BLACKTOWN CITY COUNCIL

WATER SENSITIVE URBAN DESIGN (WSUD) STANDARD DRAWINGS

DRAWING SCHEDULE

DRAWING SHEET	DRAWING TITLE
01	COVER SHEET
02	BIORETENTION – STANDARD NOTES
03	BIORETENTION – GENERAL ARRANGEMENT
04	BIORETENTION – DETAILS
05	BIORETENTION – SMALL BIORETENTION SYSTEMS
06	BIORETENTION – INLET DIVERSION STRUCTURES
07	BIORETENTION – INLET STRUCTURES
08	BIORETENTION – OUTLET STRUCTURES
09	BIORETENTION – OUTLET SCOUR PROTECTION
10	BIORETENTION – RAINGARDEN SYSTEM LESS THAN $30m^2$
11	BIORETENTION – WITHIN FLOOD DETENTION BASIN
12	BIORETENTION – LANDSCAPING
13	BIORETENTION – CONSTRUCTION WORKS STAGING – 1
14	BIORETENTION – CONSTRUCTION WORKS STAGING – 2
15	VEGETATED SWALES – FLAT SITES
16	VEGETATED SWALES – STEEP SITES
17	POROUS PAVING
18	BIORETENTION – TOWN CENTRES
19	TREE PIT BIORETENTION – STREET
20	OSD – REQUIREMENTS
21	OSD – ABOVE GROUND STORAGE
22	OSD – UNDERGROUND STORAGE
23	OSD – COMBINED OSD & FILTER CARTRIDGES
24	OSD – DEEMED TO COMPLY SOLUTION
25	RAINWATER TANKS – CHARGED LINE SYSTEMS & MUSIC MODELLING REQUIREMENTS

GENERAL NOTES

A. THE PURPOSE OF THESE DRAWINGS IS TO PROVIDE GENERAL DESIGN GUIDANCE ON KEY DETAILS HOWEVER THEY ARE NOT A STAND ALONE DESIGN RESOURCE. THEY SHOULD BE READ IN CONJUNCTION WITH OTHER DESIGN GUIDELINES INCLUDING:
   - WSUD HANDBOOK
   - BLACKTOWN CITY COUNCIL'S ENGINEERING GUIDE FOR DEVELOPMENT
   - BLACKTOWN CITY COUNCIL'S WORKS SPECIFICATIONS CIVIL
   - BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION (DRAFT)
   - OTHER RELEVANT GUIDELINES AS REFERENCED.

B. THESE DRAWINGS ARE INTENDED TO PROVIDE A LIST OF COMPLYING SOLUTIONS THAT COUNCIL ACCEPTS. THEY SHALL NOT BE USED TO STIFLE INNOVATION OR REPLACE SOUND ENGINEERING JUDGEMENT. ALTERNATIVE SOLUTIONS WILL BE ADDRESSED BY COUNCIL ON A MERITS BASED APPROACHED.

C. THE OSD DRAWINGS INCLUDED IN THIS SET ARE TO BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. WHILE THE ONLINE DEEMED TO COMPLY TOOL WILL HELP SIZE OSD SYSTEMS, THESE SYSTEMS WILL NEED TO BE CONSTRUCTED AND DESIGNED IN ACCORDANCE WITH THESE DRAWINGS.

D. THE BIORENTENTION DRAWINGS IN THIS SET MAY BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. THE TOOL IS APPLICABLE TO DEVELOPMENTS UP TO 4ha.

E. WHERE THERE IS A CLASH BETWEEN THESE DRAWINGS AND COUNCIL'S BIORETENTION SPECIFICATION, THE CONTRACTOR SHALL SEEK CLARIFICATION FROM COUNCIL.

F. THE STANDARD DRAWINGS SHOWN HEREIN MAY REQUIRE MODIFICATION TO SUIT LOCAL TOPOGRAPHY, SOILS, LANDSCAPE, SERVICES & SITE CONDITIONS. DESIGNS SHOULD INTEGRATE TREATMENT SYSTEMS INTO THE SURROUNDING LANDSCAPE.

G. WSUD SYSTEMS WITH STRUCTURAL ELEMENTS (e.g. RETAINING WALLS) REQUIRE SITE SPECIFIC STRUCTURAL DESIGN INPUT.

H. ALL WATER QUALITY AND QUANTITY MANAGEMENT MEASURES SHALL BE DESIGNED TO ENSURE:
   - EASE OF MAINTENANCE
   - ACCESS FOR MAINTENANCE
   - SAFE WORK PRACTICES
   - PUBLIC SAFETY AND HEALTH
   - COMPLIANCE WITH DESIGN CRITERIA

REFERENCES

- ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS (CRCWSC, 2015)
- WATER BY DESIGN 2014 "BIORETENTION TECHNICAL DESIGN GUIDE"
- CATCHMENTS & CREEKS, FACT SHEETS (VARIOUS)

ABBREVIATIONS

NSL	– NATURAL SURFACE LEVEL	CL	– COVER LEVEL
FSL	– FINISHED SURFACE LEVEL	RL	– REDUCED LEVEL
U/S	– UPSTREAM	RCP	– REINFORCED CONCRETE PIPE
D/S	– DOWNSTREAM	NTS	– NOT TO SCALE
IL	– INVERT LEVEL	EDD	– EXTENDED DETENTION DEPTH
RRJ	– RUBBER RING JOINT	HGL	– HYDRAULIC GRADE LINE
UNO	– UNLESS NOTED OTHERWISE	NOM	– NOMINAL
TYP	– TYPICAL	TWL	– TOP WATER LEVEL
EY	– EXCEEDANCES PER YEAR	K_{SAT}	– SATURATED HYDRAULIC CONDUCTIVITY RATE
HDPE	– HIGH DENSITY POLYETHYLENE		
PSD	– PARTICLE SIZE DISTRIBUTION		

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THIS WORK IS LICENSED UNDER A CREATIVE COMMONS ATTRIBUTION 3.0 AUSTRALIA LICENCE SUBJECT TO ATTRIBUTING THE MATERIAL TO 'BLACKTOWN CITY COUNCIL http: //www.blacktown.nsw.gov.au'

PREPARED BY:

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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE: FEB '17

CLIENT
DATE:

Blacktown City Council

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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: COVER SHEET
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ASSET DESIGN

BIORETENTION SYSTEMS ARE FULLY VEGETATED FILTERS. THE ABILITY OF A BIORETENTION SYSTEM TO DETAIN AND INFILTRATE INCOMING STORMWATER IS A FUNCTION OF THE FILTER SURFACE AREA, EXTENDED DETENTION (PONDING) DEPTH, INFILTRATION RATE OF THE SURFACE AND THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA.

BLACKTOWN CITY COUNCIL REQUIRES **'SATURATED SYSTEMS'**. THE CONFIGURATION OF THE OUTLET IS SUCH THAT THE SYSTEM RETAINS WATER IN A 'SATURATED' ZONE. THIS IMPROVES WATER TREATMENT THROUGH BETTER PLANT SURVIVAL. THE RECOMMENDED MINIMUM DEPTH OF THIS ZONE IS 400mm, IN LARGE SYSTEMS THE TOP OF THE SATURATED ZONE SHOULD BE 200mm BELOW THE BOTTOM OF THE FILTER MEDIA LAYER, WITHIN THE TRANSITION LAYER. THIS MAY BE REDUCED IN SMALL SYSTEMS SUBJECT TO HGL CALCULATIONS.

SATURATED SYSTEMS MUST BE LINED TO PREVENT EXFILTRATION & RETAIN WATER.

MEDIA PROPERTIES

A TYPICAL BIORETENTION SYSTEM HAS 3 LAYERS; A DRAINAGE LAYER, A TRANSITION LAYER AND THE FILTER MEDIA LAYER. GEOFABRIC IS **NOT** TO BE PLACED BETWEEN THE LAYERS OF MEDIA, OR SOCKS PLACED ON SUB-SOIL DRAINAGE.

THE MEDIA SHOULD BE PLACED IN LIFTS NO DEEPER THAN 250mm THICK AND LIGHTLY COMPACTED. A MAXIMUM OF ONE PASS WITH A SMALL VIBRATING COMPACTOR OR EQUIVALENT. EQUIPMENT SHOULD NOT BE USED FOR MEDIA PLACEMENT THAT WOULD INADVERTANTLY COMPACT THE LAYERS AND AFFECT THE INFILTRATION RATES OF WATER THROUGH THE MEDIA.

FILTER MEDIA SPECIFICATIONS

THE FILTER MEDIA IS THE TOP LAYER AND THE GROWING MEDIUM. MEDIA SHALL BE IN ACCORDANCE WITH THE PROPERTIES LISTED IN TABLE 3 *ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS* (CRC FOR WSC, 2015). AS MODIFIED BELOW:

DEPTH	500mm TYP BUT VARIES DEPENDING ON SYSTEM SCALE AND SIZE
MATERIAL	EITHER AN ENGINEERED MATERIAL - A WASHED, WELL GRADED SAND - OR NATURALLY OCCURRING SAND, A MIXTURE IS PERMITTED. IT SHOULD BE FREE OF RUBBISH AND WEEDS AND NOT BE HYDROPHOBIC. AN APPROVED FILTER MEDIA IS THE (M165) MEDIA FROM BENEDICT SAND AND GRAVEL OR APPROVED EQUIVALENT.
HYDRAULIC CONDUCTIVITY	HYDRAULIC CONDUCTIVITY: A TARGET, AS BUILT OR IN-SITU SATURATED HYDRAULIC CONDUCTIVITY RATE OF THE FILTER MEDIA SHALL BE A MINIMUM OF 100mm/Hr. THE EX-SITU (EX BIN) RATE SHALL BE A MINIMUM OF 250mm/Hr AND VERIFIED, WITH INDEPENDENT NATA REGISTERED LABORATORY TEST DATA NO LONGER THAN ONE MONTH OLD. FOR ALL MUSIC MODELS ADOPT THE IN-SITU RATE OF 100mm/Hr. TESTING OF MEDIA SHALL CONFORM TO ASTM-F1815-11. EVERY 100m^3 OF MEDIA SHALL BE TESTED FOR COMPLIANCE WITH ALL SPECIFIED CRITERIA IN THIS TABLE.
PH	5.5 - 7 AS SPECIFIED FOR "NATURAL SOILS AND BLENDS" (PH : IN WATER)
ELECTRICAL CONDUCTIVITY	<1.2 DS/M AS SPECIFIED FOR "NATURAL SOILS AND BLENDS"
NUTRIENT CONTENT	LOW NUTRIENT CONTENT TOTAL NITROGEN (TN) < 1000 mg/kg NITROGEN DRAWDOWN > 0.5 (NDI) AVAILABLE PHOSPHATE (COLWELL) < 80mg/kg ORTHOPHOSPHATE < 40 mg/kg (IN BOTH STANDARD OR SATURATED SYSTEMS)
GRADING OF PARTICLES	SMOOTH GRADING - ALL PARTICLE SIZE CLASSES SHOULD BE REPRESENTED ACROSS SIEVE SIZES FROM THE 0.05mm TO THE 3.4mm SIEVE AS PER ASTM F 1632-03 (2010). ACCEPTABLE RANGE (%W/W) RETAINED CLAY & SILT < 3% (< 0.05 mm) VERY FINE SAND 5-30% (0.05 - 0.15 mm) FINE SAND 10-30% (0.15 - 0.25 mm) MEDIUM SAND 40-60% (0.25 - 0.5 mm) COARSE SAND < 25% (0.5 - 1.0 mm) VERY COARSE SAND 0-10% (1.0 - 2.0 mm) FINE GRAVEL < 3% (2.0 - 3.4 mm) ORGANIC CONTENT ≤ 5% IMMIDIATELY PRIOR TO DELIVERY TO SITE A PSD TEST (AS1141) SHALL BE UNDERTAKEN. IF THE PSD DOES NOT COMPLY A HYDRAULIC CONDUCTIVITY TEST SHALL BE UNDERTAKEN. DELIVERY SHALL NOT BE APPROVED UNTIL THE MEDIA IS APPROVED. THERE SHOULD BE NO GAP IN THE PARTICLE SIZE GRADING AND THE COMPOSITION SHOULD NOT BE DOMINATED BY A SMALL PARTICLE SIZE RANGE. ORGANIC MATTER CONTENT SHALL BE 3% TO 5% TO SUPPORT VEGETATION.

TO AVOID MIGRATION OF THE FILTER MEDIA INTO THE TRANSITION LAYER THE PARTICLE SIZE DISTRIBUTION SHOULD BE ASSESSED TO MEET BRIDGING CRITERIA. THE SMALLEST 15% (D_{15}) OF THE TRANSITION LAYER PARTICLES MUST BE NO GREATER THAN 5 TIMES THE SIZE OF THE LARGEST 15% (D_{85}) OF THE FILTER MEDIA PARTICLES. THAT IS:

D_{15}(TRANSITION) ≤5 x D_{85}(FILTER)

ALTERNATIVE MEDIA MAY BE APPROVED AT THE DISCRETION OF COUNCIL. AS A MINIMUM DETAILED MATERIAL TESTING AND DEMONSTRATED PERFORMANCE WILL BE REQUIRED. IF ANY RECYCLED MATERIAL IS TO BE USED IT MUST BE DEMONSTRATED AT THE CONTRACTOR'S EXPENSE THAT THE MATERIAL IS BOTH INERT AND FREE OF CONTAMINANTS.

THE CONTRACTOR SHALL ARRANGE FOR IN-SITU TESTING OF THE SPECIFIED HYDRAULIC CONDUCTIVITY AT A RATE OF 2 TESTS PER 50m^2 OR PART OF & 1 TEST PER 200m^2 THEREAFTER OF FILTER MEDIA AREA FOR COMPLIANCE WITH THE ABOVE SPECIFICATION.

BATTERS:

BATTERS SHALL BE SCARIFIED WITH A ROTARY HOE. A SOIL FERTILITY REPORT SHALL BE UNDERTAKEN BY A NATA REGISTERED LAB AND QUALIFIED HORTICULTURIST / SOIL SCIENTIST. BATTERS SHALL BE AMELIORATED TO IMPROVE FERTILITY IN ACCORDANCE WITH SOIL FERTILITY REPORT.

ALTERNATIVELY REMOVE TOP 200mm OF TOPSOIL AND REPLACE WITH AN IMPORTED TOPSOIL COMPLIANT WITH AS4419.

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TRANSITION LAYER (MIDDLE) SPECIFICATION

THE PURPOSE OF THE TRANSITION LAYER IS TO PREVENT THE MIGRATION OF THE FILTER MEDIA INTO THE DRAINAGE LAYER. IT CREATES A LAYER BETWEEN THE FILTER MEDIA AND THE DRAINAGE LAYER. THE LAYER DEPTH IS TO BE A MIN OF 400mm THICK, IN A SATURATED SYSTEM.

THE MATERIAL MUST BE CLEAN, WELL GRADED SAND/COARSE MATERIAL CONTAINING LITTLE OR NO FINES. USE OF WELL WASHED RECYCLED GLASS IS ACCEPTABLE. AN INDICATIVE PARTICLE SIZE DISTRIBUTION IS BETWEEN 0.5mm AND 1.4mm. FINE PARTICLE CONTENT <2%. IN ADDITION TO BRIDGING CRITERIA, THE D_{15} (TRANSITION) ≥ D_{15} (FILTER) x 5, THIS CRITERIA ENSURES GREATER HYDRAULIC CONDUCTIVITY OF THE TRANSITION LAYER THAN THE MEDIA.

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m^2 OF FILTER MEDIA AREA.

DRAINAGE LAYER SPECIFICATION

THIS LAYER COLLECTS STORES AND CONVEYS TREATED STORMWATER INTO A SLOTTED COLLECTION PIPE BEDDED INTO THE DRAINAGE LAYER. IT CONSISTS OF A CLEAN GRAVEL 5-7mm WASHED SCREENINGS (NOT SCORIA). THE LAYER DEPTH SHALL MAINTAIN A MINIMUM 50mm COVER OVER THE SUB SURFACE DRAINAGE PIPE. RECYCLED CONCRETE OR BRICK PRODUCTS WILL NOT BE ACCEPTED.

BRIDGING CRITERIA AS FOLLOWS APPLIES: THE D_{15} (DRAINAGE LAYER) ≤ 5 x D_{85} (TRANSITION LAYER)
HYDRAULIC CONDUCTIVITY CRITERIA APPLIES AS FOLLOWS: THE D_{15} (DRAINAGE LAYER) ≥ D_{15} (TRANSITION) x 5

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m^2 OF FILTER MEDIA AREA & AND MINIMUM OF 1 TEST.

SUB SURFACE DRAINAGE PIPES

SYSTEMS > 60m LONG NEED INTERMEDIATE FLUSHING POINTS AND RISERS. THE PIPES WITHIN THE BIORETENTION SYSTEM SHOULD BE A MINIMUM 90mm (UNO) DIAMETER UPVC SLOTTED PIPE (CONSISTENT WITH AS/NZS 1254) WITH MINIMUM 1,500mm² OPENINGS/M. JOINTS TO BE RUBBER RING JOINT, BENDS SHOULD BE 45° TO ENSURE THAT THE PIPE CAN BE FLUSHED. SLOTS SHALL BE A MAXIMUM OF 4MM WIDE.

CORRUGATED PLASTIC PIPE (I.E. 'AG' PIPE) IS NOT ACCEPTABLE DUE TO THE RISK OF COMPRESSION FAILURE AND ROOT PENETRATION. THE PIPES SHALL BE:

1. SPACED AT A MAXIMUM OF 3m CENTRES.
2. DESIGNED TO CONVEY A MINIMUM FLOW OF 4.45L/S/100m^2 OF FILTER AREA. THIS WAS CALCULATED USING DARCY'S LAW AND ASSUMED EDD OF 0.3m AND FILTER MEDIA DEPTH OF 0.5m AND K_{SAT} OF 100mm/Hr.

FOR LARGE SYSTEMS, THE STANDARD DRAWINGS ADOPT DIA 150mm PIPES SPACED AT 3m CENTRES WHICH MEETS THIS CRITERIA. FOR SMALLER SYSTEMS DIA 90mm PIPES MY BE USED SUBJECT TO CONFIRMATION THE HGL REMAINS BELOW THE FILTER MEDIA (AT MAXIMUM DESIGN FLOW). HGL CALCULATIONS SHALL CONSIDER DEPTH OF WEIR FLOW (REFER DETAIL 11 &13 SHEET 8), FRICTION & FITTING LOSSES ALONG THE LENGTH OF THE SUBSOIL DRAINAGE PIPE. ASSUME 50% OF THE DESIGN FLOW CONVEYED AT MID POINT OF PIPE.

LINERS

ALL BIORETENTION SYSTEMS ARE TO BE LINED TO RETAIN WATER. LINING CAN INCLUDE CLAY LINING (MIN. 300mm COMPACTED THICKNESS), HDPE WATERTIGHT MEMBRANE 1.5mm THICK, GEOSYNTHETIC CLAY LINERS (I.E. BENTOFIX). THE LINER IS TO EXTEND TO THE SURFACE OF THE MEDIA LAYER WHERE NO BUILDINGS ARE LOCATED NEXT TO THE SYSTEM. IF BUILDINGS ARE LOCATED NEXT TO THE SYSTEM THE LINER IS TO BE ATTACHED 100mm ABOVE THE EXTENDED DETENTION DEPTH TO THE SIDE OF THE BUILDING.

INSTALL A LAYER OF NON-WOVEN NEEDLE PUNCHED GEOFABRIC, SUCH AS BIDIM A34 OR APPROVED EQUIVALENT, UNDER AND OVER HDPE LINERS, TO MINIMISE THE RISK OF DAMAGE CAUSED BY ROCKS IN THE SUBSOIL. ALL HDPE LINERS SHALL HAVE WELDED WATER TIGHT JOINTS.

GROSS POLLUTANT TRAPS (GPTs)

A GPT IS REQUIRED UPSTREAM OF ALL BIORETENTION BASINS WHERE THE UPSTREAM CATCHMENT >2000m^2. IT MUST BE LOCATED AWAY FROM UNDERGROUND SERVICES WITH MAINTENANCE ACCESS. IF LOCATED ON PRIVATE LAND AN EASEMENT OR COVENANT WILL BE REQUIRED.

GPTs SHALL HAVE CONCRETE SURROUNDS WITH CLEAR ACCESS FOR EDUCTOR TRUCKS. THE DIMENSIONS OF THE CONCRETE SURROUND SHALL BE DETERMINED IN CONSULTATION WITH COUNCIL.

SCOUR PROTECTION:

OUTLET PIPES FROM BIORETENTION BASINS WHICH DISCHARGE TO A WATERWAY SHALL HAVE OUTLET PROTECTION IN ACCORDANCE WITH THE DETAILS SHOWN IN THESE DRAWINGS.

BIORETENTION SIZES & DIMENSIONS:

MAX FILTER AREA TO BE 1000m². IF A FILTER > 1000m^2 IS REQUIRED , USE TWO OR MORE CELLS LINKED IN PARALLEL. CELLS SHALL NOT BE IN SERIES.

TYPICAL BIORETENTION SIZES

SCALE	AREA	TYP. MAXIMUM CATCHMENT SIZE	APPLICABLE SHEETS
RAINGARDENS	<30m^2	2000m^2	4, 10, 12
SMALL	30m^2 - 100m^2	6500m^2	4, 5, 6, 8, 12, 13, 14
LARGE	>100m^2	6.5ha PER 1000m^2 CELL	3, 4, 6, 7, 8, 12, 13, 14

THE MAX WIDTH OF LARGE BIORETENTION SYSTEMS IS TO BE 15m (IF ACCESS IS AVAILABLE FROM BOTH SIDES) OR A MAXIMUM 7.5m WIDTH IF ONLY ACCESSIBLE FROM ONE SIDE. DESIGN ACCESS TRACKS IN ACCORDANCE WITH AUSTROADS PUBLICATION (AP-G34-13) FOR A 9m SERVICE VEHICLE AND AN EXCAVATOR WITH 9m REACH. ALL PARTS OF THE BASIN MUST BE REACHABLE BY EXCAVATOR.

VEGETATION, SHADING AND MULCHING

PLANTS ARE AN ESSENTIAL COMPONENT OF THE BIORETENTION SYSTEM, REMOVING POLLUTANTS AND MAINTAINING THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA. PLANTS MUST BE CAPABLE OF SURVIVING IN THE FILTER MEDIA ENVIRONMENT (SANDY SOIL, DRY PERIODS WITH INTERMITTENT INUNDATION). A LIST OF SUITABLE SPECIES IS INCLUDED.

PLANTS IN 50mm TUBES OR HIKO CELLS ARE SUITABLE FOR PLANTING IN BIORETENTION SYSTEMS. ESTABLISHMENT WATERING WILL BE REQUIRED.

PLANTS WILL NEED TO BE PRE-ORDERED EARLY IN THE DESIGN PROCESS TO ENSURE THEY ARE AVAILABLE AT THE DESIRED TIME. ALL PLANTS SHALL BE VIGOROUS AND HEALTHY AND FREE FROM ROOT BALLING AND WEEDS. THE PLANTS SHALL BE POTTED ON IF A DELAY OCCURS.

DESIGNS MUST CONSIDER SUNLIGHT AVAILABILITY FOR THE PLANTS. THE ORIENTATION OR DEPTH OF THE SYSTEM CAN CAUSE EXCESSIVE PLANT SHADING, ESPECIALLY IN WINTER.

BIORETENTION SYSTEMS SHALL NOT BE MULCHED. IF MULCH IS USED ON ADJACENT BATTERS IT SHALL BE PLACED SO THAT IT WILL NOT BE WASHED INTO THE BIORETENTION SYSTEM.

DURING ESTABLISHMENT EROSION OF THE BOTTOM OF ACCESS RAMPS & AROUND ALL SURCHARGE PITS SHALL BE CONTROLLED USING JUTE.

ACCESS

ACCESS FOR MAINTENANCE IS AN ESSENTIAL PART OF SYSTEM DESIGN AND OPERATION. ALL DESIGNS SHALL ENSURE EASE OF ACCESS WITHOUT UNDUE RISK TO MAINTENANCE PERSONNEL. DEEP BIORETENTION SYSTEMS SHALL INCLUDE AN ACCESS SYSTEM THAT ENSURES MAINTENANCE CREWS CAN EASILY AND SAFELY CARRY OUT REMOVAL OF LITTER, DEBRIS, SEDIMENT, REPLANTING, WEEDING AND REPLACEMENT OF THE FILTER MEDIA.

ESTABLISHMENT / STAGING OF WORKS

IT IS RECOMMENDED THAT BIORETENTION SYSTEMS BE ESTABLISHED OFF-LINE WHEREVER POSSIBLE. THIS ALLOWS VEGETATION TO ESTABLISH WITHOUT BEING IMPACTED BY HIGH STORMWATER FLOWS. DESIGN DRAWINGS SHALL SHOW TEMPORARY WORKS FOR THE ESTABLISHMENT PHASE, SUCH AS A TEMPORARY COVER ON AN INLET, TEMPORARY IRRIGATION AND TEMPORARY EROSION CONTROL. REFER TO BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION FOR FURTHER INFORMATION. STAGES AS FOLLOWS:

WHEN INCORPORATING WATER QUALITY CONTROLS IN A SUBDIVISION DEVELOPMENT, COUNCIL REQUIRES A STAGED IMPLEMENTATION. STAGES TYPICALLY INCLUDE:

1. DURING BULK EARTHWORKS PHASE A SEDIMENT BASIN IN PLACE OF THE FINAL BIORETENTION.
2. FOLLOWING COMPLETION OF BULK EARTHWORKS A SACRIFICIAL BASIN SHOULD BE CONSTRUCTED TO HAVE THE SUBDIVISION CERTIFICATE / LINEN PLANS RELEASED.
3. ONCE 90% OF CATCHMENT DEVELOPMENT IS COMPLETE A FULLY FUNCTIONAL BIORETENTION SYSTEM IS MADE OPERATIONAL. THIS IS AT THE DISCRETION OF COUNCIL WHO MAY VARY THIS REQUIREMENT.

INSPECTION/HOLD POINTS

DURING CONSTRUCTION, IT IS CRITICAL THAT THE DESIGNER UNDERTAKE INSPECTIONS AT KEY POINTS, TO ENSURE THAT BIORETENTION SYSTEMS ARE INSTALLED ACCORDING TO THEIR DESIGN INTENT. THE FOLLOWING MINIMUM HOLD POINTS ARE REQUIRED:

STAGE	INSPECTION AND HOLD POINTS
2	COMPLETION OF BASIN BULK EARTHWORKS AND INSPECTION OF SUBGRADE INCLUDING REMOVAL OF ALL SEDIMENT.
2	INSTALLATION OF GEOTEXTILE AND LINER AS APPROPRIATE.
2	INSTALLATION OF INLET PITS AND PIPES.
2	INSTALLATION OF OUTLET PIT AND PIPES.
2	INSTALLATION OF SLOTTED PIPES AND FLUSHING POINTS.
2	PRIOR TO PURCHASE OF BIORETENTION MEDIA, TRANSITION AND DRAINAGE LAYER, PROVIDE TEST RESULTS, INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
2	INSTALLATION OF DRAINAGE LAYER. INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF TRANSITION LAYER (250mm). INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF GEOTEXTILE A16 OR SIMILAR.
3	INSTALLATION OF SACRIFICIAL MEDIA LAYER & TURF.
3	REMOVAL OF SACRIFICIAL LAYER AND GEOTEXTILE.
3	INSTALLATION OF UPFLOW PITS.
3	INSTALLATION OF PERMEABLE CONCRETE PIPES.
3	INSTALLATION OF REMAINING 200mm OF TRANSITION LAYER. INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF FILTER MEDIA.
3	COMPLETED WORKS, INCLUDING SCOUR PADS.
3	INSITU TESTING OF FILTER MEDIA HYDRAULIC CONDUCTIVITY USING DOUBLE RING INFILTROMETER BY NATA REGISTERED OR AN APPROVED TESTER.
3	PLACEMENT OF JUTE MAT AND PLANTING.
3	CERTIFICATION OF PLANT SPECIES AND DENSITY BY HORTICULTURIST / ECOLOGIST / LANDSCAPE ARCHITECT / ENVIRONMENTAL ENGINEER.

AT EACH STAGE, CHECK THE FINISHED LEVELS AS WELL AS THE QUALITY OF COMPLETED WORK. THE SUPERINTENDENT SHALL PROVIDE CERTIFICATION VERIFYING INSTA COMPLIANCE AT EACH STAGE.

