TECHNICAL GUIDELINE
FOR WATER MANAGEMENT

Ku-ring-gai Council

SCHEDULE OF AMENDMENTS		
No.	**Date**	**Amendment**
0	28/05/2023	New Technical Guideline prepared.

DISCLAIMER

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The drawings may be subject to revision and users need to ensure that when referencing any standard drawing the current version is being used. Whilst all care has been taken to provide the most accurate and current standard drawings, it is the responsibility of the person referencing the drawings to ensure that the requirements of all relevant Australian Standards and guidelines are being met.

CONTENTS

INTRODUCTION

This technical guideline is intended to set out Council's requirements for the design of stormwater drainage and other engineering elements associated with development. It is not intended to be a comprehensive design manual nor a stand-alone document but rather to be read in conjunction with Part 24 'Water Management' of the Ku-ring-gai DCP as well as relevant instruments, policies, codes, industry guidelines and standards.

It is anticipated that adherence to this guideline will facilitate the efficient processing of engineering plan submissions, and to ensure that stormwater infrastructure associated with any development is designed and constructed to be safe, serviceable, economical to maintain and meets community expectations. However, it should be noted that the design guidelines do not limit Council's right to vary any necessary engineering requirements in accordance with industry best practices. Applicants are advised to contact Council's Development Engineers to discuss their proposal where an inconsistency may arise.

PART 1: Specifications for Water Management Devices

1.1 Rainwater Tanks

In certain circumstances, rainwater tanks with a volume of up to 10,000 litres can be installed without development consent. The circumstances under which this is possible are detailed in State Environmental Planning Policy No. 4. For tanks that are not exempt, the following controls apply:

a) The tank shall not be located forward of the building line or within the setback to a secondary street frontage, except where:

   i) it is located on a battleaxes allotment and is not visible from the street; or

   ii) where another building is located between the street to which the property is adjoined and the building with which the tank is associated.

b) The tank shall be located at least 450mm from any property boundary.

c) The tank shall not be installed over or immediately adjacent to a water main or sewer main unless it is installed in accordance with any requirements of the public authority that has responsibility for the main.

d) The tank shall not be installed over any structure or fittings used by a public authority to maintain a water or sewer main.

e) If installed above-ground, the tank shall be located at least 100mm from any parallel potable water supply pipe and if installed below-ground, the tank shall be located at least 300mm from any parallel potable water supply pipe.

f) No part of the tank or any stand for the tank shall rest on a footing of any building or other structure, including a retaining wall, unless it is demonstrated that the footing or structure is designed to take the load of a full tank of water.

g) The tank, together with any stand or slab for the tank, shall be structurally sound, shall satisfy any applicable deemed-to-satisfy conditions of the Building Code of Australia and shall be installed in accordance with any requirements of Sydney Water Corporation.

h) All plumbing work shall be carried out by a licensed plumber.

i) Excess (overflow) stormwater shall be:

   i) diverted away from the foundations of any buildings or structures including the rainwater tank itself;

   ii) directed to an existing stormwater system, to another retention or detention system within the subject property or to a garden area within the subject property;

   iii) directed in such a way that it does not pool on site or cause nuisance to neighbouring properties or to areas of public access.

j) The tank shall be enclosed and any inlet to the tank shall be screened or filtered to prevent the entry of foreign matters or creatures.

k) The tank shall be fitted with a first-flush device that causes the initial run-off from any rain event to bypass the tank in order to reduce the pollutants entering the tank.

l) A sign shall be affixed to the tank clearly stating that the water in the tank is rainwater and all taps and rainwater tank apertures shall be similarly marked.

m) Distribution pipes, both below and above ground, from the rainwater tank shall be continuously marked 'RAINWATER' in accordance with AS 1345 or otherwise above-ground distribution pipes shall be clearly labelled 'RAINWATER' with adhesive pipe markers made in accordance with AS 1345 and below-ground distribution pipes shall have identification tape/pipe sleeve continuously marked 'RAINWATER' in accordance with AS 2648.

n) The tank shall comply with Australian Standard AS/NZS 2179-2014 – Specifications for rainwater goods, accessories and fasteners.

o) If the tank is metal it shall comply with Australian Standard AS 2180-1986 (or as amended) – Metal rainwater goods – selection and installation.

p) Noise emissions from any pump used with the rainwater tank shall not exceed 5dB(A) above ambient background noise levels measured at the allotment boundary.

q) Water retained for indoor household uses shall be augmented by mains water supply and an approval for the activity shall be obtained from Sydney Water Corporation.

r) As required by Sydney Water Corporation, where retained water is augmented by mains water supply, a backflow prevention device shall be installed to prevent contamination of mains water in accordance with Australian Standard AS 3500.1:2021 (or as amended) – Plumbing and drainage: water services.

s) The indirect connection to mains water shall be by means of a visible 'air gap' external the rainwater tank in accordance with the provisions of AS/NZS 3500 – Minimum air gap requirements.

t) If the tank water is connected to fixtures other than toilet, laundry and outdoor uses, the water supply shall be monitored and, where necessary, treated, to ensure that it meets the standards for potable water in accordance with the National Water Quality Management Strategy 'Australian Drinking Water Guidelines' 2004.

u) Any use of retained water for potable purposes shall be in accordance with NSW Department of Health guidelines.

v) The rainwater tank shall be maintained in accordance with the NSW Health Department Circular No. 2002/1 "Use of rainwater tanks where a reticulated potable supply is available' or any circular that replaces it.

w) A positive covenant and restriction on use shall be established for the retention system in accordance with Ku-ring-gai Development Control Plan Part 24R.4.2.

x) Refer to Figure 1 'Typical Rainwater Re-use Tank and Uses' detail within this guideline.

1.2 Absorption / Infiltration Trenches

Absorption / infiltration trenches are designed to infiltrate stormwater into the groundwater table and can assist with water quality treatment. Where employed in accordance with Part 24B.5 of the Ku-ring-gai DCP requirements, they shall adhere to the following controls:

a) Absorption trenches shall be 600mm wide x 600mm deep x 1000mm run per $10m^2$ of area to be drained and located along contours.

b) Trenches shall be fitted with half round PVC (450mm diameter) dome sections backfilled with crushed or round river gravel to within 200mm of finished surface level, surrounded with suitable geofabric and finished with topsoil and appropriately vegetated.

c) Where detached structures, such as sheds or swimming pools, are to be established in the rear yard, these shall be established uphill of the absorption trenches without compromise to the minimum distances required under the previous control.

Note: Establishment of detached structures uphill of absorption trenches is necessary so as to ensure that artificial redirection or concentration of overland flow to adjoining neighbouring properties does not occur. A proposal to establish a structure in a manner contrary to this control must be accompanied by certification by a qualified civil/hydraulic engineer that the natural flow pattern will not be affected.

d) A suitably designed litter and coarse sediment arrestor pit, at least $450mm^2$ and grated is to be provided immediately upstream of the absorption trench.

e) Trenches shall be designed so as not to require any excavation under the canopy areas of any trees to be retained unless as approved by a qualified arborist's certification that such excavation will not affect the longevity of the subject tree(s).

f) Trenches shall be oriented parallel to the ground surface contour and shall be located as far upslope as possible.

g) Refer to Figure 2 'Typical Absorption Trench' and Figure 3 'Combined Charged Line / Absorption Trench' detail within this guideline.

1.3 Dispersal Trench / Level Spreader

Where the means of an absorption trench system are not available, the use of level spreader will be permitted subject to the following circumstances:

i. The level spreader will have minimal impact on the adjoining property, including public reserves and parks, by the direction and flow of stormwater and,
ii. Soil absorption characteristics and other physical constraints indicate the on-site absorption system is not appropriate for the property.

Where a dispersal trench / level spreader is used as a component of stormwater management, the device must comply with the following controls:

a) Level spreader is to be designed by a suitably qualified and experienced civil/hydraulic engineer.
b) The level spreader should not be located within 5 metres of the rear boundary, 1 metre of the side boundary and 3 metres from any on-site building, neighbouring properties, or permanent structures.
c) The level spreader ideally is to be located as far as possible from the downstream boundary.
d) Level spreader shall be oriented parallel to the ground surface contours.
e) A suitably designed litter coarse sediment arrestor pit, at least 450mm^2 and grated is to be provided immediately upstream of the level spreader.
f) The level spreader shall not be located within the dripline of any trees to be retained.
g) The level spreader shall be a minimum 10 metres in length (unless approved otherwise by Council's Development Engineer).
h) Refer to Figure 4 'Typical Level Spreader Dispersion System' detail within this guideline.

1.4 Biofiltration / Raingarden

Biofiltration devices are designed to capture and treat stormwater before passing it through a filter medium. They are used primarily to control water quality (sediment and gross and chemical pollutants) but can also contribute to stormwater retention on a property. Where used, the following controls apply:

a) Biofiltration devices shall be installed only where the developer can demonstrate that the existing terrain will be suitable.

b) The biofiltration shall be designed to be compatible with the overall layout and landscaping of the development site.

c) The biofiltration devices shall be sited so as to capture site stormwater by gravity drainage site and to direct treated stormwater and all overflow to another on-site stormwater management device, landscape area or public drainage system.

d) The biofiltration devices shall be sited clear of surface flow paths from adjoining land.

e) The location and design of the biofiltration devices must not affect the structural integrity of adjacent buildings.

f) A sediment trap, grassed buffer or other filter shall be installed upstream from the biofiltration devices to remove coarse sediment and reduce the risk of clogging.

g) The design and construction of the biofiltration devices must be specified by a competent civil engineer eligible for membership to the Institution of Engineers Australia.

h) A positive covenant and restriction on use shall be established for the biofiltration system in accordance with Ku-ring-gai Development Control Plan Part 24R.4.2.

i) Refer to Figure 7 ‘Typical Biofiltration System’ and Figure 8 ‘Biofiltration System Standard Details’ within this guideline.

1.5 Porous Paving

In certain situations, porous paving can be used as a stormwater management device by enabling infiltration and retention of runoff. At the same time, the porous paving system will tend to filter the water to improve water quality. Porous paving may be composed of asphalt, concrete or modular paving units and may incorporate groundcover plantings such as turf within or between the modules.

a) Paving shall not be laid immediately downstream for areas likely to contribute significant amounts of sediment, debris or windblown material.

b) The slope of the land where porous paving is utilised shall not exceed 5% or as specified by the manufactures.

c) Sediment traps, vegetated filter strips or specially designed gutter systems shall be installed upstream of the porous paving so as to reduce the volume of sediment input and to minimise the likelihood of clogging.

d) During the construction phase of the development, in order to ensure the long-term viability of the system, the porous paving shall not be laid until the surrounding areas have been stabilised.

e) Porous paving shall have the capacity to store the volume of a 1 in 1 year ARI event.

f) The porous paving must be laid by suitably trained persons.

g) The porous paving must be cleaned regularly to remove oils and fine sediments in accordance with the designer's maintenance recommendations (gravel in fill will require removal and replacement to ensure ongoing efficiency).

h) A positive covenant and restriction on use shall be established for the porous (permeable) pavers in accordance with Ku-ring-gai Development Control Plan Part 24R.4.9.

i) Refer to Figure 5 'Typical Porous Paving Details' within this guideline.

Note: Owing to the extreme likelihood of soil compaction or compression, porous paving that is laid in areas that receive high traffic volumes or regular use by heavy vehicles will not be considered to be part of the on-site stormwater management system.

