Private Stormwater Code

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Private Stormwater Code

1 Introduction

The Private Stormwater Code explains Council's aims and requirements for the disposal of private stormwater within the Municipality of Woollahra. It should be read carefully by anyone involved in the submission of a building or development application to Council, where provision of a private stormwater system is required as part of the application.

Enquiries about the Code and how it should be applied should be directed to officers of Council's Engineering Department, who will be pleased to assess individual circumstances and advise appropriate course of action.

The Code is divided into two main sections:

- **Section 1** — requirements for single dwelling houses.
- **Section 2** — requirements for developments other than single dwelling houses. That is residential flat, institutional, commercial and industrial developments.

This Code, and Section 2 in particular, is based mainly on methodologies and data provided in "Australian Rainfall and Runoff' volumes 1 and 2 (1987) as the current relevant standard.

No allowance is made in the Code for the "Greenhouse Effect'. Anyone involved in the design of a private stormwater system should refer to published literature and take into consideration the views of the Australian Institute of Engineers as to the possible impacts of global warming.

Private Stormwater Code

2 Aims of the Code

2.1 To provide designers, developers builders and the general public with a guide to Council's requirements for the disposal of private stormwater.

2.2 To control the release of stormwater from private properties to avoid damage to private or Council property and prevent danger and nuisance to the general public.

2.3 To avoid overloading Councils drainage system by controlling the release of private stormwater.

3 Definitions of Terms

- **Private stormwater -** includes all rainwater falling on the applicant's property which does not evaporate or become absorbed into the ground. In other words, all surface runoff.

- **Private stormwater systems** - include all delivery lines, underground pipelines, drains, pits, sumps and pumps which enable private stormwater to be carried to a suitable outlet. In most cases, a suitable outlet will be Council's stormwater system. Properties susceptible to seepage must include subsoil drainage in the system.

- **Council stormwater system -** includes all gutters, street gully pits, pipelines, channels and drains.

4 Section 1

Single Dwelling Houses

4.1 Surface runoff must be directed into Council's system wherever possible. 'Hard' surfaces, including roofs, patios, driveways and paved areas must drain through a private stormwater system into Council's system.

Where there is runoff from a garden, grassed or landscaped area, the effect on adjoining premises should be addressed. Wherever possible, the runoff should be drained into Council's system through a private system.

For most single dwellings of average size, a pipe of 100 mm diameter, connected to a Council gutter will be

adequate to drain runoff. As an alternative, it may be possible to discharge to a Council gully pit or pipeline, or through an inter-allotment drainage system.

4.2 The layout of the proposed drainage system must be shown on a site plan. The plan should include all buildings, hard paved areas and the location of the connection into Council's gutter.

4.3 Where stormwater cannot be discharged directly to the street gutter or Council's drainage system, possible alternatives are suggested in **Sections 9 and 10** of this Code which deal with pump-sump and/or absorption trenches.

4.4 The volume of runoff generated from the site should be limited wherever possible by providing increased opportunity for infiltration. Use of lattice slabs and brick paving as alternatives to Impermeable surface treatments may be considered.

5 Section 2

Development other than Single Dwelling Houses

For residential flats, institutional, commercial or industrial development - sufficient information must be given to Council to enable assessment of the proposed drainage system and method of stormwater disposal. The general requirements for submissions to Council are listed below, followed by specific requirements regarding the method to be used. The three permissible methods of stormwater disposal are:

- gravity feed
- pump-sump or
- absorption trench systems.

Designers are advised to limit the volume and rate of runoff generated from the site. Porous surfaces such as lattice slabs and planting beds which allow moisture to

soak through are preferable to impermeable materials. It may be necessary to retain water on surfaces such as carparks, roofs and tennis courts to lessen the flow, especially on sites located at the top of the catchment.

No obstruction to overland flow or stormwater runoff from properties draining naturally onto the site will be permitted.

6 General Requirements

6.1 Council requires:

- an estimate of the flow rate from the property in question
- details of the system used to remove stormwater from the site, and
- the method of connection to Council's stormwater system.

All materials and methods are to be in accordance with relevant Australian Standards.

