

Surface Water Drainage Statement and Design Notes for #18 West View Drive

#18 West View Drive

Yapton

ARUNDEL

BN18 0JR

EXISTING DRAINAGE DISPOSAL

Investigations have revealed that the front roof area (yellow), of 16.89 square metres, drains via a single rainwater down-pipe RWP#4 into an existing soakaway within the front garden at an approximate distance of 5 metres from the building foundations. It is thought to be of geocellular construction though its size or depth or its condition is unknown. It is proposed to keep this existing soakaway, however. There is no indication, or has been any report that this front garden soakaway has suffered from flooding issues above ground level. Additionally the identical front roof area (yellow) of the adjacent property #17 also drains to this rainwater down-pipe RWP#4. Currently this is no water butt or silt trap installed.

Investigations have revealed that the side roof area (blue), of 16.98 square metres drains via rainwater down-pipe RWP#3, and the small side lean-to extension (blue) of 3.21 square metres drains via rainwater down-pipe RWP#2, and indicate both drain into an assumed soakaway under the front concrete driveway. The total roof areas draining to the assumed front soakaway is 20.19 square metres. It is proven that they don't discharge into the foul. Currently there are no water butts or a silt trap installed. There is no indication, or has been any report that this assumed front soakaway has suffered from flooding issues above ground level. The design proposes that these two rainwater down-pipes are to be abandoned.

Investigations have revealed that the rear roof area (green), of 16.80 square metres, drains via a single rainwater down-pipe RWP#1 directly into the rear foul drainage system at Inspection Chamber FW.IC#1. It is proposed to completely remove this rear roof flow from the foul drainage. Additionally the identical rear roof area of the adjacent property #17 also drains to this rainwater down-pipe RWP#1, however for practical considerations it will not be possible to remove this flow, from #17 -- the neighbouring property, from the foul drainage system at #18 -- the application site. Currently this is no water butt or silt trap installed.

GROUNDWATER MONITORING :

In late November 2024 a single 75mm diameter BoreHole was augered, at the approximate location of the proposed rear storage tank and was left as a covered open borehole, at its maximum depth. Groundwater was monitored on a weekly basis from late November 2024 to early March 2025.

In the rear garden, Groundwater Monitoring Point GWP#1 was installed to a depth of 2015mm Below Ground Level (BGL), at 4.385 metres AOD, and groundwater was encountered at 1700mm BGL, rising to a stable rest level of 1165mm BGL, within approximately 60 minutes. During the monitoring period, the peak level of groundwater, of 685mm BGL at 5715 metres AOD, was recorded on the 6th January 2025, and the second peak level of groundwater, of 900mm BGL at 5.500 metres AOD, was recorded on the 1st February 2025.

The guidance from Arun DC changed in mid July 2024 regarding the amount of freeboard acceptable within designs, as now conforming to that as detailed in the SuDS Manual. This change of guidance now precludes the proposal of a new infiltration structure. It is though, still relevant as regards following the “hierarchy of preference for different types of sustainable surface water drainage disposal systems” detailed below.

The groundwater data recorded is submitted with the Discharge of Conditions application.

SOIL INFILTRATION (PERCOLATION) TESTING

Infiltration testing generally is needed to be fully investigated with a site specific Soil Infiltration (Percolation) Testing exercise, due to the variability of soils encountered in any local area, where infiltration rates of substrata can vary significantly. In this case where the recorded Groundwater Level is so high, being unable to meet the Freeboard requirements of the SuDS Manual, Infiltration as a method of disposal has been discounted early on, so no Soil Infiltration exercise has been carried out.

SURFACE WATER DRAINAGE CONSIDERATIONS

Any SuDS and source control solutions for a surface water disposal strategy, should follow “the hierarchy of preference for different types of sustainable surface water drainage disposal systems” as set out in the recommendations of the SuDS Manual and in Approved Document H of the Building Regulations. These being :-

1. Rainwater reuse where possible.
2. Complete discharge into the ground (infiltration).
3. Hybrid infiltration and restricted discharge to an appropriate water body or surface water sewer.
4. Restricted discharge to an appropriate water body.
5. Restricted discharge to a surface water sewer (public / private).
6. Restricted discharge to a combined sewer

Note a water body may be defined as a river, watercourse, ditch, culverted watercourse, reservoir, wetland or the sea.

In general, options 1) & 2) above are always the preferred solution and options 3) to 6) above are only to be considered after rigorous groundwater monitoring and soil infiltration testing has discounted option 2) as unviable.

