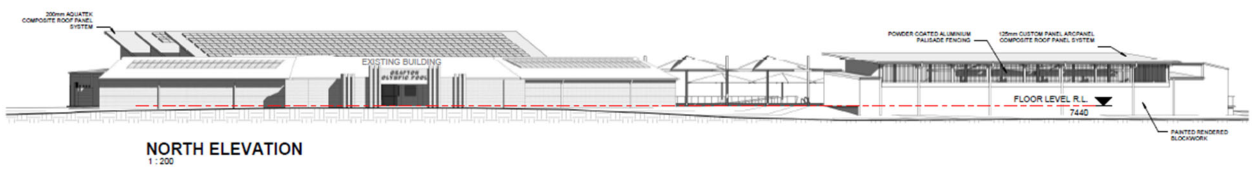
Stormwater Management Plan Report

Grafton Aquatic Centre

Cnr Turf Street and Oliver Street
GRAFTON NSW 2460



For

Facility Design Group
PO Box 82
Cambewarra NSW 2540

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ECLIPSE Consulting Engineers Pty Ltd
305/12 Century Circuit
NORWEST NSW 2153

Phone : (02) 9894 8500
info@eclipseconsulting.com.au
www.eclipseconsulting.com.au

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2. Introduction and Background

2.1. Purpose

The purpose of this stormwater management plan is to provide the stormwater drainage system and stormwater quality treatment design parameters and demonstrate that the proposed stormwater system will meet the requirements of Clarence Valley Council stormwater targets.

The principal objectives of this review are to provide:

- A summary of stormwater design parameters.
- A summary of Australian Standards used and the local council's stormwater requirements.
- A summary of the stormwater design strategy.
- A maintenance schedule of each stormwater drainage component proposed for the development.

2.2. Site Description

The site is described as Lot 1 in DP1115980. The development site is addressed as 84 Centre Street, Casino. The location of the site is shown in Figure 2.1, below.

Figure 2.1: Aerial Photograph of the Site Location

The site currently consists of an existing aquatic centre, comprising a 50 metre Olympic swimming pool and associated infrastructure. The site is bounded by Oliver Street to the north-east, Turf Street to the north-west, Bacon Street to the south-west, and Alumy Creek and sports courts to the south-east. The site slopes gradually from south-east to north-west towards the intersection of Turf Street and Oliver Street. The proposed redevelopment works intend to maintain the existing flow regime by disposing of stormwater to existing drainage adjacent Alumy Creek.

The development's new roof area is 2,943 m^2 in total.

2.3. Proposed Development

The proposed development works include:

- Construction of new Olympic pool and associated concourse and footpaths. Total area = 1,839 m^2.
- New pool hall. Total roof area = 2,340 m^2.
- New grandstand and plant room. Total roof area = 603 m^2.

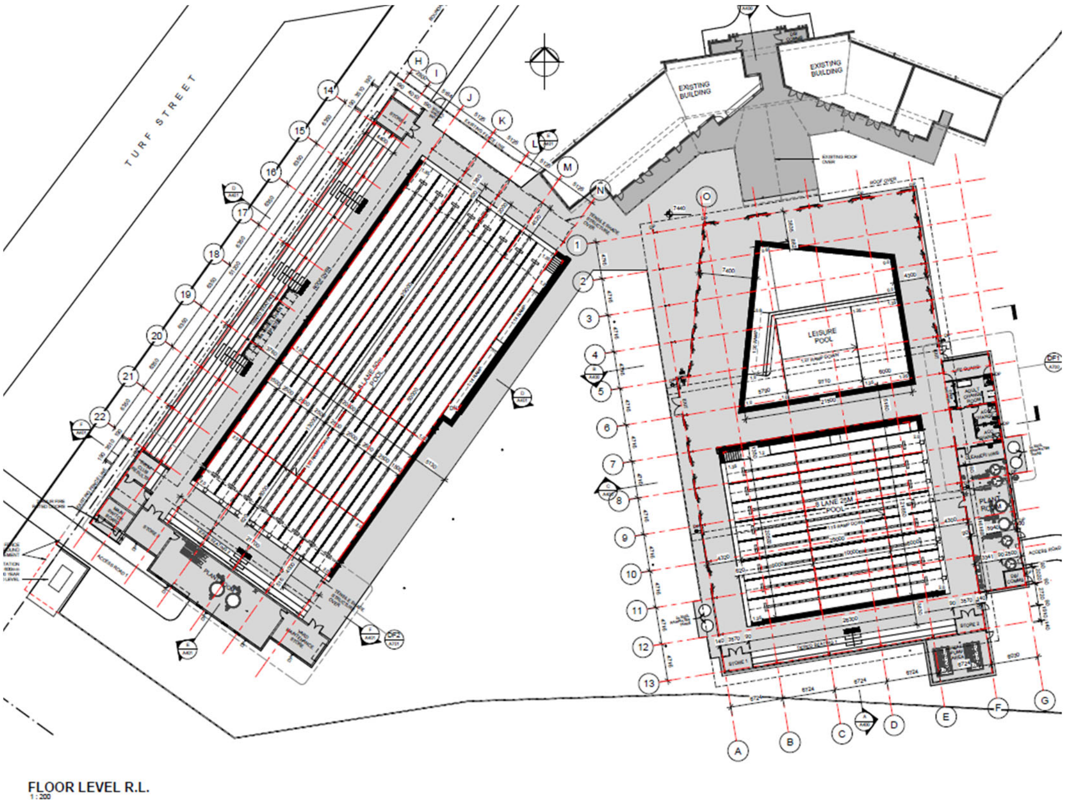

Figure 2.2: Proposed Development Site Plan

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3. Design Standards & Council Requirements

3.1. Australian Standards

The stormwater design of the site has been based on the following design standards:

- AS/NZS 3500.3:2018 – Plumbing and Drainage, Part 3: Stormwater Drainage

3.2. Stormwater Requirements

The stormwater requirements for the development site have been determined by the Clarence Valley Council Development Control Plan.

Stormwater Retention Requirements

Rainwater tanks have been designed for the site with the intent to meet a minimum of 80% of the re-use demand. Re-use rates have been adopted as follows:

- 0.1 kL/day per toilet or urinal

The above parameters result in a total re-use demand of 0.3 kL/day for the 3 toilets in the new pool hall.

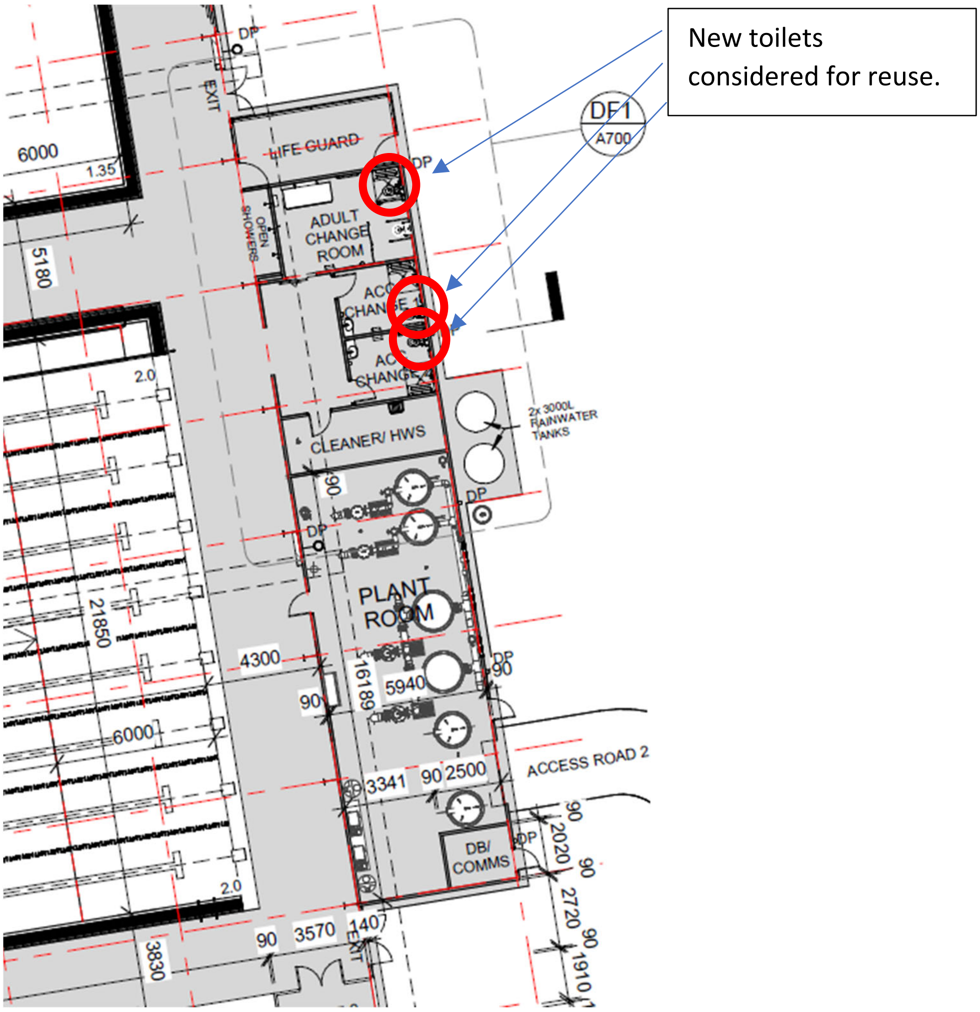


Figure 3.1: Location of New Toilets Connected to Rainwater Tanks

Stormwater Quantity Requirements

The provision of stormwater detention has been required to ensure that there is no increase in runoff from the site due to the development in all storms up to and including the 1% AEP event.

Stormwater Quality Requirements

The following reductions in pollutant loads must be achieved by commercial/industrial developments, compared to untreated runoff from the developed impervious area of the site:

- 85% reduction in suspended solids.
- 60% reduction in total phosphorus.
- 45% reduction in total nitrogen.
- 90% reduction in gross pollutants.

4. Hydrological Data

4.1. General

A DRAINS model has been prepared in the design of the on-site detention system used in discharge control of stormwater. The data shown in Table 4.1 was used in conjunction with procedures outlined in Australian Rainfall and Run off 2019 to determine pre- and post-development discharge rates.

	Rainfall Depths (mm) [29.6875 (S), 152.9375 (E)] issued 7 June 2021						
	Exceedance per Year (EY)			Annual Exceedance Probability (AEP)			
Duration	**1EY**	**0.5EY**	**0.2EY**	**10%**	**5%**	**2%**	**1%**
1 min	2.47	3.04	3.69	4.23	4.85	5.7	6.37
2 min	4.17	5.05	5.94	6.73	7.65	9.01	10.1
3 min	5.81	7.08	8.39	9.55	10.9	12.8	14.4
4 min	7.32	8.95	10.7	12.2	14	16.5	18.5
5 min	8.69	10.7	12.9	14.7	16.9	19.9	22.3
10 min	14	17.3	21	24.2	27.8	32.7	36.5
15 min	17.6	21.7	26.5	30.5	34.9	41	45.7
20 min	20.3	25	30.4	34.9	40	46.9	52.3
25 min	22.4	27.6	33.4	38.3	43.9	51.4	57.3
30 min	24.2	29.7	35.9	41.1	47	55.1	61.5
45 min	28.1	34.4	41.3	47.2	54	63.3	70.8
1 hour	30.8	37.7	45.2	51.6	59.1	69.5	77.8
1.5 hour	34.8	42.6	51	58.4	66.9	79.1	89.1
2 hour	37.8	46.3	55.6	63.8	73.5	87.2	98.5
3 hour	42.4	52	63.2	73.1	84.6	101	115
6 hour	52	64.6	80.9	95.1	112	136	155
12 hour	65.4	82.5	107	128	153	188	216

Table 4.1: Bureau of Meteorology Rainfall Depths for the Development Site

4.2. Discharge Calculations

A Horton/ILSAX hydrological model was utilised to determine the pre-development discharge rates from the site. The pre-development catchment characteristics have been determined by measuring pervious and impervious areas over which the proposed new roof structures are to be constructed. The resulting catchment has been assumed to be 12% impervious and 88% pervious. Post-development discharge rates have been restricted to rates below those produced by this catchment.

The discharge rates shown in Table 4.2 summarise the critical results for a variety of storm durations.

