Hunter River High School

Stormwater Management Report

Prepared for:	**NSW Department of Education**
Date:	**18th July 2023**
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Revision

Site Address:	36 Elkin Avenue, Heatherbrae, NSW 2324
Real Property Description:	Lot 1, DP120189 Lot 1, DP579025 Lot 1, DP540114
Proposed Development:	Educational Facility
Client:	NSW Department of Education
Local Authority	Port Stephens Council
Authority Reference #:	N/A
Stantec Reference:	301350957-SWMP_005

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Revision	Date	Comment	Prepared By	Approved By
001	26.07.22	Draft Schematic Design	JMB	RET
002	08.08.22	Final Schematic Design	JMB	RET
003	13.04.23	Revised Schematic Design	JMB	RET
004	20.04.23	Revised Schematic Design	JMB	RET
005	18.07.23	Issue for DA	JMB	JMB

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1. Introduction

Stantec have been commissioned by NSW Department of Education to prepare this Stormwater Management Plan (SWMP) in support of the approval for the proposed additions to the existing High School development at 36 Elkin Avenue, Heatherbrae NSW 2324.

This report has been prepared to support:

a) A development application for the construction of a Construction of gymnasium (Block Y), consisting of a basketball court, equipment storage, canteen kitchen, staff room, first aid room and change room amenities, construction of hardstand civic space north of the gymnasium, construction of full-size rugby field, the construction of new carpark consisting of sixty-five (65) parking spaces (including 6 accessible parking spaces) and the construction and connection of a reticulated sewer pipe.

b) A Part 5 Activity Approval, development permitted without consent, for the construction of a new administration building, student learning hub and provision of essential services.

c) A Part 5 Activity Approval, development permitted without consent, for the construction of a new linking road and kiss and drop bay between Adelaide Street and Elkin Avenue.

This SWMP outlines the conceptual level stormwater design for the proposed development of an upgraded secondary school.

This SWMP illustrates that the proposed development complies with the conditions set out by Port Stephens Council, Australian Rainfall and Runoff, Australian Standards and best engineering practices.

The purpose of this SWMP is to evaluate the quantity and quality of stormwater associated with the proposed development plan so as to demonstrate to Council that an appropriate stormwater management strategy has been adopted.

This SWMP specifically addresses the following items for both the construction and operational phases of the development:

- Stormwater runoff volumes;
- Stormwater quality treatment measures;
- Water Sensitive Urban Design (WSUD) measures
- Erosion Sedimentation Control
- Stormwater Network Maintenance during Operation

The following will be achieved with the correct application of this SWMP report:

- Appropriate standards to be maintained on all aspects of stormwater within the site,
- Pollution control to be maintained,
- Establishment of a unified, clear, and concise stormwater management strategy.

2. Abbreviations Definitions

- **AEP** Annual Exceedance Probability
- **AHD** Australian Height Datum
- **ARI** Average Recurrence Interval
- **ARR** Australian Rainfall and Runoff
- **DA** Development Application
- **DCP** Development Control Plan
- **DN** Diameter Nominal (mm)
- **EY** Exceedances per Year
- **GPT** Gross Pollutant Trap
- **IFD** Intensity-Frequency-Duration
- **IL** Invert Level
- **L/s** Litres per second
- **m/s** Metres per second
- **MUSIC** Model for Urban Stormwater Improvement Conceptualisation
- **OSD** On-site Stormwater Detention
- **PSD** Permissible Site Discharge
- **RCP** Reinforced Concrete Pipe
- **RL** Relative Level
- **SID** Safety In Design
- **SQID's** Stormwater Quality Improvement Devices
- **SSR** Site Storage Requirement
- **WQO's** Water Quality Objectives
- **WSC** Water Services Coordinator
- **WSUD** Water Sensitive Urban Design

3. Relevant Policies, Standards and Guidelines

The following listed policies, standards and guidelines were referred to in the preparation of this report:

- Port Stephens Council DCP (Section B General Provisions) 2022
- Port Stephens 0074 Stormwater Drainage Design (Development Design Specification) 2022
- Port Stephens 0043 Subsurface Drainage Design (Development Design Specification) 2022
- Australian Rainfall & Runoff 2016;
- AS3500 parts 0-5: 2013 Plumbing and Drainage
- Landcom Managing Urban Stormwater: Soils and Construction Volume 1 2004
- NSW Floodplain Development Manual 2005
- Guidelines for development adjoining land and water managed by DECCW (OEH, 2013)
- Educational Facilities Standards & Guidelines (EFSG), NSW Department of Education

4. Existing Site Characteristics

4.1 Property Detail

The proposed development forms part of the site with the following property details:

Site Address:	36 Elkin Avenue, Heatherbrae, NSW 2324
Real Property Description:	Lot 1, DP120189 Lot 1, DP579025 Lot 1, DP540114
Development Area:	Approximately 92,350 m^2 (9.235 Ha)

The proposed development can be seen on the Civil Design Documentation shown in Appendix A of this report.

The proposed development consists of refurbishment of existing buildings as well as additional school buildings, carparking changes to the bus drop-off/ pick-up facilities, as well as external general open play and sporting fields/ facilities.

The overall site is bounded by:

- Residential Neighbouring Properties to the North and South
- The Pacific Highway to the East
- Agricultural lots/ Floodplain to the West

Refer to locality plan in Figure 1 for further clarification.

Figure 1: Site Location Plan (Source: Nearmaps 2022)

4.2 Topography

The local topography around the site is extremely flat, as indicated in Figure 2 below. The high point of the site is located along the South-East boundary at a level of RL 7.5 m AHD and the low point located along the North-Western boundary at a level of RL 2 m AHD, this is an average slope of approximately 1%.

Figure 2: Site Topography (Mecone Mosaic 2022)

4.3 Stormwater Catchments

The surrounding area has been investigated to determine the likely impact of existing external stormwater catchments on the proposed site.

The site is currently surrounded by developments and roadway, so it is believed that no external catchments other than the flooding discussed in following sections impact the development site.

4.4 Existing Stormwater Infrastructure

Stormwater runoff generated from hardstand area is currently either collected and conveyed via pit and pipe network or runs overland on to pervious landscape surfaces. While there are multiple piped systems across the site, for the most part captured stormwater is ultimately conveyed and discharged to the western portion of the site within the school's agricultural area. No connection to external trunk drainage stormwater lines existing within the site and runoff is managed via absorption and runoff to the north west of site.

4.5 Existing Stormwater Discharge

Northrop's site observations (2020), determine that ultimately, stormwater collected within the formal pit and pipe drainage network discharges to the west of the main school buildings within the lower elevation school agricultural area. Stormwater is discharged via infiltration, with no connection to Council stormwater infrastructure identified.

Refer to Figure 3 for further information.

Figure 3: Stormwater Discharge

4.6 Approvals Staging

The proposed stormwater infrastructure for this proposed development is to be approved in various stages, with the majority of the site's network to be approved under a Development Application (Ref: 16-2023-259-1). Parts of the stormwater network connecting into the stormwater network approved under the Development Application will be approved under two REFs. For the purpose of understanding design performance of the completed network, this report and design documentation assumes all items have been approved. However, the stormwater network relevant to this Development Application have been identified within Figure 4 below (area in red).

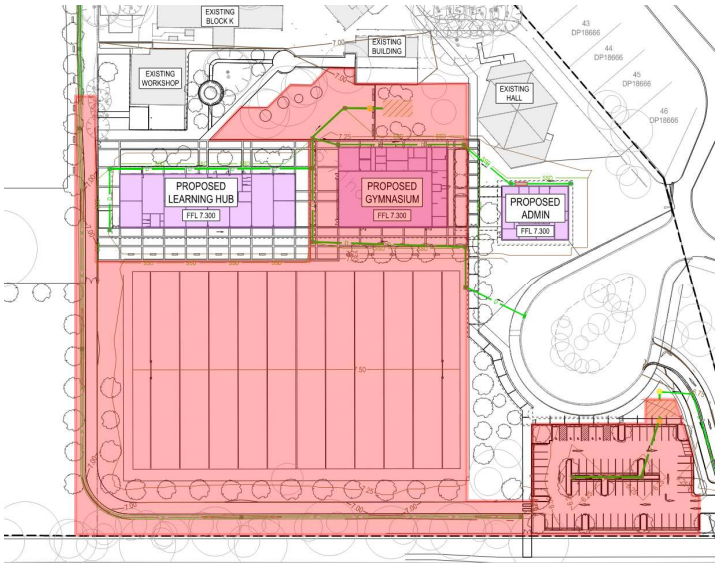


Figure 4: Stormwater for Approval Under Application 16-2023-259-1

5. Local Authority Requirements

Design requirements for stormwater management on the site have been set out in The Port Stephens Council DCP (2022). These requirements are summarised in the sections below.

5.1 Stormwater Conveyance Requirements

The Port Stephens Council DCP (2022) states that the following design storm Annual Exceedance Probabilities (AEP)'s should be allowed for when designing the Stormwater runoff conveyance systems for the development.

Design Parameter	Annual Exceedance Probability (AEP)	Conveyance Method
Minor Drainage System	10% Flood Event	In Ground (Piped)
Major Drainage System	1% Flood Event	Overland

Table 1: Stormwater Drainage Serviceability

However, the Educational Facilities Standards & Guidelines (EFSG) nominates that "*Design the inground drainage piped system for a 20 year ARI Storm event or to the requirements of the Local Council whichever is more severe. Provide above ground overland flow paths for 100 year ARI storm events in accordance to NSW Floodplain Management Manual (2001).*"

For the minor drainage system, a 5% AEP storm event will be adopted, aligning with the EFSG's 20yr ARI storm event. For major drainage, Council and the EFSG policies align and will be adopted.

5.2 Infiltration System Requirements

According to the Port Stephens Council DCP (2022), on-site infiltration is required where post-development flow rate or volume exceeds the pre-development flow rate or volume, exceeds the total percentage of site area. The on-site infiltration system is to be sized so that post-development flow rate and volume equals the pre-development flow rate and volume for all storm events up to and including the 1% AEP.

The on-site infiltration system should be provided by either underground chambers, surface storage or a combination of the two and positioned under grassed areas for any cellular system, or under hardstand areas such as driveways or any concrete tank structures.

An on-site infiltration system is an alternative to a traditional pit and pipe stormwater network. Geotechnical investigations and Council soil mapping indicate that the site subsurface conditions could cater for this type of system.

Infiltration based systems can be provided in a variety of forms and will need to be explored during the design process. Providing an infiltration system will allow the reduction in any proposed stormwater pit and pipe sizes, as well as the removal of the main trunk line.

5.3 Stormwater Quality

The Port Stephens Council DCP (2022) states that the post-development stormwater runoff quality shall be improved to achieve the following reduction targets when compared to pre-development levels:

Total Suspended Solids	90% reduction in the average annual load of Total Suspended Solids
Total Nitrogen	45% reduction in the average annual load of Total Nitrogen
Phosphorus	60% reduction in the average annual load of Total Phosphorus

Gross Pollutants	90% reduction in the average annual load of Gross Pollutants (>5mm)

Table 2: Pollution Reduction Targets

6. Flood Impact Assessment

When considering a new development, it is important to assess the impact of existing flooding on the proposed development and also the impact of the proposed development on existing or potential flooding both upstream and downstream of the development.

6.1 Existing Flooding

6.1.1 Regional Flooding

A flood impact assessment report has been undertaken by BMT. The following outlines a summary of the extent of the report.

Runoff contributing to Hunter River forms the basis for flooding of the site. Substantial flood warning time of the order of days is anticipated through the lower Hunter.

The subject site is exposed to flooding during the 1% AEP (otherwise referred to as the 1 in 100yr flood event). During a 1% AEP flood event, floodwaters are expected to approach the site from the west inundating the low-lying school agricultural area. Flood waters during this event are expected to reach 4.7m AHD, and PMF levels are anticipated to reach 8.5m AHD. The corresponding flood planning level of 5.7m AHD is provided for the site.

Table 3 below summarises these flood levels.

Flood Levels	
Probable maximum flood level	8.5m AHD
Current day 1% AEP flood level	4.7m AHD
Adaptable minimum floor level	5.7m AHD

Table 3: Site Flood Levels

During the PMF event the existing buildings are expected to be inundated with flood waters up to approximately 1.5m in depth. While early evacuation is the recommended response to a PMF event (i.e. onsite refuge is not recommended), however should onsite refuge be desired then an adequate refuge area should be provided to house student and staff at a level about 8.5m AHD. Response time to peak flood levels during the PMF event is expected to be in the order of days for this site, and therefore sufficient response time should be available to safely evacuate the site prior to any buildings being inundated.