It should be noted that surface water disposal into the Foul Water Sewer System is not supported within the SuDS Manual and as such, here, no disposal of surface water by this method will be recommended, especially with the site being within the Lidsey Catchment Area.

PROPOSED DRAINAGE DISPOSAL

Following “the hierarchy of preference for different types of sustainable surface water drainage disposal systems” as detailed above :

Option 1) -- It is specified that the use of water butts, with diverter kits, are to be included on all of the new rainwater down pipes, excluding the 2 retained as existing. These water butts offer a small impact on the full drainage strategy, as recommended by the SuDs Manual, and are also included as an environmental consideration. Similarly a suitably designed “Rainwater Harvesting” system may be considered, though not initially specified in this proposal.

Option 2) – Complete Discharge into the Ground (Infiltration). It is not appropriate at this location, being unable to meet the Freeboard requirements of the SuDs Manual.

Option 3) – Hybrid Infiltration and discharge to a body of water or surface water sewer. This is not appropriate as for option 2) above.

Option 4) -- Discharge to a surface water body e.g. ditch or (culverted) watercourse. This is the proposed method of disposal for the additional increase of impermeable roof areas, using a new storage tank and attenuated discharge connection.

Option 5) -- Discharge to a Surface Water Sewer. Here the records show that there is no availability of a public surface water sewer close by, into which a possible connection could be made.

Option 6) -- Discharge to a combined sewer. The only exception to the disposal of surface water into the foul drainage system is where Southern Water specifically designate a sewer to be a ‘Combined System’ which is not the case here.

The proposed drainage disposal is as follows :

The Front Drainage

The existing front roof area (yellow), of 16.89 square metres currently drains using the existing rainwater down-pipe RWP#4 into an existing soakaway located within the front garden area. It currently has no silt trap installed and there is no proposal to install one due to practical constraints. It should be noted that the mirror image roof area from the adjacent property #17 also drains into RWP#4. There is no proposal to install a standard water butt at RWP#4.

The existing rainwater down-pipes RWP#2 & RWP#3 and part of their associated pipework, to the assumed front soakaway under the existing driveway, will be abandoned.

The proposed single storey side extension roof area (grey) of 9.93 square metres will drain with a new rainwater down-pipe RWP#6, and installed standard water butt into the pipe-work to the assumed front soakaway. This pipe-work will also pick up the reduced existing side roof area (blue) of 9.77 square metres into rainwater down-pipe RWP#5 and installed standard water butt. This provides a very slight betterment of roof area flow to the existing assumed front soakaway. A new Silt Trap is to be introduced between this connection and the assumed front soakaway.

Most importantly the existing side guttering run is to be split, using double stop-ends, at the position of the ridgeline, to separate the side roof flows to ensure that the reduced side roof area (blue) drains to the assumed front soakaway and the modified side roof area (orange) drains to the rear sealed storage tank.

The Rear Drainage

The modified side roof area (orange) of 8.07 square metres is guttered to the new main rear rainwater down-pipe RWP#7, installed with a standard water butt, and ultimately drains to the rear sealed storage tank.

The 2 storey rear extension (pink) of 35.39 square metres is split by virtue of its ridge and hips. The southern side of the roof area is guttered to the new main rainwater down-pipe RWP#7, and the northern side of the roof area is guttered to rainwater down-pipe RWP#8 where it drops onto the pitched roof of the very small single storey rear extension (pink).

The reduced rear roof area (green) of 14.03 square metres is also guttered to rainwater down-pipe RWP#8.

The single storey part of the rear extension (pink) at 3.63 square metres, picks up rainwater down-pipe RWP#8 and drains via rainwater down-pipe RWP#9 and an installed standard water butt, to the rear sealed storage tank.

Thus this main run rear pipe-work picks up rainwater down-pipes RWP#7 & RWP#9 and drains via a Silt Trap to the sealed storage tank, then into the Attenuation Chamber and finally discharges at the outfall in the Concrete Bagwork Headwall in the boundary ditch.

The total contributing roof areas draining to the sealed storage tank is 61.12 square metres. **This provides a significant betterment by removing all of the existing rear roof water flow of #18, amounting to 16.80 square metres, ultimately from the Lidsey Catchment foul sewer system.**

Most importantly the existing common rear guttering run between #17 and #18 is to be split, using double stop-ends, at the position of the boundary, to separate the roof area flows, to ensure that the development reduced rear roof area (green) of #18 only drains to rainwater down-pipe RWP#8 and does not contain any flow from the rear roof area (green) of #17.

