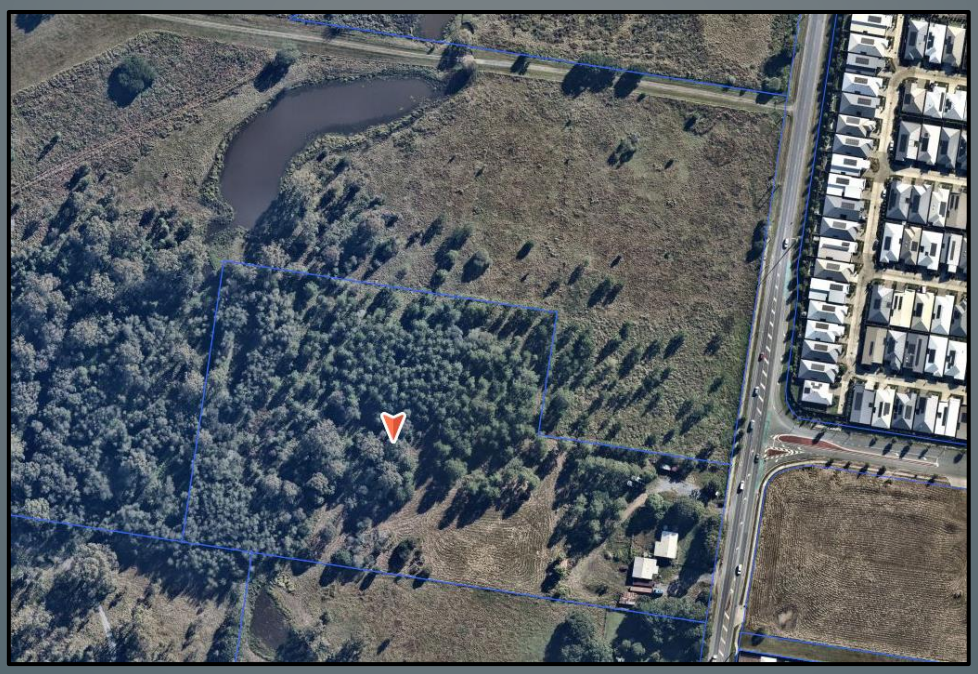
HCE Engineers

Ref. 23331

CULTURAL CENTRE
283-293 LOGAN RESERVE ROAD, LOGAN RESERVE

STORMWATER MANAGEMENT PLAN
REVISION 0



Prepared For
QUEENSLAND NEPALESE CULTURAL CENTRE

HCE Engineers

PO Box 7214, Redland Bay Qld 4165
55-57 Jardine Dr, Redland Bay QLD
Tel: (07) **3829 1399**
Email: mail@hce-engineers.com.au
Web: www.hce-engineers.com.au

HCE Engineers

REPORT CONTROL SHEET

HCE Ref. No.:	23331
Site:	**283-293 Logan Reserve Road, Logan Reserve**
Report Title:	Stormwater Management Plan

Rev No.	Date	Written By	Reviewed By	Authorised By	Signed
0	17/06/24	MN	GH	GH	Digitally signed by Greg Henwood DN: C=AU, E=GHenwood@hce-engineers.com.au, O=HCE Engineers, CN=Greg Henwood Date: 2024.06.17 09:15:38+10'00'

DISTRIBUTION

Destination	Date Sent	Revision Number								
		Draft	0	1	2	3	4	5	6	7
HCE - File	-		☒							
Queensland Nepalese Cultural Centre	17/06/24		☒							
Urban Strategies	17/06/24		☒							

INDEX

Appendix C – Music Modelling Results

Appendix D – Maintenance Guidelines

Appendix E – Council Flood Report

1. INTRODUCTION

HCE Engineers have been engaged to prepare a Stormwater Management Plan to accompany the development application for the material change of use at 283-293 Logan Reserve Road, Logan Reserve.

This report identifies stormwater quality and quantity management measures proposed to be incorporated within the development, in order to satisfy the required outcomes of the Logan City Council Planning Scheme.

This report has been prepared expressly to provide commentary regarding compliance with Council requirements for the proposed development on the subject site. Information presented in this report should not be applied to properties or developments other than the subject development. No responsibility is accepted for use of any part of this report in any other context or for any other purposes or by any third party.

2. EXISTING SITE AND CATCHMENT DESCRIPTION

The development site is Lot 1 RP 162124 which is more commonly known as 283-293 Logan Reserve Road, Logan Reserve and has a total area of 40,850m^2 however, the majority of the site is flood effected and the actual area of development is approximately 5,340m^2.

A review of contour mapping via detailed survey, councils mapping and aerial imagery indicates that the development site is currently a residential property and falls towards the mapped waterway at an approximate grade of 3.5%. Refer to Image 1 below.

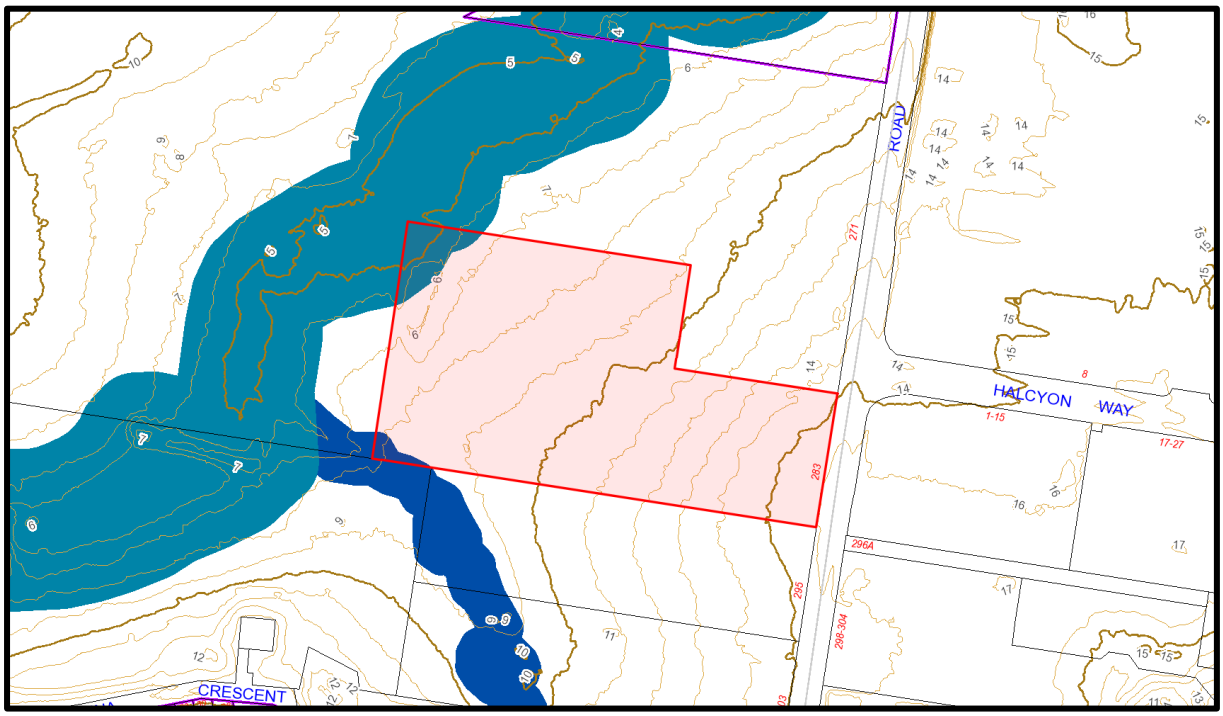


Image 1 *– Contours Mapping (Source Council Mapping)*

2.1. Existing Drainage Conditions

Currently, stormwater runoff from the subject site is conveyed to ground and then traverses as sheet flow across the property until its collected by the mapped waterway at the rear of the site.

2.2. External Catchments

No external catchments have been identified.

2.3. Flood Assessment

A flood search has been undertaken and the subject site is located within a mapped flood area. The site is subject to flooding from the Logan River with council mapping indicating the site is within Flood Risk Areas low, medium, and high. No, Flood Assessment Report has been prepared at this stage with commentary towards meeting the purpose of the code provided within the Civil Engineering Assessment Report to provide justification for council to support the development.

Refer to Appendix E for the council flood report.

3. WATER QUANTITY MANAGEMENT

3.1. Overview and Objectives

The proposed cultural centre is to be progressively built over two stages.

Stage 1 includes the carpark, roadworks and religious buildings (Stupa and Temple).

Stage 2 will include the construction of the community hall.

The current staging results in Stage 2 being a building project as the civil works can be constructed in Stage 1.

The overall proposal will result in an increase in impervious area and given the location of the property within the Logan River catchment on site detention is proposed to meet the requirements of Planning Scheme Policy 5 – Infrastructure.

A model has been set up using XP-RAFTS software package in in order to determine existing site runoff hydrographs and to determine the effectiveness of the proposed detention tank.

3.2. Lawful Discharge

The lawful discharge point is the mapped waterway at the rear of the property.

3.3. Design Storms

Design Storms for the development have been determined in accordance with Table 7.3.1 of the Queensland Urban Drainage Manual. The proposed development is a commercial development.

Table 1 *– Design Storms*

Storm Event	AEP
Minor	10.0%
Major	1.0%

3.4. Hydrologic Modelling

A model has been set up using XP-RAFTS software package in in order to determine existing site runoff hydrographs and to determine the effectiveness of the detention basin when incorporating the additional runoff into the basin under developed conditions.

Initial and continuing losses and hydraulic roughness are outlined in Sections 3.4.1 and 3.4.2 respectively. Each catchment is represented by a node with applicable inputs including;

- catchment area
- pervious and impervious percentage
- slope

3.4.1. Losses

***Table 2** – Losses*

	Initial Loss (mm/hr)	Continuing Loss (mm/hr)
Pervious	10	2
Impervious	2	0

3.4.2. Hydraulic Roughness

Manning's n values have been used to represent the pervious and impervious surface. The following values were adopted;

***Table 3** – Hydraulic Roughness*

	Manning's 'n'
Pervious	0.045
Impervious	0.025

3.4.3. Existing Conditions

XP-RAFTS computer software package was used to model the peak discharges immediately downstream of the subject site under existing conditions during the 39%, 18%, 10%, 5%, 2% and 1% AEP rainfall events.

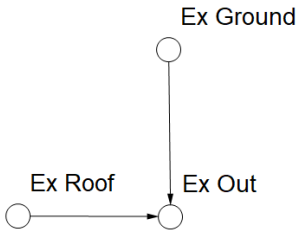


***Image 2** - XP-RAFTS model set up for existing site conditions*

The table below summarises the input parameters for the XP-RAFTS model for the existing scenario.

***Table 4** – XP-RAFTS Source Node Parameters for Existing Site Conditions*

Catchment ID	Area(ha)	Impervious %	Slope (%)
Ex Roof	0.029	100	1.0
Ex Ground	0.505	5	2.5

Although the majority of the existing site is undeveloped, a 5% fraction impervious has been selected for the existing site node as per the recommendations of the user manual.

RAFTS is an empirical runoff routing model recognised as a suitable method to predict runoff hydrographs in the urban environments. The Rational Method is a simple hand calculation broadly accepted as being able to provide reasonable peak flow estimates in small urban catchments. The Rational Method calculation has been undertaken to verify the suitability of the RAFTS predicted flows and the results are summarised below.

Table 5 below displays the Rational Method inputs whilst, Table 6 summaries the flow rates for each catchment based on the two methods used. Given each catchment has a different time of concentration the total sum of runoff cannot be used to sum the total runoff, but when assessed

individually it can be seen that the flow rates predicted between the two methods are similar. Given this summary Table 5 has been prepared which predicts the runoff from the two existing catchments based on the RAFTS model.

Refer to Appendix A for Rational Method Calculations. Refer to Appendix B for XP-RAFTS outputs.

***Table 5** – Rational Method Inputs*

Catchment ID	C_{10}	Time of Concentration (min)	I (mm/hr)	Area (ha)
Ex Roof	0.90	12	149	0.029
Ex Ground	0.70	12	149	0.505

***Table 6 –** Existing Peak Discharge Rates*

AEP	XP-RAFTS Existing Peak Discharge (m^3/s)	Rational Method Existing Peak Discharge (m^3/s)
39%	0.10	0.10
18%	0.14	0.13
10%	0.16	0.16
5%	0.20	0.19
2%	0.24	0.24
1%	0.27	0.28

3.4.4. Proposed Mitigated Conditions

Input parameters under developed conditions are summarised below in Table 7 and the model setup is shown in Image 3.

***Table 7** – XP-RAFTS Source Node Parameters for Developed Site Conditions*

Catchment ID	Area(ha)	Impervious %	Slope (%)
Roof	0.088	100	1.0
Hardstand	0.384	100	2.0
Landscape	0.035	5.0	1.0
Hard Free	0.018	100	2.0
Land Free	0.009	5.0	1.0

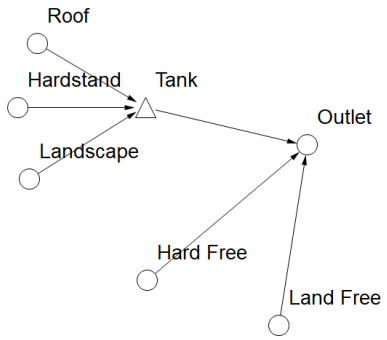


***Image 3** – XP-RAFTS model set up for developed mitigated site conditions*

The detention tank parameters including outlet control is shown in Table 8.