1.6 Vegetated Swales

Vegetated open channels (swales) capture stormwater runoff for temporary storage and treatment, so that they are both a means of OSR and water quality treatment. They work by filtering and conveying during regular rainfall events (with an average recurrence interval of 3-6 months). This device, which can be used at either the street or lot level, helps to prevent streambank erosion and can also assist in maintaining water balance. Where used, vegetated swales shall adhere to the following controls:

a) The slope of the land on which they are located shall be not more than 5%.

b) Swales shall be designed to be nearly parallel to the contour with a longitudinal slope of 1% and 4%.

c) Swales shall be designed so as to minimise the possibility of scour during heavy rain.

d) Swales shall be designed and located so as to ensure that they are not traversed by vehicles or pedestrians.

e) Check dams shall be installed along the swales to increase storage capacity and to reduce flow velocity.

f) The swales shall be designed to minimise the opportunity for waterlogging and to maximise the opportunity for survival of the vegetation (for example, with the installation of low flow pipes and subsoil drainage).

g) Stormwater overflow shall be directed to the public drainage system (in accordance with the requirements in Part 24).

h) Swales shall be regularly maintained to ensure survival of the vegetation, continued functioning of the swales as stormwater management devices and continued visual attractiveness.

i) A positive covenant and restriction on use shall be established for the retention system in accordance with Ku-ring-gai Development Control Plan Part 24R.4.2.

1.7 Other Techniques

The developer may wish to propose one or more alternative techniques for on-site stormwater management, stormwater disposal and water quality to those described in this DCP. In such an event, it will be the responsibility of the developer to demonstrate that proposal is appropriate in that it:

- meets the overall Objectives of the DCP;
- meets the specific Chapter Objectives and controls of the relevant section(s) of the DCP;
- is appropriate to the site in terms of soils, appearance and environmental performance; and will be viable in the long term.

PART 2: Stormwater Pits

2.1 General

Stormwater pits or cleaning eyes shall be installed to facilitate maintenance of stormwater pipes, orifice plates, debris screens and reflux values. All drainage systems draining to Council's trunk drainage system or to a public road must have drainage pit of dimensions not less than 450 x 450 mm at the lowest point of the site system just before it leaves the site. In the case of drainage systems that do not have an on-site detention system, this pit must contain a debris screen.

In residential flat buildings and medium density residential developments, the private courtyard of each residence must contain at least one stormwater drainage pit of dimensions not less than 300 x 300 mm and be suitable graded to this pit. Stormwater pits should be located in a manner that will ensure sheet stormwater flow between buildings, or between buildings and boundary fences is minimised.

Pits or cleaning eyes shall be installed:

- at all junctions, changes of gradient and changes of direction of stormwater drains;
- at a maximum spacing of 30 metres along a length of pipe; and
- directly above any reflux values, orifice plates, or debris screens.

2.2 Inlet Pits

Inlet pits are to be installed at depressions and other locations to permit the entry of water to a stormwater drain must have a flush fitting grate.

Surface inlet pits shall be sufficiently large to accept the predicted inflow.

Pits and grated trench drains shall be positioned within the site to ensure:

- all runoff from roofed, paved and landscaped areas is collected;
- runoff does not enter garages or buildings;
- long term ponding of stormwater does not occur;
- pedestrian access to buildings is not affected by flow depths and/or flow velocities; and
- runoff from paved driveways courtyards and paths, or concentrated runoff from grassed and landscaped areas, does not flow over the public footway or onto adjoining properties.

2.3 Arrestors

Arrestors are installed to remove contaminants such as sediment, oil and other contaminants from the stormwater before it discharges into the receiving system.

Sediment arrestors must be installed for the following developments:

- Residential developments, other than residential flat buildings, of more than six dwellings;
- All Commercial Developments that may involve the use/transportation of contaminants.
- Commercial developments on allotments greater than 5000 m^2. Where developments directly involve more than one allotment, then the total area of all allotments directly involved in to be considered.

Sediment and oil arrestors must be installed for all industrial developments.

Any sediment and/or oil arrestors shall be designed in accordance with AS 3500.3 -1990 and shall have an opaque pit lid to prevent sunlight entering into the pit thereby reducing the likelihood of mosquito breeding.

2.4 Pit Sizes and Design

Depth (mm)	Minimum Pit Size (mm)
$300 \geq D$	300 x 300
$600 \geq D > 300$	450 x 450
$900 \geq D > 600$	600 x 600
$1200 \geq D > 900$	900 x 900
$D > 1200$	900 x 900 (with step irons)

All pipes are to be cut flush with the wall of the pit. Pits shall be designed with benching to improve hydraulic efficiency and reduce water ponding. Safety and safe access are important considerations in pit design. Step irons shall be detailed where pits are greater than 1.2 metres deep and grates shall be of “bicycle safe” design.

For typical pit designs and other pit design requirements, refer to Figure 6 ‘Typical Stormwater Pit Details’ within this guideline.

PART 3: Site Impermeability Indicator

3.1 Site Impermeability Indicator

The site impermeability indicator provides a measure of the extent to which the site will be covered by impermeable surfaces following completion of the proposed development.

Impermeable surfaces are surfaces that do not allow natural infiltration of rainfall to the underlying soil, thereby increasing the volume and peak flow rate of surface runoff.

The impermeable site area is calculated by adding up the areas (in square metres) for each different type of ground surface that does not allow natural infiltration of rainwater. As some types of surfaces are only partially impermeable, it is necessary to multiple the area of the surface with an appropriate 'impermeability factor' as indicated below.

Surface type	Material	Impermeability factor
Roof surfaces	Metal, tile, slates and other impermeable materials	1.00
Ground surfaces	Concrete / paving (non-porous)	1.00
	Gravel	0.75
	Porous paving	0.50
Decks	Concrete / paving (non-porous)	1.00
	Timber (over natural soil)	0.50
Swimming pools	All types*	0.00

* Overflows from swimming pools are assumed to be directed to the sewer, not to stormwater.

PART 4: On-site Stormwater Detention

4.1 On-site Detention Calculation Sheet

On-Site Detention Calculation Sheet

Address .....

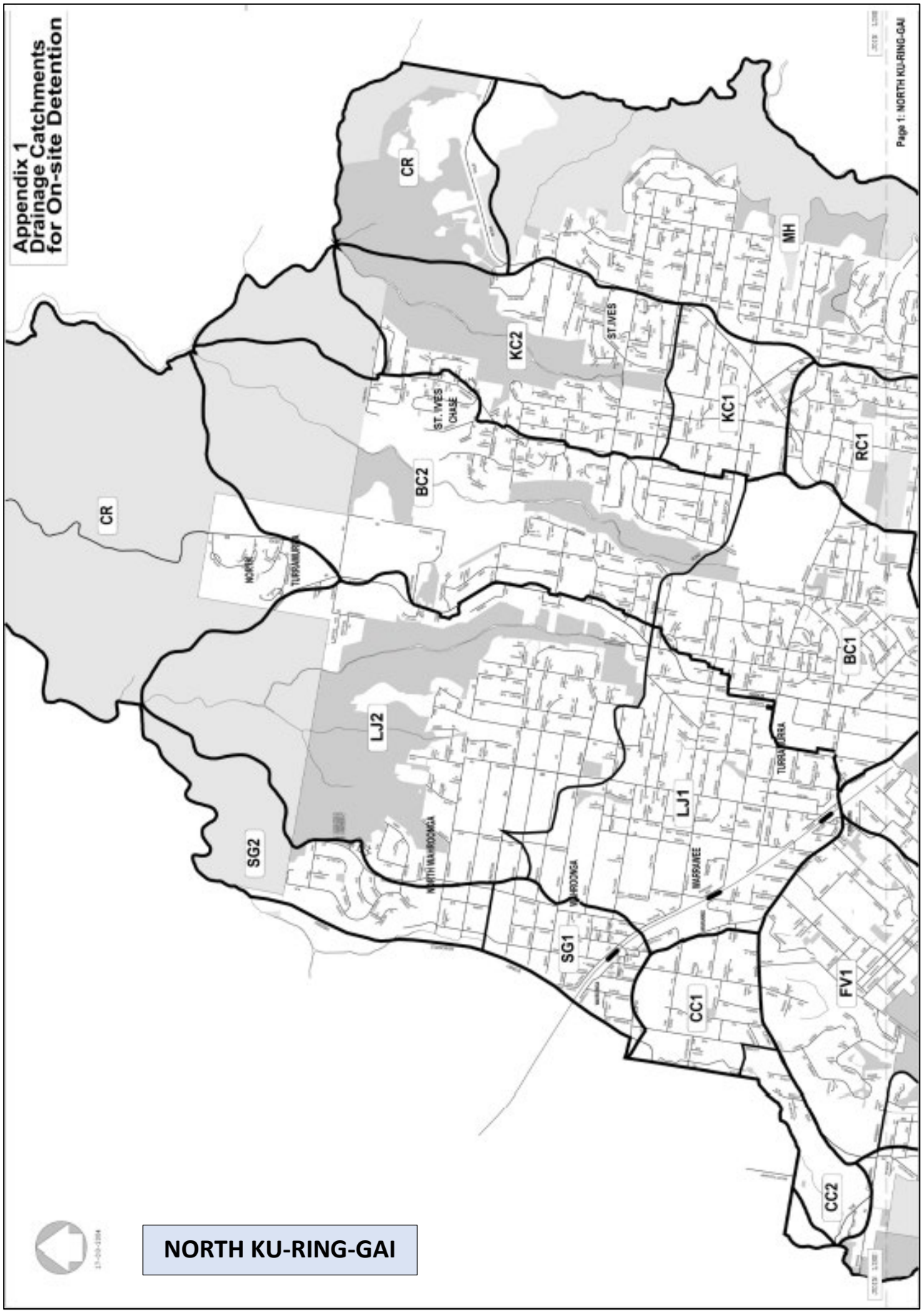
Catchment Detail				
1.	Catchment Name			
2.	Catchment Discharge Rate	.....	l/sec/m^2	**A**
3.	Catchment Storage Rate	.....	m^3/m^2	**B**
Site Details				
4.	Site Area .....m^2 ^ 60% of site area	.....	m^2	**C**
5.	Area(s) not draining to the detention system.....m^2			
6.	Total impervious area (roofs, driveways, paving, etc.)	.....	m^2	**D**
7.	Impervious area bypassing detention system	.....	m^2	**E**
Permitted Site Discharge				
8.	**C** [.....m^2] x **A** [..... l/sec/m^2] =	.....	l/sec	**Flow 1**
9.	Adjustment for any uncontrolled impervious flow **E / D =**	.....	(<0.25)	**F**
10.	**Flow 1** [..... l/sec] x **F** [.....] =	.....	l/sec	**Flow 2**
11.	**Flow 1** [.....] – **Flow 2** [.....] =	.....	**l/sec**	**PSD**
Site Storage Requirement				
12.	**C** [.....m^2] x **B** [.....m^3/m^2 =	.....	**m^3**	**SSR1**
13.	If the storage is in a landscaped basin, **SSR1** x 1.2 =	.....	**m^3**	**SSR2**
Outlet Control				
14.	Height difference between top water surface level and the centre of the orifice	.....	m	**G**
15.	Orifice Diameter $21.8 \times \sqrt{\frac{PSD}{\sqrt{G}}}$	.....	**mm**	**OD**

PSD = Permitted Site Discharge
SSR1 = Site Storage Requirement (except for landscaped basins)
SSR2 = Site Storage Requirement (landscaped basins) **(Note: Use only SSR1 or SSR2)**
OD = Orifice Diameter

Signature..... **Name**.....

