.
7. All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
8. Control water from upstream of the site such that it does not enter the disturbed site.
9. All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
10. All vehicles leaving the site shall be cleaned and inspected before leaving.
11. Maintain all stormwater pipes and pits clear of debris and sediment. Inspect stormwater system and clean out after each storm event.
12. Clean out all erosion and sediment control devices after each storm event.

Sequence Of Works

1. Prior to commencement of excavation the following soil management devices must be installed.
1.1. Construct silt fences below the site and across all potential runoff sites.
1.2. Construct temporary construction entry/exit and divert runoff to suitable control systems.
1.3. Construct measures to divert upstream flows into existing stormwater system.
1.4. Construct sedimentation traps/basin including outlet control and overflow.
1.5. Construct turf lined swales.
1.6. Provide sandbag sediment traps upstream of existing pits.
2. Construct geotextile filter pit surround around all proposed pits as they are constructed.
3. On completion of pavement provide sand bag kerb inlet sediment traps around pits.
4. Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.

WATER QUALITY TESTING REQUIREMENTS

Prior to discharge of site stormwater, groundwater and seepage water into council's stormwater system, contractors must undertake water quality tests in conjunction with a suitably qualified environment consultant outlining the following:

- Compliance with the criteria of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- If required subject to the environmental consultants advice, provide remedial measures to improve the quality of water that is to be discharged into Councils storm water drainage system.This should include comments from a suitably qualified environmental consultant confirming the suitability of these remedial measures to manage the water discharged from the site into Councils storm water drainage system. Outlining the proposed, ongoing monitoring, contingency plans and validation program that will be in place to continually monitor the quality of water discharged from this site. This should outline the frequency of water quality testing that will be undertaken by a suitably qualified environmental consultant.

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NARRABEEN EDUCATION PRECINCT
NAMONA STREET STREET, NORTH NARRABEEN, NSW, 2101

drawing title
NARRABEEN NORTH PUBLIC SCHOOL EROSION AND SEDIMENT CONTROL PLAN

status
DEVELOPMENT APPLICATION

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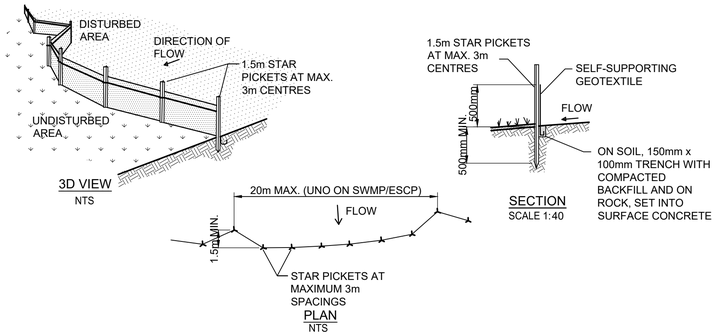
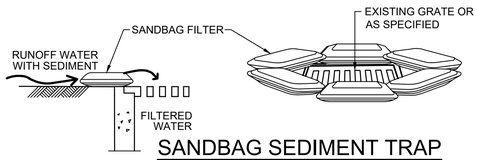


SILTATION FENCE DETAIL

NOTES
1. CONSTRUCT SEDIMENT FENCE AS CLOSE AS POSSIBLE TO PARALLEL TO THE CONTOURS OF THE SITE.
2. DRIVE 1.5m LONG STAR PICKETS INTO GROUND, 3 METRES APART.
3. DIG A 200mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
4. BACKFILL TRENCH OVER BASE OF FABRIC.
5. FIX SELF-SUPPORTING GEOTEXTILE TO UPSLOPE SIDE OF POSTS WITH WIRE TIES OR AS RECOMMENDED BY GEOTEXTILE MANUFACTURER.
6. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.



SANDBAG SEDIMENT TRAP
NTS

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NARRABEEN, NSW, 2101

drawing title
NARRABEEN SPORTS HIGH SCHOOL
EROSION AND SEDIMENT CONTROL DETAIL SHEET

status
DEVELOPMENT APPLICATION

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project no.	sheet	rev.
6683	6683-CV-1101	01

A1

TEMPORARY BATTER SLOPE AT 2(H):1(V)

PROPOSED BUILDING LINE

PROPOSED AWNING

FFL 2.55
BE 2.20

FFL 3.32
BE 2.20

FFL 2.42
BE 2.07

SCALE 1:250

0 5 10 15 m

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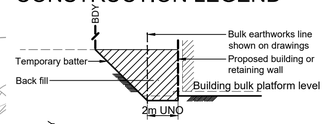
BULK EARTHWORKS LEGEND

