

Land west of Old Manor Farm, south of Lower Road, Bedhampton

Drainage Technical Note

Planning App: APP/21/01071
MJA Reference: SS/22/2695/6430
2nd December 2022

Introduction

- 1.1 MJA Consulting was appointed to prepare a drainage strategy for the disposal of surface water from the proposed development, incorporating the principles of Sustainable Drainage Systems (SuDS) and in accordance with Environment Agency guidance, The National Planning Policy Framework (NPPF) and through liaison with Hampshire County Council.
- 1.2 MJA Consulting previously prepared a drainage strategy for the development directly east of the site, under application APP/20/01031 (Land south of Lower Road, Havant). The drainage strategy was approved by the Environment Agency, Lead Local Flood Authority and Local Planning Authority. Due to the similarities between the two sites, namely in terms of topography and geology, it is proposed to mimic the drainage strategy for this site.

Surface Water Strategy and SuDS Assessment

- 2.1 The design of the surface water system at the above follows the principles set out in Ciria SuDS Manual C753. This list the priority for surface water run off disposal as:
 - Infiltration
 - Discharge to surface waters
 - Discharge to surface water sewers
 - Discharge to highway drain
 - Discharge to another drainage system
 - Discharge to a combined sewer

Roads

- 2.2 The roads are a combination of impermeable macadam and impermeable block paved roads. The roads drain either via flush kerbs and stone spillways into a roadside swale or by gullies directly into the swales.



Roadside Swales

- 2.3 The roadside swales vary in depth from 0.3m to 0.5m and are 2.5-3.0 m wide planted with grass. The primary function of the swales is to provide shallow infiltration for the road run off and primary treatment for any hydrocarbons washed off from the carriageway. A vertical gravel trench will be provided in the base of the swale for conveyance of exceedance flows to perforated pipework laid in the base of the trench. The perforated pipework will either infiltrate the runoff to ground or convey the runoff to the next swale and pipework and ultimately to the final stages of shallow infiltration (infiltration basin), treatment devices and soakage. The pipework within the swales has been sized to ignore the effects of any infiltration.

Shared surface car parking areas

- 2.4 These areas drain via permeable block paving through to a permeable subbase. Hydrocarbon removal from run off takes place within the stone bedding layer of the block paving and the subbase itself. Run off that cannot infiltrate to ground is collected via permavoid collectors and directed towards the pipework located at the base of the sub-base/swales.

Houses

- 2.5 The houses drain via gravity to either the permeable subbase of the shared surface car parking areas via permavoid distributors or directly into the pipework located within the base of the swales.

Infiltration/Attenuation basin

- 2.6 The Infiltration and attenuation basin has been designed to ignore any potential infiltration that may have taken place upstream via the roadside swales or perforated pipework. It has been designed to attenuate and infiltrate the runoff from the development all storm events up to and including the 1:100 year + 40% climate change event with an allowance for a 300mm freeboard over and above this design level. The design of the attenuation basin is such that infiltration will be allowed through the base. Discharge from the basin is via a headwall and pipework located to the south side.

Penstock control chamber

- 2.7 If the flow control device, Up Flow filter, soakaway or deep bored soakaways require maintenance then the flow from the attenuation basin can be shut off via the use of a control valve located within the Penstock control chamber.

Hydrobrake control chamber

- 2.8 Flow into the treatment/infiltration features is regulated via a Hydrobrake situated within the flow control chamber. The flows will be limited to 0.7 l/s.

Up flow filter

2.9 Additional pollution removal will be provided by an 'Up Flow Filter' by Hydro International. This provides a 5-stage treatment train. This combines multiple sequential treatment processes to deliver sedimentation, screening and filtration all in one unit to remove a wide variety of pollutants including:

- **Very Fine Particles:**
Greater than 80% removal of fine sand and silt particles to a mass-median particle size of 22 µm
- **Heavy Metals:**
Greater than 70% removal of metals commonly found in surface water runoff.
- **Gross Pollutants:**
Inclusion of the angled screen and protected bypass syphon effectively removes gross pollutants, including litter and leaf debris.
- **Nutrients:**
Greater than 70% removal of phosphorus and other nutrients.
- **Liquid and Sediment Bound Hydrocarbons:**
Sand filter removes various forms of hydrocarbons, including polycyclic aromatic hydrocarbons (PAHs).

