April 2024

MNCE Ref: C3301

SITE BASED STORMWATER MANAGEMENT PLAN

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2023/1460

Date: 23 August 2024

Queensland Government

221 Teviot Road, Greenbank

Commissioned By
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REPORT CONTROL SHEET

MNCE Ref. No.:	C3301
Site:	221 Teviot Road, Greenbank
Report Title:	Site Based Stormwater Management Plan
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Revision / Checking

Rev No.	Date	Issued By	Signed	Authorised By	Signed
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			Draft	A	B	C	D	E	F	G
MNCE File	-	-		1	1	1	1	1	1	
N&A Campbell Developments	03/05/19	E		1						
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A	C3301-190403-CALCS-RAFTS-REVB	C3301-190405-CALCS-REVB(SPEL)	C3301-190403-CALCS-REVB
B	C3301-190403-CALCS-RAFTS-REVC	C3301-190405-CALCS-REVC(SPEL)	C3301-190403-CALCS-REVC
C/D	C3301-190403-CALCS-RAFTS-REVC	C3301-190405-CALCS-REVC(SPEL)	C3301-190403-CALCS-REVC
E	C3301-190403-CALCS-RAFTS-REVE	C3301-190405-CALCS-REVC(SPEL)	C3301-190403-CALCS-REVE
F	C3301-240322-CALCS-RAFTS-REVF	C3301-240402-CALCS-REVD(SPEL)	C3301-240322-CALCS-REVF

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1 INTRODUCTION

1.1 Overview and Background

This report has been updated to support the extension of an existing childcare centre previously approved and constructed over Lot 9 on RP184971 at 221 Teviot Road, Greenbank in response to Item 1 of a Further Issues Letter dated 31st January 2024 from the Minister for Economic Development Queensland (MEDQ) which states:

1. *Site Based Stormwater Management Plan*

The proposed expansion of the child care centre's building footprint results in an increase of the impervious area of the site. Submit an updated Site Based Stormwater Management Plan, taking into consideration the additional extension areas and demonstrate the suitability of the existing detention tank and treatment measures.

The site is located within a priority development area in Logan City Council and has a total area of approximately 2.0ha. Figure 1.1 below provides an aerial locality of the site and adjacent areas.

Figure 1.1: Subject Site bound by Teviot Road to the east (Nearmap)

Prior to the construction of the existing childcare centre, the existing site fell in a north westerly direction on a grade of approximately 3% away from Teviot Road with no stormwater infrastructure present onsite.

It is to be noted that the site does not appear to be affected by any flood overlay based on Council mapping.

1.2 Objectives and Scope

Milanovic Neale Consulting Engineers have been commissioned by Ashmore Constructions to undertake an assessment of stormwater quality and quantity impacts associated with the proposed development. Stormwater management strategies are also to be identified for the proposed development as required.

The scope of works undertaken for this project is summarized below:

1. Assessment of the development against State and Local Government legislation to identify water quality management measures to be adopted for the proposed development.

2. Undertake pollutant export modelling of anticipated pre and post development pollutant concentrations and loads and conceptual design of water quality improvement devices.

3. Assessment of the pre and post development stormwater discharge and undertake preliminary design and commentary of any mitigation devices required to control site discharge if required.

2 DATA

2.1 State and Local Government Policies

The *Planning Scheme Policy 5 - Infrastructure* and the *Infrastructure Code* from *Logan City Council's Planning Scheme Version 3.0*, the *State Planning Policy – July 2017* and the *PDA Guideline No. 13 – Engineering Standards* have been used as a guide to establish the required stormwater objectives and requirements for the development.

2.2 Level and Modelling Data

Contour information for the site and adjacent properties was obtained from survey data prepared by Ian Davis Surveys which comprise surface level contours at 0.25m intervals.

Rainfall data for the Logan Region was extracted from AR&R 2016 through the IFD tool on the Bureau of Meteorology website.

The *Queensland Urban Drainage Manual (QUDM)* and the *Australian Rainfall and Runoff, 2016* have been used as a guide to establish the modelling inputs and methodologies applicable for the development.

2.3 MEDQ Approved Detailed Design Plans

Mitigated model parameters specified in the originally approved stormwater management plan are to be updated to reflect the revised stormwater layout and discharge arrangement presented in detailed design plans by Xander Structural Design Pty Ltd which were approved by MEDQ in February 2023 (Appendix D).

These plans suggest that the detention tank constructed as part of the original childcare centre works discharges into the existing dam, rather than to surface via. level spreader as per the originally approved stormwater management plan. It is also noted that the detention tank outlined in the detailed design plans for the original childcare centre is of a slightly larger volume than that which was originally proposed and both of these amendments are to be accounted for as part of the mitigated model.

3 OPPORTUNITIES AND CONSTRAINTS

3.1 Site Opportunities

There may be scope for the proposed development to utilise the combined stormwater detention and treatment tank which currently services the childcare centre.

3.2 Site Constraints

The combined stormwater detention and treatment tank servicing the childcare centre may have insufficient capacity to treat and detain runoff generated from additional development areas and additional infrastructure may be required.

4 WATER QUALITY MANAGEMENT

This section of the report will provide an assessment of the development against State and Local Government legislation to identify water quality management measures to be adopted for the proposed development.

Pollutant export modelling will also be undertaken of anticipated pre-and post-development pollutant concentrations and loads and conceptual design of water quality improvement devices.

4.1 Risk Category

The *State Planning Policy – July 2017, PDA Guideline 13 – Engineering Standards* and *Planning Scheme Policy 5 - Infrastructure* from *Logan Planning Scheme 2015* identifies developments as high risk with respect to stormwater quality if any of the following criteria are triggered:

1. Material change of use urban purposes that involves a land area greater than 2,500m^2 that:
    a. Will result in an impervious area greater than 25 percent of the net developable area; or
    b. Will result in six or more dwellings;
    c. Located in the Loganholme local plan area; or
    d. 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 size of the subject premises is greater than 2,500m2 and results in an increased number of non-residential lots (e.g. industrial, commercial, etc); or
    b. it results in the creation of six or more residential lots;
    c. located in the Loganholme local plan area and results in a total of four or more lots; or
    d. Where 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 and results in a total of four or more lots.
3. Operational work for urban purposes that involves disturbing more than 2,500m^2 of land;

With respect to the above, the proposed area of works is less than 2500m^2 and is therefore considered low risk with regards to stormwater quality, however a Further Issues Letter issued by EDQ Development Assessment on 31st January 2024 requested that an updated stormwater management plan be prepared to demonstrate the suitability of the existing detention tank and treatment measures.

The previously approved pollutant export modelling and stormwater treatment train is to therefore be updated to account for the proposed childcare extension.

4.2 Water Quality Objectives

4.2.1 Construction Phase

The *Urban Stormwater Quality Guidelines 2010* identify that eroded soils and litter are major pollutant sources during construction activity. There is also potential for hydro-modification of streams due to increased run-off coefficients when subsoils are exposed, for longer-term major developments. Water sensitive urban design principles and reducing erosion during construction are fundamental to achieving water quality objectives in relevant waterways.

It is therefore proposed to prepare an erosion and sediment management plan during the operational works phase of the development which will incorporate a range of control measures to be implemented during the construction phase of the project.

4.2.2 Operational Phase

Stormwater quality management design objectives for the operational phase of the development are identified in the following table in accordance with the *Urban Stormwater Quality Guidelines 2010.* These objectives provide an emphasis on the reduction of mean annual loadings associated with suspended sediments and nutrients.

Table 4.1: Stormwater Quality Objectives

Region	Minimum Reductions in Mean Annual Loads from Unmitigated Development (%)			
	Total Suspended Solids (TSS)	Total Phosphorus (TP)	Total Nitrogen (TN)	Gross Pollutants > 5mm (GP)
South East Queensland	80	60	45	90

4.3 Pollutant Export Modelling

4.3.1 Model Selection

In order to determine on-site pollutant generation, discharge concentrations of target pollutants and the effectiveness of Stormwater Quality Improvement Devices the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been used to model the development proposal.

4.3.2 MUSIC Model Configuration

The following sections identify the modelling parameters used in the configuration of the MUSIC Model adopted for the development. The following figure provides a screenshot of the MUSIC model schematic for reference.

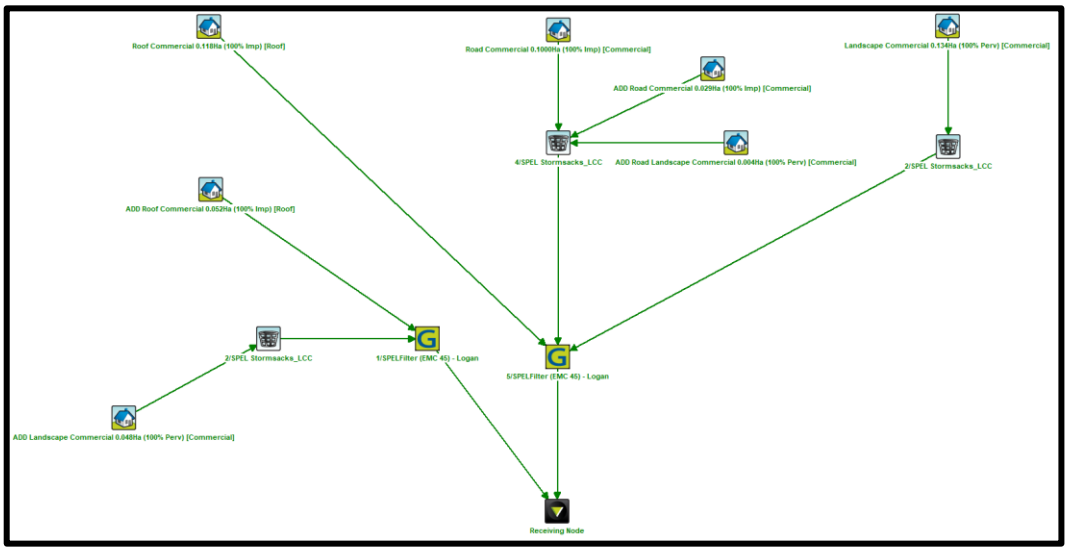


Figure 4.1: MUSIC Model Layout

4.3.2.1 Meteorological and Time Step

Meteorological Data used in the MUSIC model has been identified in accordance with the *MUSIC Modelling Guidelines* 2010, incorporating the following parameters:

Rainfall Period: 01/01/1980 12:00 AM to 31/12/1989 11:54 PM

Rainfall Station: 40659 GREENBANK

A model time step of 6 minutes has also been adopted as recommended in Section 3.2 of the *MUSIC Modelling Guidelines 2010.*

4.3.2.2 Catchment Properties

The MUSIC model for the development adopts a split catchment approach, whereby the site has been broken down into various catchments in accordance with site specific land uses. The following table provides a summary of the catchment data used in the MUSIC analysis.

Table 4.2: MUSIC Catchment Parameters

Catchment Name	Area (ha)	Fraction Impervious (%)	MUSIC Source Node
Roof	0.118	100	Commercial
Road	0.100	100	Commercial
Landscape	0.134	0	Commercial
Add Roof	0.052	100	Commercial
Add Road	0.029	0	Commercial
Add Road Landscape	0.004	0	Commercial
Add Landscape	0.048	0	Commercial

4.3.2.3 Rainfall Runoff Parameters

The following table provides a summary of the rainfall runoff parameters adopted for the source nodes used in the MUSIC analysis which has been extracted from Table 3.8 of the *MUSIC Modelling Guidelines 2010.*

Table 4.3: MUSIC Catchment Parameters

Parameter	Residential
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (%)	10
Field Capacity (mm)	80
Infiltration Capacity Coefficient a	243
Infiltration Capacity Coefficient b	0.6
Initial Depth (mm)	0
Daily Recharge Rate (%)	31
Daily Base-Flow Rate (%)	0

4.3.2.4 Pollutant Export Parameters

The following table provides a summary of the pollutant export parameters for split catchment surface types which have been adopted for the source nodes used in the MUSIC analysis. This information has been extracted from Table 3.8 of the *MUSIC Modelling Guidelines 2010.*

Table 4.4: MUSIC Source Node Base and Storm Flow Concentration Parameters

Land Use	Parameter	Total Suspended Solids (Log_{10} mg/L)		Total Phosphorus (Log_{10} mg/L)		Total Nitrogen (Log_{10} mg/L)	
Roof	Mean	N/A	1.3	N/A	-0.89	N/A	0.25
	Std Deviation	N/A	0.44	N/A	0.36	N/A	0.32
Road	Mean	0.78	2.43	-1.11	-0.30	0.14	0.25
	Std Deviation	0.45	0.44	0.48	0.36	0.20	0.32
Ground	Mean	0.78	2.16	-0.6	0.5	0.32	0.3
	Std Deviation	0.39	0.38	-0.39	0.34	0.37	0.34

4.3.3 Developed Unmitigated Conditions

MUSIC Modelling has been performed to determine the pollutant export and corresponding concentrations from the development site under the proposed conditions. The mean annual loads that have been estimated for proposed unmitigated conditions are given in Table 4.5 below, also shown are the mean annual load percentage reductions required to meet current State Planning Policy objectives.