If not already in place, it is recommended a Flood Emergency Response Plan (FERP) is produced and implemented as part of the development. If there is a current FERP available for the site, then it is recommended this is reviewed and updated to align with current Council requirements and industry standards.

Refer to Figure 4 for 1% AEP design event flood depths.

The proposed design aims to have all new infrastructure functional and out of the 1% AEP flood extents.

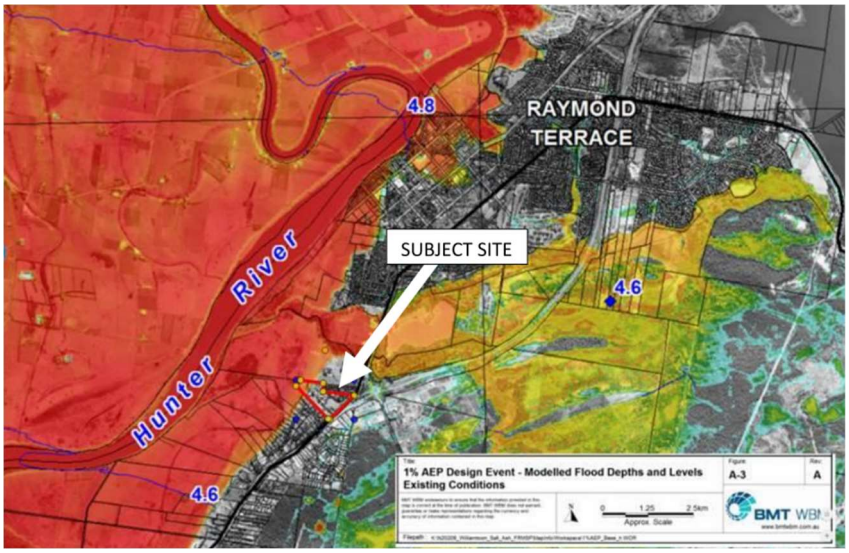


Figure 4: 1% AEP Design Event Flood Depths

6.1.2 Local Flooding

Local or Nuisance flooding describes flooding occurring due to site specific constraints. Local flooding is often caused by local topographical constraints and stormwater drainage system capacity restrictions.

The topography of the site is such that there is no risk of local flooding on the site as it currently exists.

6.2 Flood Impacts

As previously mentioned, the proposed site is flood affected. The site currently has a major overland flow path from the South to the North-West.

This overland flow path mitigates impacts of flooding on the proposed development as well as impact from the development on existing flooding a channel through the site has been designed to control the flood water.

The overland flow path will follow the natural grade of the site from South to the North-West of the site, where it will discharge into the existing infiltration/ discharge area. It has been designed such that there are no building entrances or wall penetrations located in the overland flow path.

7. Stormwater Conveyance

This section of the report discusses the systems proposed to allow for stormwater to be conveyed across the site to the legal point of discharge.

As discussed in Section 5.1 of this report council have set serviceability requirements for the stormwater conveyance network such that minor flows are conveyed through piped drainage, and major flows are discharged via controlled overland flow.

7.1 Roof Drainage

The drainage system will be designed in accordance with AS3500.3-2003 to convey the minor design storm runoff from the roof to the in-ground drainage system. For storm events exceeding the design storm event, flows will surcharge the roof drainage system and discharge onto the surrounding ground where it will then convey through the inground pits to the stormwater network within the site.

7.2 Surface Drainage

The surface areas will be drained through a variety of methods, discussed below, in accordance with AS3500.3:2003 and Council's stormwater drainage guidelines.

7.2.1 In Ground Drainage

The in-ground drainage has been designed to meet the following criteria:

- In the minor design storm event (5% AEP) there will be no surcharging of the in-ground drainage system and;
- In the major design storm event (1% AEP) there will be no uncontrolled discharge from the site onto neighbouring properties or the surrounding street

Surface runoff from the roads and hardstand areas will be directed to the proposed inground stormwater network using the design topography of these elements. The inlet structures have been designed to adequately convey the surface runoff into the in-ground drainage network.

The runoff will then be conveyed underground across the site to the legal point of discharge using gravity and the geometric falls of the pipe system.

7.3 Legal Point of Discharge

As discussed in Section 4.5, the development area discharges via infiltration onto lawn/ agricultural areas. The collected stormwater is proposed to discharge to the lawn area between existing building Q and the proposed new gymnasium building via a storm chamber absorption trench, that will filtrate over minimum 120m^2 of the lawn. The new carpark will also have the proposed runoff discharged to landscaped lawn area via a storm chamber absorption trench, that will filtrate over minimum 60m^2.

Absorption capacity of the absorption trenches has been based around soil capacity for the site, detailed within the geotechnical investigation prepared by Douglas Partners (Ref: 216008.00, Dated August 2022). This report outlines in section 6.1 that permeability of 10^{-5} to 10^{-3} m/s would be expected in the sandy soils, however, there may be some variability. As 10^{-5} m/s is the median value, it has been adopted within calculations. Groundwater was identified at the site, however, is located at a depth much lower than the proposed stormwater network.

For the largest impervious catchment, see below calculation.

ABSORPTION TRENCH CALCULATIONS (ARI 20)

IMPERVIOUS AREA = 4900 m^2 K = 0.05 $l/m^2/s$ 180 mm/hr (absorption rate)

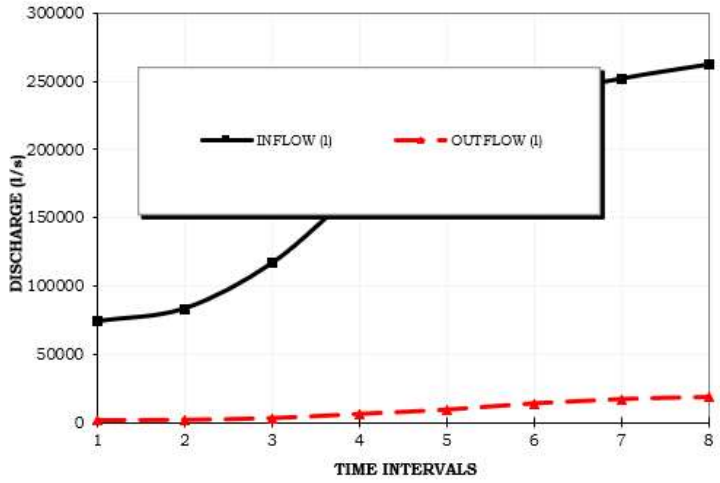
Adjusted Absorption Rate K for 15% clogging factor = 0.0425 mm/s 0.00005 m/s (site permeability)

TRENCH ABSORBTION AREA = 120 m^2 C = 0.85

OR L = 8 m W = 15 m

TIME INTERVALS	INTENSITY	DURATION (min)	INFLOW (l)	OUTFLOW (l)	VOLUME (l)
1	213.0	5	73988	1530	72458
2	200.0	6	83367	1836	81531
3	168.0	10	116713	3060	113653
4	122.0	20	169512	6120	163392
5	97.0	30	202164	9180	192984
6	76.0	45	237595	13770	223825
7	66.0	55	252184	16830	235354
8	63.0	60	262605	18360	244245

INFLOW-OUTFLOW DIAGRAM



Absorbtion trench designed for 20yr storm event

Volume required =	244.24 m^3

As proposed trenches have 2100mm deep granular material and chamber units, the proposed 120m^2 area will be suitably sized for managing inground stormwater up to and including the 5% AEP storm.

Roads are proposed to drain via grassed table drains with receiving grated inlet pits with absorption chambers at the base.

8. Stormwater Attenuation

As discussed in section 4.2 the attenuation of stormwater discharge from the site will be provided in accordance with The Port Stephens Council Development Control Plan requirements (2022) and the Educational Facilities Standards & Guidelines (EFSG). Hydraulic modelling in DRAINS software has been used to determine the required on-site detention so as to restrict discharge from the development site back to pervious predevelopment discharge rates for all storm events from the 10% AEP event up to the 1% AEP event.

Two SPEL Stormchamber has been proposed for the site for stormwater disposal. This absorption trench is proposed to have a pre-treatment SPEL Hydrosystem HS. 1200/3 or approved equivalent. The storm chamber will ensure filtration over a minimum of 120 m^2 and 60m2 lawn area for each of the zones. The SPEL Stormchamber is an inground modular arch system which is used for onsite detention, retention and infiltration applications. The system is encased by an impermeable LLDPE liner which is sealed and watertight. The open-bottom arches allow the stormwater runoff to balance across the tank through the clean aggregate stone which surround the arches.

The system helps counter drought conditions by maintaining groundwater base flow to streams, extensive range of 4 different arch heights and the ability to increase the size of the tank to suit the volume required in the available footprint, can be implemented in landscape areas, structural design of the arch allows for superior load ratings which comply with AS5100 & W80 wheel loads, and the system is fast to install and easy to maintain.

Several grassed table drains have been proposed, which fall towards deep stormwater pits with heel guard galvanised grating. An Atlantis cell will be provided at the base of the pits for absorption.

AEP Rainfall Event	Pre-development Discharge (m^3/s)	Infiltration tank Discharge (m^3/s)	Total Site Peak Discharge (m^3/s)
5%	0.315	0.245	0.245
1%	0.525	0.395	0.395

Table 4: Pre vs. Post Development Discharge

9. Water Quality Treatment

As discussed in section 5.3 of this report The Port Stephens Council DCP (2022) require stormwater quality treatment on new developments to reduce the pollutant loading of stormwater discharged into the council drainage system.

This section of the report describes the proposed Stormwater Quality Improvement Devices (SQID's) and the effectiveness of the treatment system in achieving the reduction targets set by council for the proposed development.

9.1 Potential Pollutants

There are a wide range of potential stormwater pollutant sources which occur from urbanised catchments, many which can be managed through appropriate stormwater quality treatment. Typical urban pollutants may include:

- Atmospheric deposition
- Erosion (including that from subdivision and building activities)
- Litter and debris
- Traffic emissions and vehicle wear
- Animal droppings
- Pesticides and fertilisers
- Application, storage and wash-off of car oil, detergents and other household and commercial solvents and chemicals
- Solid's accumulation and growth in stormwater systems
- Weathering of buildings

The following specific pollutants in urban stormwater assessed through water quality modelling and management include:

- Suspended Solids
- Litter
- Nutrients such as Nitrogen and Phosphorous
- Biological oxygen demand (BOD) and chemical oxygen demand (COD) materials
- Micro-organisms
- Toxic organics
- Trace metals
- Oils and surfactants

While only the key pollutants underlined above will be examined within the modelling, the Stormwater Quality Improvement Devices implemented are expected to assist in reducing a wide range of pollutants. For example, heavy metals are commonly associated with, and bound to fine sediments. This reduces the discharge of fine sediment during the construction and operational phases will also reduce the discharge of heavy metals to existing stormwater systems.

9.2 Pollutant Reduction System

In order to achieve the pollutant reduction targets specified in section 5.3 of this report, a series of treatment devices are proposed within the stormwater network which form a treatment train.

The diagram below shows a typical treatment train:

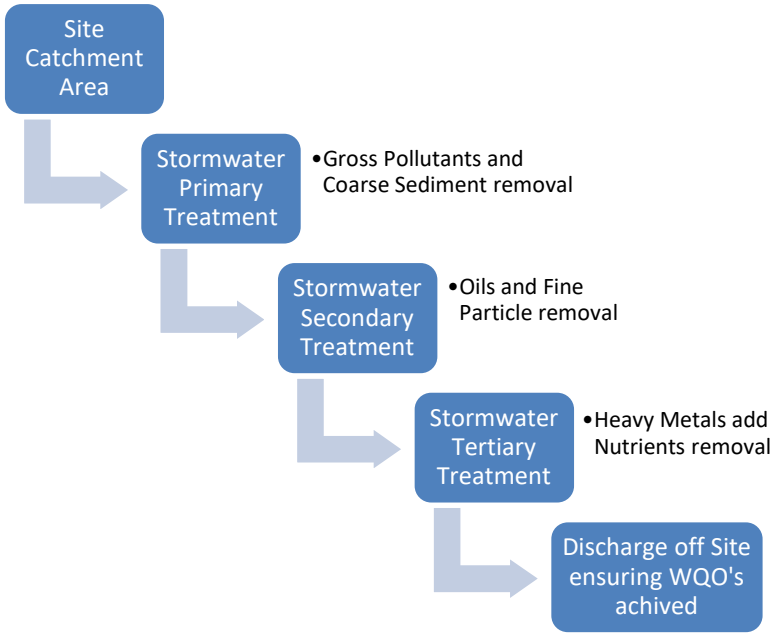


Figure 4: Treatment Train

9.2.1 Water Treatment Modelling

In order to demonstrate that the proposed treatment train s the required reduction targets, a pollutant reduction model has been generated using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Software program Version 6.3 by eWater CRC. Pollutant export rates are currently only available for Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP) and Gross Pollutants (GP). Therefore, only quantitative modelling for TSS, TN, TP & GN has been undertaken using MUSIC.