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SURVEYED –
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APPROVED
MANAGER ASSET DESIGN
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CLIENT
DATE

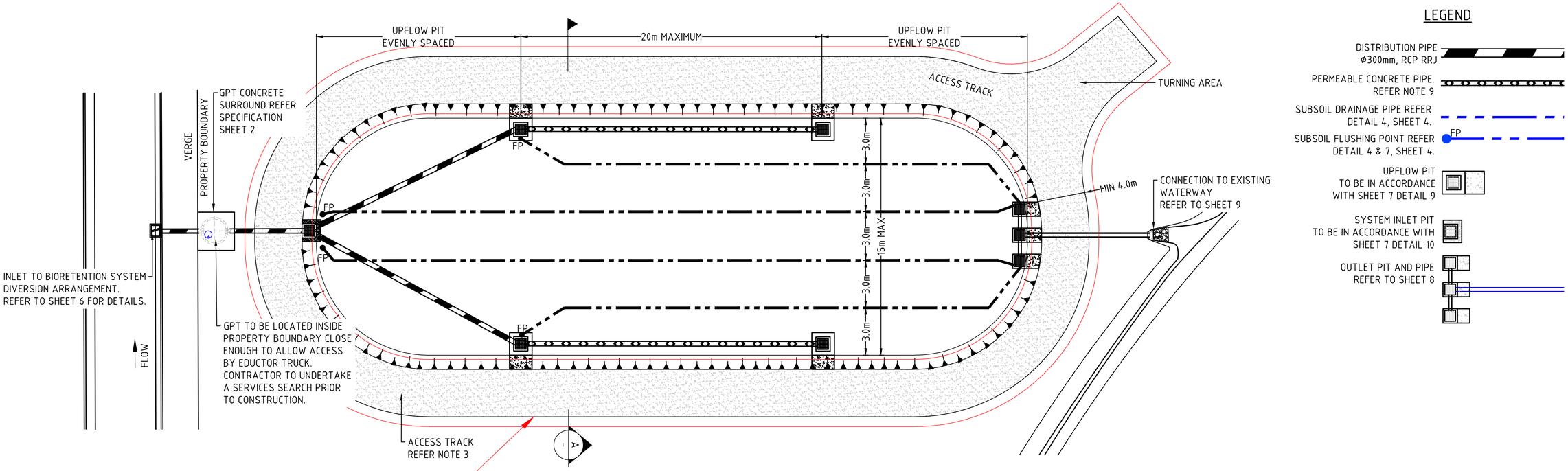
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - STANDARD NOTES
CAD FILE: A(BS)175M.dwg
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ASSET DESIGN



LEGEND

- DISTRIBUTION PIPE Ø300mm, RCP RRJ
- PERMEABLE CONCRETE PIPE. REFER NOTE 9
- SUBSOIL DRAINAGE PIPE REFER DETAIL 4, SHEET 4.
- SUBSOIL FLUSHING POINT REFER DETAIL 4 & 7, SHEET 4. (FP)
- UPFLOW PIT TO BE IN ACCORDANCE WITH SHEET 7 DETAIL 9
- SYSTEM INLET PIT TO BE IN ACCORDANCE WITH SHEET 7 DETAIL 10
- OUTLET PIT AND PIPE REFER TO SHEET 8

PLAN 1
TYPICAL BIORETENTION SYSTEM
NTS

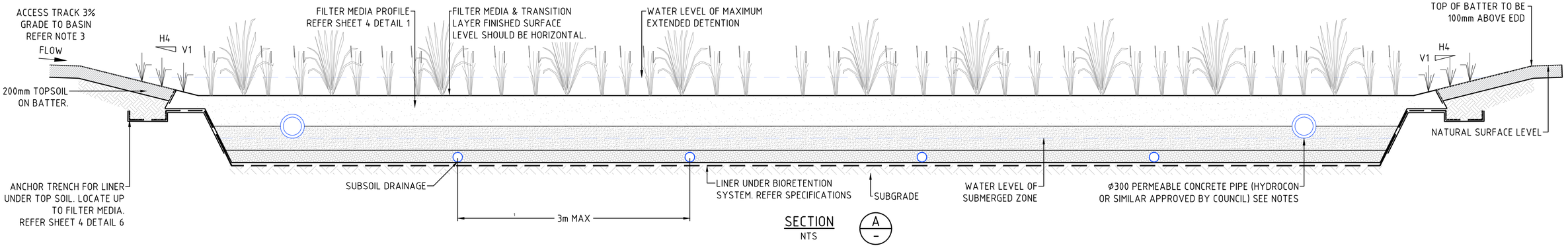
CHANGES AS OF DECEMBER 2021:

1. BIORETENTION DESIGN LAYOUT IS CURRENTLY UNDER REVIEW TO IMPROVE THE INTEGRATION OF SYSTEMS INTO THE PARKLAND LANDSCAPE. PLEASE DISCUSS WITH COUNCIL AT EARLY STAGE OF DEVELOPMENT FOR GUIDANCE AS TO THE CHANGES. SEE PLAN 7 ON PAGE 11 FOR MORE INFORMATION.

2. AS PER DESIGN NOTE 3, THE MAINTENANCE TRACK DETAIL 5 ON PAGE 4 HAS ALSO CHANGED. COUNCIL'S PREFERENCE IS TO REMOVE VEHICLE ACCESS INTO THE PARKLAND SETTING AS TOP PRIORITY. SEEK COUNCIL GUIDANCE FOR MORE DETAIL.

DESIGN NOTES:

1) BIORETENTION SYSTEMS SHALL BE DESIGNED TO ACCEPT ONLY LOW FLOWS WITH A HIGH FLOW BYPASS DIVERTED AROUND THE BIORETENTION SYSTEM.
2) GENERALLY BIORETENTION SYSTEMS ARE DESIGNED TO TREAT THE 6 MONTH PEAK FLOW BEING APPROXIMATELY THE 0.75 x 1 YEAR ARI.
3) THE ACCESS TRACK SHALL BE 4m WIDE AND GRADED WITH A 3% CROSSFALL REFER DETAIL 5 SHEET 4. ACCESS TRACKS SHALL BE DESIGNED FOR ACCESS BY A 9m SERVICE VEHICLE. EVERY PART OF THE BASIN SHALL BE REACHABLE BY AN EXCAVATOR WITH A 9m REACH. A FILTER MEDIA WIDTH OF 15m WILL ACHIEVE THIS OBJECTIVE.
4) SUBSOIL AND PERMEABLE CONCRETE PIPES SHALL BE LAID HORIZONTAL.
5) DESIGNERS SHALL CONSIDER DEPTH OF PIPES & SPECIFY APPROPRIATE PIPE CLASSES.
6) OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.
7) THE OVERFLOW/OUTLET PIT SHALL BE SIZED TO CONVEY THE DESIGN INFLOW SUCH THAT THE DEPTH OF FLOW, H, ABOVE THE PIT INLET LEVEL IS LIMITED TO LESS THAN 100mm USING THE WEIR EQUATION. THE DESIGNER SHALL ASSUME THAT ONLY 50% OF THE WEIR LENGTH IS AVAILABLE AND THE REMAINING 50% IS BLOCKED.
8) FOR BIORETENTION SYSTEMS UP TO 600 m^2, 2 OFF UPFLOW PITS SHALL BE USED. FOR BIORETENTION SYSTEMS > 600 m^2, 4 OFF UPFLOW PITS SHALL BE PROVIDED WITH PERMEABLE CONCRETE PIPES AS SHOWN.
9) PERMEABLE CONCRETE PIPE WITH A MINIMUM IMPEDED EXFILTRATION RATE OF 0.6L/s/m OF PIPE SHALL BE PROVIDED AT A RATE OF 4m OF PIPE PER 100m^2 OF FILTER AREA. . CURRENTLY HYDROCON PIPES SATISFY THIS CRITERIA.
10) UPFLOW PITS SHALL BE LOCATED ON EDGE OF FILTER MEDIA AS SHOWN AND SPACED TO ALLOW AN EVEN DISTRIBUTION OF WATER INTO THE BIORETENTION SYSTEM WITH A MAXIMUM SPACING OF 20m.
11) LINER TO BE IN ACCORDANCE WITH DETAIL 6. SHEET 4.



SECTION
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D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KM	DEC '21
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HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

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CADD AJ
VERIFIED ML
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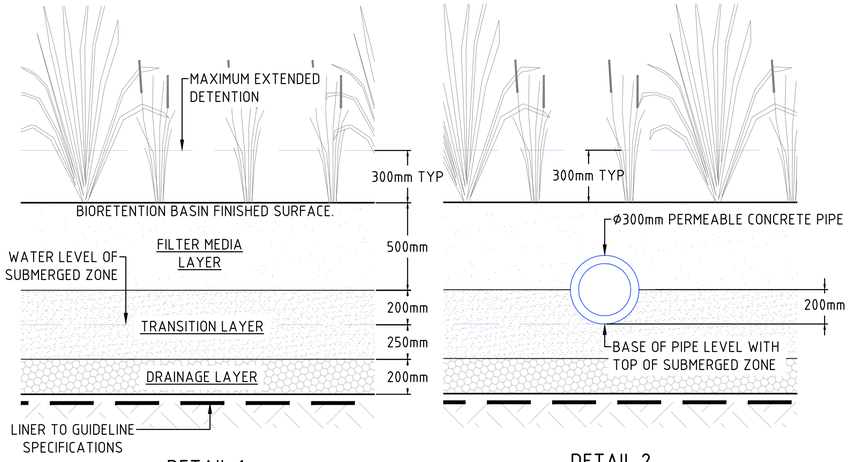
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PLAN 1:1000 @ A1
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VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – GENERAL ARRANGEMENT

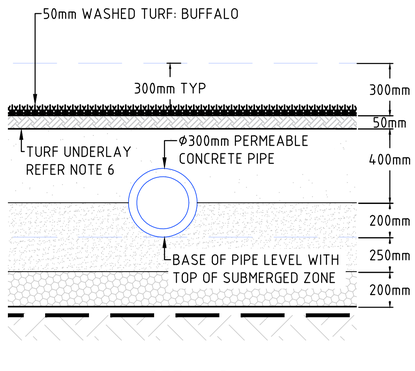
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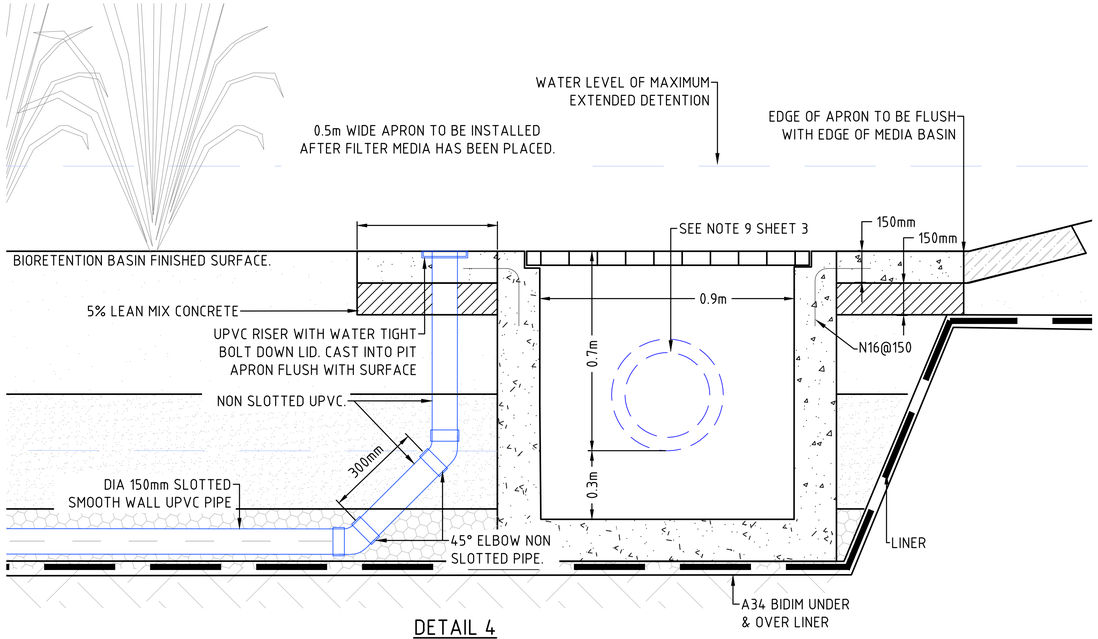


DETAIL 1
TYPICAL BIORETENTION FILTER PROFILE
NTS

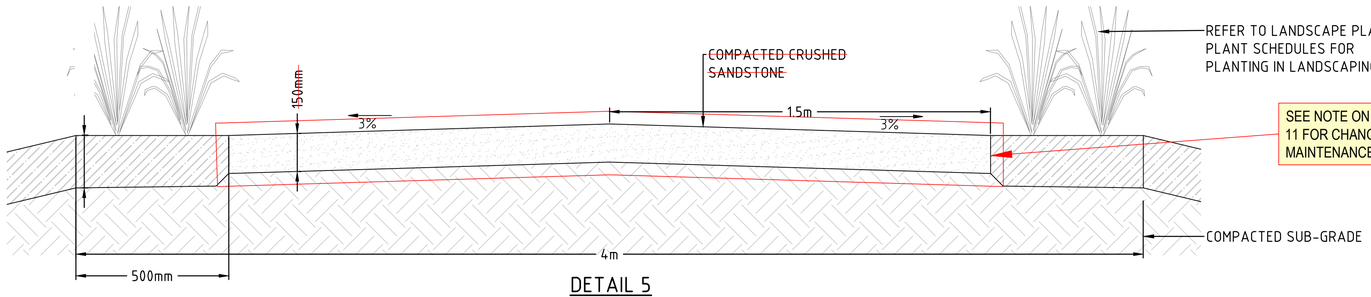
DETAIL 2
BIORETENTION FILTER PROFILE INCLUDING PERMEABLE CONCRETE PIPE
NTS



DETAIL 3
FILTER PROFILE FOR GRASSED SYSTEMS INCLUDING PERMEABLE CONCRETE PIPE
NTS



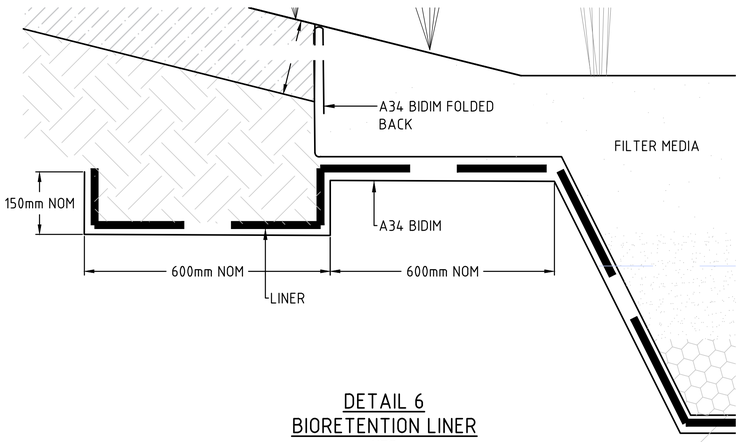
DETAIL 4
UPFLOW PIT, FLUSHING POINT AND DISTRIBUTION PIPE TYPICAL SECTION
NTS



DETAIL 5
MAINTENANCE ACCESS TRACK
NTS

DESIGN NOTES:

1. EDD MAY BE INCREASED TO 500MM WHERE REQUIRED.
2. GEOTEXTILE FABRICS MUST NOT BE USED BETWEEN THE FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS IN BIORETENTION SYSTEMS DUE TO THE RISK OF CLOGGING. THE SOIL SPECIFICATIONS ARE DESIGNED TO LIMIT THE MIGRATION OF PARTICLES THROUGH THE SYSTEM.
3. NO GEOTEXTILE SOCKS TO BE INSTALLED ON THE SLOTTED DRAINAGE PIPES.
4. THE TOP LEVEL OF THE SATURATED ZONE MUST BE LOCATED WITHIN THE TRANSITION LAYER 200mm BELOW THE FILTER MEDIA. THE HEIGHT OF THE SATURATED ZONE IS CONTROLLED BY THE OUTLET LEVEL. REFER SHEET 8
5. FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS SHALL BE PROVIDED IN ACCORDANCE WITH THE SPECIFICATION ON SHEET 2.
6. TURF UNDERLAY SHALL BE A 70:30 SAND:TOPSOIL MIX. SAND SHALL COMPLY WITH THE TRANSITION LAYER SPECIFICATION ON SHEET 2.
7. TOPSOIL SHALL COMPLY WITH AS4419. SITE TOPSOILS MAY BE REUSED PROVIDED THEY HAVE BEEN ASSESSED BY A QUALIFIED HORTICULTURIST OR SOIL SCIENTIST AND AMELIORATED ACCORDING TO THEIR RECOMMENDATIONS.
8. TURF SHALL BE WATERED IMMEDIATELY AFTER LAYING UNTIL UNDERLAY IS MOISTENED TO FULL DEPTH. CONTINUE WATERING AS REQUIRED TO MAINTAIN GROWTH RATES FREE OF STRESS FOR 6 WEEKS.
9. ONCE TURF HAS ESTABLISHED (4-6 WEEKS TYP.) TOP DRESS WITH FILTER MEDIA TO CREATE A LEVEL FINISH, TWO OR MORE ADDITIONAL TOP DRESSES MAY BE REQUIRED DEPENDING ON THE EXTENT OF SETTLEMENT.



DETAIL 6
BIORETENTION LINER
NTS

DETAIL 7
FLUSHING POINT
NTS

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SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - DETAILS
CAD FILE: A(BS)175M.dwg
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PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
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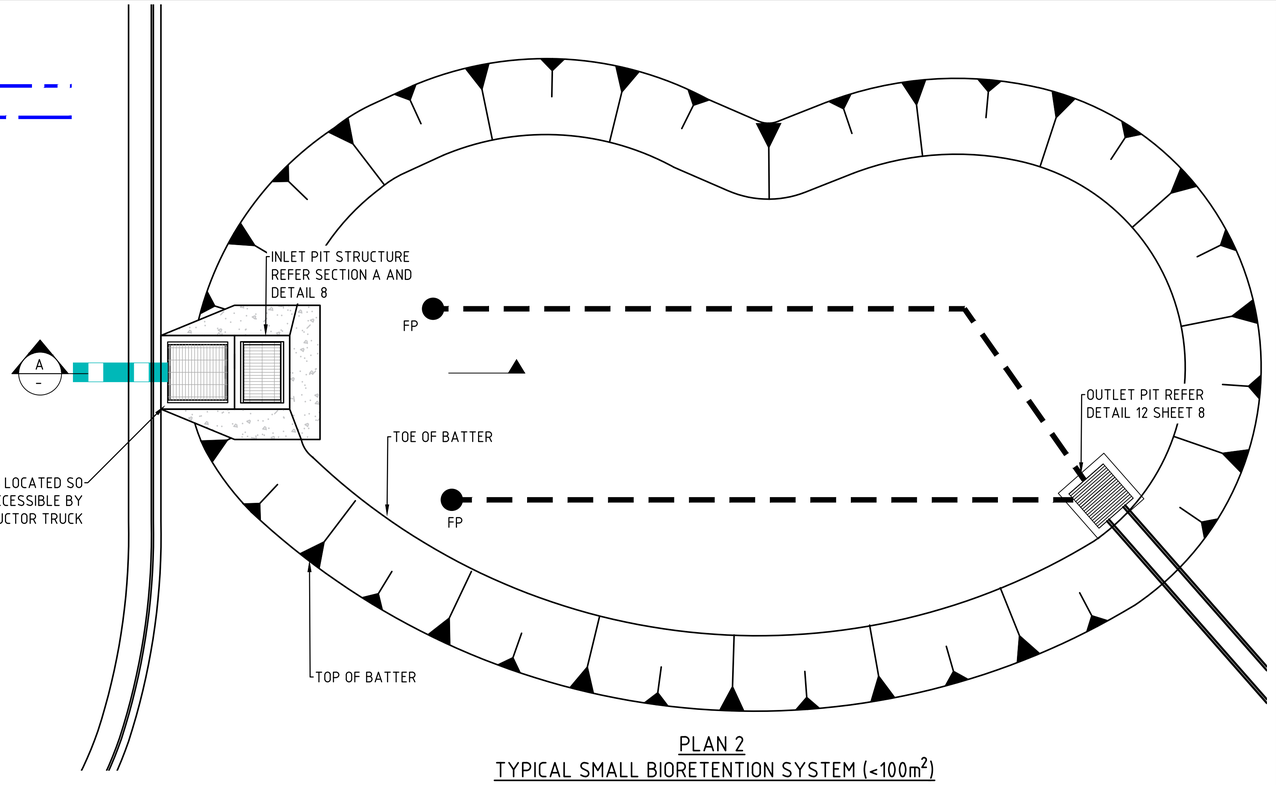
DESIGN NOTES:

1. THIS APPROACH IS TO BE USED FOR BIORETENTION SYSTEMS >30m^2 AND <100m^2. FOR SYSTEMS <30m^2 REFER TO SHEET 10. FOR SYSTEMS LARGER THAN 100m^2 REFER TO LARGE SYSTEMS DETAILS SHOWN ON SHEET 3 ONWARDS.
2. MAXIMUM LENGTH TO BE 20m.
3. FOR CATCHMENTS UP TO 2000m^2 THE MINIMUM REQUIREMENT IS FOR A RAINGARDEN SEDIMENT PIT.
4. FOR CATCHMENTS GREATER THAN 2000m^2; EITHER
   - 4.1. PROVIDE SYSTEM INLET WITH SEDIMENT PIT PLUS A PROPRIETARY GPT TARGETING 90% ANNUAL GROSS POLLUTANT AND HYDROCARBONS REMOVAL AND SIZED FOR 0.75 x 1YR ARI PEAK FLOWS. OR:
   - 4.2. PROVIDE A 200 MICRON ENVIROPOD OR STORMSACK OR APPROVED EQUIVALENT TO EVERY SURFACE INLET PIT OR TRENCH GRATE AND DESIGN THE BIORETENTION FOR 400mm EXTENDED DETENTION DEPTH. TO TREAT HYDROCARBONS.
5. ENSURE THE HGL IN ALL UPSTREAM PITS IS ABOVE THE EDD HEIGHT TO PREVENT UPWELLING ELSEWHERE IN THE SYSTEM & DIRECT ALL OVERLAND FLOWS TOWARDS THE BASIN
6. WHERE THE BIORETENTION FORMS PART OF A DETENTION SYSTEM THE SUBSOIL FLOWS ARE TO DISCHARGE DOWNSTREAM OF THE DISCHARGE CONTROL PIT.
7. AS AN ALTERNATIVE TO THE ARRANGEMENT SHOWN HERE, SMALL SYSTEMS MAY BE CONFIGURED AS LARGE SYSTEMS (REFER SHEETS 3&4) USING PERMEABLE PIPES AND SURCHARGE PITS TO DISTRIBUTE THE FLOW.

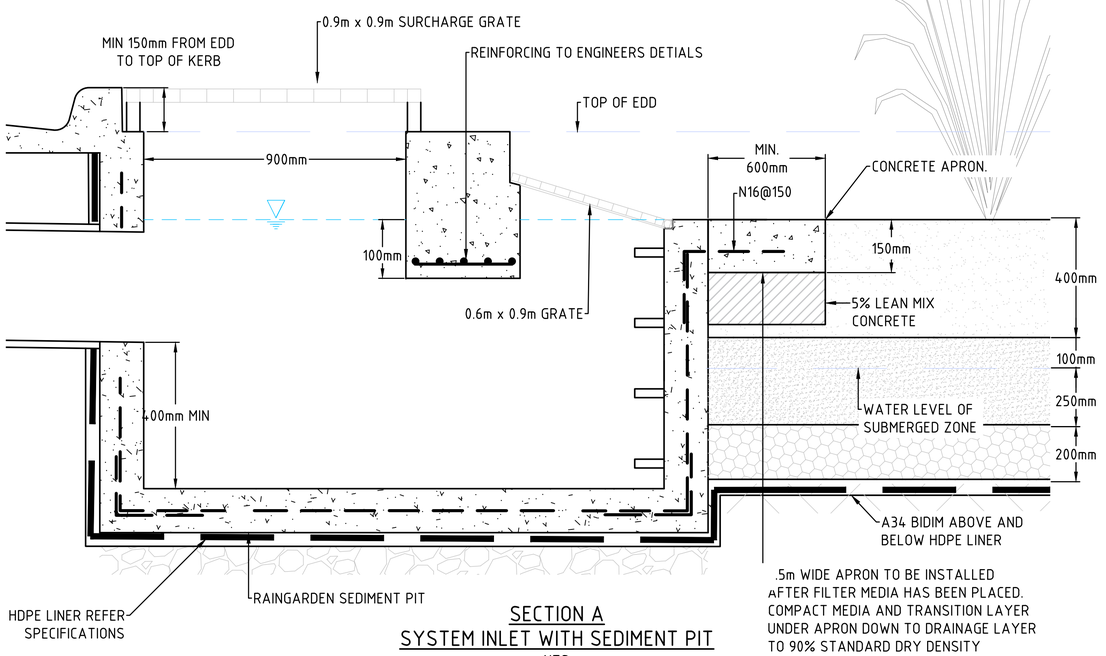
LEGEND

SUBSOIL DRAINAGE PIPE REFER DETAIL 7, SHEET 4.