Batter

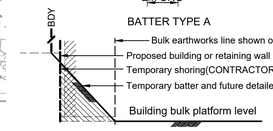
BE 22.00 Bulk earthworks platform level

Flat platforms shown as hatched

BULK EARTHWORKS CONSTRUCTION LEGEND



BATTER TYPE A



BATTER TYPE C

NOTE

1. * Bulk Earthworks level = Finish surface - Pavement/slab thickness
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 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 GENERAL NOTES

1. All bulk earthworks setout from grid lines U.N.O.
2. (i) All permanent batter at slope of 4(H) :1(V) U.N.O.
   (ii) All temporary batter at slope of 2(H) :1(V) U.N.O.
3. 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 GRANULAR fill U.N.O.
6. Contractor to provide proof roll compaction evidence for signoff.
7. Contractor shall place safety barriers around excavations in accordance with relevant safety regulations.
8. For interpretation of bulk earthworks foot print line shown on the bulk earthworks drawings refer to the bulk earthworks construction legend.
9. Bulk earthwork drawings are not to be used for detailed excavation.
10. Refer to Geotechnical Report prepared by - DOUGLASPARTNERS NO.86973.00

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NARRABEEN EDUCATION PRECINCT

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NARRABEEN, NSW, 2101

drawing title
NARRABEEN SPORTS HIGH SCHOOL
BULK EARTHWORKS PLAN

status
DEVELOPMENT APPLICATION

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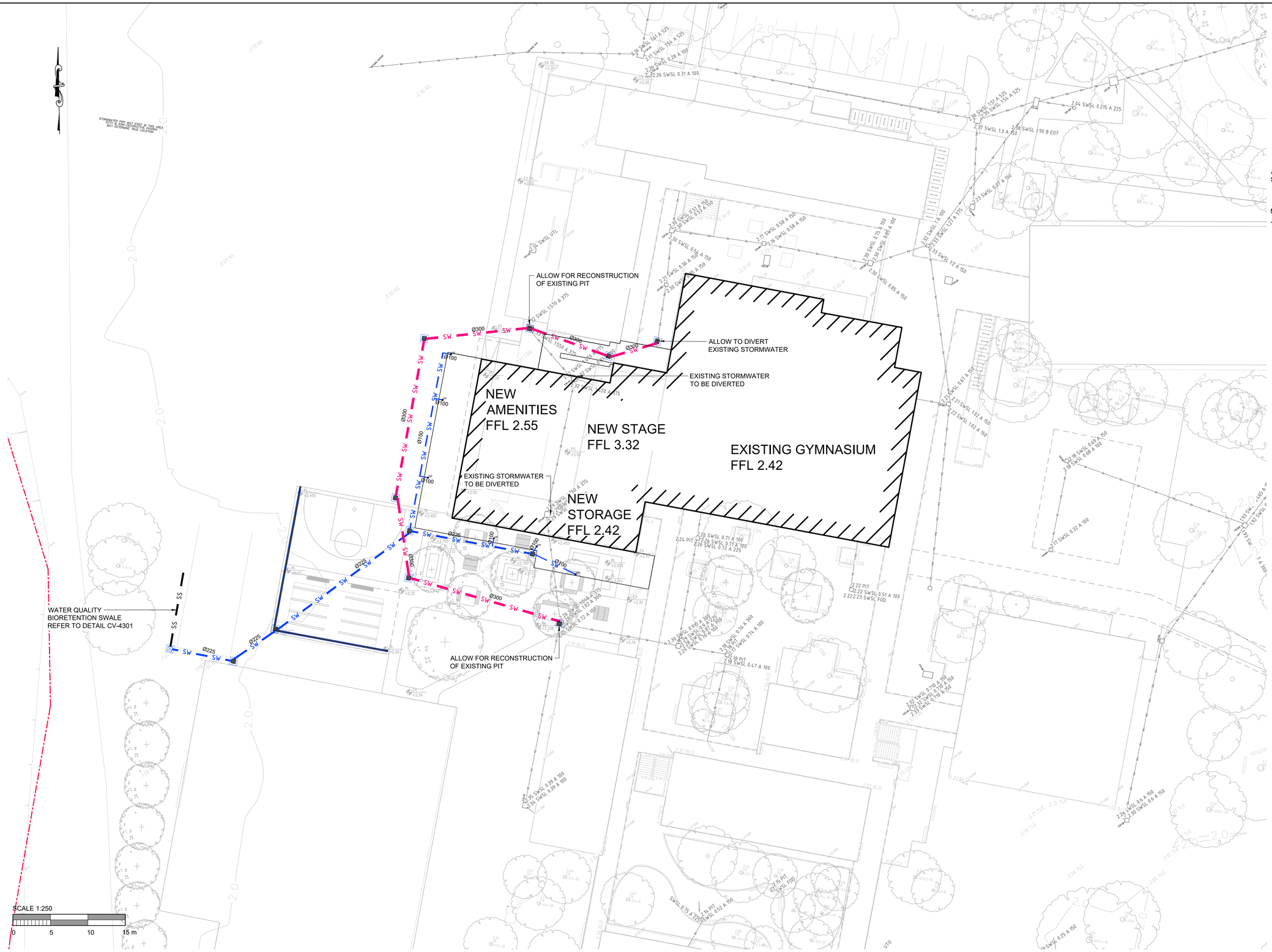