Modelling has only been undertaken on the post-development proposal with SQID's installed so as to demonstrate the percentage reduction for each pollutant type.

The proposed treatment train includes the following:

- SPEL Hydrosystem HS. 1200/3
- SPEL Stormsacks

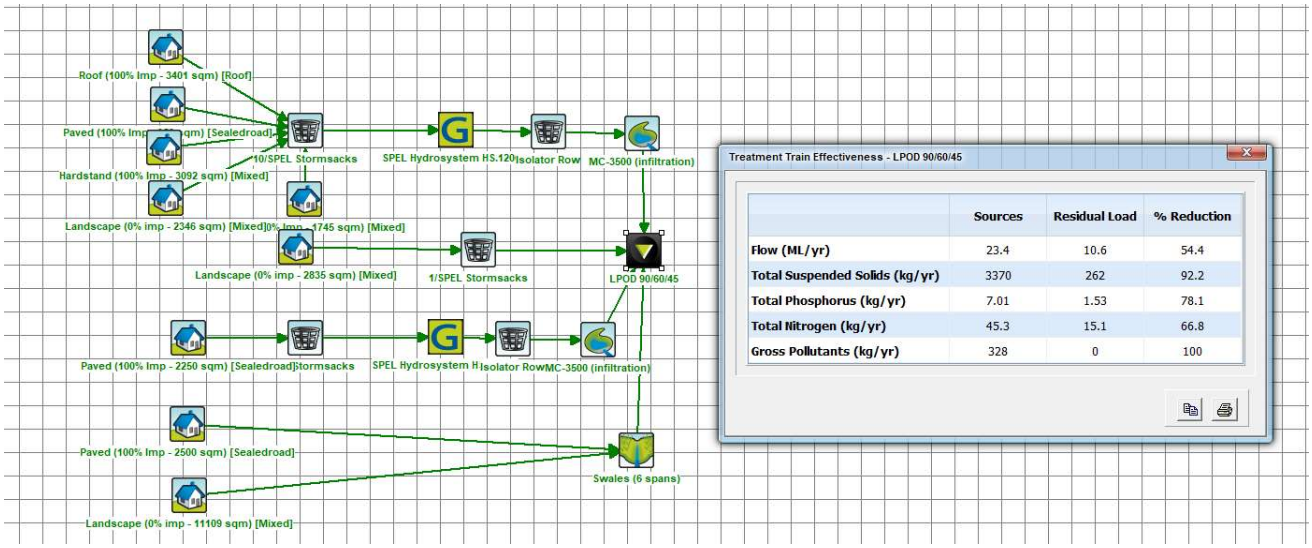


Figure 5: MUSIC Model Treatment Train

Pollutant/Issue	Target	Reduction	Target Achieved
TSS	90%	92.2%	YES
Phosphorus	60%	78.1%	YES
Nitrogen	45%	66.8%	YES
Gross Pollutants	90%	100%	YES

Table 5: MUSIC Results vs. Site Targets

As can be seen in the table above, the MUSIC model show that the proposed design meets council's reduction target. Refer to Appendix C for Port Stephens Council MUSIC Link report.

9.2.2 SPEL Hydrosystem

The SPEL Hydrosystem is a specialist stormwater filter, designed for installation within load bearing shafts and chambers of concrete or plastic construction. The SPEL Hydrosystem uses an up-flow process. This means there is minimal head drop between the inlet and the outlet. The stormwater is treated within the unit but the following processes: sedimentation, filtration, adsorption, and precipitation. It is suitable for heavy metal, TSS and nutrient reduction.

Figure 6: SPEL Hydrosystem (Source: SPEL Website)

9.2.3 SPEL Stormsacks

The SPEL stormsack is specifically designed for the capture of gross pollutants: sediment, litter and oil and grease. It is a water quality device that is deployed directly in the stormwater system to capture contaminants close to the surface for ease of maintenance. The benefits of the SPEL stormsack include:

- Low cost gross pollutant capture
- Quick and easy installation
- Simple maintenance
- At source capture
- Adjusts to custom pit sizes

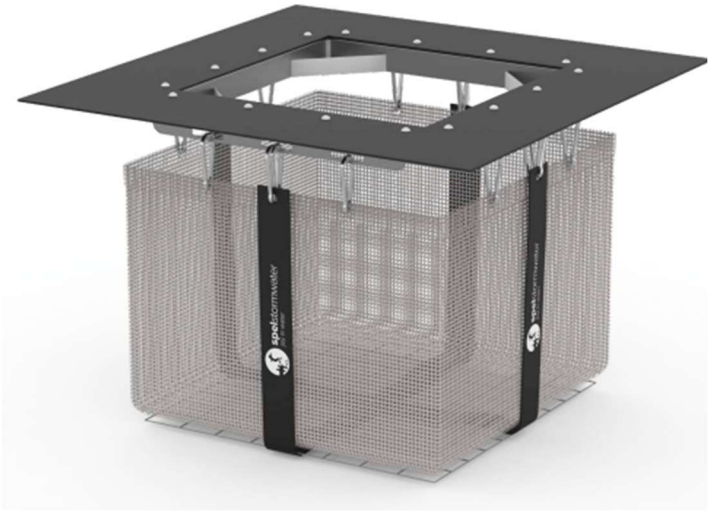


Figure 7: SPEL Stormsack (Source: SPEL Website)

10. Water Sensitive Urban Design Strategy

WSUD Background Information

Design guidelines for Water Sensitive Urban Design (WSUD) on the site have been set out in the Port Stephens Council DCP (2022). WSUD integrates land use and water management in the aim of minimising impacts of urban development on the natural water cycle. The WSUD design strategy for the proposed development is as follows. No previous WSUD studies have been done for this site.

Site Context

Full site context has been provided in Section 4 above.

Proposed Development

The proposed development has been outlined in Section 7-9 above, as well as in Appendix A with the Civil Design Documentation.

WSUD Objectives and Targets

As discussed in Section 9 above, the site will implement stormfilters and stormsacks in order minimise the development impact on the natural water cycle.

Constraints and Opportunities

There are always opportunities to adopt a range of WSUD measures for any development. There were no major constraints within or neighbouring the site such as flood plains, watercourses or sensitive environments that are required to be preserved or remediated as part of the proposed works.

Stormwater Management

The proposed stormwater system has been designed as per Liverpool Development Control Plan (LDCP) 2008. The full extent of the stormwater management procedures undertaken in the design has been explored throughout the entirety of this SWMP.

Water Table Management

It is not expected that the proposed development will have any impact on the existing water table. No impervious areas of the site will discharge to the ground and hence no groundwater quality measures are required to ensure WSUD requirements are met.

11. Stormwater Network Maintenance Schedule

In order to ensure the ongoing effective operation of the stormwater network and water quality treatment devices, the devices must be maintained in accordance with manufacturer recommendations/requirements and general best practice. It is noted that all pits are to be inspected in a safe manner that assesses localised risk and in accordance with maintenance contractor safe work method statements (SWMS).

The below summaries the various stormwater network components that will need to be maintained, whilst Schedule 1 below details required maintenance of specific items within the network requiring maintenance.

11.1 Pit and Pipe Network

A general inspection of the stormwater pit network is to be undertaken every six (6) months and after major storm events. The general inspection involves visual inspection inside pits, removal and disposal of larger gross pollutants within pits in accordance with waste disposal regulations to prevent blockages, and minimal rectification works as required. Inspection of general pits can coincide with inspection and maintenance of water quality pit inlets (if applicable).

11.2 Water Quality Treatment Devices

The filtration inserts, located within the pits, are to undergo minor service every three (3) months and after major storm events or a hazardous material spill. This involves inspection and evaluation of the filter bad and its condition, removal of captured pollutants, and the appropriate disposal of captured material in accordance with waste disposal regulations. The minor service is designed to return the ocean guard back to optimal operating performance. An inspection of the condition is to be particularly undertaken following major storm events to check for damage and higher than normal sediment accumulation. Refer to manufacturer's maintenance procedures for details of safely undertaking hand maintenance or vacuum maintenance of the ocean guards.

A major service of the ocean guards is undertaken on an as-required basis and involves the inspection of ocean guards to determine the need for filter bag replacement and support frame rectification. Replacement is based on the outcomes from the minor service whereby damage is detected. Contact manufacturer for assessment and replacement components and refer to manufacturer's maintenance procedures for safely replacing components.

A general inspection of the filtration cartridges located in a Stormfilter chamber within the OSD tank, is to be undertaken every six (6) months and after major storm events or a hazardous material spill. The general inspection involves visual inspection of the Stormfilter cartridges and chamber, removal and disposal of larger gross pollutants from the device in accordance with waste disposal regulations to prevent blockages, and minimal rectification works as required. Cartridges are also to be checked to ensure they are all firmly connected to the connectors.

A minor service of the Stormfilters, undertaken every twelve (12) months and after major storm events or a hazardous material spill, involves the evaluation of the Stormfilter cartridges and media, removal of accumulated sediment and a wash-down of the Stormfilter chamber. Refer to Ocean Protect maintenance procedures for details of safely undertaking maintenance of the Stormfilter cartridges. During this service, the cartridge media is to be inspected and replaced if it is revealed that the cartridge media is exhausted. If this is the case, a major service is to be undertaken to replace the Stormfilter cartridge media. Contact manufacturer for assessment and replacement components and refer to manufacturer's maintenance procedures for details of safely replacing the media components.

11.3 Civil Structures

A general inspection of civil structures and associate drainage across a site should be undertaken annually. The general inspection involves visual inspection, with identified defects assessed by applicable qualified engineers

11.4 Stormwater and OSD Maintenance Schedule

Maintenance Action	Frequency	Responsibility	Procedure
Pit and Pipe Network			
Blockages of inlet and outlet pipes within pits	Six Monthly	Maintenance Contractor	Remove grate. Remove any debris/litter/sludge from within pits.
Condition of inlet grates	Six Monthly	Maintenance Contractor	Clear vegetation and any debris from the pit grate and repair as required.
Condition of pit structures and section of pipes at inlets/ outlets.	Two Years	Maintenance Contractor	Remove grate to inspect internal walls. Repair as required. Clear vegetation from external walls if necessary and repair as required. Notify structural engineer if detrimental features observed.
Overland flow paths and drainage swales	Six Monthly	Maintenance Contractor	Walk along the flow path and swale. Check batters and condition of path extent. Remove any debris/litter/sludge.
Survey pipe condition with CCTV's and repair defects as necessary	Five Years	Maintenance Contractor	Remove grate. Clear blockages for camera access. Operate camera in accordance with manufacturer specifications and operator standard procedures.
Water Quality Devices			
Blockages and debris within stormwater pit filtration inserts/ storm sacks	Six Monthly	Maintenance Contractor	Remove grate. Remove any debris/litter/sludge from within inserts.
Blockages and debris within filtration tanks and devices	Six Monthly	Maintenance Contractor	Remove grate. Remove any debris/litter/sludge. Hose out tank and devices from outside tank.
Blockages and debris within filtration cartridges inside storage tanks.	Six Monthly	Maintenance Contractor	Remove grate. Remove any debris/litter/sludge. Hose out tank and devices from outside tank.
Blockages and water conveyance within filtration stormwater lines	Annual	Maintenance Contractor	Remove grate. Flow water through filtration stormwater line from inspection openings to remove blockages.
Condition of stormwater pit filtration inserts/ storm sacks	Annual	Manufacturer's Contractor	Remove inserts from pit to inspect. Repair as required.
Condition and performance of treatment tank components	Annual	Manufacturer's Contractor	Remove grate and follow SWMS procedures to enter into the tank. View and repair damaged components.

Condition and performance of filtration cartridges	Annual	Manufacturer's Contractor	Remove cartridges from pit to inspect. Repair as required.
Civil Structures			
Check subsoil behind retaining walls drainage capacity via hose flushing	Annual	Maintenance Contractor	Blast with hose, water into inspection openings and pits to ensure conveyance through lines. Review outlets to ensure flow through line.
Condition of retaining walls and other structures, including cracking and stability	Annual	Maintenance Contractor	Walk along and inspect all visible faces of wall structure. Observe for cracking, crack width, any lean in on wall and moisture within structure. Notify structural engineer if detrimental features observed.
Check batters for signs of scour and erosion	Annual	Maintenance Contractor	Walk along bottom of embankments where possible. Check batter stability and vegetation. Notify civil engineer if detrimental features observed.

12. Erosion & Sedimentation Control

Landcom have published a design guide entitled “Managing Urban Stormwater - Soils and Construction” which is regarded as the standard to which erosion and sedimentation control should be designed to within NSW.