Table 4.5: MUSIC Unmitigated Mean Annual Loads (kg/yr)

Pollutant	Unmitigated Mean Annual Load (kg/yr)	Reduction required to meet Council Requirements (%)
Total Suspended Solids (TSS)	523	80
Total Phosphorous (TP)	1.13	60
Total Nitrogen (TN)	8.36	45
Gross Pollutants (GP)	51.1	90

4.3.4 Developed Mitigated Conditions

The scale of the development is large enough to support the implementation of effective water quality design measures. Therefore, a consideration of a variety of best management measures has been given with a focus on water quality treatment measures and reducing polluted runoff volumes from the site.

Key elements of the proposed stormwater management plan are as follows:

- Runoff associated with the existing childcare access, car parking and playground area are treated through 4 source pollutant filters (SPEL Stormsacks or similar) before being piped to the existing underground detention tank within the driveway (see Section 5).
- Runoff associated with proposed car park extension is to be treated through 2 source pollutant filters (SPEL Stormsacks or similar) before being piped to the existing underground detention tank within the driveway (see Section 5).
- Runoff associated with existing childcare roof areas to be piped to the proposed underground detention tank (see Section 5) which is fitted with 5. SPELFilter cartridges.
- Runoff associated with proposed childcare roof and playground extension to be piped to independent treatment tank which is to be fitted with a single SPELFilter cartridge.

- Treated and detained site flows for the existing childcare and proposed extension are to be discharged to existing dam to the rear of the site as per detailed design plans by Xander Structural Design Pty Ltd which were approved by MEDQ in February 2023 (Appendix D).

The table below demonstrates that the required pollutant reductions have been achieved through the implementation of the proposed stormwater treatment train.

Table 4.6: MUSIC Model Removal Efficiencies

Pollutant	Unmitigated Mean Annual Load (kg/yr)	Mitigated Mean Annual Load (kg/yr)	Reduction required to meet Council Requirements (%)	Removal Efficiency Achieved (%)
Total Suspended Solids (TSS)	523	107	80	80
Total Phosphorous (TP)	1.13	0.4	60	65
Total Nitrogen (TN)	8.36	4.2	45	49
Gross Pollutants (GP)	51.1	2.0	90	96

5 WATER QUANTITY MANAGEMENT

This section of the report will provide an assessment of the pre and post development stormwater discharge and undertake preliminary design and commentary of any mitigation devices required to control site discharge.

5.1 Existing Conditions

This section of the report will analyse and comment on original site stormwater discharge conditions, prior to the construction of the childcare centre. The XP-RAFTS modelling software, utilising the Laurenson Routing Method will be used to generate the hydrographs and peak flows from the site for all storm events up to an including the 1% AEP storm event.

5.2 Existing Hydrologic Model

5.2.1 Catchment Definition

An examination of original site land topography and land use was undertaken to quantify the number of sub catchments and sub catchment areas applicable for the original site. It was established that the original site consisted of three fundamental sub catchments; the impervious roof areas associated with the original dwelling, the hardstand areas which make up the original driveway, and the vegetated/grassed area which made up the rest of the site.

Refer Table 5.1 below for original site catchment details. The catchment roughness for impervious and pervious areas has been defined using manning's 'n' values of 0.015 and 0.05 respectively which are considered reasonable. The catchment slope has been determined by reviewing survey data prepared by Ian Davis Surveys.

Table 5.1: Catchment Data Summary Table

Catchment	Area (ha)	Impervious (%)	Slope (%)	Manning's 'n'
Roof	0.049	100	12	0.015
Hardstand	0.034	100	3	0.015
	0.004	0	3	0.030
Vegetation	1.915	0	3	0.050

5.2.2 Mitigation Parameters

The site has an existing dam that will attenuate flows under existing conditions, hence a portion of the vegetation catchment denoted above was directed to a retarding basin included in the proposed model.

The following parameters were used to define a stage storage discharge relationship for the dam:

- Minimum dam depth of 0.80m (depth available at time of survey) as agreed with John Atkinson, Economic Development Queensland Engineer.
- Total Storage Volume of 194m^3 (storage available at time of survey)
- 1 x 7m wide weir at basin obvert

There were also tanks on site which attenuated roof flows under original site conditions. One tank was assumed to receive flows from a shed on the northern side of the residence (which was removed as a result of the development) and two tanks are assumed to receive flow from the residence and a shed on the southern side of the residence (which were be retained as part of the development). The northern tank has hence been included in the proposed model. The southern tanks have not been considered however, as discharge to and from the tanks are envisaged to be the same under both existing and proposed conditions, and the catchment are negligible in relation to the whole site.

The following parameters were used to define a stage storage discharge relationship for the northern tank:

- Minimum Tank depth of 1.80m.
- Total Storage Volume of 2.5m^3 (75% full) as agreed with John Atkinson, Economic Development Queensland Engineer.
- 1 x 100mm outlet at basin obvert.

Refer to Appendix B for XP-RAFTS hydrographs and XP-RAFTS stage storage discharge relationship.

5.2.3 Rainfall Parameters and Losses

As indicated in Section 2.2 above, Rainfall data for the Logan Region has been extracted from AR&R 2016 through the IFD tool on the Bureau of Meteorology website.

The uniform loss method was adopted to account for rainfall losses throughout the existing catchment. Based on information provided in the *ARR Data Hub tool*, initial

and continuing loss coefficients adopted for the impervious and pervious sub catchments have been tabulated below.

Table 5.2: Initial and Continuing Loss Parameters

Parameter	Value (mm)
Initial Loss (Pervious)	20.0
Continuing Loss (Pervious)	1.6

Temporal patters applicable to East Cost North has been adopted in accordance with the *Australian Rainfall and Runoff, 2016*.

5.2.4 Existing Hydrological Results

The following table provides a summary of the peak discharge from the original site that was estimated by the XP-RAFTS model for all storm events up to and including the 1% AEP storm event.

Table 5.3: Existing Site Peak Discharges

Storm Event	XP-RAFTS Peak Runoff (m^3/s)
39% AEP	0.192
10% AEP	0.389
5% AEP	0.505
2% AEP	0.584
1% AEP	0.679

5.2.5 Runoff Comparison

QUDM Section 4.1.3 recommends hydrologic models are calibrated with actual flow data rather than to an alternate runoff routing model. In the absence of such data, Section 4.1.3 continues to state that as an alternative, model results may be compared with the results to a Rational Method peak discharge for catchments less than 500ha.

Based on the methods outlined in *QUDM*, the following parameters were used to estimate the peak runoff from the upstream catchment affecting the site. Refer Appendix C for detailed rational method calculation summary.

Table 5.4: Rational Method Parameters

Area (ha)	Runoff Coefficient (C10)	Time of Concentration (mins)
2.002	0.71	25

It is to be noted that the time of concentration has been derived based on the application of Friend's Equation.

The following table provides a comparison of the results of both the Rational Method and XP-RAFTS Model results for peak discharges up to and including the 1% AEP storm event.

Table 5.5: Existing Site Peak Discharge Comparison

Storm Event	XP-RAFTS Peak Runoff (m^3/s)	Rational Method Peak Runoff (m^3/s)	Difference	
			+/-	%
39% AEP	0.192	0.252	0.060	24
10% AEP	0.389	0.439	0.050	11
5% AEP	0.505	0.532	0.027	5
2% AEP	0.584	0.686	0.102	15
1% AEP	0.679	0.798	0.119	15

As can be seen above, the Laurenson Routing Method established from the XP-RAFTS model generates peak flows that are generally within 15% to what is estimated by the Rational Method, with the exception of the minor storm event which may be attributed to the Laurenson Method directly accounting for dam and tank storage where as the Rational Method does not. Hence the scenario that has been modelled and applied to the site is considered suitable.

5.3 Developed Conditions

This section of the report will analyse and comment on the developed site stormwater discharge conditions, which includes the recently constructed childcare centre and the proposed extension works. The XP-RAFTS modelling software, utilising the Laurenson Routing Method will be used to generate the hydrographs and peak flows from the site for all storm events up to an including the 1% AEP storm event.

5.4 Developed Unmitigated Model

5.4.1 Catchment Definition

An examination of the developed site land topography and land use was undertaken to establish the quantity of sub catchments applicable to the recently constructed and proposed development. These catchments may be summarised as follows;

Childcare Centre

- Previously approved roof area for initial building and shed.
- Previously approved play area with 40% impervious fraction as per previous MEDQ engineer direction.
- Previously approved hardstand areas associated with current car park.

Proposed Extension

- Additional roof areas which include building extension and proposed shed.
- Additional play area with 40% impervious fraction as per previous MEDQ engineer direction.
- Additional hardstand and planting areas associated within proposed car park extension.

It is noted that original dwelling roof and hardstand areas which were included as part of the originally approved developed model have been reallocated to the vegetated catchment which makes up the rest of the site, following review of recent aerial imagery which shows that these impervious areas have since been removed.

Since the Laurenson Routing Method is being adopted to estimate the catchment runoff, the ground surface has been further broken down to pervious and impervious sub catchments and Manning's 'n' numbers were adopted for specific surface areas. Refer Appendix A for proposed stormwater management layout and Table 5.6 below for developed site catchment details.

The catchment slope has been estimated from architectural plans.

Table 5.6: Catchment Data Summary Table

Catchment	Sub Catchment	Area (ha)	Impervious (%)	Slope (%)	Manning's 'n'
Roof	Impervious	0.118	100	12	0.015
Driveway	Impervious	0.090	90	3	0.015
	Pervious	0.010		3	0.030
Vegetation	Pervious	1.517	0	3	0.050
Ground	Impervious	0.054	40	3	0.015
	Pervious	0.080			0.030
Add Roof	Impervious	0.052	100	12	0.015
Add Ground	Impervious	0.019	40	3	0.015
	Pervious	0.029			0.030
Add Driveway	Impervious	0.026	90	3	0.015
	Pervious	0.003			0.030
Add Vegetation	Pervious	0.004	0	3	0.050

5.4.2 Mitigation Parameters

Mitigation parameters have been adopted in accordance with Section 5.2.2 of this report with the exception of the rainwater tank which serviced the previous dwelling located on site. Recent aerial imagery suggest that this dwelling has since been removed

5.4.3 Rainfall Parameters and Losses

Rainfall Parameters and Losses have been adopted in accordance with Section 5.2.3 of this report.

5.4.4 Developed Hydrological Results

The following table provides a summary of the peak discharge from the developed site that was estimated by the XP-RAFTS model for all storm events up to and including the 1% AEP storm event.

Table 5.7: Developed Site Peak Discharges

Storm Event	XP-RAFTS Peak Runoff (m^3/s)
39% AEP	0.298
10% AEP	0.518
5% AEP	0.629
2% AEP	0.808
1% AEP	0.931

5.4.5 Runoff Comparison

As noted in Section 5.2.5 of this report, a comparison between the XP-RAFTS discharge and Rational Method peak discharge is recommended to be undertaken by *QUDM*.

Based on the methods outlined in *QUDM*, the following parameters were used to estimate the peak runoff from the upstream catchment affecting the site. Refer Appendix C for detailed rational method calculation summary.

Table 5.8: Rational Method Parameters

Area (ha)	Runoff Coefficient (C10)	Time of Concentration (mins)
2.002	0.74	19

It is to be noted that the time of concentration is based on the combination of Standard Inlet Times and Friends Equation.

The following table provides a comparison of results of the Rational Method and XP-RAFTS Model results for peak discharges up to and including the 1% AEP storm event.

Table 5.9: Developed Site Peak Discharge Comparison

Storm Event	XP-RAFTS Peak Runoff (m^3/s)	Rational Method Peak Runoff (m^3/s)	Difference	
			+/-	%
39% AEP	0.238	0.298	0.060	20
10% AEP	0.469	0.518	0.049	9
5% AEP	0.565	0.629	0.064	10
2% AEP	0.680	0.808	0.128	16
1% AEP	0.802	0.931	0.129	14

As can be seen above, the Laurenson Routing Method established from the XP-RAFTS model generates peak flows that are generally within 16% to what is estimated by the Rational Method, with the exception of the minor storm event which may be attributed to the Laurenson Method directly accounting for dam storage where as the Rational Method does not. Hence the scenario that has been modelled and applied to the site is considered suitable.

5.5 Potential Impacts of Development

The following table provides a summary of the peak runoff from the site under both original and developed scenarios.