Qualifications..... **Date** .....

4.2 Drainage Catchments for On-site Detention



Note: Refer to Council's online map viewer

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4.3 Permitted Site Discharge and Minimum On-site Detention Storage Volumes

Code	Catchment Area	Permitted Site Discharge (l/s/ha)	Equivalent Minimum OSD Storage Volume (m^3/ha)
AC1	Avondale Creek	102	398
AC2	Avondale Creek	166	241
BB1	Blackbutt Creek	141	302
BB2	Blackbutt Creek	166	241
BC1	Cowan Creek	96	414
BC2	Cowan Creek	166	241
BG1	Blue Gum Creek	147	287
BG2	Blue Gum Creek	166	241
CC	Coups Creek	132	325
CR	Cowan River	166	241
FV1	Fox Valley	129	332
FV2	Fox Valley	166	241
GC1	Gordon Creek	128	336
GC2	Gordon Creek	166	241
KC1	Ku-ring-gai Creek	139	308
KC2	Ku-ring-gai Creek	166	241
LG1	Lady Game Creek	147	287
LG2	Lady Game Creek	166	241
LC	Lane Cove River	166	241
LQ1	Loftberg Quarry Creek	153	272
LQ2	Loftberg Quarry Creek	166	241
LJ1	Lovers Jump Creek	94	417
LJ2	Lovers Jump Creek	166	241
MH	Middle Harbour	166	241
MC1	Moores Creek	136	315
MC2	Moores Creek	166	241
RC1	Rocky Creek	124	345
RC2	Rocky Creek	166	241
SG1	Spring Gully Creek	134	320
SG2	Spring Gully Creek	166	241

4.4 On-site Stormwater Detention (OSD) Certification Sheet

On-Site Stormwater Detention (OSD) Certification Sheet

DA Number:	**Date inspected:**
Address:	
Drawing No:	**Prepared by:**
Rev:	**Dated:**

Attributes	Designed Parameters	Constructed Parameters
Tank Dimensions (L x W x H)		
Tank Volume (m^3)		
Height difference between TWL and the centre of the orifice (m)		
Orifice Size (mm)		
High level overflow provided		
Debris screen provided		
No. of access grates		
Marker plate provided		
Step irons provided		

Comments:	
Engineers details	
Engineers name:	**Company:**
Qualifications:	**Phone No.**
Signature:	**Date:**

PART 5: On-site Retention and Reuse Certification

5.1 On-Site Retention (OSR) and Reuse Certification Sheet

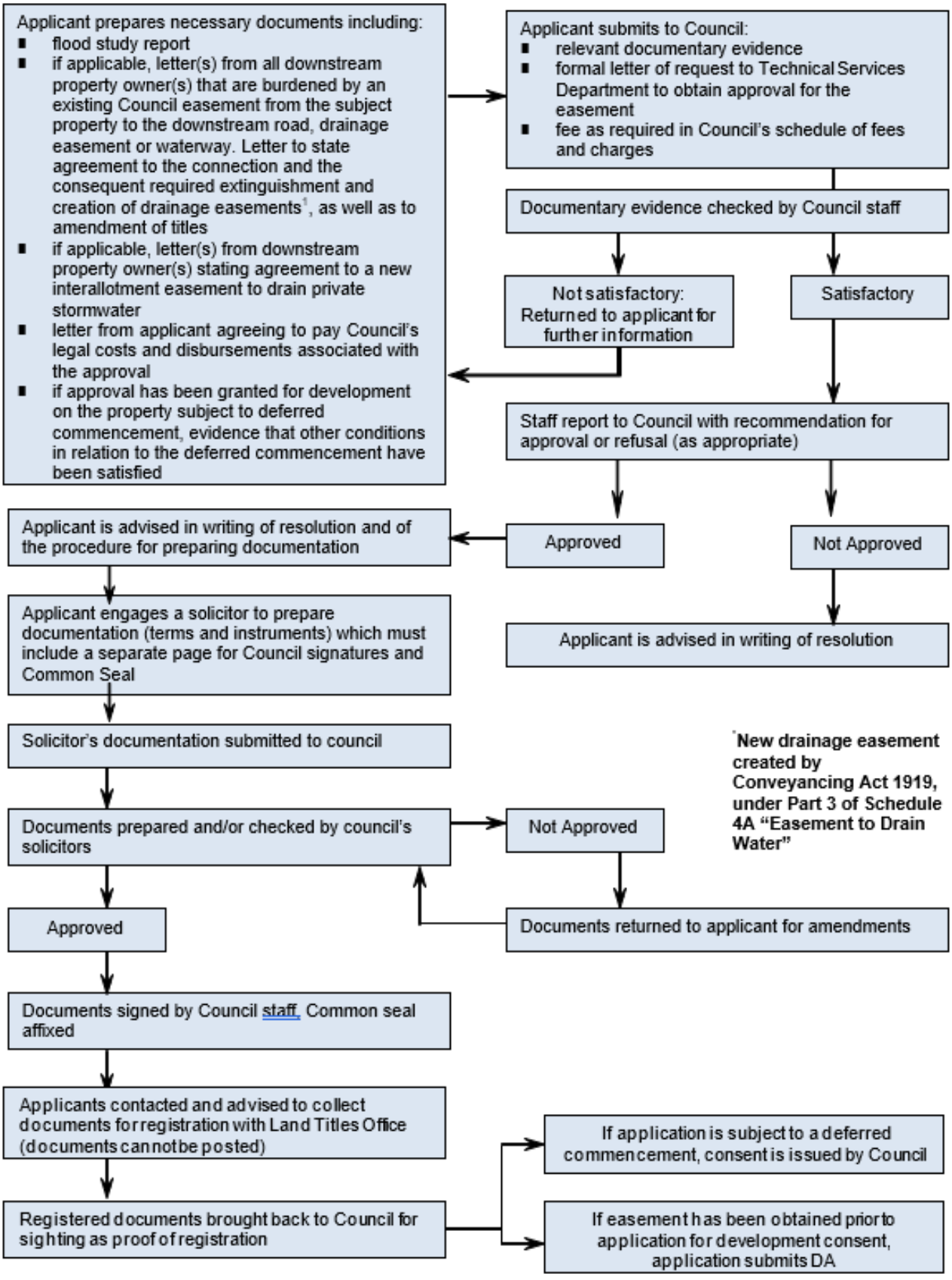
On-Site Retention (OSR) and Reuse Certification Sheet	
Date inspected:	
DA Number:	
Address:	

Attributes	Designed Parameters	Constructed Parameters
Tank Dimensions (L x W x H)		
Tank Volume (L)		
No. of downpipes connected to tank		
Overflow directed to:		
Leaf guard		
First flush device		
Connections: • **Outdoor tap** • **Toilets** • **Laundry** • **Swimming pool top-up**		

Comments:			
Engineer or Plumber Name:		**Company:**	
Qualifications (Engineer):		**Licence No. (Plumber):**	
Phone No.			
Signature:	**Date:**		

PART 6: Process for Obtaining Approval for Connection into an Easement

6.1 Process for Obtaining Approval for Connection into an Easement



PART 7: Sample Letter to Neighbours Requesting Interallotment Easement

7.1 Sample Letter to Neighbours Requesting Interallotment Easement

Dear …….

We are proposing to redevelop our property at ……

Council has advised us that, in order to proceed with the proposal, we are required to put forward a proposal for the drainage of stormwater. We have been provided with two options.

The first, preferred, method is to obtain a drainage easement to convey the stormwater runoff from our property to ……

In order to achieve this, you would be required to grant us a drainage easement through your property. Should you grant us a drainage easement, all costs for the creation of the easement would be borne by us, together with any consideration for the use of your property as may be determined by an independent valuation or later agreement.

The alternative to a drainage easement is that our development be limited to 30% of the property area to allow sufficient area between the house and our back / side fence next to your property for installation of an underground absorption trench system that would spread and absorb the stormwater flow into the ground.

You may be affected by this option as the runoff and seepage from this system could flow towards your property because of the slope of the land.

It would be appreciated if you would indicate your position regarding drainage from our property by filling out the section at the base of this letter. Once you have done so, we will be able to advise Council of your decision and have assessment of our application progress.

Yours sincerely,

……..

……..

Please delete one as relevant:

YES, I / we are willing to grant you a drainage easement.

NO, I / we are not willing to grant you a drainage easement.

Name: …… …… Signature: …….

Name: …… Signature: ……..

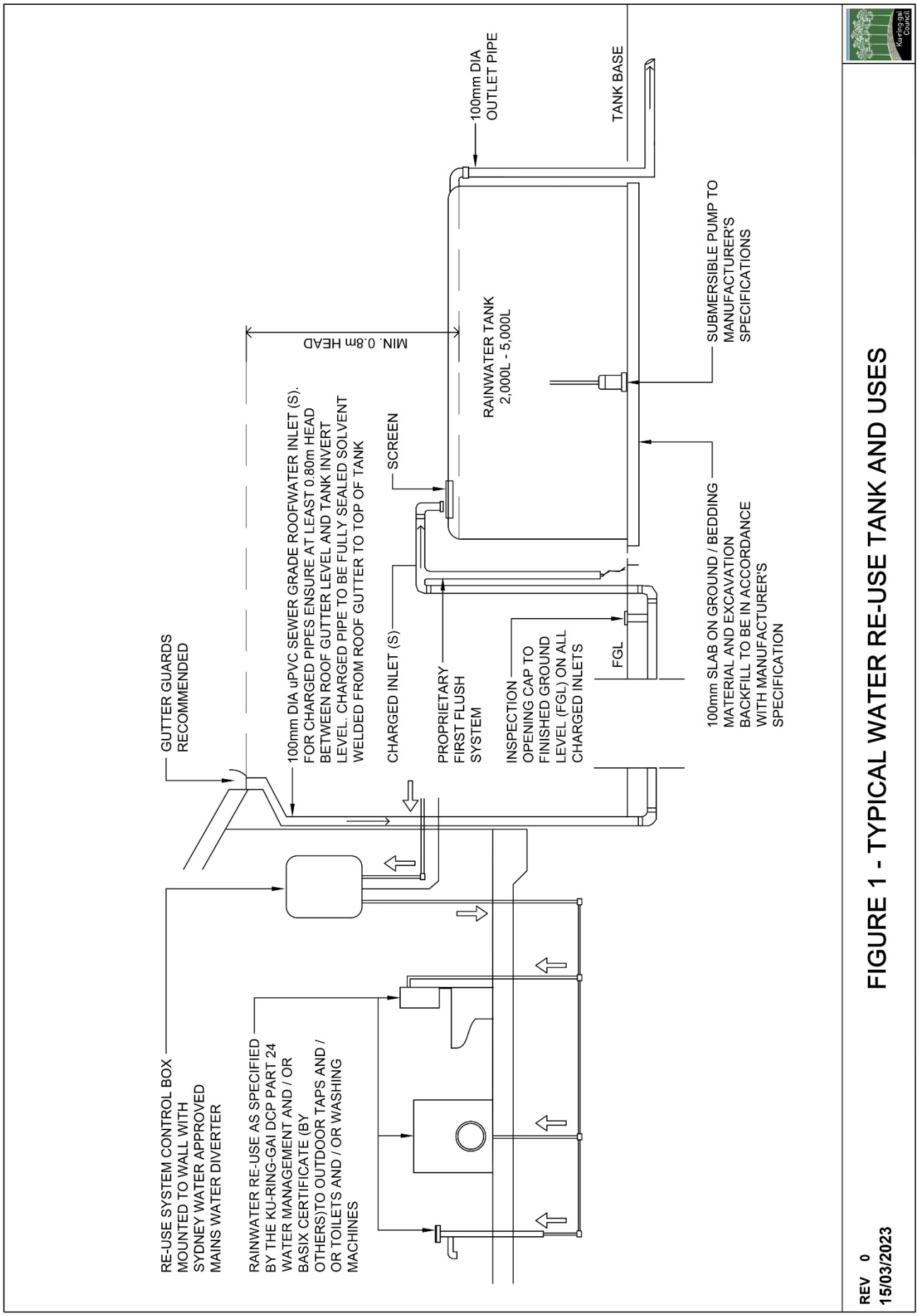
Address: ……..