The control of erosion and sedimentation describes the measures incorporated during and following construction of a new development to prevent the pollution and degradation of the downstream watercourse.

A Soil and Water Management Plan has prepared as part of the development application documentation and is included in Appendix A of this report.

12.1 Stormwater Drainage Infrastructure Inlets

Risk:

- Sediment from the construction site washing into the existing stormwater drainage inlet infrastructure.

Consequence:

- The sediment will then be conveyed into the downstream waterbody by stormwater runoff, contaminating the waterbody.
- The sediment will build up blocking the stormwater infrastructure and preventing stormwater conveyance to the downstream waterbody and impacting drainage upstream.

Mitigation:

- Sediment traps protection will be installed surrounding all existing stormwater drainage infrastructure inlets to prevent sediment entering the system.
- Temporary Stormwater Systems are to be installed where required to capture all site runoff within the zone of excavation. Runoff will be allowed to settle out suspended particles and debris, and an acceptable water of 50mg per litre of Non Filterable Residues (NFR) is required to be achieved prior to discharge.
- Installation of a fence around the perimeter of the basin is required as well as a rip rap to allow for bobcat access for periodic removal of sediment. Also, a perforated riser outlet pipe needs to be placed for the connection and discharge to an existing pit.

Maintenance:

- Frequent inspection of the sandbags to ensure they are arranged in a manner that prevents sediment from accessing the drainage system. If sediment is building up on the sandbags they should be cleared of sediment and re-established.
- All soil erosion and sediment control structures including temporary sediment basins and sediment traps shall be inspected following each storm event and any necessary maintenance work shall be undertaken to ensure their continued proper operation.

12.2 Construction Exit Protection

Risk:

- Spoil such as soil being conveyed from the site on the wheels of vehicles.

Consequence:

- Spoil being tracked onto the public road corridors where it is then washed into the existing stormwater drainage infrastructure and is then washed downstream polluting the downstream waterbody.
- Spoil being tracked onto the public road creating dangerous driving conditions for other road users.

Mitigation:

- A shaker grid and wash down facility will be installed at all exits from the construction site. All vehicles leaving the site will have their wheels washed down and pass over the shaker grid to remove any spoil collected on their wheels and retaining the spoil on site.

Maintenance:

- Frequent inspection of the shaker grid to ensure it is clean and still functioning.

12.3 Downstream Site Boundaries

Risk:

- Rainfall runoff falling on the site collecting sediment from the construction site and conveying it overland onto downstream properties and waterbodies.

Consequence:

- Sediment discharge polluting downstream properties and waterbodies.

Mitigation:

- Installation of sediment fences on all downstream boundaries of the site to collect sediment and prevent it discharging onto downstream properties or waterbodies.

Maintenance:

- Regular inspection of the sediment fences to ensure they are functioning correctly and are intact.
- If sediment build up is present it should be removed to ensure correct functionality of the fences.

12.4 Sediment Runoff

Risk:

- Sediment from the construction site washing into the existing stormwater drainage inlet infrastructure.

Consequence:

- The sediment will build up blocking the stormwater infrastructure and preventing stormwater conveyance to the downstream waterbody and impacting drainage upstream.

Mitigation:

- A sediment basin will be installed, and all overland flow directed towards it. The basin will attenuate stormwater flows allowing for the settlement of sediment preventing discharge into the downstream infrastructure.

Maintenance:

- Frequent inspection of the basin to ensure there is sufficient volume for the storage of settlement. If there is insufficient storage the basin should be cleared of sediment and re-established.

Appendix A Civil Design Documentation

JOINS SHEET 4

JOINS SHEET 2

PRE-TREATMENT SPEL HYDROSYSTEM HS.1200/3 OR APPROVED EQUIVALENT

DISH DRAIN BUTTERFLY PIT. CLASS E LID

STORM CHAMBER INGROUND ABSORPTION TRENCH WITH PRE-TREATMENT TANK. ENSURE FILTRATION OVER MIN 60 SQ.M OF LAWN AREA. PROVIDE INSPECTION POINTS FOR EACH CHAMBER. REFER TO TYPICAL DETAIL

USIL 5.300m
DSIL 5.160m
Ø225

DISH DRAIN BUTTERFLY PIT. CLASS E LID

USIL 5.510m
DSIL 5.330m
Ø225

120mm THICK, SL72 MESH, 25MPa JOINTED CONCRETE PATHWAY ON 50mm COMPACTED BEDDING SAND. SURFACE FINISH TO LANDSCAPE ARCHITECTURAL SPECIFICATION.

KERB INLET PIT

NEW ACCESS ROAD. REQUIRES 450mm DEEP PAVEMENT CONSISTING OF 200mm DGB20 AND 250mm DSG40 ON COMPACTED SUBGRADE OF CBR 10%.

OPTION: 7mm PRIMER SEAL AND 50mm AC10 ASPHALT IF SEALED PAVEMENT IS REQUIRED

PROVIDE DRIVEWAY LAYBACK TO EXISTING ROLL KERB FOR NEW ACCESS ROAD

PROVIDE 900x900 GRATED INLET PIT - CLASS D LID. REFER TO TYPICAL DETAIL

ELKIN AVENUE

ADELAIDE STREET

PACIFIC HIGHWAY

9
P24914

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- LANDSCAPE
- SPORTS FIELD
- ROAD PAVEMENT - ASPHALT SURFACING
- UNSEALED PAVEMENT
- EXISTING UNSEALED PAVEMENT TO BE MAINTAINED
- EXISTING PAVEMENT RE-SHEETED
- CONCRETE FOOTPATH
- PAVER PAVEMENT
- PROPOSED SURFACE LEVELS
- EXISTING CONTOURS
- KERB AND GUTTER
- KERB ONLY
- FLUSH KERB
- DISH DRAIN
- PROPOSED STORMWATER PIPE
- PROPOSED GRATED DRAIN
- PROPOSED SUBSOIL DRAIN
- RAINWATER TANK
- STORM CHAMBER
- SPEL HYDROSYSTEM
- GRASSED TABLE DRAIN
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- PROPOSED SWALE

1:200 2 0 2 4 6 8 10 A1
1:400 A3

Notes

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E	REVISED SCHEMATIC DESIGN	CPO	JMB	2023.04.13
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HEATHERBRAE NSW 2324

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Title
SITEWORKS PLAN- SHEET 1

Project No.

Scale
1:200

Revision
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Drawing No.
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JOINS SHEET 5

JOINS SHEET 3

JOINS SHEET 1

120mm THICK, SL72 MESH, 25MPa JOINTED CONCRETE PATHWAY ON 50mm COMPACTED BEDDING SAND. SURFACE FINISH TO LANDSCAPE ARCHITECTURAL SPECIFICATION.

USIL 5.450m
DSIL 5.335m
Ø225

USIL 5.305m
DSIL 5.220m
Ø225

06\01

06\02

GRASSED TABLE DRAINS, MIN 1200 WIDE, 200mm DEEP, FALLING AT MIN 0.5% TO NEAREST PIT

PROVIDE 900x900 GRATED INLET PIT - CLASS D LID. REFER TO TYPICAL DETAIL

PACIFIC HIGHWAY

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- LANDSCAPE
- SPORTS FIELD
- ROAD PAVEMENT - ASPHALT SURFACING
- UNSEALED PAVEMENT
- EXISTING UNSEALED PAVEMENT TO BE MAINTAINED
- EXISTING PAVEMENT RE-SHEETED
- CONCRETE FOOTPATH
- PAVER PAVEMENT
- 14.0 PROPOSED SURFACE LEVELS
- 18.0 EXISTING CONTOURS
- KERB AND GUTTER
- K&G KERB ONLY
- KO FLUSH KERB
- FK DISH DRAIN
- DD PROPOSED STORMWATER PIPE
- D PROPOSED GRATED DRAIN
- PROPOSED SUBSOIL DRAIN
- SSD RAINWATER TANK
- STORM CHAMBER
- SPEL HYDROSYSTEM
- GRASSED TABLE DRAIN
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
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- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
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- PROPOSED SWALE

1:200 2 0 2 4 6 8 10 A1
1:400 A3

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SITEWORKS PLAN- SHEET 2

Project No.

Scale
1:200

Revision
F

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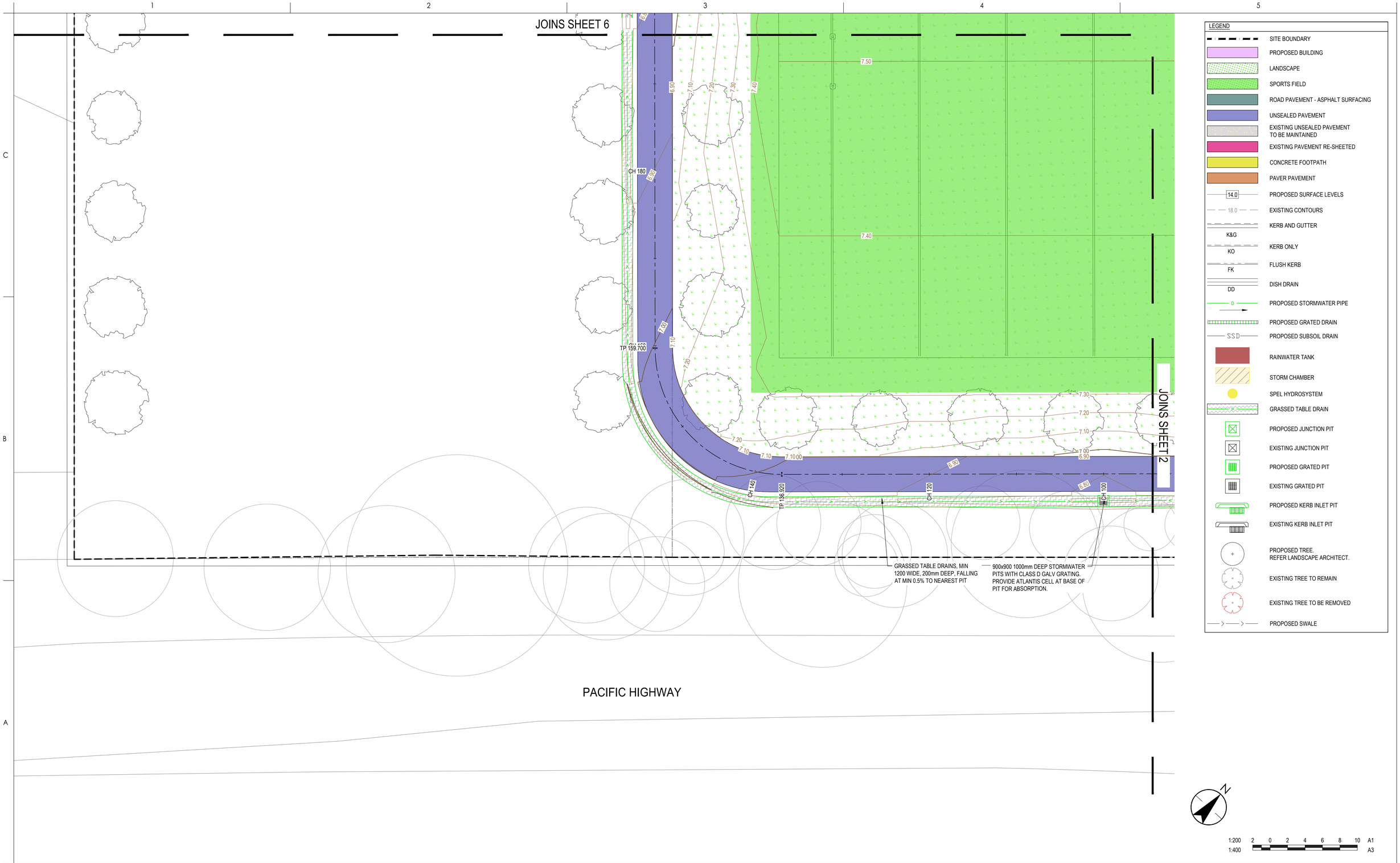

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Project No.