SUBSOIL FLUSHING POINT REFER DETAIL 7, SHEET 4. (FP)

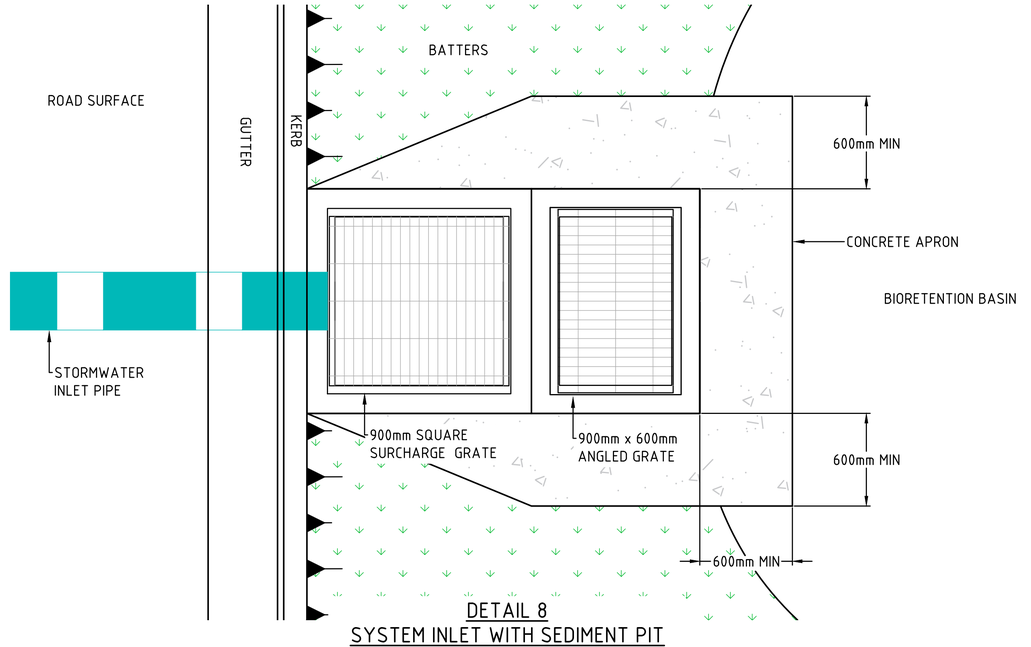


PLAN 2
TYPICAL SMALL BIORETENTION SYSTEM (<100m^2)
NTS



SECTION A
SYSTEM INLET WITH SEDIMENT PIT
NTS

.5m WIDE APRON TO BE INSTALLED AFTER FILTER MEDIA HAS BEEN PLACED. COMPACT MEDIA AND TRANSITION LAYER UNDER APRON DOWN TO DRAINAGE LAYER TO 90% STANDARD DRY DENSITY



DETAIL 8
SYSTEM INLET WITH SEDIMENT PIT AND SCOUR PROTECTION
NTS

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A	MAY '16	ISSUED FOR CONSULTATION	M.L	TN	MAY 16

PUBLIC UTILITIES LEGEND

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HYDRANT	GAS VALVE	TELSTRA PIT
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SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

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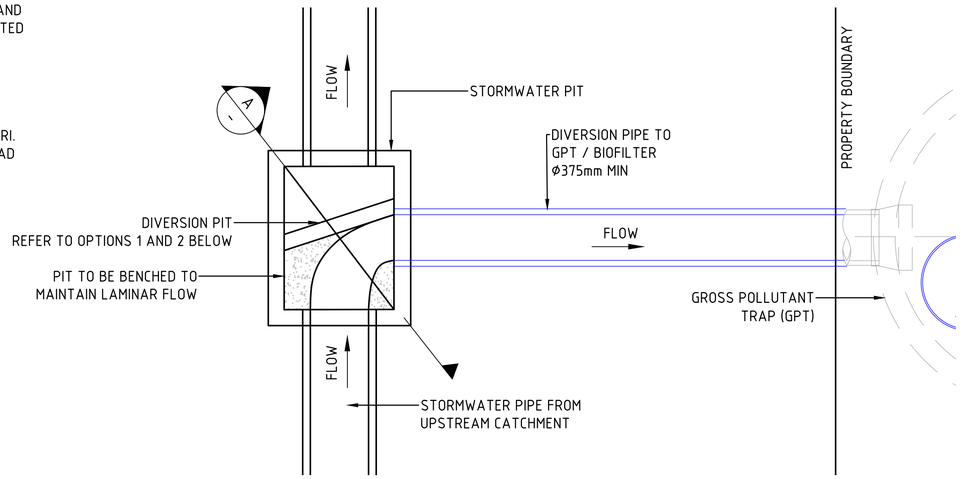
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ISO 9001 International Standards Certifications
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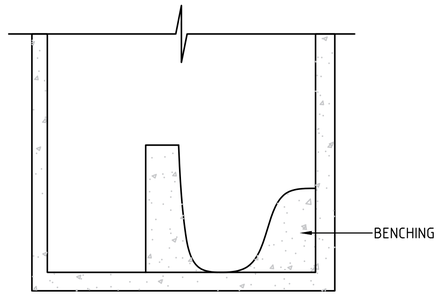
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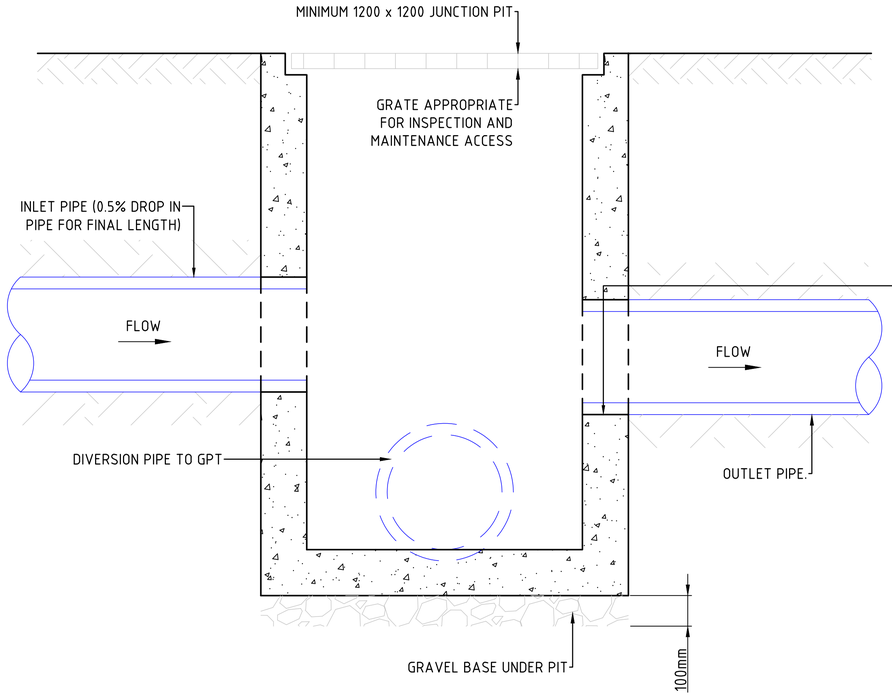
1. DIVERSION PITS ARE KEY POINTS WHERE MAINTENANCE IS OFTEN REQUIRED – CONSIDER ACCESS AND MAINTENANCE TECHNIQUES. SUMPS WILL REQUIRE PERIODIC MAINTENANCE TO REMOVE ACCUMULATED MATERIAL.
2. WEIRS CAN ALSO BE USED TO DIVERT FLOWS WITHIN STORMWATER PITS, HOWEVER CHECK THE HYDRAULIC GRADE LINE TO AVOID IMPACTS ON HYDRAULIC GRADES UPSTREAM.
3. THE MINIMUM SIZE OF DIVERSION PIPE SHALL BE ϕ375mm TO REDUCE BLOCKAGE RISK.
4. THE GRADE AND LEVEL OF THE DIVERSION PIPE SHALL BE DETERMINED BY HYDRAULIC DESIGN. TYPICALLY SYSTEMS SHOULD BE DESIGNED FOR 6 MONTH PEAK FLOW BEING THE 0.75 x 1 YEAR ARI.
5. GPTs SHALL BE DESIGNED TO TREAT 0.75 x 1YR ARI PEAK FLOW & REMOVE 50% ANNUAL TSS LOAD



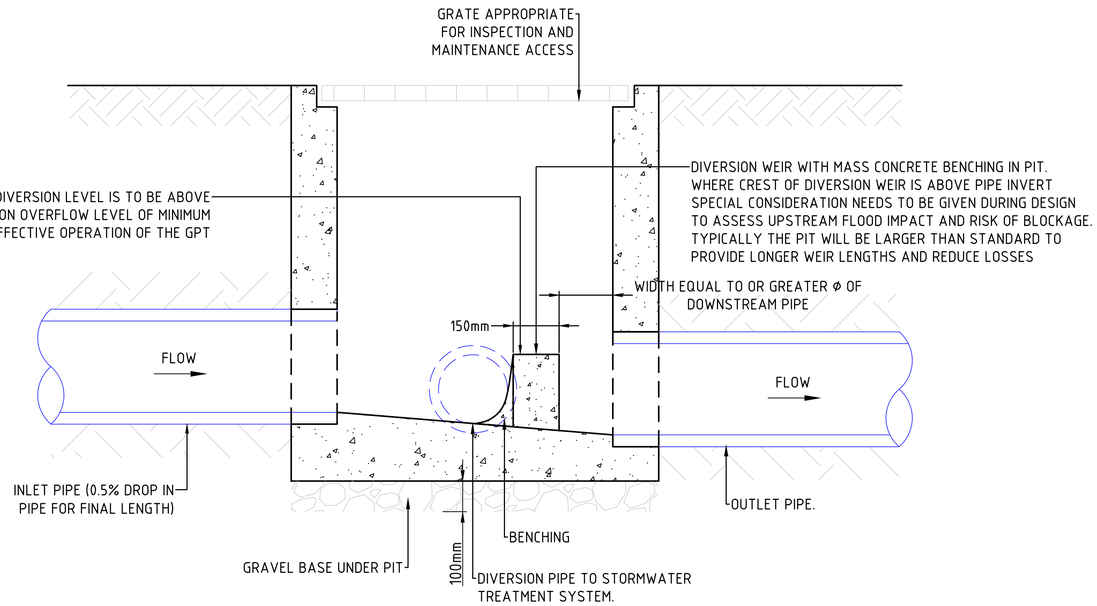
PLAN 3
TYPICAL DIVERSION STRUCTURE FOR PIPED FLOWS
NTS



SECTION A
OPTION 2 BENCHING DETAIL
NTS



DIVERSION PIT OPTION 1
NTS



DIVERSION PIT OPTION 2
NTS

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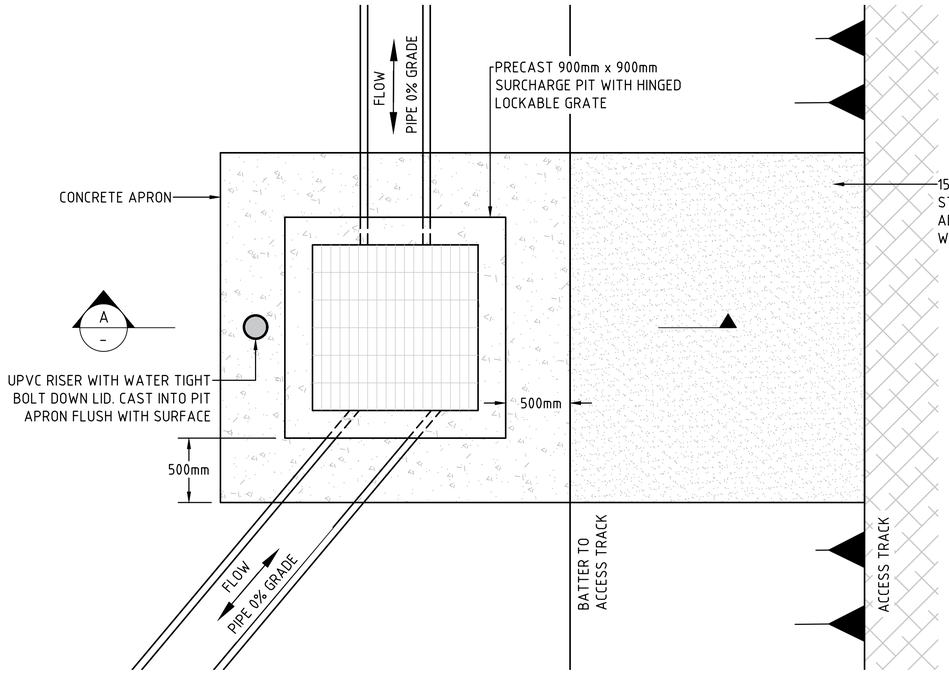
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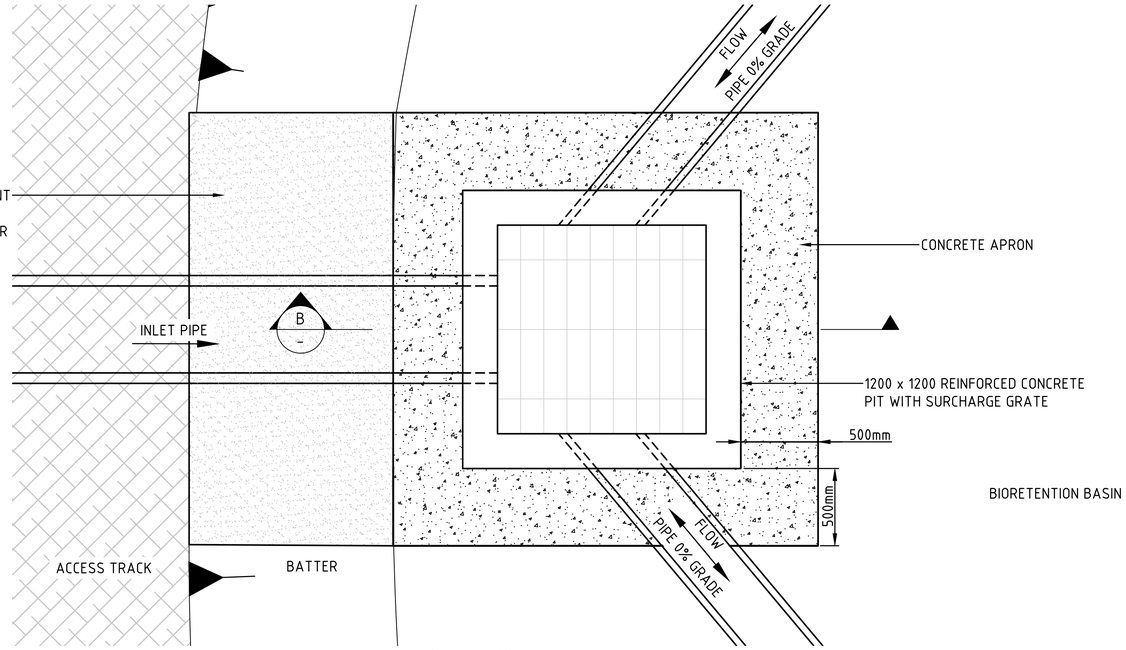
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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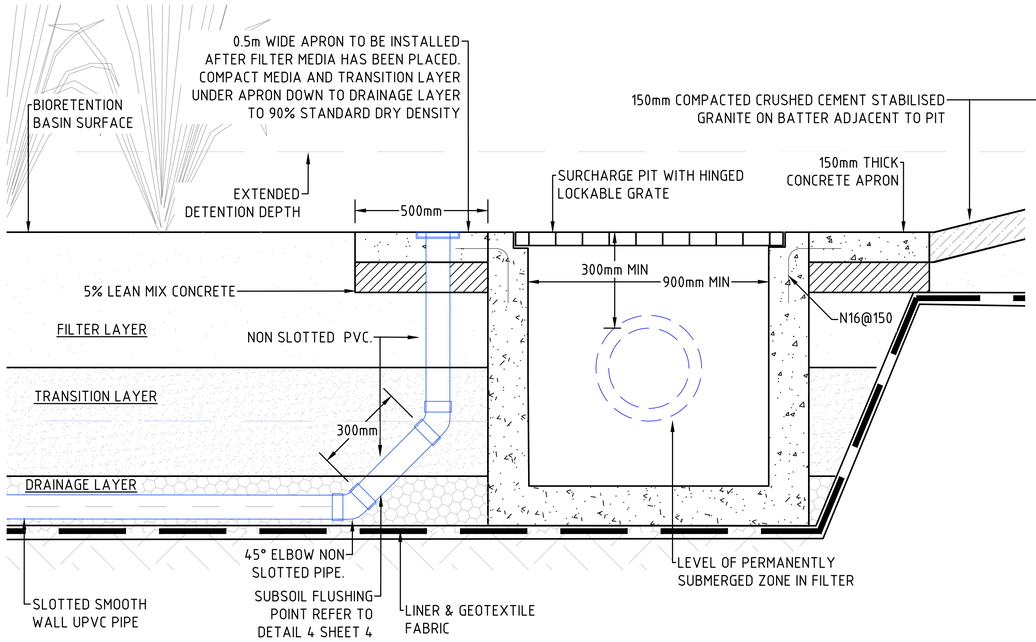
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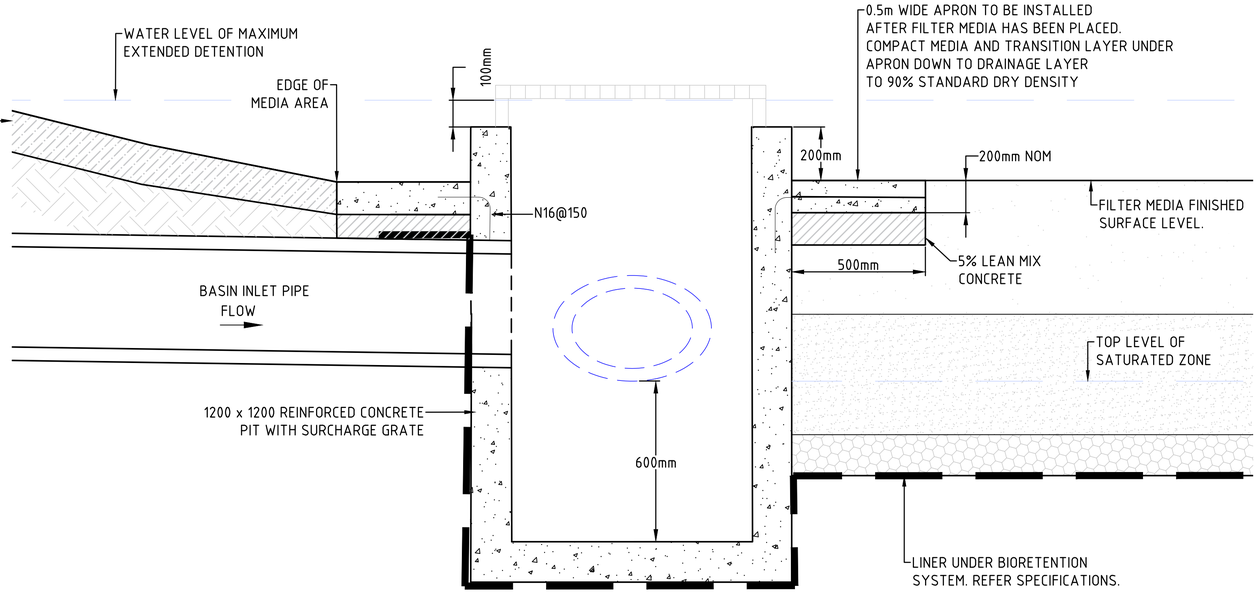
DETAIL 9
TYPICAL UPFLOW PIT OUTLET FOR INSIDE OF BIORETENTION BASIN
NTS



DETAIL 10
SYSTEM INLET PIT
NTS



SECTION A
NTS



SECTION B
NTS

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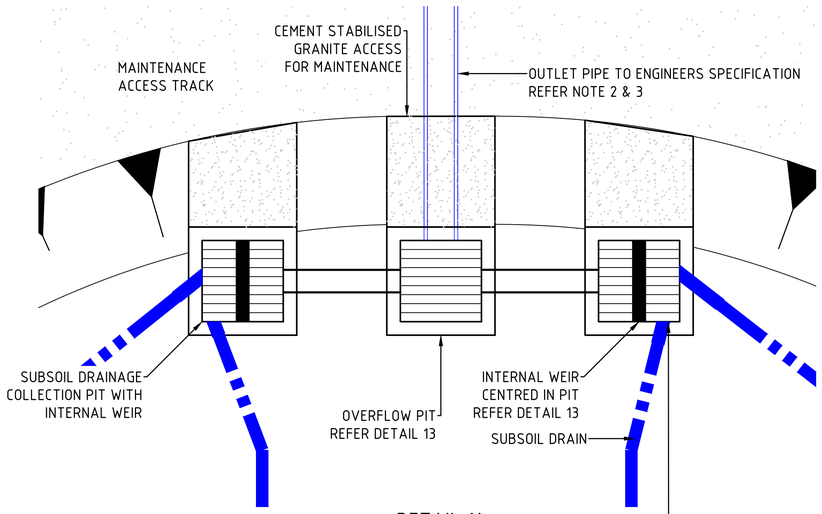
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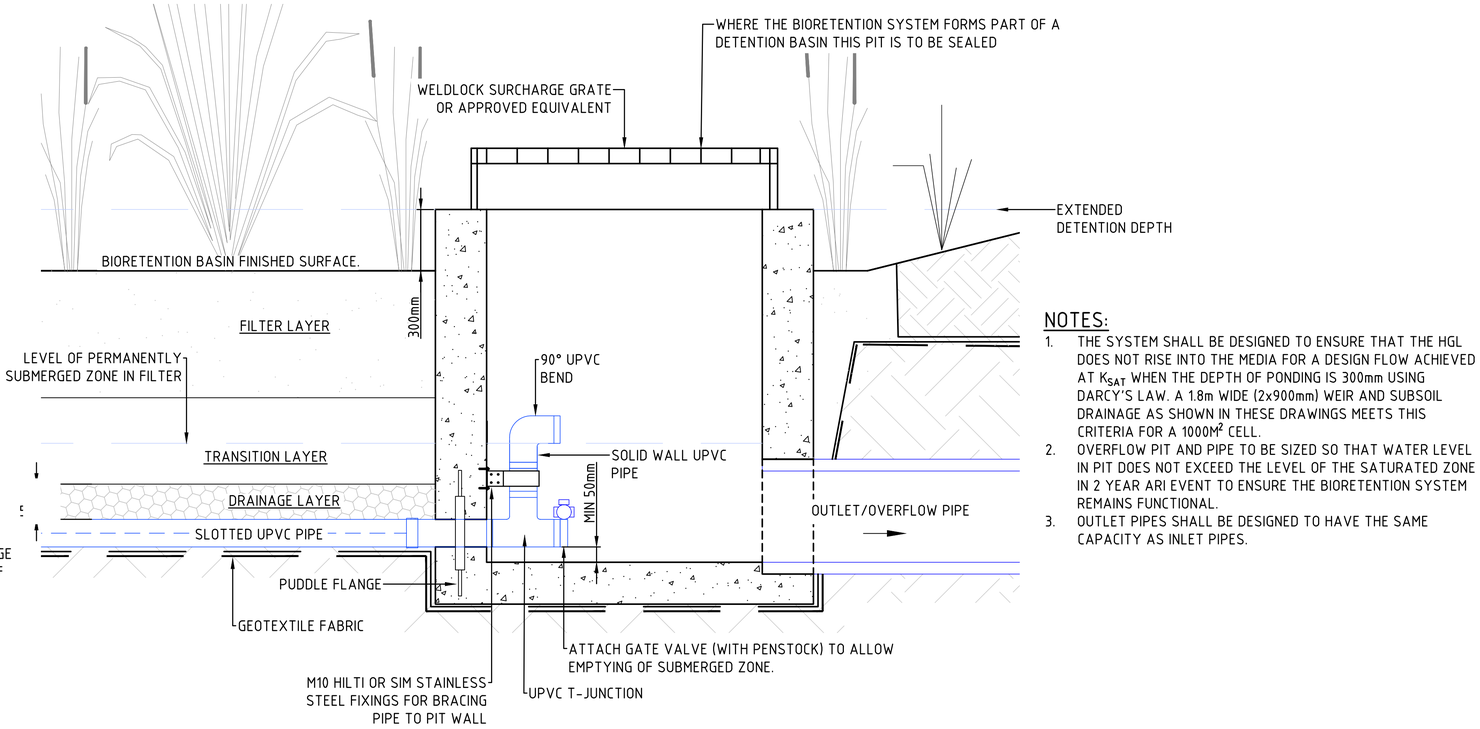
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7 OF 25
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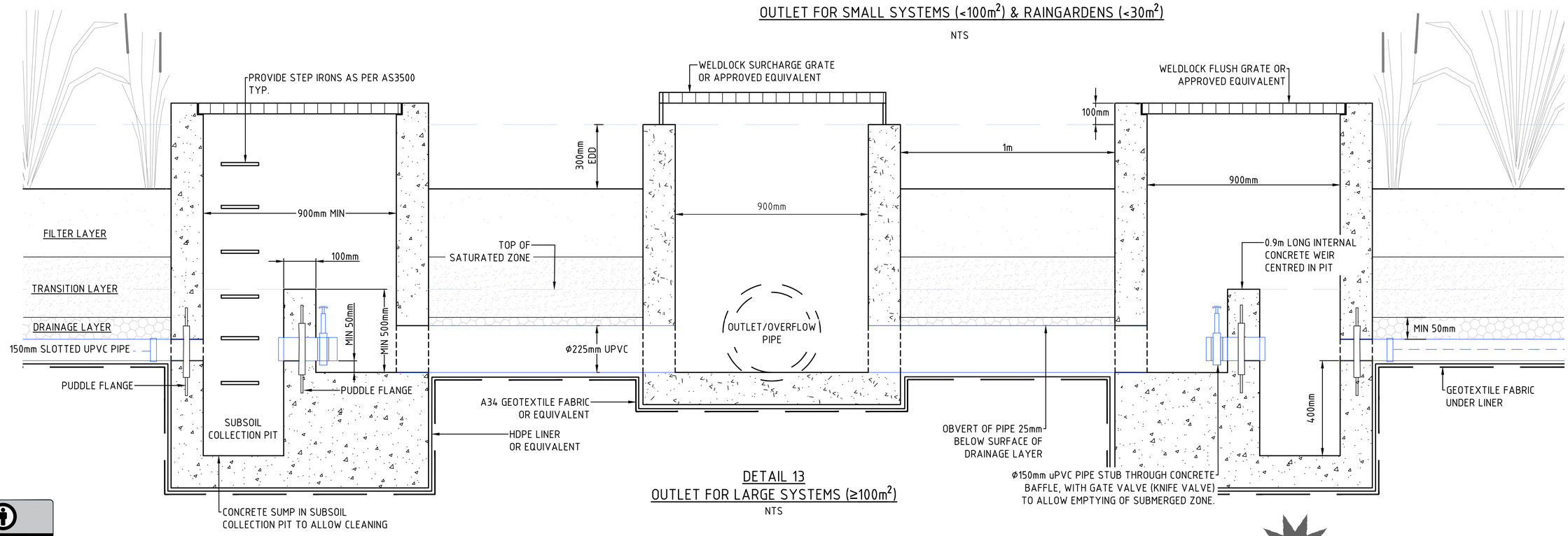


DETAIL 11
OUTLET FROM LARGE BIORETENTION SYSTEM
NTS



NOTES:
1. THE SYSTEM SHALL BE DESIGNED TO ENSURE THAT THE HGL DOES NOT RISE INTO THE MEDIA FOR A DESIGN FLOW ACHIEVED AT K_{SAT} WHEN THE DEPTH OF PONDING IS 300mm USING DARCY'S LAW. A 1.8m WIDE (2x900mm) WEIR AND SUBSOIL DRAINAGE AS SHOWN IN THESE DRAWINGS MEETS THIS CRITERIA FOR A 1000M^2 CELL.
2. OVERFLOW PIT AND PIPE TO BE SIZED SO THAT WATER LEVEL IN PIT DOES NOT EXCEED THE LEVEL OF THE SATURATED ZONE IN 2 YEAR ARI EVENT TO ENSURE THE BIORETENTION SYSTEM REMAINS FUNCTIONAL.
3. OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.