PART 8: Ku-ring-gai Rainfall Intensity Frequency Duration

8.1 Ku-ring-gai Rainfall Intensity Frequency Duration

The IFD Design Rainfall Depth and Intensity tables listed below have been downloaded from the Bureau of Meteorology (BOM) website and are the data derived for a location at Kissing Point Road, Turramurra from the Australian Rainfall & Runoff 2019. Council will accept this data as valid for any catchment within the Local Government Area. Alternatively, the engineer may download the site specific rainfall

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	139	156	214	255	296	353	398
2 min	113	127	172	204	237	286	327
3 min	105	118	160	190	221	266	303
4 min	99.2	111	152	181	210	252	286
5 min	94.2	106	144	172	200	239	271
10 min	75.2	84.8	116	138	161	191	215
15 min	62.6	70.6	96.8	115	134	159	179
20 min	53.8	60.8	83.2	99.1	115	137	154
25 min	47.4	53.5	73.2	87.2	101	121	136
30 min	42.5	47.9	65.6	78.1	90.8	108	122
45 min	32.9	37.1	50.7	60.4	70.3	84.0	95.0
1 hour	27.3	30.7	42.0	50.0	58.2	69.8	79.2
1.5 hour	20.9	23.5	32.1	38.3	44.7	53.8	61.2
2 hour	17.3	19.5	26.6	31.8	37.2	44.9	51.2
3 hour	13.4	15.1	20.7	24.8	29.0	35.1	40.1
4.5 hour	10.5	11.9	16.3	19.6	23.0	27.9	31.9
6 hour	8.95	10.1	13.9	16.7	19.7	23.9	27.4
9 hour	7.17	8.10	11.2	13.6	16.0	19.4	22.2
12 hour	6.16	6.98	9.73	11.8	13.9	16.9	19.3
18 hour	4.98	5.67	7.97	9.66	11.4	13.8	15.7
24 hour	4.27	4.88	6.90	8.37	9.90	12.0	13.6
30 hour	3.78	4.33	6.14	7.45	8.81	10.6	12.0
36 hour	3.41	3.91	5.56	6.75	7.97	9.59	10.9
48 hour	2.86	3.30	4.70	5.71	6.73	8.07	9.12
72 hour	2.19	2.52	3.61	4.37	5.14	6.14	6.91
96 hour	1.77	2.04	2.92	3.53	4.14	4.92	5.52
120 hour	1.48	1.71	2.44	2.94	3.44	4.08	4.56
144 hour	1.27	1.46	2.08	2.51	2.93	3.46	3.85
168 hour	1.11	1.27	1.80	2.17	2.54	2.98	3.31


RE-USE SYSTEM CONTROL BOX
MOUNTED TO WALL WITH
SYDNEY WATER APPROVED
MAINS WATER DIVERTER
RAINWATER RE-USE AS SPECIFIED
BY THE KU-RING-GAI DCP PART 24
WATER MANAGEMENT AND / OR
BASIX CERTIFICATE (BY
OTHERS)TO OUTDOOR TAPS AND /
OR TOILETS AND / OR WASHING
MACHINES
GUTTER GUARDS
RECOMMENDED
100mm DIA uPVC SEWER GRADE ROOFWATER INLET (S).
FOR CHARGED PIPES ENSURE AT LEAST 0.80m HEAD
BETWEEN ROOF GUTTER LEVEL AND TANK INVERT
LEVEL. CHARGED PIPE TO BE FULLY SEALED SOLVENT
WELDED FROM ROOF GUTTER TO TOP OF TANK
CHARGED INLET (S)
PROPRIETARY
FIRST FLUSH
SYSTEM
SCREEN
INSPECTION
OPENING CAP TO
FINISHED GROUND
LEVEL (FGL) ON ALL
CHARGED INLETS
FGL
MIN. 0.8m HEAD
RAINWATER TANK
2,000L - 5,000L
100mm DIA
OUTLET PIPE
TANK BASE
SUBMERSIBLE PUMP TO
MANUFACTURER'S
SPECIFICATIONS
100mm SLAB ON GROUND / BEDDING
MATERIAL AND EXCAVATION
BACKFILL TO BE IN ACCORDANCE
WITH MANUFACTURER'S
SPECIFICATION
FIGURE 1 - TYPICAL WATER RE-USE TANK AND USES
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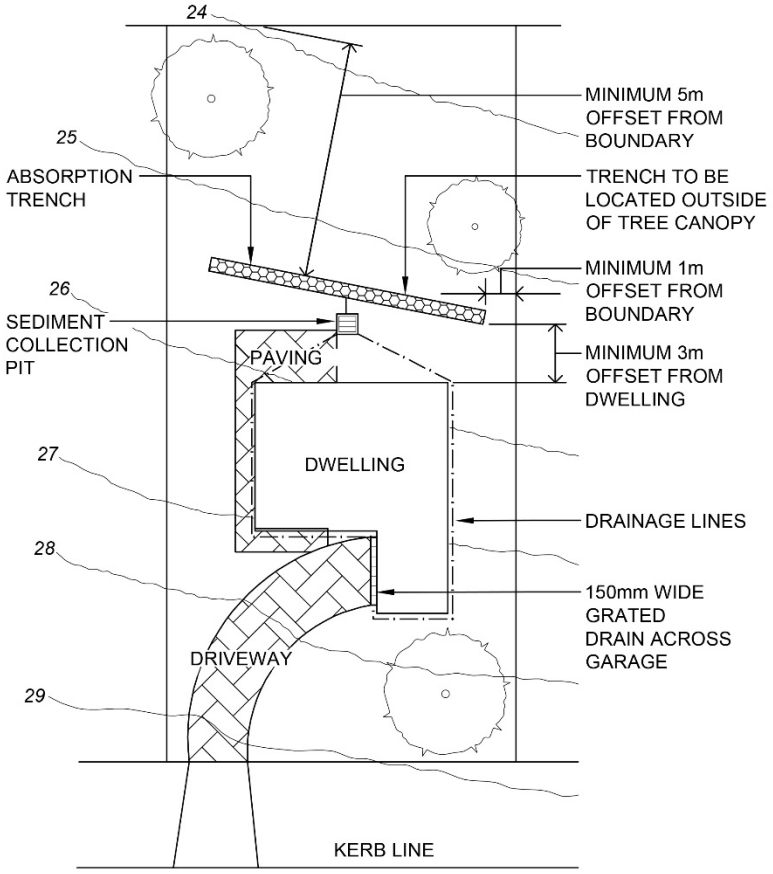
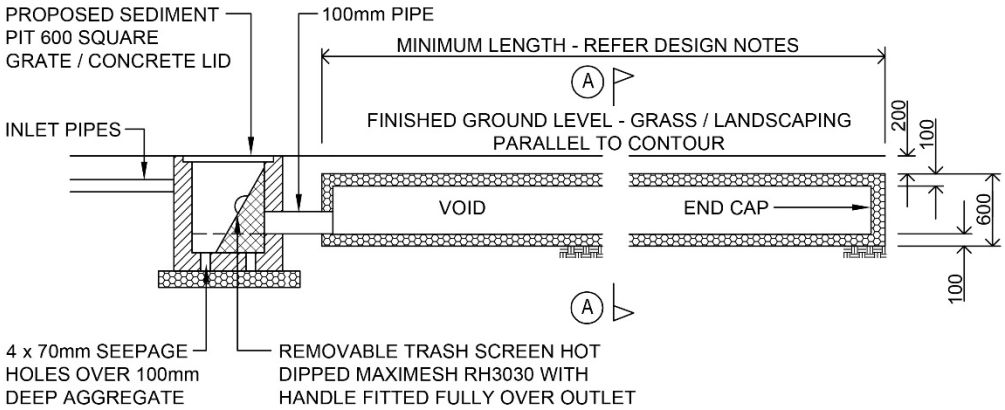
15/03/2023

LETTERS ARE REQUIRED FROM ALL ADJOINING DOWNSLOPE PROPERTY OWNERS INDICATING A REFUSAL TO GRANT A DRAINAGE EASEMENT. (REFER TO SAMPLE LETTER IN THE TECHNICAL GUIDELINE FOR WATER MANAGEMENT)

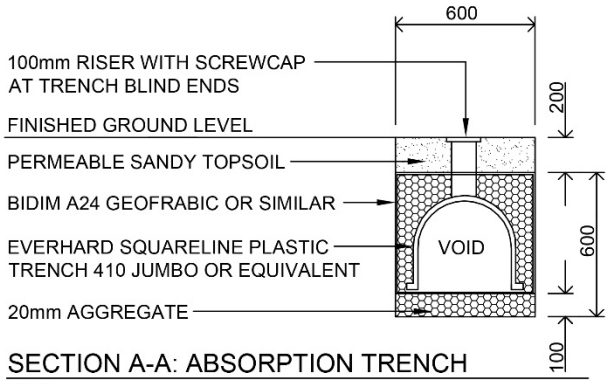
DESIGN NOTES
1. 1 METRE RUN OF TRENCH FOR 10m^2 OF AREA DRAINING TO IT.
2. ALL TRENCHES MUST BE A MINIMUM OF 5 METRES AND PREFERABLY 8 METRES FROM DOWNSLOPE BOUNDARY.
3. ALL TRENCHES MUST BE 3 METRES FROM FOOTINGS OF ANY STRUCTURES.
4. ALL TRENCHES MUST RUN ALONG THE CONTOUR LINE.
5. SIZE AND CAPACITY TO BE 410 JUMBO EVERTRENCH (EVERHARD INDUSTRIES) PLASTIC TRENCH OR EQUIVALENT.