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Revision
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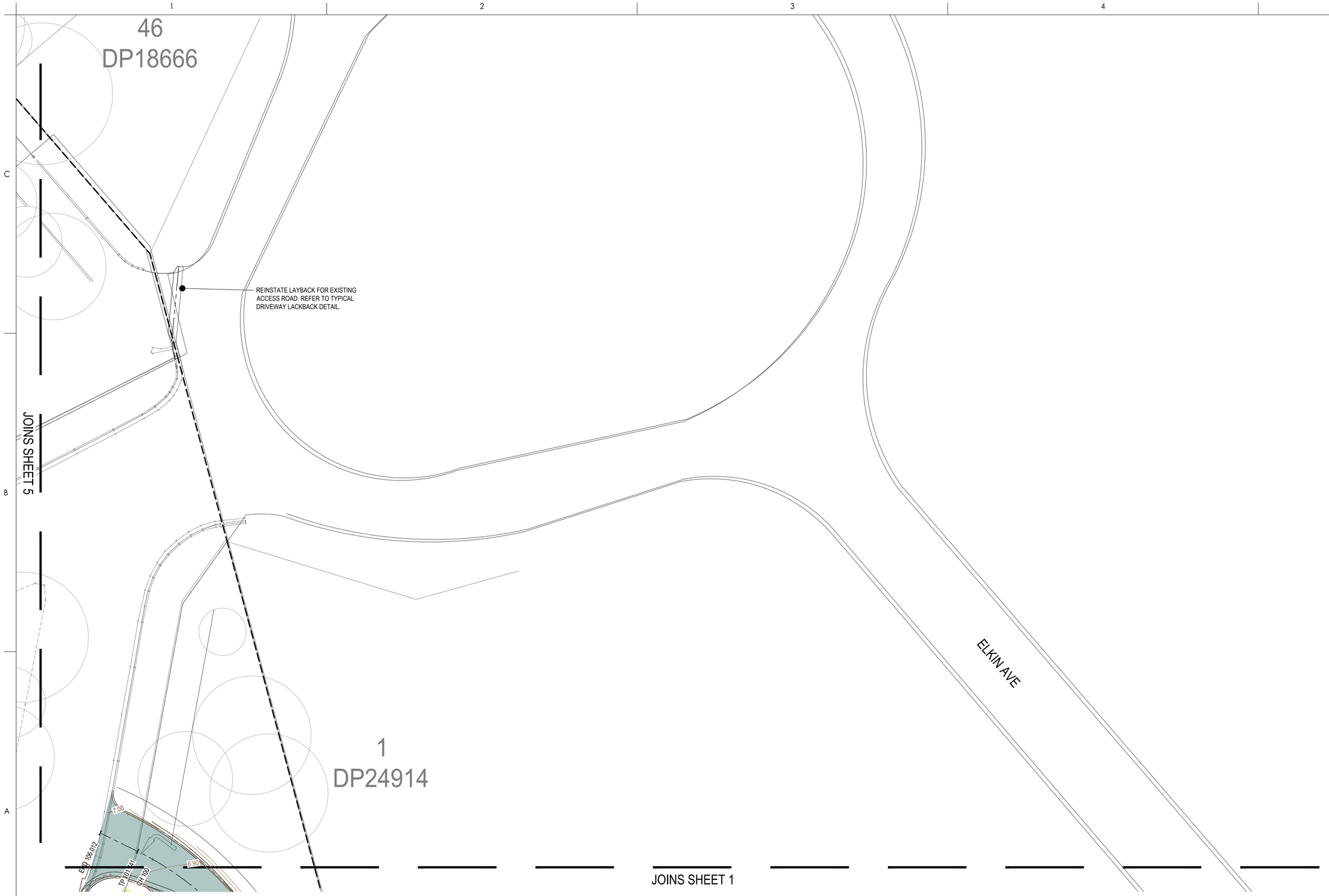

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- LANDSCAPE
- SPORTS FIELD
- ROAD PAVEMENT - ASPHALT SURFACING
- UNSEALED PAVEMENT
- EXISTING UNSEALED PAVEMENT TO BE MAINTAINED
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- KERB AND GUTTER (K&G)
- KERB ONLY (KO)
- FLUSH KERB (FK)
- DISH DRAIN (DD)
- D PROPOSED STORMWATER PIPE
- PROPOSED GRATED DRAIN
- SSD PROPOSED SUBSOIL DRAIN
- RAINWATER TANK
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- EXISTING GRATED PIT
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- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
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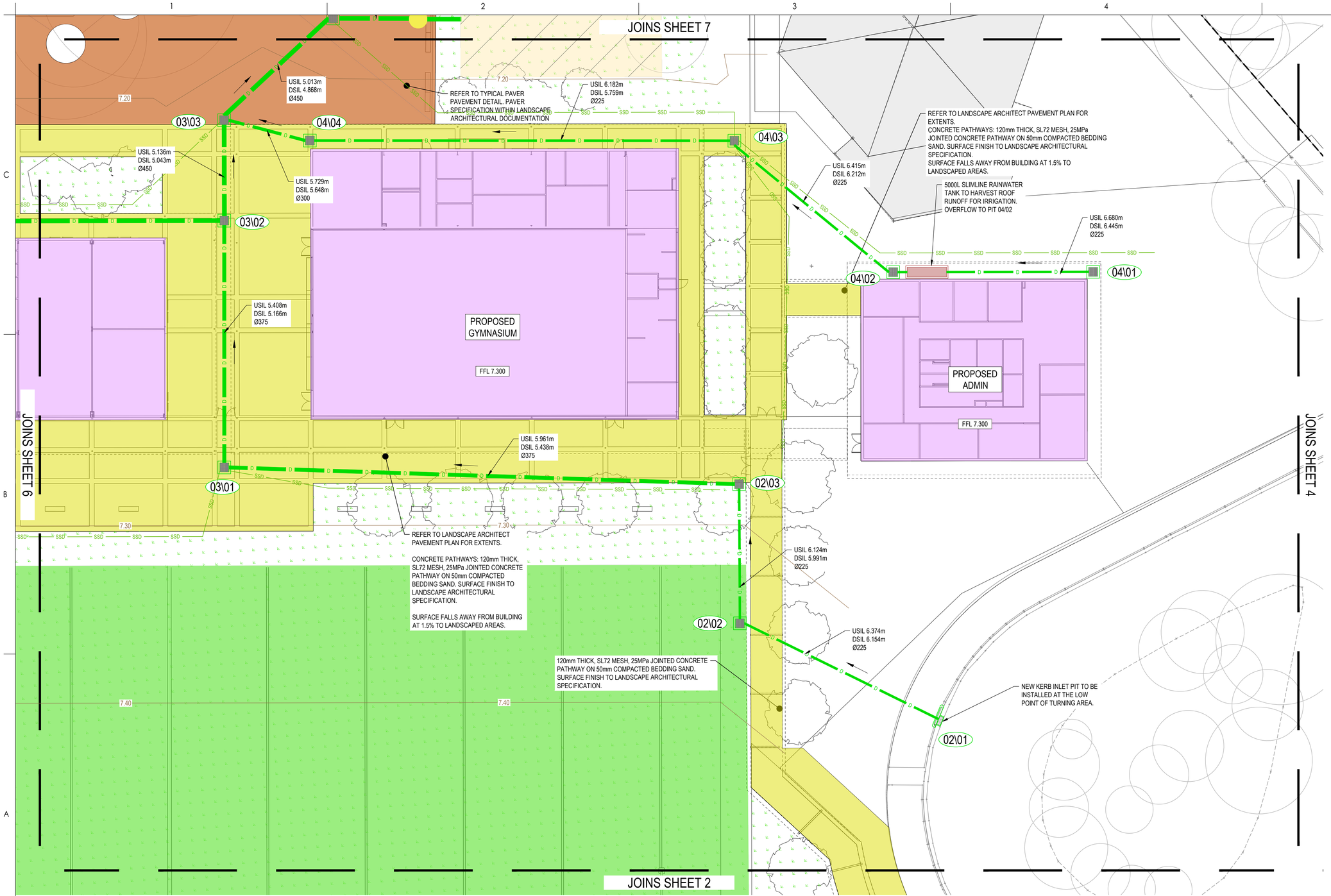

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- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- PROPOSED SWALE

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SITEWORKS PLAN- SHEET 5

Project No.

Scale 1:200

Revision F

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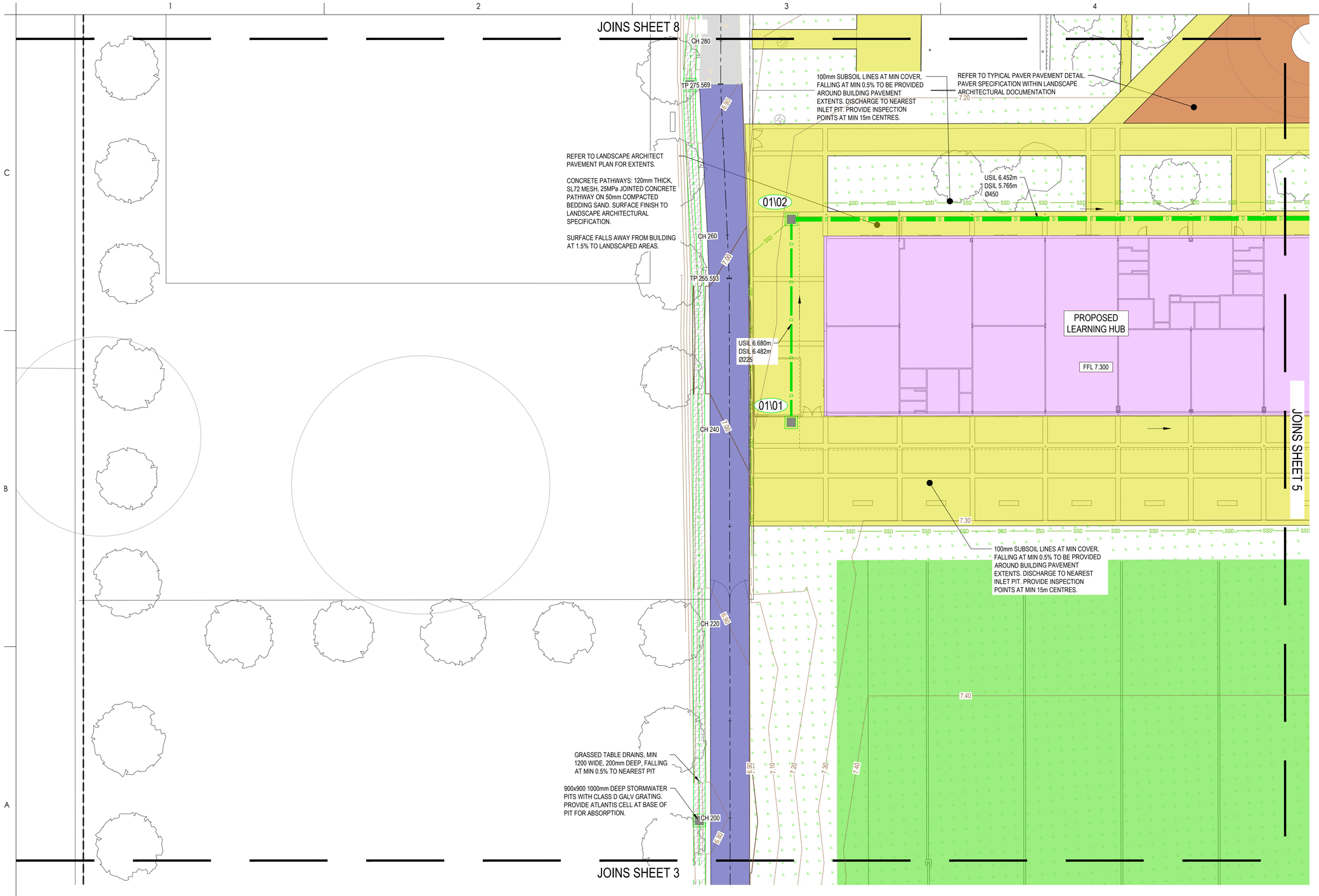

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Title

SITEWORKS PLAN- SHEET 6

Project No.