Rainfall Event	Pre-Development Flow (L/s)	Critical Storm Duration (min)
1EY	683	10
0.5EY	880	10
0.2EY	1115	20
10%	1428	15
5%	1675	15
2%	1952	10
1%	2222	10

Table 4.2: Pre-Development Stormwater Discharge as Determined Using a DRAINS Model

5. Water Balance Analysis

A rainfall reuse analysis has been conducted using daily rainfall data from Ulmarra (Newsagency) supplied by the Bureau of Meteorology. The analysis conducted resulted in a calculated percentage of 83.21% for the proportion of days in which reuse demand is met since the beginning of the rainfall record (1891).

A total roof area of 1,170 m^2 plumbed to a 20 kL above ground combined rainwater and detention tank meets the re-use demand for the development site.

Figure 5.1: BOM Weather Stations Local to the Development

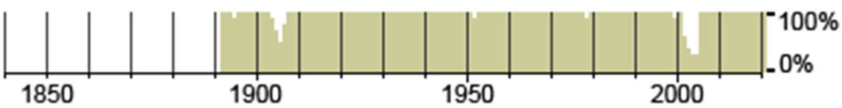


Figure 5.2: Available Daily Rainfall Data for Ulmarra (Newsagency)

6. Hydraulic Analysis

The OSD system designed for the development site meets the quantity requirements outlined in Section 3, while also contributing to the water quality treatment train. The content of this section discusses the method and results of the analyses used in the design of this system.

6.1. On-Site Detention Parameters

A significant portion of the new roof has been designed to be directly connected to the detention system. Bypassing areas include a portion of the roof area over the plant room adjacent the new pool hall, for which drainage cannot be directly connected to the detention system due to the location of the proposed detention tank.

The on-site detention characteristics are listed below:

- 3x 20,000 L rainwater tanks for reuse and detention. Lower chamber contains permanent volume for reuse internally, with the upper chamber utilising a low-flow and high-flow outlet to detain excessive rainfall volumes. Each tank is divided into the following volume:
    - Tank 1, connected to the eastern side of the new pool hall: 6,000 L reuse & 14,000 L detention.
    - Tank 2, connected to the western side of the new pool hall: 10,000 L reuse & 10,000 L detention.
    - Tank 3, connected to the grandstand and plant room: 15,000 L reuse & 5,000 L detention.
- The reuse volume has not been considered in the modelling of the detention system and are considered to be at 100% capacity during all rainfall events.

A summary diagram of the DRAINS model used to model the above parameters is shown in Figure 6.1.

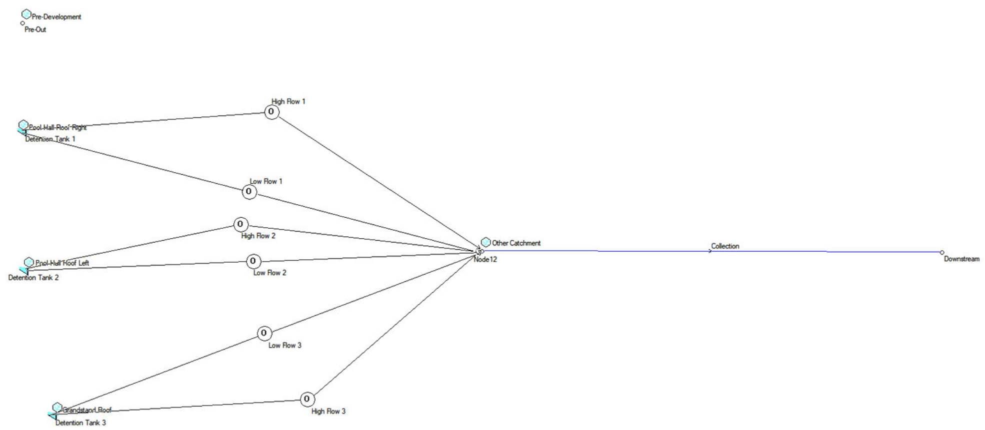


Figure 6.1: DRAINS Model Arrangement of the On-Site Detention System

A comparison of the pre-development and post-development results have been documented in Table 5.2 below. These results show that the post-development flows have been reduced to match the pre-development flows from the site.

Rainfall Event	Pre-Development Flow (L/s)	Post-Development Flow (L/s)
1EY	683	684
0.5EY	880	879
0.2EY	1115	1109
10%	1428	1406
5%	1675	1659
2%	1952	1920
1%	2222	2178

Table 6.1: Pre- and Post-Development Stormwater Discharge as Determined Using a DRAINS Model

There is a discrepancy of up to 1 L/s in the post-development flows. Due to the nature of the model produced, it is assumed that additional storage will be provided by the gutters and downpipes connecting to the above-ground detention tanks, further reducing post-development flows. As such, these discrepancies have been deemed acceptable for modelling purposes.

7. Water Quality Analysis

7.1. Rationale

Clarence Valley Council's WSUD objectives have been outlined in Section 3. In general, new developments are required to meet specific pollutant reduction targets. Most commercial developments involve the construction of new paved and roofed areas, which significantly increases pollutant loading when compared to greenfield sites.

The proposed development works consist of the demolition of existing pool and pavement areas and construction of roofing over what is currently pavement and landscaping areas. Roofed areas produce significantly lower pollutant loads than pavement areas. As such, the proposed development reduces the pollutant load in the stormwater system prior to treatment of runoff.

Stormwater treatment measures are designed to remove large volumes of pollutants when they are present in high quantities. The roof areas in the proposed development produce so little pollutants in the analysed period that typical stormwater treatment systems are ineffective in removing them to the required degree.

As an alternative approach, a comparison between pre-development and post-development pollutant loading has been conducted, rather than source loading and residual loading. The method, results and qualitative merits of the system are discussed in this section.

The analysis has considered the use of the following Stormwater Quality Improvement Devices (SQIDs) to improve the stormwater discharge leaving the site:

- 3x rainwater tanks for reuse. Each tank is assumed to have a reuse demand of 0.3 kL/day. Exact reuse demands have not been provided at this stage in the application.
- 3x detention tanks. Details and properties have been provided in Section 6.
- 2x Ocean Protect OceanGuards, downstream of stormwater tanks, for removal of pollutants in high-flow events.

7.2. MUSIC Input Parameters

The input parameters representing the urban catchment areas across the site have been adopted from the default values required for Clarence Valley Council MUSICLink. The site has been divided into sub-catchments that drain into the various treatment nodes of the treatment train. Figure 7.1 and Table 7.2 provide an arrangement and summary of the input values used for source nodes in the MUSIC model.

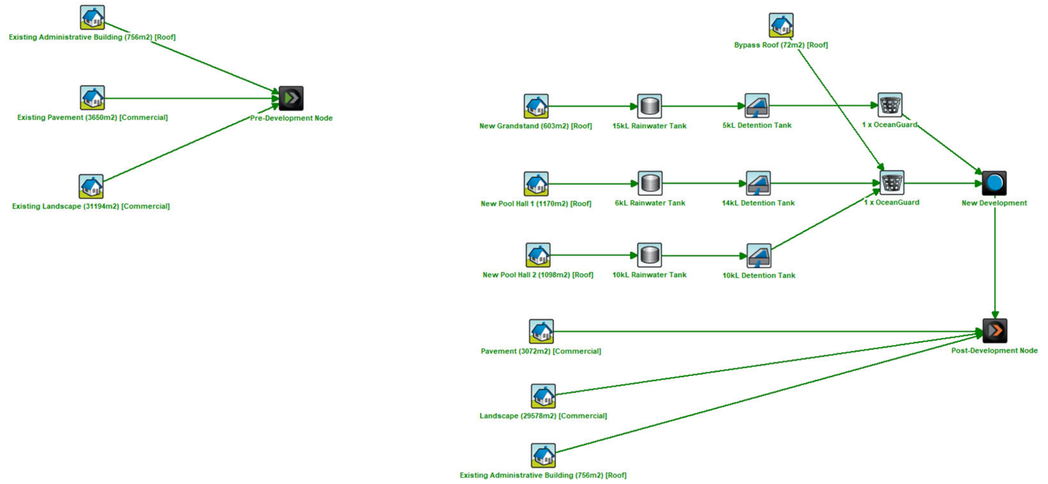


Figure 7.1: MUSIC Model Arrangement of the Treatment Trains Designed for the Proposed Development

Data Type		**Catchment Type**		
		Roof Area	Pavement Area	Landscaped Area
Area Parameters				
Impervious Area (%)		100	100	0
Pervious Area (%)		0	0	100
Rainfall Runoff Parameters				
Rainfall Threshold (mm/day)		1.00	1.00	1.00
Soil Storage Capacity (mm)		54	54	54
Initial Storage (%)		25	25	25
Field Capacity (mm)		51	51	51
Infiltration Capacity Coefficient		180	180	180
Infiltration Capacity Exponent		3.00	3.00	3.00
Total Suspended Solids (log mg/L)				
Base Flow	Mean	1.100	1.200	1.200
	Std Dev	0.170	0.170	0.170
Storm Flow	Mean	1.300	2.150	2.150
	Std Dev	0.320	0.320	0.320
Total Phosphorus (log mg/L)				
Base Flow	Mean	-0.820	-0.850	-0.850
	Std Dev	0.190	0.190	0.190
Storm Flow	Mean	-0.890	-0.600	-0.600
	Std Dev	0.250	0.250	0.250
Total Nitrogen (log mg/L)				
Base Flow	Mean	0.320	0.110	0.110
	Std Dev	0.120	0.120	0.120
Storm Flow	Mean	0.300	0.300	0.300
	Std Dev	0.190	0.190	0.190

Table 7.1: MUSIC Model Input Parameters

7.3. Analysis Results

The pollutant reduction results for the designed treatment train are summarised in Table 7.2.

	Pre-Development (kg/yr)	Post-Development (kg/yr)	% Reduction Achieved
Total Suspended Solids	3120	2930	6.1
Total Phosphorus	5.17	4.94	4.4
Total Nitrogen	38.8	40.4	-4.1
Gross Pollutants	113	98.3	13.0

Table 7.2: Design Treatment Train Effectiveness as Reported by MUSIC Model

In addition, the treatment train performance of the new roof and pavement areas for the new development only have been provided in Table 7.3.

	Sources (kg/yr)	Residual Load (kg/yr)	% Reduction Achieved
Total Suspended Solids	81.9	23.5	71.3
Total Phosphorus	0.476	0.272	42.8
Total Nitrogen	6.81	4.47	34.4
Gross Pollutants	75.5	0	100

Table 7.3: Design Treatment Train Performance for New Structures

7.4. Discussion of Results

As outlined in Section 7.1, the provision of stormwater treatment devices is ineffective due to the nature of the post-development catchment. Without tertiary treatment devices, pollutant loads are reduced in the system except for total nitrogen. Nitrogen loading is increased as pollutants are generally less likely to be absorbed in the catchment in roofed surfaces, and they are generally not effectively removed by detention and rainwater tanks and require direct filtration.

Due to the low total nitrogen pollutant loads, and the performance of the system when only the new development areas are considered, concession is sought for the design of the proposed system.

8. Maintenance Schedule

8.1. Stormwater Drainage System Maintenance

To ensure the system functions efficiently long term, regular maintenance must be carried out on the stormwater system and water quality treatment devices. The maintenance of the on-site detention and rainwater tank systems will be undertaken during regular inspections and a maintenance schedule is included in Appendix B.

Appendix A – ECLIPSE Consulting Civil Drawings

GRAFTON AQUATIC CENTRE
cnr Turf & Oliver St, Grafton
CONCEPT STORMWATER WORKS

GENERAL NOTES
G1. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL DRAWINGS AND SPECIFICATIONS AND OTHER WRITTEN INSTRUCTIONS THAT MAY BE ISSUED.
G2. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING FROM THE DRAWINGS. REFER ARCHITECTS DRAWINGS FOR ALL DIMENSIONS.
G3. REFER ANY DISCREPANCY TO THE PROJECT ENGINEER/ARCHITECT.
G4. MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE APPROPRIATE SAA SPECIFICATIONS OR CODE AND WITH THE REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY.
G5. THE ALIGNMENT AND LEVEL OF ALL SERVICES SHOWN ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL CONFIRM THE POSITION AND LEVEL OF ALL SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION. ANY DAMAGE TO SERVICES SHALL BE RECTIFIED AT THE CONTRACTORS EXPENSE.
G6. NO WORKS ARE TO COMMENCE UNTIL THE REQUIRED TREE REMOVAL PERMITS HAVE BEEN GRANTED BY RELEVANT LOCAL AUTHORITY, AND THE APPROPRIATE NOTICE OF INTENTION TO COMMENCE GIVEN.
G7. ALL SERVICES, OR CONDUITS FOR SERVICING SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF PAVEMENT CONSTRUCTION.
G8. SUBSOIL DRAINAGE, COMPRISING 100 AGRICULTURE PIPE IN GEO-STOCKING TO BE PLACED AS SHOWN AND AS MAY BE DIRECTED BY THE SUPERINTENDENT. SUBSOIL DRAINAGE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RELEVANT LOCAL AUTHORITY CONSTRUCTION SPECIFICATION.
G9. NO WORK IS PERMITTED WITHIN ADJOINING PROPERTIES WITHOUT WRITTEN PERMISSION FROM THE OWNERS OR RESPONSIBLE AUTHORITY.