TYPICAL LAYOUT: ABSORPTION TRENCH
NTS



TYPICAL DETAIL: ABSORPTION TRENCH
NTS



SECTION A-A: ABSORPTION TRENCH
NTS

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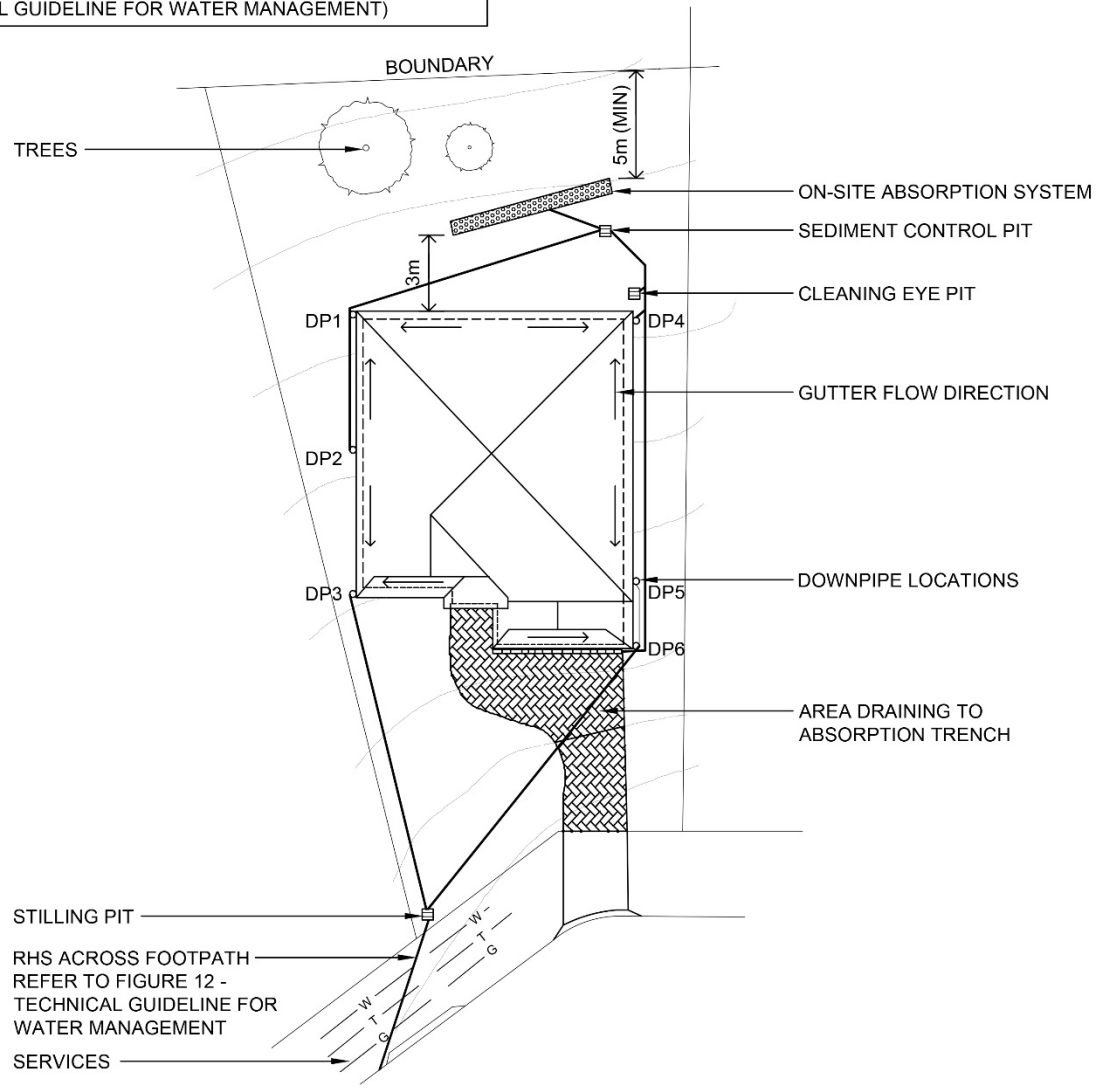
FIGURE 2 - TYPICAL ABSORPTION TRENCH

LETTERS ARE REQUIRED FROM ALL ADJOINING DOWNSLOPE PROPERTY OWNERS INDICATING A REFUSAL TO GRANT A DRAINAGE EASEMENT. (REFER TO SAMPLE LETTER IN THE TECHNICAL GUIDELINE FOR WATER MANAGEMENT)



COMBINED CHARGED LINE / ABSORPTION DRAINAGE SYSTEM

NOTES:

- A PORTION OF THE FRONT ROOF AREA (UP TO A MAXIMUM OF 120m^2 AND WITH NO MORE THAN FOUR (4) DOWNPIPES CHARGED) IS TO BE DIRECTED TO THE STREET BY WAY OF A CHARGED DRAINAGE SYSTEM.
- ALL GUTTERS AND PIPES IN THE SYSTEM MUST BE DESIGNED FOR A 1% AEP (1 IN 100 YEAR STORM EVENT).
- THERE MUST BE A MINIMUM DIFFERENCE IN HEIGHT BETWEEN THE ROOF GUTTER AND THE STILLING PIT AT THE PROPERTY BOUNDARY OF 1.8 METRES.
- THERE MUST BE GRAVITY FLOW ACROSS THE FOOTPATH FROM THE STILLING PIT WITHIN THE PROPERTY.
- ALL SERVICES WITHIN THE FOOTPATH MUST BE LOCATED PRIOR TO SUBMITTING THE PLANS AND ALL DETAILS MUST BE SHOWN ON THE PLANS.
- A CLEANING EYE MUST BE PROVIDED AT THE LOW POINT IN THE SYSTEM WITHIN A PIT THAT CAN BE DRAINED TO AN ONSITE ABSORPTION SYSTEM.
- MAXIMUM OF 30% OF THE TOTAL SITE AREA TO DRAIN TO THE REAR ONSITE ABSORPTION TRENCH(S).
- IF THE PROPERTY BACKS ONTO BUSHLAND THEN A MAXIMUM OF 35% OF THE TOTAL SITE AREA CAN DRAIN TO THE REAR ONSITE ABSORPTION TRENCH(S) OR TO A LEVEL SPREADER (OR EQUIVALENT).

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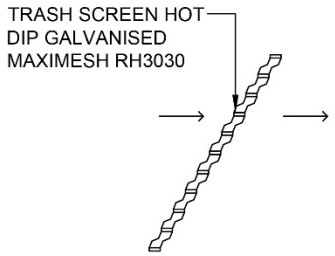
FIGURE 3 - COMBINED CHARGED LINE / ABSORPTION TRENCH



TRASH SCREEN DETAIL
NTS

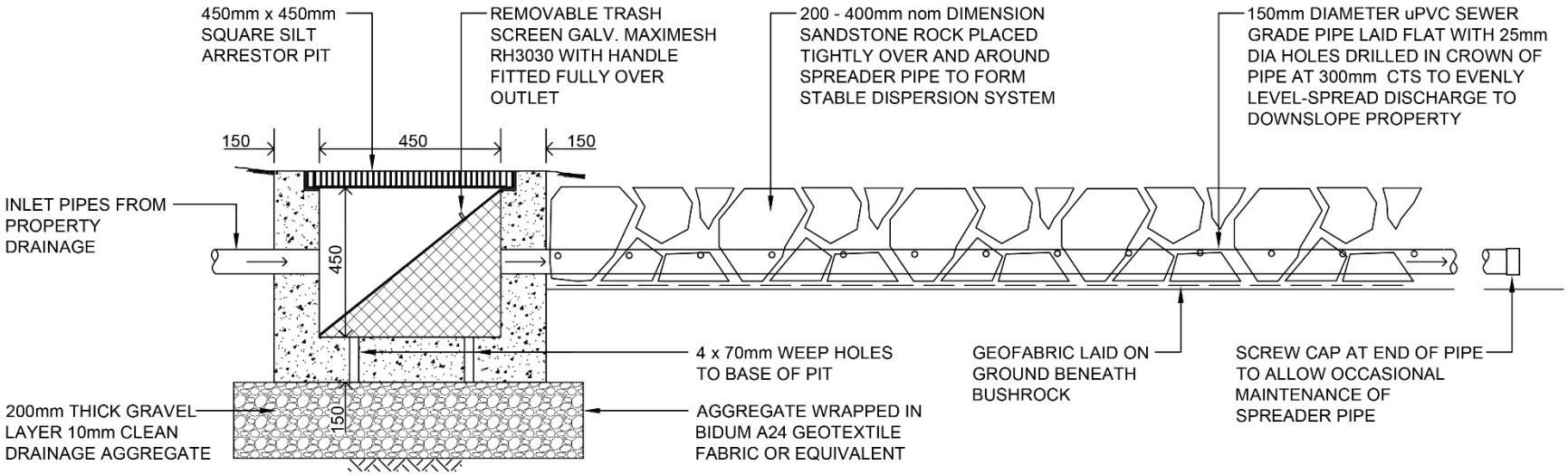


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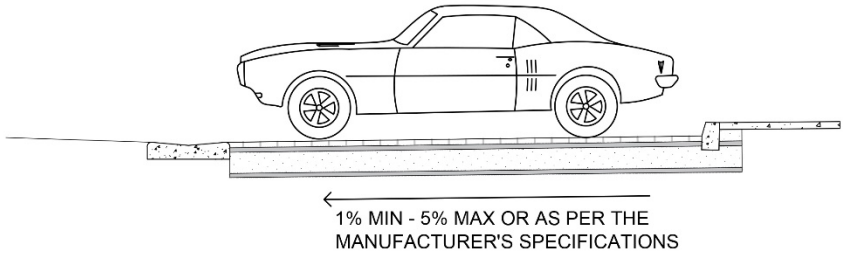
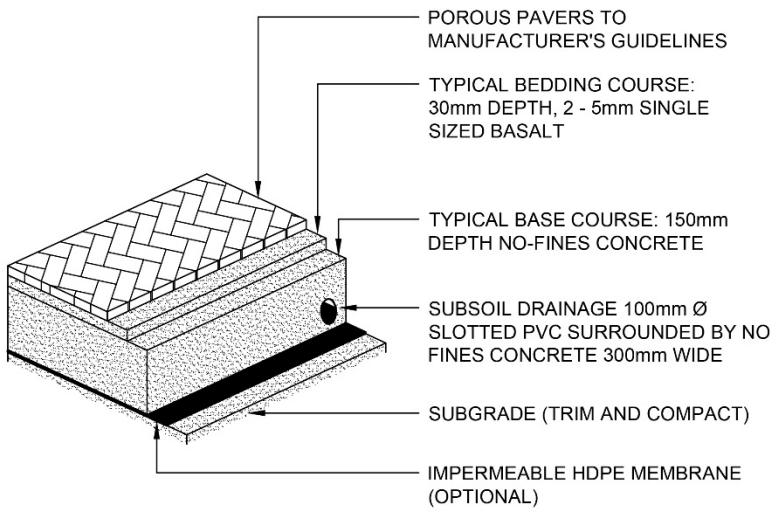
FIGURE 4 - TYPICAL LEVEL SPREADER DISPERSION SYSTEM



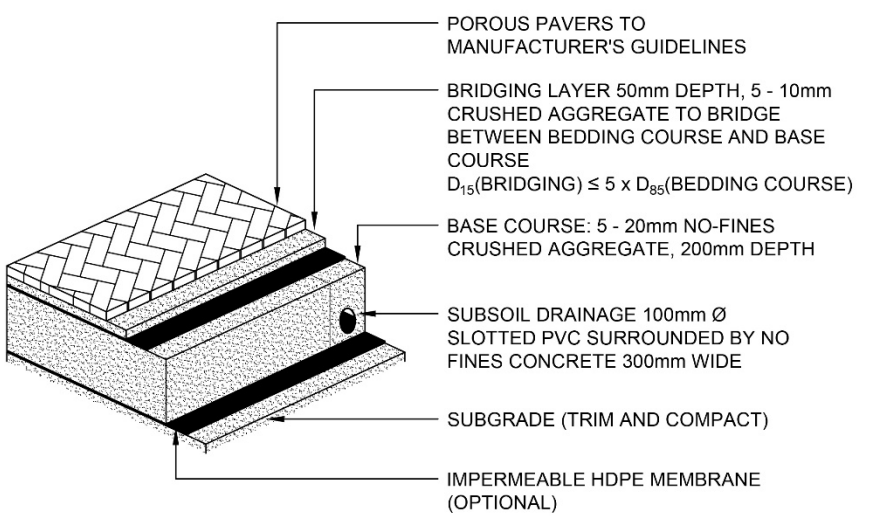
TYPICAL SECTION
NTS

DESIGN NOTES
1. POROUS PAVEMENT IS MOST SUITABLE TO PEDESTRIAN OR LOW TRAFFIC AREAS.
2. POROUS PAVEMENT SHALL NOT BE USED IN AREAS WITH HEAVY TRAFFIC OR WHERE HEAVY VEHICLES ARE TURNING.
3. CLAY SOILS RESTRICT INFILTRATION AND SUBSOIL DRAINAGE SHALL BE USED.
4. POROUS PAVEMENTS SHALL HAVE NO RUN-ON WATERFLOW.
5. ANY POROUS PAVEMENTS SHALL BE DESIGNED BY AN EXPERIENCED, QUALIFIED CIVIL, GEOTECHNICAL OR STRUCTURAL ENGINEER IN ACCORDANCE WITH KU-RING-GAI COUNCIL'S TECHNICAL GUIDELINE FOR WATER MANAGEMENT.
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. CLEANING AND / OR RENEWAL REQUIRED WHERE WATER PONDS FOR MORE THAN 1 HOUR AFTER RAINFALL.