DETAIL 12
OUTLET FOR SMALL SYSTEMS (<100m^2) & RAINGARDENS (<30m^2)
NTS



DETAIL 13
OUTLET FOR LARGE SYSTEMS (≥100m^2)
NTS

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REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
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B	DEC '16	FINAL DRAFT	M.L	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	M.L	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	W	GAS	G	TELSTRA	T
HYDRANT		GAS VALVE		TELSTRA PIT	
STOP VALVE		ELECTRICITY	E	TELSTRA PILLAR	
WATER METER	M	ELECTRICITY PIT		TELSTRA POLE	
WATER TAP		POWER POLE		STORMWATER PIT	
SEWER	S	POWER LIGHT POLE			
SEWER LAMPHOLE		LIGHT POLE			
SEWER MANHOLE		STAY POLE			

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED –
DESIGNED –
CADD AJ
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APPROVED
MANAGER ASSET DESIGN
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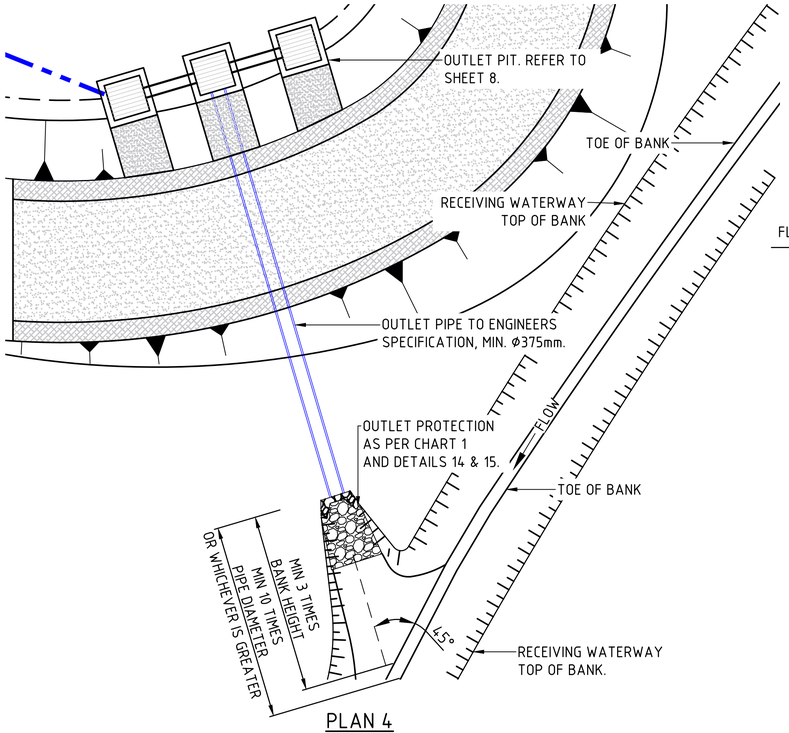
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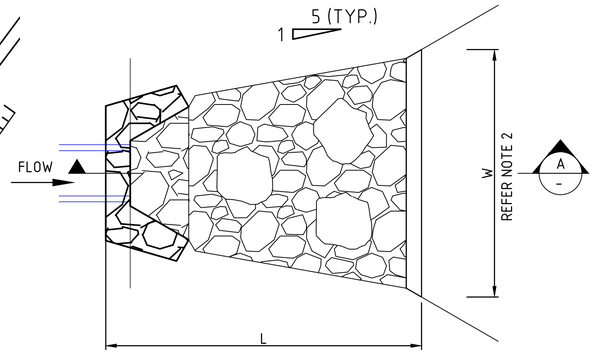
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LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – OUTLET STRUCTURES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

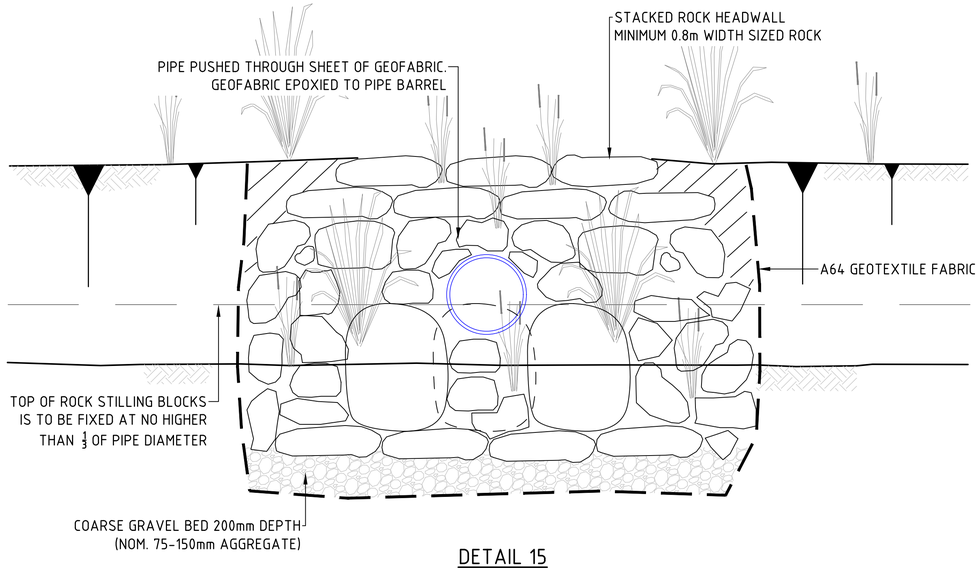
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PLAN 4
OUTLET TO WATERWAYS
NTS



DETAIL 14
TYPICAL ROCK OUTLET PAD LAYOUT
NTS



DETAIL 15
TYPICAL ROCK HEADWALL TREATMENT FOR CHANNEL OUTLET WORKS
NTS

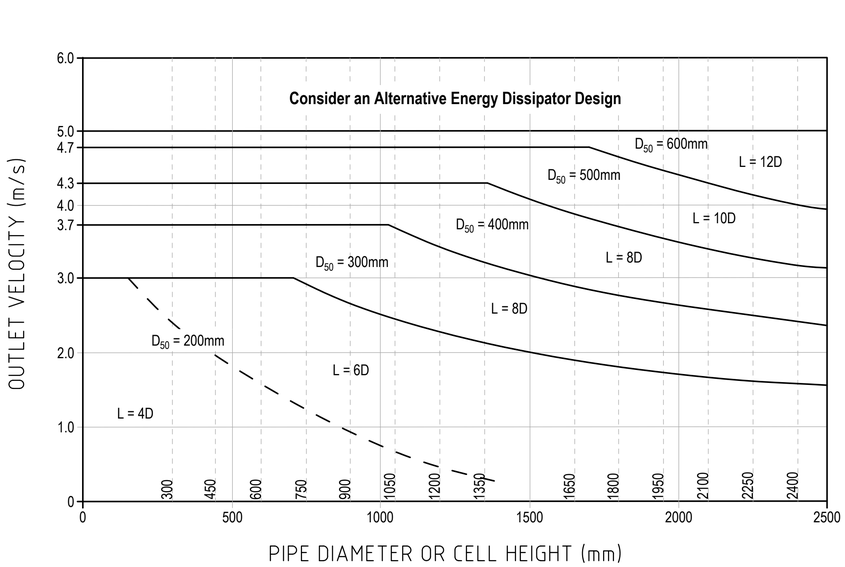


CHART 1
SIZING OF STORMWATER OUTLET SCOUR PROTECTION
NTS

NOTES:

1. READ 'L' FROM CHART 1. LEFT.
2. W = 3 TIMES PIPE DIAMETER 'D'.
3. THE MEDIAN ROCK SIZE D_{50} AND LENGTH (L) OF ROCK SCOUR PROTECTION DOWNSTREAM OF STORMWATER OUTLETS IS TO BE DETERMINED USING CHART 1. MIN. D_{50} = 200mm
4. ROCK IS TO BE GRADED IN ACCORDANCE WITH THE ROCK SIZE DISTRIBUTION TABLE AS SHOWN BELOW
5. IN THE EVENT THE WIDTH OF THE OUTLET CHANNEL IS LESS THAN THE DESIGN WIDTH OF THE ROCK APRON, THE ROCK SCOUR PROTECTION SHALL EXTEND UP TO THE BANK TO EITHER THE HEIGHT OF THE OBVERT OF PIPE OR CULVERT OR TO THE DESIGN TAILWATER LEVEL.
6. REFER TO 'BCC ENGINEERING GUIDE FOR DEVELOPMENT' TO ASSESS CHANNEL HYDRAULICS.

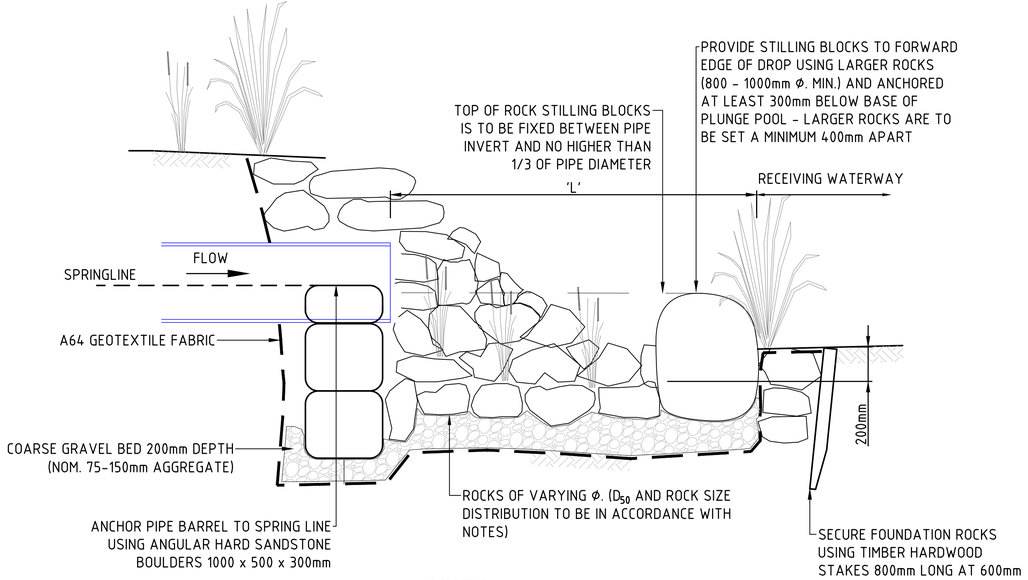
REFERENCES:

- BRISBANE CITY COUNCIL (BCC) 2003 "STORMWATER OUTLETS IN PARKS AND WATERWAYS"
- NSW OFFICE OF WATER: GUIDELINE FOR OUTLET STRUCTURES ON WATERFRONT LANDS.

ROCK SIZE DISTRIBUTION TABLE

D_{100}/D_{50} - 2.0	D_{33}/D_{50} - 0.50
D_{90}/D_{50} - 1.8	D_{25}/D_{50} - 0.45
D_{75}/D_{50} - 1.5	D_{10}/D_{50} - 0.20
D_{65}/D_{50} - 1.3	
D_{40}/D_{50} - 0.65	

D_x = NOMINAL ROCK DIAMETER OF WHICH x% OF THE ROCKS IS SMALLER



SECTION A
NTS

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DATUM: AHD
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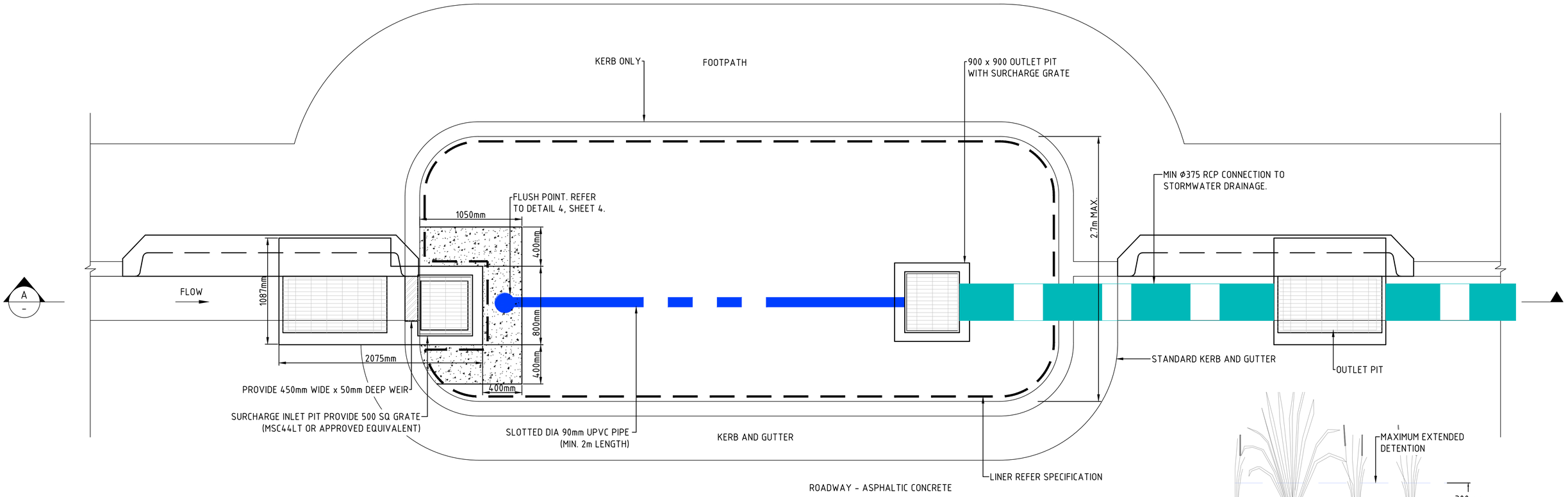
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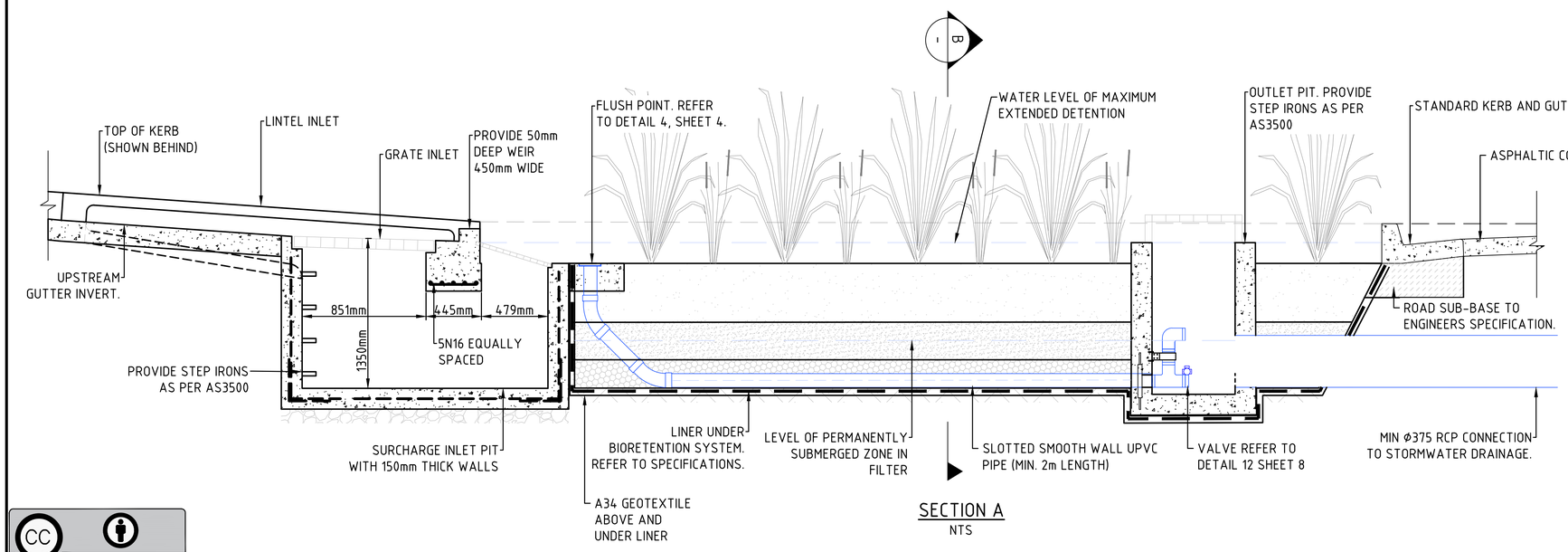
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - OUTLET SCOUR PROTECTION
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN



PLAN 6
BIORETENTION SYSTEM - ROADWAY / TRAFFIC CALMING DEVICE
NTS



SECTION A
NTS

SECTION B
NTS

DESIGN NOTES:

1. THIS DESIGN APPROACH SHALL BE USED WHERE THE RAINGARDEN IS < 30m² FOR CATCHMENTS UP TO 2000m²
2. FOR APPLICATIONS NOT IN A ROADWAY THE ARRANGEMENT SHALL BE MODIFIED TO SUIT SITE CONDITIONS
3. IN THE ROADWAY THE KEY CONSIDERATIONS ARE TRAFFIC AND DRAINAGE.
4. USE STANDARD KERB & GUTTER TO EXCLUDE VEHICLES.
5. THE ROAD IS OFTEN A MAJOR OVERLAND FLOWPATH. ESTIMATE DESIGN FLOWS AND VELOCITIES AND CONSIDER HOW THESE FLOWS WILL BE ACCOMMODATED.
6. CONSIDER IMPACT OF VEGETATION ON VISUAL SIGHT DISTANCE.
7. THE DRAWINGS SHOW THE TYPICAL LOCATION OF STORMWATER DRAINAGE PIPES WITHIN THE STREET, HOWEVER OTHER SERVICES ARE ALSO OFTEN LOCATED WITHIN THE ROADWAY. CONSIDER EXISTING UTILITY LOCATIONS AND/OR ALLOCATIONS FOR FUTURE WORKS WHEN LOCATING WSUD MEASURES.
8. A LINER IS REQUIRED TO PREVENT EXFILTRATION.
9. EMPLOY BICYCLE FRIENDLY DESIGN PRINCIPLES. REFER RMS(2005).
10. KERBS AND FOOTINGS IN THE ROADWAY MUST BE DESIGNED TO WITHSTAND VEHICLE IMPACT.

REFERENCES:

- CITY OF SYDNEY'S STANDARD DRAWING 7.2.9 "RAINGARDENS - SURCHARGE INLET PIT"

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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

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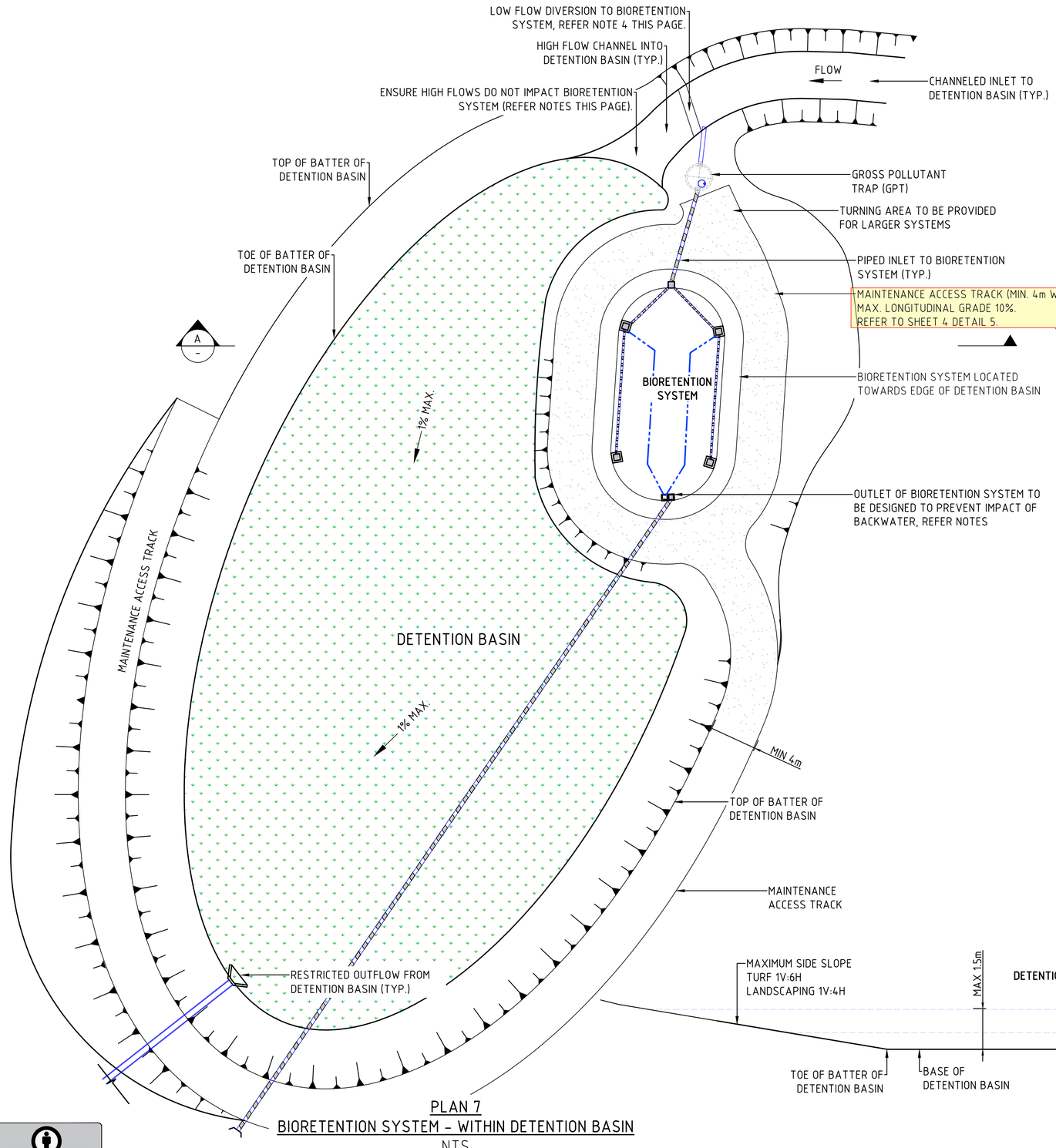
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LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - RAINGARDEN SYSTEM LESS THAN 30m²

CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certification
Lic No.QAC/R61/0103
ASSET DESIGN

REV D



PLAN 7

BIORETENTION SYSTEM – WITHIN DETENTION BASIN

NTS

SECTION A

NTS

DESIGN NOTES:

1. DESIGN OF STORMWATER DETENTION BASIN IS TO BE UNDERTAKEN BY SUITABLY QUALIFIED ENGINEER TO MEET THE DESIGN OBJECTIVES FOR THE SITE.
2. THE INCLUSION OF A BIORETENTION SYSTEM FOR STORMWATER TREATMENT MUST NOT IMPACT ON THE FUNCTION OF THE DETENTION SYSTEM.
3. WHERE TREATED FLOWS DRAIN TO A NATURAL WATERWAY, ENSURE THAT THE SYSTEM OUTLET CAN CONNECT INTO THE STREAM WITHOUT LOWERING THE BED LEVEL.
4. ONLY TREATABLE FLOW TO BE DIVERTED TO BIORETENTION BASIN. FLOW TO BE DIVERTED WILL BE DETERMINED DURING DETAILED DESIGN TO MEET THE STORMWATER TREATMENT OBJECTIVES FOR THE SITE. THIS IS TYPICALLY THE 6 MONTH ARI PEAK FLOWS.
5. THE OUTLET OF THE BIORETENTION SYSTEM IS TO BE DESIGNED SO THAT BACKWATER DOES NOT IMPACT ON THE TREATMENT FUNCTION OF THE BIORETENTION BASIN UP TO AND INCLUDING THE 2 YEAR ARI STORM EVENT.
6. ENSURE BIORETENTION SYSTEM IS CONSTRUCTED SO THAT HIGH FLOWS INTO THE DETENTION BASIN DO NOT IMPACT ON THE INTEGRITY OF THE BIORETENTION SYSTEM.
7. THE NUMBER OF PIPES OR CULVERTS THROUGH DETENTION BASIN EMBANKMENT IS TO BE MINIMISED.
8. BIORETENTION SUBSOIL AND OUTFLOWS SHALL BE KEPT SEPARATE FROM DETENTION BASIN OUTFLOWS TO ENSURE EACH FUNCTIONS HYDRAULICALLY INDEPENDENTLY.
9. THE EMBANKMENT SHALL BE DESIGNED & SPECIFIED AS A WATER RETAINING STRUCTURE TO PREVENT PIPING FAILURE. THE DESIGN SHALL BE VERIFIED BY A GEOTECHNICAL ENGINEER
10. BASIN EMBANKMENT SHALL BE DESIGNED TO BE STABLE IN A PMF & VERIFIED BY AN EXPERIENCED GEOTECHNICAL ENGINEER

CHANGES AS OF DECEMBER 2021:

1. CONSULT WITH COUNCIL AT AN EARLY STAGE TO GET THE LATEST INFORMATION.
2. GENERALLY, THE PLACEMENT OF BIORETENTION SYSTEM IN PARKLAND SETTING PRIORITIES:
   a. COMMUNITY ACCESS AND USABILITY OF THE PARK
   b. IMPROVED AESTHETICS
3. THE DESIGN OF THE MAINTENANCE TRACKS IS TO BE PRIORITISED IN THE BELOW ORDER:
   a. REMOVE ACCESS INTO PARK FOR HEAVY VEHICLES BY PLACING BIORETENTION SYSTEM NEAR PERIMETER ROAD.
   b. ONLY ALLOW 1 ACCESS PATH BY MEANS OF A SHARED USER PATH WITH SYSTEMS ON EITHER SIDE OF PATH.
   c. REPLACE GRAVEL MAINTENANCE ACCESS PATHS WITH STRUCTURED GRASS CELLS.

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SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD

GRID: MGA

SHEET SIZE: A1

TITLE BLOCK VERSION: A

SURVEYED: –

DESIGNED: –

CADD: AJ

VERIFIED: ML

DATE: FEB '17

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MANAGER ASSET DESIGN

DATE FEB '17

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PLAN 1:1000 @ A1

LONG SECTION:HORIZ

VERT

CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS

SHEET TITLE: BIORETENTION – WITHIN FLOOD DETENTION BASIN

CAD FILE: A(BS)175M.dwg

FILE No: N/A

PLAN No: A(BS)175M

ISO 9001 International Standards Certifications

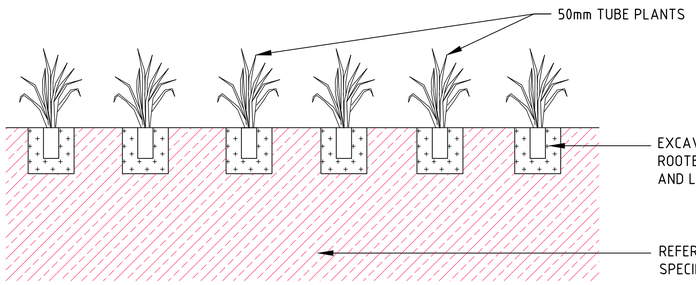
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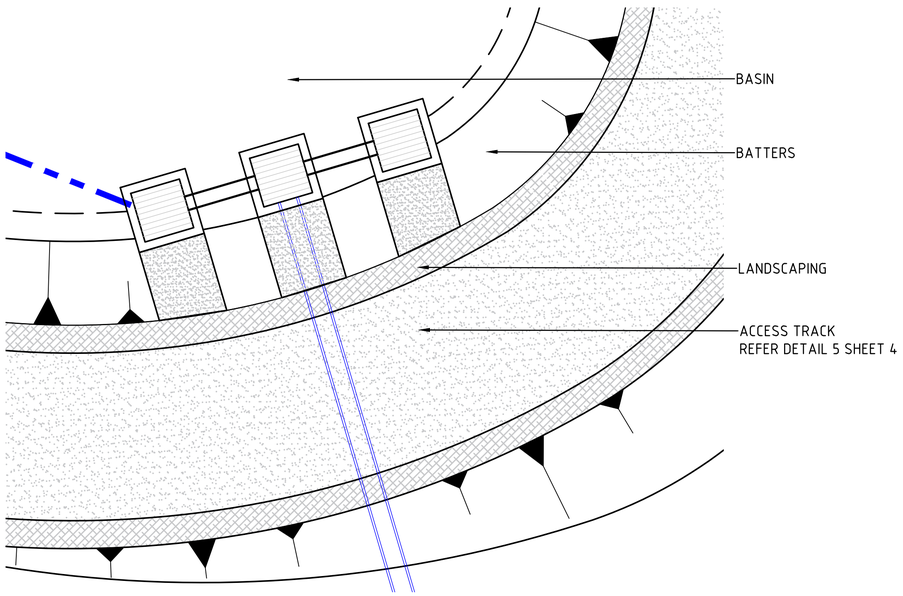
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DESIGN NOTES:

1. VEGETATION COVER IS AN ESSENTIAL FUNCTIONAL COMPONENT OF THE BIORETENTION BASIN
2. PLANTS ARE TO BE 25mm HIKO CELLS OR 50mm TUBESTOCK
3. PLANTING SHOULD OCCUR NO LATER THAN 14 DAYS AFTER INSTALLATION OF THE FILTER MEDIA. AFTER PLANTING THE SOIL SHOULD BE RE-INSTATED TO A FLAT SURFACE.
4. THE PLANTS SHALL BE PLANTED AS A MATRIX ENSURING A DIVERSE COVERAGE.
5. PLANTING SHOULD INCORPORATE SEVERAL TYPES OF VEGETATION INCLUDING SHRUBS AND GRASSES AND TUFTED PLANTS FROM THE PLANTING LIST.
6. A MINIMUM OF 4 DIFFERENT SPECIES IS REQUIRED FOR RAINGARDENS (<30m^2), A MIN OF 6 FOR SMALL SYSTEMS < 100m^2 & 10 OR MORE FOR LARGE SYSTEMS (>100m^2).
7. PLANT ESTABLISHMENT AND WATERING IS REQUIRED FOR 12 MONTHS FROM PLANTING.
8. NO SURFACE MULCHING OF BIORETENTION BASINS IS PERMITTED.
9. NO WEED MAT OR HYDRO-MULCH IS TO BE APPLIED TO THE SURFACE OF THE BIORETENTION BASIN FOLLOWING THE CONSTRUCTION PHASE (I.E. IN ITS FINAL DESIGN FORM, VEGETATED AS PER PLANTING SCHEDULE), AS THIS WILL HINDER FILTRATION OF STORMWATER THROUGH THE FILTER MEDIA. JUTE MATTING IS PERMITTED.
10. 40% OF COVERAGE SHALL COMPRISE OF THE PLANTS MARKED WITH ×××
11. PLANTS FROM THE PREFERRED PLANTING LIST SHALL BE PLANTED IN PREFERENCE TO PLANTS FROM THE ALTERNATIVE PLANTING LIST. PLANTS FROM THE ALTERNATIVE PLANTING LIST CAN BE USED WHERE PREFERED PLANTS ARE COMMERCIALLY UNAVAILABLE.
12. PLANTING SHALL IDEALLY OCCUR FROM OCTOBER TO MARCH TO IMPROVE VIABILITY OF JURENILE PLANTS.
13. ALL PLANTS SHALL BE HARDENED PRIOR TO PLANTING.
14. SOME PLANTS MAY NOT BE AVAILABLE COMMERCIALLY & MAY NEED TO BE GROWN FROM SEED. THIS CAN TAKE UP TO 12 MONTHS. PLANNING OF PLANTING STAGE SHALL TAKE LONG LEAD IN TIMES INTO ACCOUNT.
15. THE FINAL PLANTING LIST SHALL BE APPROVED BY COUNCIL.