DRAINAGE NOTES
D1. ALL DRAINAGE OUTLET LEVELS SHALL BE CONFIRMED ON SITE, PRIOR TO CONSTRUCTION COMMENCING.
D2. ALL PIPES WITHIN THE PROPERTY TO BE MIN. 100 DIA UPVC @ 1% MIN. GRADE, UNO.
D3. ALL PITS WITHIN THE PROPERTY ARE TO BE FITTED WITH "WELDLOK" OR APPROVED EQUIVALENT GRATES:
- LIGHT DUTY FOR LANDSCAPED AREAS
- HEAVY DUTY WHERE SUBJECTED TO VEHICULAR TRAFFIC

D4. PITS WITHIN THE PROPERTY MAY BE CONSTRUCTED AS:
1) PRECAST STORMWATER PITS
2) CAST INSITU MASS CONCRETE
3) CEMENT RENDERED 230mm BRICKWORK

D5. ENSURE ALL GRATES TO PITS ARE SET BELOW FINISHED SURFACE LEVEL WITHIN THE PROPERTY. TOP OF PIT RL'S ARE APPROXIMATE ONLY AND MAY BE VARIED SUBJECT TO APPROVAL OF THE PROJECT ENGINEER. ALL INVERT LEVELS ARE TO BE ACHIEVED.
D6. ANY PIPES BENEATH RELEVANT LOCAL AUTHORITY ROAD TO BE RUBBER RING JOINTED RCP, UNO.
D7. ALL PITS IN ROADWAYS ARE TO BE FITTED WITH HEAVY DUTY GRATES WITH LOCKING BOLTS AND CONTINUOUS HINGE.
D8. PROVIDE STEP IRONS TO STORMWATER PITS GREATER THAN 1200 IN DEPTH.
D9. TRENCH BACK FILL IN ROADWAYS SHALL COMPRISE SHARP, CLEAN GRANULAR BACK FILL. NON-TRAFFICABLE AREAS TO BE COMPACTED BY RODDING AND TAMPING USING A FLAT PLATE VIBRATOR.
D10. WHERE A HIGH EARLY DISCHARGE (HED) PIT IS PROVIDED ALL PIPES ARE TO BE CONNECTED TO THE HED PIT, UNO.
D11. DOWN PIPES SHALL BE A MINIMUM OF DN100 SW GRADE UPVC OR 100X100 COLORBOND/ZINCALUME STEEL, UNO.
D12. COLORBOND OR ZINCALUME STEEL BOX GUTTERS SHALL BE A MINIMUM OF 450 WIDE X 150 DEEP.
D13. EAVES GUTTERS SHALL BE A MINIMUM OF 125 WIDE X 100 DEEP (OR OF EQUIVALENT AREA) COLORBOND OR ZINCALUME STEEL, UNO.
D14. SUBSOIL DRAINAGE SHALL BE PROVIDED TO ALL RETAINING WALLS & EMBANKMENTS, WITH THE LINES FEEDING INTO THE STORMWATER DRAINAGE SYSTEM, UNO.

EARTHWORKS NOTES
E1. THE EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT GEOTECHNICAL REPORT (IF AVAILABLE).
E2. THE SITE OF THE WORKS SHALL BE PREPARED BY STRIPPING ALL EXISTING TOPSOIL, FILL AND VEGETATION.
E3. SUBGRADE SHALL BE COMPACTED UNTIL A DRY DENSITY HAS BEEN ACHIEVED OF NOT LESS THAN 100% OF THE STANDARD MAXIMUM DRY DENSITY WHEN TESTED IN ACCORDANCE WITH AS 1289 TESTS E.1.1. OR E.1.2.
E4. THE EXPOSED SUBGRADE SHOULD BE PROOF ROLLED TO DETECT ANY SOFT OR WET AREAS WHICH SHOULD BE LOCALLY EXCAVATED AND BACK FILLED WITH SELECTED MATERIAL.
E5. THE BACK FILLING MATERIAL SHALL BE IMPORTED GRANULAR FILL OF LOW PLASTICITY, PREFERABLY CRUSHED SANDSTONE, AND TO BE PLACED IN LAYERS NOT EXCEEDING 150 LOOSE THICKNESS AND COMPACTED TO 98% OF STANDARD DRY DENSITY AT A MOISTURE CONTENT WITHIN 2% OF OPTIMUM.
E6. SITE WORKS ARE TO BE BATTERED TO ADJACENT PROPERTY LEVELS.
E7. STORMWATER MUST NOT BE CONCENTRATED ON TO AN ADJACENT PROPERTY.
E8. AT NO TIME DURING OR AFTER CONSTRUCTION IS STORMWATER TO BE PONDED ON ADJOINING PROPERTIES.
E9. THE SITE SHALL BE GRADED AND DRAINED SO THAT STORMWATER WILL BE DIRECTED AWAY FROM THE BUILDING PLATFORM.
E10. STORMWATER DRAINAGE SHALL BE PROVIDED AND MAINTAINED THROUGHOUT THE COURSE OF CONSTRUCTION. ALL STORMWATER RUNOFF SHALL BE GRADED AWAY FROM THE SITE WORKS AND DISPOSED OF VIA SURFACE CATCHDRAINS AND STORMWATER COLLECTION PITS.
E11. ALL SURFACE CATCH DRAINS SHALL BE GRADED AT 1% (1 IN 100) MINIMUM. THE GROUND SHALL GRADE AWAY FROM ANY DWELLING AT 5% (1 IN 20) FOR THE FIRST METRE THEN AT 2.5% (1 IN 40).
E12. WHERE A CUT FILL PLATFORM IS USED THERE SHALL BE A MINIMUM BERM 1000 WIDE TO THE PERIMETER OF THE SITE WORKS WHICH SHALL BE SUPPORTED BY BATTERS OF 3:1 IN FILL.
E13. ANY VERTICAL OR NEAR VERTICAL PERMANENT EXCAVATION (CUT) DEEPER THAN 600 IN MATERIAL OTHER THAN ROCK SHALL BE ADEQUATELY RETAINED OR BATTERED AT A MINIMUM OF 3:1.
E14. WHERE BATTERS CANNOT BE PROVIDED TO SUPPORT THE CUT OR FILL, THEY SHALL BE ADEQUATELY RETAINED.
E15. RETAINING WALLS ARE TO BE CONSTRUCTED WITH ADEQUATE SUBSOIL DRAINAGE.

CONCRETE PAVEMENT
C1. SUBGRADE SHALL BE PREPARED AS OUTLINED IN EARTHWORKS.
C2. PROVIDE JOINTING AT MINIMUM 6000 MAX. INTERVALS OR AS OTHERWISE SPECIFIED IN THE DRAWINGS.
C3. CONCRETE SHALL COMPRISE A MIN. COMPRESSIVE STRENGTH OF 32MPa AT 28 DAYS IN ACCORDANCE WITH THE RELEVANT LOCAL AUTHORITY SPECIFICATION, UNO.
C4. ANY SUB-BASE MATERIAL SHALL BE COMPACTED AS OUTLINED IN EARTHWORKS.
C5. CONCRETE KERB AND GUTTER SHALL COMPRISE A MINIMUM COMPRESSIVE STRENGTH OF 25MPa, UNO.
C6. CONCRETE WORKS ARE TO BE CURED BY ONE OF THE FOLLOWING MEANS:
i) WETTING TWICE DAILY FOR THE FIRST THREE DAYS;
ii) USING AN APPROVED CURING COMPOUNDED FOR A MINIMUM OF 7 DAYS COMMENCING IMMEDIATELY AFTER POURING.

FLEXIBLE PAVEMENT NOTES
F1. SUBGRADE SHALL BE PREPARED AS OUTLINED IN EARTHWORKS.
F2. PAVEMENT MATERIAL SHALL CONSIST OF APPROVED OR RIPPED SANDSTONE, NATURAL GRAVEL OR FINE CRUSH ROCK.
F3. PAVEMENT MATERIALS SHALL BE SPREAD IN LAYERS NOT EXCEEDING 150 AND NOT LESS 75 COMPACTED THICKNESS.
F4. PAVEMENT MATERIALS SHALL BE SIZED AND OF A STANDARD OUTLINED IN AS1141.
F5. CRUSHED OR RIPPED SANDSTONE SHALL BE MINUS 75 NOMINAL SIZE DERIVED FROM SOUND, CLEAN SANDSTONE FREE FROM OVERBURDEN, CLAY SEAMS, SHALE AND OTHER DELETERIOUS MATERIAL.
F6. PAVEMENT MATERIALS SHALL BE COMPACTED BY SUITABLE MEANS TO SATISFY THE FOLLOWING MINIMUM SPECIFICATIONS (AS PER AS1289.2)

DESCRIPTION	MEDIUM DENSITY RATIO
SUB-BASE	98% MOD
BASE COURSE	98% MOD
ASPHALTIC CONCRETE	97% MOD.

F7. TESTING FOR EACH LAYER SHALL BE UNDERTAKEN BY A N.A.T.A. REGISTERED LABORATORY IN ACCORDANCE WITH AS1289, AT NOT MORE THAN 50m INTERVALS AND A MINIMUM OF TWO PER LAYER. FURTHER FREQUENCY OF TESTING SHALL BE NO LESS THAN THAT REQUIRED BY AS3978.

PAVED AREAS NOTES
A1. SUBGRADE SHALL BE PREPARED AS OUTLINED IN EARTHWORKS.
A2. ALL PAVERS ARE TO BE PLACED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION.
A3. TRAFFICABLE AREAS:
SUB-BASE TO BE 150 COMPACTED THICKNESS DGS75.
SUB-BASE TO BE SUITABLY COMPACTED TO MEDIUM DENSITY 98% MOD.
SUB-BASE TO EXTEND AT LEAST 200 BEYOND PAVED SURFACE.
PAVERS TO BE 80 THICK INTERLOCKING PAVERS ON 50 SAND BEDDING.
A4. NON TRAFFICABLE AREAS:
SUB BASE AS PER TRAFFICABLE AREAS
PAVERS TO BE 60 INTERLOCKING PAVERS ON 50 SAND BEDDING (UNO).

