Surface water strategy report

For the proposed extensions to

Wildewood, Essendon, Herts, AL9 6JG.

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1 Executive Summary

A. The proposed development is to Wildewood, Essendon, Herts, AL9 6JG

B. The site lies wholly in flood zone 1.

C. Flood risk from all other sources is considered to be Low

D. The use of infiltration SuDS will form a major part of the strategic surface water drainage provision for this site.

2 Introduction

2.1 Site location

The proposed development is to Wildewood, Essendon, Herts, AL9 6JG (see Figure 1).

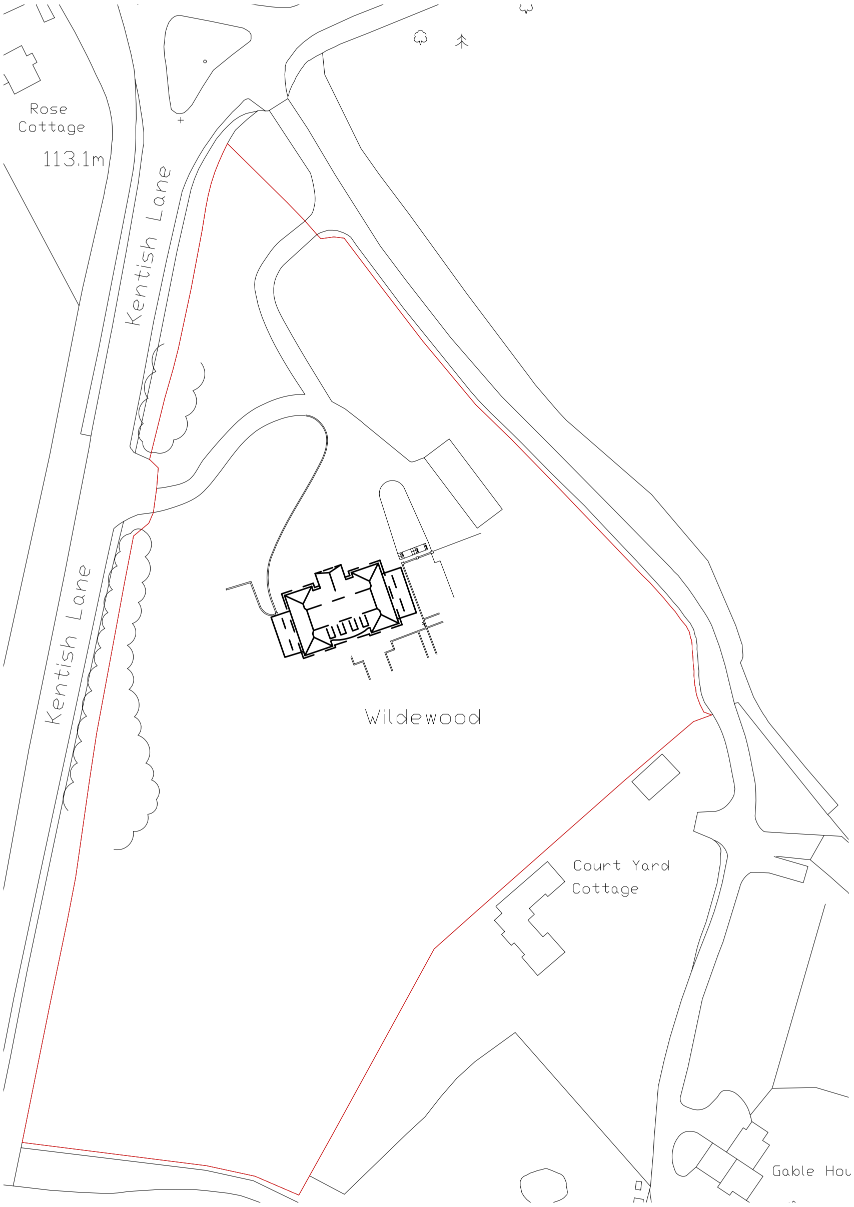


Figure 1: Site location plan, outlined in red. North to top (source: Architect)

2.2 Proposed development description

The proposal is for an extension the existing to form a basement swimming pool and reception room over. Refer to proposal plans at Appendix A.

2.3 Site geology

With refernce to BGS mapping, the site sits on Sand And Gravel Of Uncertain Age And Origin - Sand And Gravel over London Clay. Bore hole data from the site (BGS ID: 18459199 & BGS ID: 532409) indicate a capping layer sits over the sand and gravel strata to a depth of circa 3m.