DETAIL 17
TYPICAL PLANTING
NTS



PLAN 8
BIORETENTION PLANTING ZONES
NTS

PREFERED PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Tall Sedge ***	*Carex appressa*	Tufted short rhizomatous, 1.2 h	8-10	Basin
Blue Flax-Lily	*Dianella revoluta*	Tufted perennial herb, 1 h	8-10	Basin
Wallaby Grass ***	*Rytidosperma tenuior, Austrodanthonia tenuior, Danthonia tenuior*	Tufted perennial grass, 1.2 h	8-10	Basin
Common Rush ***	*Juncus usitatus*	Tufted short rhizomatous, 1 h	8-10	Basin
Kangaroo Grass ***	*Themeda trianda, Themeda australis*	Densely tufted leafy perennial, 1.2 h	8-10	Basin
Knobby Club Rush ***	*Ficina nodosa*	Rhizomatous perennial, 1 h	8-10	Basin
Eskdale, Tussock Grass	*Poa labillardieri*	Densely tufted perennial grass, 0.6 h	8-10	Basin
Gorse Bitter Pea	*Daviesia ulicifolia*	Small shrub, 2 h	1 per 2 m^2	Basin & Batters
Pink Honey Myrtle	*Melaleuca erubescens*	Hard, rough barked shrub, 2 m	1 per 2 m^2	Basin & Batters
Blueberry Lily	*Dianella longifolia*	Perenial rhizomatous tufted herb, 1 h	8-10	Batters & Landscape
Wattle Mat-rush	*Lomandra filiformis*	Perennial tussock, 0.5 h	8-10	Batters & Landscape
Tanika, Spiny Mat-rush	*Lomandra longifolia*	Perennial weeping tussock, 0.7 h	8-10	Batters & Landscape
Weeping Grass	*Microlaena stipoides*	Slender, tufted perennial grass, 0.7 h	8-10	Batters & Landscape
Pale Rush	*Juncus pallidus*		8-10	Basin
Sea Rush	*Juncus kraussii*	Tussock, rhizomatous perennial, 1 m	8-10	Basin
N/A	*Lachnagrostis filiformis*	Erect perennial grass, 0.7 h	8-10	Basin
N/A	*Lachnagrostis billardierei*	Erect perennial grass, 0.7 h	8-10	Basin
Chaffy Saw-sedge	*Gahnia filum*	Tussock forming perennial, 1 h	8-10	Basin
N/A	*Cyperus polystachyos*	Tufted perennial, short rhizome, 0.6 h	8-10	Basin
N/A	*Austrostipa stipoides*	Tufted perennial grass, 1.2 h	8-10	Basin
Tassel Sedge	*Carex fascicularis*	Tufted rhizomatous perennial, 1 h	8-10	Basin
Swamp Foxtail Grass	*Pennisetum alopecuroides*	Clumping tussocks perennial, 1.5 h	8-10	All
N/A	*Baloskion / Restio pallens*	Dioecious perennial herb, 1 h	8-10	Basin
N/A	*Schoenoplectus mucronatus*	Tufted perennial, 1 h	8-10	Basin
Marsh Clubrush	*Bolboschoenus fluviatilus*	Rhizomatous tufted perrenial, 2.5 h	8-10	Basin
N/A	*Bolboschoenus caldwellii*	Rhizomatous tufted perrenial, 1 h	8-10	Basin

THE PLANTS IN THIS LIST HAVE BEEN SELECTED SPECIFICALLY FOR WESTERN SYDNEY CONDITIONS BY HUNTER & SAINTY
h REFERS TO MATURE HEIGHT (m)

ALTERNATIVE PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Corkscrew Grass	*Austrostipa setacea*	Tufted perennial grass, 0.8h	8-10	Basin
Barbed Wire Grass	*Cymbopogan refractus*	Tufted perennial grass, 1 h	8-10	Basin
Shorthair Plume Grass	*Dichelachne micrantha*	Tufted perennial grass, 1.2 h	8-10	Basin
Forest Hedgehog Grass	*Echinopogon ovatus*	Rhizomatous perennial, 1.2 h	8-10	Basin
Wiry Panic Grass	*Entolasia stricta*	Shrubby rhizomatous perennial, 0.8 h	8-10	Basin
Paddock Lovegrass	*Eragrostis leptostachya*	Loosely tufted perennial, 1 h	8-10	Basin
Hop Goodenia	*Goodenia ovata*	Erect, ascending or prostate shrub, 2 h	1 per 2 m^2	Basin & Batters
Sticky Hop Bush	*Dodonaea viscosa*	Small shrub to tree, 8 m	1 per 2 m^2	Batters & Landscape
N/A	*Cyperus laevigatus*	Rhizomatous perennial, 0.6 h	8-10	Basin
Queensland Bluegrass	*Dichantheum sericeum*	Tufted warm season perennial, 1.2 h	8-10	Basin

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A	MAY '16	ISSUED FOR CONSULTATION	M.L	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: –
DESIGNED: –
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

Blacktown City Council
COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
DX : 8117 BLACKTOWN

PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION – LANDSCAPING
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

STAGING OF BIORETENTION CONSTRUCTION WORKS

DESIGN NOTES:

1. WHERE THE UPSTREAM CATCHMENT HAS NOT ACHIEVED 90% OF FINAL CONSTRUCTION, INCLUDING LANDSCAPING, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITH A SACRIFICIAL LAYER.
2. ONCE THE 90% TARGET HAS BEEN ACHIEVED, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITHIN 6 MONTHS. CAPTURED SEDIMENT AND SATURATED SOIL IS TO BE REMOVED AND THE BIORETENTION SYSTEM CONSTRUCTED AS PER THE DESIGN.
3. THE MAINTENANCE PERIOD OF THE SYSTEM IS TO EXTEND FOR MINIMUM 36 MONTHS FROM WHEN THE BIORETENTION SYSTEM IS FULLY PLANTED BEFORE HANDOVER TO ANY FINAL CUSTODIAN.
4. BIORETENTION SYSTEMS SHALL ACHIEVE A MINIMUM DENSITY OF 8 PLANTS PER m^2 AT 36 MONTHS AND BE VIGOROUS, HEALTHY AND FREE OF WEEDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADVISE COUNCIL IF THIS DENSITY IS NOT ACHIEVED AT 24 MONTHS AND TO REPLANT SO THAT ALL PLANTS HAVE BEEN GROWING A MINIMUM OF 12 MONTHS AT THE SPECIFIED DENSITY AT HAND OVER.
5. ANY REQUIREMENT OF FENCING OR OTHER MEASURE TO ENSURE PUBLIC SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE MAINTAINED IN ACCORDANCE WITH COUNCIL OR OTHER REQUIREMENTS FOR THE DURATION OF THE CONSTRUCTION AND ESTABLISHMENT PERIOD.

REFER TO HOLD AND INSPECTION POINTS ON SHEET 2
CONSTRUCTION ACTIVITIES CAN GENERATE LARGE SEDIMENT LOADS IN RUNOFF WHICH CAN SMOTHER VEGETATION AND CLOG BIORETENTION FILTER MEDIA. BIORETENTION BASINS ARE BEST CONSTRUCTED IN STAGES, IN CONJUNCTION WITH OTHER DEVELOPMENT ACTIVITIES:

STAGE 1:

TEMPORARY SEDIMENT BASIN - EXCAVATE BULK EARTHWORKS, INSTALLATION OF OUTLET TO MEET REQUIREMENTS OF BLUE BOOK, INSTALLATION OF SYSTEM INLET PIT, SURROUNDED EACH SIDE BY TEMPORARY ROCK DISSIPATOR. DISSIPATOR SHALL EXTEND A MINIMUM OF 2m AROUND THE INLET PIT AND HAVE A D_{50} = 300mm.

STAGE 2:

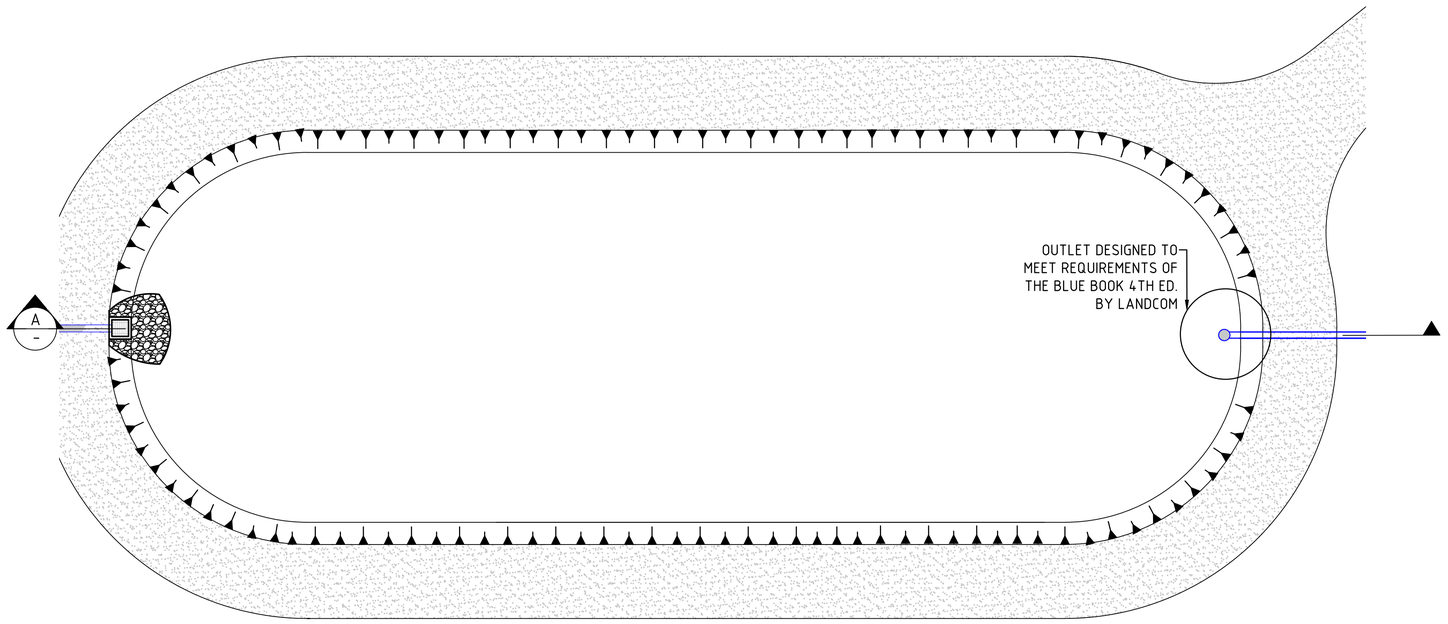
FUNCTIONAL INSTALLATION OF SACRIFICIAL BIORETENTION - ONCE UPSTREAM CATCHMENTS BULK EARTHWORKS ARE COMPLETE AND HAVE EFFECTIVELY BEEN SEALED A SACRIFICIAL FILTER SYSTEM SHALL BE CONSTRUCTED. THIS INCLUDES:

- REMOVAL OF TEMPORARY ROCK DISSIPATOR AT SYSTEM INLET PIT.
- REMOVAL OF ALL SEDIMENT
- INSTALLATION OF GEOTEXTILE AND LINERS UNDER
- INSTALLATION OF SUBSOIL DRAINS AND DRAINAGE LAYERS. TEMPORARY SUPPORT FLUSHING POINTS
- INSTALLATION OF 250mm OF TRANSITION LAYER
- INSTALLATION OF UPFLOW PITS, CONNECTING PIPES AND TEMPORARY SOIL BARRIERS
- LOCALISED MOUNDING OVER PIPES
- INSTALLATION OF TEMPORARY GEOTEXTILE AND 150mm MEDIA OR COARSE SAND LAYER
- INSTALLATION OF WASHED TURF OVER THE SACRIFICIAL MEDIA LAYER

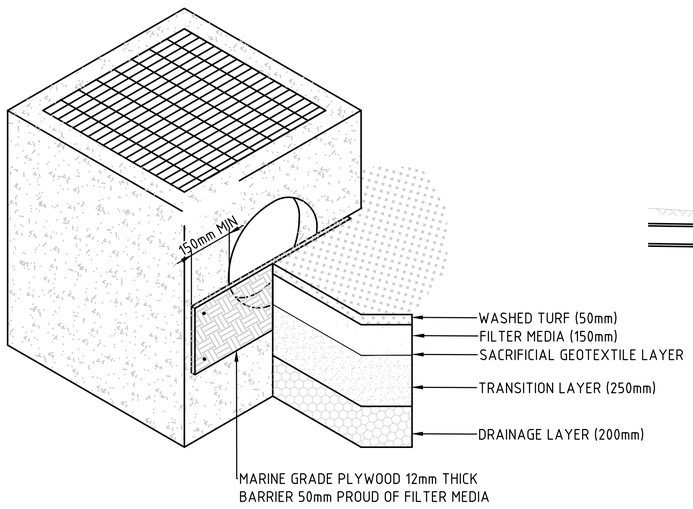
STAGE 3:

OPERATIONAL ESTABLISHMENT ONCE 90% DEVELOPMENT HAS OCCURRED- REMOVAL OF TURF, SACRIFICIAL MEDIA LAYER AND TEMPORARY GEOTEXTILE INSTALLATION OF:

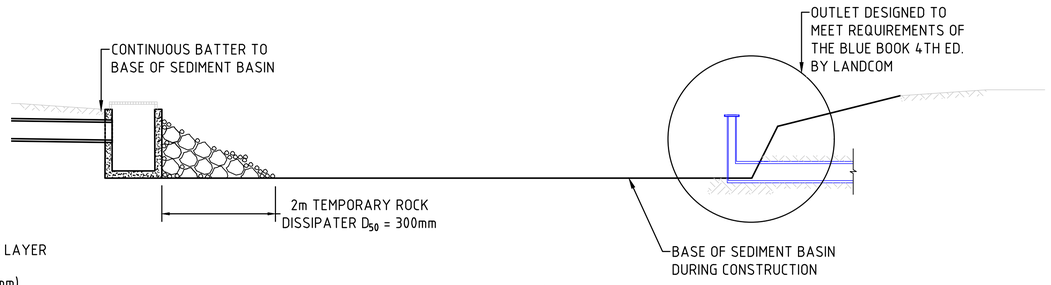
- REMAINING UPFLOW PITS
- PERMEABLE CONCRETE PIPE
- UPPER 200mm OF TRANSITION LAYER
- FILTER MEDIA LAYER
- PLANTING
- REMOVAL OF ALL SEDIMENT FROM PIPES, INLETS AND OUTLETS.



STAGE 1
NTS



DETAIL 18
STAGE 2 TEMPORARY SOIL BARRIER ON UPFLOW PIT
NTS



SECTION A (STAGE 1)
NTS

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SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

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DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
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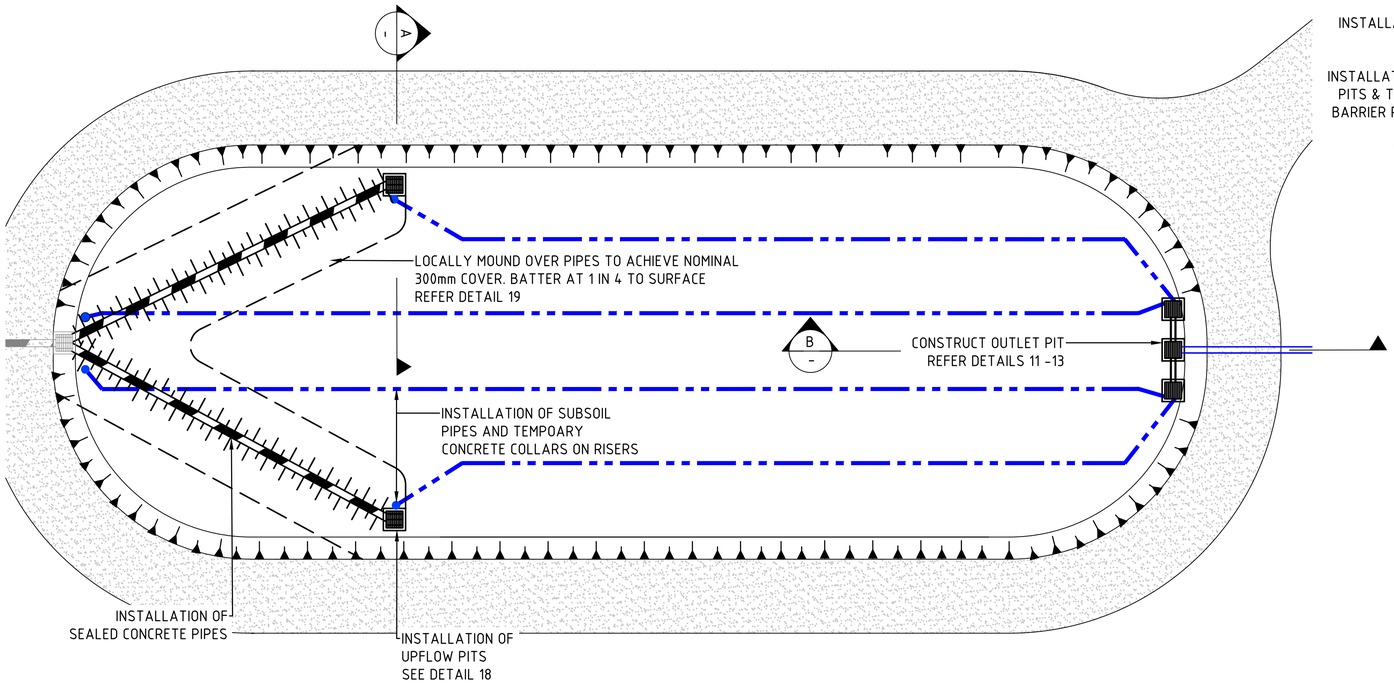
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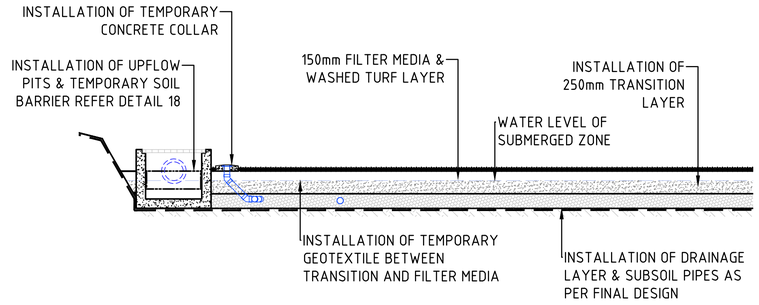
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - CONSTRUCTION WORKS STAGING - 1
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

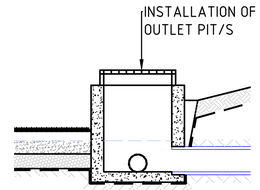
ISO 9001 International Standards Certifications
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ASSET DESIGN



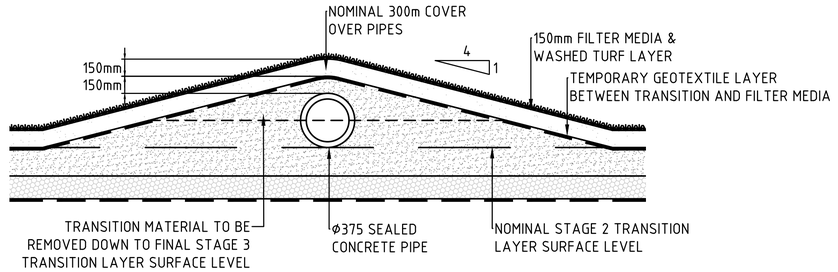
STAGE 2
NTS



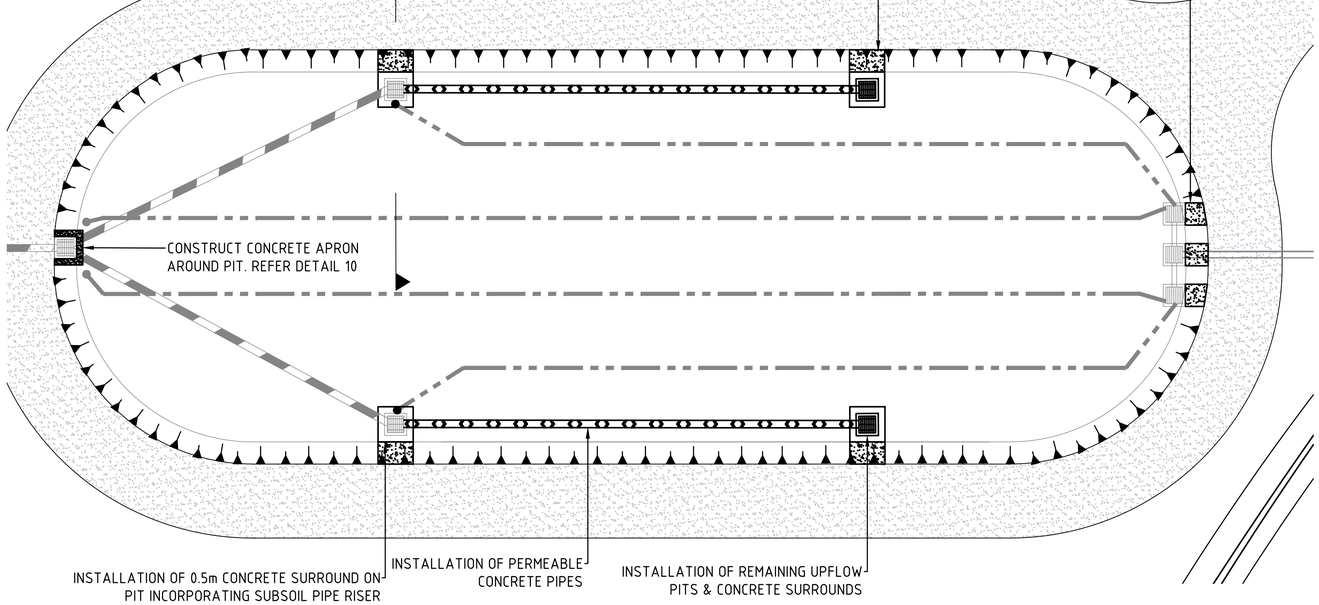
SECTION A (STAGE 2)
NTS



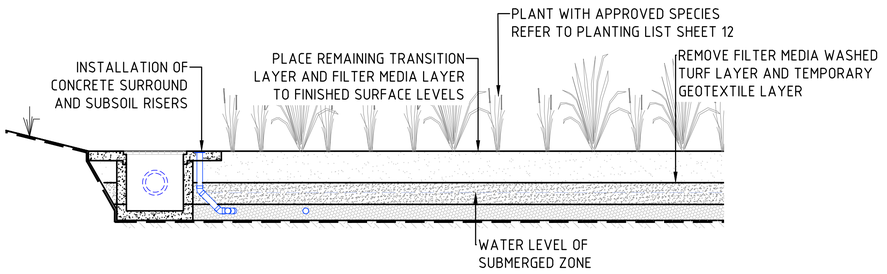
SECTION B (STAGE 2)
NTS



DETAIL 19
LOCAL MOUNDING OVER PIPES FOR STAGE 2
NTS



STAGE 3
NTS



SECTION C (STAGE 3)
NTS

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DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

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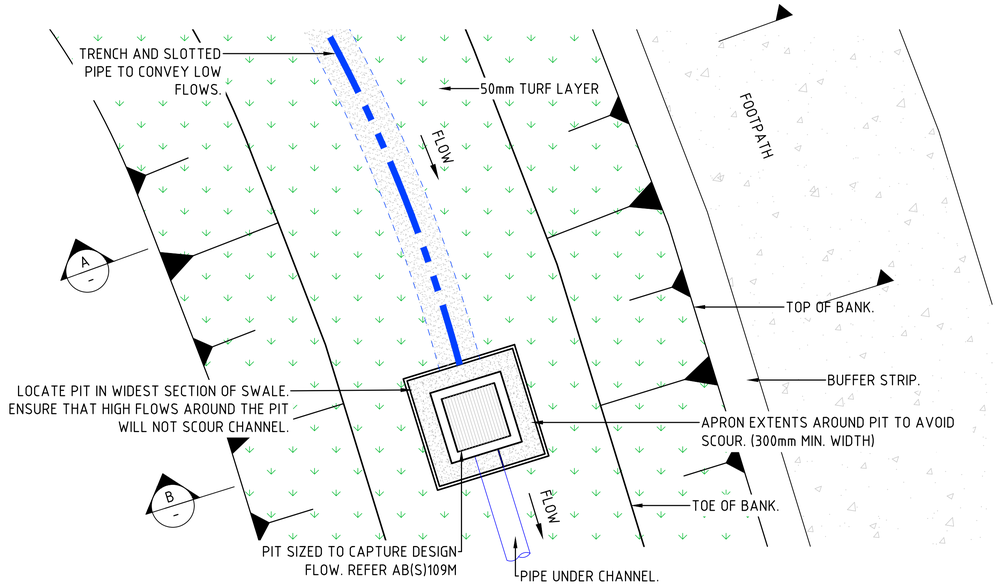
COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
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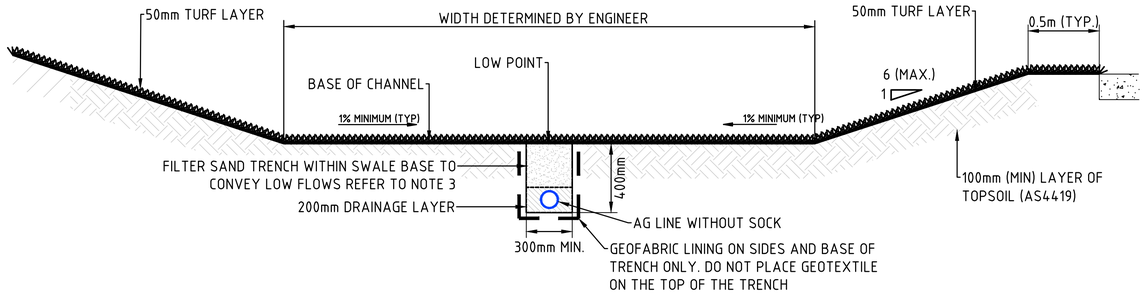
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: BIORETENTION - CONSTRUCTION WORKS STAGING - 2
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

REV D



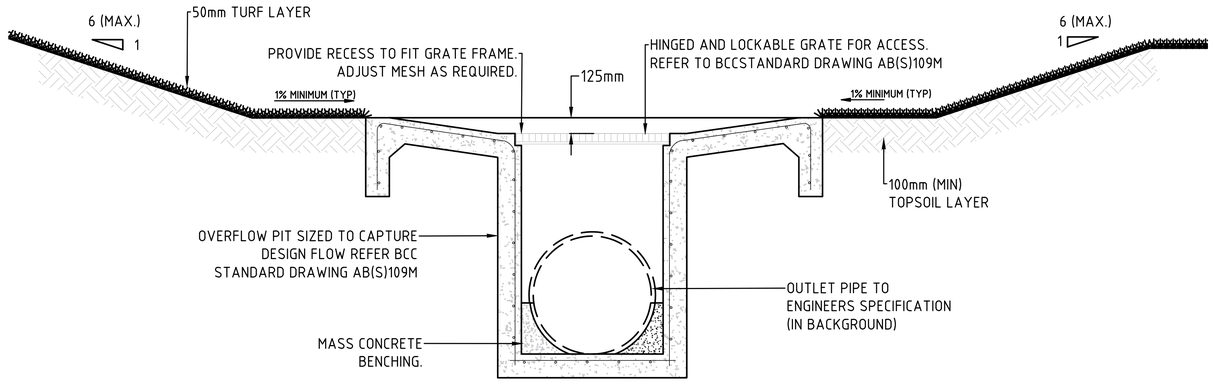
PLAN 10
TYPICAL SWALE FOR FLAT SITE
NTS



SECTION A
NTS

DESIGN NOTES:

1. PERMANENT PONDING AND WATERLOGGING CAN BE AN ISSUE IN FLAT SWALES, WHERE THE LONGITUDINAL SLOPE IS 1% OR LESS, LOW FLOW DRAINAGE SHALL BE INCLUDED TO MINIMISE THIS PROBLEM. CONSIDER MULTIPLE SLOTTED PIPES IN LARGE SWALES OR WHERE THE GRADE IS LESS THAN 1%. WHERE GRADE ARE STEEPER THAN 4% USE CHECK DAMS - REFER SHEET 16 FOR DETAILS
2. WHERE SWALES ARE INCORPORATED IN STREET VERGES, OTHER KEY ISSUES INCLUDE:
   - CROSS SECTIONAL DIMENSIONS NEED TO ACCOMMODATE PATHWAYS, ETC. TO MEET LOCAL AUTHORITY GUIDELINES
   - CROSSING POINTS - REFER A(BS)103 FOR DRIVEWAY CROSSING DETAIL.
   - INFLOWS FROM NEIGHBOURING ALLOTMENTS.
   - PROTECTION FROM VEHICULAR DAMAGE. USE BOLLARDS OR OTHER BARRIERS TO PREVENT VEHICLE ENTRY.
   - A ROOT BARRIER MAY BE REQUIRED WHERE THE SWALE INCLUDES TREES PLANTED NEXT TO ROADWAYS OR OTHER INFRASTRUCTURE.
3. FILTER SAND TO COMPLY WITH SPECIFICATION FOR TRANSITION LAYER. REFER SHEET 2 FOR DETAILS.
4. MAX ACCEPTABLE VELOCITY DURING A 100 YEAR ARI EVENT SHALL BE 1.0m/s TO AVOID SCOUR OF THE SURFACE