Scale 1:200

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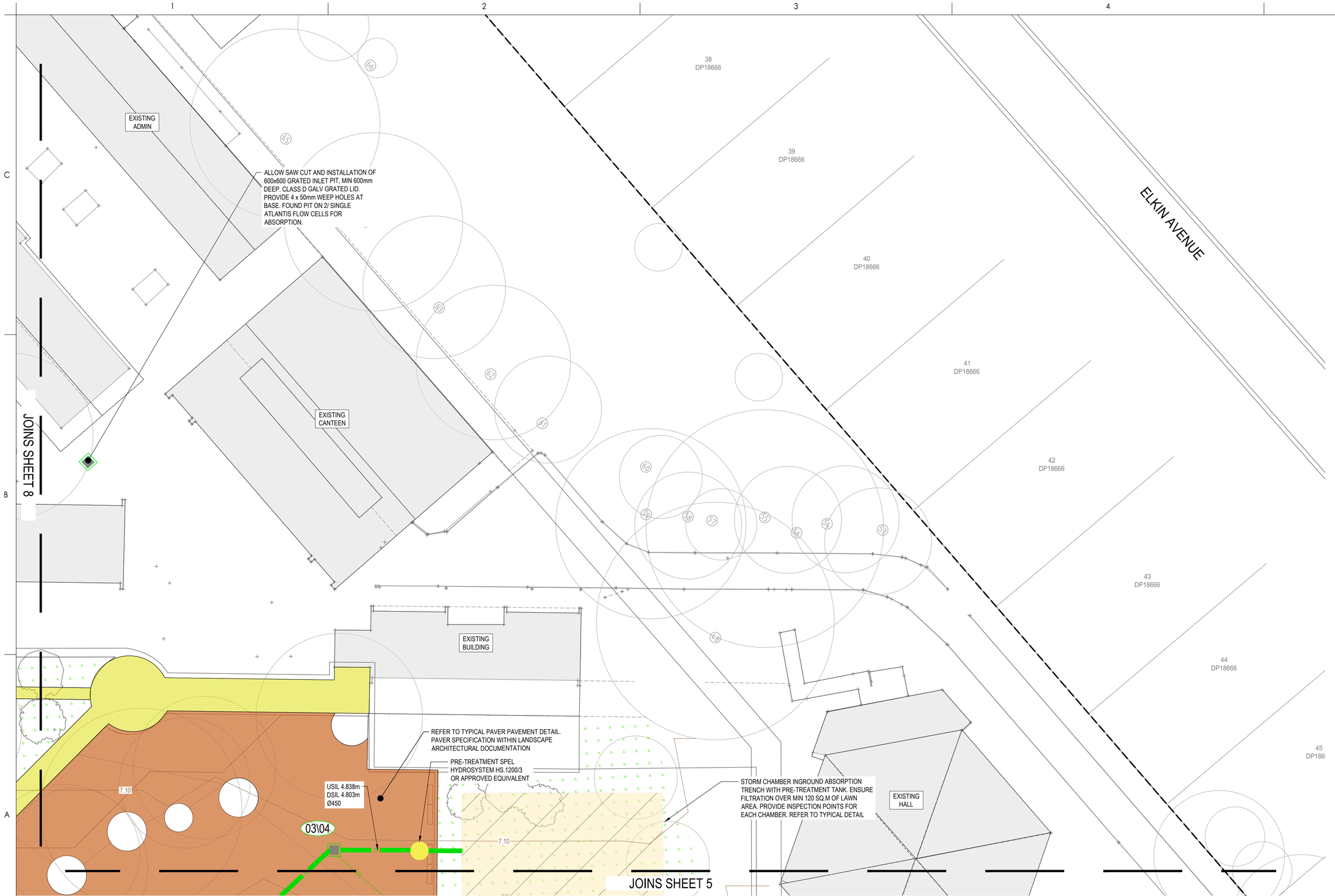

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- LANDSCAPE
- SPORTS FIELD
- ROAD PAVEMENT - ASPHALT SURFACING
- UNSEALED PAVEMENT
- EXISTING UNSEALED PAVEMENT TO BE MAINTAINED
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- KERB AND GUTTER K&G
- KERB ONLY KO
- FLUSH KERB FK
- DISH DRAIN DD
- D PROPOSED STORMWATER PIPE
- PROPOSED GRATED DRAIN
- SSD PROPOSED SUBSOIL DRAIN
- RAINWATER TANK
- STORM CHAMBER
- SPEL HYDROSYSTEM
- GRASSED TABLE DRAIN
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- PROPOSED SWALE

1:200 2 0 2 4 6 8 10 A1
1:400 A3

Notes

F	REVISED SCHEMATIC DESIGN	LPT	JMB	2023.07.14
E	REVISED SCHEMATIC DESIGN	CPO	JMB	2023.04.13
D	DRAFT REVISED SCHEMATIC DESIGN ISSUE	CPO	JMB	2023.03.24
C	FINAL PHASE 3 ISSUE	CPO	JMB	2022.08.08
B	100% SCHEMATIC DESIGN PROCESS	CPO	JMB	2022.07.29
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Issue Status

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HEATHERBRAE NSW 2324

File Name: HRHS-STNC-XX-XX-DR-C-060101.DWG | CPO Dwn. | JMB Dsgn. | JMB Chkd. | 2022.07.14 YYYY.MM.DD

Title

SITEWORKS PLAN- SHEET 7

Project No.

Scale 1:200

Revision F

Drawing No. **HRHS-STNC-XX-XX-DR-C-060107**

Plotted: 14-Jul-23 3:14:10 PM By: TODD, LAUREN
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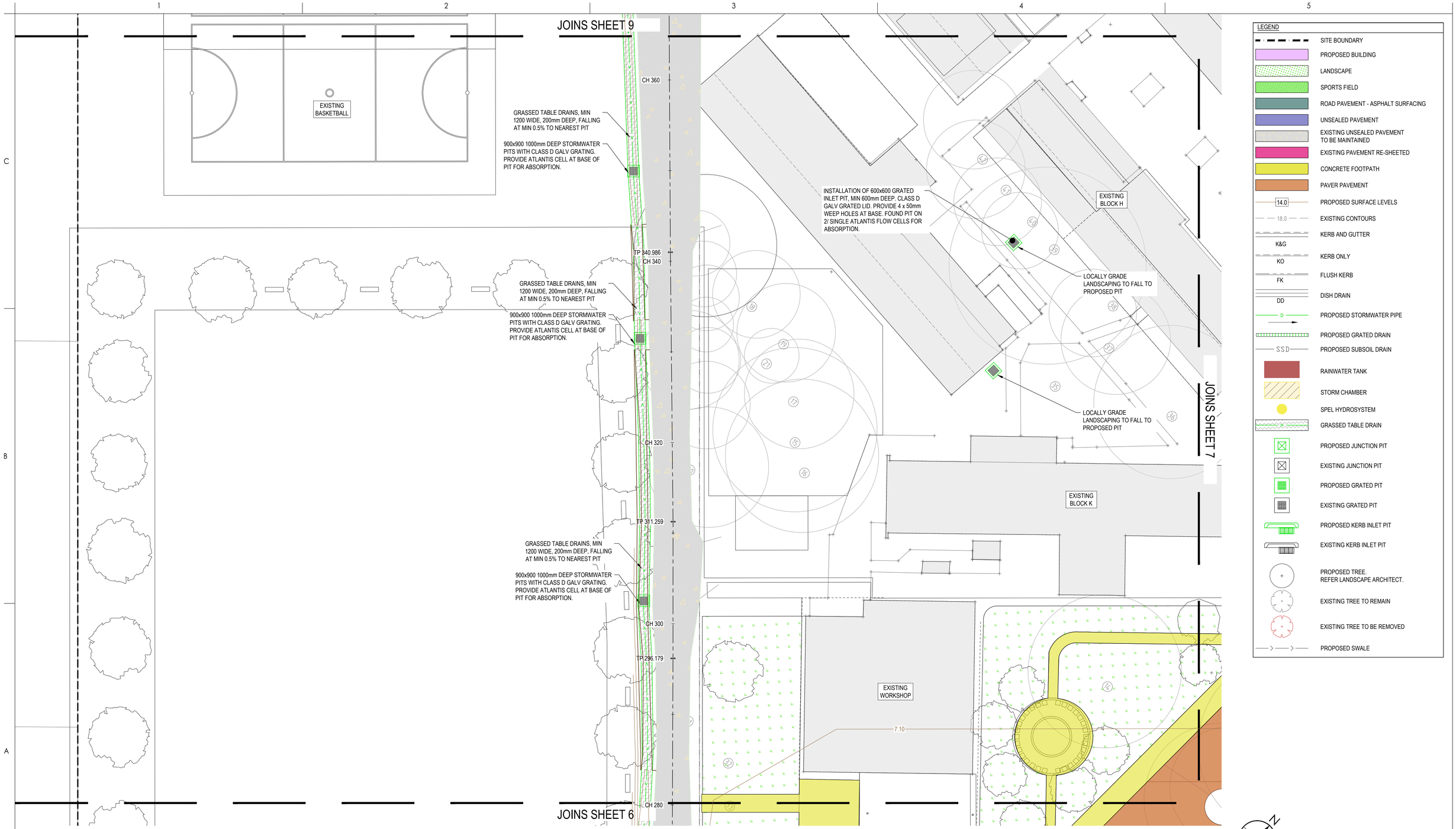
ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD



Notes

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E	REVISED SCHEMATIC DESIGN	CPO	JMB	2023.04.13
D	DRAFT REVISED SCHEMATIC DESIGN ISSUE	CPO	JMB	2023.03.24
C	FINAL PHASE 3 ISSUE	CPO	JMB	2022.08.08
B	100% SCHEMATIC DESIGN PROCESS	CPO	JMB	2022.07.29
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Title

SITEWORKS PLAN- SHEET 8

Project No.

Scale 1:200

Revision F

Drawing No. **HRHS-STNC-XX-XX-DR-C-060108**

Plotted: 14 Jul 23 3:14:25 PM By: TODD LAUREN
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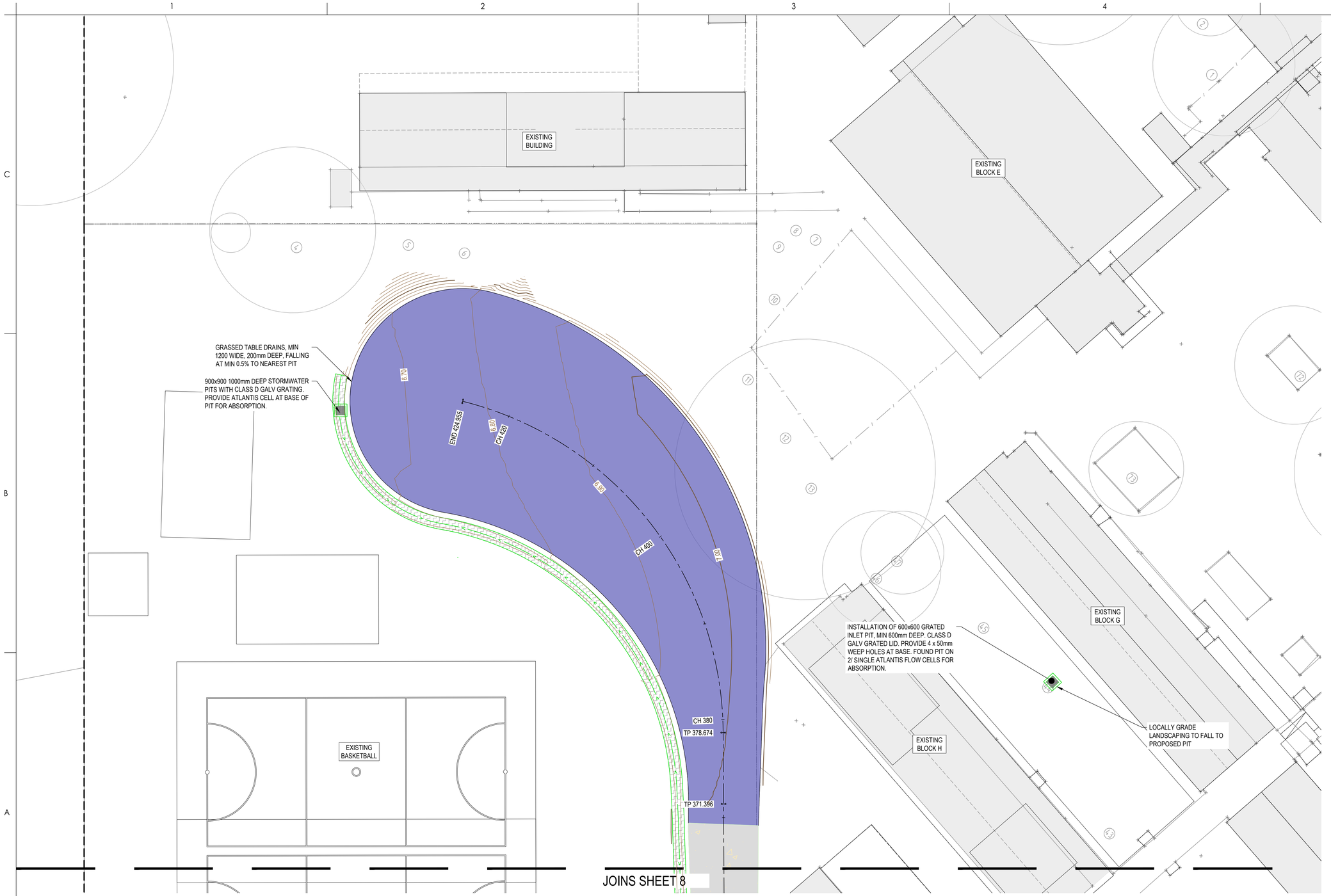
ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD



LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- LANDSCAPE
- SPORTS FIELD
- ROAD PAVEMENT - ASPHALT SURFACING
- UNSEALED PAVEMENT
- EXISTING UNSEALED PAVEMENT TO BE MAINTAINED
- EXISTING PAVEMENT RE-SHEETED
- CONCRETE FOOTPATH
- PAVER PAVEMENT
- 14.0 PROPOSED SURFACE LEVELS
- 18.0 EXISTING CONTOURS
- K&G KERB AND GUTTER
- KO KERB ONLY
- FK FLUSH KERB
- DD DISH DRAIN
- D PROPOSED STORMWATER PIPE
- PROPOSED GRATED DRAIN
- SSD PROPOSED SUBSOIL DRAIN
- RAINWATER TANK
- STORM CHAMBER
- SPEL HYDROSYSTEM
- GRASSED TABLE DRAIN
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- PROPOSED SWALE

1:200 2 0 2 4 6 8 10 A1
1:400 A3

Notes

F	REVISED SCHEMATIC DESIGN	LPT	JMB	2023.07.14
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D	DRAFT REVISED SCHEMATIC DESIGN ISSUE	CPO	JMB	2023.03.24
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Title

SITEWORKS PLAN- SHEET 9

Project No.