6.2 Determination of Stormwater Flows

For most private stormwater systems, the "Rational Method" will be adequate for determining peak flow rate. The method is based on the following formula:

Q	=	fCIA
where Q	=	peak rate of discharge (m3/s)
f	=	conversion factor to balance the units used
	=	1/360
I	=	rainfall intensity (mm/hr) for the design storm
C	=	runoff coefficient
A	=	catchment areas (hectares)

Explanations and minimum requirements associated with each of this above variables are listed in Clauses 6.2.1 to 6.2.6.

A more detailed explanation of the Rational Method is provided in "Australian Rainfall and Runoff - volume 1" (1987).

Calculation of the peak flow rate using formulae other than the Rational Method is acceptable, provided that a summary of all calculations is submitted. Peak flow rates obtained by computer are acceptable and may provide more physically correct models of rainfall runoff processes.

6.2.1 Average Recurrence Interval

All private stormwater systems should be designed using the major / minor approach. All systems should be able to cope with storms of a minimum Average Recurrence Interval (ARI) of ten (10) years to prevent nuisance flooding. If a system fails frequently, it should be designed for a longer ARI. For example, it may be more appropriate to design commercial developments with an ARI of twenty (20) years.

For a 'major' storm with an ARI of one hundred (100) years, the design should provide means for water to escape overland. This route must be planned to cause minimum damage to downstream properties and should take into consideration the possible failure of pump-sump systems and absorption trench systems.

6.2.2 Time of Concentration

The Rational Method requires an estimate of time allowed for concentration and travel of runoff. For flows from roofs and other surfaces which drain quickly through downpipes and underground drains, a single response time can be nominated. This is approximately (5) minutes for single dwellings and 13 to 15 minutes for commercial and industrial buildings.

6.2.3 Design Rainfall

Design rainfall intensity is dependent on the ARI and time of concentration. Intensity should be determined from the Rainfall Intensity Frequency Duration (IFD)

curve appropriate to the location of the applicants property. IFD tables for Rose Bay. Paddington and Vaucluse are attached in **Appendix A, FIGURE 1.**

6.2.4 Runoff Coefficient

"C" - the runoff coefficient - can represent the ratio of a peak flow and a rainfall rate of selected duration determined for the same ARI from frequency analyses of flood peaks and rainfalls. Other relationships relate runoff coefficients to factors such as land-use, surface type, slope and rainfall intensity.

Designers should refer to Australian Rainfall and Runoff - volumes 1 and 2 (1987). The method proposed in fig. 14.13 of AR&R should be used in preference to methods recommended in previous editions. It should be noted that for recurrence intervals other than 10 years, a frequency factor must be applied to the coefficient.

6.2.5 Site Area

For all proposals, Council requires site area dimensions and the relative proportions of paved, roofed, grassed and landscaped areas. These must be classified as either drained or undrained. The collection point for each area must be identified. Areas which drain onto the site from beyond it must also be identified and included in any calculations.

6.2.6 Partial Area Effect.

Most urban areas consist of impervious (hard paved) and pervious areas. Where impervious areas are directly connected, the time of concentration for them may be much less than the time of concentration for the whole site. Runoff from directly connected impervious areas may therefore be critical. Designers should take this partial area effect into consideration where appropriate.

6.3 Pipe Details

Details regarding the pipe system should include:

- pipe diameters
- pipe materials and classes
- pipe grades
- reduced levels and invert levels of all pits and sumps to Australian Height Datum (AHD)
- invert levels of the pipeline
- the location, dimensions and reduced levels of all outlets and junction structures

The minimum acceptable fall on all pipes draining by gravity is 1% and minimum acceptable pipe diameter is 100 mm.

6.4 Discharge to Council System

6.4.1 Details must be included showing connection into Council's stormwater system. This may either involve connection to a Council street gutter, a Council stormwater drain or a Council stormwater pipe.

All proposals should show the location of the closest Council stormwater pit and line regardless of the point of discharge. This information can be obtained by a visual inspection of the area and by studying Council's Drainage Plans.

6.4.2 Connection to a Council Gully Pit or Drain

If a Council pipe/pit is located next to the subject property, discharge into this system is preferable. If the discharge rate exceeds 25 l/s. the stormwater must be connected directly into a Council pit or drain. Council also requires subsoil seepage waters and fire sprinkler test waters to be piped into a Council gully pit or drain.

If direct discharge is required and there is no Council pit or line adjacent to the applicant's property, the applicant may be required to construct a street gully pit and line to connect into Council's system - or as directed by Council's Engineering Department.