Table 5.10: Runoff Comparison

Storm Event	Existing Peak Runoff (m^3/s)	Developed Peak Runoff (m^3/s)	Difference	
			+/-	%
39% AEP	0.192	0.298	0.106	35
10% AEP	0.389	0.518	0.129	33
5% AEP	0.505	0.629	0.124	25
2% AEP	0.584	0.808	0.224	38
1% AEP	0.679	0.931	0.252	37

The proposed development has increased the proportion of the site that is impervious, consequently the runoff characteristics from the site will be altered as a result of the development. As demonstrated above, the development has increased runoff volumes and peak flow rates downstream in comparison to original conditions for all storm events. If left unmitigated, the developed runoff could have an adverse effect on downstream properties and/or stormwater infrastructure. It is therefore proposed that an on-site detention system be constructed within the site to mitigate increased peak discharges to below pre-development levels.

5.6 Proposed Mitigated Conditions

This section of the report will specify the mitigation device(s) required to detain the post development flow rate to match existing site runoff conditions. The XP-RAFTS modelling software, utilising the Laurenson Routing Method will be used to generate the hydrographs and peak flows from the mitigated site in conjunction with the design of on-site detention devices for all storm events up to an including the 1% AEP storm event.

5.7 Developed Mitigated Model

Flows associated with original childcare centre are directed to an underground detention tank beneath the existing car parking area before being discharged to an existing on-site dam as per detailed design plans by Xander Structural Design Pty Ltd which were approved by MEDQ in February 2023. Refer Section 2.3 and Appendix D for further detail.

Flows associated with the proposed car park extension are to be captured and directed into this tank and the existing outlet configuration is to be modified to incorporate a 0.5m high flow weir in place of the current 210mm dia. high flow orifice. The 140mm dia. low flow and 140mm dia. mid flow are to be maintained as per existing conditions.

The following parameters were used to define a stage storage discharge relationship for the current tank:

- Tank depth of 1.20m.
- Tank surface area of 130m^2.
- Total Storage Volume of 156m^3 (as per MEDQ approved plans).
- 1 x 140mm low flow orifice at basin invert.
- 1 x 140mm mid flow outlet at 0.47m from basin invert
- 1 x 500mm wide high flow weir, 1m above basin invert.

Flows associated with proposed childcare extension roof and outdoor play areas are to be captured and discharged into the current tank outlet pipe which ultimately discharges into an existing dam. This pipe is to be upgraded to convey this additional flow.

Stage storage parameters for the existing dam, outlined in Section 5.2.2 above, have been updated to reflect proposed modification dam works which is limited to:

- 1x 1.5m wide overflow weir at 65.200m AHD.
- Remainder of dam crest to demonstrate minimum level of 65.400m AHD.

Flows which pass from the dam are to generally discharge as sheet flow to the north west as per existing conditions.

All storm events up to and including the 1% AEP storm event have been modelled in the XP-RAFTS software package. Retarding basins has been included in the proposed model to account for the proposed modifications to the current tank and existing dam on site to cater for development works.

Refer to Appendix B for XP-RAFTS hydrographs and XP-RAFTS stage storage discharge relationship.

The table below is a summary of the peak discharge flows from the site with the proposed detention measure implemented:

Table 5.11: Mitigated Runoff Comparison

Storm Event	Existing Peak Runoff (m^3/s)	Proposed Mitigated Peak Runoff (m^3/s)	Difference	
			+/-	%
39% AEP	0.192	0.148	-0.044	-23
10% AEP	0.389	0.298	-0.091	-24
5% AEP	0.505	0.395	-0.110	-22
2% AEP	0.584	0.549	-0.035	-6
1% AEP	0.679	0.669	-0.010	-1

All storm events have been mitigated below pre-developed levels; as such the proposal is considered to satisfy Council's condition of a non-worsening effect in regards to peak stormwater runoff.

6 INTERPRETATION AND CONCLUSIONS

An updated stormwater management plan has been prepared to account for the childcare extension works proposed at 221 Teviot Road, Greenbank in response to a Further Issues Letter dated 31st January 2024 from the Minister for Economic Development Queensland (MEDQ).

The following stormwater quantity management measures/alterations are proposed to be implemented as part of these works to satisfy state and local government objectives, with reference to MEDQ approved detailed design plans by Xander Structural Design Pty Ltd:

- Existing 156m^3 detention tank outlet configuration is to be modified to incorporate a 0.5m high flow weir in place of the current 210mm dia. high flow orifice. The 140mm dia. low flow and 140mm dia. mid flow are to be maintained as per existing conditions.
- Existing dam to be modified to incorporate 1x 1.5m wide overflow weir at 65.200m AHD, with remainder of dam crest to demonstrate minimum level of 65.400m AHD.

This follows the proposed discharge of car park extension flows to the childcare centre tank and free discharge of wider extension flows to the existing dam. It is noted that the childcare centre tank was found to be of insufficient volume to detain wider extension flows.

The following stormwater quality management measures/alterations are proposed to be implemented as part of these works to satisfy state and local government objectives, with reference to MEDQ approved detailed design plans by Xander Structural Design Pty Ltd:

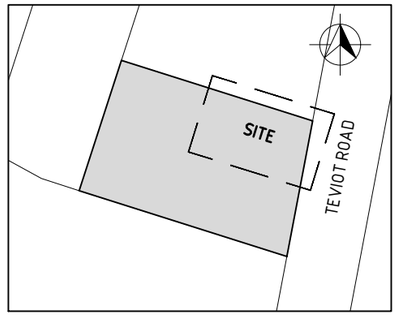
- Runoff associated with the existing childcare access, car parking and playground area are treated through 4 source pollutant filters (SPEL Stormsacks or similar) before being piped to the existing underground detention tank within the driveway (see Section 5).
- Runoff associated with proposed car park extension is to be treated through 2 source pollutant filters (SPEL Stormsacks or similar) before being piped to the existing underground detention tank within the driveway (see Section 5).
- Runoff associated with existing childcare roof areas to be piped to the proposed underground detention tank (see Section 5) which is fitted with 5. SPELFilter cartridges.

- Runoff associated with proposed childcare roof and playground extension to be piped to independent treatment tank which is to be fitted with a single SPELFilter cartridge.
- Treated and detained site flows for the existing childcare and proposed extension are to be discharged to existing dam.

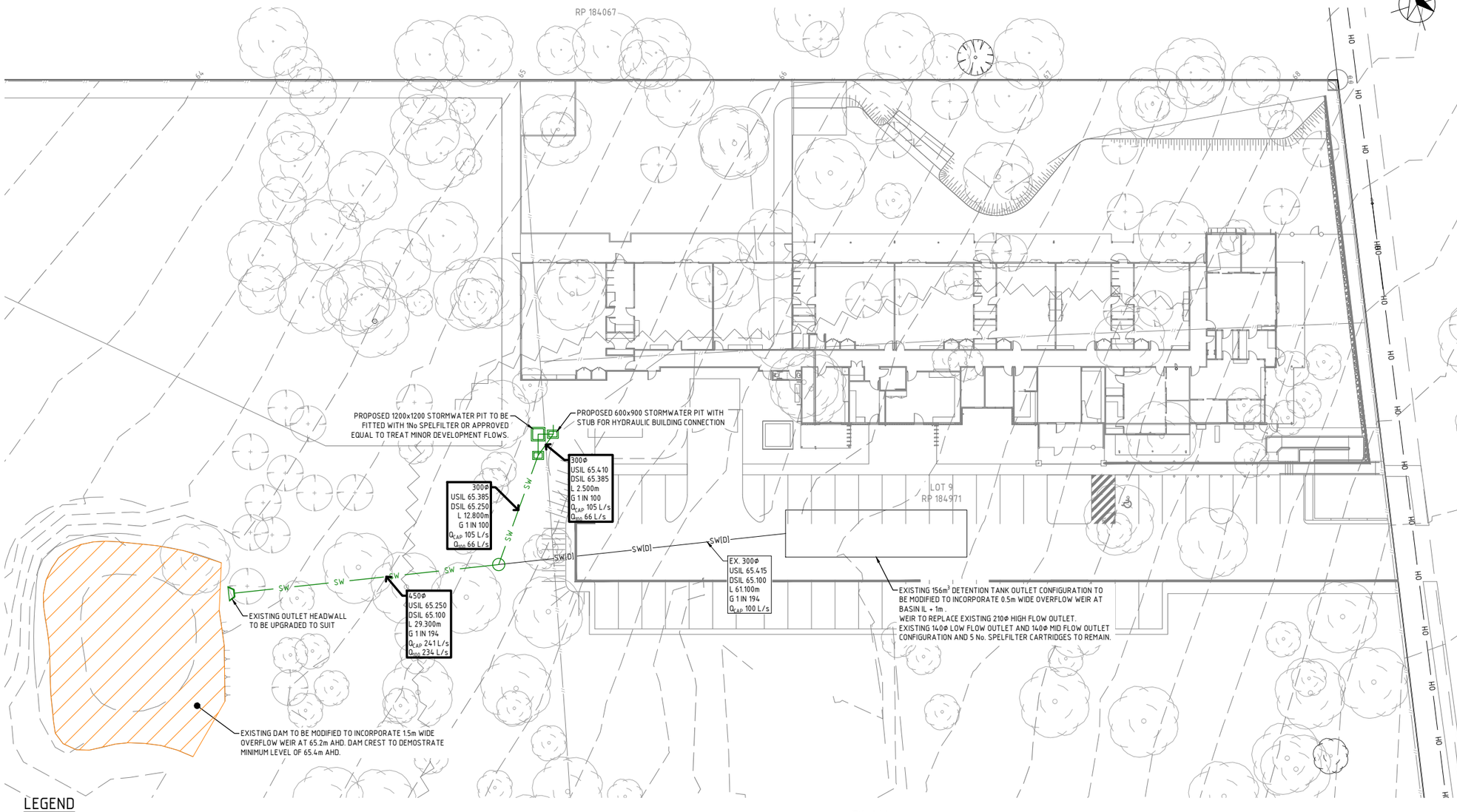
Refer Appendix A for the proposed stormwater management layout.

APPENDIX A: Proposed Development Layout

NOT FOR CONSTRUCTION



LOCALITY PLAN
SCALE 1:2500



PLAN
SCALE 1:250

NOTE:
ALL PROPOSED GRATED INLETS TO BE FITTED WITH SPEL STORMSACK OR APPROVED EQUAL AND EXISTING STORMSACKS TO BE MAINTAINED.

NOTE:
ANY EXISTING INTERNAL PRIVATE DRAINAGE INFRASTRUCTURE IMPACTED BY DEVELOPMENT TO BE MODIFIED AS REQUIRED. ASSOCIATED WORKS TO BE DOCUMENTED BY HYDRAULICS CONSULTANT AT LATER DESIGN STAGE.

LEGEND

- UG — EXISTING ELECTRICAL UNDERGROUND
- OH — EXISTING ELECTRICAL OVERHEAD
- SW — EXISTING STORMWATER DRAINAGE
- 9.999 — EXISTING CONTOURS
- SW — PROPOSED STORMWATER DRAINAGE
- EXISTING TREE

NOTES:
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EXISTING SERVICES NOTE:
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SCALE 1:250 (A1) 0 5 10 15m (SCALE BEFORE REDUCTION)

SCALE 1:2500 (A1) 0 50 100 150m (SCALE BEFORE REDUCTION)

REAL PROPERTY DESCRIPTION
LOT 9 ON RP184971

REV.	DESCRIPTION	DATE	INIT.
A	PRELIMINARY ISSUE	02.04.24	PA

MILANOVIC NEALE CONSULTING ENGINEERS
CIVIL
STRUCTURAL
TRAFFIC
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MILANOVIC NEALE CONSULTING ENGINEERS ARE ISO9001:2015 CERTIFIED.
EMAIL mail@mnce.com.au
WEB www.mnce.com.au

CLIENT: ASMMORE CONSTRUCTIONS (QLD)