2.10 These filter media target fine sediments and metals, as well as sediment bound pollutants, including polycyclic aromatic hydrocarbons (PAHs) – which have been identified by the EA as a significant pollutant of concern. PAH removal is strongly related to sediment removal, as typically 89% of PAHs are associated with sediments in runoff. Based on the Up-Flo™ filter removing 80% of sediments, it follows that the Up-Flo Filter will remove around 70% of PAHs.

2.11 As far as liquid or free-floating hydrocarbons are concerned, the standard Up-Flo configuration incorporates a hooded bypass syphon with integrated floatables baffle. This helps to trap light liquids and other floatables within the chamber. To further protect the aquifer the normal internal by-pass facility wouldn't be installed to remove the possibility of any residual free-floating hydrocarbons not already removed by the treatment train from reaching the aquifer.

PCC Perforated ring soakaway

2.12 The PCC ring soakaway serves a dual purpose. It provides treated run off with the opportunity to infiltrate at a shallow depth with the greatest dissolution depth between the base of the soakaway feature and groundwater level. The PCC soakaway will also act the sampling point prior to the deep bored soakaways.

Water Quality Sampling

2.13 During the construction period and 12 months post construction the sampling testing will be undertaken at a minimum of every 3 months. The results of this will be reviewed after this period and frequency of

sampling subject to future discussions and agreements with the local authority and Environment Agency. The management Contractor will take samples from the sampling chamber prior to the boreholes. Initially the sample will be checked for the following:

- colour
- odour
- clarity
- floating solids
- settled solids
- suspended solids
- foam
- oil sheen

- 2.14 Samples will then be sent to an MCerts accredited independent testing laboratory for analysing for the presence of Speciated Hydrocarbons (TPH CWG), Speciated PAH (EPA-16), routine metals, pH, TOC and suspended solids. All results from both the site and laboratory will be noted by the Management Company and included in the submission to the local authority.

Boreholes:

- 2.15 The depth of groundwater onsite was found to be circa 2.71 m BGL. This is similar to the groundwater level found on the adjacent site (Land to the south of Lower Road). On that site, the Environment Agency was consulted and ultimately approved a design of deep borehole soakaways into the saturated chalk. This decision was based on the location not being within a Source Protection Zone and have a multistage treatment system and emergency penstock valve prior to the boreholes.
- 2.16 The design of drainage system for this site mimics the previous by utilising the same drainage features of: swales, an infiltration basin, a hydrobrake to limit the flow into an Up-Flo filter, a ringed soakaway, and a penstock valve, before finally boreholes. We are currently consulting the EA to ensure they are as equally satisfied with our design.
- 2.17 The depth of the proposed surface water discharge borehole has been based on the permeability testing undertaken within the chalk strata at a depth of 16.00m (Report: GE20814 WP02 220518). Falling head testing within the borehole gave an infiltration rate of 1.48×10^{-6} m/s. The discharge from the attenuation basin has been set at a maximum of 0.7 l/sec discharge for all storm events. Based on permeability to achieve the 0.7 l/sec in the boreholes they need to be a minimum of No.8 16m deep within the chalk strata. All boreholes will be 10 m apart.

- 2.18 During the borehole installation testing will be undertaken to check the permeability, should a greater discharge be recorded, the flow can be extrapolated, and depth of the borehole reduced. Based on the above the depth of the borehole will be reduced, if possible, to increase the unsaturated zone. Testing will be carried out at 5m intervals within the chalk strata as part of the drilling carried out to form each proposed surface water discharge borehole.

Conclusion

- 3.1 The total combination of SuDS will meet the high water quality and silt removal requirements to discharge via infiltration to the saturated chalk below.
- 3.2 The proposed SUDS system is sized to manage the 1 in 30 year and 1 in 100 year (1% AEP) storm event, plus an extra allowance of 40% for the predicted potential increase in peak rainfall up to 2115.
- 3.3 The proposed surface water drainage strategy offers a sustainable, safe and robust system, which mimics the approved design for the adjacent site. This is achieved by attenuating all additional runoff from impermeable surfaces, incorporating the principles of a Sustainable Drainage System (SuDS). This strategy ensures that the peak rate and volume of surface water runoff will be no greater than the existing runoff rate for the road network for all rainfall events up to the 100 year +40% rainfall event.
- 3.4 The procedure for surface water management in accordance within 'Rainfall runoff management for developments' (DEFRA/EA Report – SC030219 E, 2013) states; *For the range of annual flow rate probabilities up to and including the 1% (1 in 100 year) annual exceedance probability event including an appropriate allowance for climate change, the post-developed rate and volume of run-off into a watercourse, sewer, or other receiving water body, should be no greater than the existing pre-developed rate of run-off for the same event.*