SECTION B
NTS

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PUBLIC UTILITIES LEGEND

WATER MAINS (W)	GAS (G)	TELSTRA (T)
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY (E)	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER (S)	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
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APPROVED
MANAGER ASSET DESIGN
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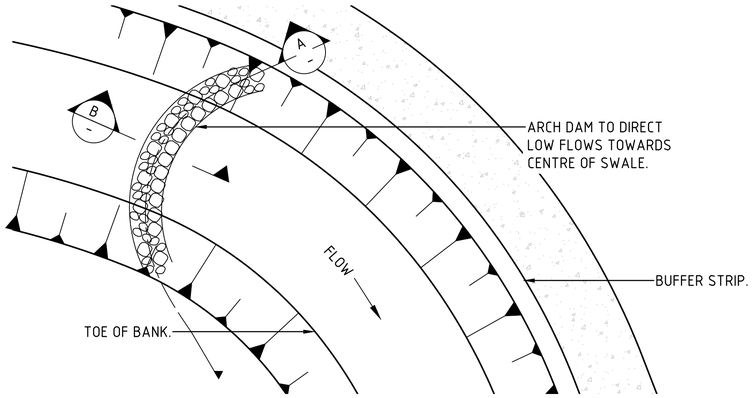
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
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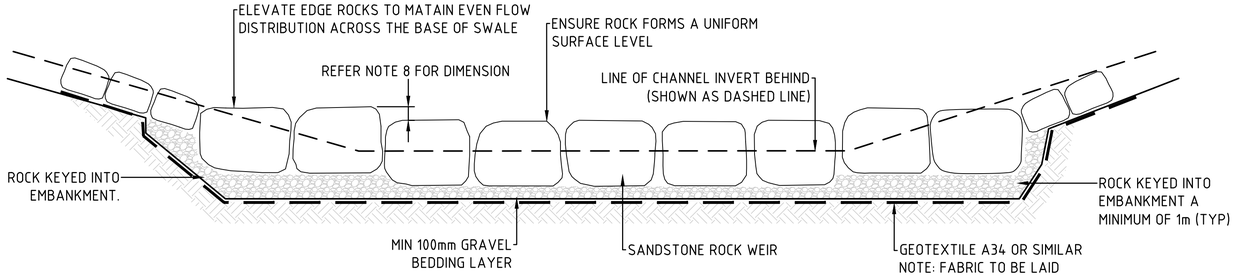
PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: VEGETATED SWALES - FLAT SITES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

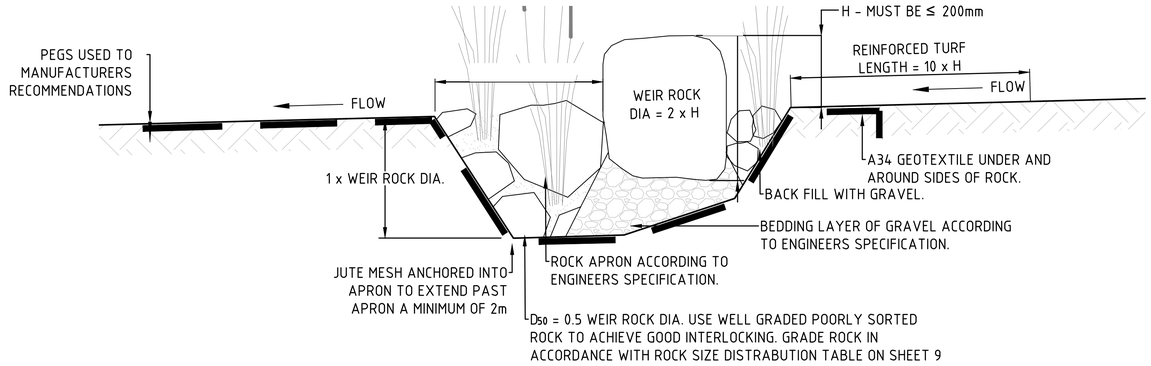
REV D



PLAN 11
TYPICAL SWALE STEEP SITES
NTS



SECTION A
NTS



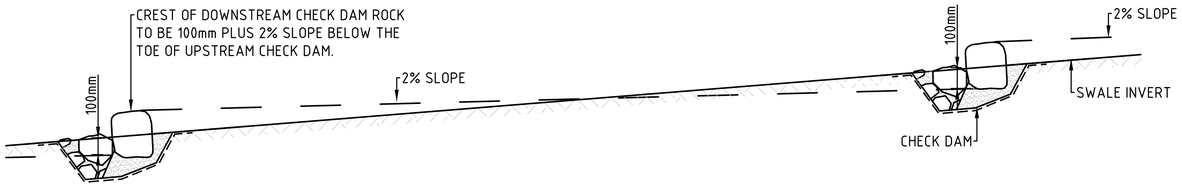
SECTION B
NTS

DESIGN & EXPLANATORY NOTES:

1. SCOUR AND EROSION CAN BE AN ISSUE IN STEEP SWALES, WHERE THE LONGITUDINAL SLOPE IS 4% OR GREATER. CHECK DAMS (AS SHOWN) ARE RECOMMENDED TO MINIMISE THIS PROBLEM.
2. IN STEEP SWALES, SCOUR AND EROSION CAN ALSO OCCUR AROUND OVERFLOW PITS AND OTHER STRUCTURES.
3. SWALES USING CHECK DAMS SHOULD NOT BE CONSTRUCTED AT GRADES STEEPER THAN 7%.
4. CHECK DAMS CAN BE CONSTRUCTED FROM DIFFERENT MATERIALS e.g. ROCK OR CONCRETE OR TIMBER.
5. ALL CHECK DAMS REQUIRE CAREFUL INSTALLATION TO ENSURE THEY ARE BUILT TO THE CORRECT LEVELS AND WILL BE STABLE UNDER DESIGN FLOW CONDITIONS.
6. ROCK APRON DEPTH IS TO BE EQUAL TO WEIR ROCK DIAMETER WITH A MIN OF 400mm. LENGTH = 10 x H
7. ROCK APRON LENGTH IS EQUAL TO 1.5 x WEIR ROCK DIAMETER. MIN LENGTH IS 600mm.
8. WEIR HEIGHT SHALL BE SUFFICIENT TO CONVEY THE 1 IN 10 YEAR CRITIAL STORM EVENT.
9. PLACE REINFORCED TURF FOR A DISTANCE OF 10 x H UPSTREAM OF WEIR.

REFERENCES:

- HEALTHY WATERWAYS PARTNERSHIP (HWP) 2006 "WATER SENSITIVE URBAN DESIGN TECHNICAL GUIDELINES FOR SOUTH EAST QUEENSLAND". CHECK WATER BY DESIGN WEBSITE (www.waterbydesign.com.au) FOR LATEST UPDATE.



DETAIL 20
TYPICAL LONGITUDINAL DISTRIBUTION OF CHECK DAMS
NTS

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DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
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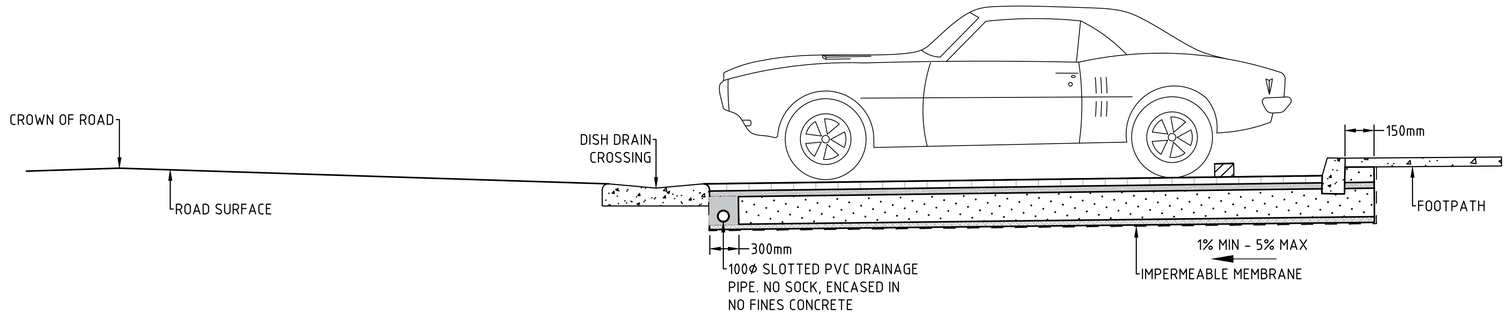
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DATE:

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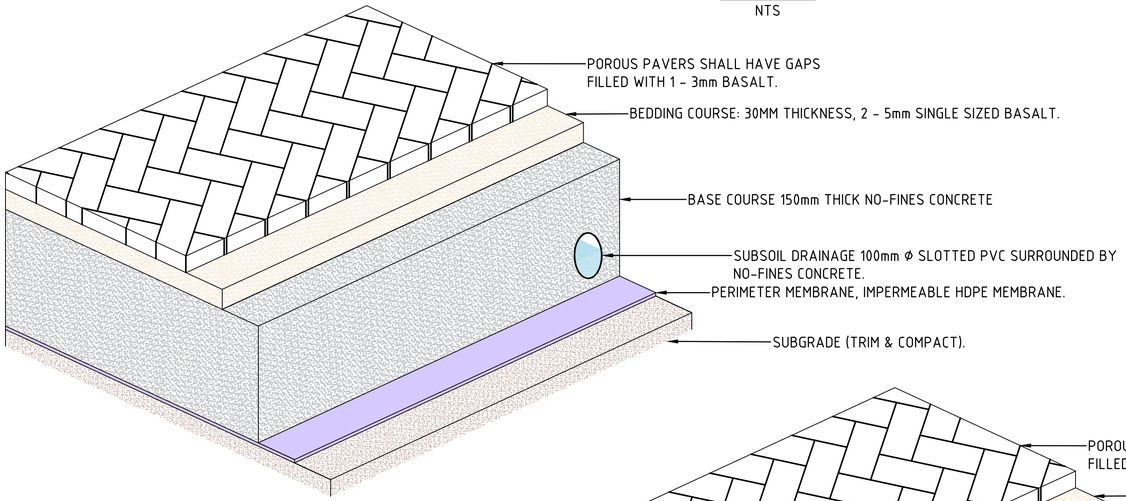
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: VEGETATED SWALES - STEEP SITES
CAD FILE: A(BS)175M.dwg
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PLAN No: A(BS)175M

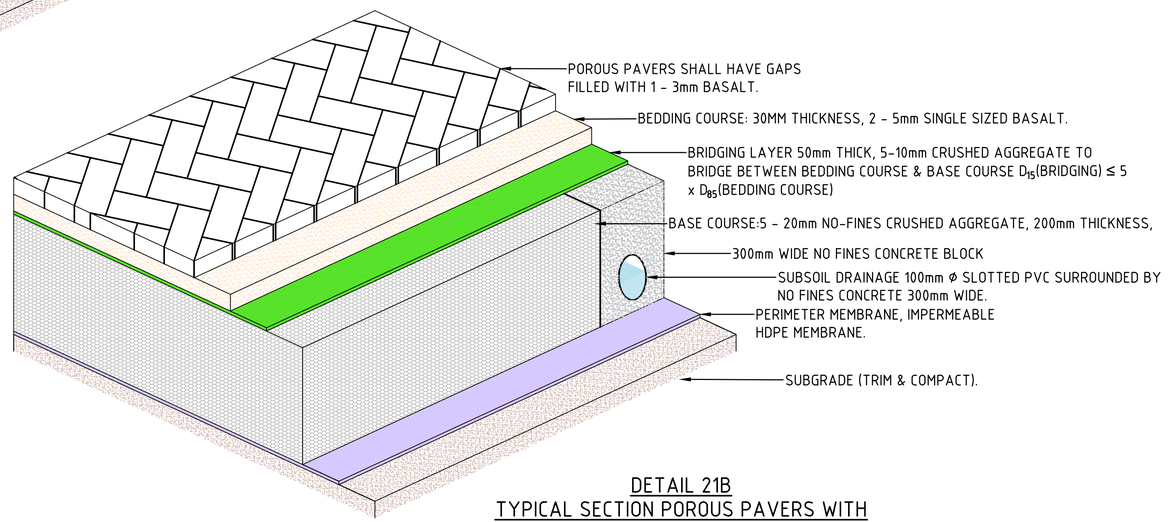
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ASSET DESIGN



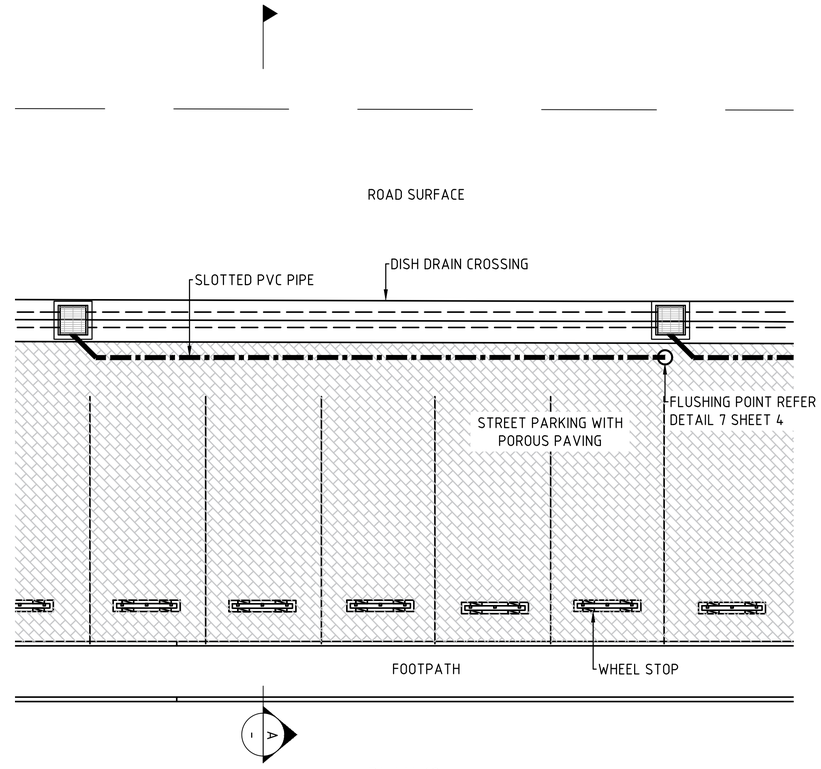
SECTION A
NTS



DETAIL 21A
TYPICAL SECTION POROUS PAVERS WITH NO-FINES CONCRETE BASE COURSE
NTS



DETAIL 21B
TYPICAL SECTION POROUS PAVERS WITH CRUSHED AGGREGATE BASE COURSE
NTS



PLAN 12
USE OF POROUS PAVING IN ON STREET PARKING
NTS

DESIGN NOTES:

1. PERMEABLE PAVEMENT IS MOST SUITABLE TO PEDESTRIAN OR LOW TRAFFIC AREAS.
2. PERMEABLE PAVEMENT SHALL NOT BE USED IN AREAS WITH HEAVY TRAFFIC OR WHERE HEAVY VEHICLES ARE TURNING.
3. CLAY SOILS IN BLACKTOWN RESTRICT INFILTRATION. SUBSOIL DRAINAGE SHALL BE USED.
4. PERMEABLE PAVEMENTS SHALL HAVE NO RUN-ON WATERFLOW.
5. ANY PERMEABLE PAVEMENTS SHALL BE DESIGNED BY AN EXPERIENCED, QUALIFIED CIVIL, GEOTECHNICAL OR STRUCTURAL ENGINEER.
6. ONLY POROUS PAVERS SHALL BE USED.
7. IF THE BASE COURSE IS TO BE NO-FINES CONCRETE THEN THE BRIDGING LAYER IS NOT REQUIRED
8. SUBSOIL DRAIN LINES ARE TO HAVE FLUSHING POINTS EVERY 20m NOMINAL.
9. CLEANING & OR RENEWAL REQUIRED WHERE WATER PONDS FOR MORE THAN 1 HOUR AFTER RAINFALL.

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WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

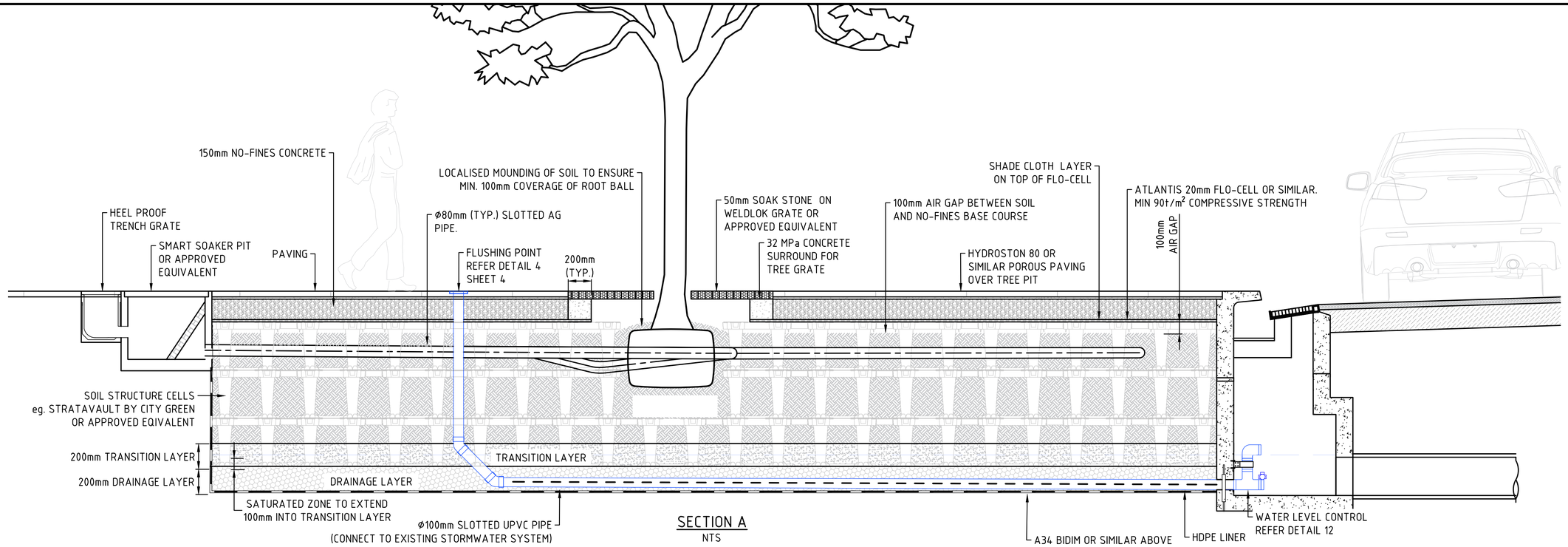
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COUNCIL CHAMBERS 62 FLUSHCOMBE ROAD,BLACKTOWN
ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
DX : 8117 BLACKTOWN

PLAN 1:1000 @ A1 1:100 5 0 1 2 3
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

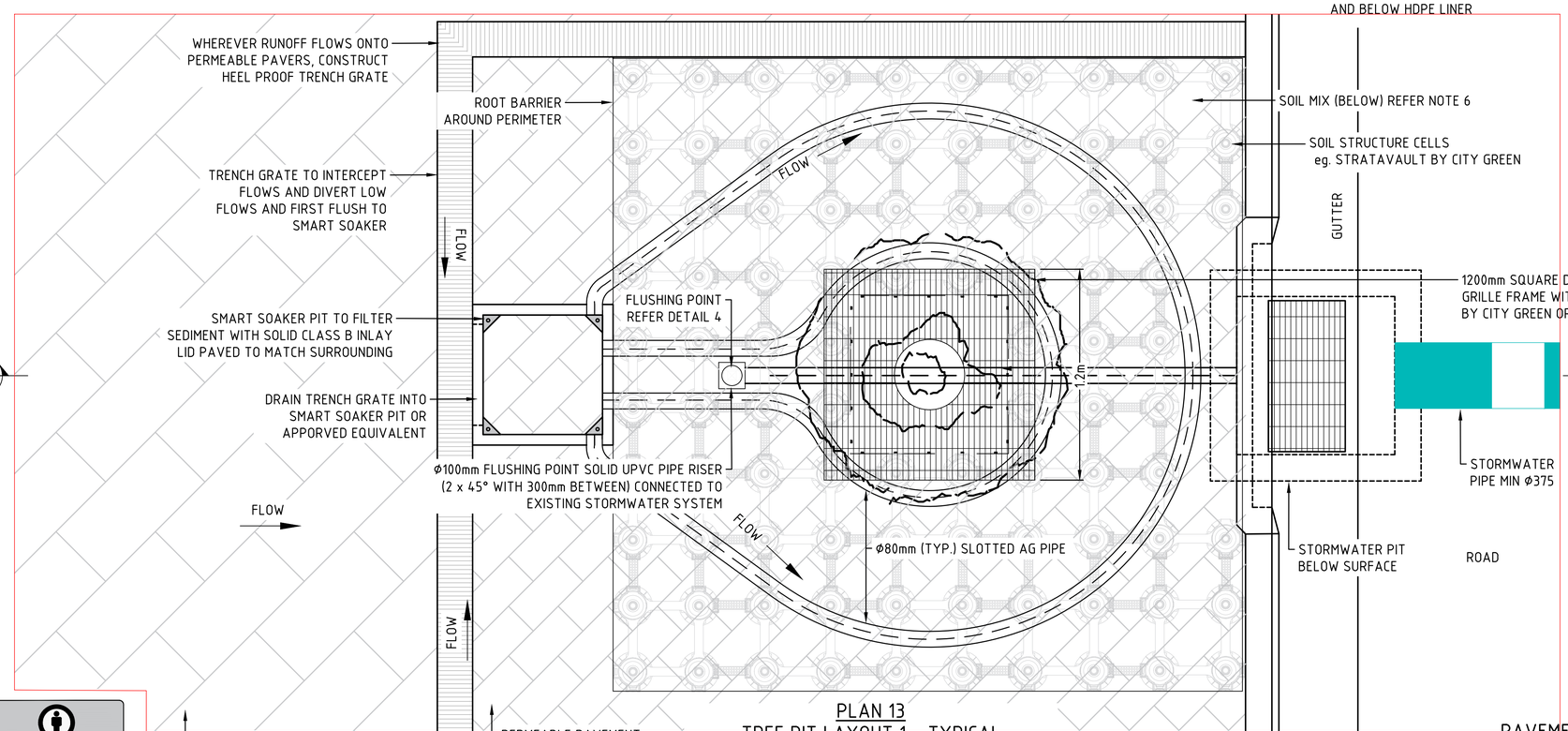
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SHEET TITLE: POROUS PAVING
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

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REV D



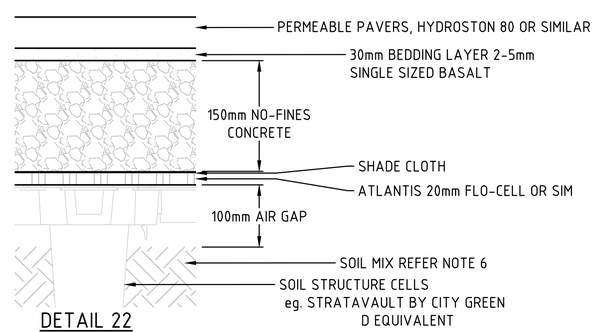
SECTION A
NTS



PLAN 13
TREE PIT LAYOUT 1 - TYPICAL
NTS

DESIGN NOTES:

1. IT IS INTENDED THAT THIS TREATMENT IS APPLICABLE TO TOWN CENTRES AND DENSE URBAN AREAS. IT WOULD BE SUITABLE FOR PAVED OPEN SPACE AREAS WHICH CAN BENEFIT FROM EXTENSIVE SHADING AND URBAN COOLING SUCH AS OUTDOOR EATING AREAS.
2. THE LENGTH TO WIDTH RATIO OF THE TREE PIT SHALL NOT EXCEED 2:1.
3. THE STANDARD DETAILS SHOWN ON THIS DRAWING ARE TYPICAL ONLY. THESE DETAILS MAY NEED TO BE RECONFIGURED TO SUIT SITE SPECIFIC CONDITIONS
4. THE VOLUME OF SOIL TO BE USED IN A TREE PIT SHALL BE A MIN. OF 30m³.
5. WHERE POSSIBLE GRADE PAVING TO DIRECT FLOWS TOWARDS THE TREE PITS WITHOUT CREATING A TRAPPED LOW POINT.
6. SOIL MIX SHALL BE AS PER CITY GREEN RECOMMENDATIONS FOR TREE PITS.
7. WHERE TRENCH GRATES OR PERMEABLE PAVERS ARE INAPPROPRIATE OR THE CATCHMENT IS LESS THAN 100m² CONSIDER SUPPLYING WATER FROM ALTERNATIVE SOURCES SUCH AS ROOF RUNOFF AND PROVIDE A HIGH FLOW BYPASS.