PROJECT: 221 TEVIOT ROAD, GREENBANK

TITLE: STORMWATER MANAGEMENT LAYOUT PLAN - PROPOSED EXTENSION

DRAWN	DESIGNED	DATE
PA	CFR	APR 2024
CHECKED	APPROVED	
CFR		

DRAWING No. C3301 - SK210 REV. A

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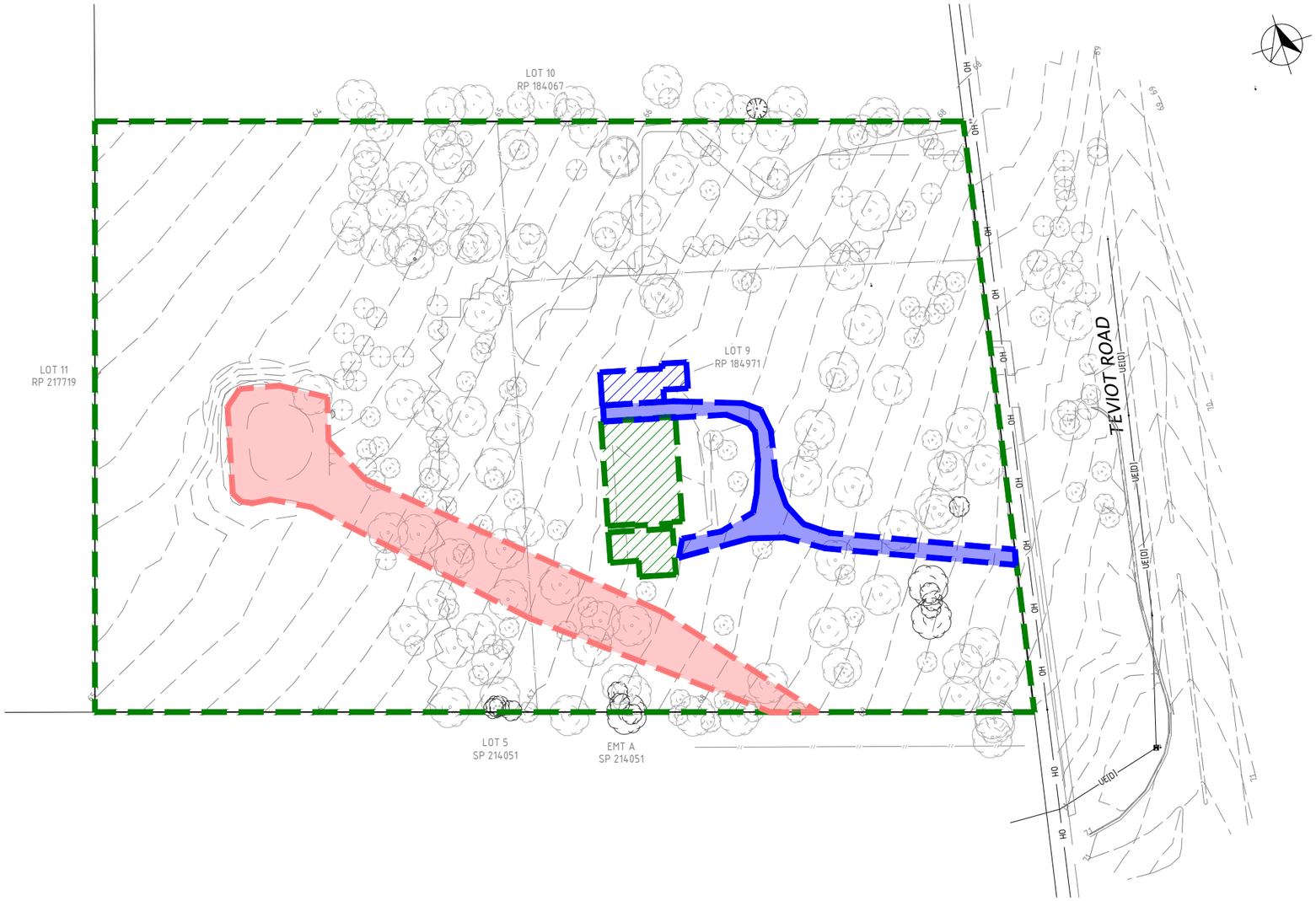

PLAN
SCALE 1:500

LEGEND

10.000 EXISTING MAJOR CONTOURS

ROOF CATCHMENT
A = 0.039 ha
I = 100%
S =12%
n = 0.015

HARDSTAND CATCHMENT
A = 0.038 ha
I = 90%
S =3%
n(I) = 0.015
n(P) = 0.030

VEGETATED CATCHMENT
A = 1.796 ha
I = 0%
S = 3%
n = 0.05

ROOF CATCHMENT
A = 0.010 ha
I = 100%
S =12%
n = 0.015

DAMCATCHMENT
A = 0.119 ha
I = 0%
S =3%
n = 0.05

NOTES:
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SCALE 1:500 (A1) 0 10 20 30m
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REAL PROPERTY DESCRIPTION
LOT 9 ON RP184971

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CLIENT: ASMMORE CONSTRUCTIONS (QLD)

PROJECT: 221 TEVIOT ROAD, GREENBANK

TITLE: STORMWATER MANAGEMENT EXISTING CATCHMENT LAYOUT PLAN – PROPOSED EXTENSION

DRAWN	DESIGNED	DATE
PA	CFR	APR 2024
CHECKED	APPROVED	
CFR		

DRAWING No. C3301 – SK220 REV. A

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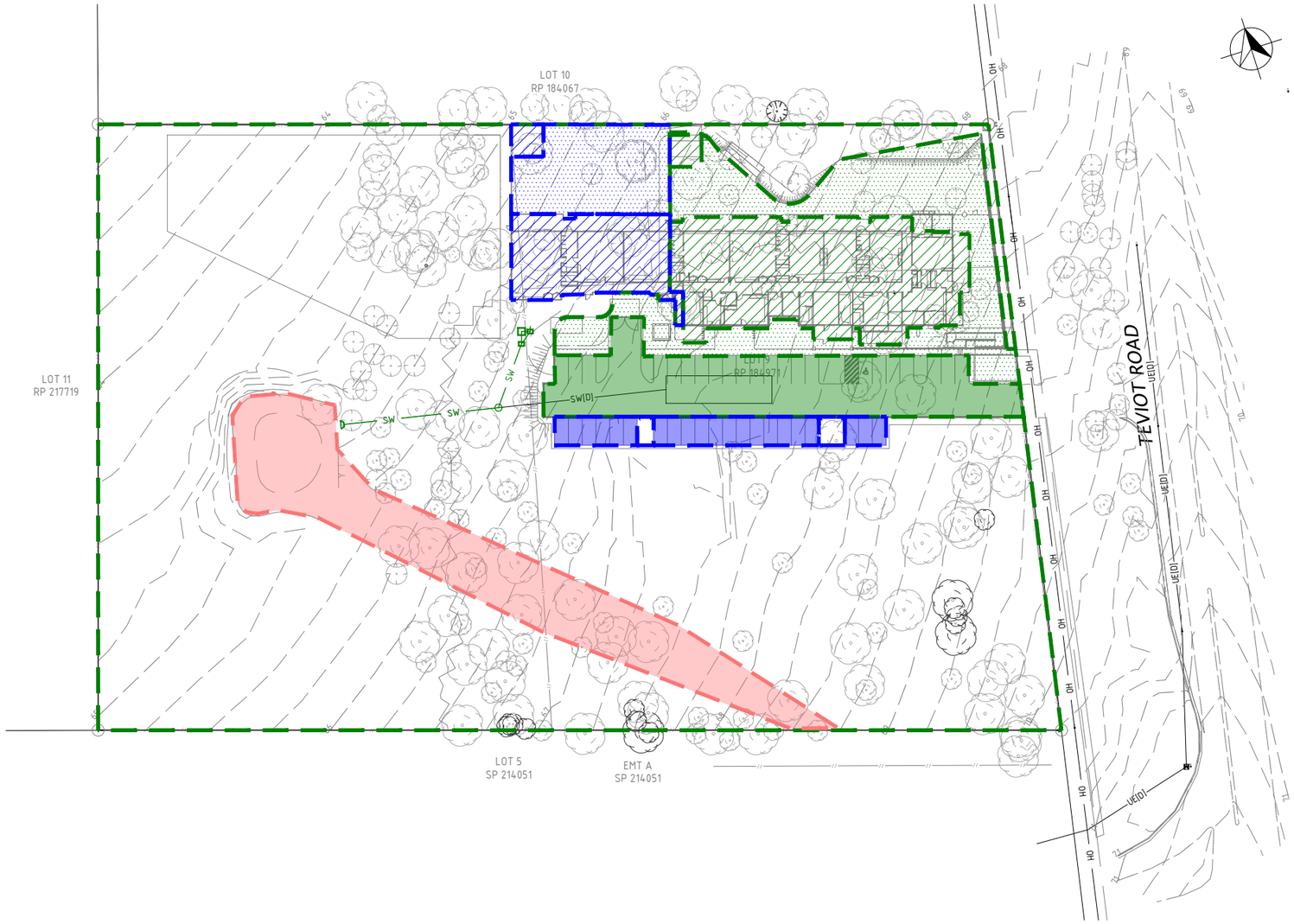

PLAN
SCALE 1:500

LEGEND

- SW — PROPOSED STORMWATER DRAINAGE
- 10.000 — EXISTING MAJOR CONTOURS
- ROOF CATCHMENT
  A = 0.0118 ha
  I = 100%
  S =12%
  n = 0.015
- HARDSTAND CATCHMENT
  A = 0.100 ha
  I = 90%
  n(I) = 0.015
  n(P) = 0.030
- VEGETATED CATCHMENT
  A = 1.517 ha
  I = 0%
  n = 0.05
- GROUND CATCHMENT
  A = 0.134 ha
  I = 40%
  n(I) = 0.015
  n(P) = 0.030
- DAMCATCHMENT
  A = 0.119 ha
  I = 0%
  S =3%
  n = 0.05
- ROOF EXTENSION
  A = 0.052 ha
  I = 100%
  n = 0.015
  S = 12%
- DRIVEWAY EXTENSION
  A = 0.029 ha
  I = 90%
  n(I) = 0.015
  n(P) = 0.030
  S = 3%
- VEGETATION EXTENSION
  A = 0.004 ha
  I = 0%
  n = 0.050
  S = 3%
- GROUND EXTENSION
  A = 0.048 ha
  I = 40%
  n (I) = 0.015
  n (P) = 0.030
  S = 3%

NOTES:
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EMAIL mail@mnce.com.au
WEB www.mnce.com.au

CLIENT: ASMMORE CONSTRUCTIONS (QLD)

PROJECT: 221 TEVIOT ROAD, GREENBANK

TITLE: STORMWATER MANAGEMENT CATCHMENT LAYOUT PLAN - PROPOSED EXTENSION

DRAWN	DESIGNED	DATE
PA	CFR	APR 2024
CHECKED	APPROVED	
CFR		
DRAWING No.		REV.
C3301 - SK230		A

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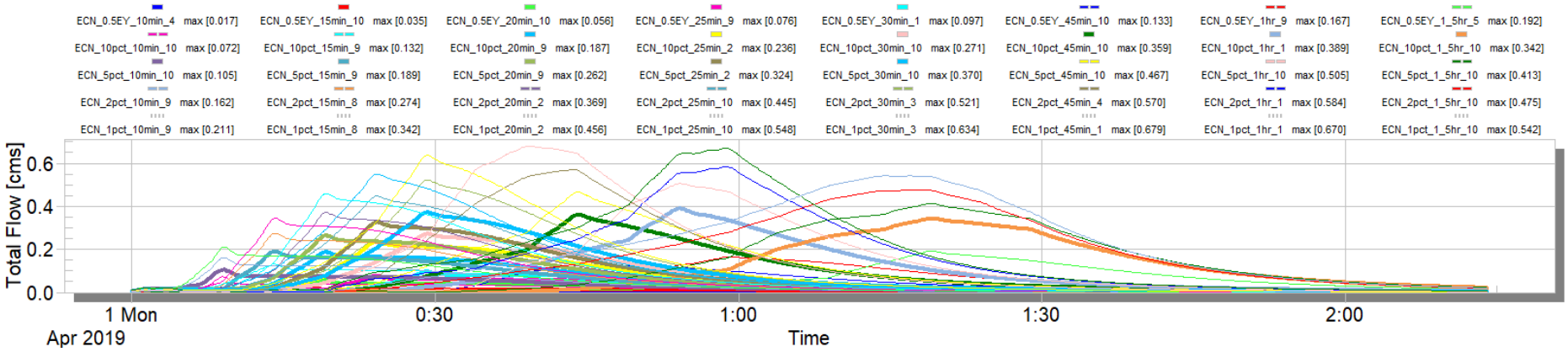
APPENDIX B: XP-RAFTS Hydrographs and Stage Storage Relationship

Existing [ALL STORMS]

Total Flow



Ex RWT

Orifice Details

Low Flow		*Mid Flow*			High Flow Conditions	Orifice		Number	1
Size (m)		Size (m)		Number	Size (m)	0.1		Height (m	0.37
		Height (m)							

Basin Level (m)	S.A. (m^2)	Ave S.A. (m^2)	Thickness (m)	Volume (m^3)	Cumulative Volume (m^3)
0.000	0.000	0.000	0.000	0.000	0.000
0.028	5.308	2.654	0.028	0.074	0.074
0.055	5.308	5.308	0.028	0.147	0.221
0.083	5.308	5.308	0.028	0.147	0.368
0.111	5.308	5.308	0.028	0.147	0.515
0.139	5.308	5.308	0.028	0.147	0.662
0.166	5.308	5.308	0.028	0.147	0.809
0.194	5.308	5.308	0.028	0.147	0.956
0.222	5.308	5.308	0.028	0.147	1.103
0.249	5.308	5.308	0.028	0.147	1.250
0.277	5.308	5.308	0.028	0.147	1.397
0.305	5.308	5.308	0.028	0.147	1.544
0.332	5.308	5.308	0.028	0.147	1.691
0.360	5.308	5.308	0.028	0.147	1.838
0.388	5.308	5.308	0.028	0.147	1.985
0.416	5.308	5.308	0.028	0.147	2.132
0.443	5.308	5.308	0.028	0.147	2.279