The following conditions apply:

a) A plan and long section of the proposed system with levels to AHD and to a scale of 1:100 - unless otherwise approved - will be required. All services in the immediate vicinity must be located and indicated on the plan.

b) The capacity of the pipe is to be based on the discharge from the site and must include any flow from the street which will drain into the pit and line.

c) The street line is to consist of concrete pipe of a class appropriate to the depth of the pipe and expected load on it, according to the Australian Standard for pre-cast concrete pipes. The pipe should be laid according to the Code of recommended practice for concrete pipe laying.

d) Where the applicant is required to construct a street gully pit, the pit is to be constructed according to Council requirements with a heavy duty galvanised steel grate or similar. Pre-cast pits are acceptable. A drawing of the Councils standard gully pit is available from the Engineering Department.

e) The applicant must obtain a Road Opening Permit from Council's Engineering Department prior to the start of work.

On completion of work in a Council street, the applicant must ensure that the excavation is in a condition considered to be safe by a Council Engineer until Council can restore the road to its original condition. This will involve compacting over the excavation and applying cold mix. The applicant must notify the Council on completion of this work. Council may allow restoration to be carried out by approved contractors under conditions similar to those applying to the provision of vehicular crossings and similar features.

g) All street gully pits and pipes laid in the street must be inspected by a Council Engineer prior to backfilling. Twenty four hours notice must be given for inspection. Testing of the pipeline by a Council Engineer may also be required.

6.4.3 Detention Basins

Where the discharge rate to Councils system exceeds the capacity of the subsurface system, or the rate to the gutter exceeds 25 l/s, on-site detention and/or retention may be required. (Detention and retention basins temporarily store stormwater and release it at reduced flow rates).

Specific requirements for on-site detention will depend on the capacity of the system to which runoff is discharged. This can only be determined by a detailed analysis of the Council system. Until this can be carried out, the following applies:

Half of all runoff occurring on the site in a storm with an average recurrence interval of 20 years must be detained on site for 10 minutes.

This condition is to apply at the top of the catchment - e.g. Bondi Junction. For sites further down the catchment, it may be acceptable for surface runoff to be retained on site for shorter periods. Storage may be provided on roofs, tennis courts, carparks and the like.

6.4.4 Wastes Prohibited for Discharge to the Council's system

No foul water - including trade wastes and wastes from air conditioning cooling towers - is to be discharged into Council's system. This prohibition includes discharges from floor wastes in undercover parking areas.

6.4.5 Discharge of Stormwater to Other Systems

Approval must be obtained from the relevant Authority if the applicant wishes to discharge stormwater to a system not owned by the Council such as:

Sydney Harbour - approval to be obtained from the Maritime Services Board

Sydney Water Board stormwater channels

Stormwater shall not be discharged into the Sydney Water Board's sewers.

6.5 Maintenance

The applicant is required to carry out regular maintenance to ensure that all stormwater systems function efficiently. Systems should be designed to allow this. All designs should address the following points:

- access to system components for cleaning and maintenance
- siltation of pits and sumps
- blockages of pipes
- problems caused to stormwater drains by tree roots
- siltation of absorption pits
- regular maintenance of pumps

Council recommends that the owner/developer should obtain a service contract guaranteeing regular maintenance of all pump systems.

6.6 Submissions to Council

The above-mentioned details should be submitted to Council in the following form:

a) **a summary of assumptions, methods and calculations,** including the assumed ARI, design rainfall, runoff co-efficient and calculated peak discharge.

b) **a plan of the site and the designed system to a scale of 1:100 unless otherwise approved**, showing all invert levels and reduced levels (to AHD) of all pits and sumps, pipe details and layout, delineation of drained and undrained areas and collection points, connection to Council system, closest Council stormwater pit, inspection and maintenance outlets and all other relevant details.

6.7 Construction Over, or Adjacent to Council Easements

In general, building over Council's drainage easements is prohibited. However, light structures such as tennis courts may be approved in exceptional circumstances.

Where a building is to be located adjacent to a Council easement, the structure must be outside the 45 degree line of influence from the invert of the pipe.

Where permission has been given for construction over a Council drainage easement, the following conditions apply:

- access is to be provided to the entire length of the pipe
- the structure is to be supported so that the Council pipe does not bear its load

In cases where a natural watercourse or drainage pipeline is not covered by easement rights, an easement in favour of the Council is to be created.