DETAIL 22
PAVEMENT LAYERS FOR TREE PIT
NTS

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D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KM	DEC '21
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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM AHD
GRID MGA
SHEET SIZE A1
TITLE BLOCK VERSION A

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DESIGNED –
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VERIFIED ML
DATE FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

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DATE

Blacktown City Council

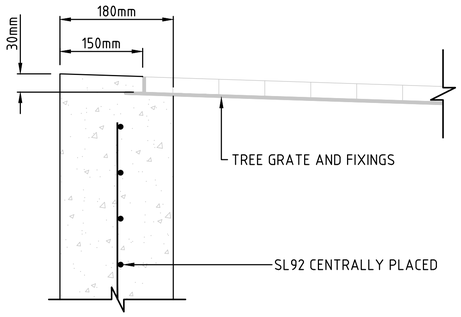
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

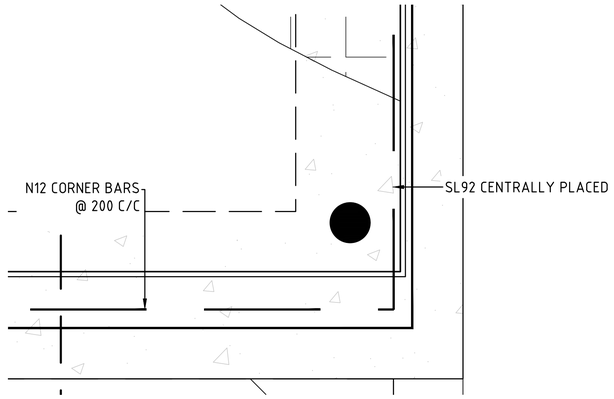
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SHEET TITLE: BIORETENTION - TOWN CENTRES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

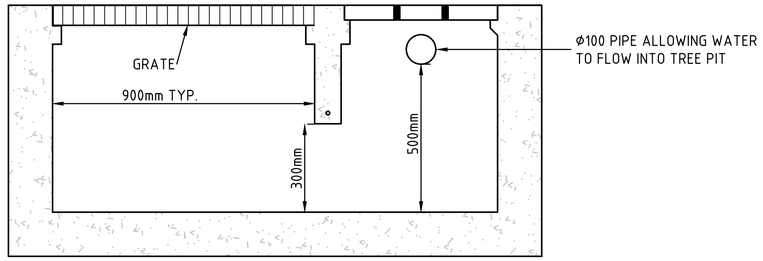
18 OF 25
REV D



DETAIL 23
TREE PIT WALL DETAIL
NTS



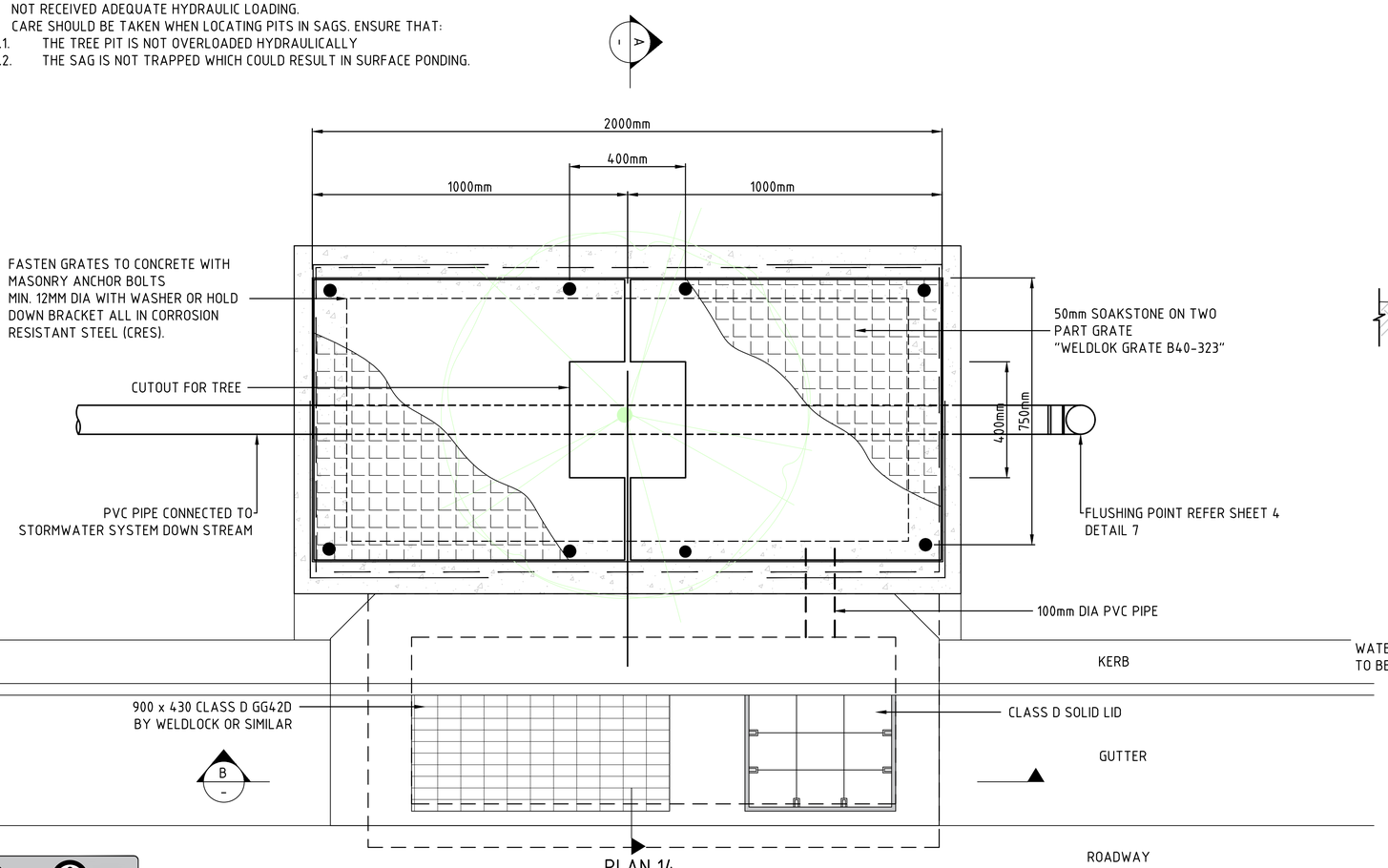
DETAIL 24
TREE PIT CORNER REINFORCEMENT
NTS



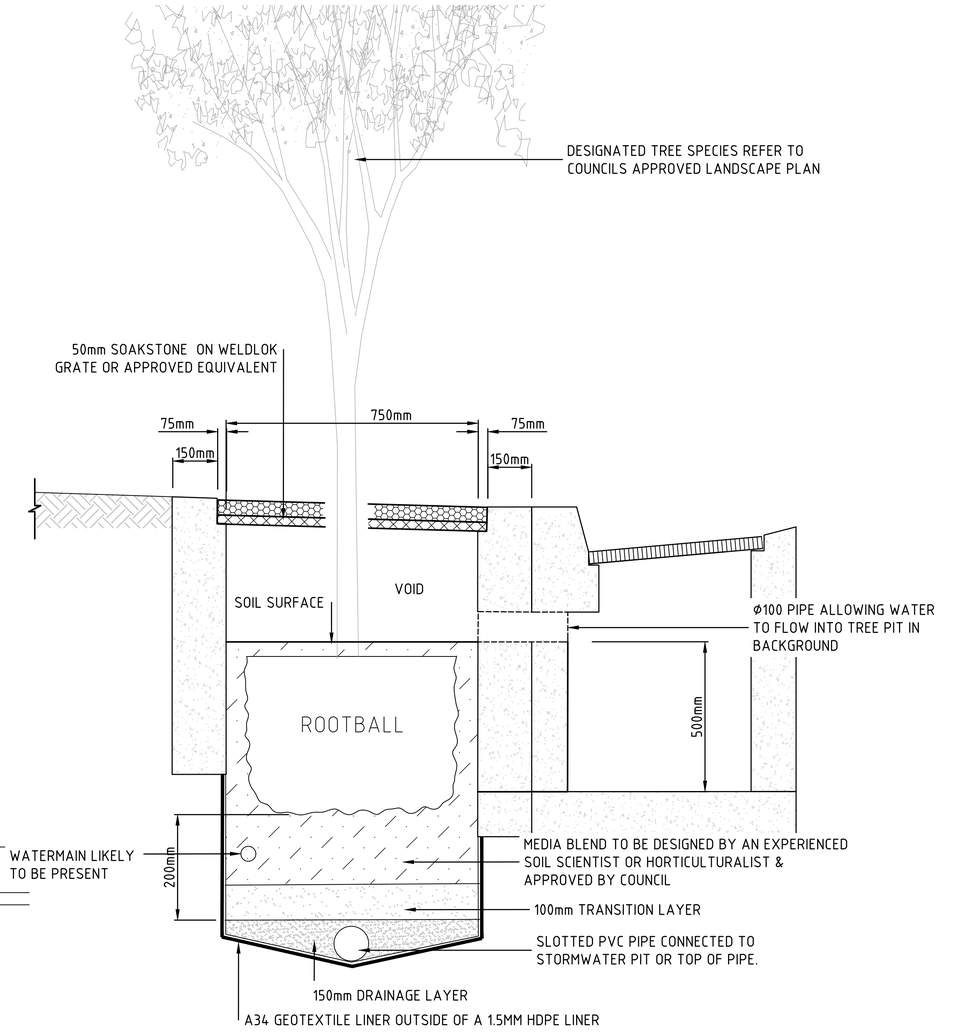
SECTION B
NTS

DESIGN NOTES:

1. ALL CONCRETE KERBS AND GRATES TO BE FLUSH WITH SURROUNDING PAVEMENT AND KERB.
2. FOOTPATHS TO BE REINSTATED AS PER COUNCIL STANDARD (WHERE REQUIRED).
3. BIORETENTION TREE PITS SHOULD NOT BE PLACED ON CRESTS WHERE THEY DO NOT RECEIVED ADEQUATE HYDRAULIC LOADING.
4. CARE SHOULD BE TAKEN WHEN LOCATING PITS IN SAGS. ENSURE THAT:
   - 4.1. THE TREE PIT IS NOT OVERLOADED HYDRAULICALLY
   - 4.2. THE SAG IS NOT TRAPPED WHICH COULD RESULT IN SURFACE PONDING.



PLAN 14
TYPICAL TREE PIT LAYOUT 2 - ADJACENT TO KERB
NTS



SECTION A
NTS

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DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

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CADD AJ
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APPROVED
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DATE FEB '17

CLIENT
DATE

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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: TREE PIT BIORETENTION - STREET
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

DESIGN NOTES:

1. ALL SYSTEMS SHALL USE AT LEAST 2 ORIFICE PLATES TO CONTROL FLOWS.
   - THE 1.5 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 40 L/s/ha.
   - THE 100 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 190 L/s/ha.
2. STORAGE SHALL BE PROVIDED AS FOLLOWS:
   - VOLUME UP TO 1.5 YEAR ARI TWL = 300m^3/ha
   - VOLUME UP TO 100 YEAR ARI TWL = 455m^3/ha
3. ORIFICE FLOW RATES WILL BE ADJUSTED FOR BYPASS WITH A MAXIMUM SITE BYPASS OF 15%.

TOTAL OSD BYPASS	ENVIRONMENTAL DISCHARGE (1.5 YEAR ARI ORIFICE) (L/s/ha)	ENVIRONMENTAL STORAGE (BELOW 1.5 YEAR ARI WEIR) (m^3/ha)	FLOOD DISCHARGE (100 YEAR ARI ORIFICE) (L/s/ha)	FLOOD STORAGE (BELOW EMERGENCY WEIR) (m^3/ha)
0%	40.0	300	190	455
2.5%	38.5	300	176	455
5%	37.0	300	162	455
7.5%	35.5	300	148	455
10%	34.0	300	134	455
12.5%	32.5	300	120	455
15%	31.0	300	106	455

4. STORAGE VOLUMES WILL BE ADJUSTED FOR DROWNED ORIFICES.
5. ALL PITS GREATER THAN 1.2m SHALL BE FITTED WITH COUNCIL APPROVED STEP IRONS AT nom 300mm C/C IN A STAGGERED CONFIGURATION AND IN ACCORDANCE WITH AS 4198-1994
6. MINIMUM PIT SIZE 900mm x 900mm, ALL PITS DEEPER THAN 1.2m SHALL BE A MINIMUM SIZE OF 1200mm X 1200mm
7. FOR ORIFICE DIAMETERS:
   - LESS THAN 150mm:
     PROVIDE MAXI-MESH TRASH SCREEN WITH SURFACE AREA 50 TIMES THAT OF THE ORIFICE OPENING
   - GREATER THAN 150mm:
     PROVIDE WELDLOK F40/203 TRASH SCREEN WITH SURFACE AREA 20 TIMES THAT OF THE ORIFICE OPENING
8. CONCRETE BENCHING INSIDE THE PITS SHALL BE CARRIED OUT POST INSTALLATION OF THE ORIFICE PLATES
9. ALL REDUCED LEVELS AND DIAMETERS, DIMENSIONS OR TOLERANCES ARE TO BE NOMINATED BY THE DESIGNER
10. THE ORIFICE PLATE SHALL BE 3mm THICK STAINLESS STEEL FOR ORIFICE SIZES < 150mm OR FOR ORIFICES > 150mm USE 5mm THICK STAINLESS STEEL WITH SHARP EDGES MACHINED TO 0.5mm ACCURACY - FASTENED TO PIT WALL USING "HILTI" (OR APPROVED EQUIVALENT) STAINLESS HSIx1(R) - M6x40 BOLTS
11. THE DOWNSTREAM PIPE DIAMETER SHALL BE AT LEAST 3x ORIFICE DIAMETER. MINIMUM Ø100mm & HAVE A MIN CAPACITY OF 2 x ORIFICE FLOW
12. REFER TO UPRCT "ON-SITE STORMWATER DETENTION HANDBOOK" 4th EDITION DECEMBER 2005

DESIGN NOTES:

13. THE BASE OF THE DETENTION STORAGE TANK IS TO BE BENCHED TO FALL @ 2% TO THE INVERT OF THE OUTLET POINT
14. OWNERS MUST BE ABLE TO INSPECT CRITICAL PARTS OF THE STORAGE TANK FROM THE SURFACE WITHOUT HAVING TO REMOVE HEAVY ACCESS COVERS. ALL SECTIONS OF THE OSD SHALL HAVE GRATED ACCESS POINTS
15. FOR PITS:
    - LESS THAN THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 900mm x 900mm
    - GREATER THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 1.2m x 1.2m
16. FOR ALL OTHER ACCESS POINTS TO THE DETENTION TANK THE MINIMUM OPENING SIZE IS 900mm x 900mm
17. ALL OPENINGS SHALL BE COVERED BY A HINGED GALVANISED MILD STEEL GRATE AND FRAME AND FITTED WITH CHILD PROOF LOCKS
18. DETENTION STORAGE ACCESS GRATES TO THE BELOW GROUND OSD ARE TO BE POSITIONED SUCH THAT THE MAXIMUM REACH FROM ANY POINT IN THE TANK TO THE NEAREST GRATE IS DETERMINED BY THE TABLE BELOW:

DEPTH OF TANK	LENGTH OF REACH
0.5m - 0.7m	1.5m
0.7m - 1m	2m
1m - 1.5m	3m
1.5m - 2m	4m
>2m	6m

19. FOR BELOW GROUND OSD TANKS AS SHOWN ON SHEET 22 THE MINIMUM INTERNAL HEIGHT IS TO BE A MINIMUM OF 0.5m FOR EASE OF MAINTENANCE AND SAFE WORK SPACE REQUIREMENTS.
20. THE SAME ACCESS REQUIREMENTS AS IN NOTE 18. APPLY TO FILTER STORAGE AREAS WHERE USED. SEE SHEET 23
21. THE MINIMUM ORIFICE SIZE SHALL BE 25mm DIA.
22. STRUCTURAL DESIGN OF OSD STORAGE TO BE DESIGNED BY A QUALIFIED ENGINEER.
23. CONFINED SPACE ENTRY REQUIREMENTS APPLY.
24. UNDERGROUND OSD EMERGENCY OVERFLOW WEIR SHALL BE DESIGNED TO CONVEY 100 YEAR ARI, 5 MINUTE STORM EVENT AND BE A MINIMUM HEIGHT OF 100mm



CONFINED SPACE DANGER SIGN

NOTES:

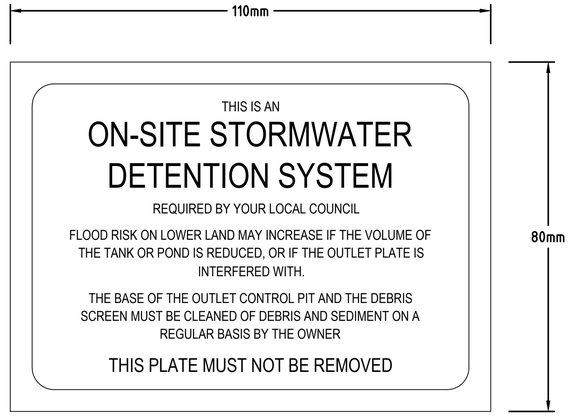
1. A CONFINED SPACE DANGER SIGN SHALL BE PLACED NEXT TO EACH AND EVERY ACCESS POINT SO THAT THEY ARE VISIBLE TO PERSONS ENTERING ANY BELOW GROUND TANK OR PIT.
2. COLOURS:
   - "DANGER" AND BACKGROUND - WHITE
   - ELLIPTICAL AREA - RED
   - RECTANGLE CONTAINING ELLIPSE - BLACK
   - LETTERING AND BORDER - BLACK
3. MINIMUM DIMENSIONS OF THE SIGN:
   - LARGE ENTRIES: - 300mm x 450mm
   - SMALL ENTRIES: - 250mm x 180mm
4. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY



ON SITE STORMWATER DETENTION WARNING SIGN

NOTES:

1. SIGN SHALL BE PLACED IN A CLEAR AND VISIBLE LOCATION AT EACH DETENTION BASIN.
2. COLOURS:
   - TRIANGLE AND "WARNING" - RED
   - WATER - BLUE
   - FIGURE AND LETTERING - BLACK
3. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
4. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY



ON SITE STORMWATER DETENTION SYSTEM SIGN

NOTES:

1. CORNERS SQUARE
2. COLOURS:
   ETCHED AND FILLED BLACK LEDGEND ON A NATURAL SILVER BACKGROUND.
3. CONSTRUCTED FROM ALUMINIUM 0.9mm MILL.
4. THIS SIGN SHALL BE PLACED IN A VISIBLE LOCATION NEAR A DISCHARGE CONTROL PIT OR AT THE ACCESS TO ONE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

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DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

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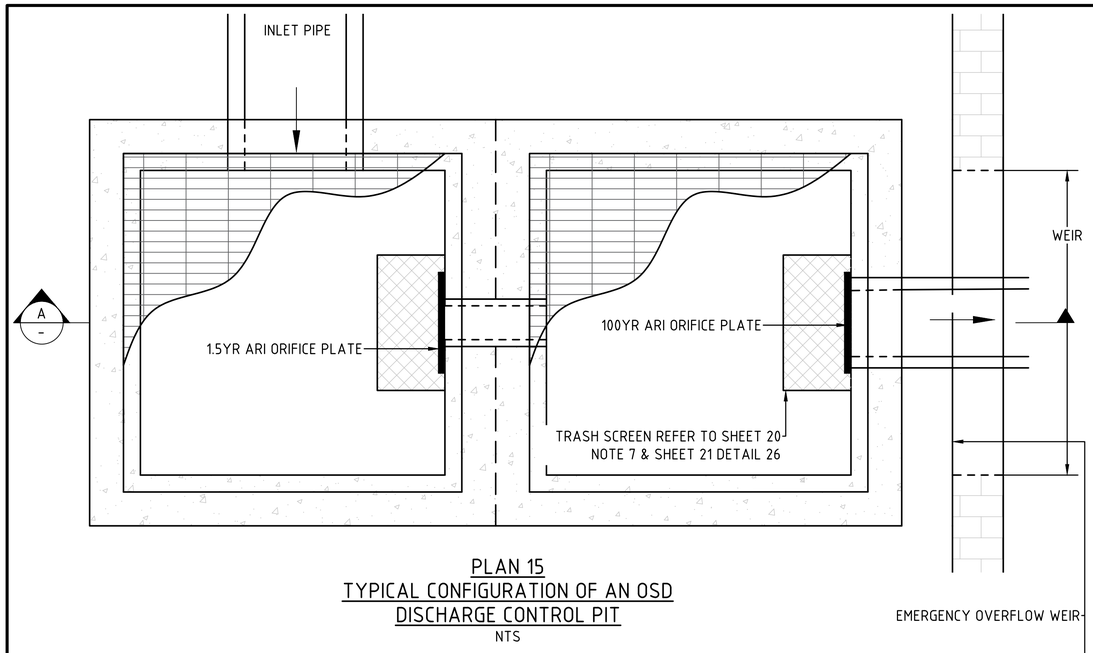
Blacktown City Council
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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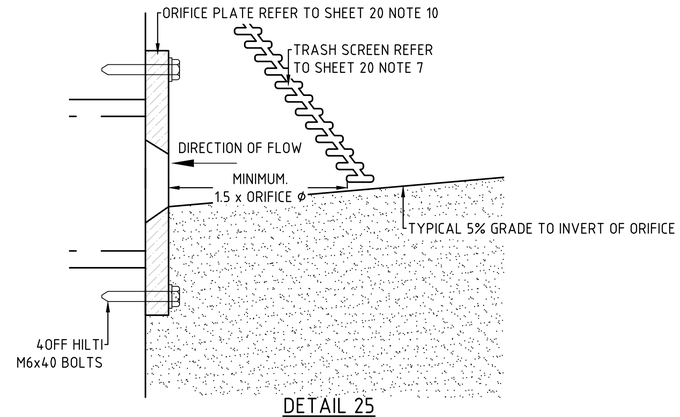
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SHEET TITLE: OSD - REQUIREMENTS
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PLAN No: A(BS)175M

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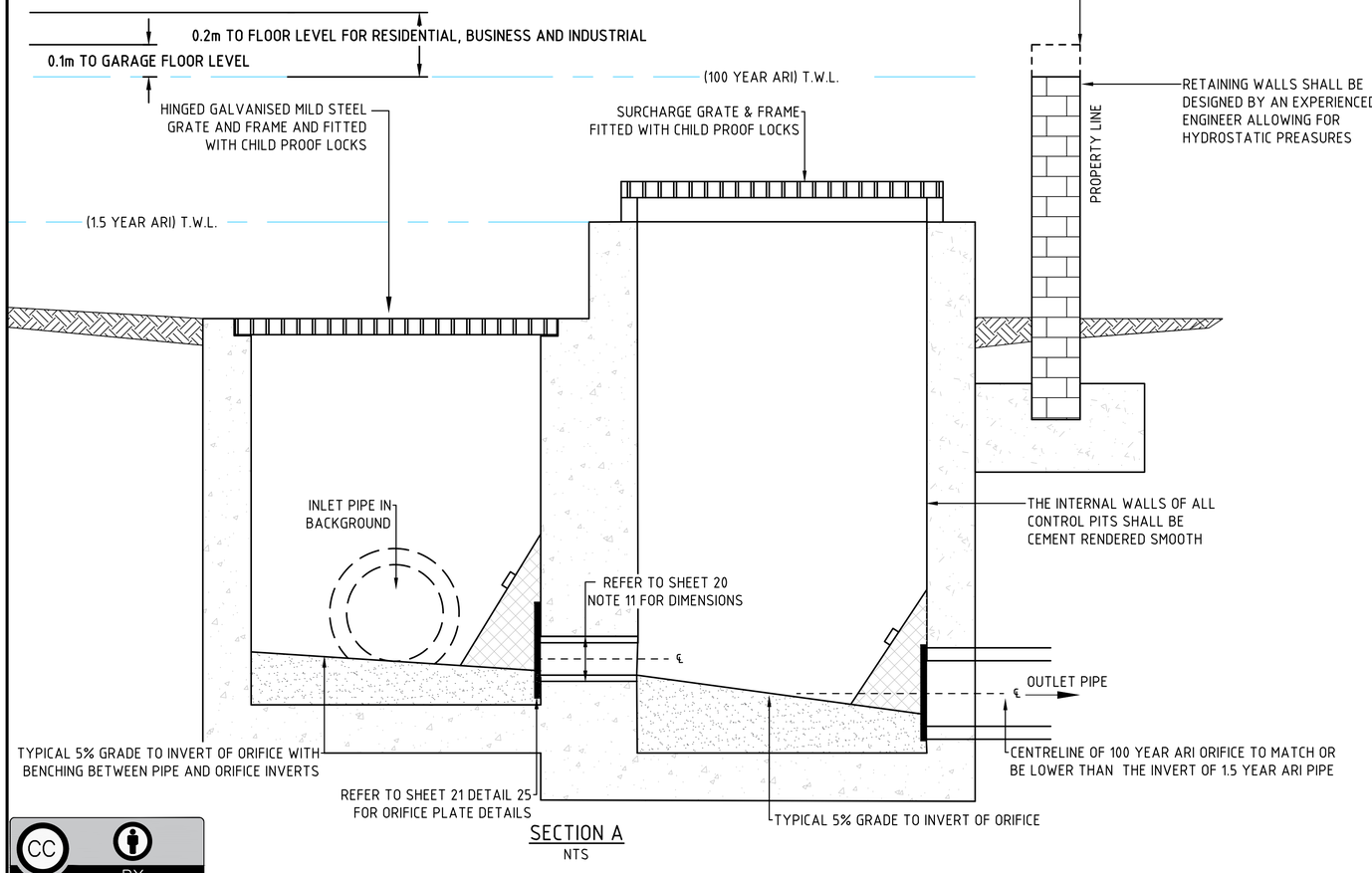
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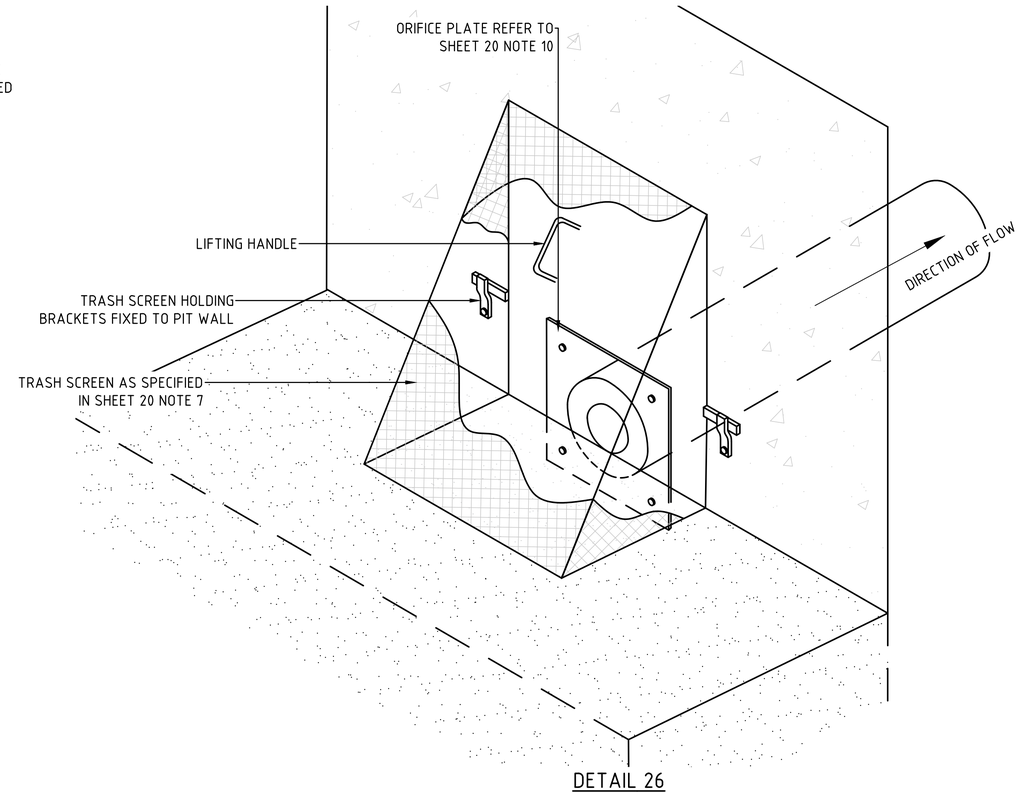
PLAN 15
TYPICAL CONFIGURATION OF AN OSD
DISCHARGE CONTROL PIT
NTS



DETAIL 25
ORIFICE PLATE
NTS



SECTION A
NTS



DETAIL 26
ORIFICE PLATE & TRASH SCREEN
NTS

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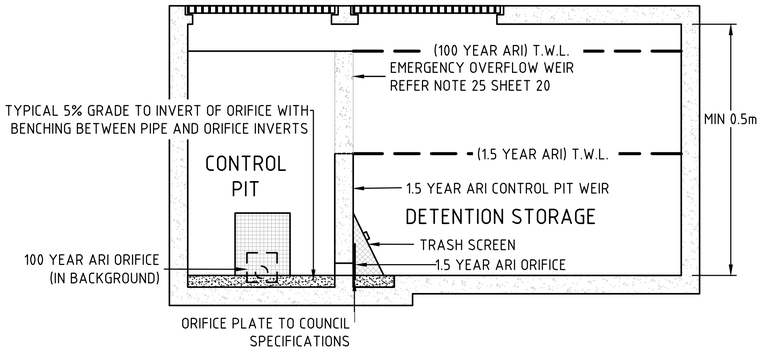
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VERT
CROSS SECTIONS

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SHEET TITLE: OSD – ABOVE GROUND STORAGE

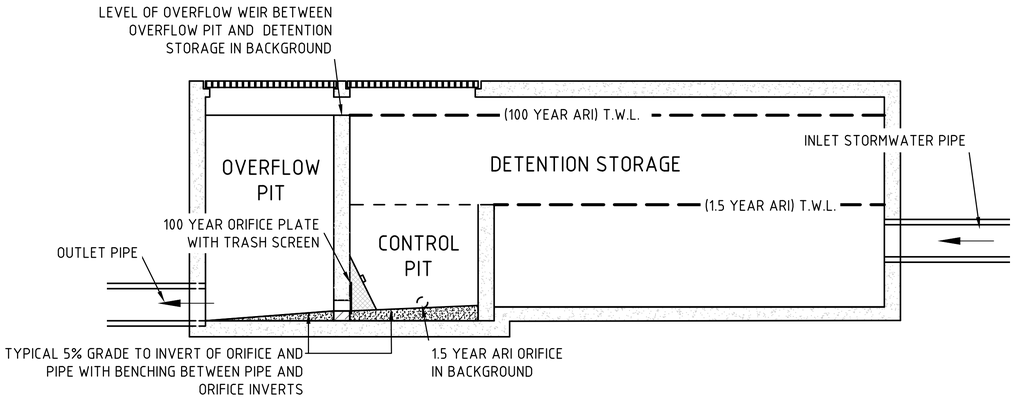
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PLAN No: A(BS)175M

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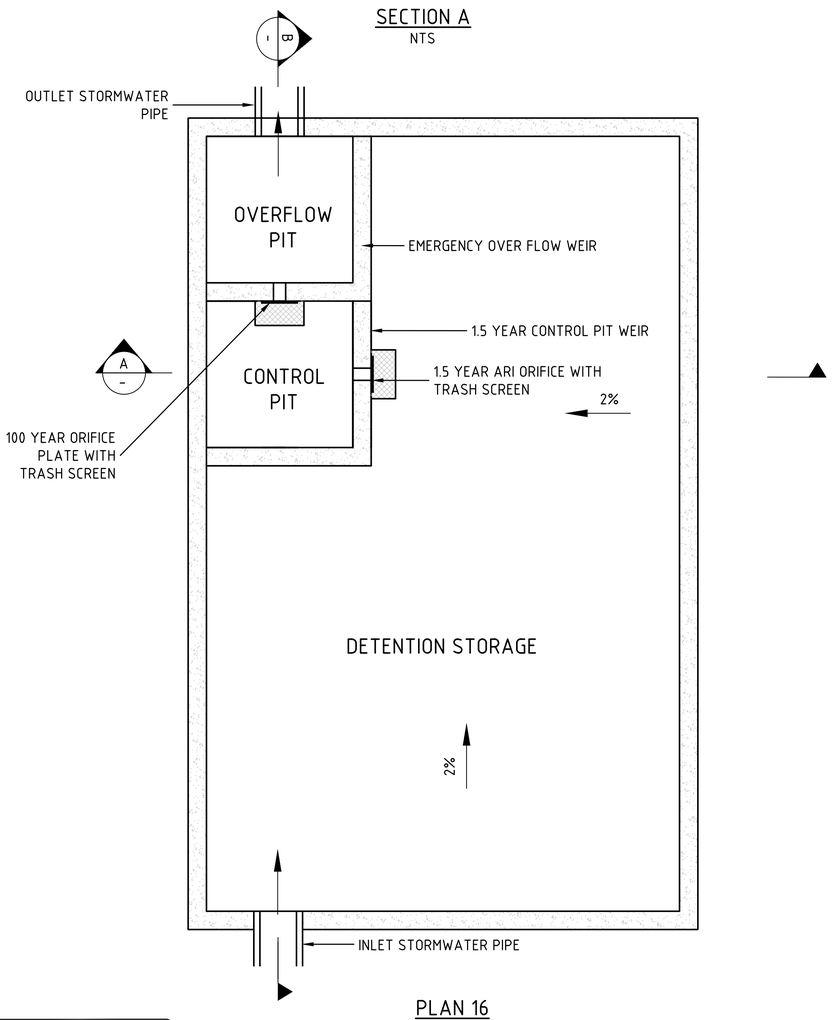
21 OF 25
REV D