SOURCE: BLACKTOWN COUNCIL



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



TYPICAL SECTION
POROUS PAVERS WITH CRUSHED AGGREGATE BASE COURSE
NTS

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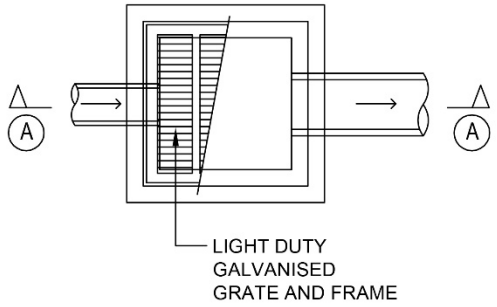
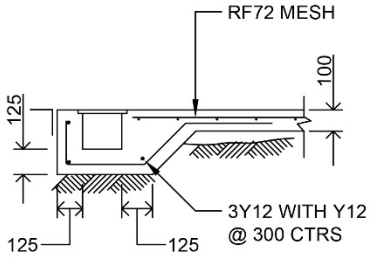
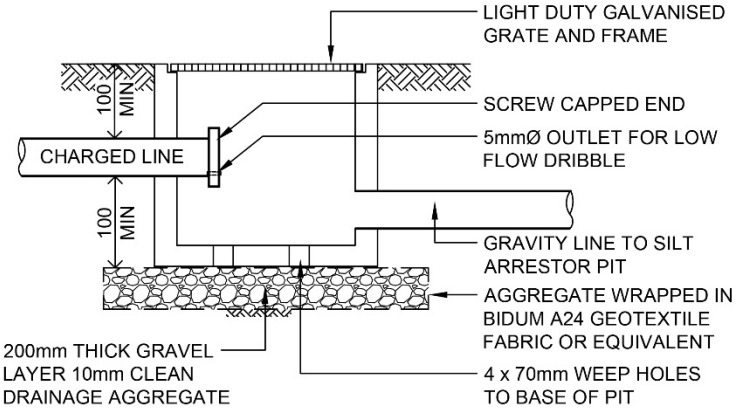
FIGURE 5 - POROUS PAVING DETAILS



TYPICAL PIT DETAIL
NTS

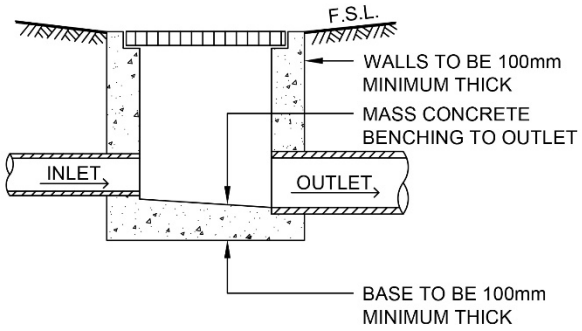


GRATED DRAIN
NTS



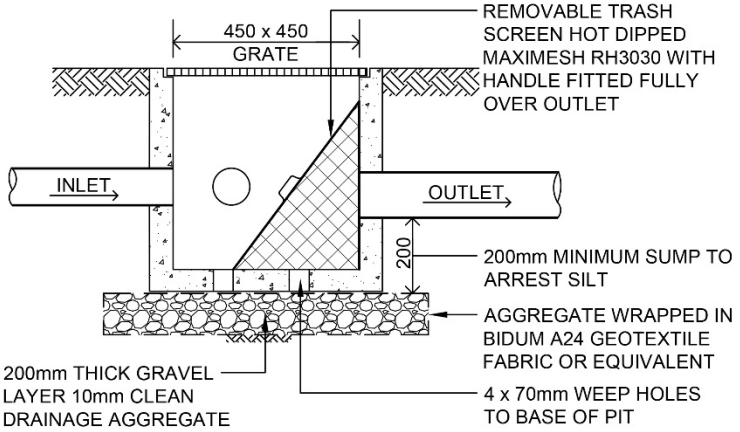
CLEAN-OUT PIT (350 x 350) FOR CHARGED LINE SYSTEMS
NTS

TRAFFICABLE AREAS	NON-TRAFFICABLE AREAS
BRICKWORK / BLOCKWORK WALLS OR PRECAST CONCRETE PITS MAY BE USED SUBJECT TO APPROVAL	FIBRE-GLASS OR HARD-PLASTIC PITS MAY BE USED SUBJECT TO APPROVAL



TYPICAL SECTION A-A
NTS

NOTE: PIT TO BE CLEANED AND MAINTAINED REGULARLY TO MITIGATE BUILDUP OF SEDIMENT



SITE DISCHARGE AND SILT ARRESTOR PIT (450 x 450)
NTS

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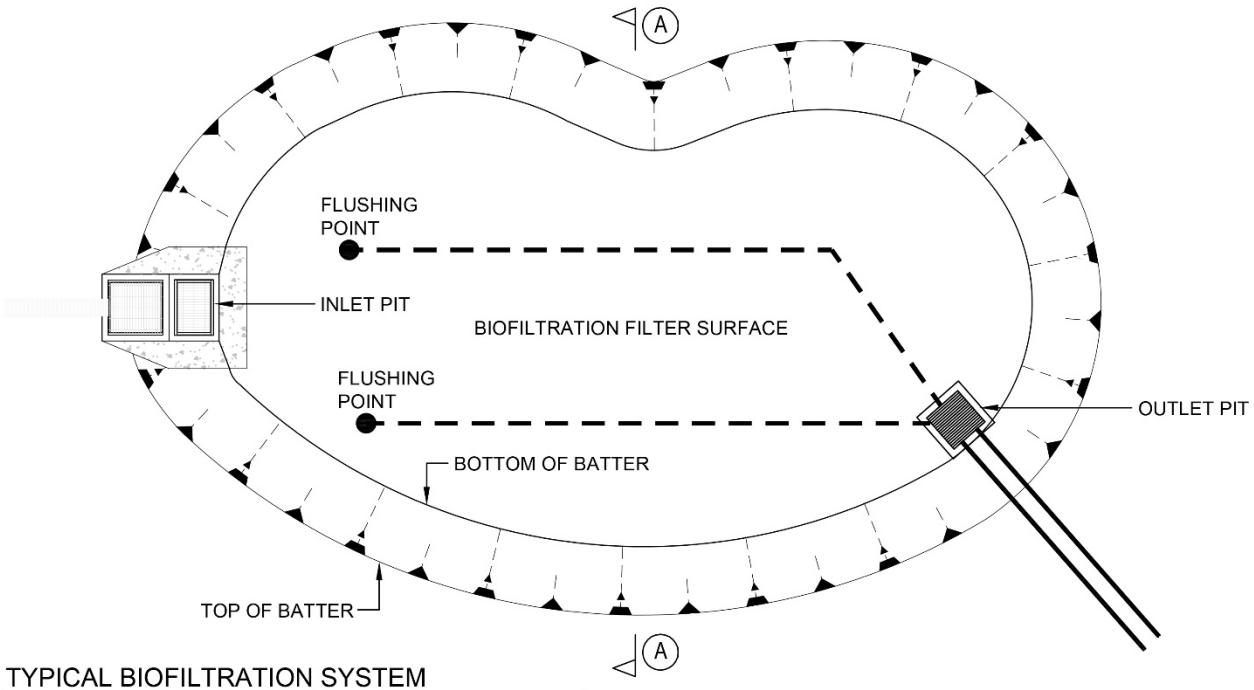
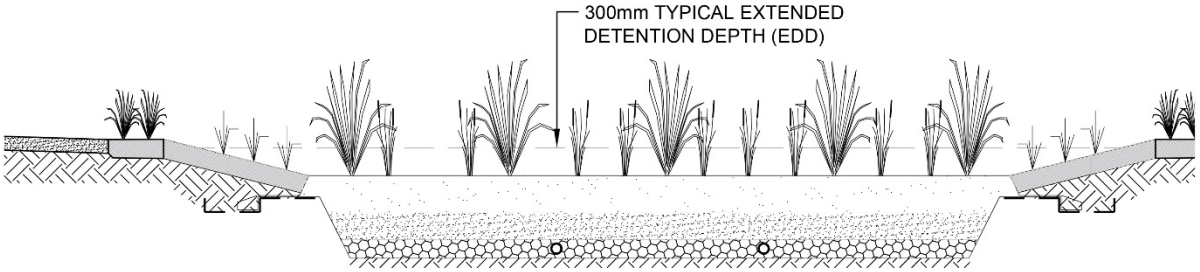
FIGURE 6 - TYPICAL STORMWATER PIT DETAILS



TYPICAL BIOFILTRATION SYSTEM
NTS



TYPICAL BIOFILTRATION SECTION A-A
NTS

SOURCE: BLACKTOWN COUNCIL

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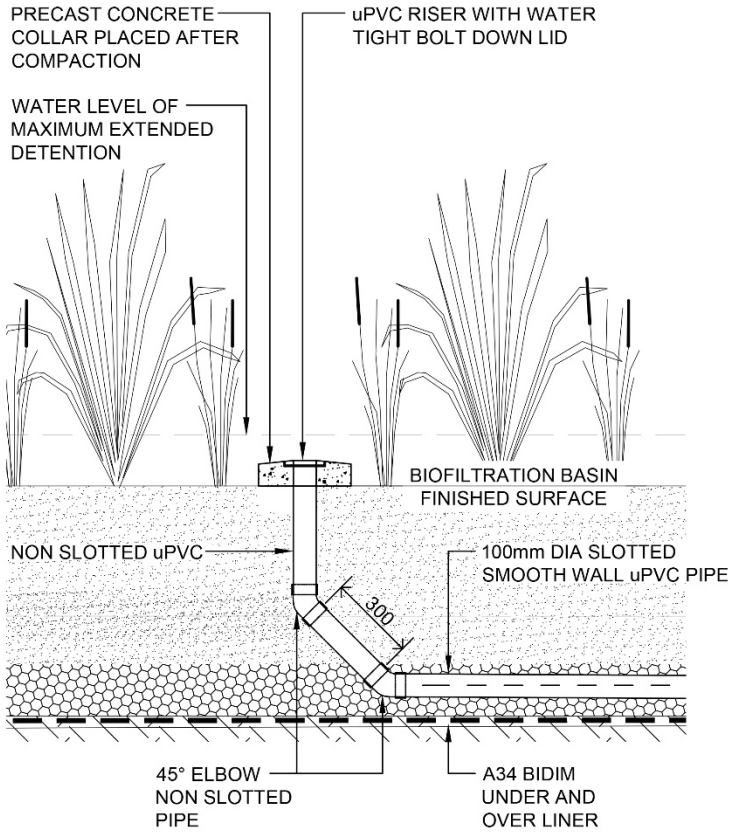
FIGURE 7 - TYPICAL BIOFILTRATION SYSTEM