7 Gravity Feed Systems

7.1 Gravity feed systems are Council's preferred option for the disposal of private stormwater. Applicants must comply with all details as set out under General Requirements.

If a property is below street level, direct gravity feed to the street may not be possible. In these cases, it may be possible to drain by gravity by:

- creating an easement drain through adjoining properties
- connection into a Council easement or drainage reserve. The location of these may be determined by study of Council's Drainage Plans (available from the Engineering Department).

7.2 Inter-allotment Drains

Permission must be obtained from downstream property owners before approval can be granted for the construction of an inter-allotment drain. Applicants must provide proof of agreement by adjacent owners and proof of registration of the easement at the Land Titles Office.

The applicant must make every attempt to provide a gravity feed system to drain the site. Where a downstream property owner refuses to give permission for a drainage easement, copies of correspondence from both parties proving this must be submitted to Council before any alternative will be considered.

Council is prepared to assist by encouraging downstream property owners to agree to the provision of easements.

Details of inter-allotment drains must be included on the site plan and submitted to Council.

8 Pump-Sump Systems

8.1 Pump-sump systems will not be approved if easements, inter-allotment drains or drainage reserves are available to provide gravity-feed access to Council's system. Pump-sump systems must be designed by a Hydraulic or Consulting Engineer with appropriate experience.

In addition to the general requirements already listed, the following must be submitted:

8.2 Pump Specification

Council must be informed of the type of pump, discharge rate, pump curves detailing pump rate versus head, and the head against which the pump must operate.

A minimum of two pumps is required for pump-sump systems

8.3 Sump Size

The sump volume and all calculations used to determine this are required. The design for storage may be based on a mass curve method as detailed in "Australian Rainfall and Runoff' - Volume 1 (1987) or other another method preferred by the designer.

The provision of additional storage in retention basins (such as on a tennis court), is acceptable.

8.4 Submission to Council

The pump system and layout, and reduced levels of the sump invert must be included in the plan submitted to Council. All calculations used to determine the capacity of the pump and the sump must also be submitted.

9 Absorption Trenches

9.1 Absorption trenches will not be considered if easements, inter-allotment drains or drainage reserves are available to provide gravity feed access to Councils system.

In areas of the Municipality which are underlain by sandstone, such as parts of Vaucluse absorption trenches will not be considered.

If the site is underlain by a permeable material, an absorption trench may be approved providing the paved and roof areas to be drained are acceptable to the Council, geological conditions are shown to be acceptable and the effects on downstream properties are not deleterious.

9.2 Regions Considered for the Installation of Absorption pits

The Municipality consists of three main geological conditions. These are:

- **Area 1** - medium to coarse grained sandstone
- **Area 2** - man-made fill/silty to peaty quartz sand. silt and clay
- **Area 3** - medium to fine grained marine sands

The extent of these ground types is indicated in **Appendix A, FIGURE 2**

- **In Area 1** - approval will not be considered
- **In Area 2** - approval may be considered
- **In Area 3** - approval will be considered

Where the property is situated on either man-made fill/silty to peaty sand or marine sand, further geotechnical analysis must be carried out to determine accurately the required soil characteristics (listed in Section 9.4.2.). Approval for an absorption pit may then be granted provided the absorption pit is sized according to the following procedure and site conditions are acceptable for its construction.

9.3 Sizing of Absorption Pits

Anticipated inflow and outflow rates (depending on the permeability of the soil) should be addressed by the design of absorption pits. The trench should be adequate to contain the difference between the inflow and outflow.

Some possible absorption trench arrangements are shown in FIGURE 3

Alternative design methods may be acceptable if an explanation of the method, all calculations and assumptions are submitted to Council.