SECTION A
NTS



SECTION B
NTS



PLAN 16
DISCHARGE CONTROL PIT WITH EMERGENCY OVERFLOW
NTS

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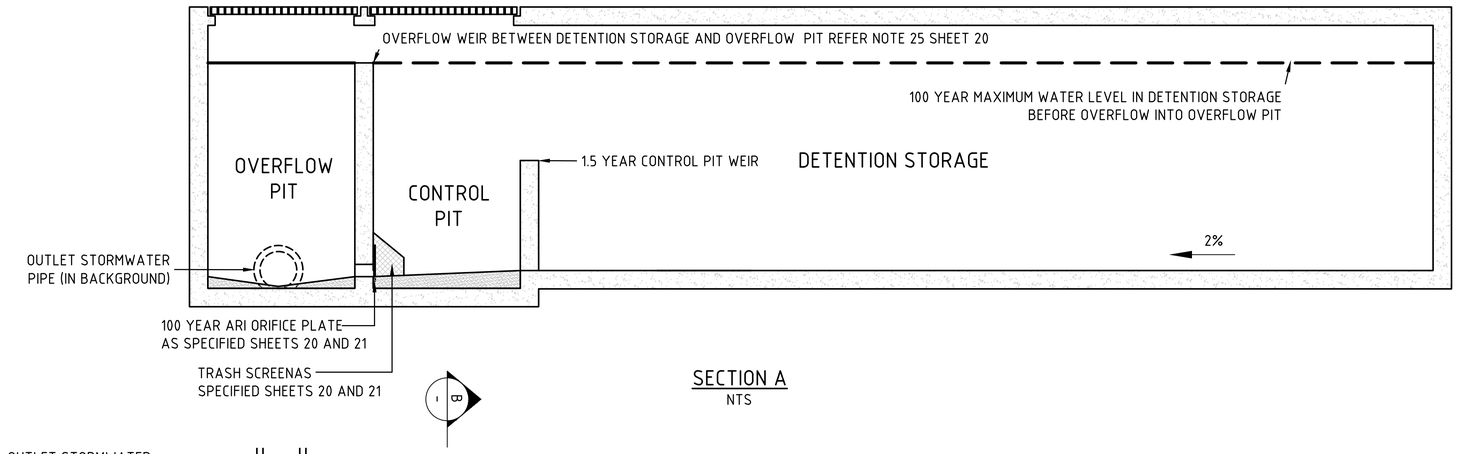
PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD - UNDERGROUND STORAGE

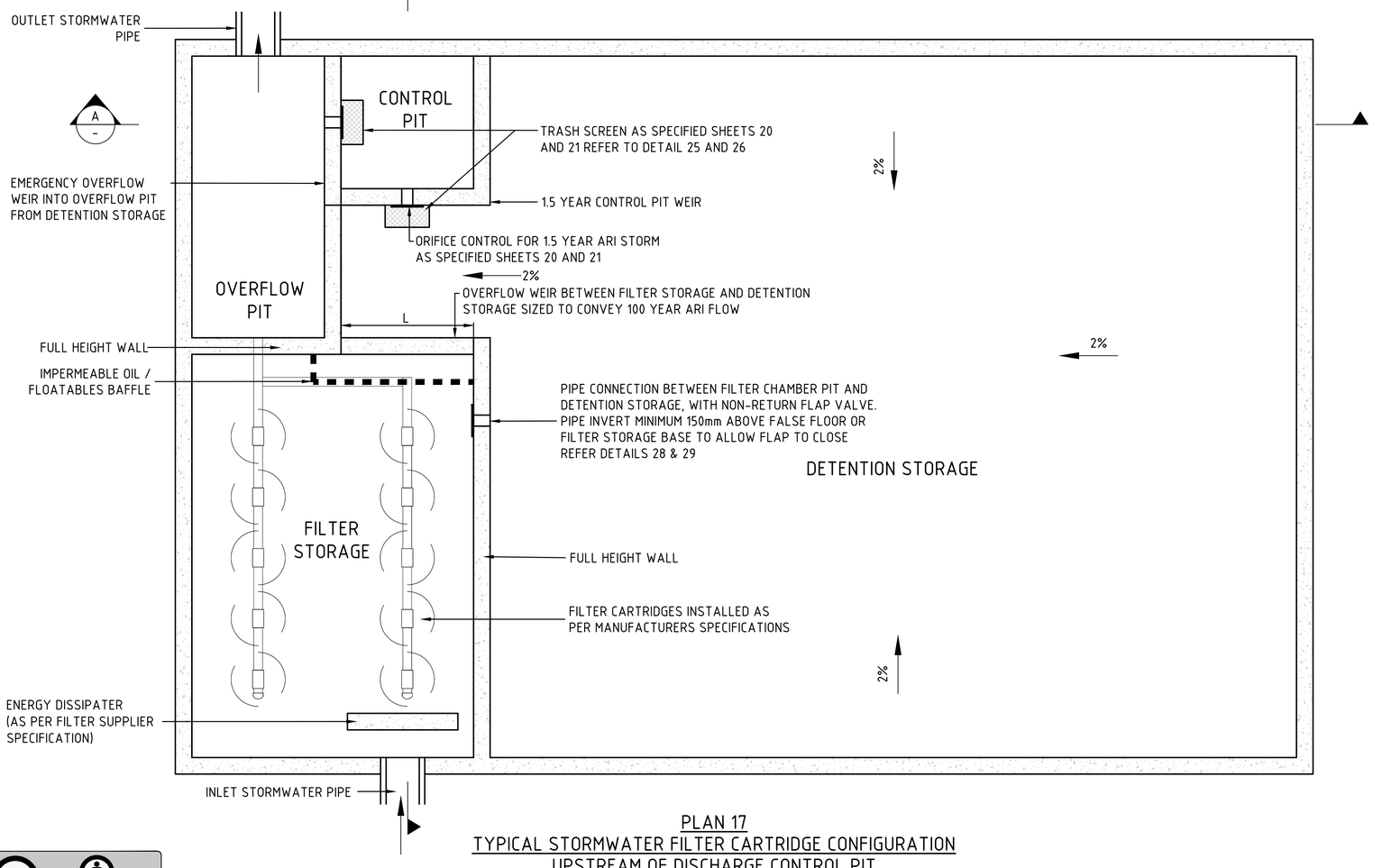
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FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN

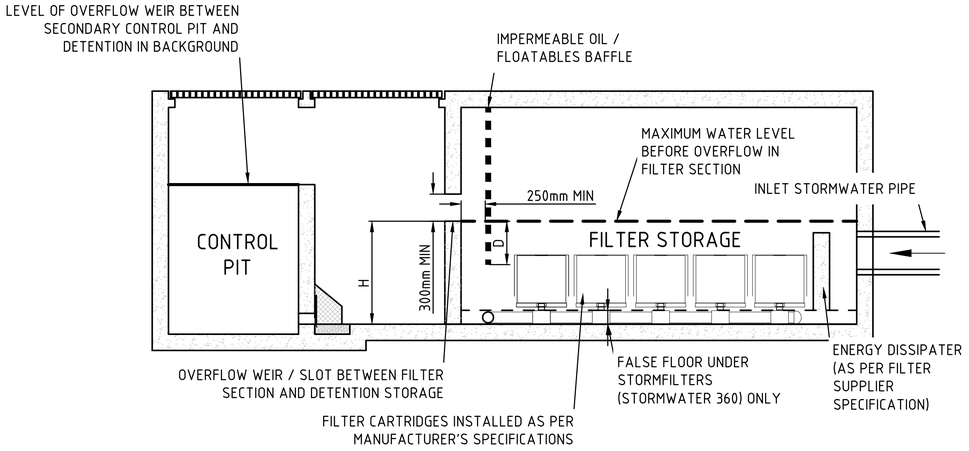
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SECTION A
NTS



PLAN 17
TYPICAL STORMWATER FILTER CARTRIDGE CONFIGURATION
UPSTREAM OF DISCHARGE CONTROL PIT
NTS



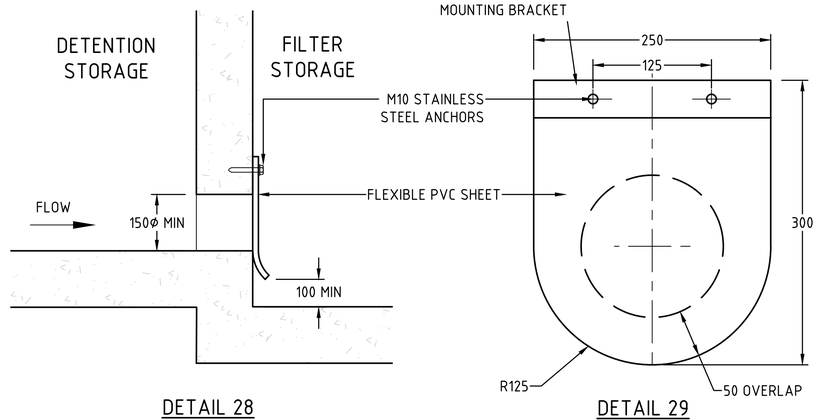
SECTION B
NTS

DESIGN NOTES:

1. THE FILTER TANK STORAGE IS CONSIDERED AS PART OF THE 1.5 YEAR ARI DETENTION STORAGE.
2. COMBINED OSD & FILTER CARTRIDGE SYSTEMS SHALL COMPLY WITH THE STORAGE VOLUME AND DISCHARGE REQUIREMENTS DOCUMENTED ON SHEET 20. THIS REQUIRES THAT ORIFICES BE ADJUSTED TO ACCOUNT FOR THE COMBINED FLOW FROM THE CARTRIDGES AND THE ORIFICES.
3. THE SIZING OF THE 1.5 YEAR ARI ORIFICES NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER THROUGH THE UNDERDRAIN FROM THE FILTER STORAGE USING THE MANUFACTURERS NOMINAL DESIGN FLOW RATES (REFER MANUFACTURER'S SPECIFICATIONS). IF THE MINIMUM ORIFICE SIZE NEEDS TO BE LESS THAN 15mm.
4. IN THE EVENT THAT THE NOMINAL DISCHARGE FROM THE FILTER STORAGE EXCEEDS THE 1.5 YEAR ARI FLOW THEN OMIT THE 1.5 YEAR ARI ORIFICE CONTROL AND GRADE FLOOR OF OSD TANK TO NON-RETURN FLAP.
5. THE SIZING OF THE 100 YEAR ARI ORIFICE NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER FROM THE FILTER CARTRIDGES, THE CARTRIDGE FLOW WILL EXCEED THE NOMINAL DESIGN FLOW RATES DURING EVENTS LARGER THAN A 1.5 YEAR ARI STORM DUE TO ADDITIONAL HEAD ON EACH CARTRIDGE. CONTACT THE MANUFACTURER FOR THE REVISED CARTRIDGE FLOW AT THE 100 YEAR TOP WATER LEVEL.
6. THE ADJUSTED ORIFICE SIZES WILL BE MANUALLY CALCULATED USING THE DIFFERENCE BETWEEN THE FLOW RATES FROM SHEET 20 AND THE CARTRIDGE FLOW RATE.
7. DETAILED DESIGN OF THE DETENTION AND FILTER CARTRIDGE SYSTEM IS TO BE DONE IN ACCORDANCE WITH SPECIFICATIONS FOR ONSITE DETENTION AND THE DETAILED DESIGN SPECIFICATIONS FROM THE CARTRIDGE MANUFACTURER.
8. DIMENSIONS D, H AND WEIR LENGTH (L) IN METRES FOR FLOW ($Q=m^3/s$) (REFER SECTION B ABOVE). FOR DETENTION TANKS Q IS 100 YEAR ARI HOWEVER FOR OFF LINE TREATMENT MINIMUM Q IS 0.75 x 1 YEAR ARI.

FILTER CARTRIDGE	D	H	L
STORMFILTER (690)	400mm	770mm + FALSE FLOOR THICKNESS	10.0 x Q
STANDARD STORMFILTER (460)	300mm	540mm + FALSE FLOOR THICKNESS	13.2 x Q
SMALL STORMFILTER (310)	200mm	390mm + FALSE FLOOR THICKNESS	17.8 x Q
SPEL FILTER EMC - 45N (STANDARD)	450mm	850mm	10.0 x Q
SPEL FILTER EMC - 45L (LOW)	250mm	530mm	13.2 x Q

9. ALL SECTIONS OF THE OSD SYSTEM SHALL HAVE GRATED ACCESS POINTS. MINIMUM 900mm x 900mm AS PER AS3500



DETAIL 28
NON-RETURN FLAP MOUNTING
NTS

DETAIL 29
NON-RETURN FLAP MIN DIMENSIONS
NTS

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REV	DATE	DESCRIPTION	CHECKED	APPROVED	DATE
D	DEC'21	AMENDMENTS TO SHEETS 3, 4 & 11	CB	KM	DEC '21
C	FEB '17	PEER REVIEWED FOR ADOPTION	GJH	TN	FEB '17
B	DEC '16	FINAL DRAFT	M.L	TN	DEC '16
A	MAY '16	ISSUED FOR CONSULTATION	M.L	TN	MAY '16

PUBLIC UTILITIES LEGEND

WATER MAINS	GAS	TELSTRA
HYDRANT	GAS VALVE	TELSTRA PIT
STOP VALVE	ELECTRICITY	TELSTRA PILLAR
WATER METER	ELECTRICITY PIT	TELSTRA POLE
WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED: -
DESIGNED: -
CADD: AJ
VERIFIED: ML
DATE: FEB '17

APPROVED
MANAGER ASSET DESIGN
DATE FEB '17

CLIENT
DATE

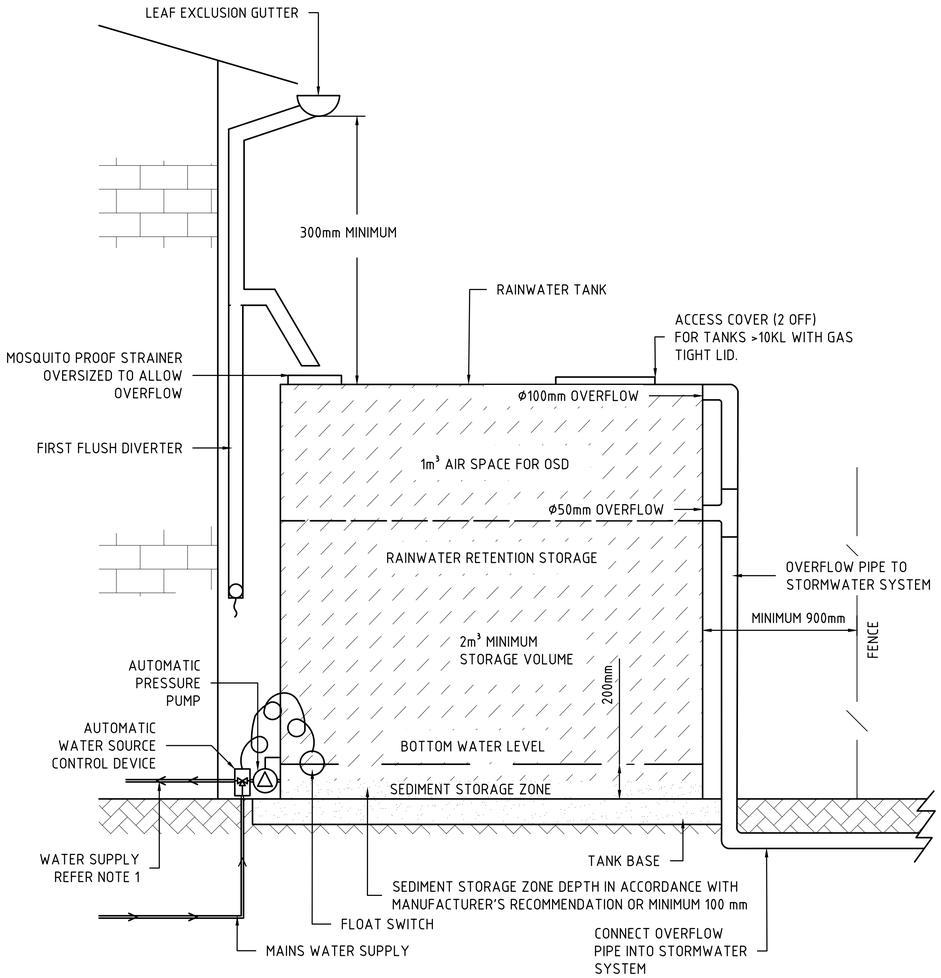
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ALL MAIL: GENERAL MANAGER PO BOX 63, BLACKTOWN NSW 2148
TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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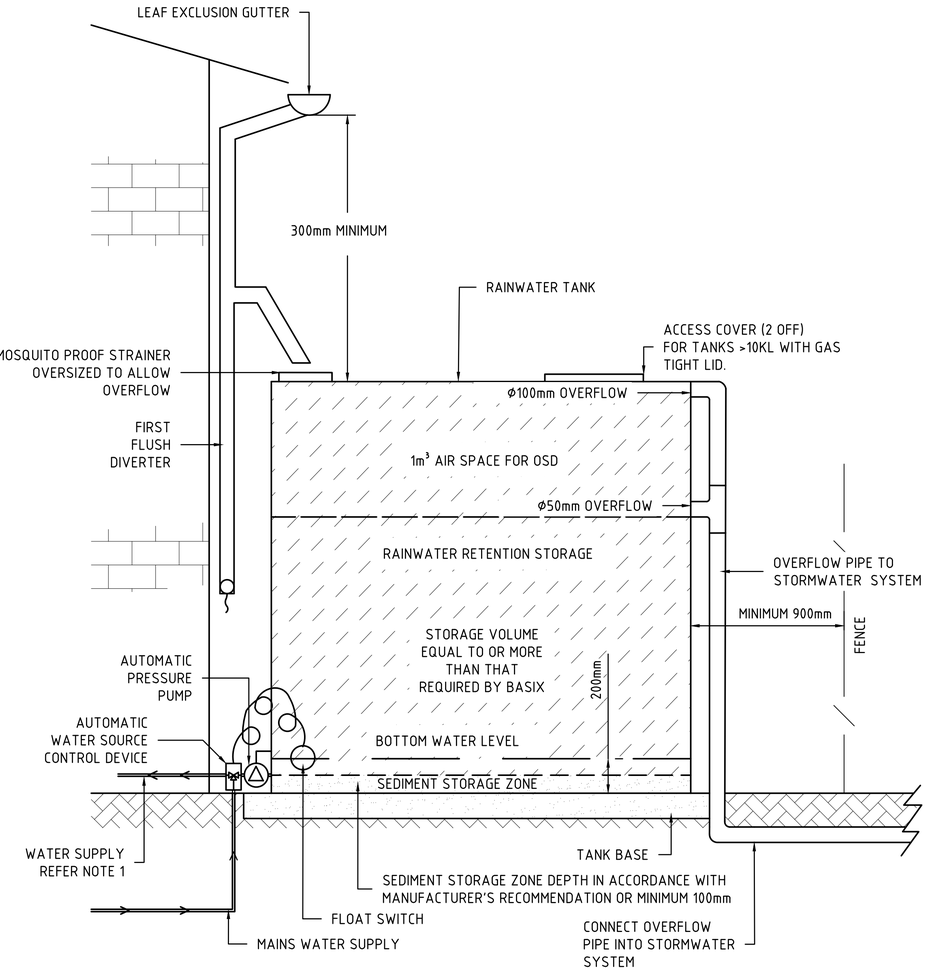
Blacktown City Council

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD - COMBINED OSD & FILTER CARTRIDGES
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

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DETAIL 30
DEEMED TO COMPLY ON SITE STORMWATER DETENTION & WATER CONSERVATION SOLUTION FOR BUSINESS & INDUSTRIAL DEVELOPMENT FOR SITES 150m² TO 500m²
NTS



DETAIL 31
DEEMED TO COMPLY ON SITE STORMWATER DETENTION SOLUTION FOR ATTACHED HOUSING
NTS

NOTES:
1. THE TANK SHALL SUPPLY TOILET, LAUNDRY, HOT WATER & ALL OUTDOOR TAPS.
2. REFER SHEET 25 FOR FURTHER DETAILS & NOTES

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WATER TAP	POWER POLE	STORMWATER PIT
SEWER	POWER LIGHT POLE	
SEWER LAMPHOLE	LIGHT POLE	
SEWER MANHOLE	STAY POLE	

DATUM: AHD
GRID: MGA
SHEET SIZE: A1
TITLE BLOCK VERSION: A

SURVEYED –
DESIGNED –
CADD AJ
VERIFIED ML
DATE FEB '17

APPROVED
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DATE FEB '17

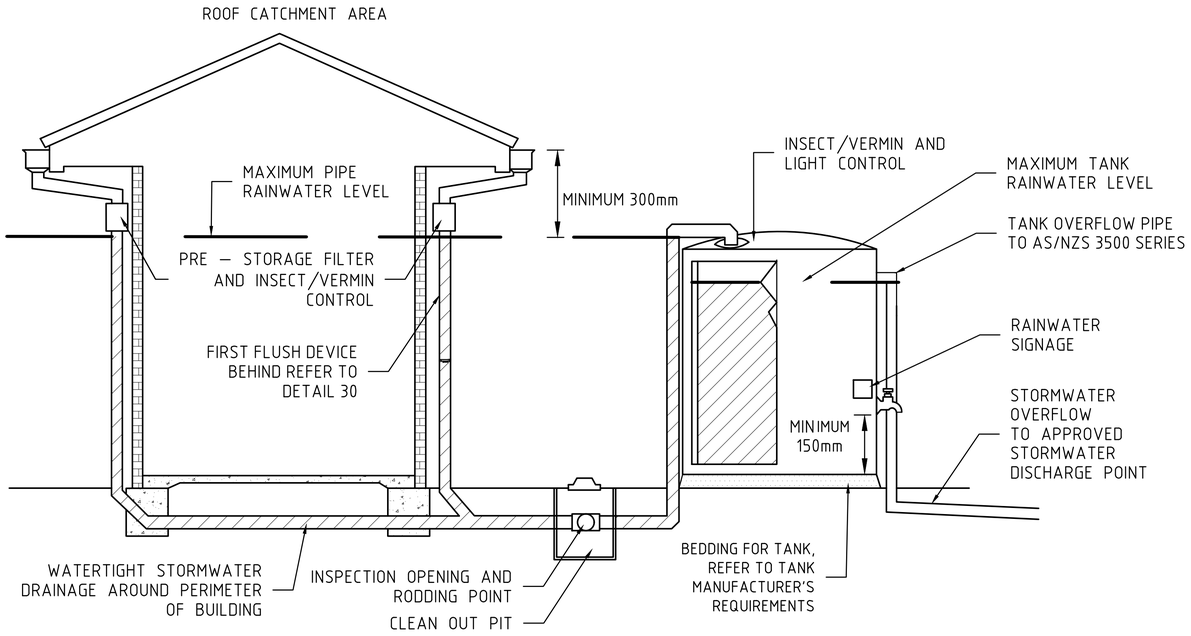
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TELEPHONE: (02) 9839 6000 FAX: (02) 9831 1961
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
VERT
CROSS SECTIONS

PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: OSD DEEMED TO COMPLY SOLUTION
CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

ISO 9001 International Standards Certifications
Lic No.QAC/R61/0103
ASSET DESIGN



DETAIL 32
RAINWATER TANK WITH CHARGED LINE
NTS

DESIGN NOTES FOR CHARGED SYSTEMS:
1. CHARGE LINES ARE TO USE TYPE 'P' PRESSURE RATED SOLVENT.
2. SOLVENT SEALED TO UNDERSIDE OF EAVES. PAINT ALL EXPOSED SURFACES OR USE UV STABILISED PIPES.
3. FORCE LOW POINT IN CHARGE LINE TO CLEAN OUT PIT.
4. FOR ISOLATED PIT WITHOUT OUTLET PIPES PROVIDE 4 OFF 5mm ø SEEPAGE HOLES IN BASE WITH GRAVEL UNDER.

NOTES FOR RAINWATER TANKS:
GENERAL:
1. THE TANK MAY SUPPLY TOLIET, LAUNDRY, HOT WATER & ALL OUTDOOR TAPS.
2. OFF TAKE POINT IS TO BE A MINIMUM OF 150mm ABVOVE THE BASE OF THE TANK.
3. FLOAT SWITCH SHALL BE SET TO ACTIVATE MAINS SUPPLY WHEN WATER LEVEL IS 200mm ABOVE BASE OF TANK.

GENERAL MODELLING REQUIREMENTS:
THE FOLLOWING POINTS STIPULATE HOW RAINWATER TANKS ARE TO BE MODELLED IN MUSIC
4. WHERE IRRIGATION IS PROPOSED, IT IS TO BE SCALED USING POTENTIAL EVAPOTRANSPIRATION (PET) MINUS RAINFALL.
5. ALLOW FOR A LOSS OF 250mm FROM THE BASE OF EACH RAINWATER TANK TO ALLOW FOR SEDIMENT STORAGE SPACE , LOW LEVEL TOP UP AND OVERFLOW.

RESIDENTIAL MODELLING REQUIREMENTS:
6. RESIDENTIAL DEVELOPMENT IS SUBJECT TO BASIX AND HAS NO MINIMUM REUSE TARGET.
7. A MINIMUM OF 50% OF RUN OFF FROM THE ROOF AREA IS TO BE DIRECTED TO THE RAINWATER TANK UNLESS THE BASIX CERTIFICATE NOTES OTHERWISE.
8. FOR LOW DENSITY RESIDENTIAL SUBDIVISIONS, ALLOW FOR A TANK SIZE OF 2.25KL ON EACH ALLOTMENT, MODELLED AS A 2.0KL TANK IN MUSIC. ALLOW A SURFACE AREA OF 1.7m² FOR TANK PER DWELLING.
9. INDOOR AND OUTDOOR DEMANDS SHALL BE MODELLED IN ACCORDANCE WITH THE FOLLOWING TABLE:

RESIDENTIAL RAINWATER REUSE		
TYPE OF DWELLING & LAND SIZE	INDOOR (L/DAY)	OUTDOOR (kL/YEAR)
DETACHED HOUSE >730m²	100	55
DETACHED HOUSE >520m²,<730m²		45
DETACHED HOUSE >320m²,<520m²		32
DETACHED HOUSE <320m²		25
ROW HOUSES		20
TOWN HOUSES	20	0.4kL/YEAR/m² OF LANDSCAPED AREA
APARTMENTS / HOME UNITS		

BUSINESS AND INDUSTRIAL MODELLING REQUIREMENTS:
10. COUNCIL REQUIRES A MINIMUM OF 80% NON-POTABLE REUSE TO BE MET THROUGH THE PROVISION OF RAINWATER OR APPROVED NON-POTABLE SOURCES SUCH AS TREATED STORMWATER
11. INDOOR AND OUTDOOR DEMANDS SHALL BE MODELLED IN ACCORDANCE WITH THE FOLLOWING TABLE:

DEVELOPMENT BUSINESS AND INDUSTRIAL WATER USE RATES		
SIZE AND TYPE OF BUILDING	INDOOR (L/DAY)	OUTDOOR (kL/YEAR)
MOTELS	25L/DAY/TOILET IN PRIVATE ROOM 100L/DAY/TOILET IN PUBLIC AREAS	0.4kL/YEAR/m²
AGED CARE / HOSPITALS		
OTHER BUSINESS AND INDUSTRIAL	100L/DAY/TOILET OR URINAL	

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DATUM AHD
GRID MGA
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PLAN 1:1000 @ A1
LONG SECTION:HORIZ
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PROJECT TITLE: WSUD STANDARD DRAWINGS
SHEET TITLE: RAINWATER TANK – CHARGED LINE SYSTEMS & MUSIC MODELING REQUIREMENTS

CAD FILE: A(BS)175M.dwg
FILE No: N/A
PLAN No: A(BS)175M

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