CAREEL BAY

NOTES:

1. ALL DIMENSIONS TO BE VERIFIED ON SITE BY BUILDER BEFORE COMMENCING WITH WORK.

NOTE:
MAINTAIN EXISTING OVERLAND FLOW PATH TO PIPED EASEMENT

NOTE:
ALL SURFACE AREAS TO BE COLLECTED AND DIRECTED TO BOUNDARY PITS IN ALL LOTS IN ACCORDANCE WITH AS 3500.3

NOTE:
100Φ PIPES TO HAVE MIN. 1% FALL UNO
150Φ PIPES TO HAVE MIN. 1% FALL UNO

NOTE:
SDI SPOON DRAIN TO COLLECT DRIVEWAY RUNOFF. REFER TO TYPICAL DETAIL ON DRAWING No. D05. ALSO REFER TO CIVIL DRAWINGS PREPARED BY: NORTHERN BEACHES CONSULTING ENGINEERS.

NOTE:
PIPEWORK INSTALLED BELOW DRIVEWAY TO BE HUNG AS REQUIRED AT 1 % MINIMUM FALL TO BIO-RETENTION BASIN

NOTE:
ALL ROOF AREAS TO BE DIRECTED TO RWT'S VIA A CHARGED SYSTEM WHERE ADEQUATE IN ACCORDANCE WITH AS 3500.3.

NOTE:
ALL BYPASS AREAS TO BE DIRECTED TO SWT. ALL SWT's TO BE USED FOR IRRIGATION ONLY. REFER MUSIC CATCHMENT PLAN

NOTE:
ALL LEVELS TO BE CONFIRMED ON SITE BY BUILDER PRIOR TO CONSTRUCTION

TANK SCHEDULE

TANK NUMBER	SIZE AND TYPE
SWT 6-9	3000L MIN.
RWT 1-9	5000L MIN.

DRAIN SCHEDULE

GRATED DRAIN NUMBER	SIZE AND TYPE
GD1	200 WIDE x 200 MINIMUM DEPTH
GD2	200 WIDE x 200 MINIMUM DEPTH
GD3	SPEL HYDROCHANNEL
GD4	200 WIDE x 200 MINIMUM DEPTH
GD8	200 WIDE x 200 MINIMUM DEPTH
GD6	SPEL HYDROCHANNEL
SDI	SPOON DRAIN, REFER DETAIL

PIT SCHEDULE

PIT NUMBER	SIZE	TYPE	COMMENT	FSL	INVERT
BP1	450x450	GRATED PIT	-	20.500	20.000
BP2	450x450	GRATED PIT	-	19.200(TBC)	18.900(TBC)
BP3	450x450	GRATED PIT	-	17.000(TBC)	16.700(TBC)
BP4	450x450	GRATED PIT	-	15.500(TBC)	15.200(TBC)
BP5	450x450	GRATED PIT	-	15.400	15.100
BP6	450x450	GRATED PIT	WITH SPEL STORMSACK	2.400	2.100(TBC)
BP7	450x450	GRATED PIT		2.650	2.400
BP8	450x450	GRATED PIT		3.500	3.250
BP9	450x450	GRATED PIT		4.500	4.300
P1	600x600	GRATED PIT	WITH SPEL STORMSACK	14.700	14.100
P2	600x600	GRATED PIT		15.000	14.250
P3	600x600	GRATED PIT		20.000	19.500
P4	600x600	GRATED PIT		-	-
P5	600x600	GRATED PIT		-	-
P6	450x450	GRATED PIT	-	19.900	19.400

LEGEND:
HATCHED AREA INDICATES AREAS TO RWT'S AS PER MUSIC REQUIREMENTS

ALL PIPES TO BE 100mm Φ uPVC UNLESS NOTED OTHERWISE

SITE STORMWATER DRAINAGE PLAN

SCALE = 1 : 250

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IF IN DOUBT ASK

NB Consulting Engineers

A1

Date:	Issue:	Description:	By:	Review:
06.12.2018	C	ISSUED FOR D.A. SUBMISSION ONLY - NOT FOR CONSTRUCTION - LOT NUMBERS ALTERED	P.R.B.	M.W.
04.12.2018	B	ISSUED FOR D.A. SUBMISSION ONLY - NOT FOR CONSTRUCTION - EASEMENT PIPE UPDATED	P.R.B.	M.W.
06.11.2018	A	ISSUED FOR D.A. SUBMISSION ONLY - NOT FOR CONSTRUCTION	P.R.B.	M.W.

DOCUMENT CERTIFICATION
Date :
Stewart McGeady
B.E.(Civil),MIEAust.
(Director NB Consulting Engineers)

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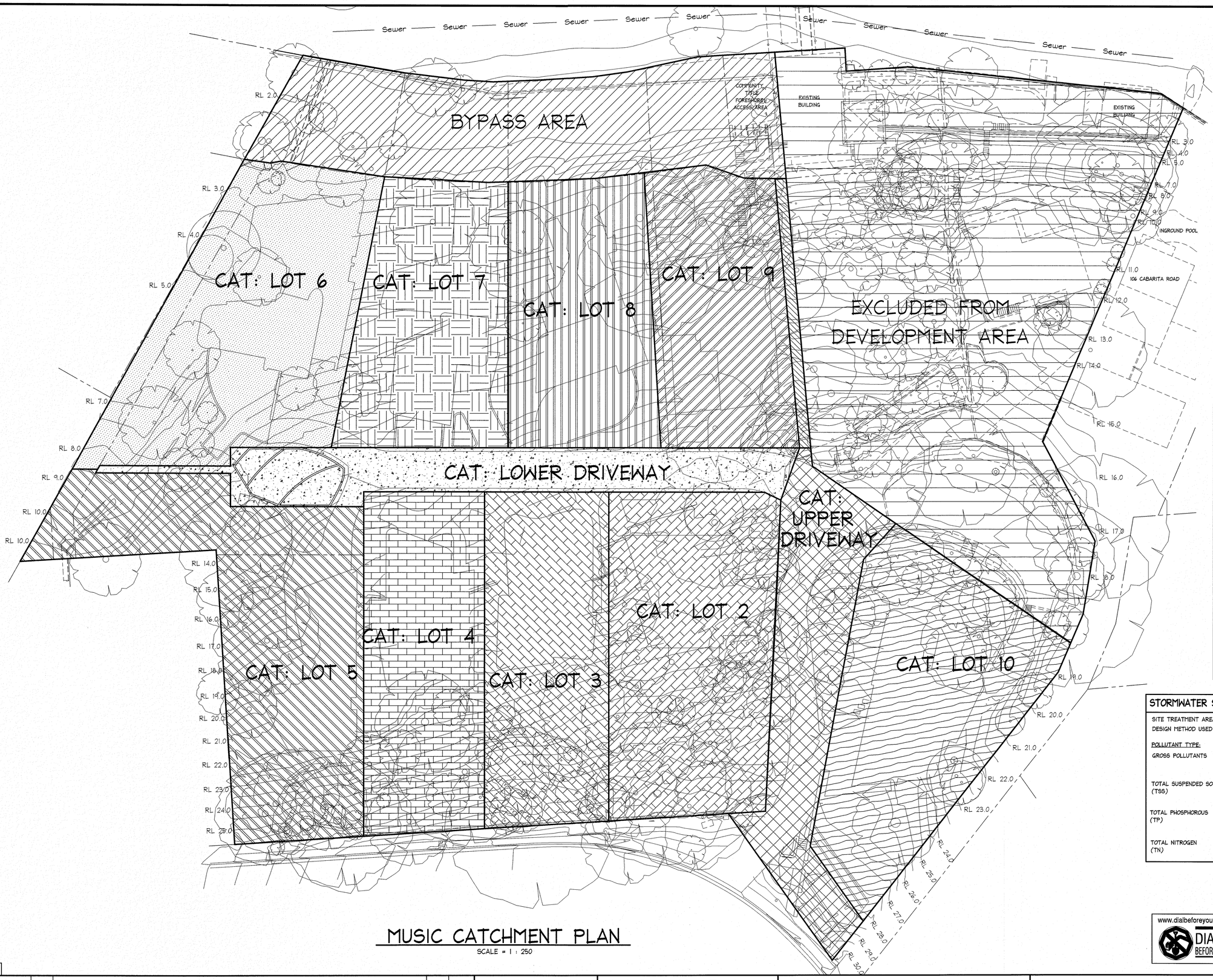
Architect: Mark Hurcum Design Practice Pty Ltd	Project: PROPOSED DEVELOPMENT 96-104 Cabarita Road Avalon Beach N.S.W. 2107	Date: Oct 2018	Design: C.F. / Drawn: Paul R Bruce AMIEAust.
Client: Meraki Developments Pty Ltd	Drawing Title: SITE STORMWATER DRAINAGE PLAN	Job No: 180411	Drawing No: D01 / Issue: C