Table 8 *– Detention Tank Parameters*

Detention ID	Base RL (m AHD)	Depth (m)	Total Volume (m^3)	Low Flow Outlet Control	High Flow Outlet Control
1	12.70	1.40	179	220mm core hole in weir wall	500mm wide weir 1.1m from base

Table 9 *– Detention Tank Performance (Developed Mitigated Conditions)*

AEP	XP-RAFTS Tank Peak Inflow Discharge (m^3/s)	XP-RAFTS Tank Peak Outflow Discharge (m^3/s)	Detention Tank Ponding Level (m)	Total Detention Tank Storage (m^3)
39%	0.20	0.09	0.67	81
18%	0.25	0.11	0.88	105
10%	0.28	0.12	1.00	119
5%	0.32	0.14	1.15	138
2%	0.34	0.20	1.27	152
1%	0.37	0.26	1.36	163

Table 9 above outlines the detention basin peak inflow and outflow discharge rates. While Table 10 outlines the pre-development and post development peak discharge rates for the site.

Table 10 *– Existing & Developed Peak Discharge Rates*

AEP	XP-RAFTS Existing Peak Discharge (m^3/s)	XP-RAFTS Developed Peak Discharge (m^3/s)	Impact (m^3/s)
39%	0.10	0.10	0.00
18%	0.14	0.12	-0.02
10%	0.16	0.13	-0.03
5%	0.20	0.15	-0.05
2%	0.24	0.21	-0.03
1%	0.27	0.27	0.00

As it can be seen from Table 10 above, the proposed detention basin will ensure the peak discharge rates leaving the site are less than existing for the 39%, 18%, 10%, 5%, 2% and 1% AEP rainfall events. Refer to concept design drawings attached. Refer to Appendix B for XP-RAFTS outputs.

3.4.5. External Catchment Management

No external catchment has been identified.

4. WATER QUALITY MANAGEMENT

4.1. Data

MUSIC version X 1.10 has been used to simulate the behaviour of stormwater in relation to water quality.

Healthy Waterways, Water by Design, "MUSIC Modelling Guidelines Version 3.0-2018" were used for MUSIC model set up.

Water Sensitive Urban Design (WSUD) Engineering Guidelines were consulted for the proposed stormwater quality improvement devices.

4.2. Construction Phase

4.2.1. Pollutants of Concern

The construction phase stormwater quality design objectives which may be relevant to this subdivision as set by the Urban Stormwater Quality Planning Guidelines 2010 are as follows.

***Table 11** - Design Objectives for Stormwater Quality Management - Construction Phase*

Objective	Measure
Drainage Control	• Design life and design storm of temporary drainage works in accordance with time the disturbed area is exposed <12 months - 1 in 2 ARI 12-24 months - 1 in 5 ARI >24 months - 1 in 10 ARI
Erosion Control	• Minimise exposure of disturbed soils at any time • Avoid or minimise large construction activities in the wet season • Divert water run-off from undisturbed areas around disturbed areas • Use erosion risk ratings to determine appropriate erosion control measures
Sediment Control	• Use soil loss rates to determine appropriate sediment control measures • Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water runoff
Water Quality Outcomes	• Coarse sediment is retained on site • Nitrogen and phosphorus are managed through sediment control • Prevent litter/waste entering the site, the stormwater or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins. • Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. • Washdown water is prevented from entering the stormwater system or internal watercourses that discharge from the site • Cations and anions including aluminium, iron and sulfate are managed as required under an approved acid sulfate soil management plan

Objective	Measure
Stormwater Drainage/Flow Management	• Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: ○ Peak flow for the one year and 100 year ARI event ○ Run-off frequency and volumes entering receiving waters ○ Uncontrolled release of contaminated stormwater

4.2.2. Water Quality Treatment

Appropriate erosion and sediment control measures can be prepared and implemented on site during construction activities to ensure 'best management practices' are achieved.

4.3. Operational Phase

4.3.1. Pollutants of Concern

Per Section 3.6.1.4 of Planning Scheme Policy 5 – Infrastructure a development is required to achieve stormwater management design objectives outlined in the State Planning Policy where the below criteria is applicable.

1. material change of use for urban purposes where:
   a. the development is greater than 2,500m2 and results in the creation of six or more additional dwellings; or
   b. the impervious area of the development is greater than 25 percent and the development is: greater than 2,500m2; or
   c. located in the Loganholme local plan area; or included in the Highway business precinct of the Specialised centre zone and located between the Pacific Highway and the southern boundary of the Loganholme local plan area; or
2. reconfiguring a lot for urban purposes where:
   a. the development is greater than 2,500m2 and where it:
   b. results in an increased number of non-residential lots (e.g. industrial, commercial, etc); or
   c. it results in the creation of six or more residential lots;

As the development creates and impervious area of greater than 25% the stormwater management design objectives are required to be met. Table 12 below identifies the minimum reductions required.

Table 12 – *Water Quality Design Objectives for South East Queensland*

Pollutant	Minimum Reduction in Mean Annual Load
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (>5mm)	90%

4.3.2. Water Quality Treatment

A proprietary cartridge-based filter system is proposed within the site. Refer to concept design drawings attached.

4.4. Pollutant Export Modelling

4.4.1. Model Selection

In order to determine the on-site pollutant generation, and the effectiveness of the proposed Stormwater Quality Improvement Devices, the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) version X 1.10 was used.

4.4.2. Model Setup

The MUSIC model was set up in accordance with the Healthy Waterways, Water by Design's "MUSIC Modelling Guidelines Version 3.0 - 2018".

All roofwater drainage for site and the majority of the internal carpark/landscaping can be discharged to the proposed stormwater system. The proposed ramps and the landscaping along the frontage will not drain to the treatment tank and as such these areas have been modelled as free drain.

Refer to Image 4 for the schematic model setup and Table 13 for the rainfall data and modelling time step that were used.

Table 13 *– Music Rainfall Data*

Rainfall Period	Rainfall Station	Modelling Time Step
1/1/1990-31/12/1999	40406 Beenleigh Bowls Club	6 Minutes

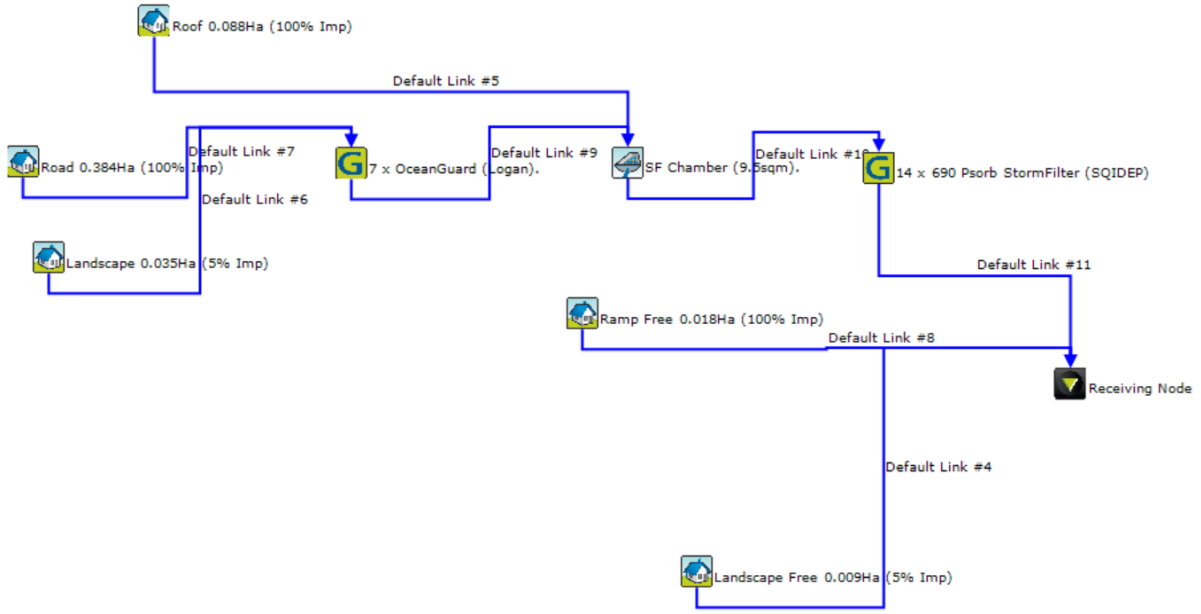


Image 4 *- MUSIC Model Set Up*

Source node catchment data is as per Table 14 below. The rainfall runoff parameters and pollutant export parameters have been set up according to Table 3.9 for split of MUSIC Modelling Guidelines Version 3.0 - 2018.

Table 14 – *MUSIC model Source Nodes*

Node	Catchment Area (ha)	Impervious Percentage
Roof	0.088	100
Road	0.384	100
Landscape	0.035	5.0
Ramp Free	0.018	100
Landscape Free	0.009	5.0

Note the catchment areas above are for the area of development only. Existing areas that are to remain pervious haven't been modelled.

4.4.3. Model Results

The above proposed treatment measures have been modelled using MUSIC Version X 1.10 and the following pollutant load-based reductions have been predicted for the site.

Table 15 *– MUSIC Modelling Results*

Target Pollutant	Required Load Based Reduction	Achieved Reduction
Total Suspended Solids (TSS)	80%	80%
Total Phosphorus (TP)	60%	80%
Total Nitrogen (TN)	45%	62%
Gross Pollutants (GP)	90%	96%

As Table 15 above demonstrates, the installation of the proposed stormwater treatment measures achieves the required reduction requirements for Total Suspended Solids, Total Phosphorus, Total Nitrogen and Gross Pollutants. Refer to Appendix C for the MUSIC results. The proposed treatment measures are therefore compliant with the Acceptable Outcome AO10 of Council's Infrastructure Code.

Trace and heavy metals are usually associated with fine sediment. The proposed treatment train removes very significant proportions of suspended solids therefore it is expected that the removal of trace and heavy metals will be acceptable to adequately protect downstream habitats and ecosystems from heavy metal contamination. No major sources of hydrocarbons are expected on site.

4.5. Water Quality Monitoring

No monitoring of water quality of the runoff from the site is proposed. Untrialled stormwater quality management measures are not proposed. Additionally, the level of treatment proposed is considered best practice and little improvement in the treatment train proposed could be provided.

4.6. Maintenance

4.6.1. OceanGuard Maintenance

Maintenance and cleaning of the Ocean Protect 'OceanGuard' is to be undertaken per the Operation and Maintenance Manual. A copy of this can be viewed in Appendix D

4.6.2. StormFilter Maintenance

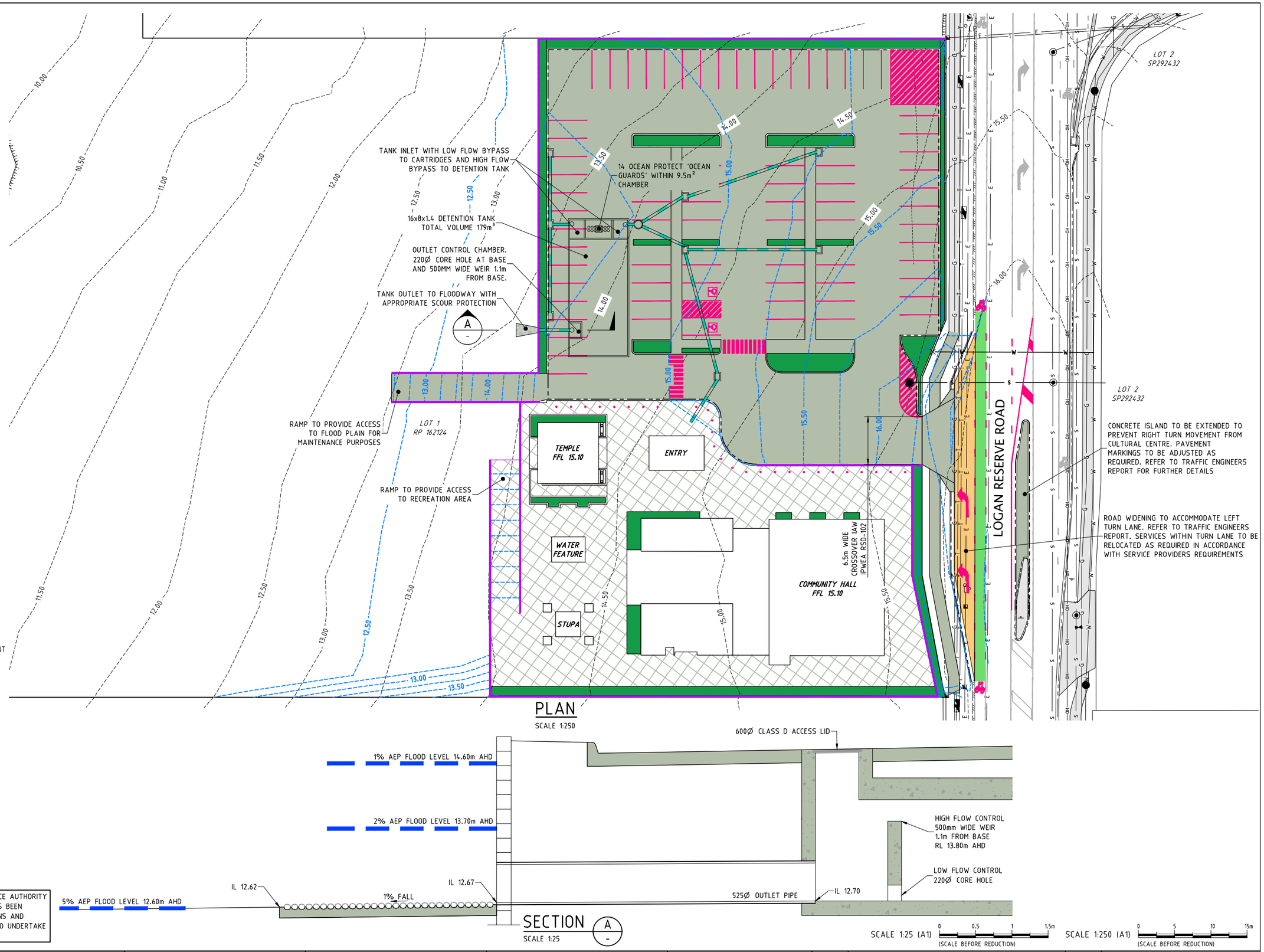
Maintenance and cleaning of the Ocean Protect 'StormFilter' is to be undertaken per the Operation and Maintenance Manual. A copy of this can be viewed in Appendix D.