2.3.1 Infiltration testing

Infiltration testing has not yet been undertaken on site. However, while the capping layer of clays would be virtually impermeable, the sands and gravels would offer a medium to good infiltration potential of circa 5.0×10^{-5} ms^{-1}.

2.3.2 Water table

The water table is not expected to inpact on any SuDS feature. Bore hole scans indicate this is resting at 210ft BGL.

3 National Planning Policy Framework (NPPF)

3.1 Paragraph 101

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding."

3.2 Paragraph 103

When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

A site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

4 Flood risk analysis

4.1 Flood risk from sea and rivers

Flooding can occur from the sea due to a particularly high tide or surge, or combination of both. Flooding can also take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.

With reference to the Environment Agency Flood Map, the proposed site at lies in Flood Zone 1. This means that the proposed site has extremely low vulnerability from river and sea flooding (less than 1 in 1000 annual probability of river or sea flooding in any year).

4.2 Flood risk from groundwater

Flooding can occur where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather.

The water table is found to be low and hence the risk of groundwater flooding is Low.

There are no identified indicators that the site has been susceptable in the past from groundwater flooding.

4.3 Flood risk from the public sewerage and highway drain

Flooding can occur when combined, foul or surface water sewers and highway drains are temporarily over-loaded due to excessive rainfall or due to blockage.

There is no record of highway flooding to the site.

4.4 Flood risk from surface water

Flooding can occur when the net rainfall falling on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.

The proposed development will increase impermeable areas, flooding risk from surface water is likely to increase unless SuDS techniques are in place to attenuate water on site. It is a recommendation of this report that the proposed scheme aims to adopt various SuDS techniques in order to fully mitigate the flooding risk from surface water (refer to Section 6).

With reference to EA SW flood maps the SW flood risk to the site is Low.

4.5 Flood risk from overland flow

The land in the area is gently sloping. Hence the the probability of groundwater flooding from, or away from the site is Low.

4.6 Flood risk from other sources

Flooding can occur due to canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.

The EA and Local Authority show no record of flooding from other sources, such as canals, reservoirs, in the vicinity of the proposed site. Hence the flood risk from other sources is Low.

4.7 Flood risk summary

Given that:

- The site lies wholly in flood zone 1;
- Flood risk from all other sources is considered to be Low and
- SW arising will be managed on site and hence not increase flood risk elsewhere.

Then, from a flood risk perspective, the extension of an existing dwelling is considered acceptable.

5 Surface water management principles

5.1 General principles and design considerations

- All surface water run-off that cannot be discharged to ground water via infiltration will be managed on site and discharged to a surface water sewer or local highway drain at greenfield (or otherwise agreed) rates.
- Attenuation and hydraulic controls will be used to manage flow rates.
- The Floods and Water Management Act 2010 requires the use of SuDS.
- Sustainable Drainage Systems (SuDS) will be implemented throughout the development scheme.
- The proposed drainage arrangement will use SuDS devices to provide source control, water quality treatment and bio-diversity enhancement. The SuDS on site will supplement a traditional drainage network.
- The piped drainage elements will be designed to the standards set out in the 7th Edition, Sewers for Adoption.
- All SuDS will require maintenance

The surface water disposal strategy will be required to manage the run off from:

- Pitched roofs
- Basement roofs
- Areas of hardstanding

5.2 SuDS Principles

In line with the SuDS management train, the following hierarchy has been considered in applying the use of SuDS into the proposed development scheme.

5.2.1 Source control

- Sedum/green roofs. The use of Sedum roofs can significantly reduce run-off volumes from roofs [2].
- Rain water harvesting / water butts. The collection and re-use of water can reduce run off volumes arising from roofs. The collected water being used for the flushing of toilets or local irrigation.
- Bio-retention planting, rain gardens. Typically these systems use the natural gradients in a beneficial manner and provide surface water retention volumes. As "rain gardens", these can be designed as a local amenity.
- Infiltration devices. Typically soakaways return surface water as close to scource as current regulations allow thus mimicing the natural hydrology.
- Permeable paving, porous asphalt. These provide both infiltration and short term storage volumes thus reducing overall un-mitigated run-off volumes.