EROSION AND SEDIMENT NOTES
B1. THIS PLAN TO BE READ IN CONJUNCTION WITH EROSION AND SEDIMENT CONTROL DETAILS AS ATTACHED.
B2. THE CONTRACTOR SHALL IMPLEMENT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY AND TO THE SATISFACTION OF THE RELEVANT LOCAL AUTHORITY PRIOR TO THE COMMENCEMENT OF AND DURING CONSTRUCTION. NO DISTURBANCE TO THE SITE SHALL BE PERMITTED OTHER THAN IN THE IMMEDIATE AREA OF THE WORKS AND NO MATERIAL SHALL BE REMOVED FROM THE SITE WITHOUT THE RELEVANT LOCAL AUTHORITY APPROVAL. ALL EROSION AND SEDIMENT CONTROL DEVICES TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH STANDARDS OUTLINED IN NSW DEPARTMENT OF HOUSING'S "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTIONS".
B3. TOPSOIL SHALL BE STRIPPED AND STOCKPILED OUTSIDE HAZARD AREAS SUCH AS DRAINAGE LINES. THIS TOPSOIL SHALL BE RESPREAD LATER ON AREAS TO BE REVEGETATED AND STABILISED ONLY, (I.E. ALL FOOTPATHS, BATTERS, SITE REGARDING AREAS, BASINS AND CATCHDRAINS). TOPSOIL SHALL NOT BE RESPREAD ON ANY OTHER AREAS UNLESS SPECIFICALLY INSTRUCTED BY THE SUPERINTENDENT. IF THEY ARE TO REMAIN FOR LONGER THAN ONE MONTH STOCKPILES SHALL BE PROTECTED FROM EROSION BY COVERING THEM WITH A MULCH AND HYDROSEEDING AND, IF NECESSARY, BY LOCATING BANKS OR DRAINS DOWNSTREAM OF A STOCKPILE TO RETARD SILT LADEN RUNOFF.
B4. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL EROSION AND SEDIMENT CONTROL DEVICES AND REMOVE ACCUMULATED SILT FROM SUCH DEVICES SUCH THAT MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL THE SILT IS TO BE PLACED OUTSIDE THE LIMIT OF WORKS. THE PERIOD FOR MAINTAINING THESE DEVICES SHALL BE AT LEAST UNTIL ALL DISTURBED AREAS ARE REVEGETATED AND FURTHER AS MAY BE DIRECTED BY THE SUPERINTENDENT OR COUNCIL.
B5. LAY TURF STRIP (MIN 300 WIDE) ON 100 TOPSOIL BEHIND ALL KERB WITH 1000 LONG RETURNS EVERY 6000 AND AROUND STRUCTURES IMMEDIATELY AFTER BACKFILLING AS PER THE RELEVANT LOCAL AUTHORITY SPECIFICATION.
B6. THE CONTRACTOR SHALL GRASS SEED ALL DISTURBED AREAS WITH AN APPROVED MIX AS SOON AS PRACTICABLE AFTER COMPLETION OF EARTHWORKS AND REGRADING.
B7. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING CONSTRUCTION CONFINING ACCESS WHERE POSSIBLE TO NOMINATED STABILISED ACCESS POINTS.
B8. WHEN ANY DEVICES ARE TO BE HANDED OVER TO COUNCIL THEY SHALL BE IN CLEAN AND STABLE CONDITION.
B9. THE CONTRACTOR SHALL IMPLEMENT DUST CONTROL BY REGULAR WETTING DOWN (BUT NOT SATURATING) DISTURBED AREA.
B10. PROVIDE AND MAINTAIN SILT TRAPS AROUND ALL SURFACE INLET PITS UNTIL CATCHMENT IS REVEGETATED OR PAVED.
B11. REVEGETATE ALL TRENCHES IMMEDIATELY UPON COMPLETION OF BACKFILLING.
B12. ALL DRAINAGE PIPE INLETS TO BE CAPPED UNTIL:
- DOWNPIPES CONNECTED
- PITS CONSTRUCTED AND PROTECTED WITH SILT BARRIER

CONCRETE STRUCTURES NOTES
S1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
S2. CONCRETE COMPONENTS AND QUALITY SHALL BE AS FOLLOWS, UNO:

ELEMENT	SLUMP mm	MAX. SIZE AGG. mm	CEMENT TYPE	f'c AT 28 DAYS - MPa	ADMIXTURE
FOOTINGS	80	20	A	25	-
PIERS & CAPS	80	20	A	25	-
SLABS ON GROUND	80	20	A	32	-
SUSPENDED SLABS	80	20	A	32	-
PITS	80	20	A	25	-

S3. MINIMUM CLEAR CONCRETE COVER TO REINFORCEMENT INCLUDING TIES AND STIRRUPS SHALL BE AS FOLLOWS UNO.

EXPOSURE CLASSIFICATION	MINIMUM COVER (mm)				
	CONCRETE STRENGTH (f'c)				
	20 MPa	25 MPa	32 MPa	40 MPa	>50 MPa
A1	20	20	20	20	20
A2	(50)	30	25	20	20
B1	-	(60)	40	30	25
B2	-	-	(65)	45	35
C	-	-	-	(70)	50

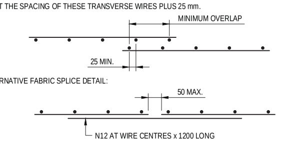
FOR BRACKETED FIGURES REFER TO AS 3600 CURRENT EDITION TABLE 4.10.3.2

S4. MINIMUM COVER FOR FIRE RESISTANCE LEVEL (FRL) SHALL BE AS FOLLOWS;

MINIMUM ELEMENT WIDTH OR THICKNESS / MIN COVER (mm)				
FRL	BEAM	SLAB	COLUMN	WALL
60	125 / 30	80 / 20	200 / 20	80 / 20
90	150 / 45	100 / 25	250 / 35	100 / 35
120	200 / 55	120 / 30	300 / 45	120 / 40
180	240 / 70	150 / 45	400 / 60	150 / 45
240	270 / 80	170 / 55	450 / 70	170 / 50

NOTE : 1. REFER TO AS 3600 CURRENT EDITION FOR REDUCED COVERS IF GREATER ELEMENT THICKNESSES ARE ADOPTED FOR BEAMS & COLUMNS.
2. COVER IS MEASURED TO THE MAIN REINFORCEMENT

S5. COVER TO REINFORCEMENT SHALL BE OBTAINED BY THE USE OF APPROVED BAR CHAIRS. ALL CHAIRS SHALL BE SPACED AT 1000 CTS MAXIMUM.
S6. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED. VIBRATORS SHALL NOT BE USED TO SPREAD CONCRETE.
S7. SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
S8. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE PROJECT ENGINEER.
S9. CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED TO APPROVAL OF THE ENGINEER. ALL CONSTRUCTION JOINTS SHALL BE SCABBLED OVER THE WHOLE FACE AND ANY UNSOUND MATERIAL REMOVED.
S10. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY; IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
S11. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN OR AS APPROVED BY THE PROJECT ENGINEER. WHERE THE LAP LENGTH IS NOT SHOWN IT SHALL BE SUFFICIENT TO DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT AS SPECIFIED IN AS3600. COGS AND HOOKS SHALL BE STANDARD UNLESS SHOWN OTHERWISE.
S12. WELDING OF REINFORCEMENT WILL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE PROJECT ENGINEER.
S13. PIPES OR CONDUITS SHALL NOT BE PLACED WITHIN THE CONCRETE COVER TO REINFORCEMENT WITHOUT THE APPROVAL OF THE PROJECT ENGINEER.
S14. REINFORCEMENT SYMBOLS:
N - DENOTES DEFORMED GRADE 500 NORMAL DUCTILITY REINFORCING BARS TO AS/NZS 4671.
R - DENOTES PLAIN ROUND GRADE 250 NORMAL DUCTILITY REINFORCING BARS TO AS/NZS 4671.
SL - DENOTES DEFORMED GRADE 500 LOW DUCTILITY REINFORCING MESH TO AS/NZS 4671.
RL - DENOTES DEFORMED GRADE 500 LOW DUCTILITY REINFORCING MESH TO AS/NZS 4671.
L--TM - DENOTES DEFORMED GRADE 500 LOW DUCTILITY TRENCH MESH TO AS/NZS 4671.
S15. ALL REINFORCING FABRIC SHALL COMPLY WITH AS1303 AND AS1304 AND SHALL BE SUPPLIED IN FLAT SHEETS.
S16. SPLICES IN FABRIC: THE OUTERMOST TRANSVERSE WIRES SHALL BE OVERLAPPED BY AT LEAST THE SPACING OF THESE TRANSVERSE WIRES PLUS 25 mm.



S17. EXPOSED CORNERS SHALL BE 20 mm CHAMFERED UNO.
S18. ALL REINFORCEMENT SHALL BE INSPECTED BY THE SUPERINTENDENT OR ENGINEER PRIOR TO PLACING CONCRETE.
S19. ALL SLAB CONCRETE TO BE CURED IN AN APPROVED MANNER FOR A MINIMUM OF 7 DAYS.
S20. ALL FORMWORK AND PROPS FOR SLABS AND BEAMS SHALL BE REMOVED BEFORE CONSTRUCTION OF ANY MASONRY WALLS OR PARTITIONS ON THE FLOOR.
S21. ALL ABBREVIATIONS ARE IN ACCORDANCE WITH AS1100.
S22. FORMWORK SHALL NOT BE STRIPPED UNTIL CONCRETE HAS ACHIEVED A MINIMUM STRENGTH OF 20 MPa. THE CONCRETE SLAB AND BEAMS SHALL BE TEMPORARLIY BACK PROPPED UNTIL THE CONCRETE HAS ACHIEVED 28 DAY STRENGTH AND ANY PROPPING TO HIGHER LEVEL FORMS HAVE BEEN REMOVED.
S23. WHERE A SUSPENDED SLAB IS TO BE SUPPORTED OFF A SUSPENDED SLAB BELOW, WRITTEN APPROVAL SHALL BE OBTAINED FROM THE PROJECT ENGINEER PRIOR TO ANY SITE WORKS.

MASONRY
M1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3700.
M2. THE DESIGN STRENGTH OF MASONRY SHALL BE AS FOLLOWS U.N.O. :

EXPOSURE CLASSIFICATION T0 AS 3600	MASONRY COMPRESSIVE STRENGTH MPa (f'm)	MASONRY SALT RESISTANCE GRADE	DURABILITY CLASSIFICATION OF BUILT IN COMPONENTS	MORTAR MIX	
				GP PORTLAND CEMENT : LIME : SAND	f'c MPa
A1 / A2	> 6.3	General Purpose	R3 (Galvanised)	1.0 : 1.0 : 6.0	2.8
B1	> 6.3	General Purpose	R3 (Galvanised)	1.0 : 1.0 : 6.0	2.8
B2	> 6.7	Exposure	R4 (Stainless)	1.0 : 0.5 : 4.5	2.8

M3. ALL MASONRY WALLS SUPPORTING SLABS AND BEAMS SHALL HAVE A PRE-GREASED TWO LAYER GALVANISED STEEL SLIP JOINT BETWEEN CONCRETE AND MASONRY.
M4. ALL MASONRY WALLS SUPPORTING OR SUPPORTED BY CONCRETE FLOORS SHALL BE PROVIDED WITH VERTICAL JOINTS TO MATCH ANY CONTROL JOINTS IN THE CONCRETE.
M5. NON LOAD BEARING WALLS SHALL BE SEPARATED FROM CONCRETE ABOVE BY 20 mm THICK CLOSED CELL POLYETHYLENE STRIP.
M6. MASONRY SHALL BE ARTICULATED IN ACCORDANCE WITH TECHNICAL NOTE 61 FROM THE CEMENT AND CONCRETE ASSOCIATION OF AUSTRALIA. VERTICAL CONTROL JOINTS SHALL NOT EXCEED 5 METRES MAXIMUM CENTRES, AND 4 METRES MAXIMUM FROM CORNERS IN MASONRY WALLS, AND BETWEEN NEW & EXISTING BRICKWORK.
M7. MASONARY RETAINING WALLS ARE TO BE BACKFILLED WITH EITHER OF THE FOLLOWING MATERIAL:
- COARSE GRAINED SOIL WITH LOW SILT CONTENT
- RESIDUAL SOIL CONTAINING STONES
- FINE SILTY SAND
- GRANULAR MATERIALS WITH LOW CLAY CONTENT

BLOCKWORK
B1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3700.
B2. REINFORCED CONCRETE BLOCKWORK SHALL COMPLY WITH THE FOLLOWING, UNO:
- BLOCKS : GRADE 15 CONFORMING TO AS1500.
- MORTAR : 1 CEMENT / 0.25 LIME / 3 SAND.
- PROVIDE CLEANOUT HOLES AT BASE OF WALL & ROD CORE HOLES TO REMOVE PROTRUDING MORTAR FINS.
- CORE FILLING : f'c = 20 MPa, 10 AGG, 230 SLUMP +/- 30 mm.
- COVER : 55 mm MIN. FROM OUTSIDE OF BLOCKWORK.

B3. BACKFILL TO RETAINING WALLS TO BE FREE DRAINING GRANULAR MATERIAL, UNO. PROVIDE SUBSOIL DRAIN BEHIND WALL AND AT WEEP HOLES.
B4. VERTICAL CONTROL JOINTS SHALL BE PROVIDED AT 10 m MAX. CENTRES.
B5. NO ADMIXTURES SHALL BE USED WITHOUT THE WRITTEN APPROVAL OF THE PROJECT ENGINEER.