Scale 1:200

Revision F

Drawing No. **HRHS-STNC-XX-XX-DR-C-060109**

Plotted: 14 Jul 23 3:14:30 PM By: TODD, LAUREN
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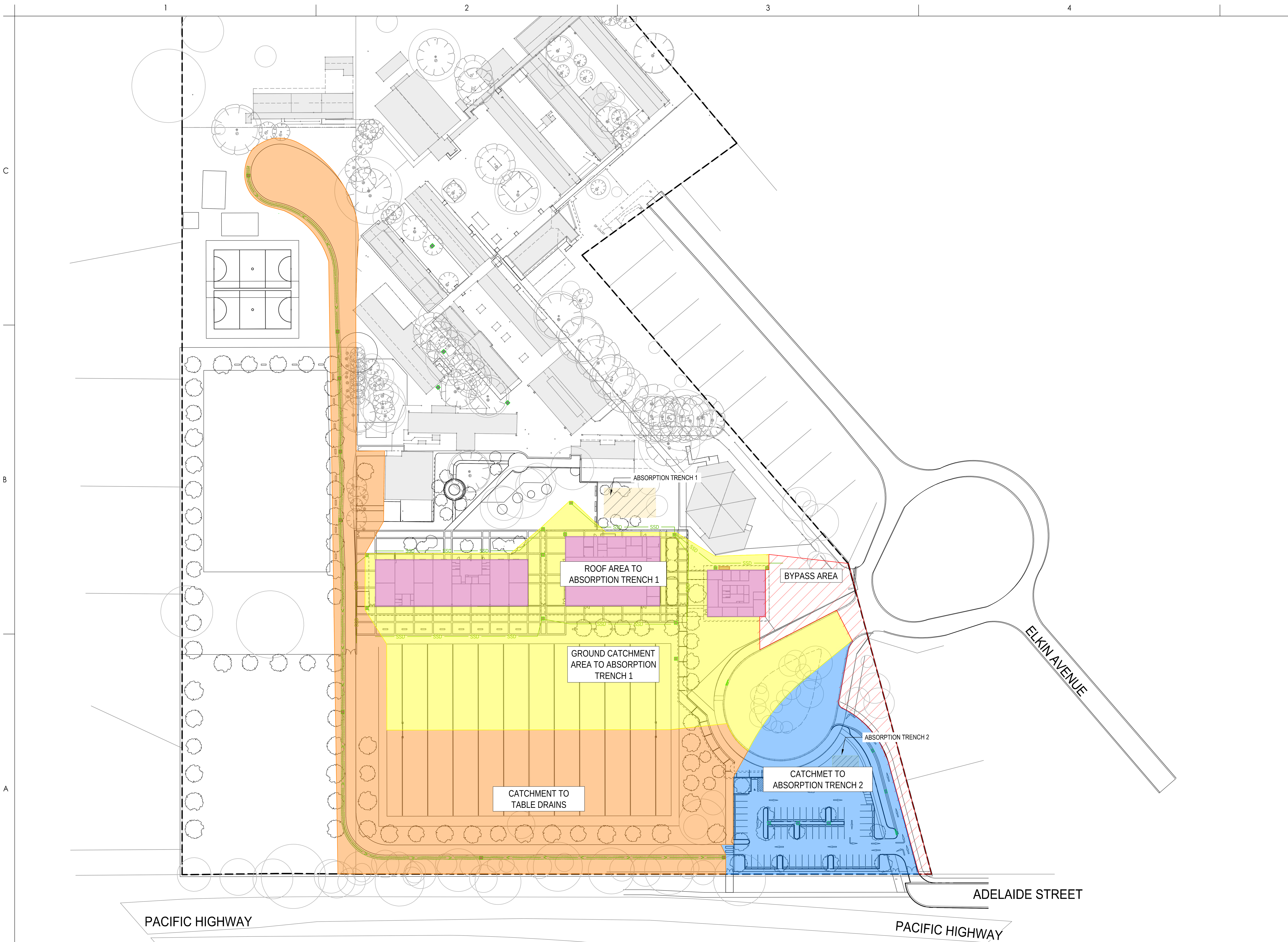
ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD



LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- CATCHMENT TO ABSORPTION TRENCH 1
- CATCHMENT TO ABSORPTION TRENCH 2
- CATCHMENT TO TABLE DRAINS
- BYPASS AREA

CATCHMENT:

- TOTAL SITE AREA = 94,217m^2
- TOTAL AREA TO BE DEVELOPED = 31,029m^2
- TOTAL CATCHMENT TO ABSORPTION TRENCH 1= 11,995m^2
  - ROOF AREA = 2,577m^2
  - GROUND AREA = 9,418m^2
- TOTAL CATCHMENT TO ABSORPTION TRENCH 2 = 4,305m^2
- TOTAL CATCHMENT TO TABLE DRAINS =12,927m^2
- TOTAL BYPASS = 1,802m^2 (5.8% of total developed area)

1:750 7.5 0 7.5 15 22.5 30 37.5 A1
1:1500 A3

Notes

Rev	Description	By	Appd	Date
A	REVISED SCHEMATIC DESIGN	LPT	JMB	2023.07.14
Issued/Revision		By	Appd	YYYY.MM.DD

Issue Status

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File Name: X-C-CATCHMENT-PLAN.DWG	CPO	JMB	JMB	2023.07.14
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
STORMWATER DRAINAGE CATCHMENT PLAN

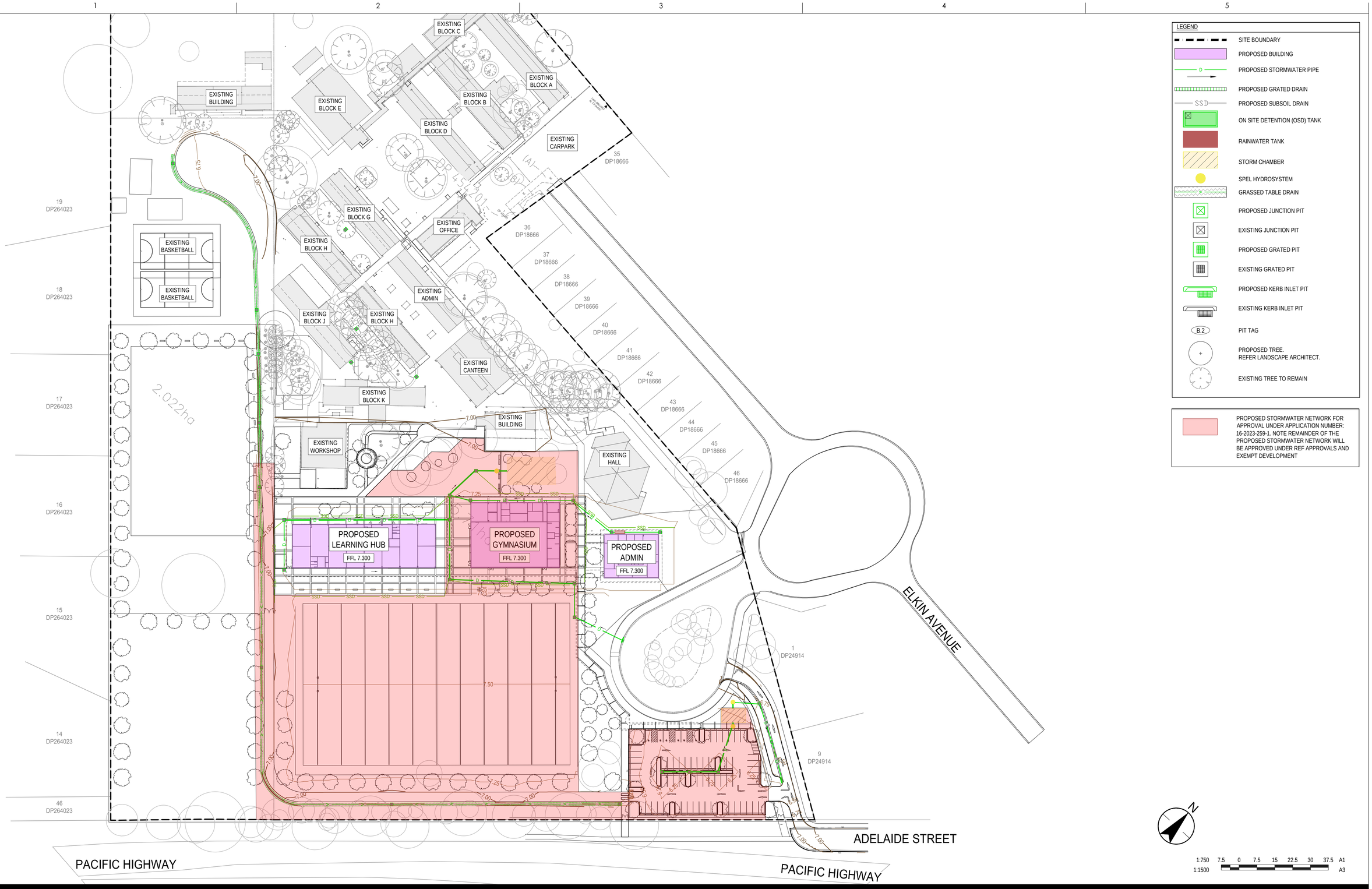
Project No.

Scale
1:750

Revision
A

Drawing No.
HRHS-STNC-XX-XX-DR-C-500001

ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD



LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- PROPOSED STORMWATER PIPE
- PROPOSED GRATED DRAIN
- PROPOSED SUBSOIL DRAIN
- ON SITE DETENTION (OSD) TANK
- RAINWATER TANK
- STORM CHAMBER
- SPEL HYDROSYSTEM
- GRASSED TABLE DRAIN
- PROPOSED JUNCTION PIT
- EXISTING JUNCTION PIT
- PROPOSED GRATED PIT
- EXISTING GRATED PIT
- PROPOSED KERB INLET PIT
- EXISTING KERB INLET PIT
- PIT TAG
- PROPOSED TREE. REFER LANDSCAPE ARCHITECT.
- EXISTING TREE TO REMAIN

PROPOSED STORMWATER NETWORK FOR APPROVAL UNDER APPLICATION NUMBER: 16-2023-259-1. NOTE REMAINDER OF THE PROPOSED STORMWATER NETWORK WILL BE APPROVED UNDER REF APPROVALS AND EXEMPT DEVELOPMENT

1:750 7.5 0 7.5 15 22.5 30 37.5 A1
1:1500 A3

Notes

F	REVISED SCHEMATIC DESIGN	LPT	JMB	2023.07.14
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File Name: HRHS-STNC-XX-XX-DR-C-520001.DWG	CPO	JMB	JMB	2022.07.14
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Title

STORMWATER DRAINAGE PLAN
SITE WIDE

Project No.