5. CONCLUSIONS

The proposed development to create a Cultural Centre, can be carried out in a manner that meets the desired performance outcomes of Planning Scheme Policy 5 – Infrastructure.

On-site stormwater detention and stormwater quality will be managed by a proprietary cartridge-based filter system within the proposed detention tank which will mitigate site runoff to pre developed conditions.

ENGINEERING DRAWINGS



PLAN
SCALE 1:250

SECTION A-
SCALE 1:25

SCALE 1:25 (A1) 0 0.5 1 1.5m (SCALE BEFORE REDUCTION)

SCALE 1:250 (A1) 0 5 10 15m (SCALE BEFORE REDUCTION)

LEGEND

- EXISTING SURFACE CONTOURS (0.50m INTERVAL)
- FINISHED SURFACE CONTOURS (0.25m INTERVAL)
- EXISTING SEWERAGE
- PROPOSED SEWERAGE
- EXISTING WATER RETICULATION
- PROPOSED WATER RETICULATION
- EXISTING UNDERGROUND ELECTRICAL
- EXISTING OVERHEAD ELECTRICAL
- EXISTING TELECOMMUNICATIONS
- EXISTING GAS
- EXISTING KERB AND CHANNEL
- PROPOSED KERB AND CHANNEL
- PROPOSED RETAINING WALL
- NEW CONCRETE
- EXISTING CONCRETE
- NEW CONCRETE/DECORATIVE PAVEMENT
- PROPOSED LANDSCAPING
- PROPOSED WATER METER
- EXISTING LIGHT POLE
- EXISTING ELECTRICAL PILLAR
- EXISTING SEWERAGE STRUCTURE
- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- NEW PAVEMENT
- EXISTING PAVEMENT MARKINGS
- PROPOSED PAVEMENT MARKINGS

THIS DESIGN HAS BEEN PREPARED BASED ON SERVICE AUTHORITY AS CONSTRUCTED INFORMATION. NO POT HOLING HAS BEEN UNDERTAKEN TO VERIFY EXISTING SERVICE LOCATIONS AND DEPTHS. IT IS THE CONTRACTORS RESPONSIBILITY TO UNDERTAKE POT HOLING TO VERIFY THE DESIGN.

HCE Engineers
Phone: (07) 3829 1399
mail@hce-engineers.com.au
P.O Box 7214
Redland Bay
Level 1
55-57 Jardine Drive
Redland Bay
QLD 4165

PROJECT	TITLE	CLIENT
283-293 LOGAN RESERVE ROAD LOGAN RESERVE QLD 4133 LOT 1 RP 162124	CONCEPT ROADWORKS AND DRAINAGE PLAN	QUEENSLAND NEPALESE CULTURAL CENTRE

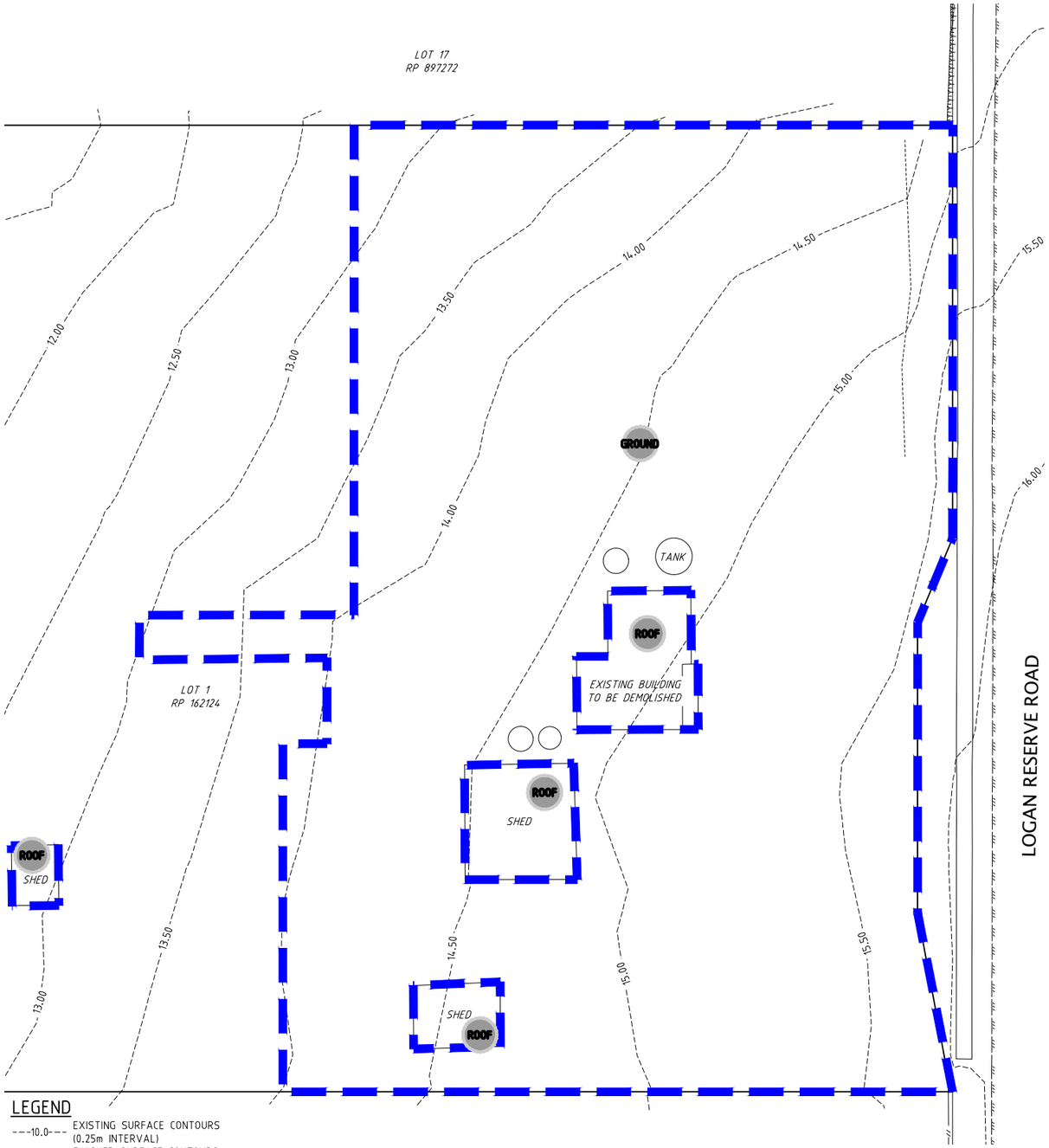
NOT FOR CONSTRUCTION. CONCEPT ONLY.

REVISION	AMENDMENT	DATE
A	ISSUED FOR DA APPROVAL	23/05/24

Designed	Drawn	Date
MN	MN	28/03/24

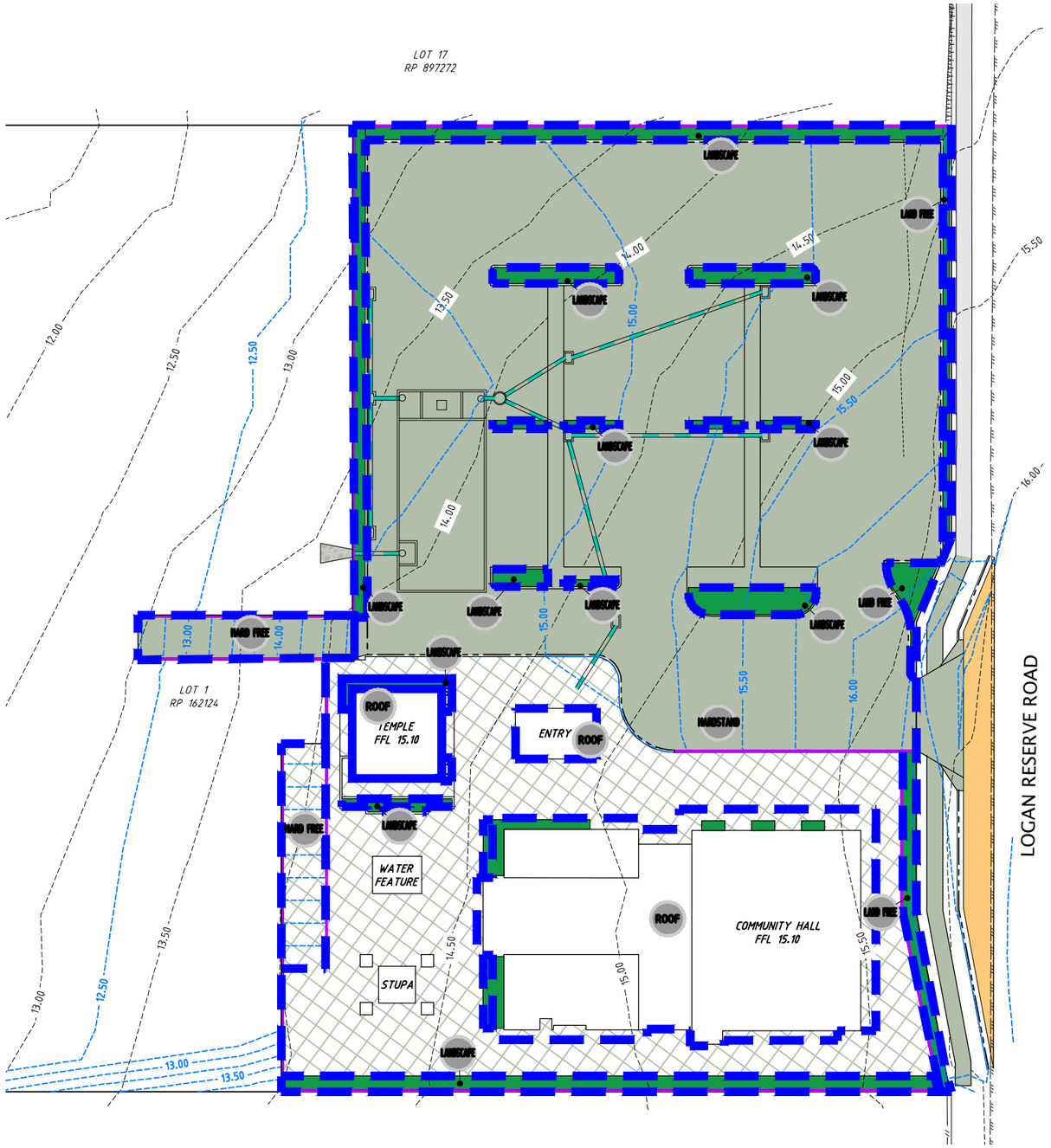
Approval No.	Scale
-	AS SHOWN

Drawing No.	Rev.
23331-SK01	A



EXISTING CATCHMENT

SCALE 1:250



PROPOSED CATCHMENT

SCALE 1:250

LEGEND

- EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- FINISHED SURFACE CONTOURS (0.25m INTERVAL)
- PROPOSED KERB AND CHANNEL
- PROPOSED RETAINING WALL
- NEW CONCRETE
- EXISTING CONCRETE
- PROPOSED STORMWATER DRAINAGE
- CATCHMENT BOUNDARY
- 1 CATCHMENT LABEL
- NEW CONCRETE/DECORATIVE PAVEMENT

THIS DESIGN HAS BEEN PREPARED BASED ON SERVICE AUTHORITY AS CONSTRUCTED INFORMATION. NO POT HOLING HAS BEEN UNDERTAKEN TO VERIFY EXISTING SERVICE LOCATIONS AND DEPTHS. IT IS THE CONTRACTORS RESPONSIBILITY TO UNDERTAKE POT HOLING TO VERIFY THE DESIGN.

SCALE 1:250 (A1) 0 5 10 15m
(SCALE BEFORE REDUCTION)

HCE Engineers
Phone: (07) 3829 1399
mail@hce-engineers.com.au
P.O Box 7214
Redland Bay
Level 1
55-57 Jardine Drive
Redland Bay
QLD 4165

PROJECT	TITLE	CLIENT
283-293 LOGAN RESERVE ROAD LOGAN RESERVE QLD 4133 LOT 1 RP 162124	STORMWATER CATCHMENT PLAN	QUEENSLAND NEPALESE CULTURAL CENTRE

NOT FOR CONSTRUCTION. CONCEPT ONLY.

REVISION	AMENDMENT	DATE
A	ISSUED FOR DA APPROVAL	23/05/24

DO NOT SCALE. CONFIRM ALL DIMENSIONS ON SITE.