STANDARD LINE TYPES AND SYMBOLS:
PROPOSED KERB & GUTTER
EXISTING KERB & GUTTER
PROPOSED BELOW GROUND PIPELINE
PROPOSED SUSPENDED PIPELINE
EXISTING PIPELINE
SUBSOIL DRAINAGE LINE
PROPOSED KERB INLET PIT
EXISTING KERB INLET PIT
PROPOSED JUNCTION OR INLET PIT
EXISTING JUNCTION OR INLET PIT
DESIGN CENTRELINE
EXISTING EDGE OF BITUMEN
TELECOMUNICATION CONDUIT
GAS MAIN
WATER MAIN
SEWER MAIN
UNDERGROUND ELECTRICITY CABLES
PERMANENT MARK & S.S.M.
BENCH MARK, SURVEY STATION

SITE LOCATION PLAN

SCHEDULE OF DRAWINGS

SHEET No	DESCRIPTION
C101	GENERAL NOTES
C102	SITE LAYOUT PLAN
C103	SEDIMENT & EROSION CONTROL PLAN
C104	PRE & POST DEVELOPMENT CATCHMENT PLAN
C105	STORMWATER CATCHMENT AREA PLAN
C106	STORMWATER DRAINAGE PLAN
C107	STORMWATER DETAILS - Sht 1 of 2
C108	STORMWATER DETAILS - Sht 2 of 2

DA APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

A1 ORIGINAL SIZE

REVISION	DATE	AMENDMENT DESCRIPTION
A	11.06.21	ISSUED FOR DA APPROVAL

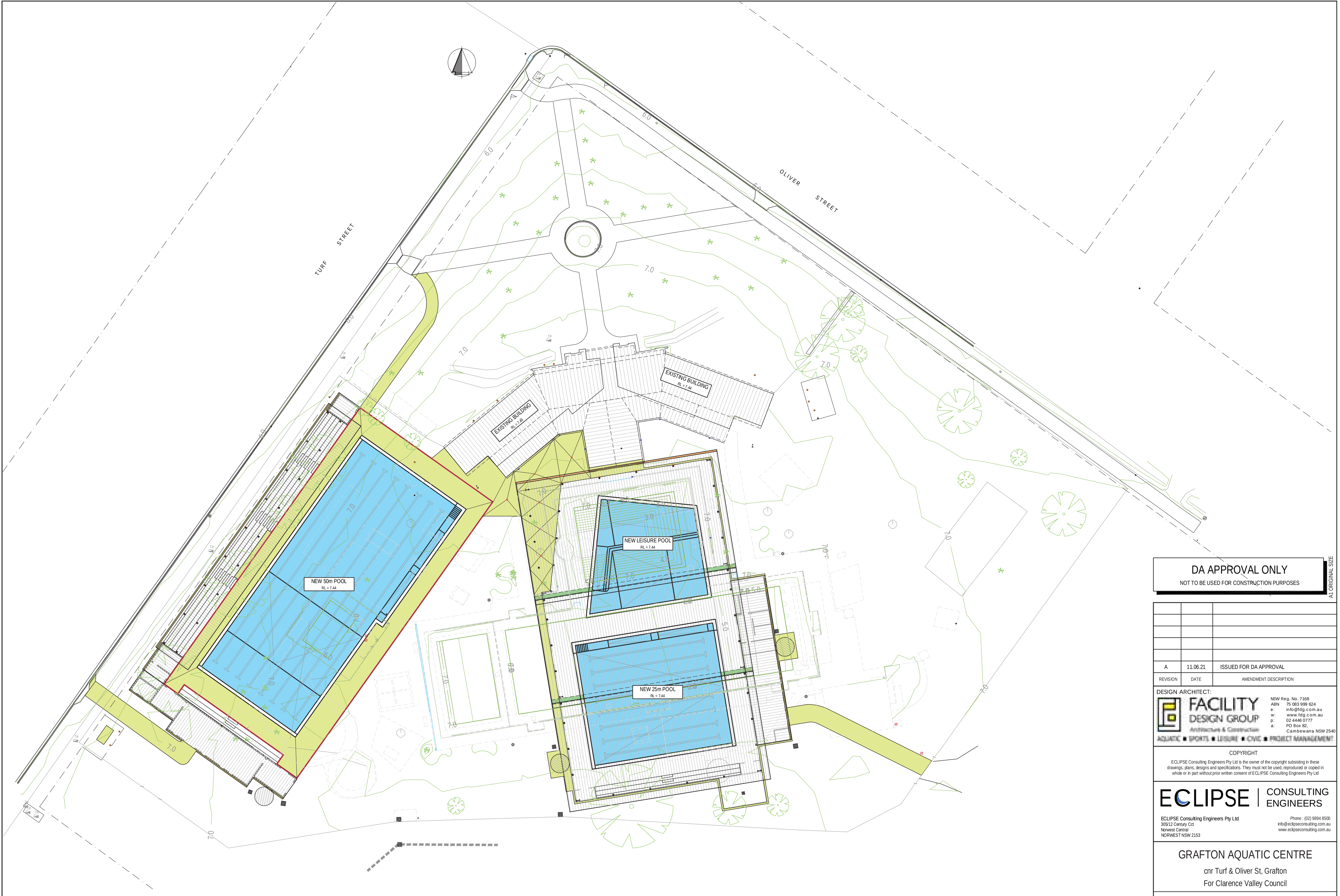
DESIGN ARCHITECT:
FACILITY DESIGN GROUP
NSW Reg. No. 7168
ABN 75 083 999 624
e: info@fdg.com.au
w: www.fdg.com.au
p: 02 4446 0777
a: PO Box 82, Cambewarra NSW 2540

ECLIPSE | CONSULTING ENGINEERS
ECLIPSE Consulting Engineers Pty Ltd
305/12 Century Cct
Norwest Central
NORWEST NSW 2153
Phone : (02) 9894 8500
info@eclipseconsulting.com.au
www.eclipseconsulting.com.au

GRAFTON AQUATIC CENTRE
cnr Turf & Oliver St, Grafton
For Clarence Valley Council

GENERAL NOTES

DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE	DRG No.
		-	C101 - A



SITE LAYOUT PLAN
1:300

DA APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

A1 ORIGINAL SIZE

REVISION	DATE	AMENDMENT DESCRIPTION
A	11.06.21	ISSUED FOR DA APPROVAL

DESIGN ARCHITECT:
FACILITY DESIGN GROUP
Architecture & Construction
AQUATIC ■ SPORTS ■ LEISURE ■ CIVIC ■ PROJECT MANAGEMENT

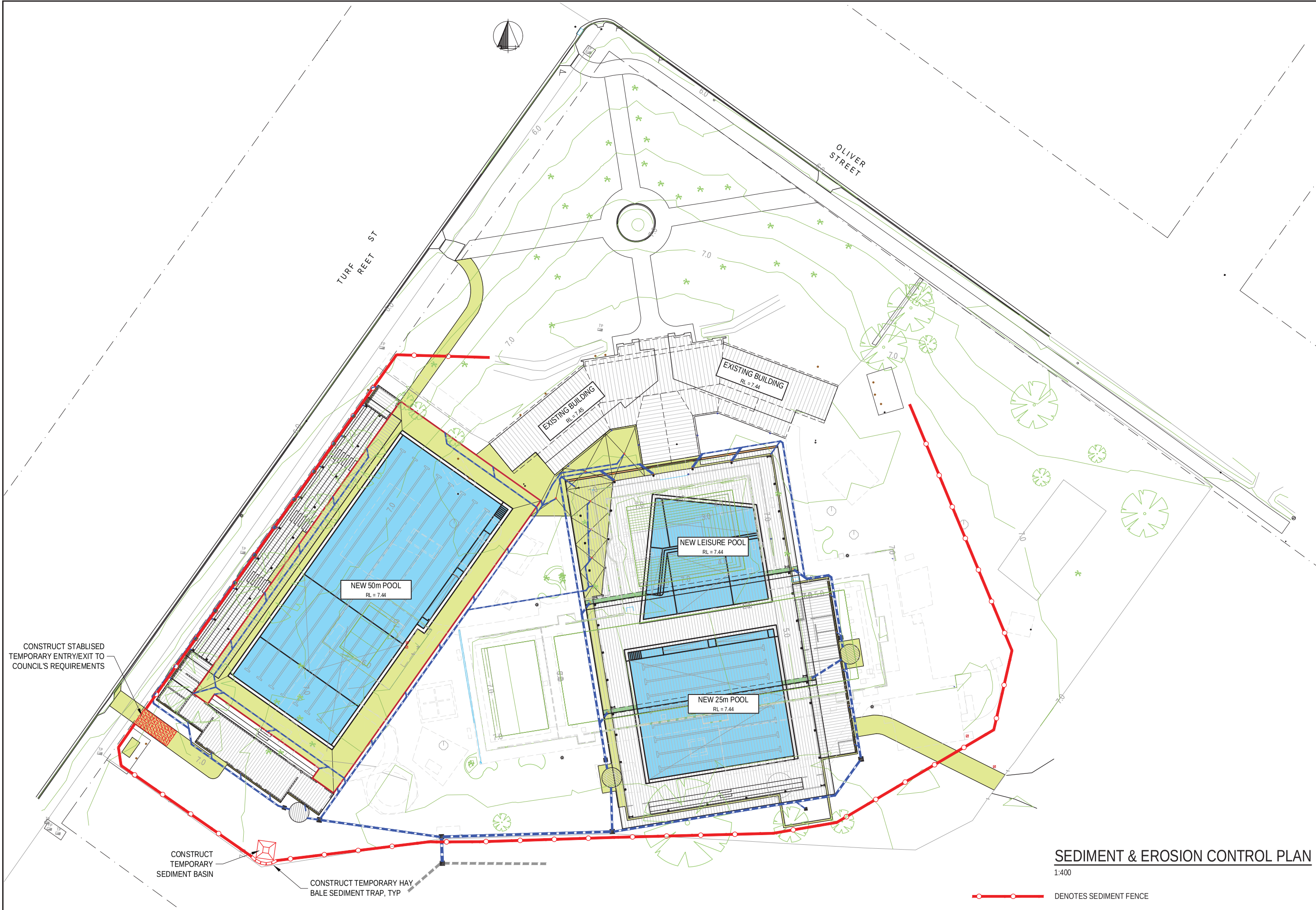
NSW Reg. No. 7168
ABN 75 083 999 624
e: info@fdg.com.au
w: www.fdg.com.au
p: 02 4446 0777
a: PO Box 82, Cambewarra NSW 2540

ECLIPSE | CONSULTING ENGINEERS
ECLIPSE Consulting Engineers Pty Ltd
305/12 Century Cct
Norwest Central
NORWEST NSW 2153
Phone : (02) 9894 8500
info@eclipseconsulting.com.au
www.eclipseconsulting.com.au

GRAFTON AQUATIC CENTRE
cnr Turf & Oliver St, Grafton
For Clarence Valley Council

SITE LAYOUT PLAN

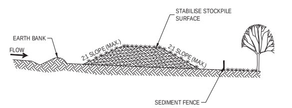
DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE 1:300	DRG No. C102 - A



SEDIMENT & EROSION CONTROL PLAN

1:400

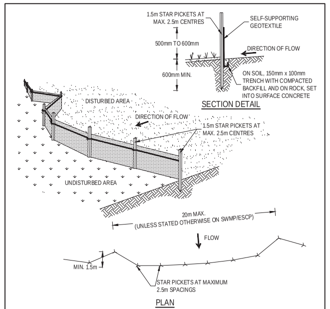
DENOTES SEDIMENT FENCE



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2 METRES DOWNSLOPE.

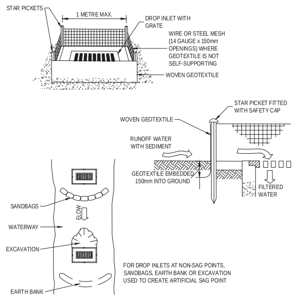
STOCKPILES — SD 4-1



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX.) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

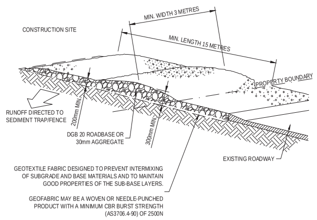
SEDIMENT FENCE — SD 6-8



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER — SD 6-12



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS — SD 6-14

SEDIMENT AND EROSION CONTROL NOTES

SEDIMENT AND EROSION CONTROL SHALL BE EFFECTIVELY MAINTAINED AT ALL TIMES DURING THE COURSE OF CONSTRUCTION AND SHALL NOT BE REMOVED UNTIL THE SITE HAS BEEN STABILISED OR LANDSCAPED TO THE SUPERINTENDENT'S SATISFACTION.

A SINGLE ALL WEATHER ACCESS WAY WILL BE PROVIDED AT THE FRONT OF THE PROPERTY CONSISTING OF 50-75 AGGREGATE OR SIMILAR MATERIAL AT A MINIMUM THICKNESS OF 150 LAID OVER NEEDLE-PUNCHED GEOTEXTILE FABRIC AND CONSTRUCTED PRIOR TO COMMENCEMENT OF WORKS.