LEGEND

- Existing Stormwater
- Proposed Stormwater
- Building Extent
- Bioretention Swale
- Proposed Grated Pit
- Proposed Junction Pit
- Proposed Linear Drain
- Proposed Stormwater Diversion
- Proposed Downpipes

STORMWATER DRAINAGE EFSG NOTES

All minimum pipe sizes are to be in accordance with ESFG Section 95.08:

- DN 100 for subsoil drainage
- DN 225 downstream of any grated pit
- DN 225 downstream of any side entry pit

Minimize the extent of pipe runs under building slabs.

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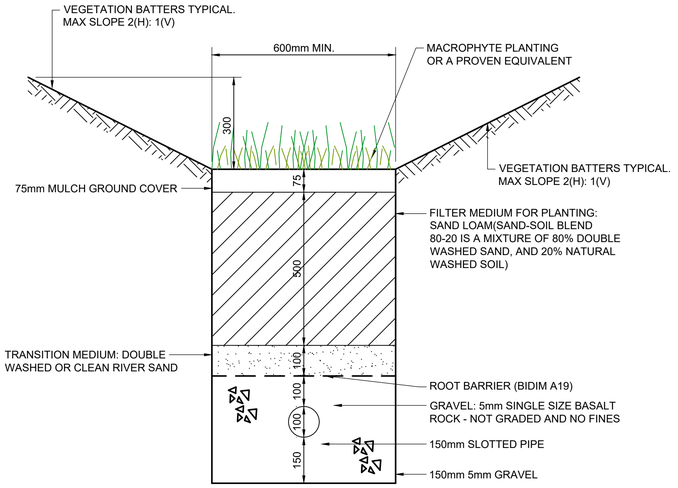
NAMONA STREET STREET, NORTH NARRABEEN, NSW, 2101

drawing title: NARRABEEN SPORTS HIGH SCHOOL STORMWATER DRAINAGE PLAN

status: DEVELOPMENT APPLICATION

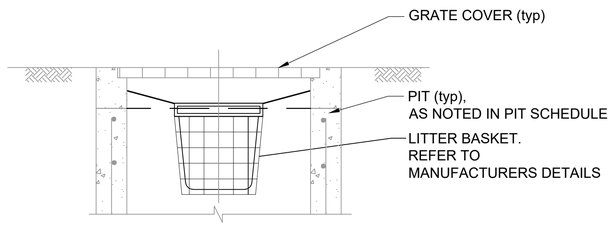
scale at A1	drawn	checked	approved
1:250	MZV	PAL	PAL

project no.	sheet	rev.
6683	6683-CV-4001	02



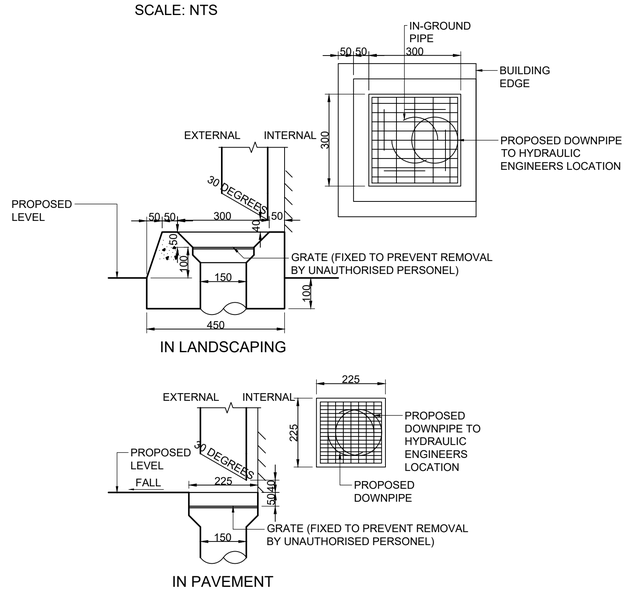
BIORETENTION SWALE (BRS)