This ensures that the rear roof area (green) of #17 continues to drain, as existing, to the existing rear rainwater down-pipe RWP#1. It is not proposed to install a standard water butt for RWP#1 for practical considerations. This drains directly into the foul drainage system of #18 at existing inspection chamber FW.IC#1, but it is not feasible to remove this flow draining into the foul. The invert level at the existing rainwater down-pipe RWP#1 was surveyed at 6.174 metres AOD and this is proposed to connect, as an existing flow, to a new foul inspection chamber (IC) within the side path at the southern corner. The invert level of this new inspection chamber will be very close to the invert level of existing inspection chamber FW.IC#2, which it will replace, and which was surveyed at 5.751 metres AOD. This will have a fall of ~423mm over a distance of ~9.00 metres give an easily acceptable gradient of 1 : 21. This new connecting pipe-work will have to cross through the foundations of the rear extension and will have to have suitable lintels to provide structural support. This is to be subject to a detailed design at Building Control stage by others.

The proposed rear flows will drain into a sealed storage tank, consisting of a single layer of 400mm deep Geocells with a cover of 400mm. The tank is calculated to be 7m00 metres long

by 1m00 wide giving a total volume of 2.80 cubic metres, and at 95% porosity this gives an available volume of 2.66 cubic metres. This tank is to be fully wrapped with an impermeable membrane and all its edges especially, around the connecting inlet pipe at soffit level, the vent pipe at soffit level and the outlet pipe at base level, to be bonded sealed not just tape wrapped. The main overlap of the membrane to occur at the soffit level with a minimum overlap of 10%.

The calculations for both the 2 year (50% AEP) storm event, with an addition of +40% for Climate Change allowance, and for the 100 year (1% AEP) storm event, plus an addition of +45% for Climate Change allowance, are submitted with the Discharge of Conditions application. It should be noted that calculations for the 30 year (3.33% AEP) storm event are not provided since it is not expected for the sealed storage tank to completely fill for the 1% AEP storm event.

The calculations use FEH22 Rainfall Data and the Point Data Locations are detailed within the top page of the calculations.

A Factor of Safety (FoS) of 1.0 has been used within the calculations, with the value of the Volumetric Runoff Coefficient $C_v=1.0$, and Urban Creep addition is accounted for at +10%.

For the 100 year (1% AEP) storm event the Critical Storm occurs at $\frac{3}{4}$ hour and the required storage volume is calculated to be 2.563 cubic metres with a $\frac{1}{2}$ drain time of 1.02 hours.

Using the HR Wallingford Greenfield Runoff Estimation tool, and using the estimation methodology – IH 124, (*where Q_{bar} is < 2.0 litres / second / ha, then the limiting discharge rate is set at 2.0 litres / second / ha*), produces a non-sensible value for the site Q_{BAR} , due to the very small catchment area to be positively drained, similarly for the flow estimated for a 1 in 100 year event.

After consultation with Arun DC drainage engineers, a flow of 0.5 litres / second for all storm events has been agreed and this is the flow rate used for the design of the Orifice Plate Attenuation Control and the subsequent storage calculations.

Using the HR Wallingford Surface Water Storage Estimation tool, and using the estimation methodology -- IH124, produces a non-sensible value for Q_{bar} , as detailed above, however a storage volume of 3.2 cubic metres, for the 1 in 100 year storm event (1% AEP) is generated for approximately similar input parameters, compared to the designed storage of 2.56 cubic metres.

Neither of the HR Wallingford reports are submitted with the Discharge of Conditions application.

Since the base level, of the geocellular storage tank TK#1, is at 5.570 metres AOD and is below the peak recorded groundwater level at 685mm Below Ground Level (BGL) at 5.715 metres AOD a buoyancy effect may be expected on the storage tank, however with only a worst case of 115mm of submergence and with a cover of 400mm of clean soil, the calculations demonstrate that, as such, no buoyancy effects are to be expected. The Buoyancy Calculation is submitted with the Discharge of Conditions application.

The attenuation tank then flows into the Level Invert Flow Control Chamber, with a sump depth of 160mm. This is a custom inspection chamber fitted with an Orifice Plate as the flow control device. The orifice plate has a diameter of 20mm which is calculated using the Standard Orifice Equation (eq 28.1) from the SuDS Manual for an hydraulic head of 350mm. *“Where flow rates are less than 5.0 litres / second, the consent for discharge is usually set at this 5.0 litres / second rate, if blockage from vegetation and other materials is possible”*. In this instance, the approved flow rate from Arun DC drainage engineers, of 0.5 litres / second, is well below this minimum rate, and any blockage risk is addressed by using appropriate drainage elements. Additionally the chamber has a removable weir-over baffle assembly, set to the soffit level of the sealed storage tank + 10mm, to provide ‘excess flow’ protection and this assembly also incorporates an integral filter to allow for the small orifice size. The calculation of the orifice diameter is part of the main storage tank and attenuation calculations which are submitted with the Discharge of Conditions application.