NB Consulting Engineers



MUSIC CATCHMENT PLAN

SCALE = 1 : 250

NOTES:

1. ALL DIMENSIONS TO BE VERIFIED ON SITE BY BUILDER BEFORE COMMENCING WITH WORK.

CATCHMENT SCHEDULE

NAME	AREA (m2)	% PAVED	% PERVIOUS
LOT 1 (RWT)	250	100	0
LOT 1 (BYPASS)	730	13	87
LOT 2 (RWT)	230	100	0
LOT 2 (BYPASS)	750	7	93
LOT 3 (RWT)	260	100	0
LOT 3 (BYPASS)	500	3	97
LOT 4 (RWT)	240	100	0
LOT 4 (BYPASS)	520	12	88
LOT 5 (RWT)	230	100	0
LOT 5 (BYPASS)	890	8	92
LOT 6 (RWT)	130	100	0
LOT 6 (SWT)	820	44	56
LOT 6 (BYPASS)	110	0	100
LOT 7 (RWT)	130	100	0
LOT 7 (SWT)	510	59	41
LOT 7 (BYPASS)	90	0	100
LOT 8 (RWT)	130	100	0
LOT 8 (SWT)	400	56	44
LOT 8 (BYPASS)	190	0	100
LOT 9 (RWT)	110	100	0
LOT 9 (SWT)	290	89	11
LOT 9 (BYPASS)	280	0	100
UPPER DRIVEWAY (FILTER)	290	100	0
UPPER DRIVEWAY (BYPASS)	370	10	90
LOWER DRIVEWAY (FILTER)	430	88	12
LOWER DRIVEWAY (BYPASS)	80	80	20
TOTAL	8950		

STORMWATER SYSTEM QUALITY TARGET SUMMARY NOTES

SITE TREATMENT AREA	8 950 m^2	
DESIGN METHOD USED	MUSIC (REFER TO DISK)	
POLLUTANT TYPE:	PERFORMANCE TARGET:	ACHIEVED
GROSS POLLUTANTS	95 % REDUCTION IN POST DEVELOPMENT MEAN ANNUAL LOAD OF TOTAL GROSS POLLUTANTS	100 %
TOTAL SUSPENDED SOLIDS (TSS)	80 % REDUCTION IN POST DEVELOPMENT MEAN ANNUAL LOAD OF TOTAL SUSPENDED SOILIDS	84.4 %
TOTAL PHOSPHOROUS (TP)	60 % REDUCTION IN POST DEVELOPMENT MEAN ANNUAL LOAD OF TOTAL PHOSPHOROUS	62.6 %
TOTAL NITROGEN (TN)	45 % REDUCTION IN POST DEVELPMENT MEAN ANNUAL LOAD OF TOTAL NITROGEN	65.7 %

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IF IN DOUBT ASK

A1

Date:	Issue:	Description:	By:	Review:
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06.11.2018	A	ISSUED FOR D.A. SUBMISSION ONLY - NOT FOR CONSTRUCTION	P.R.B.	M.W.

DOCUMENT CERTIFICATION
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Architect: Mark Hurcum Design Practice Pty Ltd

Client: Meraki Developments Pty Ltd

Project: PROPOSED DEVELOPMENT 96-104 Cabarita Road Avalon Beach N.S.W. 2107

Drawing Title: MUSIC CATCHMENT PLAN

Date: Oct 2018 | Design: C.F. | Drawn: Paul R Bruce MIEAust.

Job No: 180411 | Drawing No: D02 | Issue: B

NB Consulting Engineers

STORMWATER NOTES:

1. ALL PIPES TO BE 100mm ϕ UNLESS NOTED OTHERWISE.
2. ALL PIPES TO BE uPVC TO AS 1254-2002 UNLESS NOTED OTHERWISE.
3. ALL PIPES TO BE LAYED AT 1 % MINIMUM GRADE UNLESS NOTED OTHERWISE.
4. ALL PIPES SHALL BE LAID ON A 75mm SAND BED, COMPACTED TO 100% S.M.D.D. BELOW PAVEMENTS.
   (NO COMPACTION REQUIRED BELOW LANDSCAPING)
   COVER TO SURFACE FROM TOP OF PIPE TO BE 300mm MINIMUM.
   BACKFILL TO BE ADEQUATELY CONSOLIDATED AROUND PIPES BY METHOD OF RAMMING AND WATERING IN. TRENCHES TO BE FILLED WITH GRANULAR MATERIAL AS SPECIFIED.
5. ALL DOWN PIPES TO BE 100mm ϕ UNLESS NOTED OTHERWISE.
6. DOWN PIPE LOCATIONS ARE INDICATIVE ONLY. LOCATIONS TO BE CONFIRMED WITH ARCHITECT PRIOR TO COMMENCEMENT OF WORK.
7. PROVIDE CLEANING EYES AT ALL DOWNPIPES.
8. ALL PITS TO BE CAST INSITU OR, IF PRECAST, APPROVED BY ENGINEER. CAST INSITU PITS TO HAVE 150mm THICK CONCRETE WALLS AND BASE. WALLS TO BE REINFORCED WITH 1 N12 TOP TIE UNLESS NOTED OTHERWISE. CAST INSITU PITS GREATER THAN 900 DEEP TO BE MINIMUM 900x600 AND TO HAVE 150mm THICK CONCRETE WALLS AND BASE. WALLS TO BE REINFORCED WITH N12 AT 300 EACH WAY UNLESS NOTED OTHERWISE.
9. ALL PITS GREATER THAN 1000mm DEEP SHALL HAVE STEP IRONS AS PER COUNCIL STANDARDS.
10. THE BOUNDARY OR SILT ARRESTOR PIT SHOULD ALWAYS INCORPORATE A SUMP AND MAXI-MESH SCREEN AS PER LOCAL COUNCIL REQUIREMENTS. HOWEVER, UNLESS SPECIFICALLY REQUIRED BY COUNCILS POLICY OR IF THE SITE CONSISTS OF A CLAY OR ROCK SUBGRADE, ALL OTHER DRAINAGE PITS WILL NOT REQUIRE A SUMP.
11. ALL WORK TO BE IN ACCORDANCE WITH LOCAL COUNCIL STANDARDS AND SPECIFICATIONS.
12. PRIOR TO COMMENCING ANY SITE WORKS THE CONTRACTOR SHALL IMPLEMENT EROSION CONTROL MEASURES TO APPROVED SEDIMENT AND EROSION CONTROL PLAN, EPA GUIDELINES AND COUNCIL SPECIFICATIONS. ALL MEASURES TO REMAIN IN PLACE UNTIL COMPLETION AND STABILIZATION OF THE SITE TO COUNCIL SATISFACTION.
13. ALL LEVELS SHOWN ARE TO AHD
14. ENSURE THAT ALL PITS AND STORMWATER PIPES ARE LOCATED CLEAR FROM TREE ROOT SYSTEMS.
15. ALL EXISTING EARTHENWARE PIPES TO BE UPGRADED TO uPVC.
16. ALL WORKS TO BE IN ACCORDANCE WITH AS 3500-2003 NATIONAL PLUMBING DRAINAGE CODE PART 3 - STORMWATER DRAINAGE.
17. UNLESS NOTED OTHERWISE, SUB-SOIL DRAINS ARE TO BE INSTALLED IN ACCORDANCE WITH AS3500.3 ALONGSIDE WALLS THAT IMPEDE THE NATURAL FLOW OF GROUNDWATER. THIS MAY ALSO INVOLVE TRENCHING INTO THE CLAY OR ROCK SUBGRADE TO DIRECT GROUNDWATER AWAY FROM STRUCTURES.
18. IF NOT INDICATED ON PLANS, PROVIDE LEAF CATCHERS TO ALL DOWNPIPES.
19. ORIFICE PLATE MUST BE INSTALLED PRIOR TO INSTALLATION OF THE ROOF DRAINAGE SYSTEM AND CONNECTION OF THE SITE STORMWATER SYSTEM TO THE ONSITE DETENTION TANK.
20. 100mm ϕ x 3000 LONG TAIL OUT SUBSOIL LINE TO BE PROVIDED ON THE UPSTREAM SIDE OF ALL PITS. SUBSOIL LINE TO BE COVERED WITH GEOTEXTILE FILTER SOCK FOR THE FULL LENGTH AND END COVERED.

RAINWATER RE-USE TANKS: (RWT)

1. CONSIDERING THE ROOF CATCHMENT AREA, LOCATION OF PROPERTY, INTENDED USE OF RAINWATER AND GARDEN SIZE WE RECOMMEND PROVIDING A RAINWATER TANK FOR USE AS PER BASIX REQUIREMENTS, SYDNEY WATER AND NSW HEALTH REQUIRMENTS FOR NON DRINKING USE ONLY. REFER TO BASIX REPORT.
2. THE TANKS PROVIDED WILL REDUCE PRESSURE ON COUNCIL'S STORMWATER INFRASTRUCTURE.
3. REFERENCES:
   COOMBES P.J. & KUCZERA G. (2001), "RAINWATER TANK DESIGN FOR WATER SUPPLY & STORMWATER MANAGEMENT." STORMWATER INDUSTRY ASSOCIATION REGIONAL CONFERENCE.
   PATRICK DUPONT & STEVE SHACKEL, "RAINWATER"
   AUSTRALIAN GOVERNMENT (2004), "GUIDANCE ON USE OF RAINWATER TANKS"
4. ALL CONNECTIONS TO PLUMBING AND RAINWATER TANKS TO BE IN ACCORDANCE WITH SYDNEY WATERS' GUIDE "INSTALLING A RAINWATER TANK" AVAILABLE AT www.sydneywater.com.au
5. PROVIDE A DUAL SUPPLY SYSTEM AND BACKFLOW PREVENTION SYSTEM IN ACCORDANCE WITH 'BASIX-DESIGN GUIDE FOR SINGLE DWELLINGS' BY NSW DEPARTMENT OF INFRASTRUCTURE, PLANING AND NATURAL RESOURCES.
6. IF NOT SPECIFIED ON PLANS, THE FIRST FLUSH SYSTEM IS TO HAVE A MINIMUM SIZE OF 20L PER 100m2 OF ROOF CATCHMENT AREA PRIOR TO ENTERING THE RAINWATER TANK. INDIVIDUAL SITE ANALYSIS IS REQUIRED IN HEAVILY POLLUTED AREAS TO DETERMINE IF LARGER VOLUMES OF FIRST FLUSH RAINWATER ARE TO BE DIVERTED. IF IN DOUBT, CHECK WITH LOCAL HEALTH AUTHORITIES.
7. SCREENED DOWNPIPE RAINWATER HEAD OR OTHER SUITABLE LEAF AND DEBRIS DEVICE TO BE INSTALLED ON EACH DOWNPIPE. SCREEN MESH TO BE 4-6mm AND DESIGNED TO BE SELF-CLEANING.
8. FIRST FLUSH DEVICES, OR APPROVED ALTERATIVE, TO BE INSTALLED WITH AN AUTOMATED DIVERSION AND DRAINAGE SYSTEM, THAT IS, NO MANUAL DIVERSION AND DRAINAGE VALVES. REFER TYPICAL FLUSH OUT PIT FOR DETAILS.
9. BEFORE PURCHASING MATERIALS OR PAINT TO BE USED ON ROOF CATCHMENT AREAS, THE MANUFACTURER'S RECOMMENDATIONS ON LABELS AND BROCHURES FOR RAINWATER TANK SUITABILITY TO BE READ AND ADHERED TO.
10. PRE-STORAGE PITS FOR UNDERGROUND RAINWATER STORAGE TANKS AND FLUSH OUT PITS MAY ASSIST IN LIMITING SILT, AND PREVENT VERMIN, INSECTS (INCLUDING MOSQUITOES) AND DEBRIS FROM ENTERING THE RAINWATER STORAGE AREA.
11. BUILDER/PLUMBER TO ENSURE THE INSTALLATION OF THE RAINWATER TANK SYSTEM IS IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS AND THE RAINWATER TANK DESIGN AND INSTALLATION HANDBOOK - HB 230-2008. IF IN DOUBT CONTACT ENGINEER.
12. RAINWATER TANK TO BE WATER PROOFED IN ACCORDANCE WITH HB 230-200B

STORMWATER RE-USE TANKS:

1. BASIX RECOMMENDS PROVIDING A STORMWATER TANKS FOR USE AS PER BASIX REQUIRMENTS FOR THE FOLLOWING USES:
   a) TO WATER GARDEN AREAS
2. THE TANKS PROVIDED WILL REDUCE PRESSURE ON COUNCIL'S STORMWATER INFRASTRUCTURE.
3. IF NOT SPECIFIED ON PLANS, THE FIRST FLUSH SYSTEM IS TO HAVE A MINIMUM SIZE OF 20L PER 100m2 OF ROOF CATCHMENT AREA PRIOR TO ENTERING THE RAINWATER TANK. INDIVIDUAL SITE ANALYSIS IS REQUIRED IN HEAVILY POLLUTED AREAS TO DETERMINE IF LARGER VOLUMES OF FIRST FLUSH RAINWATER ARE TO BE DIVERTED. IF IN DOUBT, CHECK WITH LOCAL HEALTH AUTHORITIES.
4. SCREENED DOWNPIPE RAINWATER HEAD OR OTHER SUITABLE LEAF AND DEBRIS DEVICE TO BE INSTALLED ON EACH DOWNPIPE. SCREEN MESH TO BE 4-6mm AND DESIGNED TO BE SELF-CLEANING.
5. FIRST FLUSH DEVICES, OR APPROVED ALTERNATIVES, TO BE INSTALLED WITH AN AUTOMATED DIVERSION AND DRAINAGE SYSTEM, THAT IS, NO MANUAL DIVERSION AND DRAINAGE VALVES. REFER TYPICAL FLUSH OUT PIT FOR DETAILS.
6. BEFORE PURCHASING MATERIALS OR PAINT TO BE USED ON ROOF CATCHMENT AREAS, THE MANUFACTURER'S RECOMMENDATIONS ON LABELS AND BROCHURES FOR RAINWATER TANK SUITABILITY TO BE READ AND ADHERED TO.