SCALE 1:10

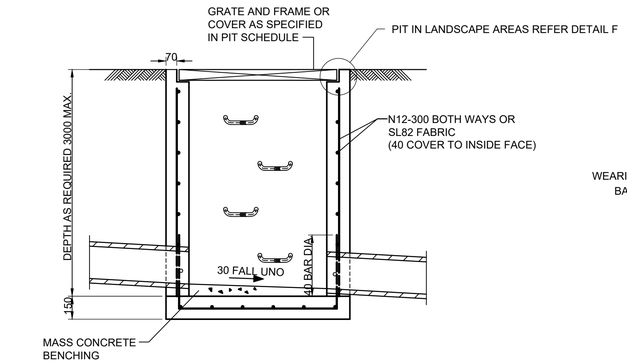


TYPICAL GROSS POLLUTANT TRAP (GPT) PIT BASKET INSERT

SCALE: NTS

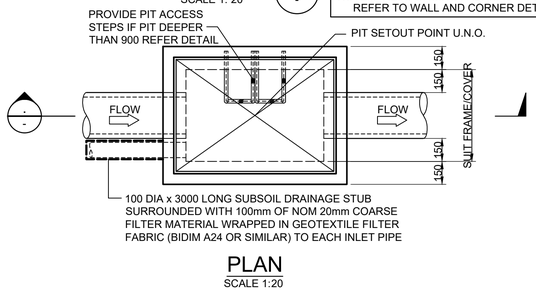


SCHOOL DOWNPIPE DETAILS



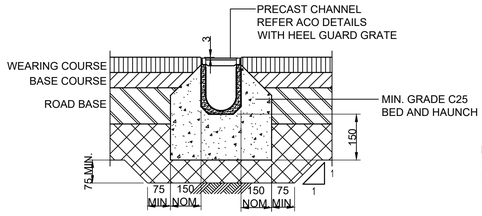
SECTION . - .
SCALE 1: 20

NOTE:IF REINFORCING FABRIC IS TO BE USED
REFER TO WALL AND CORNER DETAILS



PLAN
SCALE 1:20

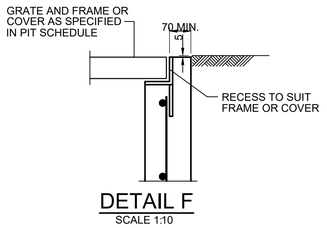
PIT TYPE C - IN-SITU REGULAR JUNCTION PIT



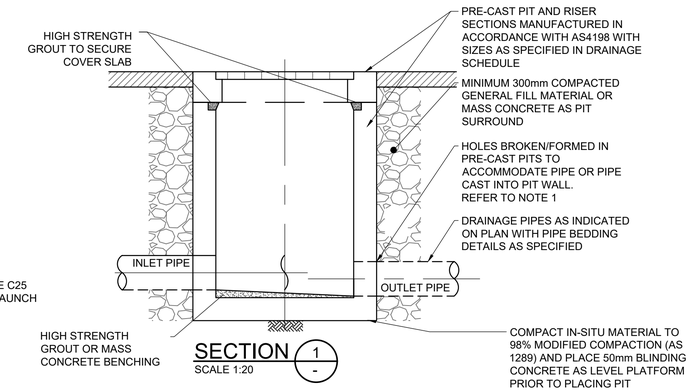
NOTE:
1. THE CHANNEL MUST NOT BE TRAFFICKED
UNTIL WEARING COURSE IS LAID

GRATED DRAIN TYPE D (GDD)

