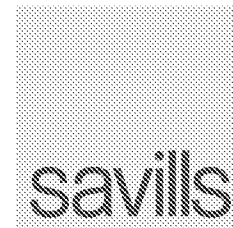


4 November 2021
SNPL 463580



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Dear Anita,

APPLICATION REFERENCE LU/116/21/PL

Following the emails received from the drainage engineer in respect of the above application dated 22 and 27 October 2021 please see a response that responds to the matters raised and demonstrates the reasoning behind the drainage strategy in light of the geotechnical testing done on the site.

General Approach to Drainage Strategy

The drainage design for the site has been developed with input from both the drainage engineer and the geotechnical adviser. The submitted Drainage Strategy and Water Quality Management Report LTH-AKSW-XX-XX-RP-C-00002 prepared by AKSWard provides details of the drainage strategy proposed for the site. As the site layout has been developed balancing a number of constraints and requirements, including but not confined to drainage related considerations, the design of the drainage strategy reflects the layout.

The submitted Drainage Strategy report explains the way in which the hierarchy of disposal (as provided in *CIRIA 753 The Suds Manual*) has been implemented. Infiltration is identified as the most desirable method of disposal. There are no surface water courses or surface water sewers in the area. There is an existing combined sewer to the south of the site.

As infiltration is the most desirable means of disposal of surface water runoff, the site has been investigated to examine whether this is feasible in totality. The geotechnical investigations have identified constraints by the site being underlain by chalk due to the risks posed by existing dissolution features and the risk of creating new ones. The requirement as identified in the geotechnical investigations carried out by LEAP Environmental to maintain 10m between structures and soakaways in the chalk limits the spaces that are likely to be available on any housing development with a typical density. Groundwater testing identified groundwater close to the top of the chalk underneath the site. The high groundwater beneath the site limits the possibility of providing infiltration over a significant depth, therefore requiring soakaways that are larger in plan. The lack of area and depth available for infiltration and the need to avoid soaking water into ground of the type under the site in a concentrated location makes infiltration of all surface water unviable.

Since the original drainage strategy was developed further geotechnical investigations have been carried out, which have identified some limited areas where soakaways could be introduced. To reflect this amended layouts and drainage calculations for some infiltration have been submitted.

As a result of the geotechnical investigations, infiltration for all surface water generated on site is deemed not possible. The hierarchy for surface water has been followed; infiltration has been enabled as far as is possible for the proposed layout combined with discharge of an attenuated flow to the combined sewer to the south of the site. Southern Water have been consulted and have confirmed that there is currently adequate capacity in the local combined sewerage network to accommodate the proposed flow rates from the development.

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ARUN DISTRICT COUNCIL LU/116/21/PL



Specific Responses to Drainage Engineer Comments

Point 1 from Drainage Engineer email dated 22 October 2021 (table of test results)

Noting the comments on the individual locations it is not typical to design to individual site investigation locations – it would normally be to a conservative scenario or where there is significant information available, such as this site designed to appropriate ground conditions. To date a total of 68 trial holes have been carried out across the site. Excluding those that have been excavated into shallow made ground there is a total of 27 holes excavated across the site. This equates to a grid of approximately 30m across the 2.56Ha site. Including all investigation locations, the density of investigation would be equivalent to a detailed investigation under the requirements of BS10175:2011+A2:2017. It is considered that the number of investigations are sufficient to establish ground conditions and variability in those conditions between locations.

Point 2 from Drainage Engineer email dated 22 October 2021

As recognised, infiltration rates will be worse in winter and as previously stated, winter testing will be required to confirm. Infiltration testing to be carried out at the location of any proposed infiltration structures at a suitable/agreed depth. A full understanding of water table levels is required across the entire site and the testing depths informed accordingly.

There has been water monitoring carried out across some of the site last winter and in October 2021. The results of the monitoring to date indicate a water level of 4.4m in the northern corner of the site dropping to 5.8 on the western side of the site. This corresponds with data from a nearby located EA borehole, at approximately the same elevation as BH8 which recorded a peak groundwater level last winter (20/21) of 4.7m bgl. This information should be adequate to support design with further monitoring carried out to confirm the design. The depth for infiltration above the groundwater is limited due to the closeness of this level to the top of the chalk and this in turn increases the area required to successfully infiltrate a given volume of water, making it impossible to fit such structures within the proposed development.