THE CONTRACTOR SHALL ENSURE THAT NO SPOIL OR FILL ENCROACHES UPON ADJACENT AREAS FOR THE DURATION OF WORKS.

THE CONTRACTOR SHALL ENSURE THAT KERB INLETS AND DRAINS RECEIVING STORMWATER SHALL BE PROTECTED AT ALL TIMES DURING DEVELOPMENT. KERB INLET SEDIMENT TRAPS SHALL BE INSTALLED ALONG THE IMMEDIATE VICINITY ALONG THE STREET FRONTAGE.

SEDIMENT FENCING SHALL BE SECURED BY POST (WHERE METAL STAR PICKETS ARE USED PLASTIC SAFETY CAPS SHALL BE USED) AT 2000 INTERVALS WITH GEOTEXTILE FABRIC EMBEDDED 200 IN SOIL.

ALL TOPSOIL STRIPPED FROM THE SITE AND STOCKPILED DOES NOT INTERFERE WITH DRAINAGE LINES AND STORMWATER INLETS AND WILL BE SUITABLY COVERED WITH AN IMPERVIOUS MEMBRANE MATERIAL AND SCREENED BY SEDIMENT FENCING.

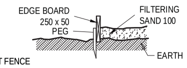
SOIL CONSERVATION NOTE:

PRIOR TO COMMENCEMENT OF CONSTRUCTION PROVIDE 'SEDIMENT FENCE,' 'SEDIMENT TRAP' AND WASHOUT AREA TO ENSURE THE CAPTURE OF WATER BORNE MATERIAL GENERATED FROM THE SITE.

MAINTAIN THE ABOVE DURING THE COURSE OF CONSTRUCTION, AND CLEAR THE 'SEDIMENT TRAP AFTER EACH STORM.

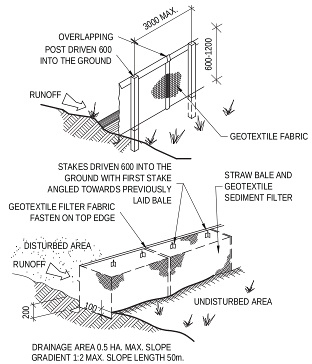
SEDIMENT BASIN
1000 x 1000 WIDE 500 DEEP BASIN, LOCATED AT THE LOWEST POINT TO THE TRAP SEDIMENT.

WASHOUT AREA
TO BE 1800 x 1800 ALLOCATED FOR THE WASHING OF TOOL & EQUIPMENT.



SEDIMENT FENCE

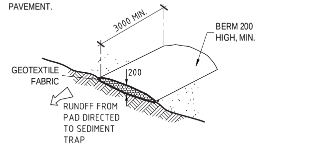
PROVIDE 'SEDIMENT FENCE ON DOWN SLOPE BOUNDARY AS SHOWN ON PLAN. FABRIC TO BE BURIED BELOW GROUND AT LOWER EDGE.



DRAINAGE AREA 0.5 HA. MAX. SLOPE GRADIENT 1:2 MAX. SLOPE LENGTH 50m.

VEHICLE ACCESS TO SITE

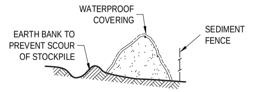
VEHICLE ACCESS TO THE BUILDING SITE SHOULD BE RESTRICTED TO A SINGLE POINT SO AS TO REDUCE THE AMOUNT OF SOIL DEPOSITED ON THE STREET PAVEMENT.



BUILDING MATERIAL STOCKPILES

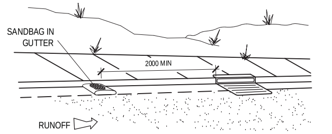
ALL STOCKPILES OF BUILDING MATERIAL SUCH AS SAND AND SOIL MUST BE PROTECTED TO PREVENT SCOUR AND EROSION.

THEY SHOULD NEVER BE PLACED IN THE STREET GUTTER WHERE THEY WILL WASH AWAY WITH THE FIRST RAINSTORM.



SANDBAG KERB SEDIMENT TRAP

IN CERTAIN CIRCUMSTANCES EXTRA SEDIMENT TRAPPING MAY BE NEEDED IN THE STREET GUTTER.



GENERAL NOTES

THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH OTHER SUCH WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DIMENSIONS ARE IN MILLIMETRES & ALL LEVELS ARE IN METRES, UNO (UNLESS NOTED OTHERWISE).

NO DIMENSION SHALL BE OBTAINED BY SCALING THE DRAWINGS.

ALL LEVELS AND SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE CHECKED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORK.

DURING EXCAVATION WORK THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED.

ALL WORK IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS & THE SPECIFICATION.

EXISTING SERVICES WHERE SHOWN HAVE BEEN PLOTTED FROM SUPPLIED DATA AND SUCH THEIR ACCURACY CAN NOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH THE LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF WORK.

ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACK FILLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL COUNCIL.

ALL TRENCH BACK FILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.

ON COMPLETION OF STORMWATER INSTALLATION, ALL DISTURBED AREAS MUST BE RESTORED TO ORIGINAL CONDITION, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AND GRASSED AREAS AND ROAD PAVEMENTS, UNLESS DIRECTED OTHERWISE.

CONTRACTOR TO OBTAIN ALL AUTHORITY APPROVALS UNLESS DIRECTED OTHERWISE.

STORMWATER DRAINAGE

THE STORMWATER DRAINAGE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH AS/NZS 3500.3 - 1990 "STORMWATER DRAINAGE" & AS/NZS 3500.3.2-1998 "STORMWATER DRAINAGE - ACCEPTABLE SOLUTIONS".

ANY VARIATIONS TO THE NOMINATED LEVELS SHALL BE REFERRED TO ENGINEER IMMEDIATELY.

ANY VARIATIONS TO SPECIFIED PRODUCTS OR DETAILS SHALL BE REFERRED TO THE ENGINEER FOR APPROVAL.

DOWN PIPES SHALL BE A MINIMUM OF DN100 SW GRADE UPVC OR 100X100 COLORBOND/ZINCALUME STEEL, UNO.

BOX COLORBOND OR ZINCALUME STEEL. GUTTERS SHALL BE A MINIMUM OF 450 WIDE X 150 DEEP.

EAVES GUTTERS SHALL BE A MINIMUM OF 125 WIDE X 100 DEEP (OR OF EQUIVALENT AREA) COLORBOND OR ZINCALUME STEEL.

SUBSOIL DRAINAGE SHALL BE PROVIDED TO ALL RETAINING WALLS & EMBANKMENTS, WITH THE LINES FEEDING INTO THE STORMWATER DRAINAGE SYSTEM.

DA APPROVAL ONLY

NOT TO BE USED FOR CONSTRUCTION PURPOSES

A1 ORIGINAL SIZE

REVISION	DATE	AMENDMENT DESCRIPTION
A	11.06.21	ISSUED FOR DA APPROVAL

DESIGN ARCHITECT:

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ABN 75 083 999 624
e: info@fdg.com.au
w: www.fdg.com.au
p: 02 4446 0777
a: PO Box 82, Cambewarra NSW 2540

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305/12 Century Cct
Norwest Central
NORWEST NSW 2153
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GRAFTON AQUATIC CENTRE

cnr Turf & Oliver St, Grafton

For Clarence Valley Council

SEDIMENT & EROSION CONTROL PLAN

DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE 1:400	DRG No. C103 - A

PRE DEVELOPMENT CATCHMENT AREA PLAN

1:600

DENOTES PRE DEVELOPMENT PERVIOUS AREA = 10,194m^2

DENOTES PRE DEVELOPMENT IMPERVIOUS AREA = 4,693m^2

POST DEVELOPMENT CATCHMENT AREA PLAN

1:600

DENOTES POST DEVELOPMENT PERVIOUS AREA = 8,681m^2

DENOTES POST DEVELOPMENT IMPERVIOUS AREA = 6,197m^2

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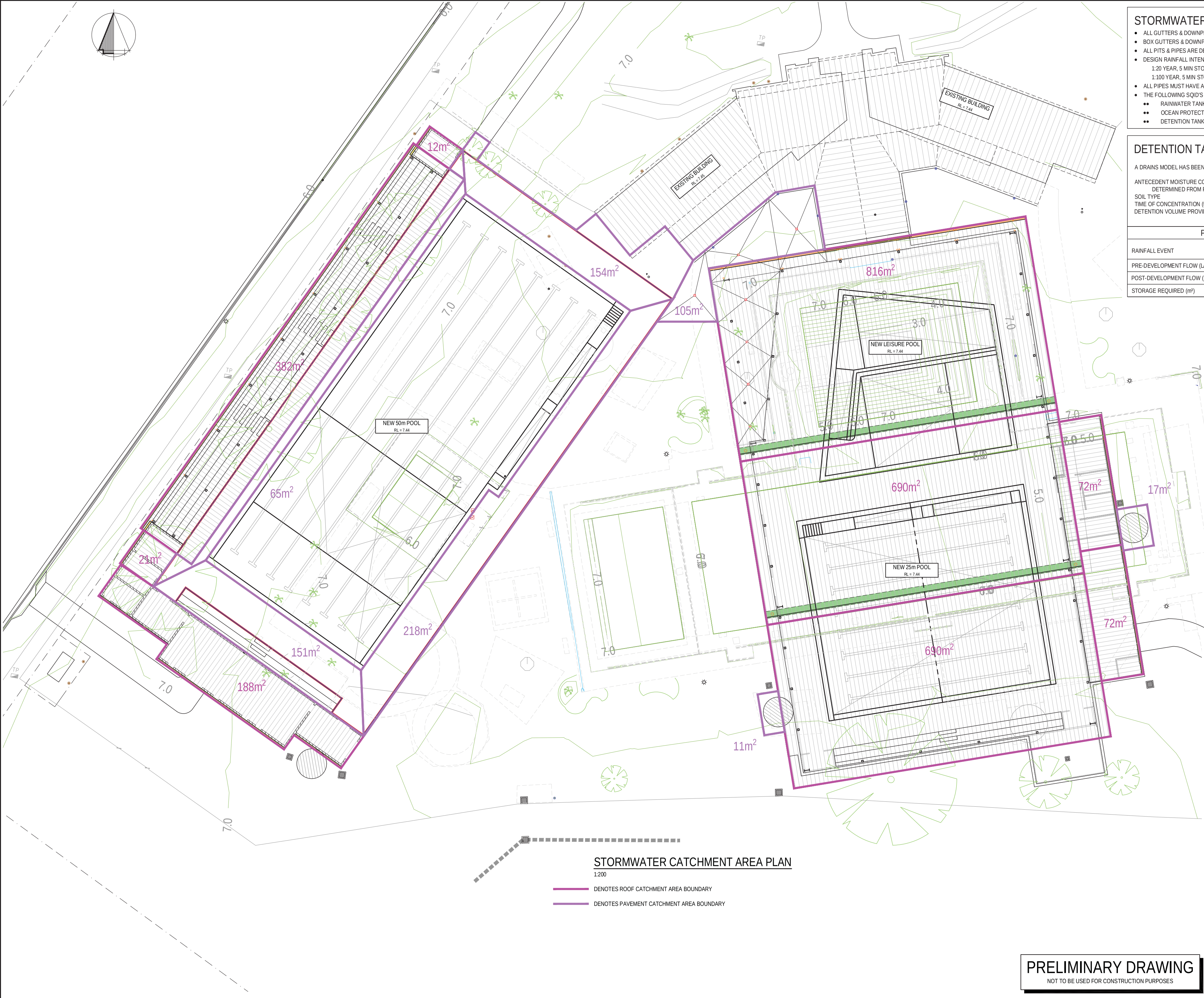
PRE & POST DEVELOPMENT CATCHMENT AREA PLAN

DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE	DRG No.
		1:600	C104 - A



STORMWATER CATCHMENT AREA PLAN

1:200

DENOTES ROOF CATCHMENT AREA BOUNDARY

DENOTES PAVEMENT CATCHMENT AREA BOUNDARY

STORMWATER DRAINAGE STRATEGY

- ALL GUTTERS & DOWNPIPES ARE DESIGNED TO ACCEPT A 1:20 YEAR ARI STORM EVENT
- BOX GUTTERS & DOWNPIPES ARE DESIGNED TO ACCEPT A 1:100 YEAR ARI STORM EVENT
- ALL PITS & PIPES ARE DESIGNED TO ACCEPT A 1:20 YEAR ARI STORM EVENT
- DESIGN RAINFALL INTENSITIES;
  - 1:20 YEAR, 5 MIN STORM = 203 mm/hr
  - 1:100 YEAR, 5 MIN STORM = 268 mm/hr
- ALL PIPES MUST HAVE A MIN 1.0% FALL, U.N.O.
- THE FOLLOWING SQID'S HAVE BEEN DESIGNED FOR THIS DEVELOPMENT
  - RAINWATER TANKS
  - OCEAN PROTECT OCENAGUARDS
  - DETENTION TANKS

DETENTION TANK DESIGN

A DRAINS MODEL HAS BEEN PREPARED TO EVALUATE THE PERFORMANCE OF THE DETENTION SYSTEM

ANTECEDENT MOISTURE CONDITION (AMC) = 3.32
DETERMINED FROM RAINFALL RECORD 058059 (1891 - 2021)
SOIL TYPE = 3
TIME OF CONCENTRATION (t_c) = 5 min.
DETENTION VOLUME PROVIDED = 29 kL

PRE & POST DEVELOPMENT FLOWS

RAINFALL EVENT	1 EY	0.5 EY	0.2 EY	10%	5%	2%	1%
PRE-DEVELOPMENT FLOW (L/s)	683	880	1115	1428	1675	1952	2222
POST-DEVELOPMENT FLOW (L/s)	684	879	1109	1406	1659	1920	2178
STORAGE REQUIRED (m^3)	7.7	10.5	13.7	16.4	19.2	23	25.4

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STORMWATER CATCHMENT AREA PLAN

DESIGN	DRAWN	DATE	PROJECT No.
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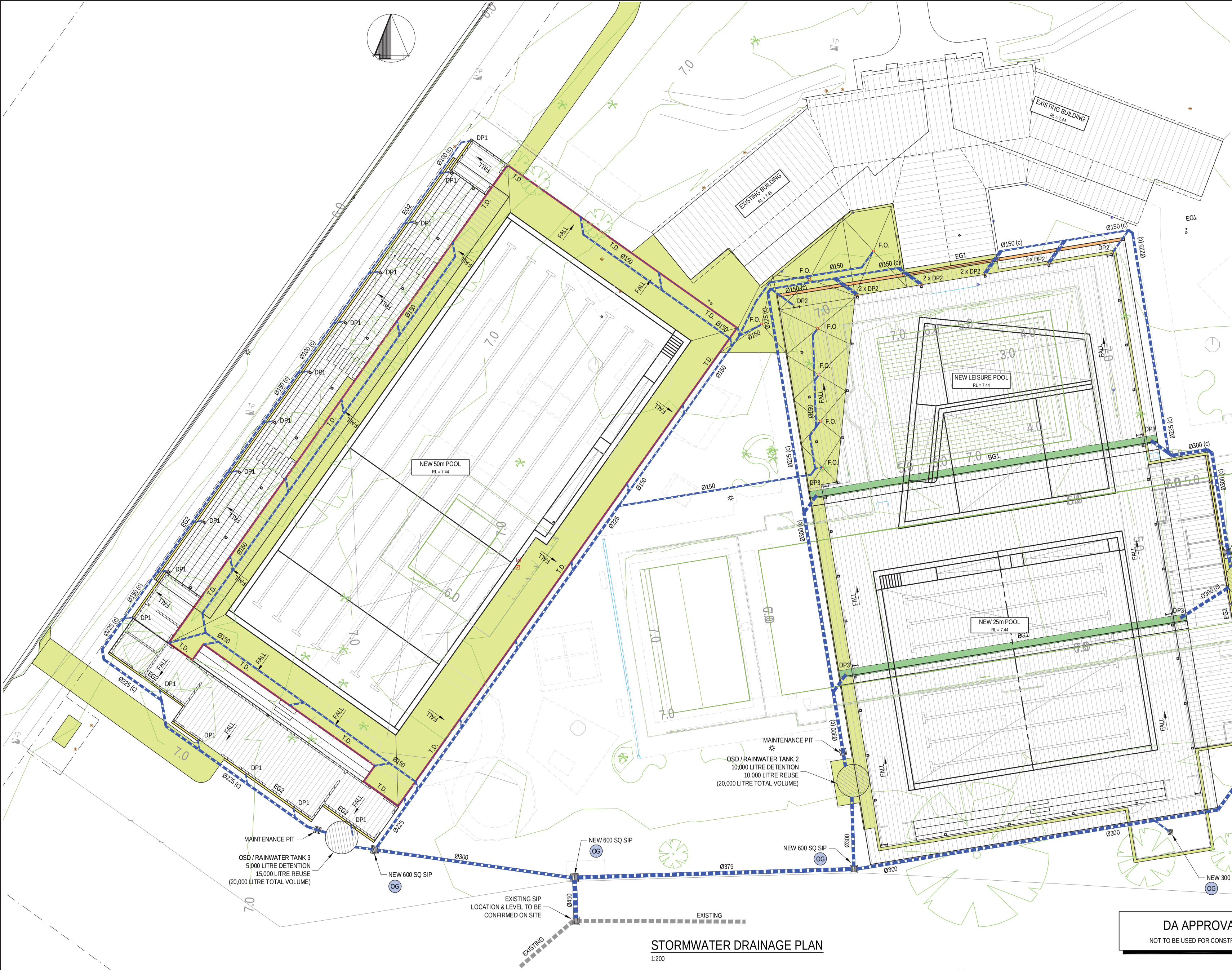
CHECKED	APPROVED	SCALE 1:200	DRG No. C105 - A

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION PURPOSES



STORMWATER DRAINAGE STRATEGY

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- ALL PITS & PIPES ARE DESIGNED TO ACCEPT A 1:20 YEAR ARI STORM EVENT
- DESIGN RAINFALL INTENSITIES;
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  - 1:100 YEAR, 5 MIN STORM = 268 mm/hr
- ALL PIPES MUST HAVE A MIN 1.0% FALL, U.N.O.
- THE FOLLOWING SQID'S HAVE BEEN DESIGNED FOR THIS DEVELOPMENT
  - RAINWATER TANKS
  - OCEAN PROTECT OCEANGUARDS
  - DETENTION TANKS

DETENTION TANK DESIGN

A DRAINS MODEL HAS BEEN PREPARED TO EVALUATE THE PERFORMANCE OF THE DETENTION SYSTEM

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PRE & POST DEVELOPMENT FLOWS

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POST-DEVELOPMENT FLOW (L/s)	684	879	1109	1406	1659	1920	2178
STORAGE REQUIRED (m³)	7.7	10.5	13.7	16.4	19.2	23	25.4

STORMWATER DRAINAGE PLAN

1:200

ALL DRAINAGE LINES SHALL BE UPVC (CLASS SH) STORMWATER DRAINAGE PIPE, UNO.
ALL DRAINAGE LINES SHALL BE LAID @ 1% FALL MIN, UNO.
ALL GRATED PITS WITHIN THE SITE BOUNDARIES TO HAVE HEEL GUARD GRATES TYPICAL
THE FOLLOWING SYMBOLS & ABBREVIATIONS HAVE BEEN USED:

- DP1 = Ø100 DOWNPIPE
- DP2 = Ø150 DOWNPIPE
- DP3 = Ø300 DOWNPIPE
- SIP = SURFACE INLET PIT (NO LINTEL)
- DP = RAINWATER SPREADER

BG1 — DENOTES PROPOSED 800 WIDE x 180 DEEP BOX GUTTER WITH 1:200 FALL MIN

EG1 — DENOTES PROPOSED 300 HALF ROUND EAVES GUTTER

EG2 — DENOTES PROPOSED 200 HALF ROUND EAVES GUTTER

F.O. — DENOTES PROPOSED 200 SQ SPS STAINLESS STEEL FLOOR OUTLET WITH HEELGUARD GRATE

T.D. — DENOTES PROPOSED EASYDRAIN 83307 TRENCH DRAIN WITH OUTLETS AT 10.0m MAX CTRS

OG — DENOTES OCEAN PROTECT OCEANGUARD INSTALLED IN STORMWATER PIT

THE BUILDER IS TO VERIFY THE LOCATIONS OF ALL SERVICES PRIOR TO COMMENCEMENT OF WORKS
MINIMUM COVER OF STORMWATER PIPES UNDER GRASSED AREAS TO BE 300mm U.N.O
VERIFY ALL INVERT LEVELS, SURFACE LEVELS & COVER TO ALL STORMWATER PIPES ARE OBTAINABLE PRIOR TO COMMENCEMENT OF ANY WORKS

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For Clarence Valley Council

STORMWATER DRAINAGE PLAN

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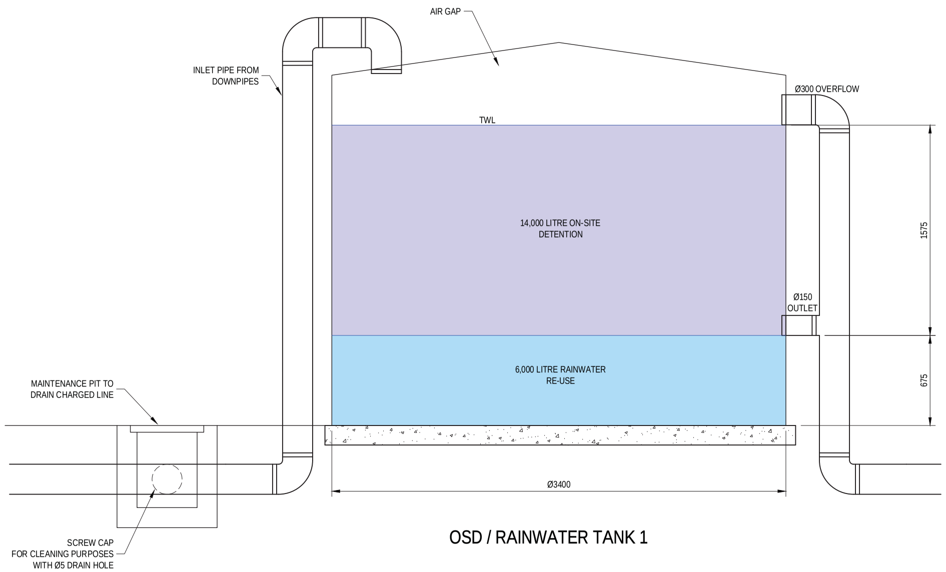
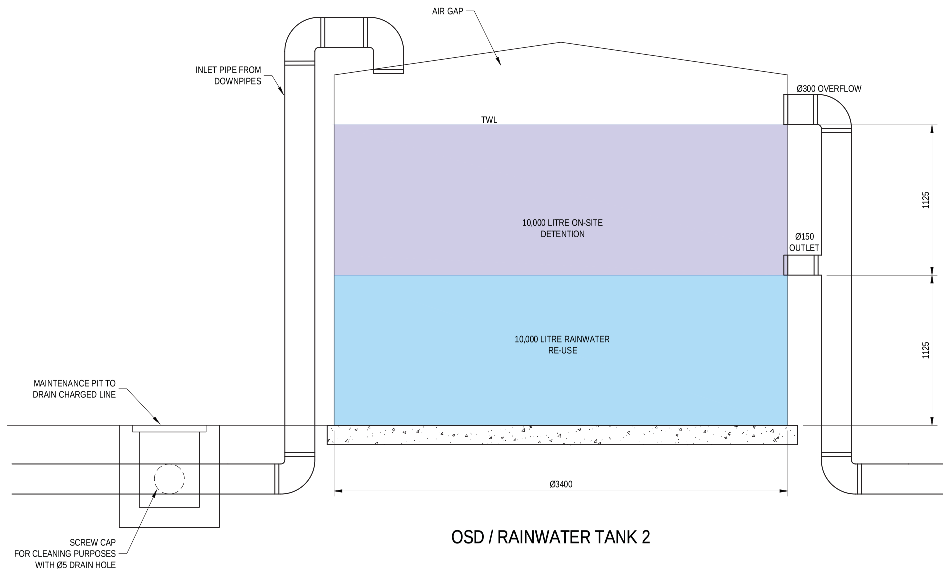
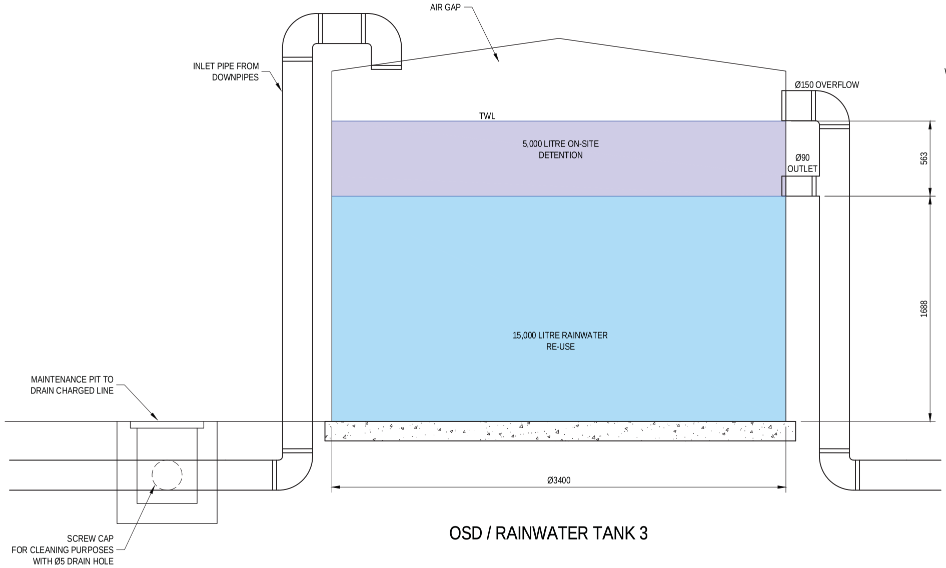
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE	DRG No.
		1:200	C106 - A