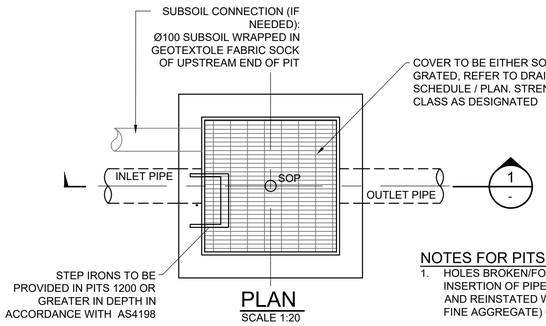
SCALE 1:10



DETAIL F
SCALE 1:10



SECTION 1 / -
SCALE 1:20

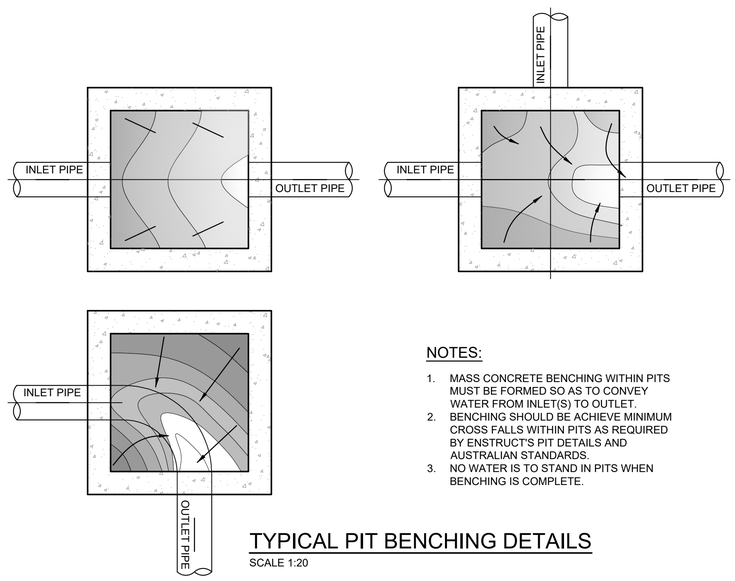


PLAN
SCALE 1:20

NOTES FOR PITS:
1. HOLES BROKEN/FORMED IN PRE-CAST PITS FOR THE INSERTION OF PIPES SHALL BE MADE WATERTIGHT AND REINSTATED WITH A STIFF MORTAR (3 CEMENT:1 FINE AGGREGATE) OR EPOXY BASED SEALANT.

PIT TYPE B - PRECAST PIT DETAIL

SCALE 1:20

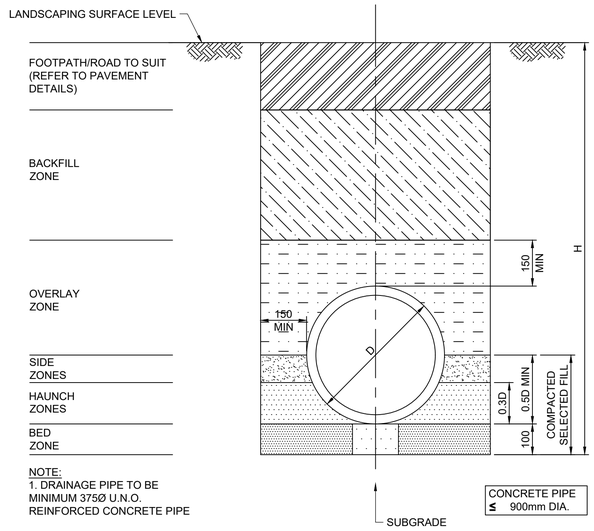


NOTES:

1. MASS CONCRETE BENCHING WITHIN PITS MUST BE FORMED SO AS TO CONVEY WATER FROM INLET(S) TO OUTLET.
2. BENCHING SHOULD BE ACHIEVE MINIMUM CROSS FALLS WITHIN PITS AS REQUIRED BY ENSTRUCT'S PIT DETAILS AND AUSTRALIAN STANDARDS.
3. NO WATER IS TO STAND IN PITS WHEN BENCHING IS COMPLETE.

TYPICAL PIT BENCHING DETAILS

SCALE 1:20



NOTE:
1. DRAINAGE PIPE TO BE
MINIMUM 375Ø U.N.O.
REINFORCED CONCRETE PIPE

TYPICAL TRENCH 'HS' SUPPORT BACKFILL DETAIL

SCALE 1:10

TO BE PRINTED IN FULL COLOUR

NOT FOR CONSTRUCTION

rev	date	description	drn	ch'k
B	15/12/22	REISSUE FOR DA - BIOSWALE ALTERED	MZV	PAL
A	28/09/22	ISSUE FOR SD	MZV	PAL
01	19/08/22	ISSUE FOR DA	MZV	PAL

rev	date	description	drn	ch'k

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NAMONA STREET STREET, NORTH
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drawing title
NARRABEEN SPORTS HIGH SCHOOL STORMWATER DRAINGE DETAIL SHEET