BIOFILTRATION BASIN (RAINGARDEN) NOTES

PART 1: INSTALLATION

GENERAL:

A1. THE FOLLOWING NOTES ARE INTENDED AS A SUMMARY ONLY TO ASSIST WITH THE CONSTRUCTION AND MAINTENANCE OF A BIO-FILTRATION BASIN (RAINGARDEN). ALL WORKS ARE TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE MOST RECENT VERSION OF THE RELEVANT INDUSTRY STANDARDS AND GUIDELINES. THIS MAY INCLUDE THE "ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS" BY THE FACILITY FOR ADVANCING WATER BIOFILTRATION (FAWB), MONASH UNIVERSITY, JUNE 2009.

A2. NBCE STRONGLY RECOMMENDS THE BIOFILTRATION BASIN BE INSTALLED ONLY AFTER ALL CONSTRUCTION AND LANDSCAPING UPSTREAM HAS BEEN COMPLETED. IF THE FILTER MEDIA IS INSTALLED BEFORE LANDSCAPING IS COMPLETED, THE UN-VEGETATED BASIN MUST BE COVERED WITH A LAYER OF GEOFABRIC UNTIL ALL BARE SOFT SURFACES UPSTREAM HAVE BEEN TURFED OR APPROPRIATELY COVERED AND CONSTRUCTION DEBRIS/SEDIEMENT IS NO LONGER EXPECTED TO ENTER THE STORMWATER SYSTEM.

A3. BIOFILTRATION BASINS REQUIRE AN ESTABLISHMENT PERIOD OF APPROXIMATELY TWO YEARS TO ALLOW THE FILTER MEDIA TO SETTLE AND THE VEGETATION TO REACH ITS DESIGN CONDITIONS. REGULAR MAINTENANCE OF THE BASIN IS ESPECIALLY IMPORTANT DURING THIS INITIAL PERIOD TO ENSURE THE VEGETATION TAKES HOLD AND DOES NOT CHOKE FROM DEBRIS OR PERIODS OF MINIMAL RAINFALL.
A4. ADEQUATE SCOUR PROTECTION IS TO BE PROVIDED AROUND ANY INLET ZONE(S), WITH CONSIDERATION GIVEN TO MINIMISING THE REQUIRED ON-GOING SYSTEM MAINTENANCE FOR THE END-CLIENT AND THE DAMAGING EFFECT OF HIGH VELOCITY STORMWATER.

BIOFILTRATION BASIN STRUCTURE:

1ST LAYER - FILTER MEDIA:

B1. THE FILTER MEDIA IS RESPONSIBLE FOR REMOVING POLLUTANTS THROUGH BOTH PHYSICAL AND CHEMICAL PROCESSES AS WELL AS TO SUPPORT THE PLANT AND MICROBIAL COMMUNITY THAT ARE RESPONSIBLE FOR BIOLOGICAL TREATMENT. THE FILTRATION LAYER WILL ALSO USUALLY ALLOW STORMWATER TO ABSORB INTO THE SURROUNDING SOIL, THEREBY REDUCING THE VOLUME OF STORMWATER WHICH ENTERS THE DOWNSTREAM SYSTEM.

B2. THE FILTER MEDIA SHOULD HAVE THE FOLLOWING SPECIFICATIONS:
- HYDRAULIC CONDUCTIVITY (Ks) RANGE: 100-300 MM/HR (AFTER COMPENSATING FOR LONG-TERM COMPACTION)
- LOW NUTRIENT ORGANIC MATTER CONTENT AT LEAST 3% (w/w) TO PROVIDE FOR SUFFICIENT WATER HOLDING CAPACITY TO SUPPORT PLANT GROWTH. THE FILTER MEDIA MUST NOT LEACH NUTRIENTS INTO THE STORMWATER SYSTEM.
- TOTAL NITROGEN (TN) CONTENT - <1000 mg/kg
- ORTHOPHOSPHATE (PO_4,3) CONTENT - <80 mg/kg OR <20mg/kg FOR PLANTS SENSITIVE TO PHOSPHORUS.
- Ph-AS SPECIFIED FOR PLANTS IN 'NATURAL SOILS AND SOIL BLENDS' (5.5-7.5)
- ELECTRICAL CONDUCTIVITY (EC) - AS SPECIFIED FOR 'NATURAL SOILS AND SOIL BLENDS' <1.2 dS/m

B3. TYPICAL FILTER MEDIA PROFILE:
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 TO COARSE SAND 40-60% (0.25-1.0 mm)
COARSE SAND 7-10% (1.0-2.0 mm)
FINE GRAVEL <3% (2.0-3.4 mm)

B4. DISPERSIBILITY TESTING ON THE FILTER MEDIA SHOULD BE CARRIED OUT WHERE IT IS SUSPECTED THAT THE SOIL MAY BE SUSCEPTIBLE TO STRUCTURAL COLLAPSE. IF IN DOUBT, THEN THIS TESTING SHOULD BE UNDERTAKEN.

2ND LAYER - TRANSITION LAYER:

C1. THE PURPOSE OF THE TRANSITION LAYER IS TO MINIMISE THE MIGRATION OF THE FILTER MEDIA INTO THE SUBMERGED ZONE AND/OR DRAINAGE LAYER.

C2. THE TRANSITION LAYER MATERIAL SHALL BE A CLEAN, WELL-GRADED SAND MATERIAL CONTAINING <2% FINES.

C3. THE PARTICLE SIZE DISTRIBUTION OF THE SAND SHOULD BE ASSESSED TO ENSURE IT MEETS 'BRIDGING CRITERIA', THAT IS, THE SMALLEST 15% OF THE SAND PARTICLES BRIDGE WITH THE LARGEST 15% OF THE FILTER MEDIA PARTICLES

3RD LAYER - SUBMERGED ZONE (WHERE DETAILED):

D1. THE SUBMERGED ZONE IS RESPONSIBLE FOR SUPPORTING THE PLANT AND MICROBIAL COMMUNITY DURING DRY WEATHER AS WELL AS FOR ENHANCED NITROGEN REMOVAL.

D2. THE SUBMERGED ZONE SHOULD BE COMPRISED OF A MIX OF MEDIUM-TO-COARSE SAND AND CARBON OR A MIX OF FINE GRAVEL AND CARBON. THE CARBON SOURCE SHOULD BE A MIX OF 5% MULCH AND 5% HARDWOOD CHIPS (APPROXIMATELY 6 MM GRADING), BY VOLUME.