9.4 Submissions to Council

In addition to the relevant information listed under General Requirements, the following must be submitted to Council:

9.4.1 Trench Characteristics

- dimensions (and volume) of the trench
- backfill material to be used in the trench

9.4.2 Underlying Soil Conditions

- soil type/s to a depth of at least 2 metres
- permeability coefficient k(m/s)

Note: this data should be estimated using an appropriate field or laboratory test (such as a field pumping test). Test results must be submitted to Council. (Assumed data may not be acceptable)

- the depth to and identification of any strata through the soil
- depth to the water table

Approval will not be granted if:

- the coefficient of permeability is less than 5×10^{-5}m/s
- strata of impermeable or low permeability material are present
- the water table is less than 2 metres from the base of the pit

9.4.3 Trench Location

A plan to a suitable scale will be required, showing accurate location of the trench in relation to building footings, fences, pools. etc., with all levels to AHD. The plan must show contour lines across the property to indicate the direction in which water will flow should the capacity of the pit be exceeded.

9.4.4 Effects on the Catchment

Details of the absorption pit's effect on the downstream catchment must be submitted. Designs must address the impact of increased subsoil flow on neighbouring properties and properties downstream of the absorption trench.

10 Combined Systems

Applicants may submit details for combined systems, such as systems involving both gravity feed and pump-sump techniques.

In this event, applicants are required to delineate clearly the areas on the site which drain to each system.

Want to know more?

For further information on this code contact our Technical Services Division on 9391 7131.

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Gary James, General Manager
Woollahra Municipal Council

Appendix A

FIGURE 1 - DESIGN RAINFALL INTENSITIES (IFD Charts) (Replaced Original Figure 1 titled "Map indicating areas of influence of the Paddington, Rose Bay & Vaucluse I.F.D Diagrams" with a Tabulated Form as set out below)

The following design rainfall intensities are to be used throughout the Woollahra Municipal Council LGA.

Woollahra Municipal Council Design Rainfall Intensities

		Average Recurrence Interval						
Duration		1 in 1	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100
Minutes	Hours	Rainfall Intensities in mm/hour						
5	0.083	104	133	167	187	213	246	271
6	0.100	98	125	157	175	199	231	254
7	0.117	92	118	148	166	189	219	241
8	0.133	88	112	141	158	180	209	231
9	0.150	84	107	135	151	173	201	222
10	0.167	80	102	130	146	166	193	214
11	0.183	77	99	125	140	161	187	207
12	0.200	74	95	121	136	156	181	201
13	0.217	72	92	117	132	151	176	195
14	0.233	69	89	114	128	147	171	190
15	0.250	67	86	111	124	143	167	185
16	0.267	65	84	108	121	139	162	180
17	0.283	64	82	105	118	136	159	176
18	0.300	62	80	102	115	133	155	172
19	0.317	60	78	100	113	130	152	168
20	0.333	59	76	98	110	127	148	165
21	0.350	57	74	95	108	124	145	162
22	0.367	56	72	93	106	122	143	159
23	0.383	55	71	91	104	119	140	156
24	0.400	54	69	90	101	117	137	153
25	0.417	53	68	88	100	115	135	150
26	0.433	52	67	86	98	113	132	147
27	0.450	51	65	85	96	111	130	145
28	0.467	50	64	83	94	109	128	143
29	0.483	49	63	82	93	107	126	140
30	0.500	48	62	80	91	105	124	138
31	0.517	47	61	79	90	104	122	136
32	0.533	46	60	78	88	102	120	134
33	0.550	46	59	77	87	101	118	132
34	0.567	45	58	75	86	99	117	130
35	0.583	44	57	74	84	98	115	128
36	0.600	43	56	73	83	96	113	126
37	0.617	43	55	72	82	95	112	125
38	0.633	42	55	71	81	94	110	123
39	0.650	42	54	70	80	92	109	121
40	0.667	41	53	69	79	91	107	120

Woollahra Municipal Council Design Rainfall Intensities

41	0.683	40	52	68	78	90	106	118
42	0.700	40	52	67	77	89	105	117
43	0.717	39	51	67	76	88	103	115
44	0.733	39	50	66	75	87	102	114
45	0.750	38	50	65	74	86	101	113
46	0.767	38	49	64	73	85	100	111
47	0.783	37	48	63	72	84	99	110
48	0.800	37	48	63	71	83	97	109
49	0.817	37	47	62	70	82	96	108
50	0.833	36	47	61	70	81	95	106
51	0.850	36	46	60	69	80	94	105
52	0.867	35	46	60	68	79	93	104
53	0.883	35	45	59	67	78	92	103
54	0.900	35	45	59	67	77	91	102
55	0.917	34	44	58	66	77	90	101
56	0.933	34	44	57	65	76	89	100
57	0.950	33	43	57	65	75	89	99
58	0.967	33	43	56	64	74	88	98
59	0.983	33	42	56	63	74	87	97
60	1	32	42	55	63	73	86	96
90	1.5	25	33	43	49	57	67	75
120	2	21	27	36	41	47	56	63
180	3	16	21	27	31	36	43	48
240	4	13	17	22	26	30	35	39
300	5	11	15	19	22	26	30	34
360	6	10	13	17	19	23	27	30
720	12	6	8	11	12	14	17	19
1440	24	4	5	7	8	9	11	12
2880	48	3	3	4	5	6	7	8
4320	72	2	3	3	4	4	5	6