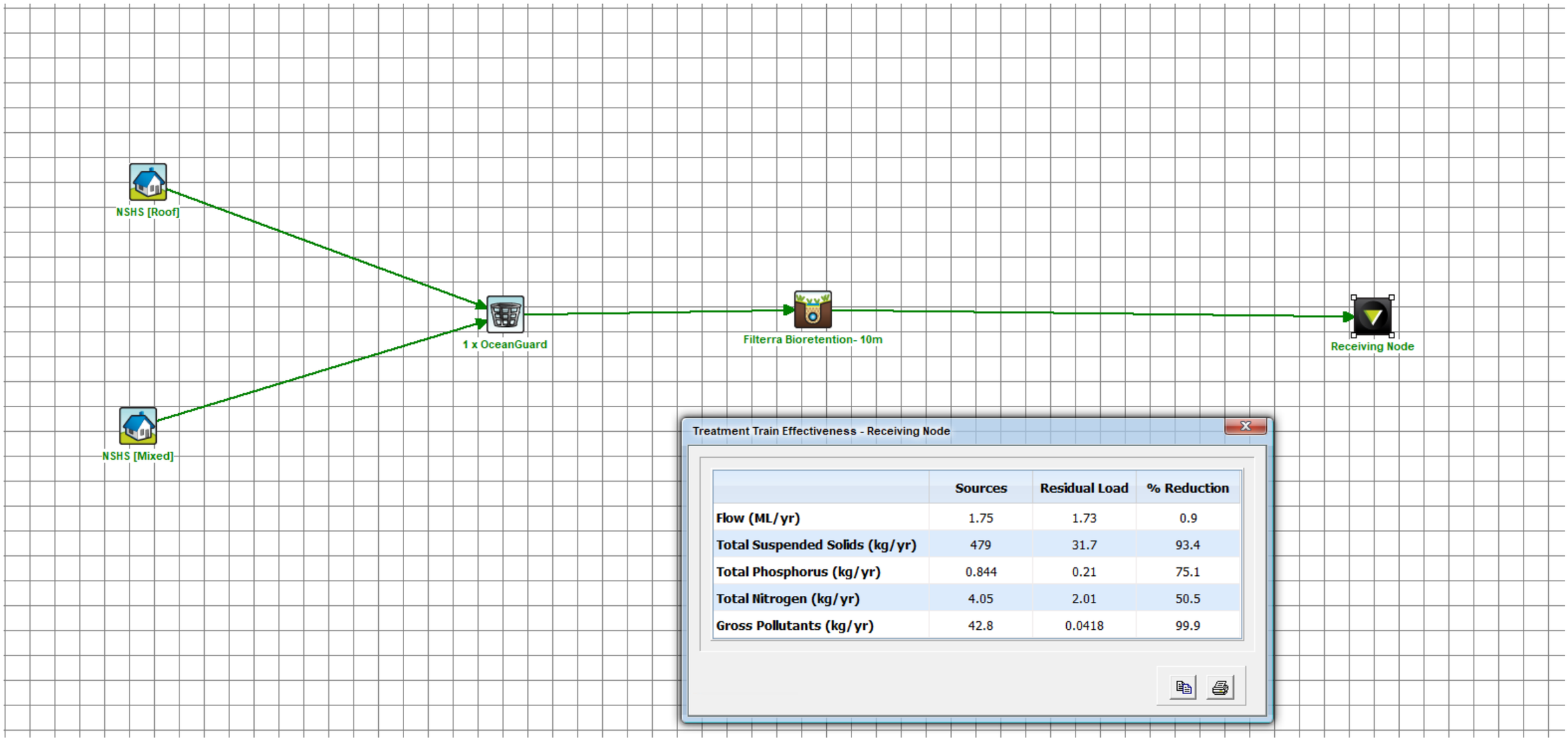
status: FOR INFORMATION

scale at A1	drawn	checked	approved
AS SHOWN	MZV	PAL	PAL

project no.	sheet	rev.
6683	6683-CV-4301	B

APPENDIX B

MUSIC MODEL



	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.75	1.73	0.9
Total Suspended Solids (kg/yr)	479	31.7	93.4
Total Phosphorus (kg/yr)	0.844	0.21	75.1
Total Nitrogen (kg/yr)	4.05	2.01	50.5
Gross Pollutants (kg/yr)	42.8	0.0418	99.9