Designed	Drawn	Date
MN	MN	28/03/24

Approval No.	Scale
-	AS SHOWN

Drawing No.	Rev.
23331-SK06	A

APPENDIX A – RATIONAL METHOD CALCULATIONS

RATIONAL METHOD CALCULATIONS - EXISTING SITE

Job Reference	23331
Site Address	Logan Reserve Road
Council	Logan City Council

Number of Sub-Catchments	2	
Minor Storm Event	Q10	*(As per QUDM Table 7.02.1)*
Major Storm Event	Q100	*(As per QUDM Table 7.02.1)*

Subcatchment Summary Table

Number	*Catchment Name*	*Catchment Description*	C_{10}	*tc*
1	Ex Roof	Impervious Roof	0.90	12
2	Ex Ground	Open Space (eg parks)	0.70	12

Catchment Calculations (Major and Minor Storm ARI's)

Number	*Area*	*C10*	*I10*	*Q10*	*C100*	*I100*	*Q100*
	ha		*mm/hr*	*m³/s*		*mm/hr*	*m³/s*
1	0.029	0.90	149	0.011	1.00	220	0.018
2	0.505	0.70	149	0.146	0.84	220	0.259

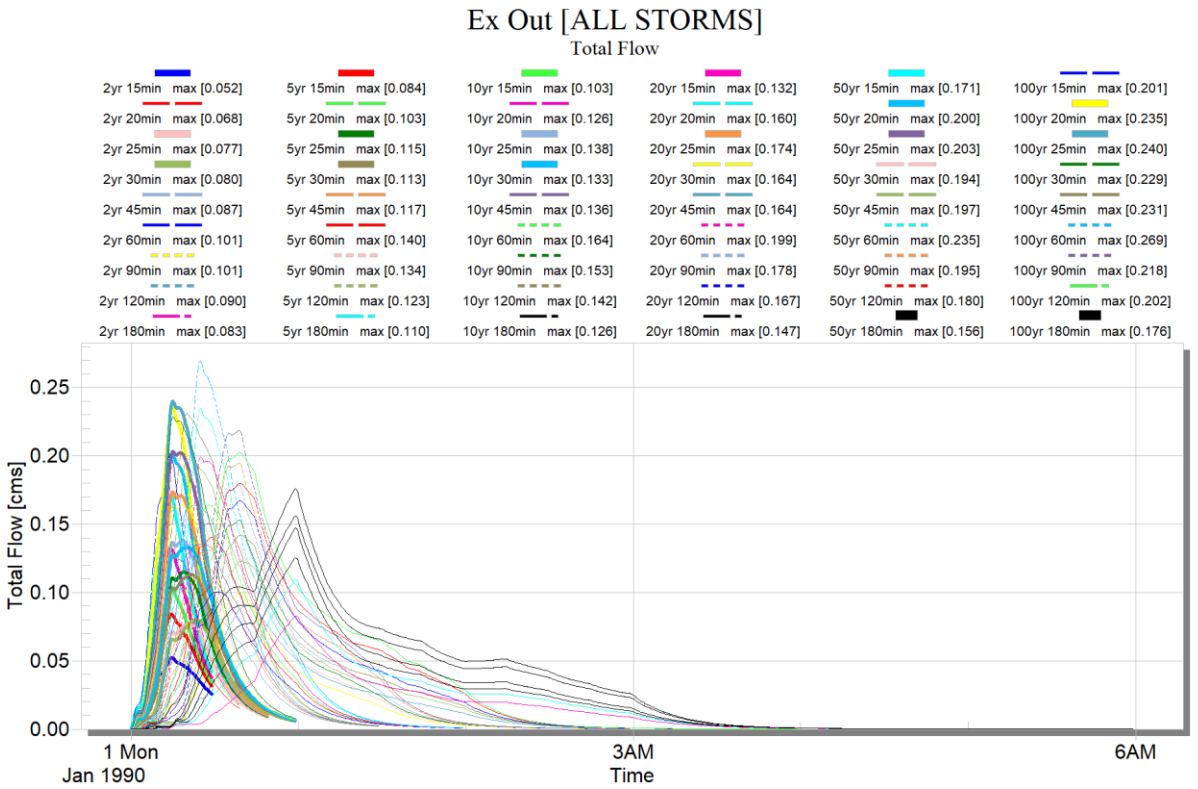
Total Runoff	Minor	0.157	*m³/s*
	Major	0.277	*m³/s*
Total Area		0.534	*ha*

Overland Flow Calculations		
Trunk SW Infrastructure		
Pipe Diameter	N/A	*m*
Number of Pipes	0	
Grade	0	*m/m*
mannings	0	
Pipe Capacity		*m^3/s*
Pipe Velocity		*m/s*
Capacity @ 3m/s		*m^3/s*
Overland Flow		*m^3/s*

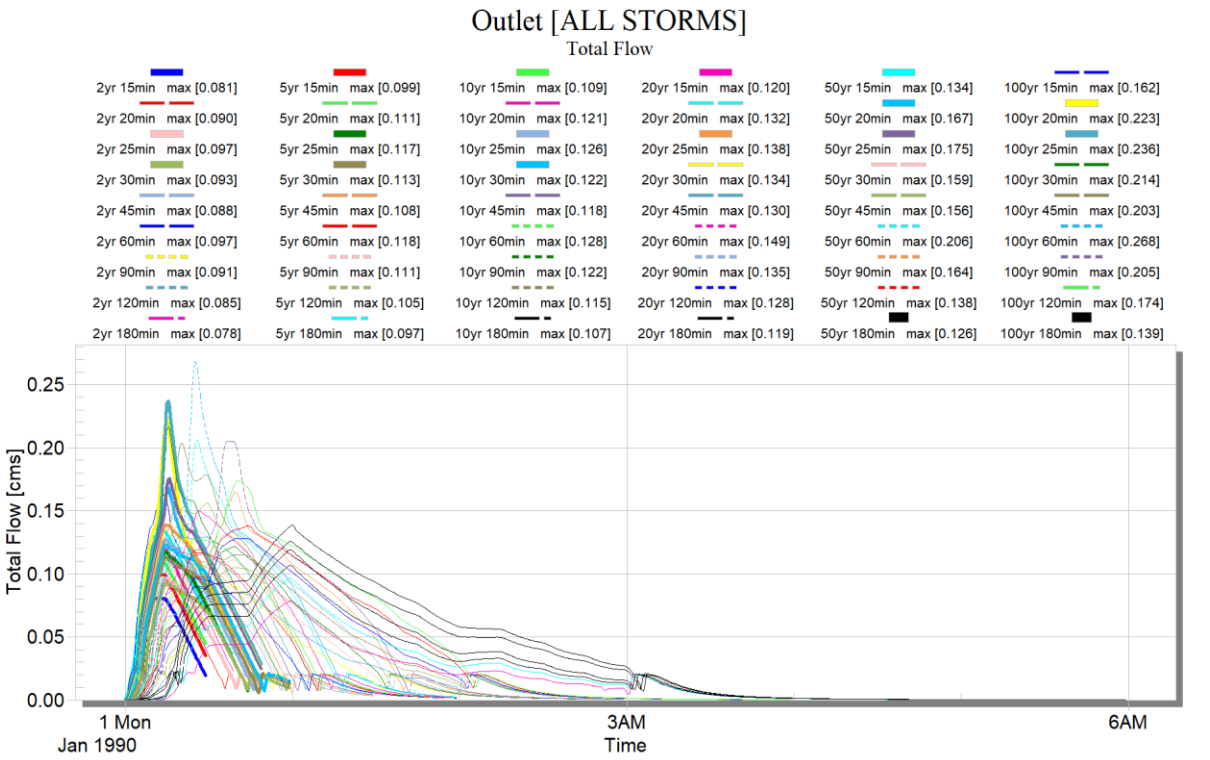
All Storm ARI's		
ARI	*Peak Discharge*	
3 Month	0.035	*m^3/s*
1	0.071	*m^3/s*
2	0.096	*m^3/s*
5	0.134	*m^3/s*
10	0.157	*m^3/s*
20	0.189	*m^3/s*
50	0.239	*m^3/s*
100	0.277	*m^3/s*