OSD / RAINWATER TANK 1



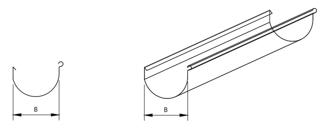
OSD / RAINWATER TANK 2



OSD / RAINWATER TANK 3

ON-SITE DETENTION TANK + RAINWATER TANK TYPICAL DETAILS

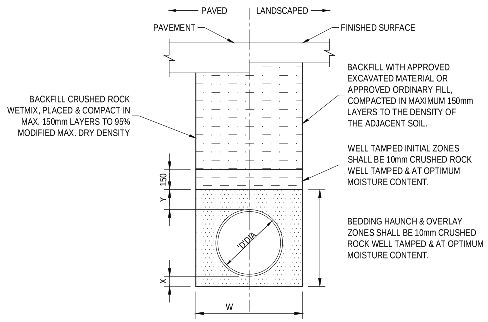
1:20



TYPICAL EAVES GUTTER DETAIL

NTS

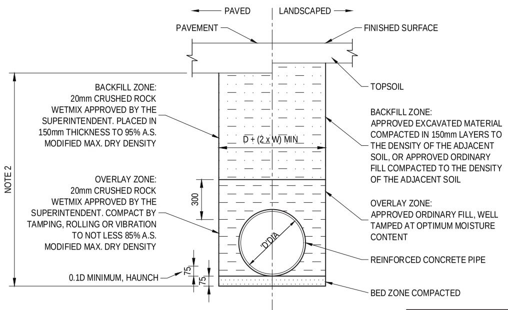
SPECIFICATIONS				
MARK	GUTTER TYPE	'B'	TOTAL CROSS SECTION AREA (mm²)	DOWNPIPE SIZE
EG1	200 HALF ROUND	200	14500	Ø100
EG2	300 HALF ROUND	300	35500	Ø150



NOTE:
1 REFER TO PIPE LAYING SPECIFICATIONS FOR DETAILS.

PIPE DIA 'D'	W	X MIN	Y
100-150	300	75	75
225-300	600	75	75

UPVC PIPE



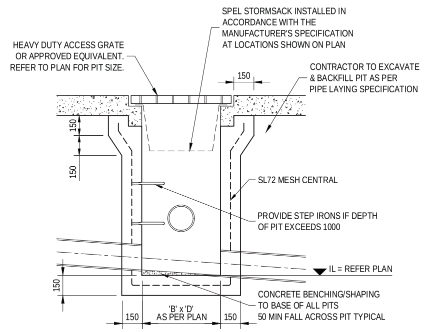
NOTE:
1 REFER TO PIPE LAYING SPECIFICATION FOR DETAILS.
2 BACKFILL OVERLAY & BEDDING ZONES 20mm CRUSHED ROCK COMPACT BY TAMPING ROLLING OR VIBRATION TO NOT LESS THAN 85% A.S. STD. MAX. DRY DENSITY.

D	W
150-300	150
375-750	300
+750	600

REINFORCED CONCRETE PIPE

TYPICAL PIPE LAYING DETAIL

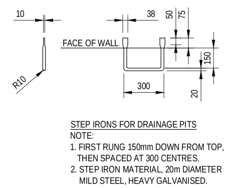
1:20



TYPICAL SURFACE INLET PIT DETAIL

1:20

TYPICAL FOR ALL PITS IN DRIVEWAY / PAVEMENT AREAS.



STEP IRONS FOR DRAINAGE PITS
NOTE:
1. FIRST RUNG 150mm DOWN FROM TOP, THEN SPACED AT 300 CENTRES.
2. STEP IRON MATERIAL, 20m DIAMETER MILD STEEL, HEAVY GALVANISED.

STEP IRONS FOR DRAINAGE PITS

1:20

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GRAFTON AQUATIC CENTRE

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For Clarence Valley Council

STORMWATER DRAINAGE DETAILS - Sht 1 of 2

DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE	DRG No.
		1:20	C107 - A

EasyDRAIN™ STANDARD

SPEC PACK

EasyDRAIN Standard Channel & Grate

Available in a range of different grate options

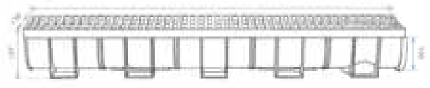
100MM PROFILE

Suitable for most residential common drainage applications, making EasyDRAIN a household standard in surface water drainage.

EASYDRAIN STANDARD 1M CHANNEL COMPARISON			
MATERIAL	CODE	CLASS	WEIGHT
Polymer	83300	A	2.7kg
Galvanised Steel	83432	N/A	2.95kg
Stainless Steel	83303	N/A	3.09kg
Duraforge	83308	A	7.08kg
Galvanised Round Bar	83307	B	5.84kg

SPECIFICATIONS - 1M CHANNEL & GRATE

Length: 1000mm
Width: 138mm
Height: 137mm

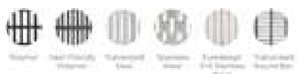


*Polymer channel and grate displayed

PRODUCT APPLICATIONS

Outdoor Areas
Driveways
High rainfall and waterflow areas
Gardens
Walkways
Residential Carparks

GRATE OPTIONS



5 YEARS

1 YEAR

1.5 TONNES

If you are after Revit files or additional information, get in touch with us for more details.

EasyDRAIN™ STANDARD

SPEC PACK

EasyDRAIN Standard Components

EasyDRAIN Standard Tee Piece
Available in:

Allows for easy change of direction

*Polymer grate displayed

EasyDRAIN Standard Corner Piece
Available in:

Allows for easy change of direction

*Polymer grate displayed

EasyDRAIN Standard Slim Pit
Available in:

Collection point for debris that has entered the drainage system

*Polymer grate displayed

EasyDRAIN Leaf Dome
EI Code: 84040

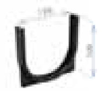
Provides a barrier against debris entering the waterway

EasyDRAIN Standard End Cap
EI Code: 83360

Provides a finishing point at the end of the EasyDRAIN channel

EasyDRAIN Standard Converter
EI Code: 83370

Acts as a joiner between cut ends of EasyDRAIN channel



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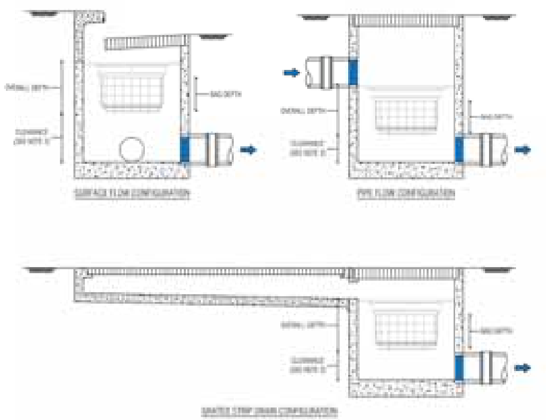

SURFACE FLOW CONFIGURATION

PIPE FLOW CONFIGURATION

GRATED STRIP DRAIN CONFIGURATION

PLAN ID	MAXIMUM PIT PLAN DIMENSIONS
S	450mm x 450mm
M	600mm x 600mm
L	900mm x 900mm
XL	1200mm x 1200mm

DEPTH ID	BAG DEPTH	OVERALL DEPTH
1	170	270
2	300	450
3	600	700

PLAN ID		DEPTH ID 1	DEPTH ID 2	DEPTH ID 3
PLAN ID	S	•		
	M	•	•	
	L	•	•	•
	XL	•	•	•

GENERAL NOTES

1. THE MINIMUM CLEARANCE DEPENDS ON THE CONFIGURATION (SEE NOTE 2) AND THE LOCAL COUNCIL REQUIREMENTS.
2. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 80mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
3. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES: 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING AND A COARSE BAG FOR TARGETING GROSS POLLUTANTS.
4. DRAWINGS NOT TO SCALE.

OCEAN PROTECT

OCEAN PROTECT
OCEANGUARD
TYPICAL ARRANGEMENTS
SPECIFICATION DRAWING

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STORMWATER DRAINAGE DETAILS - Sht 2 of 2

DESIGN	DRAWN	DATE	PROJECT No.
SWH	GOH	MAY 2021	10237
CHECKED	APPROVED	SCALE	DRG No.
		-	C108 - A

Appendix B – Stormwater System Maintenance Schedule

Grafton Aquatic Centre – Cnr Turf Street & Oliver Street, Grafton

Rainwater Tanks			
Maintenance Action	**Frequency**	**Responsibility**	**Procedure**
Check system operational performance	End of first month after installation and annually	Maintenance Contractor	• Inspect and check all components in the rainwater tank are operating normally. Repair if required. • Inspect and check for defects. Repair and replace if required.
Inspect rainwater tank parts	Every 1 to 3 months	Maintenance Contractor	• Inspect and clean the first flush device and all filters. Repair if required. • Check and clean gutters, rain heads, tank inlets and screens. Repair if required.
Check for sediment and debris	Annually	Maintenance Contractor	• Check and remove accumulated sediments and debris.

On-Site Detention Systems			
Maintenance Action	**Frequency**	**Responsibility**	**Procedure**
Check system operational performance	End of first month after installation and annually	Maintenance Contractor	• Inspect and check all components in the OSD system are operating normally. Repair if required.
Inspect system	Quarterly, after storm and/or oil spill	Maintenance Contractor	• Inspect all pits, internal, external and overflow structures. Repair and/or replace if required. • Check all pits and remove debris if required.
Clean system	Annually	Maintenance Contractor	• Clean and check the system and grates for corrosion, damage and/or blockages (especially corners and welds). Replace if required.

Stormwater Pits – Surface Inlet Pits without Gross Pollutant Traps			
Maintenance Action	**Frequency**	**Responsibility**	**Procedure**
Inspect all pits for sediment and gross pollutants	Monthly or after storm	Owner	• Inspect all pits. Remove all pollutants and sediment.
Inspect grates for damage and/or blockage	Monthly	Owner	• Check grates for corrosion, damage and/or blockage (especially corners and welds) and replace if required.
Inspect all pits for cracks or spalling	Annually	Maintenance Contractor	• Remove grate and inspect walls, repair wall if required. • Clear vegetation from pits if necessary.

Stormwater Pits – Surface Inlet Pits with Gross Pollutant Traps			
Maintenance Action	**Frequency**	**Responsibility**	**Procedure**
Inspect all pits for sediment and gross pollutants	Monthly or after storm	Owner	• Inspect all pits. Empty all contents from pollutant traps and remove all pollutants and sediment. Refer to attached maintenance guidelines.
Inspect grates for damage and/or blockage	Monthly	Owner	• Check grates for corrosion, damage and/or blockage (especially corners and welds) and replace if required. Refer to attached maintenance guidelines.
Inspect all pits for cracks or spalling	Annually	Maintenance Contractor	• Remove grate and inspect walls, repair wall if required. • Clear vegetation from pits if necessary. Refer to attached maintenance guidelines.