Low Flow Details

Basin Level (m)	Head (m)	$Q_{Orifice}$ (m^3/s)
0.000	0.000	0.000
0.028	0.028	0.000
0.055	0.055	0.000
0.083	0.083	0.000
0.111	0.111	0.000
0.139	0.139	0.000
0.166	0.166	0.000
0.194	0.194	0.000
0.222	0.222	0.000
0.249	0.249	0.000
0.277	0.277	0.000
0.305	0.305	0.000
0.332	0.332	0.000
0.360	0.360	0.000
0.388	0.388	0.000
0.416	0.416	0.000
0.443	0.443	0.000

Mid Flow Details

Basin Level (m)	Head (m)	$Q_{Orifice}$ (m^3/s)
0.000	0.000	0.000
0.028	0.028	0.000
0.055	0.055	0.000
0.083	0.083	0.000
0.111	0.111	0.000
0.139	0.139	0.000
0.166	0.166	0.000
0.194	0.194	0.000
0.222	0.222	0.000
0.249	0.249	0.000
0.277	0.277	0.000
0.305	0.305	0.000
0.332	0.332	0.000
0.360	0.360	0.000
0.388	0.388	0.000
0.416	0.416	0.000
0.443	0.443	0.000

High Flow Details

Basin Leve (m)	Head (m)	Qorifice (m^3/s)
0.000	0.000	0.000
0.028	0.000	0.000
0.055	0.000	0.000
0.083	0.000	0.000
0.111	0.000	0.000
0.139	0.000	0.000
0.166	0.000	0.000
0.194	0.000	0.000
0.222	0.000	0.000
0.249	0.000	0.000
0.277	0.000	0.000
0.305	0.000	0.000
0.332	0.000	0.000
0.360	0.000	0.000
0.388	0.000	0.000
0.416	0.000	0.000
0.443	0.023	0.001

Stage Storage Discharge Table

Basin Level (m)	Volume (m^3)	Outflow (m^3)
0.000	0.000	0.000
0.028	0.074	0.000
0.055	0.221	0.000
0.083	0.368	0.000
0.111	0.515	0.000
0.139	0.662	0.000
0.166	0.809	0.000
0.194	0.956	0.000
0.222	1.103	0.000
0.249	1.250	0.000
0.277	1.397	0.000
0.305	1.544	0.000
0.332	1.691	0.000
0.360	1.838	0.000
0.388	1.985	0.000
0.416	2.132	0.000
0.443	2.279	0.001

Existing Dam

High Flow Conditions	Weir		Number	1
Length (m)	7.35		Height (m	0.75

Basin Level	S.A.	Ave S.A.	Thickness	Volume	Cumulative Volume
(m)	*(m^2)*	*(m^2)*	*(m)*	*(m^3)*	*(m^3)*
0.000	67.521	0.000	0.000	0.000	0.000
0.100	178.338	122.930	0.100	12.293	15.097
0.200	198.790	188.564	0.100	18.856	33.946
0.300	220.211	209.501	0.100	20.950	54.888
0.400	242.601	231.406	0.100	23.141	78.020
0.500	265.960	254.281	0.100	25.428	103.440
0.600	290.288	278.124	0.100	27.812	131.245
0.700	315.585	302.937	0.100	30.294	161.530
0.800	340.725	328.155	0.100	32.816	194.381

Low Flow Details

Basin Level	Head	$Q_{Orifice}$
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.100	0.000
0.300	0.200	0.000
0.400	0.300	0.000
0.500	0.400	0.000
0.600	0.500	0.000
0.700	0.600	0.000
0.800	0.700	0.000

Mid Flow Details

Basin Level	Head	$Q_{Orifice}$
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.100	0.000
0.300	0.200	0.000
0.400	0.300	0.000
0.500	0.400	0.000
0.600	0.500	0.000
0.700	0.600	0.000
0.800	0.700	0.000

High Flow Details

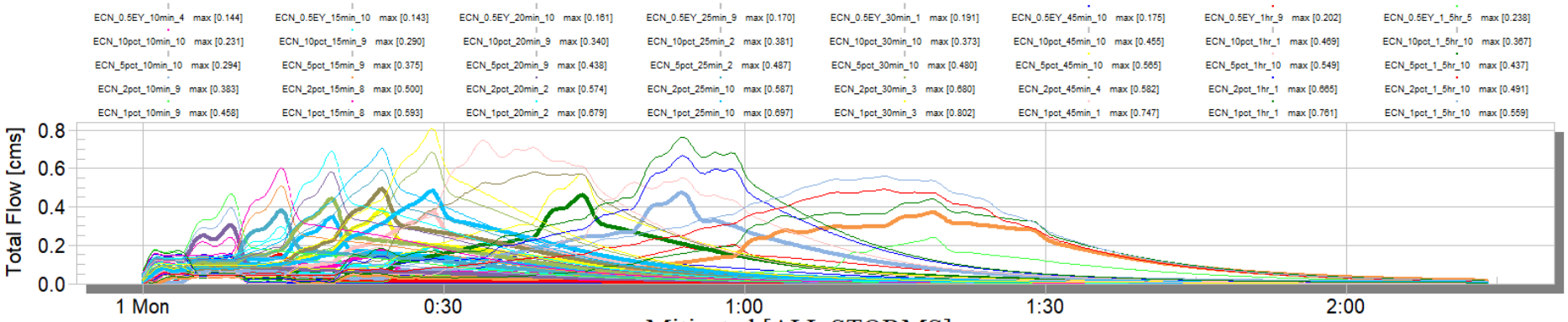
Basin Leve	Head	Qweir
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.000	0.000
0.300	0.000	0.000
0.400	0.000	0.000
0.500	0.000	0.000
0.600	0.000	0.000
0.700	0.000	0.000
0.800	0.100	0.388

Stage Storage Discharge Table

Basin Level	Volume	Outflow
(m)	*(m^3)*	*(m^3)*
0.000	0.000	0.000
0.100	15.097	0.000
0.200	33.946	0.000
0.300	54.888	0.000
0.400	78.020	0.000
0.500	103.440	0.000
0.600	131.245	0.000
0.700	161.530	0.000
0.800	194.381	0.388

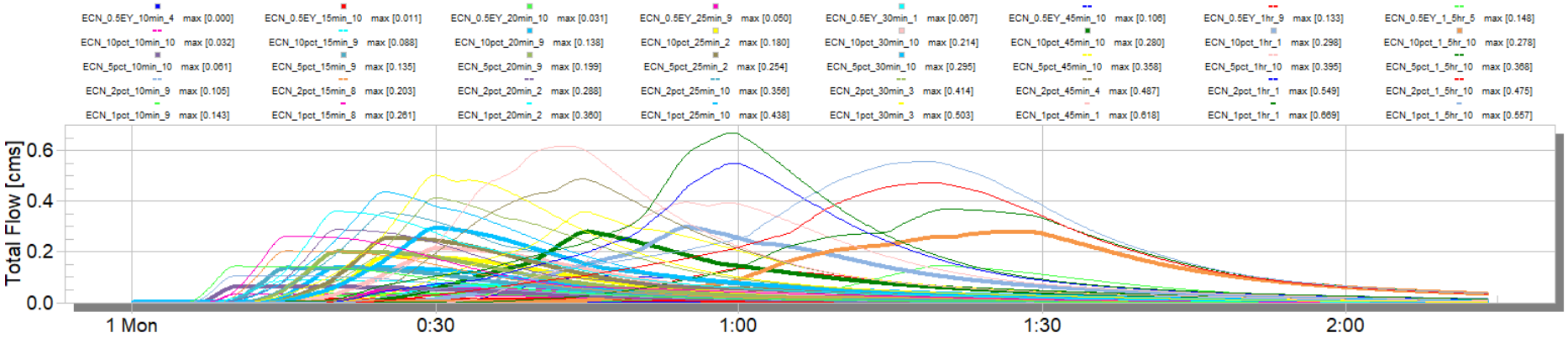
Developed [ALL STORMS]

Total Flow



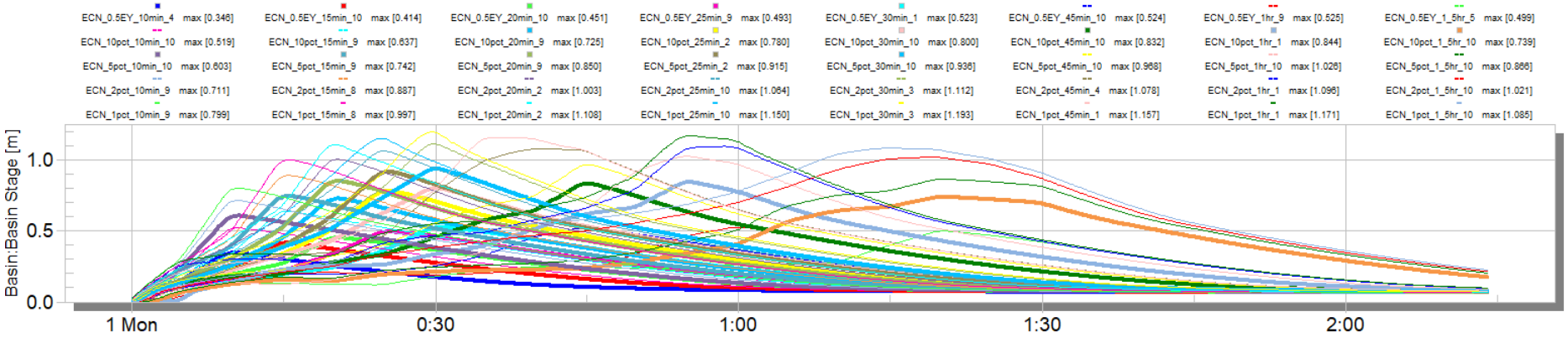
Mitigated [ALL STORMS]

Total Flow



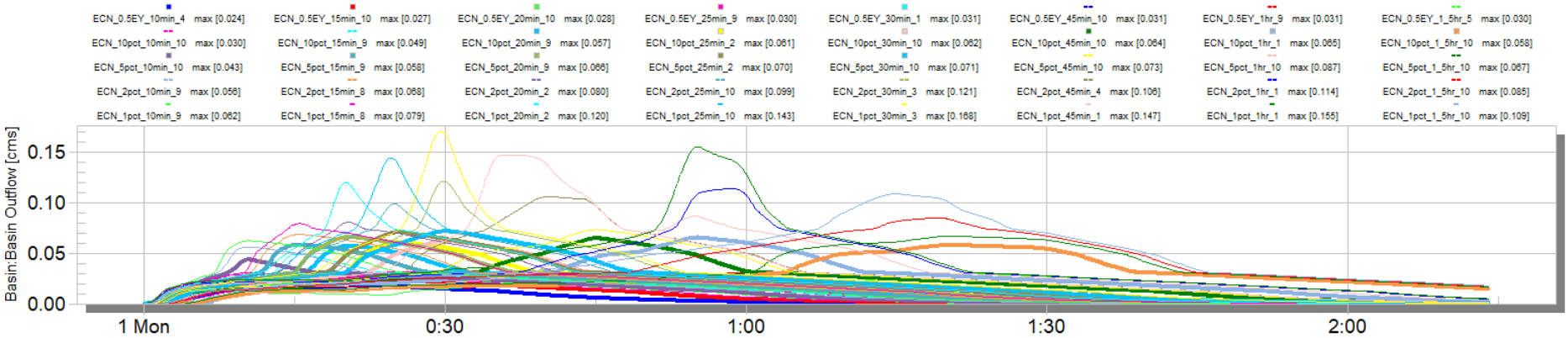
Car P Tank [ALL STORMS]

Basin:Basin Stage



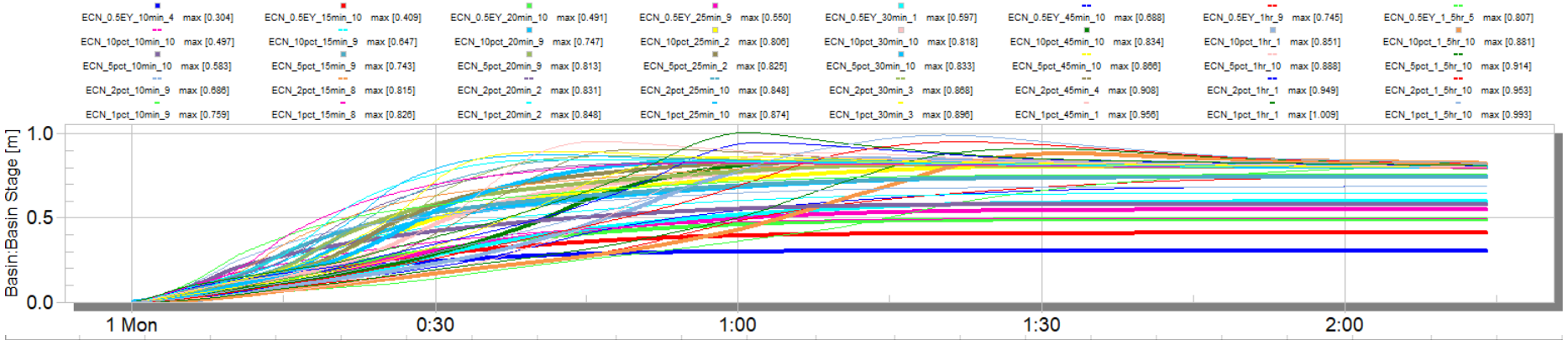
Car P Tank [ALL STORMS]