APPENDIX B – XP RAFTS OUTPUTS

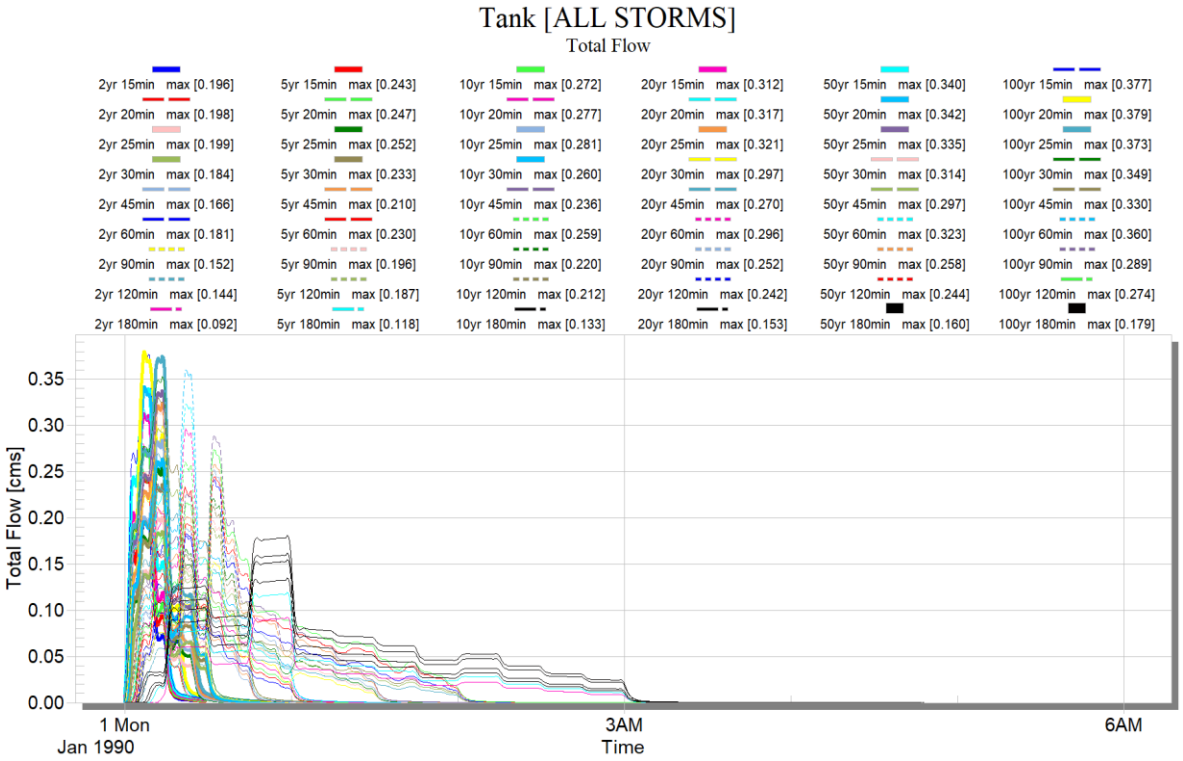
EXISTING DISCHARGE



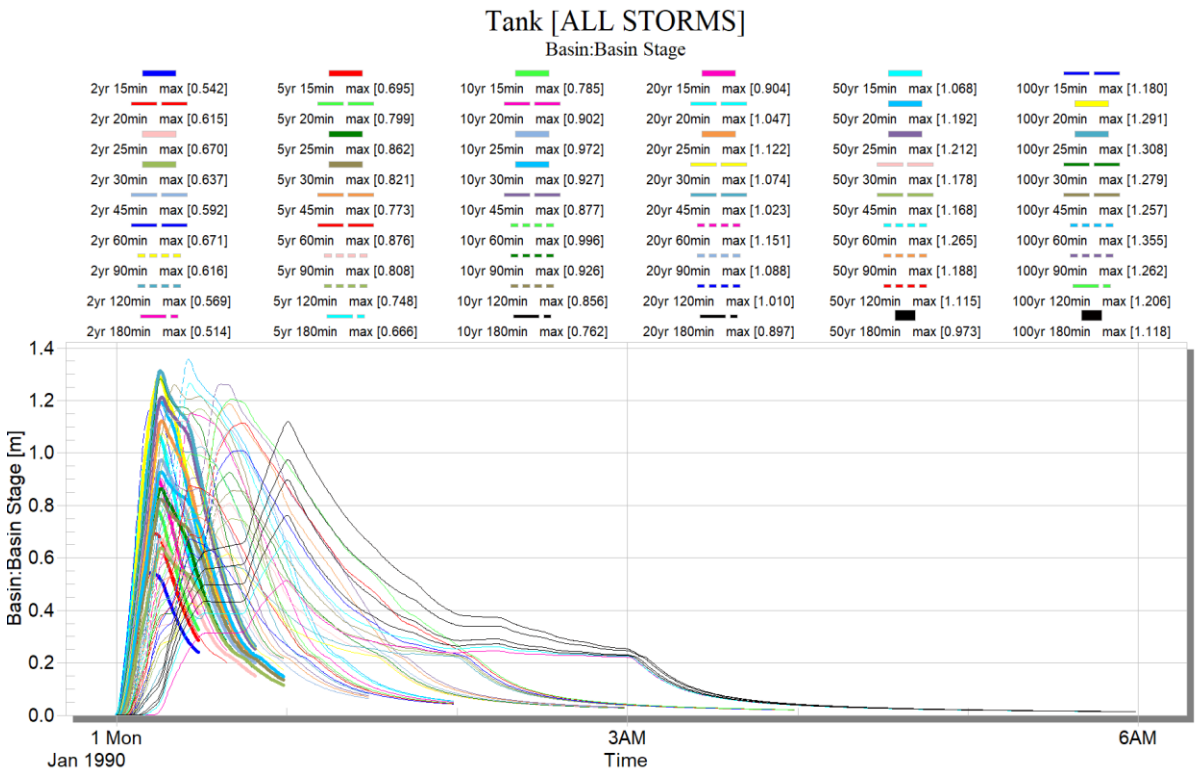
DEVELOPED MITIGATED DISCHARGE



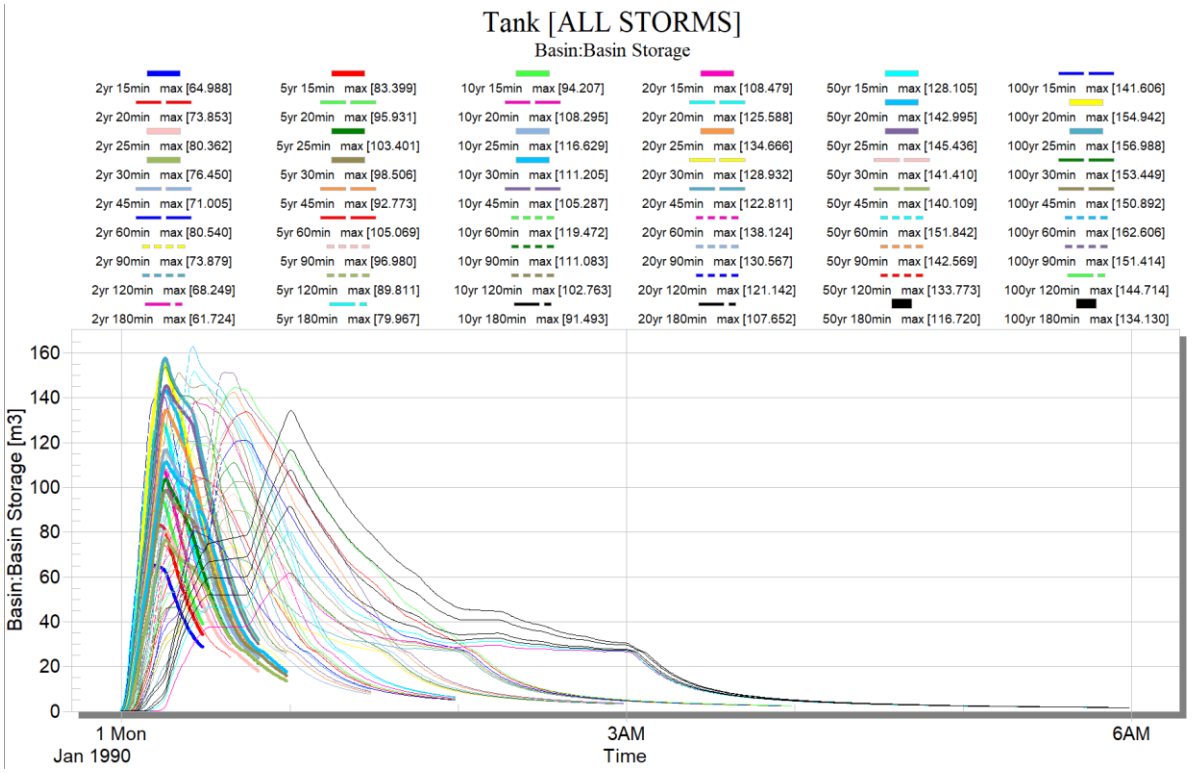
FLOW INTO DETENTION TANK/BASIN



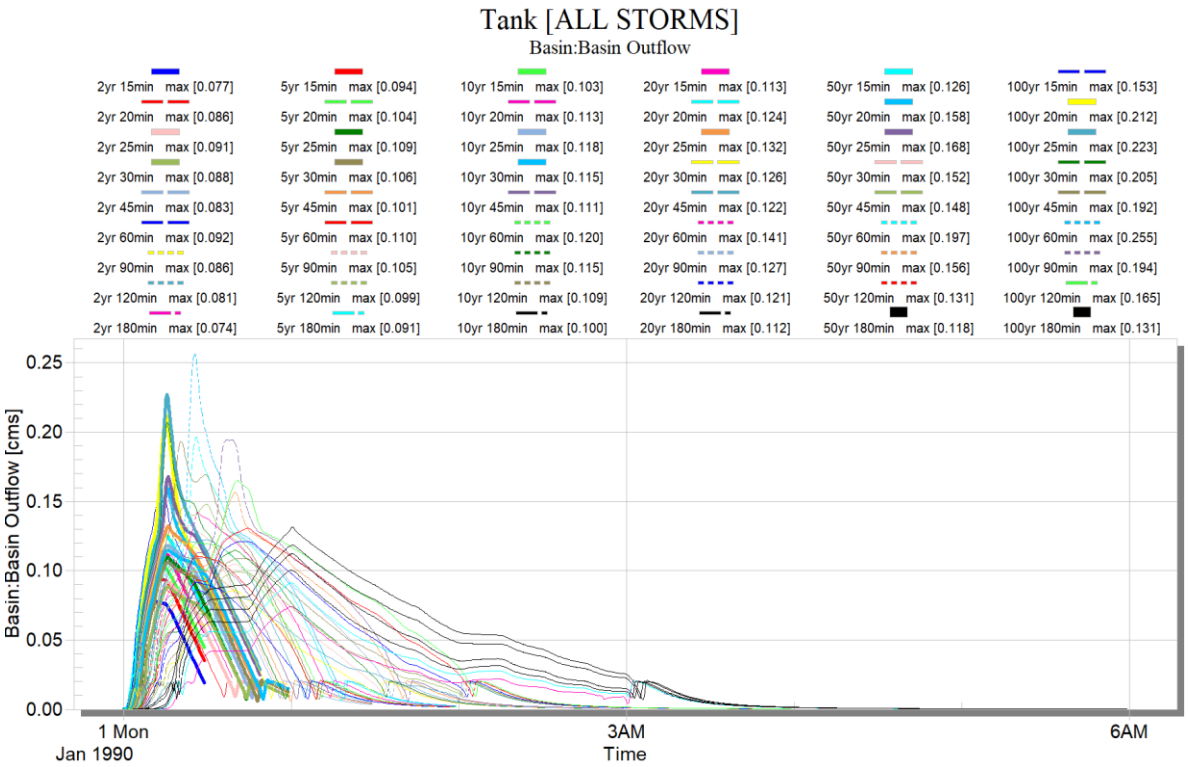
DETENTION TANK/BASIN STAGE



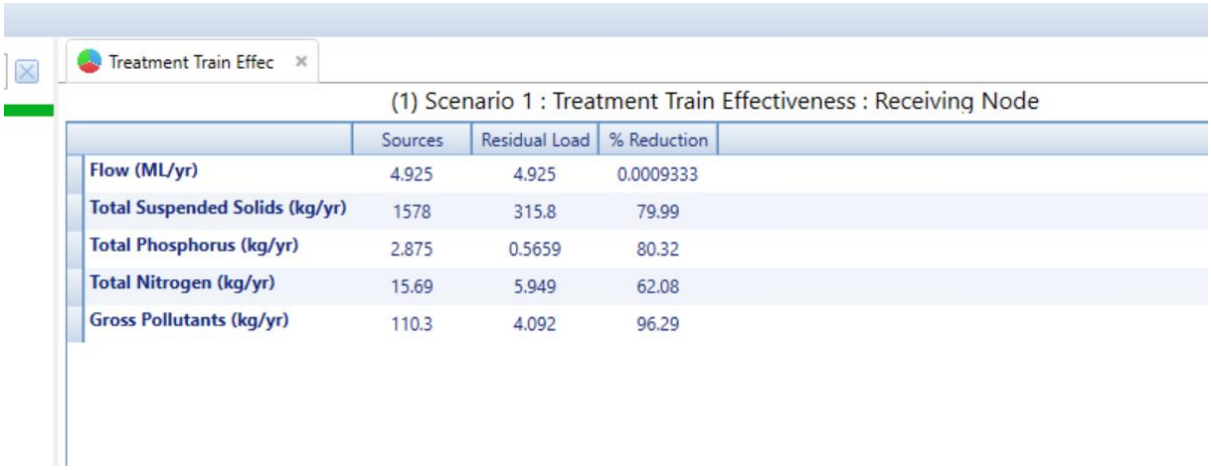
DETENTION TANK/BASIN STORAGE



DETENTION TANK/BASIN DISCHARGE



APPENDIX C – MUSIC MODELLING RESULTS

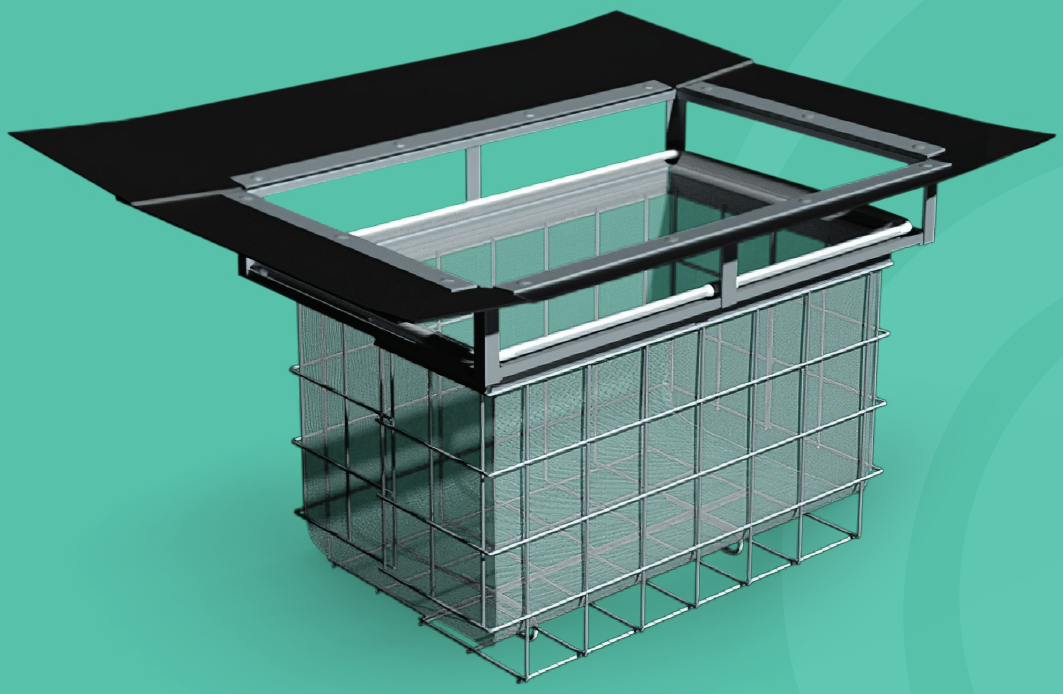

Treatment Train Effec
(1) Scenario 1 : Treatment Train Effectiveness : Receiving Node
Sources
Residual Load
% Reduction
Flow (ML/yr) 4.925 4.925 0.0009333
Total Suspended Solids (kg/yr) 1578 315.8 79.99
Total Phosphorus (kg/yr) 2.875 0.5659 80.32
Total Nitrogen (kg/yr) 15.69 5.949 62.08
Gross Pollutants (kg/yr) 110.3 4.092 96.29

APPENDIX D – MAINTENANCE GUIDELINES

OCEAN PROTECT

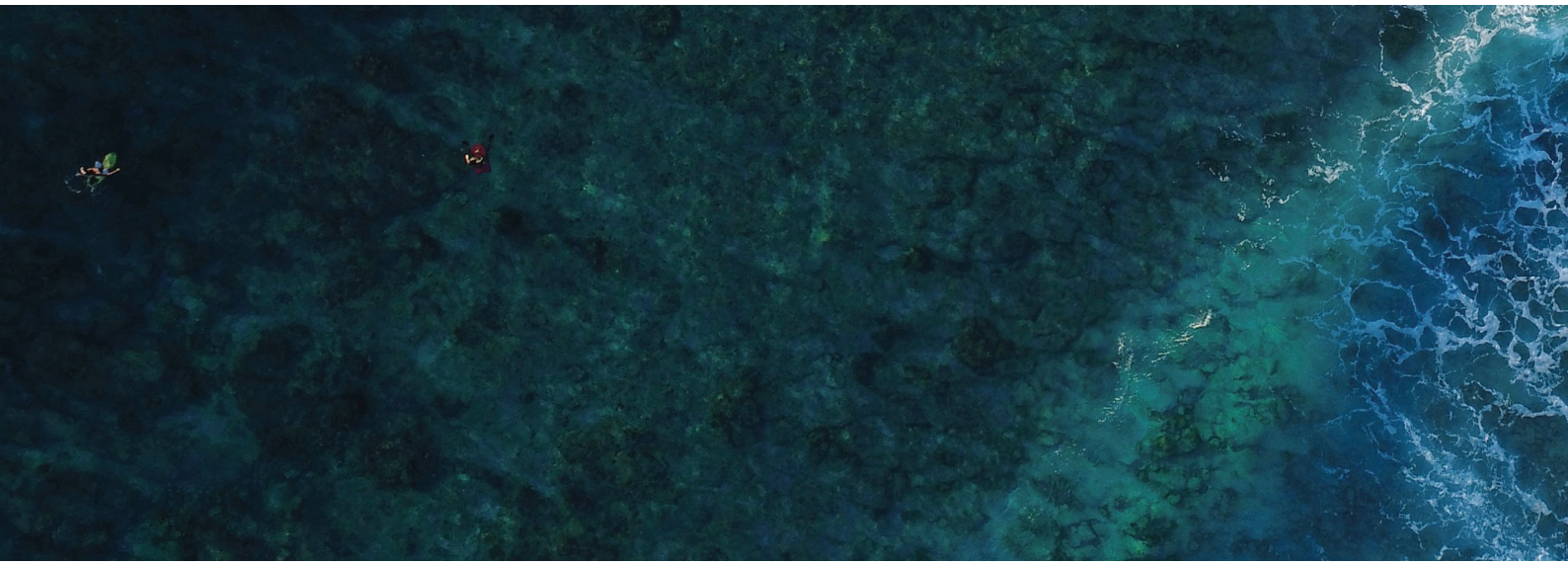
OceanGuard®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways

09/22



www.oceanprotect.com.au

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the OceanGuard® as recommended by the manufacturer (Ocean Protect).