5.2.2 Site control

- Detention basins. Areas of the site with reduced levels and allowed to flood in the short term
- Car-parks. Temporary storage of exceedence flows. To depths of 200mm.
- Recreational sports pitches/playing fields. Temporary storage of exceedence flows. To depths of 500mm (1m if secured).
- Ponds.

5.2.3 Conveyance

- Swales.
- Filter strips. These channel and filter water arising from highways with outfalls to further SuDS solutions.

5.2.4 "End of pipe" solutions

To be considered only after implementation of the above options.

- Retention tanks with outfall controlled by hydraulic means (hydrobrakes) to green field rates and volumes to discharge to existing flow pathways.

5.3 Health and Safety

The proposed SuDS solutions will be designed in line with best practice National SuDS standards to ensure they meet both hydraulic and safety criteria.

6 Proposed surface water strategy

6.1 Infiltration devices

All surface water arising from roofed areas is controlled by direct infiltration through a soakaway. Notes:

- For this report the drained area to the soakaway(s) arises from the area of roof plus a 1.1 allowance for urban creep.
- The soakaway is designed for all events up to and including the M100 6hr event.
- An allowance of x1.4 is made for climate change in line with current best practice.

Designed to BRE365, and to accommodate all surface water arising from a drained area of 340m^2 requires 1 , open void (i.e. 95%), soakaway(s) of 4m wide x 4.9m long with a 1.2m effective depth. See Table 1.

Permeability	5.00E-05	ms^{-1}
Urban Creep	1.1	
Drained area	340	m^2
Designed drained area	374	m^2
Return Period	100	yr
% voids	95	%
Climate change	1.4	

Design Width, m	4
Design Depth$_{eff}$, m	1.2
Design Qty	1

Duration, mins	5	10	15	30	60	120	240	360	600	1440
Rainfall, mm	19.1	28.6	34.5	45.4	56.7	68.5	80.3	87.5	97.4	116.1
Volume in, m^3	7.1	10.7	12.9	17	21.2	25.6	30	32.7	36.4	43.4
Length req'd, m	1.5	2.3	2.7	3.5	4.3	4.8	4.9	4.7	4.1	2.3

Crit Length, m	4.9
Crit Duration, mins	240
Empty to 50%, hrs	1.83

Table 1: BRE 365 Calculation results

6.1.1 Sedimentation risk

Domestic roofing carries a very low sediment loading. Worst case 216 kg.ha^{-1}yr^{-1} - so for this site that equates to circa 7.3kg.yr^{-1} in the worst case. Generally this would reduce the attenuation capacity by circa 2% over 50yrs (all data from the SuDS maunual). The design allows for this amount with extra capacity provided to a 100yr design life. The BRE 365 method acknowledges this sedimentation and hence the base area is not considered in the sizing calculations.

6.1.2 Minimising sedimentation risk

However, the developer will fit accessible sumped rainwater gulleys at the base of all RWP's so as to reduce the amount of any sediment entering the soakaway.

The developer will also fit downpipe leaf guards to all outfalls from the roof (or "hedge-hog" gutter guards).

6.1.3 Concrete ring option

Due to the expected depths of the Sand and gravel srata, preformed concrete ring soakaways may provide an alternative option. In this event, and following the BRE 365 methodology, the same drained area requires two 2700mm x 1500mm deep units surrounded in "reject" stone. Minimum plan dimensions of excavations equal 3.2m x 3.2m per unit.

6.2 Bio-retention, Rain gardens

As with devices that rely on infiltration Bio-retention devices are also ideally suited for this site for direct mitigation and can provide attenuation storage volume relying on evapotranspiration and infiltration to dissipate SW over longer periods. In a domestic setting bio-retention equates to standard domestic planting in a clay free, free-draining soil medium.

TSS 0.8, Metals 0.8, Hydrocarbons 0.8 = suitable for verges adjacent hard standing

All areas of domestic planting offers sufficient storage volume to accommodate the 5mm event.

The covered areas of basement roof will form a large rain garden/area of bio-retention. The indicative make up is in Figure 2. Outfall from this will be directed to the soakaway(s).