4TH LAYER - DRAINAGE LAYER:

E1. THE DRAINAGE LAYER CONTAINS THE SLOTTED PIPE UNDERDRAIN AND IS DESIGNED TO COLLECT TREATED STORMWATER FROM THE LAYERS ABOVE WHILST PROTECTING THE UNDERDRAIN FROM BLOCKAGES.

E2. THE DRAINAGE LAYER MATERIAL IS TO BE A CLEAN, FINE GRAVEL, SUCH AS 2-5 mm WASHED BLUE METAL. BRIDGING CRITERIA SHOULD BE APPLIED TO AVOID MIGRATION OF THE SUBMERGED ZONE INTO THE DRAINAGE LAYER (SEE TRANSITION LAYER FOR BRIDGING CRITERIA).

UNDERDRAIN:

F1. THE UNDERDRAIN SHOULD BE INSTALLED AT THE BASE OF THE DRAINAGE LAYER (WITH AT LEAST 50MM COVER) AND IS DESIGNED TO CONVEY TREATED STORMWATER INTO THE OUTLET PIT.

F2. THE UNDERDRAIN SHOULD BE A 100mm uPVC SLOTTED PIPE WITHOUT ANY GEOFABRIC COVERING. AGG DRAINAGE LINES SHOULD NOT BE USED AS THE RIBS FILL WITH SEDIMENT AND ARE HARDER TO FLUSH-OUT.

F3. A SERIES OF 45' BENDS RATHER THAN 90' BENDS SHOULD BE USED TO FACILITATE SYSTEM MAINTENANCE AND EFFECTIVE FLUSH-OUT.

F4. UNDERDRAINS SHOULD CONTAIN ENOUGH SLOTS SO AS TO ADEQUATELY CONVEY THE TREATED FLOW WITHOUT BECOMING A CHOKE ON THE SYSTEM.

F5. WHERE THE BASIN IS MORE THAN 2m WIDE AND ADDITIONAL UNDERDRAINS ARE SPECIFIED, THEY SHOULD NOT BE SPACED FURTHER THAN 1.5m APART.

VEGETATION:

G1. PROPERLY CHOSEN PLANTS ARE CRUCIAL FOR BOTH REMOVAL OF NUTRIENTS AND THE MAINTENANCE OF HYDRAULIC CONDUCTIVITY (Ks). HOWEVER, THE PLANTS ARE THE MOST SENSITIVE COMPONENT OF THE SYSTEM AND ADEQUATE CARE IS REQUIRED TO ENSURE LONG TERM SURVIVAL.

G2. ANY PLANTS CHOSEN SHOULD BE ASSESSED AS HAVING THE FOLLOWING CHARACTERISTICS:
- HIGH RELATIVE GROWTH RATE
- HIGH TOTAL ROOT, LEAF & SHOOT BIOMASS
- HIGH ROOT DENSITY
- HIGH ROOT: SHOOT RATIO
- HIGH LENGTH OF LONGEST ROOT
- HIGH LEAF AREA RATIO

G3. RECOMMENDED PLANTS FOR NUTRIENT REMOVAL ARE:
- CAREX APPRESSA
- MELALEUCA ERICIFOLIA (GOOD FOR MAINTAINING HIGH INFILTRATION RATES)
- GOODENIA OVATA
- FICINIA NODOSA
- JUNCUS AMABILIS
- JUNCUS FLAVIDUS

G4. THE OVERALL PLANTING DENSITY SHOULD BE AT LEAST 10 PLANTS/m2 TO INCREASE ROOT DENSITY, PROTECT SURFACE POROSITY, PROMOTE EVEN DISTRIBUTION OF FLOWS, INCREASE EVAPOTRANSPIRATION LOSSES, AND REDUCE THE POTENTIAL FOR WEED INVASION.

G5. MULCH IS NOT RECOMMENDED FOR BIOFILTRATION BASINS - A HIGHER PLANTING DENSITY SHOULD BE USED IN LIEU OF MULCH. HOWEVER IF DEEMED NECESSARY, A GRAVEL MULCH MAY BE USED WHERE THERE IS CONCERN TO PROTECT THE SOIL FROM EROSION OR DECREASE THE PHYSICAL DROP TO THE PONDING ZONE (FOR SAFETY REASONS) WHILST MAINTAINING THE PONDING VOLUME. ORGANIC MULCH SHOULD NOT BE USED DUE TO HIGH RISK OF MOBILISATION AND CLOGGING OF THE SYSTEM.

NOTE:
SURFACE DRAINAGE TO BE PROVIDED IN ACCORDANCE WITH AS 3500.3

NOTE:
SUBSOIL DRAINAGE TO BE INSTALLED WHERE REQUIRED AS PER AS 3500.3

NOTE: EXISTING SERVICES
CONTRACTOR TO LOCATE ALL EXISTING SERVICES PRIOR TO EXCAVATION AND NOTIFY ENGINEER OF ANY POTENTIAL CLASHES WITH THE PROPOSED DRAINAGE EASEMENT PIPE LINE.

ONSITE DETENTION CALCULATIONS SUMMARY
NORTHERN BEACHES COUNCIL - PITTWATER

TOTAL SITE DEVELPMENT AREA = 8,950 m^2
NOTE: AREA BEYOND FORESHORE BUILDING LINE (AND LOT 10) EXCLUDED FROM CALCULATION
EXISTING IMPERVIOUS AREA = 1,390 m^2 (16 %)
PROPOSED IMPERVIOUS AREA = 3,825 m^2 (43 %)
INCREASE = 2,435 m^2

OSD REQUIRMENT
THE SUBJECT SITE IS ADJACENT TO CAREEL BAY
THEREFORE OSD IS NOT REQUIRED FOR THIS DEVELOPMENT

WSUD REQUIREMENT
WSUD IS REQUIRED FOR THIS DEVELOPMENT, REFER TO D01 FOR DETAILS

RAINWATER RE-USE PROVIDED = 45,000 L (5,000 L PER LOT)
STORMWARER RE-USE PROVIDED = 12,000 L (3,000 L PER LOT)
MAXIMUM CONCENTRATED DISCHARGE TO KERB = N/A
DISCHARGE METHOD = DIRECT CONNECTION TO COUNCIL PIPELINE

BIOFILTRATION BASIN (RAINGARDEN) NOTES

PART 2: SYSTEM MAINTENANCE

GENERAL:

H1. THE INSTALLED BIOFILTRATION BASIN (RAINGARDEN) IS DESIGNED TO TREAT STORMWATER FLOWS AND IMPROVE STORMWATER QUALITY BEFORE IT ENTERS THE DOWNSTREAM SYSTEM. A PROPERLY FUNCTIONING SYSTEM, WHICH INCLUDES ANY UPSTREAM PITS AND TANKS IS ABLE TO EFFECTIVELY TREAT STORMWATER FROM GROSS POLLUTANTS (E.G. RUBBISH), SUSPENDED SOLIDS (E.G. SILTS), TOTAL NITROGEN, TOTAL PHOSPHORUS AND HEAVY METALS. PROPER CONSTRUCTION AND REGULAR MAINTENANCE WILL HELP ENSURE THE SYSTEM EFFECTIVELY TREATS STORMWATER BEFORE IT ENTERS LOCAL WATER BODIES.