Basin:Basin Outflow



Dam (EX) [ALL STORMS]

Basin:Basin Stage



Car Park Detention Tank Stage Storage Discharge

Orifice Details

Low Flow		*Mid Flow*				High Flow Conditions	Weir		Number	1
Size (m)	0.14	Size (m)	0.14	Number	1	Length (m)	0.5		Height (m	1
		Height (m	0.47							

Basin Level	S.A.	Ave S.A.	Thickness	Volume	Cumulative Volume
(m)	*(m^2)*	*(m^2)*	*(m)*	*(m^3)*	*(m^3)*
0.000	0.000	0.000	0.000	0.000	0.000
0.070	130.000	65.000	0.070	4.550	4.550
0.140	130.000	130.000	0.070	9.100	13.650
0.210	130.000	130.000	0.070	9.100	22.750
0.280	130.000	130.000	0.070	9.100	31.850
0.350	130.000	130.000	0.070	9.100	40.950
0.420	130.000	130.000	0.070	9.100	50.050
0.470	130.000	130.000	0.050	6.500	56.550
0.540	130.000	130.000	0.070	9.100	65.650
0.630	130.000	130.000	0.090	11.700	77.350
0.700	130.000	130.000	0.070	9.100	86.450
0.770	130.000	130.000	0.070	9.100	95.550
0.840	130.000	130.000	0.070	9.100	104.650
0.910	130.000	130.000	0.070	9.100	113.750
0.980	130.000	130.000	0.070	9.100	122.850
1.050	130.000	130.000	0.070	9.100	131.950
1.120	130.000	130.000	0.070	9.100	141.050
1.190	130.000	130.000	0.070	9.100	150.150
1.260	130.000	130.000	0.070	9.100	159.250
1.330	130.000	130.000	0.070	9.100	168.350

NOTE: MAX TANK HEIGHT 1.200 m

Low Flow Details

Basin Level	Head	$Q_{Orifice}$
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.070	0.000	0.000
0.140	0.070	0.012
0.210	0.140	0.017
0.280	0.210	0.021
0.350	0.280	0.024
0.420	0.350	0.027
0.470	0.400	0.029
0.540	0.470	0.031
0.630	0.560	0.034
0.700	0.630	0.036
0.770	0.700	0.038
0.840	0.770	0.040
0.910	0.840	0.042
0.980	0.910	0.044
1.050	0.980	0.045
1.120	1.050	0.047
1.190	1.120	0.048
1.260	1.190	0.050
1.330	1.260	0.051

Mid Flow Details

Basin Level	Head	$Q_{Orifice}$
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.070	0.000	0.000
0.140	0.000	0.000
0.210	0.000	0.000
0.280	0.000	0.000
0.350	0.000	0.000
0.420	0.000	0.000
0.470	0.000	0.000
0.540	0.000	0.000
0.630	0.090	0.014
0.700	0.160	0.018
0.770	0.230	0.022
0.840	0.300	0.025
0.910	0.370	0.028
0.980	0.440	0.030
1.050	0.510	0.033
1.120	0.580	0.035
1.190	0.650	0.037
1.260	0.720	0.039
1.330	0.790	0.041

High Flow Details

Basin Leve	Head	Qweir
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.070	0.000	0.000
0.140	0.000	0.000
0.210	0.000	0.000
0.280	0.000	0.000
0.350	0.000	0.000
0.420	0.000	0.000
0.470	0.000	0.000
0.540	0.000	0.000
0.630	0.000	0.000
0.700	0.000	0.000
0.770	0.000	0.000
0.840	0.000	0.000
0.910	0.000	0.000
0.980	0.000	0.000
1.050	0.070	0.015
1.120	0.140	0.044
1.190	0.210	0.080
1.260	0.280	0.124
1.330	0.350	0.173

Stage Storage Discharge Table

Basin Level	Volume	Outflow
(m)	*(m^3)*	*(m^3)*
0.000	0.000	0.000
0.070	4.550	0.000
0.140	13.650	0.012
0.210	22.750	0.017
0.280	31.850	0.021
0.350	40.950	0.024
0.420	50.050	0.027
0.470	56.550	0.029
0.540	65.650	0.031
0.630	77.350	0.048
0.700	86.450	0.055
0.770	95.550	0.060
0.840	104.650	0.065
0.910	113.750	0.070
0.980	122.850	0.074
1.050	131.950	0.093
1.120	141.050	0.125
1.190	150.150	0.166
1.260	159.250	0.212
1.330	168.350	0.265

Existing Dam (Modified)

High Flow Conditions	Weir		Number	1
Length (m)	1.5		Height (m	0.8

Basin Level	S.A.	Ave S.A.	Thickness	Volume	Cumulative Volume
(m)	*(m^2)*	*(m^2)*	*(m)*	*(m^3)*	*(m^3)*
0.000	67.521	0.000	0.000	0.000	0.000
0.100	178.338	122.930	0.100	12.293	15.097
0.200	198.790	188.564	0.100	18.856	33.946
0.300	220.211	209.501	0.100	20.950	54.888
0.400	242.601	231.406	0.100	23.141	78.020
0.500	265.960	254.281	0.100	25.428	103.440
0.600	290.288	278.124	0.100	27.812	131.245
0.700	315.585	302.937	0.100	30.294	161.530
0.800	340.725	328.155	0.100	32.816	194.381
0.900	340.725	340.725	0.100	34.073	228.454

Low Flow Details

Basin Level	Head	$Q_{Orifice}$
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.100	0.000
0.300	0.200	0.000
0.400	0.300	0.000
0.500	0.400	0.000
0.600	0.500	0.000
0.700	0.600	0.000
0.800	0.700	0.000
0.900	0.800	0.000

Mid Flow Details

Basin Level	Head	Qweir
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.000	0.000
0.300	0.000	0.000
0.400	0.000	0.000
0.500	0.000	0.000
0.600	0.000	0.000
0.700	0.000	0.000
0.800	0.000	0.000
0.900	0.100	0.000

High Flow Details

Basin Leve	Head	Qweir
(m)	*(m)*	*(m^3/s)*
0.000	0.000	0.000
0.100	0.000	0.000
0.200	0.000	0.000
0.300	0.000	0.000
0.400	0.000	0.000
0.500	0.000	0.000
0.600	0.000	0.000
0.700	0.000	0.000
0.800	0.000	0.000
0.900	0.100	0.079

Stage Storage Discharge Table

Basin Level	Volume	Outflow
(m)	*(m^3)*	*(m^3)*
0.000	0.000	0.000
0.100	15.097	0.000
0.200	33.946	0.000
0.300	54.888	0.000
0.400	78.020	0.000
0.500	103.440	0.000
0.600	131.245	0.000
0.700	161.530	0.000
0.800	194.381	0.000
0.900	228.454	0.079

APPENDIX C: Rational Method Calculation Summary

RATIONAL METHOD CALCULATIONS - EXISTING SITE

Job Reference	C3301
Site Address	221 Teviot Road, Greenbank
Council	Logan City Council

Number of Sub-Catchments	3	
Minor Storm Event	10% AEP	(As per QUDM Table 7.02.1)
Major Storm Event	2% AEP	(As per QUDM Table 7.02.1)

Subcatchment Summary Table

Number	Catchment Name	Catchment Description	C_{10}	tc
1	Roof	Impervious Roof	0.90	25
2	Driveway	Significant paved areas	0.88	25
3	Vegetation	Open Space (eg parks)	0.70	25

Site C_{10} 0.71

Catchment Calculations (Major and Minor Storm ARI's)

Number	Area	C10	I10	10% AEP	C50	I50	2% AEP
	ha		mm/hr	m ³/s		mm/hr	m³/s
1	0.049	0.90	111	0.014	1.00	152	0.021
2	0.038	0.88	111	0.010	1.00	152	0.016
3	1.915	0.70	111	0.415	0.81	152	0.649

Total Runoff	Minor	0.439	m³/s
	Major	0.686	m³/s
Total Area		2.002	ha

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

Runoff Summary		
Freq.	Peak Discharge	
4 EY	0.094	m^3/s
63% AEP	0.188	m^3/s
39% AEP	0.252	m^3/s
15% AEP	0.351	m^3/s
10% AEP	0.439	m^3/s
5% AEP	0.532	m^3/s
2% AEP	0.686	m^3/s
1% AEP	0.798	m^3/s

Job Reference	C3301
Site Address	221 Teviot Road, Greenbank
Council	Logan City Council

Number of Sub-Catchments	8	
Minor Storm Event	10% AEP	(As per QUDM Table 7.02.1)
Major Storm Event	2% AEP	(As per QUDM Table 7.02.1)

Subcatchment Summary Table

Number	Catchment Name	Catchment Description	C_{10}	tc
1	Roof	Impervious Roof	0.90	19
2	Driveway	Significant paved areas	0.88	19
3	Vegetation	Open Space (eg parks)	0.70	19
4	Ground	Low-medium to high density residential areas	0.87	19
5	Add Roof	Significant paved areas	0.88	19
6	Add Outdoor Play	Low-medium to high density residential areas	0.87	19
7	Add Dway	Significant paved areas	0.88	19
8	Add Dway Veg	Open Space (eg parks)	0.70	19

Site C_{10} 0.74

Catchment Calculations (Major and Minor Storm ARI's)

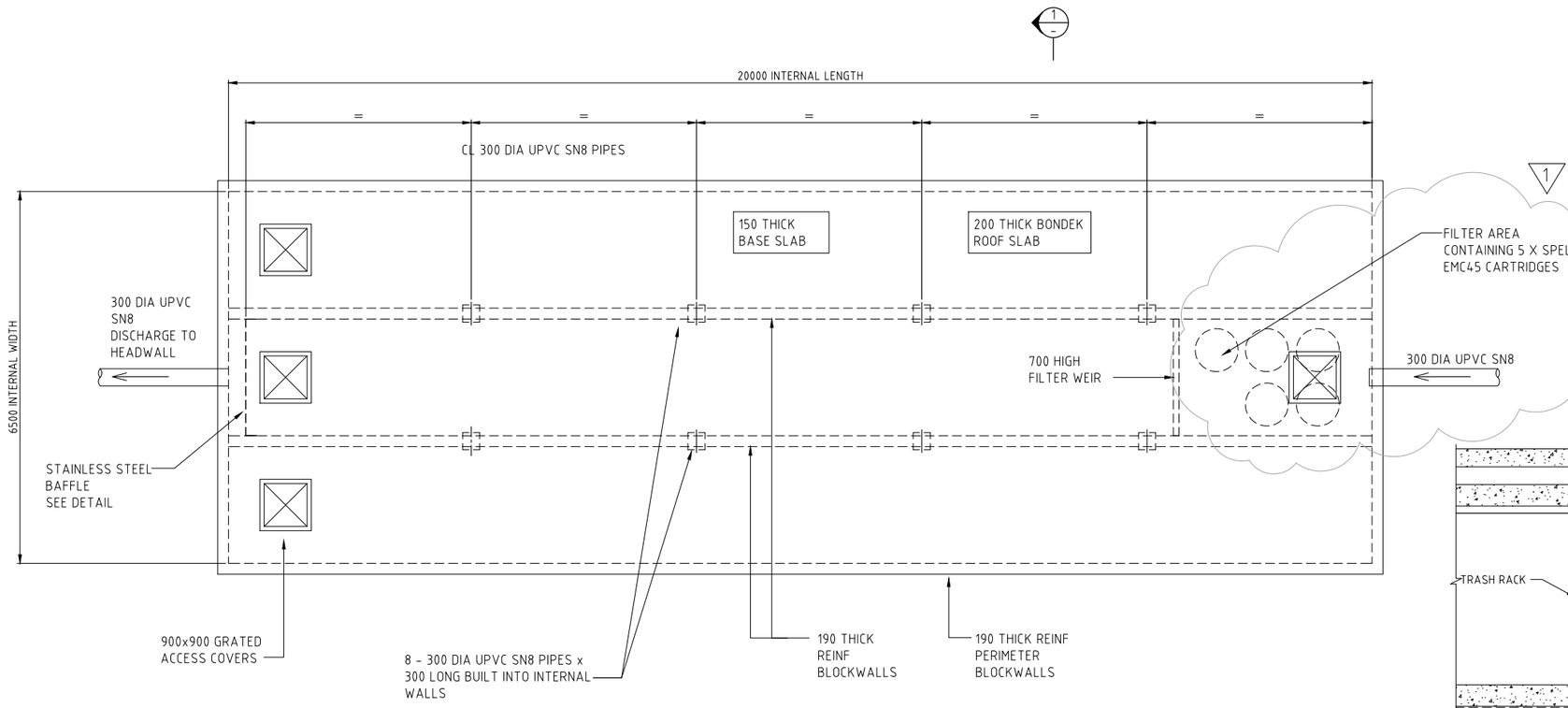
Number	Area	C10	I10	10% AEP	C50	I50	2% AEP
	ha		mm/hr	m³/s		mm/hr	m³/s
1	0.118	0.90	125	0.037	1.00	171	0.056
2	0.100	0.88	125	0.031	1.00	171	0.047
3	1.517	0.70	125	0.370	0.81	171	0.579
4	0.134	0.87	125	0.041	1.00	171	0.064
5	0.052	0.88	125	0.016	1.00	171	0.025
6	0.048	0.87	125	0.015	1.00	171	0.023
7	0.029	0.88	125	0.009	1.00	171	0.014
8	0.004	0.70	125.30	0.001	0.81	170.64	0.002