Probable Maximum Precipitation Depth in mm				
Duration		**Catchment Area**		
Minutes	**Hours**	**1km^2**	**2km^2**	**3km^2**
15	0.25	170	160	160
30	0.5	250	240	230
60	1	360	350	340
90	1.5	460	450	440
120	2	540	530	520
180	3	660	640	630
360	6	870	850	830

Linear interpolation should be undertaken for durations and catchment sizes not shown.

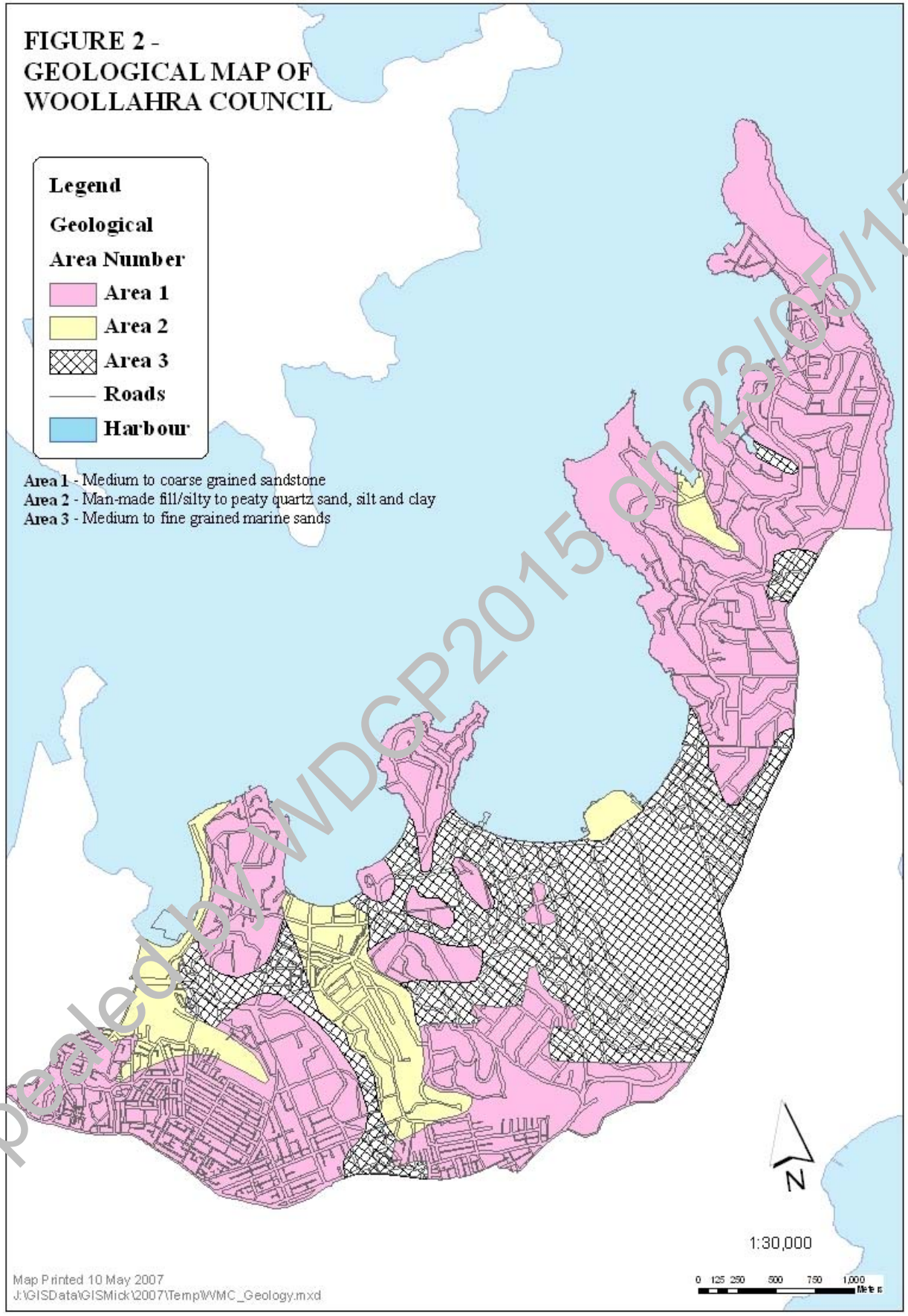
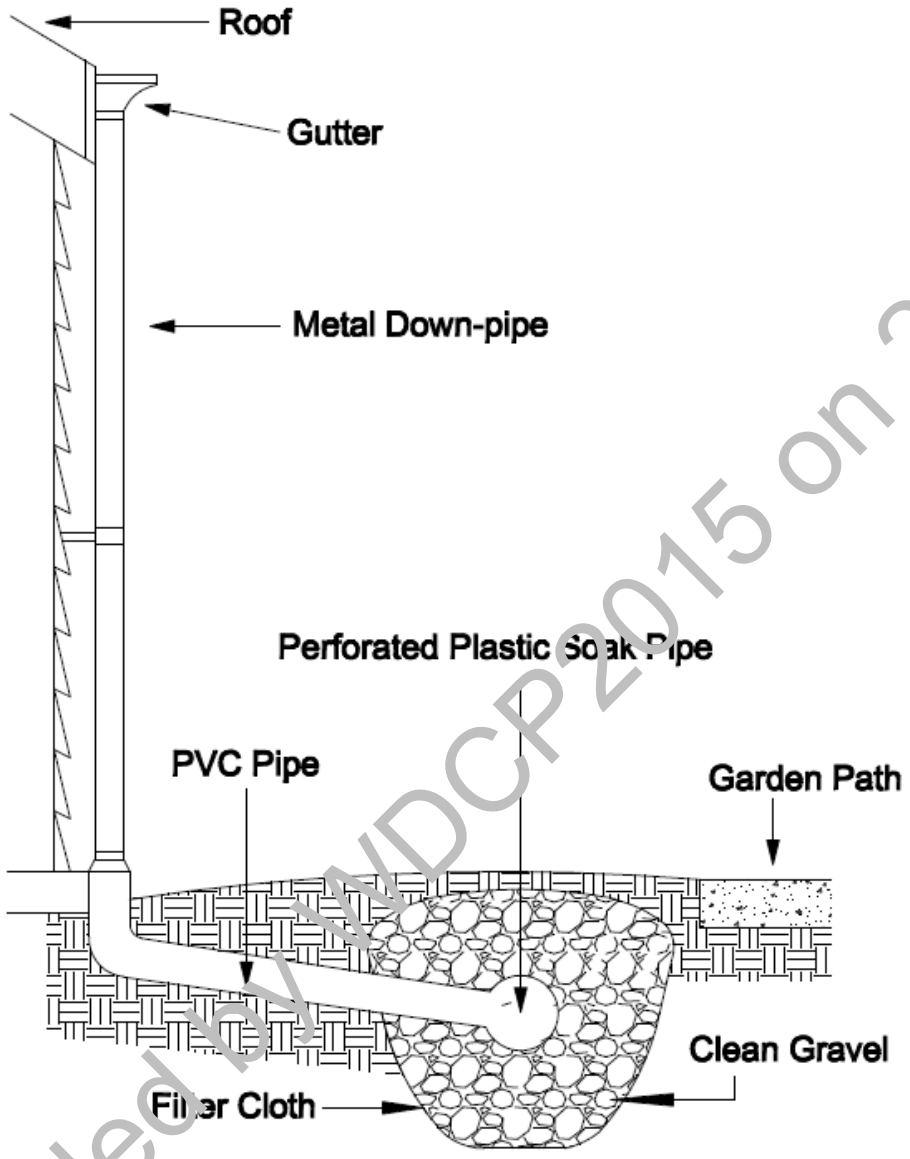


FIGURE 3: POSSIBLE ABSORPTION TRENCH ARRANGEMENT



GRAVEL TRENCH