FILTER MEDIA TASKS:

H2. SEDIMENT DEPOSITION: REMOVE SEDIMENT BUILD UP FROM FOREBAYS AND OTHER PRE-TREATMENT MEASURES IN BIOFILTRATION SYSTEMS AND FROM THE SURFACE OF BIOFILTRATION VEGETATION.
- FREQUENCY - 3 MONTHLY, AFTER RAIN

H3. HOLES OR SCOUR: INFILL ANY HOLES IN THE FILTER MEDIA. CHECK FOR EROSION OR SCOUR AND REPAIR. PROVIDE ADDITIONAL ENERGY DISSIPATION (E.G. ROCKS AND PEBBLES AT INLET) IF NECESSARY.
- FREQUENCY - 3 MONTHLY, AFTER RAIN

H4. FILTER MEDIA SURFACE POROSITY: INSPECT FOR THE ACCUMULATION OF AN IMPERMEABLE LAYER (SUCH AS OILY OR CLAYEY SEDIMENT) THAT MAY HAVE FORMED ON THE SURFACE OF THE FILTER MEDIA. A SYMPTOM MAY BE THAT WATER REMAINS PONDED IN THE BIOFILTRATION SYSTEM FOR MORE THAN A FEW HOURS AFTER A RAIN EVENT. REPAIR MINOR ACCUMULATIONS BY RAKING AWAY ANY MULCH ON THE SURFACE AND SCARIFYING THE SURFACE OF THE FILTER MEDIA BETWEEN PLANTS. REMOVE ANY ACCUMULATION OF LEAF LITTER TO HELP MAINTAIN THE SURFACE POROSITY OF THE FILTER MEDIA.
- FREQUENCY - 3 MONTHLY, AFTER RAIN

H5. LITTER CONTROL: CHECK FOR LITTER (INCLUDING ORGANIC LITTER) IN AND AROUND TREATMENT AREAS. REMOVE BOTH ORGANIC AND ANTHROPOGENIC LITTER TO ENSURE FLOW PATHS AND INFILTRATION THROUGH THE FILTER MEDIA ARE NOT HINDERED.
- FREQUENCY - 3 MONTHLY OR AS DESIRED FOR AESTHETICS

HORTICULTURAL TASKS:

H6. PESTS AND DISEASES: ASSESS PLANTS FOR DISEASE, PEST INFECTION, STUNTED GROWTH OR SENESCENT PLANTS. TREAT OR REPLACE AS NECESSARY. REDUCED PLANT DENSITY REDUCES POLLUTANT REMOVAL AND INFILTRATION PERFORMANCE AND ALLOWS WEEDS TO TAKE HOLD.
- FREQUENCY - 3 MONTHLY OR AS DESIRED FOR AESTHETICS

H7. MAINTAIN ORIGINAL PLANT DENSITIES: INFILL PLANTING - A MINIMUM 8-10 PLANTS PER SQUARE METRE SHOULD BE ADEQUATE (DEPENDING ON SPECIES) TO MAINTAIN A DENSITY WHERE THE PLANTS' ROOTS TOUCH EACH OTHER. PLANTING SHOULD BE EVENLY SPACED TO HELP PREVENT SCOURING DUE TO A CONCENTRATION OF FLOW.
- FREQUENCY - 3 MONTHLY OR AS DESIRED FOR AESTHETICS

H8. WEEDS: IT IS IMPORTANT TO IDENTIFY THE PRESENCE OF ANY RAPIDLY SPREADING WEEDS AS THEY OCCUR. THE PRESENCE OF SUCH WEEDS CAN REDUCE DOMINANT SPECIES DISTRIBUTIONS AND DIMINISH AESTHETICS. WEED SPECIES CAN ALSO COMPROMISE THE SYSTEMS LONG-TERM PERFORMANCE. INSPECT FOR AND MANUALLY REMOVE WEED SPECIES. APPLICATION OF HERBICIDE SHOULD BE LIMITED TO A WAND OR RESTRICTIVE SPOT SPRAYING DUE TO THE FACT THAT RAINGARDENS AND BIOFILTRATION TREE PITS ARE DIRECTLY CONNECTED TO THE STORMWATER SYSTEM.
- FREQUENCY - 3 MONTHLY OR AS DESIRED FOR AESTHETICS

DRAINAGE TASKS:

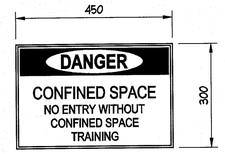
H9. UNDERDRAIN: ENSURE THAT UNDERDRAIN PIPES ARE NOT BLOCKED TO PREVENT FILTER MEDIA AND PLANTS FROM BECOMING WATERLOGGED. IF A SUBMERGED ZONE IS INCLUDED, CHECK THAT THE WATER LEVEL IS AT THE DESIGN LEVEL, NOTING THAT DRAWDOWN DURING DRY PERIODS IS EXPECTED. A SMALL STEADY CLEAR FLOW OF WATER MAY BE OBSERVED DISCHARGING FROM THE UNDERDRAIN AT ITS CONNECTION INTO THE DOWNSTREAM PIT SOME HOURS AFTER RAINFALL. NOTE THAT SMALLER RAINFALL EVENTS AFTER DRY WEATHER MAY BE COMPLETELY ABSORBED BY THE FILTER MEDIA AND NOT RESULT IN FLOW.
- FREQUENCY - 6 MONTHLY AND AFTER HEAVY RAINFALL

H10. HIGH FLOW INLET PITS, OVERFLOW PITS AND OTHER STORMWATER JUNCTION PITS: ENSURE INFLOW AREAS AND GRATES OVER PITS ARE CLEAR OF LITTER AND DEBRIS AND IN GOOD AND SAFE CONDITION. A BLOCKED GRATE MAY CAUSE NUISANCE FLOODING. REMOVE SEDIMENT FROM PITS AND INLET ZONE(S), ETC.
- FREQUENCY - MONTHLY AND OCCASIONALLY AFTER RAIN
  OTHER ROUTINE TASKS

H11. INSPECTION AFTER RAINFALL: OCCASIONALLY OBSERVE BIOFILTRATION SYSTEM AFTER A RAINFALL EVENT TO CHECK INFILTRATION. IDENTIFY SIGNS OF POOR DRAINAGE (EXTENDED PONDING ON THE FILTER MEDIA SURFACE). IF POOR DRAINAGE IS IDENTIFIED, CHECK LAND USE AND ASSESS WHETHER IT HAS ALTERED FROM DESIGN CAPACITY (E.G. UNUSUALLY HIGH SEDIMENT LOADS MAY REQUIRE INSTALLATION OF A SEDIMENT FOREBAY).
- FREQUENCY - TWICE A YEAR AFTER RAIN

NOTES:

1. ALL DIMENSIONS TO BE VERIFIED ON SITE BY BUILDER BEFORE COMMENCING WITH WORK.



TANK ENTRY SIGN
SCALE = N.T.S.

LEGEND:
BLACK ON YELLOW BACKGROUND

SIGN FOR RWT AND OUTLETS
SCALE = N.T.S.

NOTE: EXCAVATION AROUND TREES
CARE SHOULD BE TAKEN WHEN UNDERTAKING WORKS IN THE VICINITY OF SELECTED TREES NOT TO DISTURB THE TREE ROOT SYSTEM. HAND DIGGING OF TRENCHES ETC MAY BE NECESSARY. REFER ARBORISTS REPORT.