Scale
1:750

Revision
F

Drawing No.
HRHS-STNC-XX-XX-DR-C-520001

Plotted: 14-Jul-23 3:15:15 PM By: TODD.LAUREN
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ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD

Appendix B Existing Flood Information

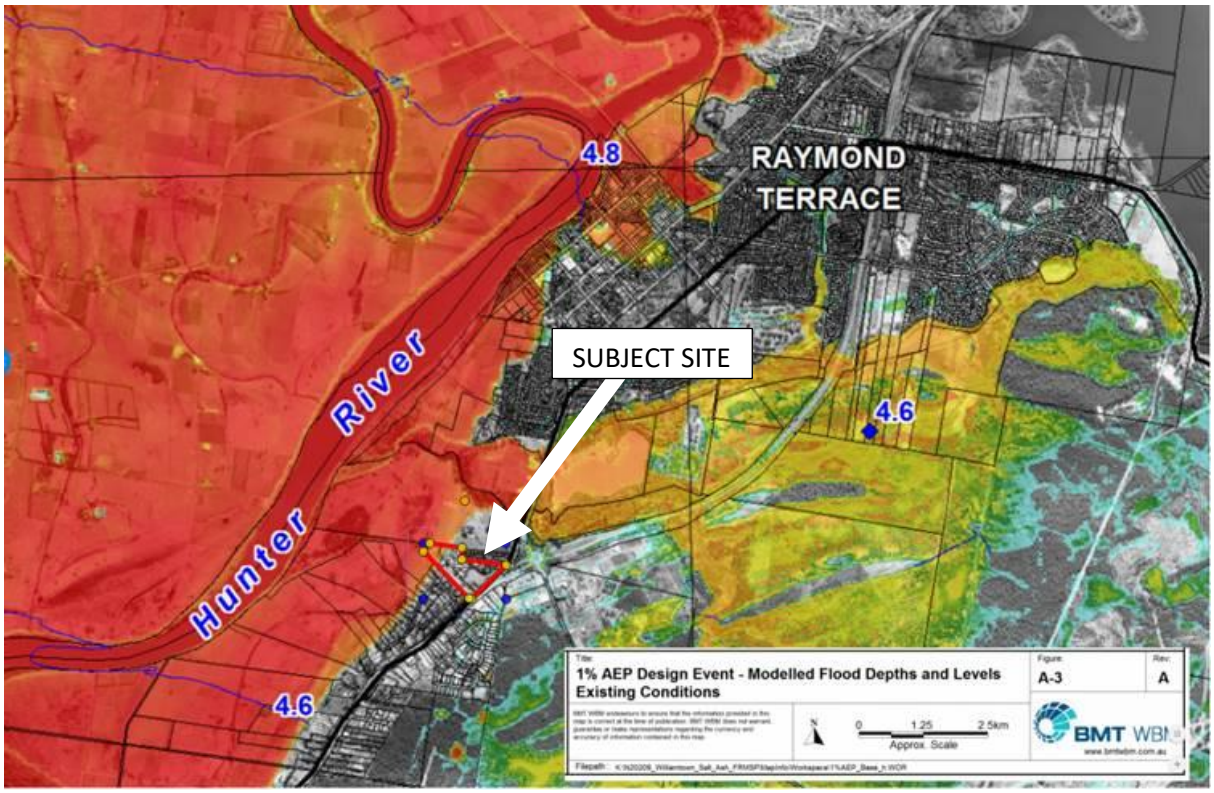

Figure 1 - 1% AEP design event flood depths

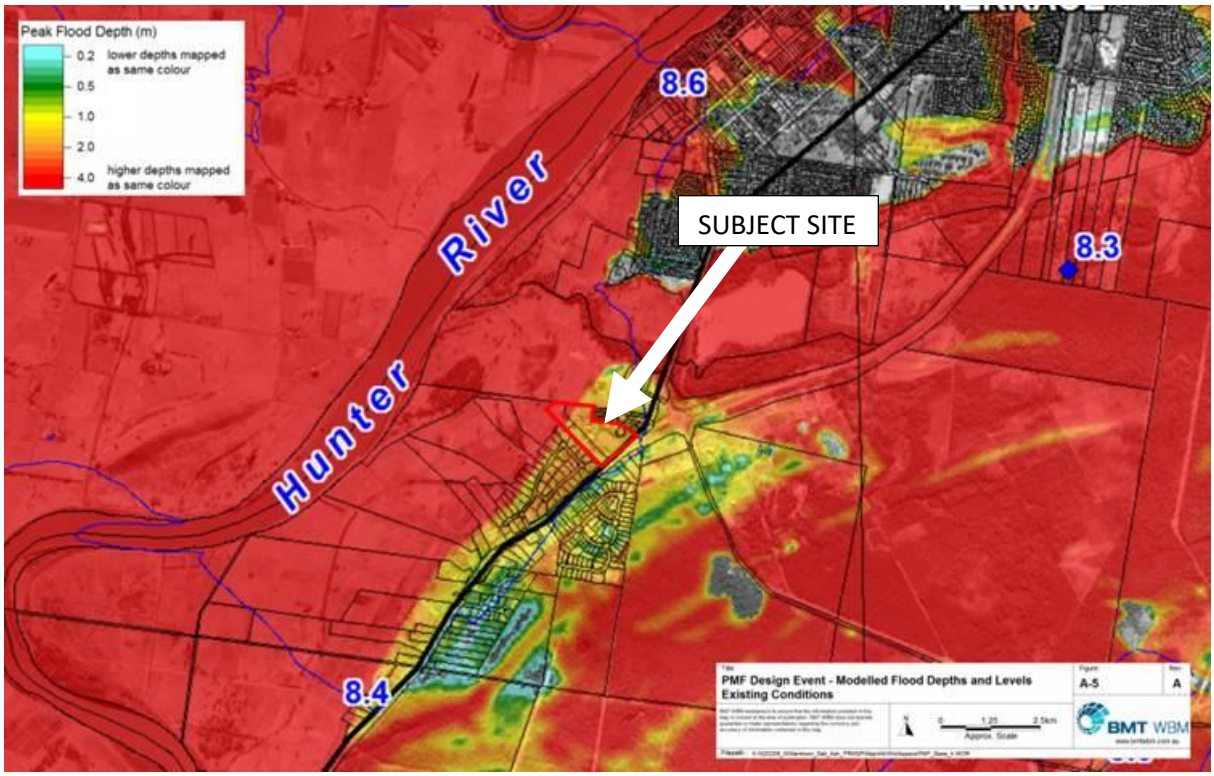

Figure 2 – PMF design event flood depths

Appendix C MUSIC Link Report

PORT STEPHENS COUNCIL

music@link

MUSIC-*link* Report

Project Details		Company Details	
Project:	301350957 Hunter River PS	**Company:**	Stantec Australia
Report Export Date:	13/04/2023	**Contact:**	Jackson Bramley
Catchment Name:	230116 Elkin C Revised	**Address:**	Lvl 9, 203 Pacific Hwy St Leonards
Catchment Area:	3.023ha	**Phone:**	0421193028
Impervious Area*:	40.32%	**Email:**	jackson.bramley@stantec.com
Rainfall Station:	WILLIAMTOWN RAAF - Station 061078 - Zone C		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1998 - 31/12/2007 11:54:00 PM		
Mean Annual Rainfall:	1238mm		
Evapotranspiration:	1394mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.34		
Study Area:	Raymond Terrace		
Scenario:	Default Catchment - Sandy soils		

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

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: LPOD 90/60/45	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	54.4%	Swale Node	1	Urban Source Node	13
TSS	92.2%	Infiltration System Node	2		
TP	78.1%	Generic Node	2		
TN	66.8%	GPT Node	5		
GP	100%				

Comments

No compliances identifed in relation to high flow and swale min grade. High flow is not an issue on this site due to absorption method of stormwater disposal. Swale min grade required to be 0.5% due to alignment of existing topography, minimising excavation in potentially contaminated existing material and sandy soil substrate minimising risks to ponded water issues.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	1/SPEL Stormsacks	Hi-flow bypass rate (cum/sec)	None	99	0.15
GPT	10/SPEL Stormsacks	Hi-flow bypass rate (cum/sec)	None	99	0.15
GPT	5/SPEL Stormsacks	Hi-flow bypass rate (cum/sec)	None	99	0.09
Infiltration	MC-3500 (infiltration)	Area (sqm)	None	None	244.6
Infiltration	MC-3500 (infiltration)	Area (sqm)	None	None	244.6
Infiltration	MC-3500 (infiltration)	Filter area (sqm)	None	None	193.2
Infiltration	MC-3500 (infiltration)	Filter area (sqm)	None	None	193.2
Infiltration	MC-3500 (infiltration)	Hi-flow bypass rate (cum/sec)	None	None	100
Infiltration	MC-3500 (infiltration)	Hi-flow bypass rate (cum/sec)	None	None	100
Receiving	LPOD 90/60/45	% Load Reduction	None	None	54.4
Receiving	LPOD 90/60/45	GP % Load Reduction	90	None	100
Receiving	LPOD 90/60/45	TN % Load Reduction	45	None	66.8
Receiving	LPOD 90/60/45	TP % Load Reduction	60	None	78.1
Receiving	LPOD 90/60/45	TSS % Load Reduction	90	None	92.2
Urban	Hardstand (100% Imp - 3092 sqm)	Area Impervious (ha)	None	None	0.309
Urban	Hardstand (100% Imp - 3092 sqm)	Area Impervious (ha)	None	None	0.309
Urban	Hardstand (100% Imp - 3092 sqm)	Area Pervious (ha)	None	None	0
Urban	Hardstand (100% Imp - 3092 sqm)	Area Pervious (ha)	None	None	0
Urban	Hardstand (100% Imp - 3092 sqm)	Total Area (ha)	None	None	0.309
Urban	Hardstand (100% Imp - 3092 sqm)	Total Area (ha)	None	None	0.309
Urban	Landscape (0% imp - 11109 sqm)	Area Impervious (ha)	None	None	0
Urban	Landscape (0% imp - 11109 sqm)	Area Pervious (ha)	None	None	1.11
Urban	Landscape (0% imp - 11109 sqm)	Total Area (ha)	None	None	1.11
Urban	Landscape (0% Imp - 1745 sqm)	Area Impervious (ha)	None	None	0
Urban	Landscape (0% Imp - 1745 sqm)	Area Pervious (ha)	None	None	0.175
Urban	Landscape (0% Imp - 1745 sqm)	Total Area (ha)	None	None	0.175
Urban	Landscape (0% imp - 2346 sqm)	Area Impervious (ha)	None	None	0
Urban	Landscape (0% imp - 2346 sqm)	Area Impervious (ha)	None	None	0
Urban	Landscape (0% imp - 2346 sqm)	Area Pervious (ha)	None	None	0.235
Urban	Landscape (0% imp - 2346 sqm)	Area Pervious (ha)	None	None	0.235
Urban	Landscape (0% imp - 2346 sqm)	Total Area (ha)	None	None	0.235
Urban	Landscape (0% imp - 2346 sqm)	Total Area (ha)	None	None	0.235
Urban	Landscape (0% imp - 2835 sqm)	Area Impervious (ha)	None	None	0
Urban	Landscape (0% imp - 2835 sqm)	Area Pervious (ha)	None	None	0.284
Urban	Landscape (0% imp - 2835 sqm)	Total Area (ha)	None	None	0.284
Urban	Paved (100% Imp - 2250 sqm)	Area Impervious (ha)	None	None	0.225
Urban	Paved (100% Imp - 2250 sqm)	Area Pervious (ha)	None	None	0
Urban	Paved (100% Imp - 2250 sqm)	Total Area (ha)	None	None	0.225
Urban	Paved (100% Imp - 2500 sqm)	Area Impervious (ha)	None	None	0.25
Urban	Paved (100% Imp - 2500 sqm)	Area Pervious (ha)	None	None	0

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Paved (100% Imp - 2500 sqm)	Total Area (ha)	None	None	0.25
Urban	Paved (100% Imp - 950 sqm)	Area Impervious (ha)	None	None	0.095
Urban	Paved (100% Imp - 950 sqm)	Area Impervious (ha)	None	None	0.095
Urban	Paved (100% Imp - 950 sqm)	Area Pervious (ha)	None	None	0
Urban	Paved (100% Imp - 950 sqm)	Area Pervious (ha)	None	None	0
Urban	Paved (100% Imp - 950 sqm)	Total Area (ha)	None	None	0.095
Urban	Paved (100% Imp - 950 sqm)	Total Area (ha)	None	None	0.095
Urban	Roof (100% Imp - 3401 sqm)	Area Impervious (ha)	None	None	0.34
Urban	Roof (100% Imp - 3401 sqm)	Area Impervious (ha)	None	None	0.34
Urban	Roof (100% Imp - 3401 sqm)	Area Pervious (ha)	None	None	0
Urban	Roof (100% Imp - 3401 sqm)	Area Pervious (ha)	None	None	0
Urban	Roof (100% Imp - 3401 sqm)	Total Area (ha)	None	None	0.34
Urban	Roof (100% Imp - 3401 sqm)	Total Area (ha)	None	None	0.34

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	Isolator Row	Hi-flow bypass rate (cum/sec)	None	99	100
GPT	Isolator Row	Hi-flow bypass rate (cum/sec)	None	99	100
Infiltration	MC-3500 (infiltration)	Evaporative Loss as % of PET	100	100	0
Infiltration	MC-3500 (infiltration)	Evaporative Loss as % of PET	100	100	0
Swale	Swales (6 spans)	Bed slope	0.01	0.05	0.005

Only certain parameters are reported when they pass validation

Design with
community in mind

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St Leonards NSW 2065
Tel +61 2 8484 7000

For more information please visit
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