The OceanGuard® technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of filtration liners, designed to remove gross pollutants, solids, and other attached pollutants as either a standalone technology or as part of a 'treatment train' (e.g. with StormFilter®, Jellyfish® or biofiltration). OceanGuards are highly effective, easy to install and simple to maintain.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most importantly ensures the long term effective operation of the OceanGuard®.

Health and Safety

Access to pits containing an OceanGuard® typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard® is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it work?

OceanGuard® is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard® has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).

During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard® ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard® filtration bag. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

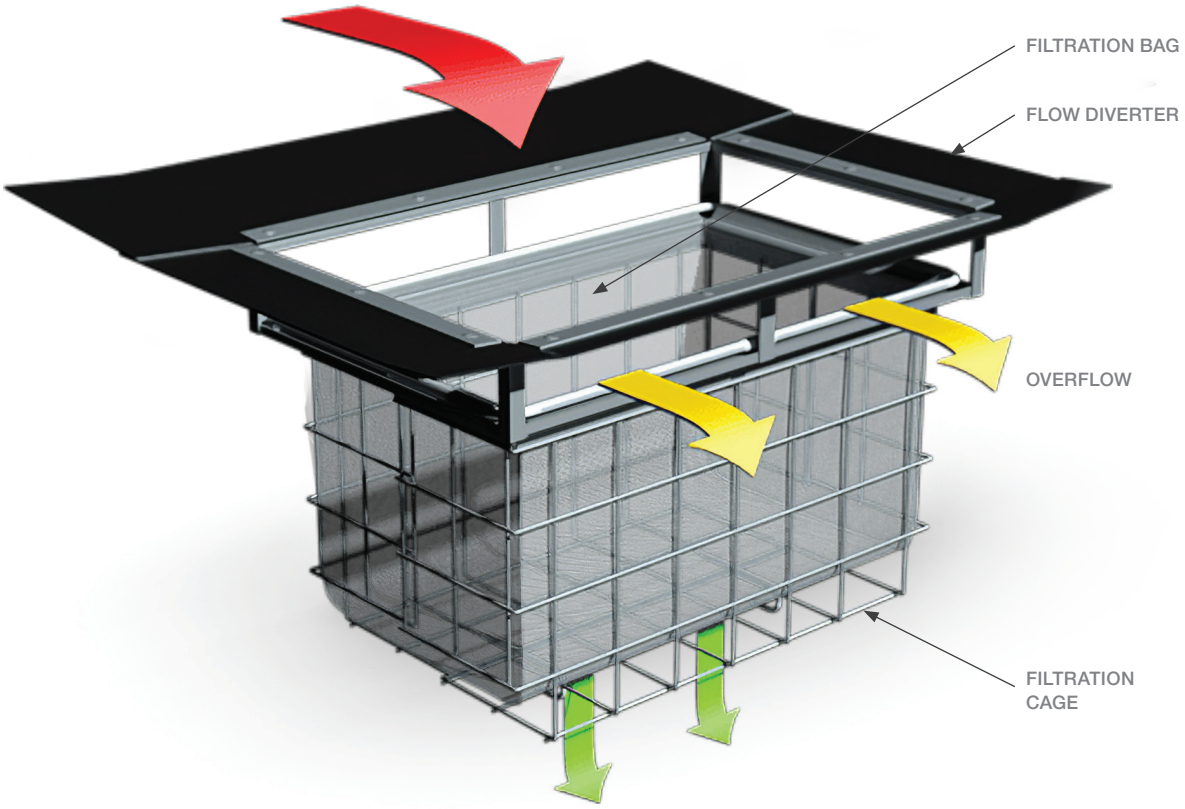


Figure 1: OceanGuard® components

Maintenance Procedures

To ensure that each OceanGuard® achieves optimal performance, it is advisable that regular maintenance is performed. The OceanGuard® requires 1-6 minor services annually (3 to 4 typical), pending the outcome of these inspections additional maintenance servicing may be required.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	1-6 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard® back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Use two lifting hooks to remove the filtration bag
4. Empty the contents of the filtration bag into a disposal container
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Vacuum captured pollutants from the filtration bag
4. Remove filtration bag
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard®, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components[1]

[1] Replacement filtration bags and components are available for purchase from Ocean Protect

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard® pits that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuard's internal high flow bypass functionality is designed to minimise the potential of blockages/ flooding and this configuration has been field proven for over twenty years. Flooding caused by an OceanGuard® style of pit basket is extremely rare and in the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

1. Inspect the OceanGuard® flow diverter, ensuring that they are free of debris and pollutants
2. Perform a minor service on the OceanGuard®
3. Remove the OceanGuard® to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard® after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

The accumulated pollutants found in the OceanGuard® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit www.oceanprotect.com.au

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.oceanprotect.com.au

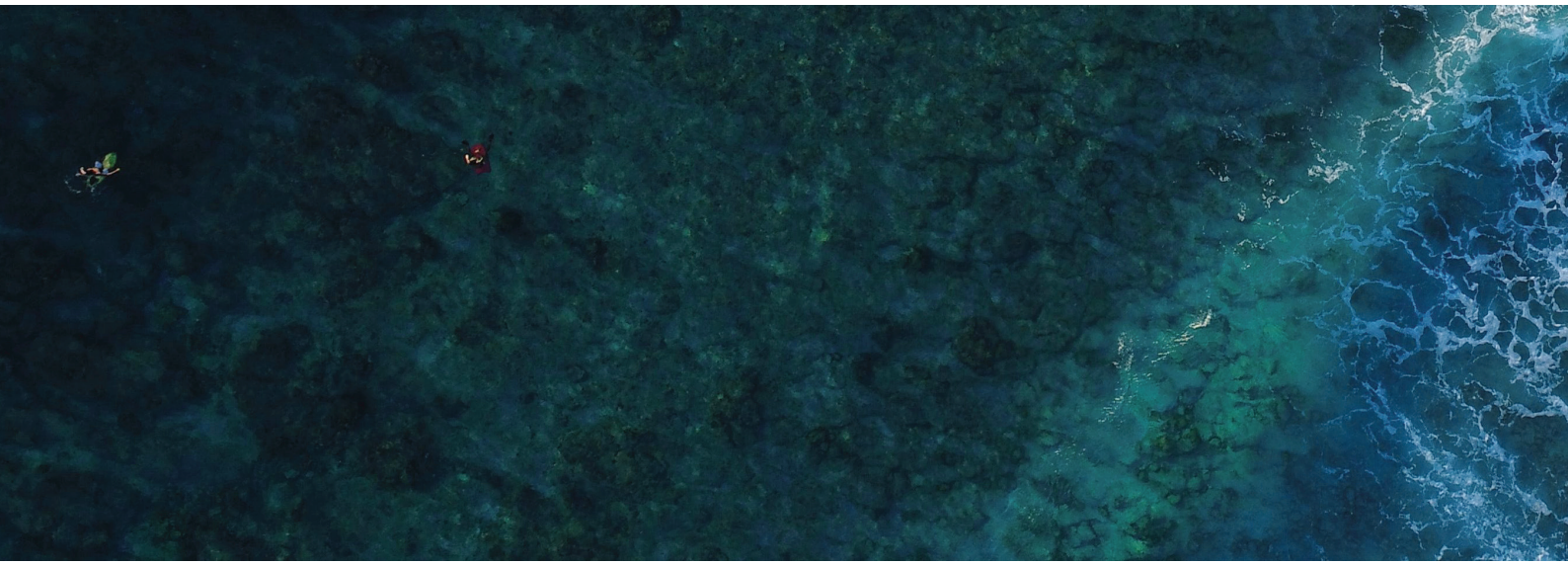
OCEAN PROTECT

StormFilter®

Operations & Maintenance Manual

Stopping Pollution Entering Waterways

09/22



www.oceanprotect.com.au

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter®, as recommended by the manufacturer (Ocean Protect).

The StormFilter® is designed and sized to meet stringent regulatory requirements. It removes the most challenging target pollutants (including fine solids, soluble heavy metals, oil, and soluble nutrients) using a variety of media. For more than two decades, StormFilter® has helped clients meet their regulatory needs and, through ongoing product enhancements, the design continues to be refined for ease of use and improved performance.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter®.

Health and Safety

Access to a StormFilter® unit requires removing heavy access covers/grates, and it is necessary to enter a confined space. Pollutants collected by the StormFilter® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter®, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter® maintenance can be performed from surface level, there will be a need to enter the StormFilter® system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it work?

Stormwater enters the cartridge chamber, passes through the filtration media and begins filling the cartridge center tube. When water reaches the top of the cartridge the float valve opens and filtered water is allowed to drain at the designed flow rate. Simultaneously, a one-way check valve closes activating a siphon that draws stormwater evenly throughout the filter media and into the center tube. Treated stormwater is then able to discharge out of the system through the underdrain manifold pipework.

As the rain event subsides, the water level outside the cartridge drops and approaches the bottom of the hood, air rushes through the scrubbing regulators releasing the water column and breaking the siphon. The turbulent bubbling action agitates the surface of the cartridge promoting trapped sediment to drop to the chamber floor. After a rain event, the chamber is able to drain dry by way of an imperfect seal at the base of the float valve.

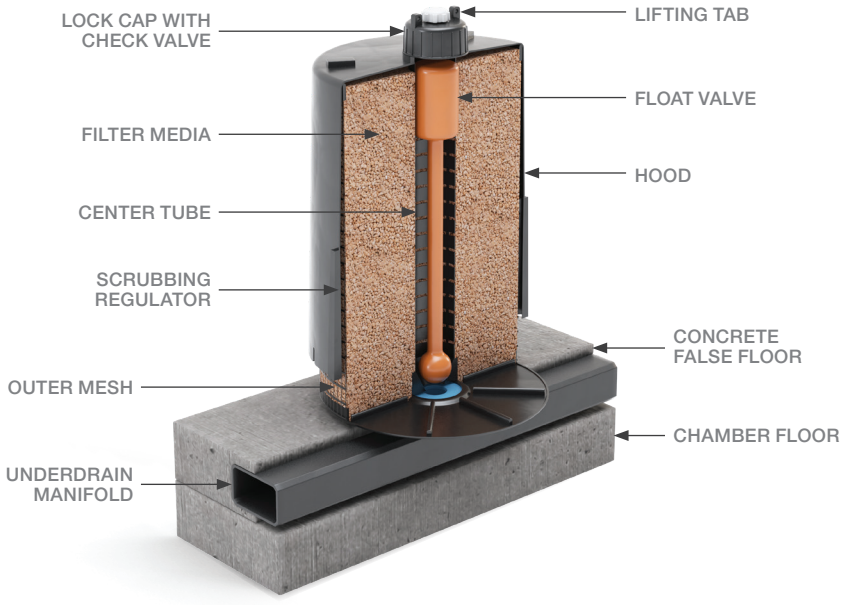


Figure 1: StormFilter® components

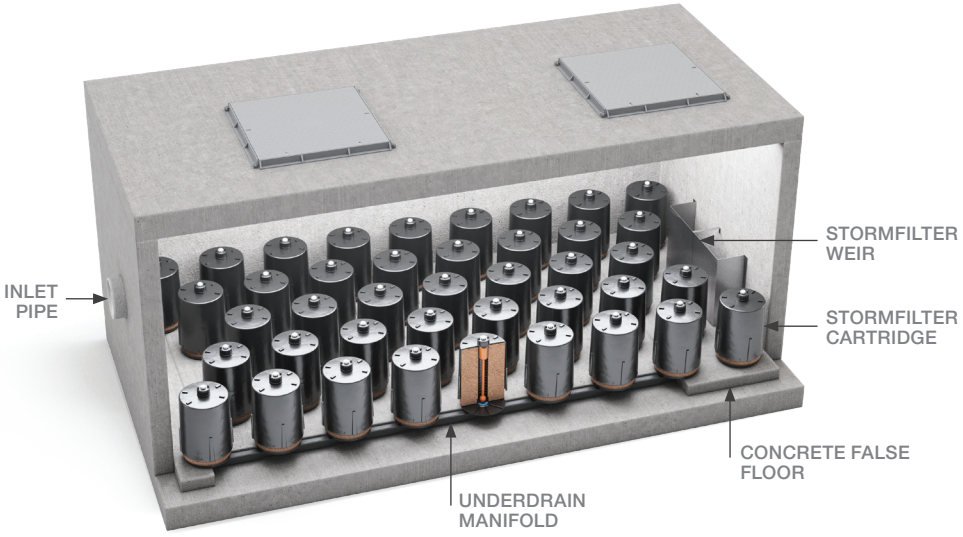


Figure 2: Example conceptual diagram of a StormFilter® system

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter® requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter® cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter®.