It should be noted that only a gravity system will be made from the site, since a pumped system would not be acceptable to Arun DC drainage engineers, as it is not approved within the SuDs Manual.

IMPERMEABLE AREAS

The proposed full roof areas to be accounted for is 97.71 square metres. This to use the external discharge points as detailed above.

The Impermeable Area consists of :-

- a) Main existing front roof draining to existing front soakaway (yellow area) – 16.89 square metres.
- b) Reduced existing side roof draining to the assumed front soakaway under the driveway (blue area) – 9.77 square metres.
- c) Proposed single storey side roof extension draining to the assumed front soakaway under the driveway (grey area) – 9.93 square metres.
- d) Modified existing side roof draining to the storage tank (orange area) – 8.07 square metres.
- e) Proposed main 2 storey rear roof draining to the storage tank (pink area) – 35.39 square metres
- f) Modified existing rear roof draining to the storage tank (green area) – 14.03 square metres
- g) Proposed single storey rear roof extension draining to the storage tank (pink area) – 3.63 square metres.

The existing entrance driveway and parking area, which is constructed of broken concrete and gravel remains unchanged.

The small side and rear pathways are to be partly permeable gravel surfaced and partly impermeable paving slabs with its runoff into the adjacent garden areas.

There are no more impermeable surfaces to be accounted for.

DESIGN CONSIDERATIONS

- All new drainage disposal options above will be required to drain via a separate Silt Trap / Catch Pit, as the final part of the drainage train, each with a minimum sump depth of 435mm, prior to its disposal point. These are to be installed on the proposed rear garden, sealed storage tank connection and additionally on the existing front soakaway system -- where none was previously installed, to bring the disposal up to current standards.
- The full drainage flow must be a gravity system – Not Pumped – to replicate natural catchments.
- Water Quality Assessment is such that any formal treatment need is not included since only clean roof areas are to be accounted for.
- Urban Creep is accounted for at +10% in this instance.
- Tree Root Protection Areas (RPA) are detailed on the drainage layout – there are no conflicts between existing or proposed trees and any of the existing or proposed drainage infrastructure.
- All the designs for drainage flows use FEH22 rainfall data, (though FEH13 may be considered to be acceptable by the Local Planning Authority (LPA)). It should be noted that using FSR rainfall data will not be accepted.
- Climate Change Addition (CCA) is set at +40% for all storm events, excluding the 100 year (1% AEP) storm event where it is set at +45%, as per current Environment Agency (EA) guidelines (as at 2024).
- Volumetric Runoff Coefficient C_v to be set to 1 for all design storm events.
- Half-drain times to meet the requirement of being less than 24 hours for all design storm events, plus climate change allowance, for the new proposed restricted attenuation tank structure.
- Factor of Safety (FoS) used in calculations is set at 1.0
- Calculations as to the additional runoff have been undertaken, however the resulting Q_{bar} for this very small positively drained area, is such that the required orifice plate size is unusable due to its very small diameter. Any new flow, resulting from the planning proposal, as an attenuated discharge to the open ditch, now ignores the calculated Greenfield Runoff Rate, and is set to an agreed rate of 0.5 litres / second, for all storm events, as agreed with the Arun DC Drainage Engineers.
- It is not considered that any 'ground raising' will be required.

(RC 09-06-2025 version 1)

Mate Geo-Technic Services

11th June 2025

REFERENCES

Building Regulations Part H.

CIRIA SuDS Manual 2015 at www.ciria.org

Supplementary guidance notes regarding surface water drainage at
<https://www.arun.gov.uk/surfacewater>

Full Surface Water Drainage Design Checklist PCENG2 September 2024 at
<https://www.arun.gov.uk/download/full-surface-water-drainage-design-checklist-pceng2-september-2024docx.docx?ver=27069&doc=docm93jjm4n21070.docx>

Ordinary Watercourse Land Drainage Consent at <https://www.arun.gov.uk/land-drainage-consent>

Lidsey Surface Water Management Plan 3.0 (October 2014) at
<https://www.arun.gov.uk/lidsey-waste-water-treatment-catchment-area>