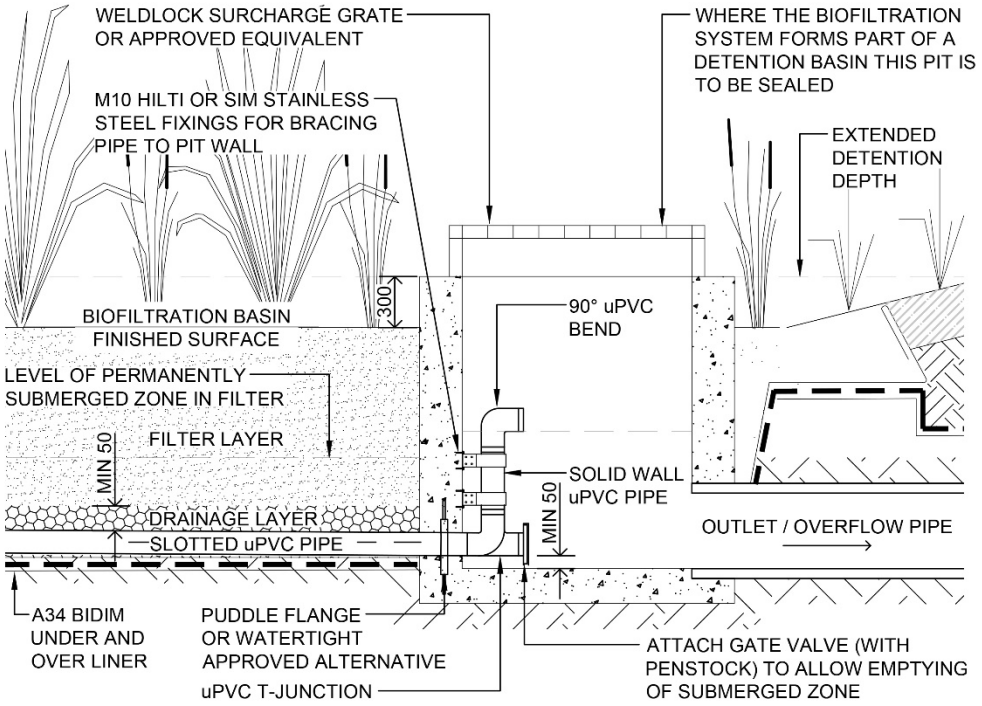
DESIGN NOTES

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 HEIGHT OF THE SATURATED ZONE IS CONTROLLED BY THE OUTLET LEVEL.
5. ONCE PLANTS HAVE ESTABLISHED (4-6 WEEKS TYPICAL) 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.

SOURCE: BLACKTOWN COUNCIL



FLUSHING POINT
NTS



TYPICAL OUTLET FOR BIOFILTRATION SYSTEMS
NTS

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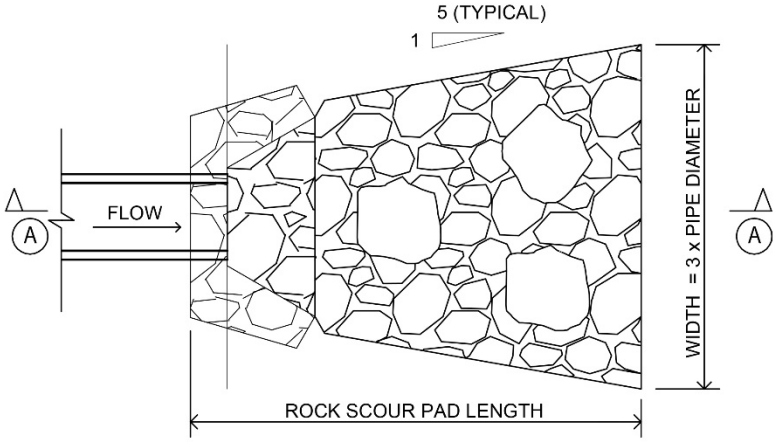
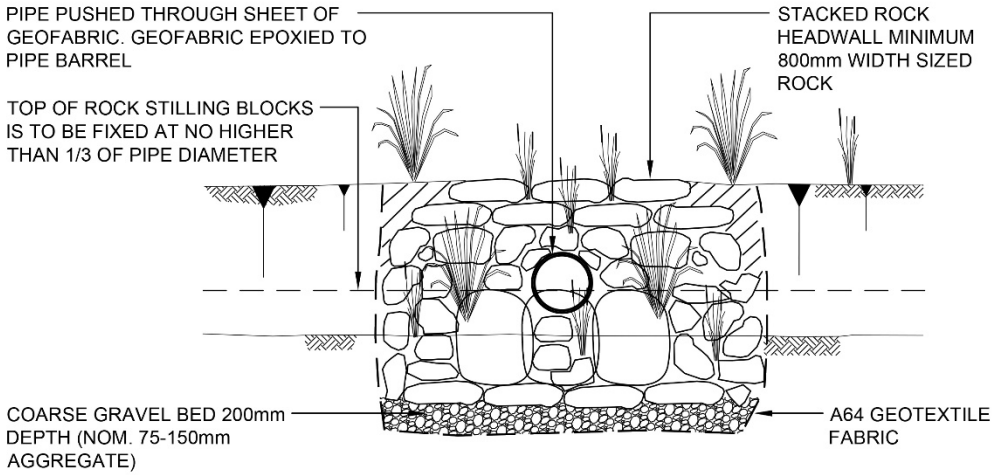
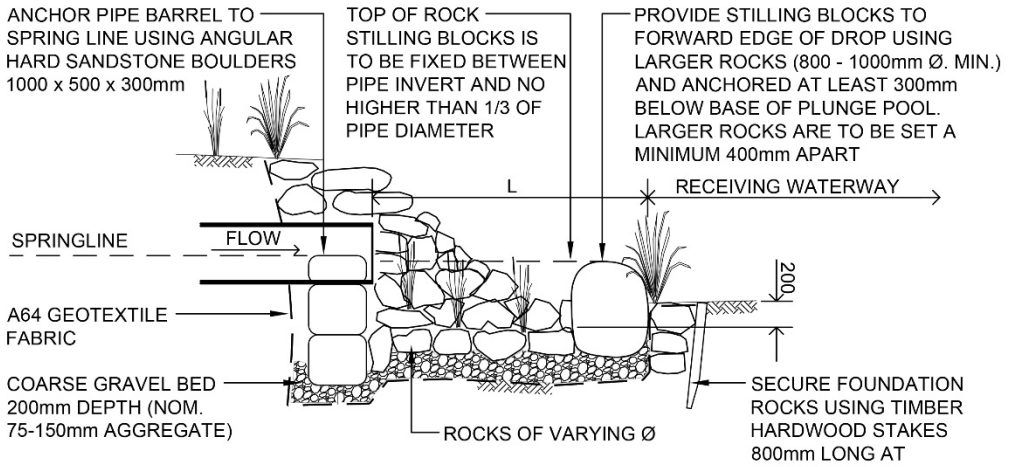
FIGURE 8 - BIOFILTRATION SYSTEM STANDARD DETAILS



TYPICAL ROCK OUTLET PAD LAYOUT
NTS



TYPICAL ROCK HEADWALL TREATMENT FOR CHANNEL OUTLET WORKS
NTS



SECTION A-A
NTS

SOURCE: BLACKTOWN COUNCIL

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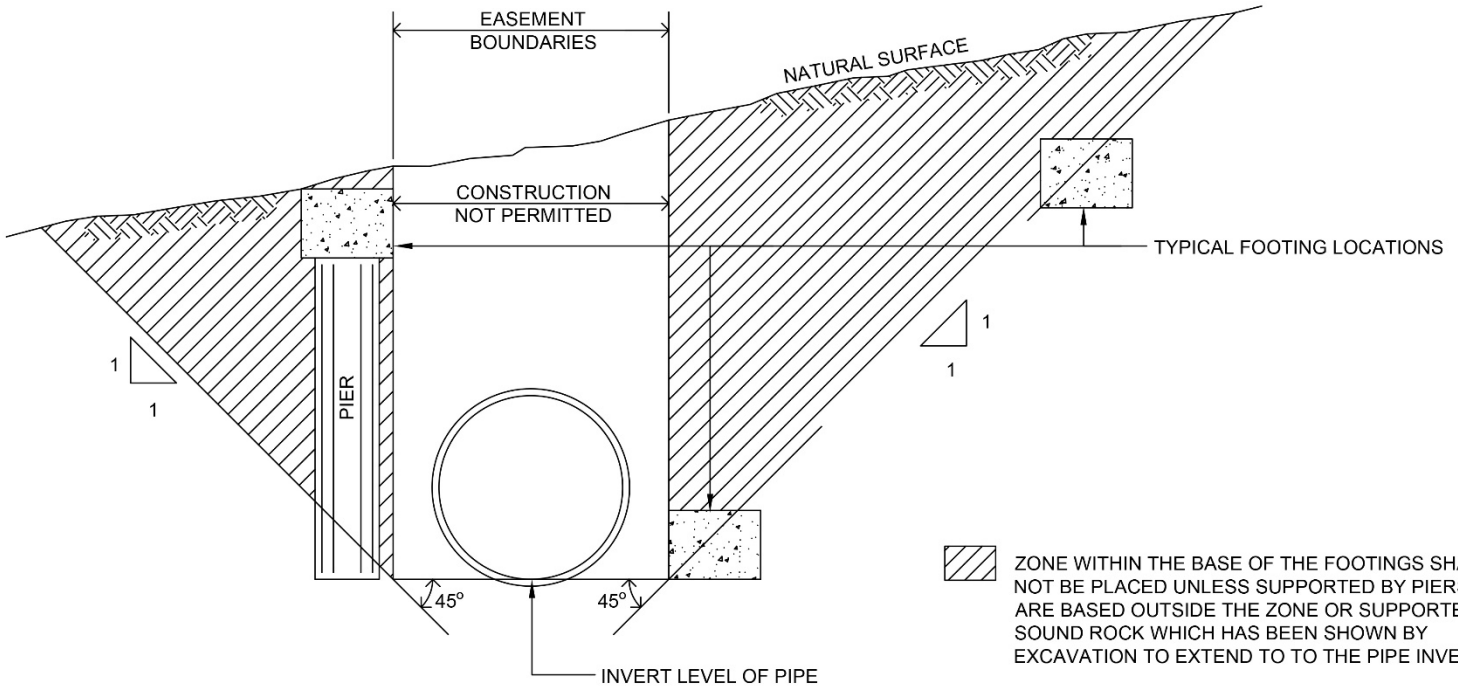
15/03/2023