Service Type	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter® chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter® cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter® system is to assess the condition of the StormFilter® chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter® weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter® system, whilst assessing the condition of the cartridge media.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. Evaluate StormFilter® cartridge media (if exhausted schedule major service within 6 months)
4. Measure and record the level of accumulated sediment in the chamber (if sediment depth is less than 100 mm skip to step 9)
5. Remove StormFilter® cartridges from the chamber
6. Use vacuum unit to removed accumulated sediment and pollutants in the chamber
7. Use high pressure water to clean StormFilter® chamber
8. Re-install StormFilter® cartridges
9. Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter® system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted[1]	Replace StormFilter® cartridge media[2]

[1] Multiple assessment methods are available, contact Ocean Protect for assistance

[2] Replacement filter media and components are available for purchase from Ocean Protect

This service is designed to return the StormFilter® device back to optimal operating performance.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media
4. Utilise a vacuum unit to remove exhausted media from each cartridge
5. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
6. Use high pressure water to clean StormFilter® chamber
7. Inspect each empty StormFilter® cartridges for any damage, rectify damage as required
8. Re-fill each cartridge with media in line with project specifications
9. Re-install replenished StormFilter® cartridges
10. Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter® unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination – and, depending on the type of spill event, it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter® system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Inspect the StormFilter® unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter® after a major storm event. The focus is to inspect for damage and abnormally high sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed

.

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience, Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of StormFilter®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement media for cartridges.

For more information please visit www.oceanprotect.com.au

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.oceanprotect.com.au

APPENDIX E – COUNCIL FLOOD REPORT

CITY OF LOGAN

PROPERTY FLOOD REPORT

Property Details

Address: 283-293 Logan Reserve Road LOGAN RESERVE QLD 4133

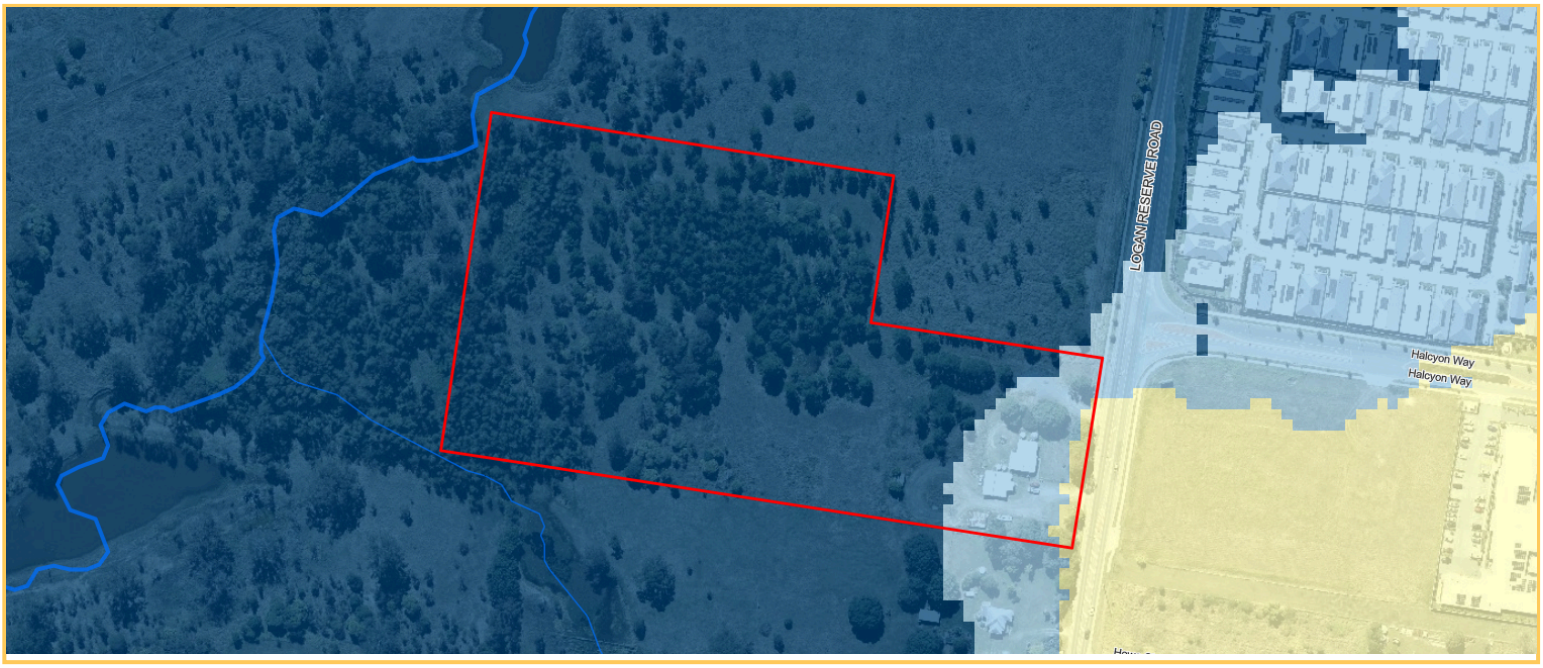
Lot/Plan: Lot 1 RP 162124

Size/Area: 40,846 m^2

Property Key: 205873

Latest Flood Risk

The extract below comes from the flood risk map based on the latest (most recent) flood studies accepted by Council applicable for this property.



LEGEND

High	Floodwaters may be deep or fast flowing, or have a relatively high chance of occurrence (e.g. 80% chance in 30 years). Conditions may pose a risk to life and cause damage to buildings, possibly severe.
Moderate	Less frequently affected by flooding or if more frequent, with shallow or slower moving floodwater. Conditions may pose an unacceptable risk to people or property if not mitigated.
Low	Extremely unlikely chance of flooding (1% chance or less over a 30 year period) and/or relatively shallow or benign flooding conditions.
Very Low	Identifies the full floodplain under the largest flood that could conceivably occur.
Investigation area	Locations where a current flood study has not been delivered and information to determine flood risk is not available. The approximation of the floodplain in these areas is based on a citywide overland flow study. Further investigation is needed.

The flood studies this map is based on consider the impacts of climate change, as required by Queensland's planning legislation and policies. The map considers the whole floodplain for Logan and reflects a risk-based approach that takes into account:

- How likely a flood of a given size is in any given year, and
- What the impact or level of danger of that flood is.

Summary Flood Assessment

The table below presents the flood risks applicable to the selected property. There may be multiple studies and flood scenarios affecting the property, particularly for larger sites.

Assessment	Details
Risk area(s)	High, Moderate, Low
Investigation area	Not applicable
River flooding	20% chance of a flood this size or larger happening in any given year
Creek flooding	Not applicable
Overland flow	Applies. It is possible that flooding from a local waterway which has not yet been studied may also impact the property. Please contact Council for further advice. Overland flow is water (stormwater run-off) that travels over land during heavy rainfall events. It generally occurs quickly and for short durations.

Flood Levels

The table below displays flood levels from the most recently accepted flood studies affecting this property. To view the flood study documents please see the Flood page on Council's website.

The levels are measured in Australian Height Datum (AHD), where sea level is approximately zero (0) metres. The level displayed in the table below is the maximum flood level on the property for that event (likelihood). For some properties, particularly large properties or those on a significant slope, flood levels can vary significantly.

The most likely flood scenarios is shown at the top of the table, with the Probable Maximum Flood (PMF) at the bottom, being the least likely but most serious flood scenario.

Some properties may be impacted by only river flooding or only creek flooding, and some may be impacted by both. There may also be other sources of inundation that may impact the property and affect flood levels, based on overland flow or local creeks where studies have not yet been completed.

Study: Logan and Albert Rivers Flood Study 2023

Likelihood (each year)	River flooding
20% chance	8.9 metres AHD
10% chance	11.0 metres AHD
5% chance	12.6 metres AHD
2% chance	13.7 metres AHD
1% chance	14.6 metres AHD
0.5% chance	15.1 metres AHD
0.2% chance	15.7 metres AHD
0.05% chance	16.1 metres AHD
PMF	20.1 metres AHD

Ground Levels

Ground levels are based on an aerial LiDAR (Light Detection and Ranging) survey, which uses millions of laser point measurements to build a model of the ground surface. The source of the data is displayed in the table below so that you know when the survey was conducted.

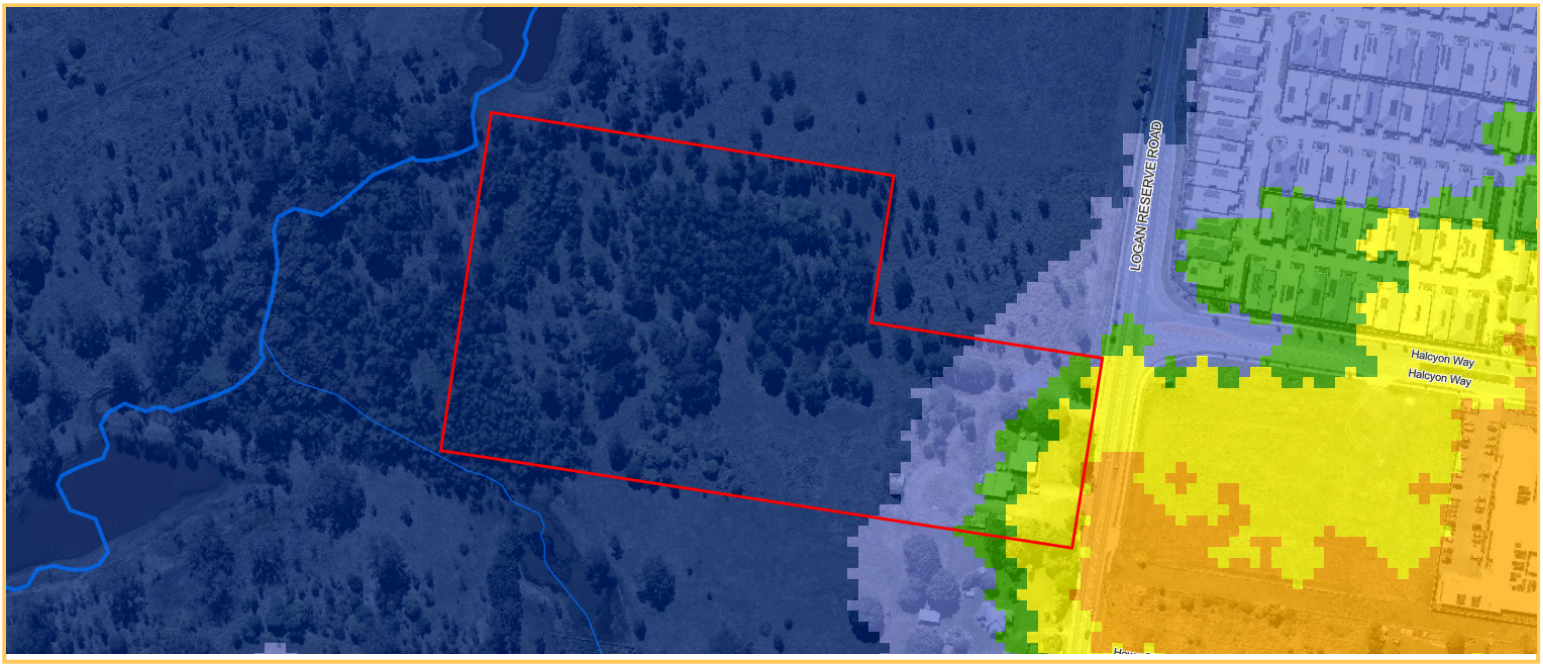
Ground level	Details
Minimum ground level	4.3 metres AHD
Maximum ground level	16.1 metres AHD

Source: 2021 Digital elevation model (1 metre grid)

CITY OF LOGAN

Flood Scenarios Map

This extract comes from the map showing the projected extent of flooding (affected areas) for multiple flood scenarios for all relevant flood studies, **including the projected impacts of climate change**. This map corresponds with the flood levels provided in the table above for the 5%, 1%, 0.5%, 0.05% and Probable Maximum Flood (PMF) scenarios.