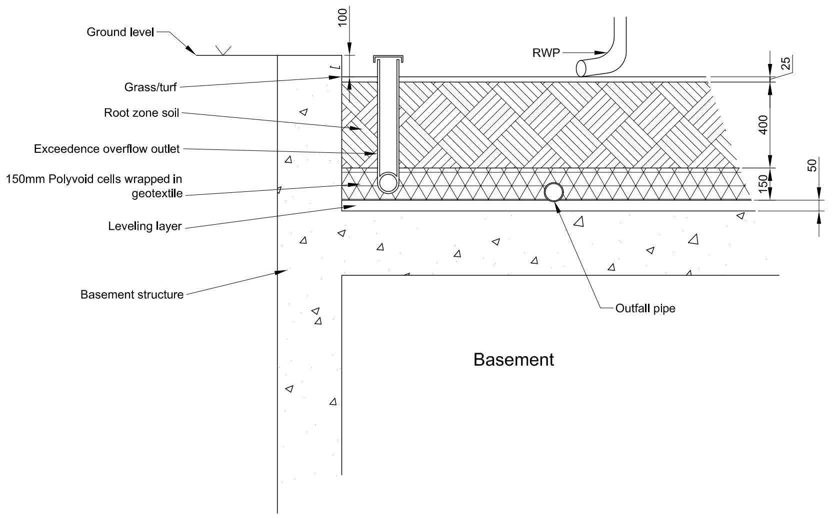


Figure 2: Proposed basement roof rain garden/bio-retention

6.3 Permeable hard standing

6.3.1 Permeable paving

All new areas of hard standingon the site will be constructed using a permeable medium.

A 30% void ratio is assumed through a 350mm sub-base. This is appropriate for a DOT Type 3 Sub-base hence the storage capacity equates to circa 105mm per 1m^2 therefore based on a M6 100hr + cc storm of 87mm rainfall the paving offers, without any allowance for infiltration, a circa 1:1.2 drained volume:storage volume capacity. Hence there is no anticipated exceedence flow from the areas of permeable paving.

Note: where soakaways are located under areas of permeable paving the perimeter of each soakaway will be bunded within the sub-base with an appropriate up-stand or kerbing so as to prevent the sub-base draining directly into the soakaways.

TSS 0.7, Metals 0.6, Hydrocarbons 0.7 = suitable for trafficked areas

All permeable paving offers sufficient storage volume to accommodate the 5mm event.

6.4 Rainwater harvesting

6.4.1 For external use

Water butts are suitable for small sites[1] in providing both volume and run-off control. Water butts however should not be considered "the SuDS solution" for a site but instead provide an additional component. Water butts should be located, where possible, away from any external foul water gulleys so as to prevent surface water entering the foul drainage system. These are designed to collect water via readily available rainwater diverters which allow exceedence flows back into the site's SW network.

Water butts can contribute in offering storage volume to accommodate the 5mm event.

6.5 Maintenance of SuDS

Ultimate responsibility for the long term maintenance with SuDS in a domestic environment lay with the land owner. For the "shared" common areas of the site, it is recommended that the responsibility is written into title deeds.

All SuDS on site to be installed with full consideration to long term maintenance. The following guidance applies:

6.5.1 Soakaways (and pre treatment sediment sumps)

Figure 3[1] provides details maintenance operations required for a soakaway system.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Figure 3: Maintenance operations for soakaway

6.5.2 Permeable pavements

The maintenance plan for rainwater harvesting devices will include:

- Monthly litter removal;
- Bi-Annual suction sweeping.
- Annual inspection and repairs as/if required.

6.5.3 Bio-retention planting

The maintenance plan for any Bio-retention devices will include:

- Monthly inspections until vegetation is established;
- Six monthly inspections after the vegetation has become established;
- Monthly litter removal;
- Removal of accumulated sediment near the inlets should be carried out as required.
- Any filter strip will require mowing during the growing season.
- Other possible tasks will include replacement of dead vegetation, erosion repair, mulch replenishment and possibly unclogging of the subsurface drain.

6.5.4 Rainwater Harvesting

A maintenance plan for rainwater harvesting devices should include:

- Regular inspection and cleaning of inlets, outlets removing any silts and other debris
- Filter replacement
- Inspection of exceedence pathways for evidence of erosion and repairs as required
- Removal and cleaning of sediment tank

6.6 Summary

All surface water arising can be managed on site using SuDS. There is no design exceedence outfall away from the site. Exceedence flows and flows arising from system failure can be accommodated on site within areas of bio retention, soakaway cells and the subbase to the hard standing.