Total Runoff	Minor	0.518	m³/s
	Major	0.808	m³/s
Total Area		2.002	ha

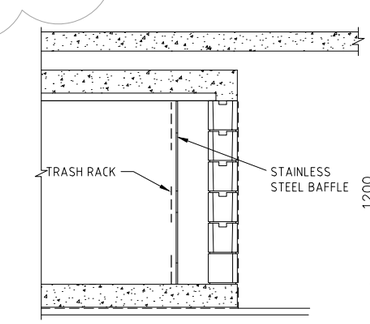
Overland Flow Calculations		
Trunk SW Infrastructure		
Pipe Diameter	N/A	m
Number of Pipes		
Grade		m/m
mannings		
Pipe Capacity		m^3/s
Pipe Velocity		m/s
Capacity @ 3m/s		m^3/s
Overland Flow		m^3/s

Runoff Summary		
Freq.	Peak Discharge	
4 EY	0.111	m^3/s
63% AEP	0.222	m^3/s
39% AEP	0.298	m^3/s
15% AEP	0.414	m^3/s
10% AEP	0.518	m^3/s
5% AEP	0.629	m^3/s
2% AEP	0.808	m^3/s
1% AEP	0.931	m^3/s

APPENDIX D: MEDQ Approved Plans



DETENTION TANK - PLAN
SCALE 1:50



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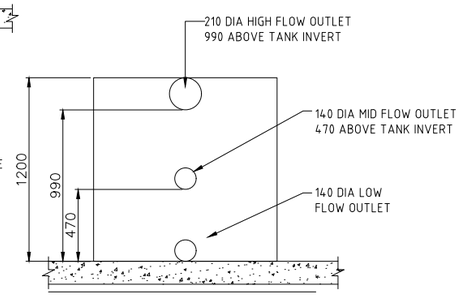
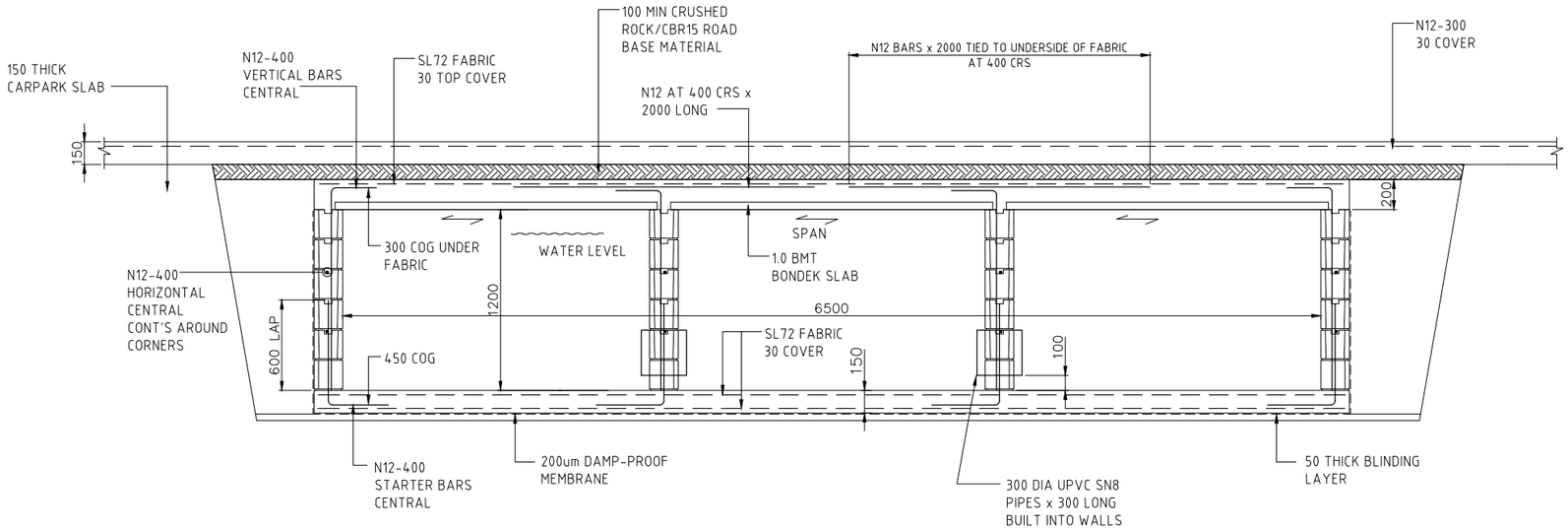


5mm G316 STAINLESS STEEL PLATE
BAFFLE WITH TRASH RACK IN FRONT

ELEVATION



SECTION 1
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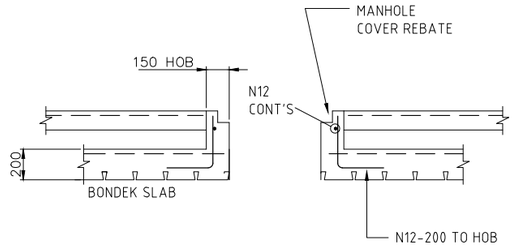


DETENTION TANK ACCESS HOLE
SCALE 1:20

NOTE.
1. DETENTION TANK MIN INTERNAL DIMENSIONS TO BE 6.5m x 20m LONG x 1.2m HIGH.
2. BASE SLAB - N32 CONCRETE
3. BONDEK SLAB - N32 CONCRETE

COMPLIANCE APPROVAL
referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2019/1054/5
Condition no: 21a & 22a
Date: 27/02/2023

Queensland Government

FOR APPROVAL
DATE 16.02.23

National Professional Engineers Register
Mr Alex Milligan - XANDER STRUCTURAL DESIGN P/L
BEng, MIStructE, MIEAust, CPEng, NER Civil & Structural
Registered Professional Engineer Qld RPEQ 7385
Signature ..... Date: 16.02.23

No	DATE	DRAFTING CHECK	DESIGN REVIEW	REV'D P.MGR	APP'D P.DIR	AMENDMENT
1	16.02.23					FILTER CARTRIDGES SHOWN TO DETENTION TANK
0	09.02.22					ISSUED FOR CONSTRUCTION

CLIENT
ASHMORE CONSTRUCTIONS (QLD) PTY LTD

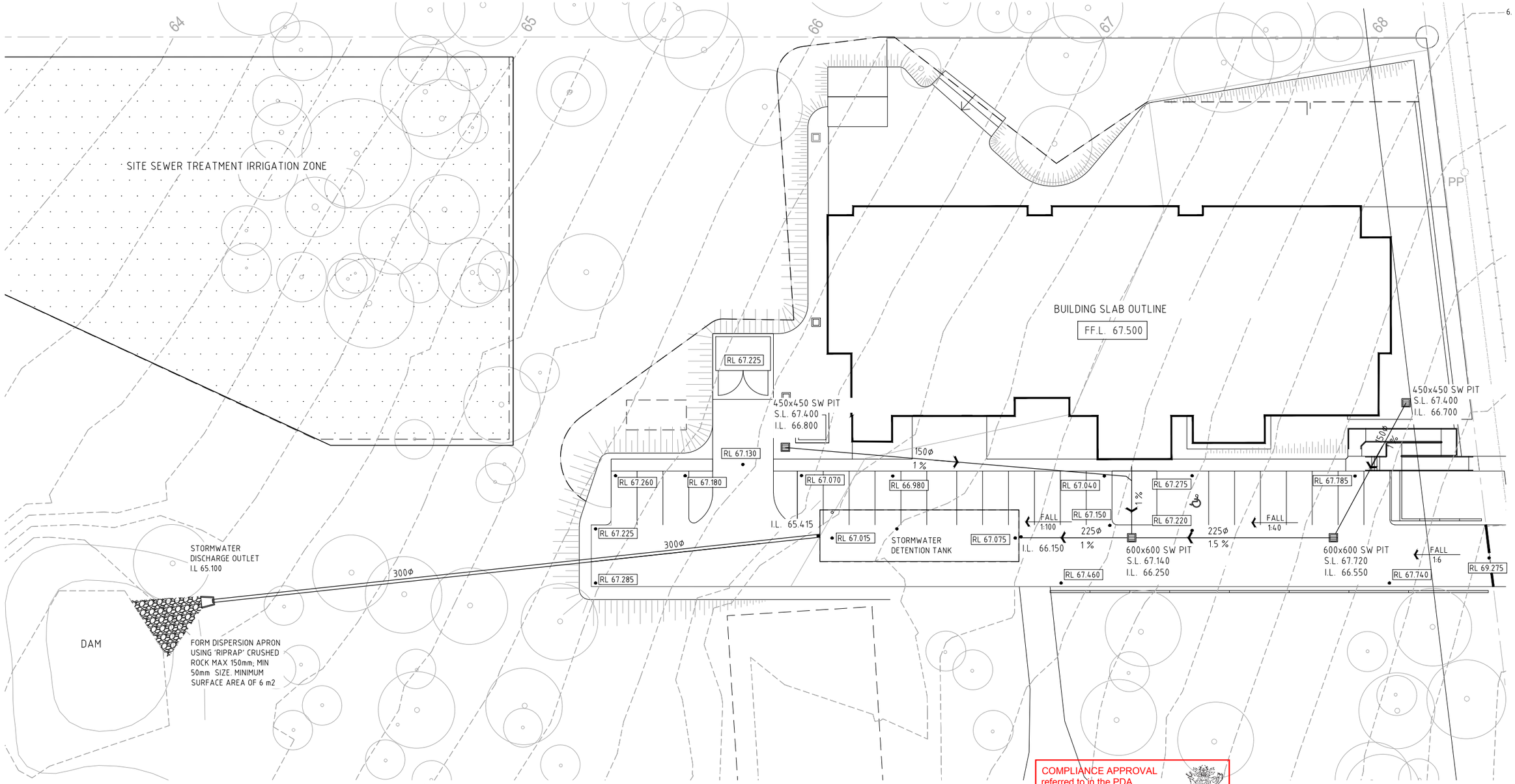
XSD
XANDER STRUCTURAL DESIGN PTY LTD
P.O. Box 5558
Manly, Qld 4179
Phone 0415 678879
email: xsd07@bigpond.com

CLIENT: N & A CAMPBELL DEVELOPMENTS PTY LTD
PROJECT: PROPOSED CHILD CARE. 221-223 TEVIOT ST, GREENBANK

DRAFTER	DRAFTING CHECK	REVIEWED PROJECT MANAGER	APPROVED PROJECT DIRECTOR
DESIGNED	DESIGN REVIEW		RPEQ No 07385.

TITLE: STORMWATER DETAILS
DETENTION TANK

SCALE	PROJECT No	DRAWING No	AMDT
AS SHOWN	2021-86	C-11	1



NOTES:

1. REFER TO DRG No. 2021-96-C-01 FOR GENERAL CIVIL WORKS NOTES.
2. REFER TO DRG No. 2021-96-C-13 FOR CIVIL STORMWATER NOTES.
3. REFER TO HYDRAULIC CONSULTANT DRAWINGS FOR BUILDING ROOF AND GENERAL LANDSCAPE AREA SURFACE DRAINAGE LAYOUT.
4. REFER TO DRAWING No. 2021-86-C-11 FOR DETENTION TANK CONSTRUCTION DETAILS.
5. ALL STORMWATER PITS TO BE ROCLA OR HUMES PRECAST WITH GALVANISED STEEL GRATE COVERS.
6. ALL STORMWATER PITS TO BE FITTED WITH SPEL "STORMSACK" OR SIMILAR TRASHBASKETS. REFER TO DRG No. 2021-86-C-13 FOR TYPICAL DETAIL AND SPEL PRODUCT BROCHURE FOR FULL INFORMATION.
7. DETENTION TANK IS TO INCORPORATE 5 No. SPEL "SPELFILTER" EMC45 CARTRIDGES (OR EQUAL) INSTALLED & PLUMBED IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATIONS AND INSTALLATION DRAWINGS.