FIGURE 9 - TYPICAL OUTLET STRUCTURES TO WATERCOURSE

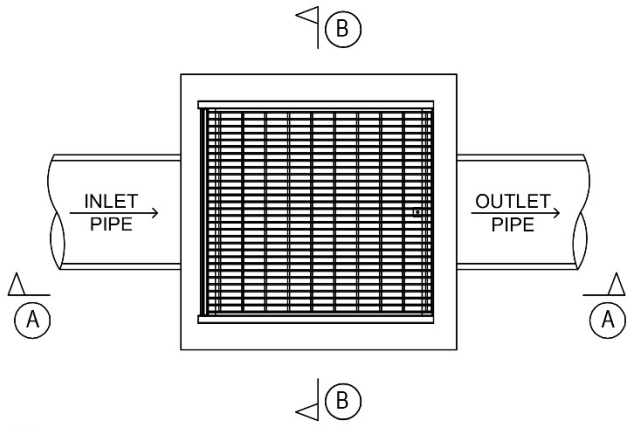
DESIGN NOTES

1. FOOTINGS INCLUDE ALL FOUNDATIONS FOR BUILDINGS, WALLS, THE UNDERSIDE OF POOLS, FLOOR SLABS OR ANY OTHER STRUCTURE SUBJECT TO THE APPROVAL OF COUNCIL.
2. THE NATURAL SURFACE WITHIN EASEMENT BOUNDARIES SHALL NOT BE FILLED OR EXCAVATED.
3. WHERE EXCAVATION IS PROPOSED WITHIN 200mm OF EASEMENT BOUNDARIES THE STANDARD INDEMNITY FORM IS TO BE SUBMITTED PRIOR TO THE COMMENCEMENT OF WORKS.
4. AT THE TIME OF THE FOOTING INSPECTION, THE EDGE OF THE EASEMENT IS TO BE PEGGED AND THE PIPE IS TO BE EXPOSED ADJACENT TO EACH END OF THE PROPOSED CONSTRUCTION AND AT ANY CHANGE IN GRADE OR DIRECTION.
5. WHERE FOOTINGS ARE PROPOSED TO BE FOUNDED ON ROCK, THE SOUNDNESS AND DEPTH OF ROCK TO THE PIPE INVERT SHALL BE PROVED BY EXCAVATION ADJACENT TO THE PIPE.
6. WHERE A PERMANENT EXCAVATION IS MADE WITHIN 2000mm OF A PIPE EASEMENT OR TO A LEVEL BELOW THE TOP OF THE PIPELINE, PROVISION SHALL BE MADE FOR THE FUTURE SUPPORT OF THE PIPE AND FOR THE COLLECTION OF SEEPAGE FROM THE PIPE OR TRENCH. COUNCIL WILL NOT ACCEPT ANY LIABILITY FOR SUCH SEEPAGE.



REV C
27/10/2022

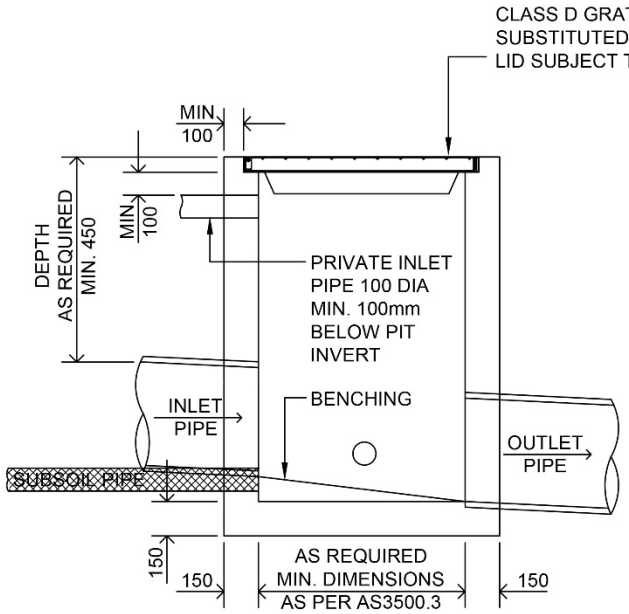
FIGURE 10 - TYPICAL FOOTING ADJACENT TO DRAINAGE EASEMENT / PIPES



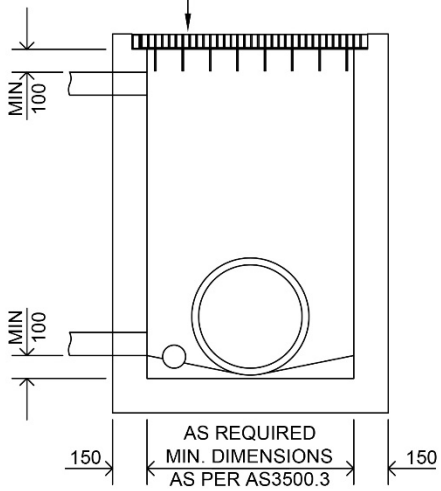
PLAN
NTS

DEPTH OF INVERT OF OUTLET	MINIMUM INTERNAL DIMENSIONS		
	RECTANGULAR		CIRCULAR
	WIDTH	LENGTH	DIAMETER
<= 600	450	450	600
> 600 <= 900	600	600	900
>900 <= 1200	600	900	1000
> 1200	900	900	1000

AS3500.03-2015 - TABLE 7.5.2.1



SECTIONAL ELEVATION A-A
NTS



SECTION B-B
NTS

DESIGN NOTES

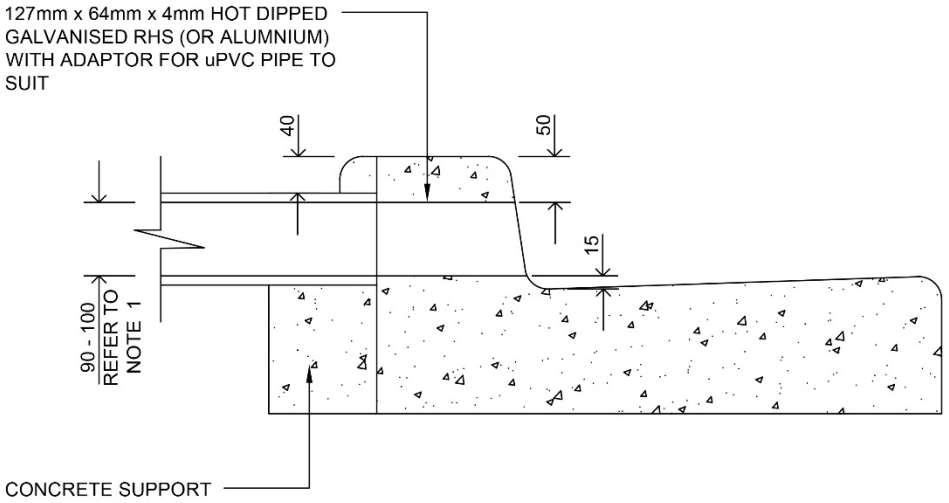
1. IN-SITU CONCRETE MINIMUM 25MPa IN ACCORDANCE WITH AS1379 AND AS3600. CONCRETE TO BE MINIMUM 150mm THICK.
2. GRATES ON PUBLIC ROADS ARE TO BE CLASS D IN TRAFFICABLE LOCATIONS, MINIMUM CLASS B IN NON-TRAFFICABLE LOCATIONS. GRATE TO BE INSTALLED SO HINGE IS CLOSEST TO APPROACHING VEHICLES.
3. GRATES WITHIN PRIVATE PROPERTIES ARE SUBJECT TO APPROVAL. CLASS D GRATES CAN BE SUBSTITUTED WITH CLASS C 'TERRA FIRMA' TYPE LID IN PEDESTRIAN OR CAR ONLY LOCATIONS WITH LOW RISK OF SURCHARGE. LID TO BE INSTALLED SO LOCK IS FURTHEST AWAY FROM ANY OBSTRUCTIONS.
4. ALL PIPES ARE TO BE LAID IN ACCORDANCE WITH AS3725. REFER TO COUNCIL DRAWING 2004-010.
5. STEP IRONS ARE TO BE INSTALLED IN ACCORDANCE WITH AS1657 FOR PITS DEEPER THAN 1200mm.
6. INSTALL MINIMUM 3m LONG 100 DIAMETER SUB-SOIL PIPE, MAX 50mm ABOVE PIPE INVERT ON ALL INLET PIPES. PROVIDE WEEPHOLE ON UPSTREAM SIDE OF FIRST PIT.
7. MINIMUM INTERNAL PIT DIMENSIONS AS PER AS3500.3-2015 TABLE 7.5.2.1.
8. PITS WITH A DEPTH OF 1.0m OF LESS DOES NOT REQUIRE REINFORCEMENT.
   PITS WITH A DEPTH OF 1.0m TO 2.0m REQUIRE REINFORCEMENT WITH SL82 **OR** N12-200 EACH WAY.
   PITS WITH DEPTH OF 2.0m OR MORE REQUIRE REINFORCEMENT WITH SL82 **AND** N12-200 EACH WAY.
   MINIMUM 50mm COVER TO REINFORCEMENT.
9. CONSTRUCTION JOINTS ARE TO INCLUDE N12 GALVANISED STARTER BARS, MINIMUM 600mm LONG EVENLY EMBEDDED, MAXIMUM 150mm SPACING D500 AS4671.
10. PRIVATE CONNECTION PIPES ARE TO BE LOCATED WITH AN INVERT AT MINIMUM 100mm ABOVE PIT INVERT AND OBVERT MINIMUM 100mm BELOW UNDERSIDE OF GRATE/LID FRAME.
11. USE OF PRECAST PITS ARE SUBJECT TO COUNCIL APPROVAL. IN PUBLIC ROADS OR AREAS SUBJECT TO VEHICULAR TRAFFIC ONLY AUS PITS PRECAST STORMWATER PITS, DURHAM SOLID WALL (MINIMUM 100mm THICK) OR SIMILAR WILL BE CONSIDERED. PUNCH OUT TYPE PITS WILL NOT BE CONSIDERED EXCEPT AS SACRIFICIAL FORMWORK.
12. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

REV C
19/09/2022

FIGURE 11 - TYPICAL JUNCTION PIT INCLUDING PRIVATE CONNECTIONS

DESIGN NOTES

1. INTERNAL DIAMETER OF PIPES OR INTERNAL HEIGHT OF RECTANGULAR SECTIONS SHALL BE 90mm - 100mm, AS SPECIFIED BY COUNCIL'S ENGINEER.
2. PIPES ARE TO BE SN6 SEWER QUALITY uPVC.
3. RECTANGULAR SECTIONS ACROSS THE FOOTPATH AND DRIVEWAY CROSSINGS ARE TO BE HOT DIP GALVANISED RECTANGULAR HOLLOW SECTION (RHS) OR A STANDARD COUNCIL CONVERTER.
4. CONVERT 150mm DIAMETER PIPE FROM WITHIN PROPERTY TO A 200mm x 100mm x 6mm GALVANISED RHS ACROSS THE FOOTPATH AND/OR DRVEWAY CROSSINGS, USING A 300mm x 300mm PIT WITH A REMOVABLE LID WITHIN THE PROPERTY.
5. CONNECTION TO THE KERB ACROSS THE FOOTPATH IS TO BE AT A MAXIMUM OF 30° PERPENDICULAR FROM THE KERB TO THE PROPERTY LINE.
6. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, UNLESS STATED OTHERWISE.



REV C
09/11/2022

FIGURE 12 - CONNECTION OF DRAINAGE LINES TO KERB

Ku-ring-gai Council

818 Pacific Highway. Gordon. NSW 2072

(02) 9424 0000