The use of SuDS techniques on site, as detailed above and when installed in line with best practice (i.e. CIRA 753), will mitigate and treat the run-off volumes in line with the core policies.

Signed: 

Date: 15th November, 2017

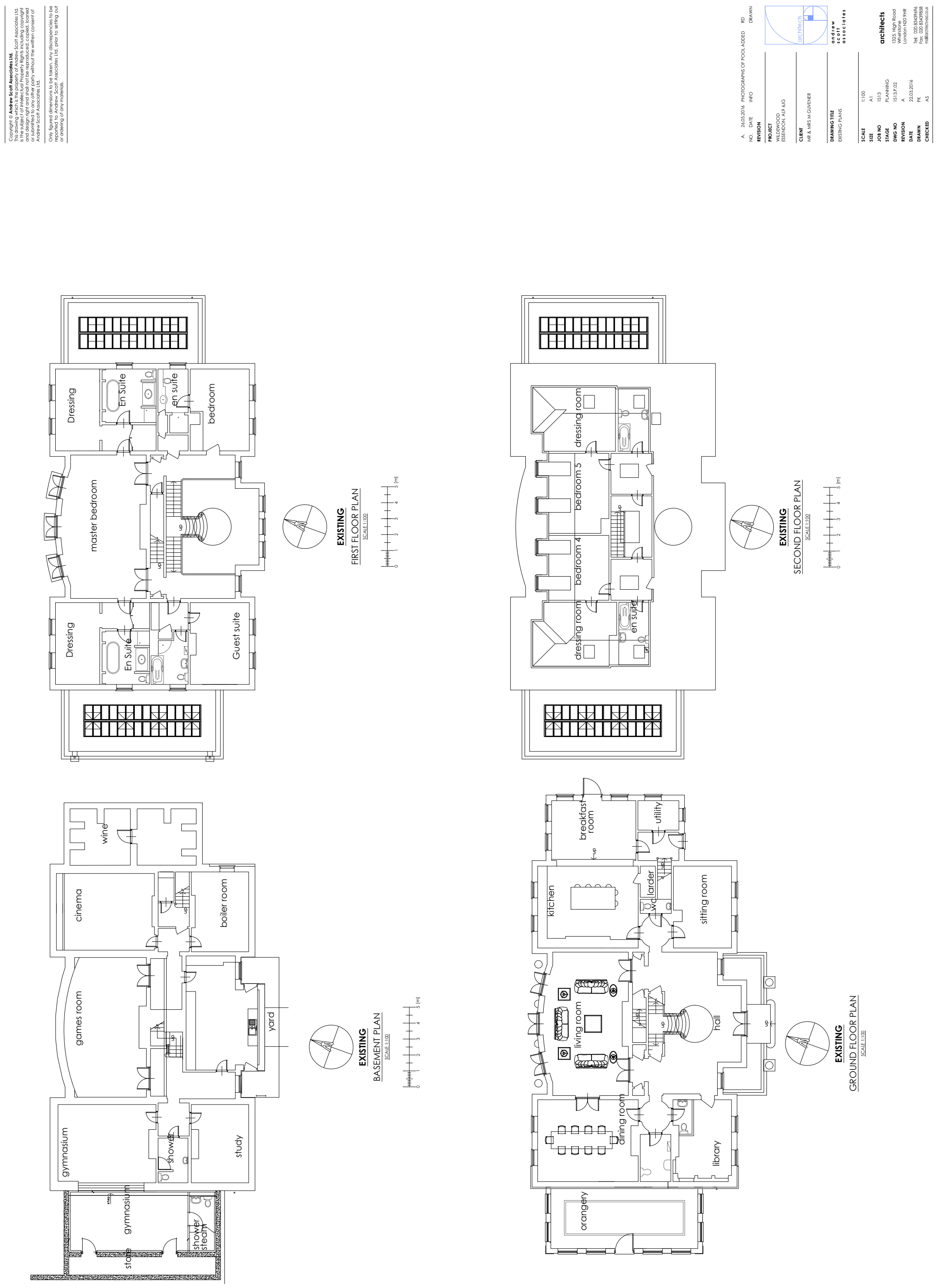
References

[1] CIRIA. The SUDS manual. Technical report, CIRIA, 2015.

[2] C Hassell and B Coombes. Green roofs. Technical report, CIBSE, 2007.

A Proposal plans

A.1 Existing plans



A.2 Proposed plans