B

LEGEND:

• R.L. 5.400 FINISHED SURFACE LEVELS.

COMPLIANCE APPROVAL
referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2019/1054/5
Condition no: 21a & 22a
Date: 27/02/2023

Queensland Government

FOR APPROVAL
DATE 16.02.23

National Professional Engineers Register
Mr Alex Milligan - XANDER STRUCTURAL DESIGN P/L
BEng, MIStructE, MIEAust, CPEng, NER Civil & Structural
Registered Professional Engineer Qld RPEQ 7385
Signature ..... Date: 16.02.23

No	DATE	DRAFTING CHECK	DESIGN REVIEW	REV'D P.MGR	APP'D P.DIR.	AMENDMENT
B	16.02.23	AM				NOTES 5 -7 ADDED - STORMWATER PITS; TRASHBASKET & DETENTION TANK FILTER REQUIREMENTS.
A	17.12.21	AM				ISSUED TO EDQ FOR COMPLIANCE ASSESSMENT

CLIENT
ASHMORE CONSTRUCTIONS (QLD) PTY LTD

XSD
XANDER STRUCTURAL DESIGN PTY LTD
P.O. Box 5558
Manly, Qld 4179
Phone 0415 678879
email: xsd07@bigpond.com

CLIENT ASHMORE CONSTRUCTIONS (QLD) PTY LTD
PROJECT 221-233 TEVIOT ROAD, GREENBANK, QLD 4124

DRAFTER	DRAFTING CHECK	REVIEWED PROJECT MANAGER	APPROVED PROJECT DIRECTOR
J.C.	A.M.		
DESIGNED	DESIGN REVIEW		RPEQ No 07385.
A.M.			

TITLE
PROPOSED CHILDCARE CENTRE
SITE STORMWATER LAYOUT PLAN

SCALE	PROJECT No	DRAWING No	AMDT
1:200 @ A1	2021-86	C-12	B

STORMWATER DRAINAGE NOTES

1 STORMWATER DRAINAGE PIPES SHALL MEET THE MINIMUM REQUIREMENTS DETAILED IN TABLE 2.1 UNLESS NOTED OTHERWISE ON DRAWINGS. THE CONTRACTOR SHALL SEEK APPROVAL FROM THE ENGINEER FOR ANY VARIATION TO THE REQUIREMENTS STIPULATED WITHIN TABLE 2.1 PRIOR TO CONSTRUCTION.

TABLE 2.1: STORMWATER DRAINAGE PIPE MINIMUM REQUIREMENTS

DRAINAGE TYPE.	PIPE SIZE (mm)	PIPE TYPE	PIPE CLASS
SURFACE	150 - 225 DIA.	UPVC	SN8
	> 300 DIA.	UPVC	SN8
ROOFWATER	100 DIA.	UPVC	SN10
	> 150 DIA.	UPVC	SN8
SUB-SURFACE	100 DIA.	PE/PVC (SLOTTED)	400/1000
	> 100 DIA.	PE (SLOTTED)	200

1.1 NOMINAL PIPE SIZES SMALLER THAN DIA. 100 SHALL NOT BE USED FOR SURFACE AND SUB-SURFACE DRAINAGE APPLICATIONS UNLESS APPROVED OTHERWISE BY THE ENGINEER.

1.2 ALL SUB-SURACE DRAINAGE PIPES SHALL HAVE A MINIMUM SLOTTED OPENING AREA OF 1500mm2/m IN ACCORDANCE WITH AS 2439. ALL SUB-SURFACE DRAINAGE PIPES SHALL BE FITTED WITH A WOVEN FABRIC FILTER SOCK (UNLESS NOTED OTHERWISE ON DRAWINGS - I.E. BIO RETENTION BASIN) APPROVED FOR USE WITH THE PIPE MANUFACTURER.

1.3 ALL SUB-SURFACE DRAINAGE SHALL BE LAID AT A MINIMUM PIPE GRADIENT OF 1:200.

1.4 ALL SUB-SURACE DRAINAGE SHALL PROVIDED WITH ONE (1) FLUSH POINT/30 LINEAR METRES OF PIPE, COMMENCING WITH ONE (1) FLUSH POINT AT THE UPSTREAM END OF THE DRAIN. THE FLUSH POINT SHALL BE FORMED BY A PLAIN WALL (NON PERFORATED) RISER EXTENDED TO THE FINISHED SURFACE LEVEL. THE FLUSH POINT SHALL PROVIDED WITH A SCREW CAP FLUSH WITH THE ADJACENT FINISHED SURFACE LEVEL.

1.5 NOTWITHSTANDING THE DETAILS PROVIDED ON THE DRAWINGS, SUB-SURFACE DRAINAGE SHALL BE INSTALLED BELOW ALL KERB ALIGNMENTS AND EDGE TREATMENTS SEPARATING LANDSCAPING AND PAVEMENTS. THE CONTRACTOR SHALL ALLOW ALL COSTS TO INSTALL AND NOMINATE A POINT OF DISCHARGE TO THE SATISFACTION OF THE ENGINEER.

2 ALL DRAINAGE PIPES SHALL BE LAID WITH THE MINIMUM COVER REQUIREMENTS AS DETAILED WITHIN THE LOCAL AUTHORITY (BRISBANE CITY COUNCIL) GUIDELINES FOR PUBLIC DRAINAGE INFRASTRUCTURE OR AS3500:3 STORMWATER DRAINAGE FOR PRIVATE PROPERTY DRAINAGE.

3 ALL DRAINAGE PIPES SHALL BE UNLESS NOTED OTHERWISE.

4 ALL REINFORCED CONCRETE PIPES SHALL BE PROVIDED WITH TYPE 'H2' SUPPORT.

5 ALL BEDDING AND HAUNCH MATERIAL SHALL BE NON-COHESIVE GRANULAR MATERIAL SUCH AS WASHED RIVER SAND OR CLEAN UNWEATHERED HARD BASALTIC OR SEDIMENTARY CRUSHED ROCK, FREE OF SALT, CLAY OR ORGANIC CONTAMINANTS. SUCH MATERIAL SHALL HAVE A MINIMUM 85% PASSING THE 2.36mm SIEVE, AND NOT MORE THAN 15% PASSING THE 0.075mm SIEVE. BEDDING AND HAUNCH MATERIAL SHALL BE COMPACTED FOR THE FULL WIDTH OF THE TRENCH BY TWO (2) PASSES OF A VIBRATING PLATE OR HAND TAMPING METHOD TO THE SATISFACTION OF THE SUPERINTENDANT.

6 ALL TRENCHES UNDER THE ROAD OR DRIVEWAY SHALL BE BACKFILLED INLAYERS NOT EXCEEDING 150mm OF COMPACTED THICKNESS. COMPACT TO NOT LESS THAN 95% MAXIMUM DRY DENSITY BY MODIFIED COMPACTION TEST (AS 1289). ELSEWHERE 95% MAXIMUM DRY DENSITY STANDARD COMPACTION TEST (AS 1289). THE CONTRACTOR SHALL UNDERTAKE ONE (1) COMPACTION TEST / 2 LAYERS / 40 LINEAR METRES OF TRENCHING. THE TESTING SHALL BE UNDERTAKEN BY A QUALIFIED GEOTECHNICAL ENGINEER WITH NATA ACCREDITATION AND THE RESULTS SUPPLIED TO THE ENGINEER.

7 A LL STORMWATER DRAINAGE ACCESS CHAMBERS/MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS PROVIDED ON THE INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA (QUEENSLAND DIVISION) IPWEAQ STANDARD DRAWINGS D-0010 TO D-0017 UNLESS NOTED OTHERWISE.

B

9 ALL STORMWATER DRAINAGE GULLIES / PITS SHALL BE FITTED WITH GROSS POLLUTANT TRAPS - SPEL STORMSACK OR EQUAL APPROVED ALTERNATIVE. INSTALLATION SHALL FOLLOW THE REQUIREMENTS & RECOMMENDATIONS OF THE MANUFACTURER TECHNICAL LITERATURE AND DRAWINGS.

10 ALL STORMWATER DRAINAGE GULLIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS PROVIDED ON THE INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA (QUEENSLAND DIVISION) IPWEAQ STANDARD DRAWINGS D-0060 TO D-0064; D-0066 TO D-0070 UNLESS NOTED OTHERWISE.

11 ALL STORMWATER DRAINAGE FIELD INLETS AND OVERFLOW GULLIES SHALL BE TYPE 2 WITH APRON CONSTRUCTED IN ACCORDANCE WITH THE DETAILS PROVIDED ON THE INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA (QUEENSLAND DIVISION) IPWEAQ STANDARD DRAWING D-0050 UNLESS NOTED OTHERWISE.

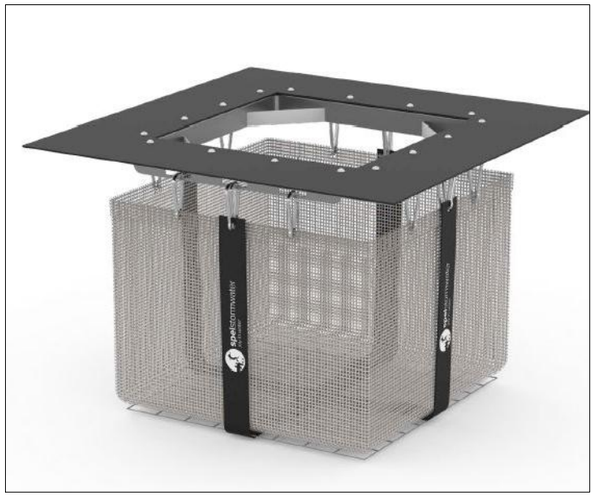
12 WHERE NOT SPECIFIED ON THE DRAWINGS , THE CONTRACTOR SHALL REQUEST THE SPECIFICATION FOR FOR ALL DRAINAGE STRUCTURE LOADING CLASS TYPES FOR LIDS, GRATES AND ASSOCIATED FRAMING. THE CONTRACTOR SHALL NOT ASSUME A TYPE.

13 ALL STORMWATER DRAINAGE INLETS AND OUTLETS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS PROVIDED ON THE INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA (QUEENSLAND DIVISION) IPWEAQ STANDARD DRAWING D-0080, UNLESS NOTED OTHERWISE.

14 ALL STORMWATER DRAINAGE INFRASTRUCTURE SHALL BE CLEANED/FLUSHED WITH WATER AND BE LEFT FREE OF DEBRIS AND SOIL AT THE COMPLETION OF THE WORKS.

15 THE ENGINEER RESERVES THE RIGHT TO REQUEST A PIPE SURVEY (CCTV) AT ANY TIME TO INSPECT CONSTRUCTED PIPE DRAINAGE WHERE CONSTRUCTION HAS PRECLUDED A DIRECT INSPECTION OF THE DRAINLINE. THE CONTRACTOR SHALL ALLOW ALL COSTS ASSOCIATED WITH THIS REQUIREMENT.

16 WHERE OMITTED ON THE DRAWINGS, THE CONTRACTOR SHALL UNDERTAKE ALL ACTIONS AND ALLOW COSTS TO CONNECT ROOFWATER PLUMBING TO A POINT OF DISCHARGE APPROVED BY THE ENGINEER.



SPEL STORMSACK IMAGE

B

COMPLIANCE APPROVAL
referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2019/1054/5
Condition no: 21a & 22a
Date: 27/02/2023

Queensland Government

FOR APPROVAL
DATE 16.02.23

National Professional Engineers Register
Mr Alex Milligan - XANDER STRUCTURAL DESIGN P/L
BEng, MIStructE, MIEAust, CPEng, NER Civil & Structural
Registered Professional Engineer Qld RPEQ 7385
Signature ..... Date: 16.02.23

No	DATE	DRAFTING CHECK	DESIGN REVIEW	REV'D P.MGR	APP'D P.DIR	AMENDMENT
B	16.02.23	AM				NOTE 8 ADDED - GROSS POLLUTANT TRAPS & IMAGE OF STORMSACK ADDED
A	17.12.21	AM				ISSUED TO EDQ FOR COMPLIANCE ASSESSMENT

CLIENT
ASHMORE CONSTRUCTIONS (QLD) PTY LTD

XSD
XANDER STRUCTURAL DESIGN PTY LTD
P.O. Box 5558
Manly, Qld 4179
Phone 0415 678879
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CLIENT: ASHMORE CONSTRUCTIONS (QLD) PTY LTD
PROJECT: 221-233 TEVIOT ROAD, GREENBANK, QLD 4124
DRAFTER: J.C. | DRAFTING CHECK: A.M. | REVIEWED PROJECT MANAGER | APPROVED PROJECT DIRECTOR
DESIGNED: A.M. | DESIGN REVIEW | RPEQ No 07385.

TITLE: PROPOSED CHILDCARE CENTRE
SITE STORMWATER TECHNICAL NOTES

SCALE: 1:200 @ A1 | PROJECT No: 2021-86 | DRAWING No: C-13 | AMDT: B