NOTE:
ALL ROOF DOWN PIPES TO DISCHARGE INTO RAINWATER RE-USE TANK IN ACCORDANCE WITH AS 3500.3

NOTE:
NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE.
ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE

DEVELOPERS & EXCAVATORS MAY BE HELD FINANCIALLY RESPONSIBLE BY THE ASSET OWNER SHOULD THEY DAMAGE UNDERGROUND NETWORKS.

CARELESS DIGGING CAN:
- CAUSE DEATH OR SERIOUS INJURY TO WORKERS AND THE GENERAL PUBLIC
- INCONVENIENCE USERS OF ELECTRICITY, GAS, WATER AND COMMUNICATIONS
- LEAD TO CRIMINAL PROSECUTION AND DAMAGES CLAIMS
- CAUSE EXPENSIVE FINANCIAL LOSSES TO BUSINESS
- CUT OFF EMERGENCY SERVICES
- DELAY PROJECT COMPLETION TIMES WHILE THE DAMAGE IS REPAIRED

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180411
D03A

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Date:	Issue:	Description:	By:	Review:
06.11.2018	A	ISSUED FOR D.A. SUBMISSION ONLY - NOT FOR CONSTRUCTION	P.R.B.	M.W.

DOCUMENT CERTIFICATION
Date : 8/11/18
Stewart McGeady
B.E.(Civil),MIEAust.
(Director NB Consulting Engineers)

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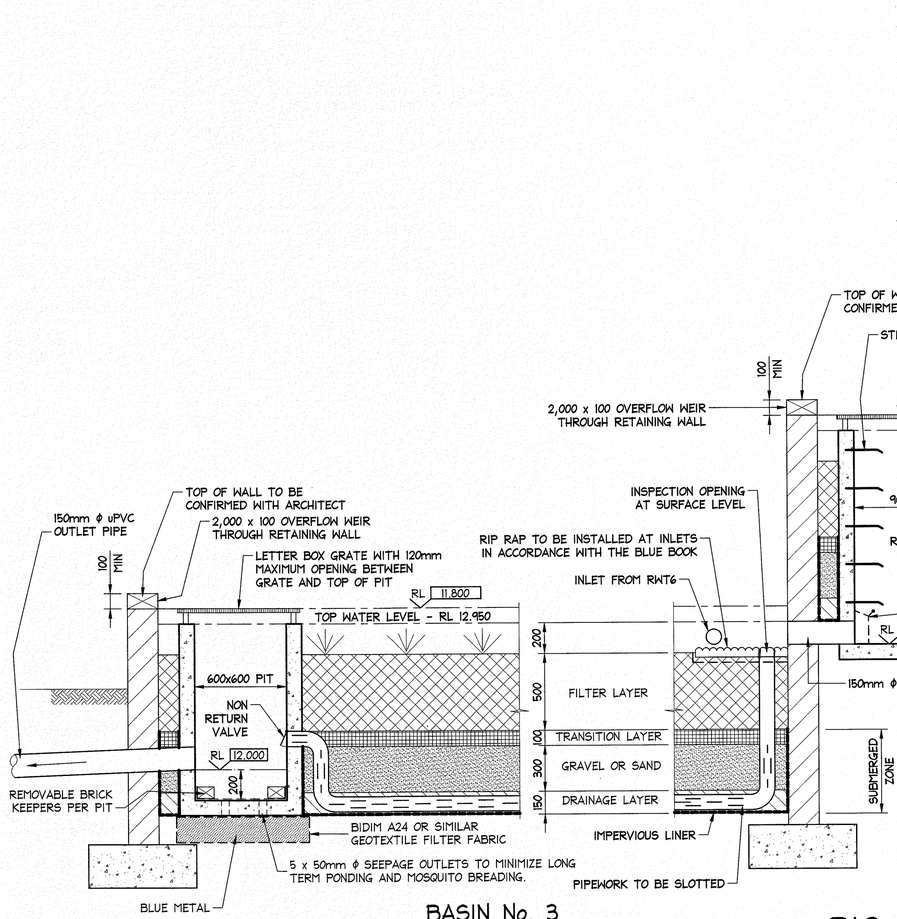
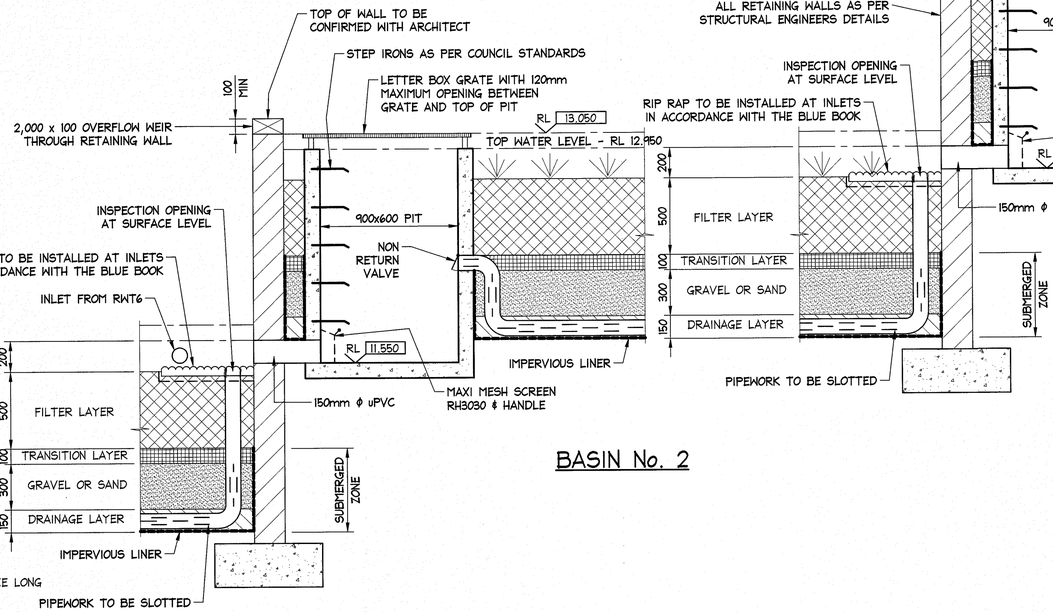
Architect: Mark Hurcum Design Practice Pty Ltd	Project: PROPOSED DEVELOPMENT 96-104 Cabarita Road Avalon Beach N.S.W. 2107	Date: Oct 2018	Design: C.F.	Drawn: Paul R Bruce MIEAust.
Client: Meraki Developments Pty Ltd	Drawing Title: STORMWATER DRAINAGE NOTES	Job No: 180411	Drawing No: D03	Issue: A

NOTES:

1. ALL DIMENSIONS TO BE VERIFIED ON SITE BY BUILDER BEFORE COMMENCING WITH WORK.



BASIN No. 3



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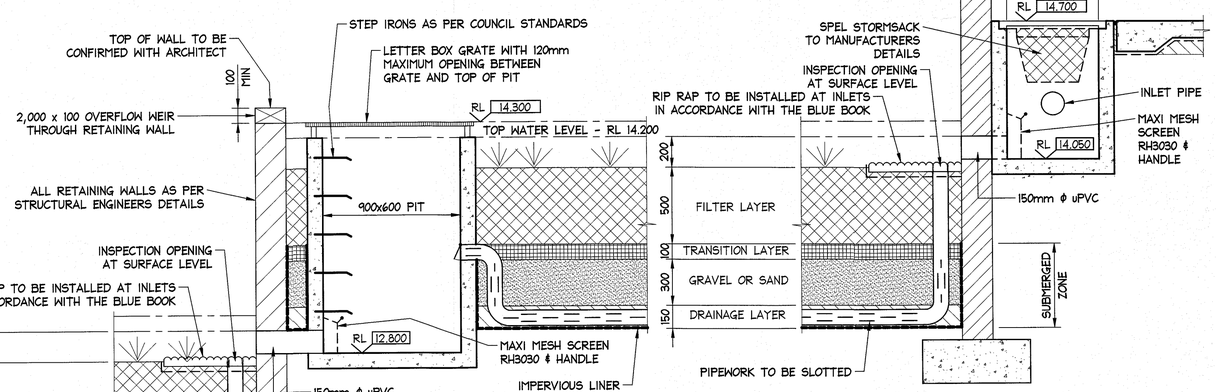

BASIN No. 1

BIO-RETENTION BASIN LONGITUDIONAL SECTION

SCALE = 1 : 20

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Architect: Mark Hurcum Design Practice Pty Ltd	Project: PROPOSED DEVELOPMENT 96-104 Cabarita Road Avalon Beach N.S.W. 2107	Date: Oct 2018	Design: C.F.	Drawn: Paul R Bruce AMIEAust.
Client: Meraki Developments Pty Ltd	Drawing Title: STORMWATER DRAINAGE DETAILS SHEET 1	Job No: 180411	Drawing No: D04	Issue: A

D04A

NB Consulting Engineers

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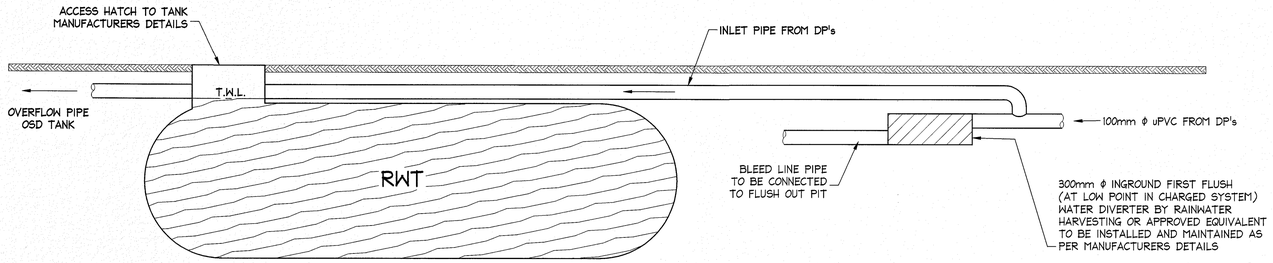
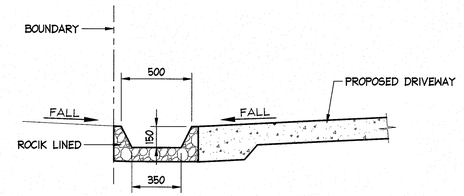


TANKS TO BE INSTALL AS PER MANUFACTURERS DETAILS

TYPICAL SECTION OF BELOW GROUND RWT WITH FIRST FLUSH SYSTEM

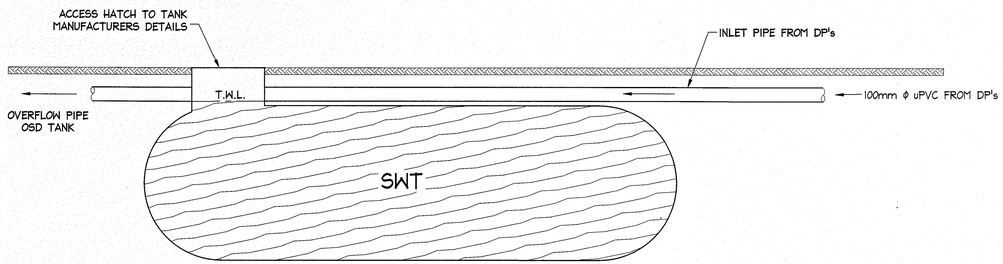
SCALE = N.T.S.

NOTE:
SWALE DESIGNED FOR MINIMUM 5 % GRADE
IF MINIMUM 5 % CANNOT BE ACHIEVED
NOTIFY ENGINEER.



SD1 - ROCK LINED 500 WIDE SPOON DRAIN

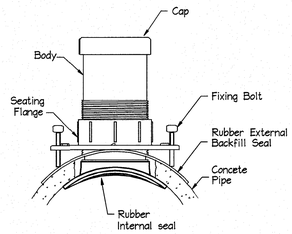
SCALE = 1 : 20



TANKS TO BE INSTALL AS PER MANUFACTURERS DETAILS

TYPICAL SECTION OF BELOW GROUND SWT

SCALE = N.T.S.

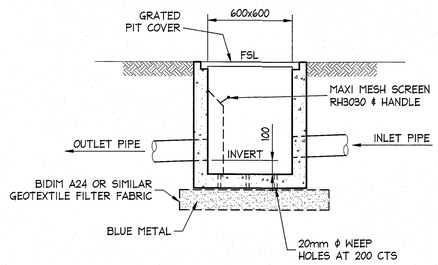


Code	Item	Size
1026635	Flowcon PVC Conconect	100mm
1026636	Flowcon PVC Conconect	150mm

TO BE INSTALLED AS PER MANUFACTURERS DETIALS

FLOWCON CONCONECT TYPICAL DETAIL

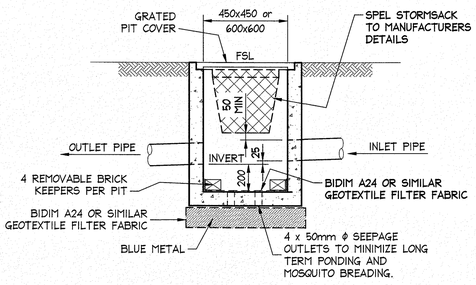
SCALE = N.T.S.



PRECAST OR CAST INSITU PIT
REFER STORMWATER NOTES
ALTERNATE POLYPROPYLENE PIT BY MANUFACTURER

600x600 BOUNDARY PIT DETAIL

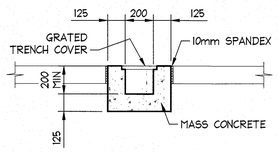
SCALE = 1 : 20



PRECAST OR CAST INSITU PIT
REFER STORMWATER NOTES

TYPICAL SPEL PIT DETAIL

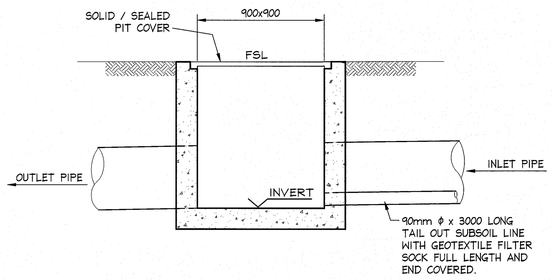
NOT TO SCALE



OR PRECAST GRATED DRAIN
ALTERNATE POLYPROPYLENE DRAIN BY MANUFACTURER

TYPICAL GRATED DRAIN

SCALE = 1 : 20



PRECAST OR CAST INSITU PIT
REFER STORMWATER NOTES

900x900 EASEMENT PIT DETAIL

SCALE = 1 : 20

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180411 D05A

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