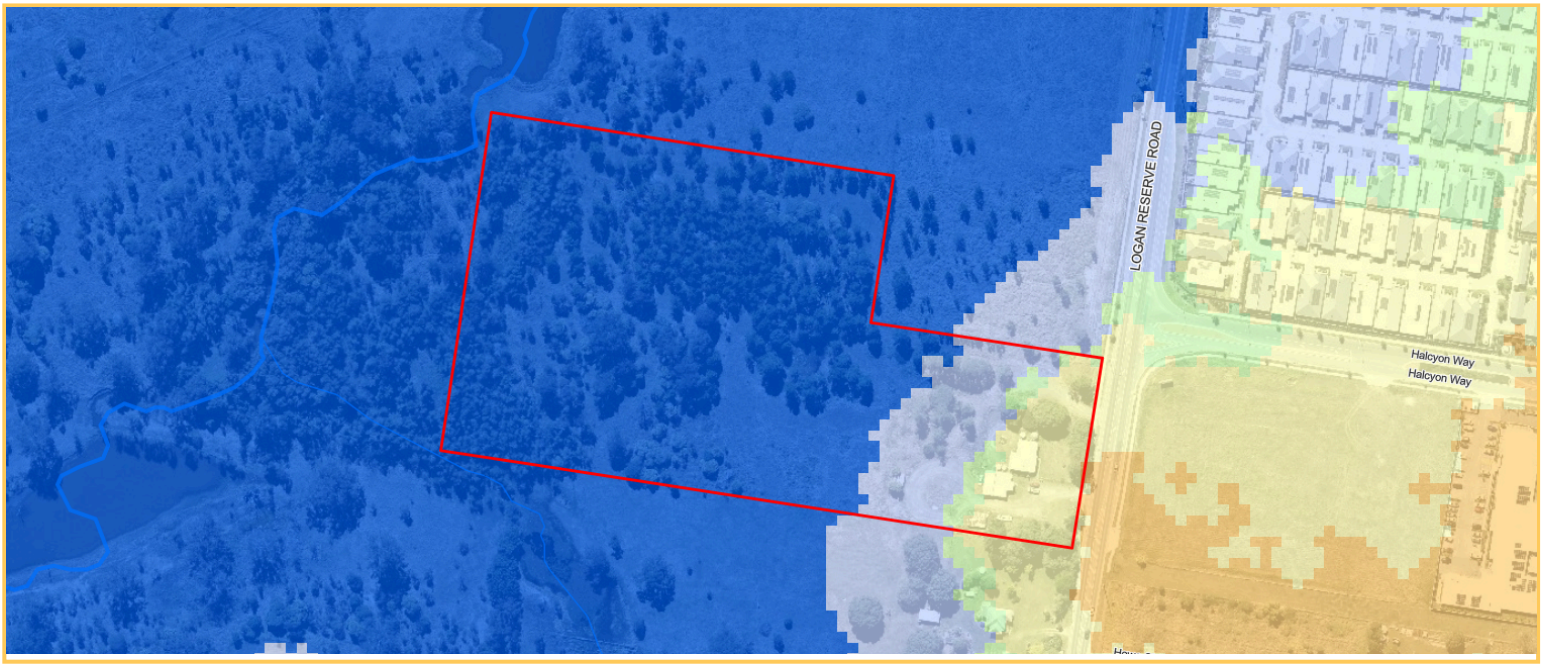


LEGEND

5% chance	The areas modelled to be impacted by a flood that has a 5% (or 1 in 20) chance of happening in any given year, or 80% chance over a 30 year period, which is the common term of a mortgage. This modelling **includes the impacts of climate change** and represents our understanding of future risk.
1% chance	The areas modelled to be impacted by a flood that has a 1% (or 1 in 100) chance of happening in any given year, or 25% chance over a 30 year period, which is the common term of a mortgage. This modelling **includes the impacts of climate change** and represents our understanding of future risk.
0.5% chance	The areas modelled to be impacted by a flood that has a 0.5% (or 1 in 200) chance of happening in any given year, or 15% chance over a 30 year period, which is the common term of a mortgage. This modelling **includes the impacts of climate change** and represents our understanding of future risk.
0.05% chance	The areas modelled to be impacted by a flood that has a 0.05% (or 1 in 2000) chance of happening in any given year. This is an extremely unlikely flood event with a 1% chance of happening over a 30 year period, not including the impacts of climate change.
PMF	The PMF or probable maximum flood scenario represents the full extent of the floodplain, or the most serious flood that could be expected to occur. This is usually estimated based on the probable maximum rainfall, not including the impacts of climate change.
Investigation area	Locations where a current flood study has not been delivered and information to determine flood risk is not available. The approximation of the floodplain in these areas is based on a citywide overland flow study. Further investigation is needed.

Present Day (Insurance) Scenarios Map

This extract comes from the map showing flood affected areas **without** considering the impacts of climate change. This map represents modelled flooding under current conditions, and can be used for insurance purposes.



LEGEND

5% chance	The areas modelled to be impacted by a flood that has a 5% (or 1 in 20) chance of happening in any given year, or 80% chance over a 30 year period, which is the common term of a mortgage. This modelling is based on **current (present day) conditions** and does not take into account the impacts of climate change.
1% chance	The areas modelled to be impacted by a flood that has a 1% (or 1 in 100) chance of happening in any given year, or 25% chance over a 30 year period, which is the common term of a mortgage. This modelling is based on **current (present day) conditions** and does not take into account the impacts of climate change.
0.5% chance	The areas modelled to be impacted by a flood that has a 0.5% (or 1 in 200) chance of happening in any given year, or 15% chance over a 30 year period, which is the common term of a mortgage. This modelling is based on **current (present day) conditions** and does not take into account the impacts of climate change.
0.05% chance	The areas modelled to be impacted by a flood that has a 0.05% (or 1 in 2000) chance of happening in any given year. This is an extremely unlikely flood event with a 1% chance of happening over a 30 year period, not including the impacts of climate change.
PMF	The PMF or probable maximum flood scenario represents the full extent of the floodplain, or the most serious flood that could be expected to occur. This is usually estimated based on the probable maximum rainfall, not including the impacts of climate change
Investigation area	Locations where a current flood study has not been delivered and information to determine flood risk is not available. The approximation of the floodplain in these areas is based on a citywide overland flow study. Further investigation is needed.

Historic Flood Events

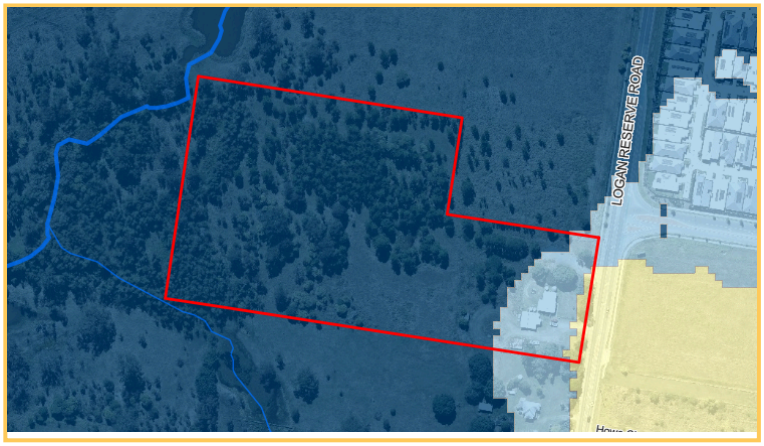
Based on the best information available to Council, the table below indicates whether or not the selected property may have been impacted by significant historic flood events. It is possible that other creek flooding or overland flow, which is not included in Council's mapping of these events, may have impacted the property.

Flood event	Property impacted
1974	Yes
2017 (after ex Tropical Cyclone Debbie)	Yes
2022 (late February / early March)	Yes

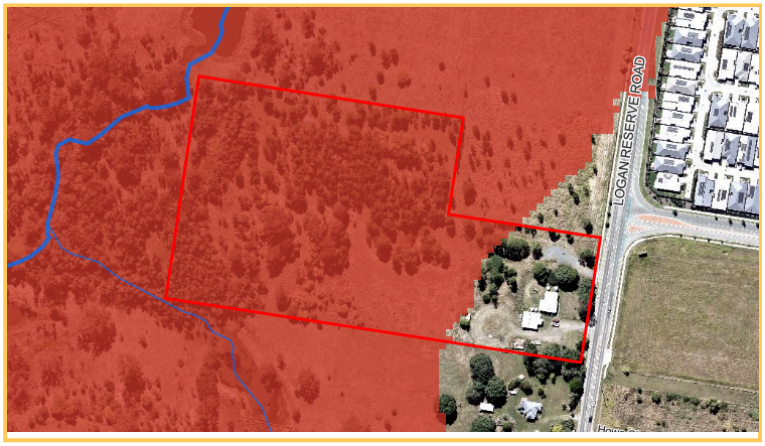
Planning Scheme Maps

The selected property is shown below on an extract of the Flood Overlay Maps from the Logan Planning Scheme 2015 V9 with TLPI No. 1/2023. Various provisions of the planning scheme which refer to properties affected by the Flood Overlay Maps will apply to the flood affected areas for the purposes of planning and development. This may include, for example, raised building floor levels and achieving safe vehicle access to the road network.

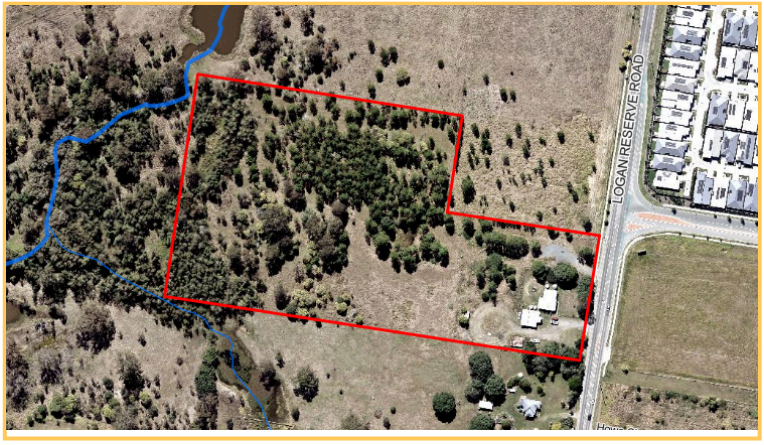
OM-05.01 Flood risk areas



OM-05.02 High flow area



OM-05.03 Isolated islands



MAP LEGEND

High	Floodwaters may be deep or fast flowing, or have a relatively high chance of occurrence (e.g. 80% chance in 30 years). Conditions may pose a risk to life and cause damage to buildings, possibly severe.
Moderate	Less frequently affected by flooding or if more frequent, with shallow or slower moving floodwater. Conditions may pose an unacceptable risk to people or property if not mitigated.
Low	Extremely unlikely chance of flooding (1% chance or less over a 30 year period) and/or relatively shallow or benign flooding conditions.
Very Low	Identifies the full floodplain under the largest flood that could conceivably occur.
Investigation area	Locations where a current flood study has not been delivered and information to determine flood risk is not available. The approximation of the floodplain in these areas is based on a citywide overland flow study. Further investigation is needed.

MAP LEGEND

High flow area	High hazard areas of flooding where significant (deeper, faster) flow of water occurs and in which a building is vulnerable to structural damage or failure from floodwater. Classified as H5 or H6 in the Australian Institute of Disaster Resilience (AIDR) Guideline 7-3 'Flood Hazard'.
High flood island	Areas which are isolated from flood-free land (surrounded by floodwater) but retain a portion of the area as flood free in a probable maximum flood (PMF).
Low flood island	Areas which are surrounded by floodwater and at first isolated from flood-free land, then completely inundated by floodwater (submerged) as the flood continues to rise.
Meadowbrook flood assessment area	Area where the function of important community infrastructure needs to be maintained. Flood mitigation measures and comprehensive emergency management planning is required to adequately manage the risk for flood events.

If more recent flood studies have been completed and accepted by Council, the Latest Flood Risk Map shown at the top of this report may be different from the planning scheme map. The latest flood information should be used to inform development decisions and will be incorporated into the planning scheme in a future amendment.

Further Information

1. Floods are highly unpredictable and variable, and properties may be affected by other sources of potential flooding. Each flood and its impact is different. Areas that were not flooded previously may be affected by future events. Areas that have been previously flooded may be impacted in different ways. This online report cannot take all of this into account.
2. The flood mapping and levels in this report are based on data from flood studies undertaken at a particular time and are subject to change. For example, if the method for calculating flood levels is updated, industry guidelines are updated or more recent information becomes available, this may result in changes to the information in this report. In areas where development is ongoing, the flood mapping and levels may not reflect developed conditions.
3. Flood studies do not create risk. They help us to understand the risk, based on relevant legislation and Queensland Government policies and guidelines. Flood studies also consider a range of other factors such as rainfall and river level information from recent events, climate change and trends, the impacts of development, changes to catchment conditions, new technologies and industry best practice (which help to improve accuracy).
4. Flood studies and models are developed from the best information available at the time. They do not tell you how the flood waters might behave, how quickly they may rise, or how dangerous the flooding will be. The models also cannot represent changes that have occurred since they were developed which may impact flood behaviour, such as earthworks, new developments or road infrastructure.
5. This report is not a substitute for independent professional advice. You should engage the services of a Registered Professional Engineer of Queensland (RPEQ) to get site specific information regarding the flood risk to your property, and how that might affect any proposed building or development work.
6. While Logan City Council takes reasonable care in producing this report, it does not guarantee that the information is accurate, complete or current. Logan City Council does not accept any responsibility for any loss or damage (however it was caused) in connection with the use of or reliance on the information in this report.

Contact Information

Where to go for further information depends on the type of information you need. Please refer to the Flood Risk Fact Sheet or contact Council using the details below.

Topic	Contact Details
Flood studies and modelling information, and the flood risk on your property	Contact Council on 07 3412 3412 or email council@logan.qld.gov.au. Further information about flooding and flood studies is available on the Flood page on Council's website.
Planning and development enquiries or proposals	Contact Council on 07 3412 3412 or email development@logan.qld.gov.au. Before lodging a development application, pre-lodgement advice is recommended.
Building information	Contact Council on 07 3412 3412 or email council@logan.qld.gov.au. You can also contact a private building certifier.
Properties in Priority Development Areas	Contact Economic Development Queensland. Council is not the planning authority for these properties.
Independent advice about flooding on your property	Contact a registered engineer through the Board of Professional Engineers of Queensland: Phone: 07 3210 3100 Email: admin@bpeq.qld.gov.au Web: Home - Board of Professional Engineers Queensland (bpeq.qld.gov.au)