Point 3 from Drainage Engineer email dated 22 October 2021

The worst infiltration rates in each pit/hole to be used for design.

It is not standard to design to an infiltration rate per location. DG365 states that “that subsoil and a general level of groundwater should be investigated” Given the available site data it has been possible to zone the site with a design rate for shallow soils (1.5m) in the area of the central loop road and the eastern side of the site. In addition a design rate has also been given for the deeper sands encountered on the eastern side of the site. However, it was noted that the sands are loose and following the guidance in section 25.2.3 of CIRIA C753, which does not recommend infiltration to soils which when wetted may lead to its collapse. Caution should be applied with using the loose sands for infiltration. For this reason where some infiltration is proposed into the sands in the updates to the design, the infiltration is through long trenches which have been designed to ensure that water is spread evenly through them and avoid concentrated discharges to the ground.

Point 4 from Drainage Engineer email dated 22 October 2021

I note from the report that solution features are not seen as an issue.

For clarification, the geotechnical investigations identify that solution features are not prevalent across the site, which is not the same as saying that they are not an issue. The investigations identify that some of the chalk is weak and that dispersed infiltration is necessary to limit settlement due to chalk solutioning. In addition, should water be discharged to the loose sands above the chalk we would recommend, as per our report (ref LP2688) that soakaways are kept 10m remote from buildings.

Point 5 from Drainage Engineer email dated 22 October 2021

No comments from the Environment Agency have been provided at this time.

We are still awaiting comment on the application and submitted drainage information from the EA, which we believe should be received prior to determination. Consent from the EA will be necessary if soakaways are used with less than 1m between the base of the soakaway and the ground water level.

Point 7 from Drainage Engineer email dated 22 October 2021

All structures should not incorporate impermeable liners as all infiltration must be utilised, no matter how minimal.

Where a drainage structure has to be provided closer to any other structure than the distance accepted to protect the development from adverse impacts of solution feature formation the drainage features have to be lined with impermeable liners to remove the risk of formation of solution features.

As described in 'Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England (Approved version 2.1, 25 May 2021)' sewerage companies have no obligation to accept flows from groundwater and that is not normally permitted. An infiltration structure without an impermeable liner provides a route by which high groundwater could enter the drainage system. If an overflow were to be provided from an infiltration structure that cannot always meet best practise drainage design criteria (for example if some flooding would occur in a 1 in 30 year return period event) it would provide a pathway for groundwater into the sewer. This would not be acceptable to Southern Water and so if there is insufficient space for a soakaway to be fully compliant with design criteria it must be replaced with an attenuation structure, with a lining discharging into the sewer.

On this site there is insufficient space far enough from the buildings and structures to allow for unlined soakaways to operate successfully. As a result lined attenuation is provided with connections to the sewer. Where possible in line with geotechnical advice issued to date, small areas of the site will be drained using soakaways.

Point 8 from Drainage Engineer email dated 22 October 2021

All infiltration structures except permeable paving to be kept 5m from buildings. Any diffuser units associated with permeable paving also to be kept 5m from buildings.

The Leap Report (ref LP2688) indicates that solution features are not prevalent across the site, thus removing the need to site soakaways 20m from structures. As per the guidance CIRIA 574 Engineering in Chalk "Concentrated ingress of water into the chalk can initiate new dissolution features, particularly in low-density chalk, and destabilise the loose backfill of existing ones. For this reason, any soakaways should be sited well away from foundations for structures, roads or railways. Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10 m away from any foundations." Should water be discharged to the loose sands above the chalk we would recommend, as per our report that soakaways are kept 10m remote from buildings.

The agreement on this spacing is critical to the drainage strategy as it dictated how much space can be made available for infiltration and therefore the extent to which it is possible to drain the site in this way.

Point 9 from Drainage Engineer email dated 22 October 2021

Southern Water will require all infiltration structures a specified distance from any existing/adoptable sewers. They may also resist permeable paving over such sewers, whether they have impermeable liners or not.

The spacing required is to be agreed with Southern Water during the detailed design stage and the sewer adoption negotiations. There are locations where lined permeable paving is currently shown over adoptable sewers. If this is not acceptable to Southern Water sections of impermeable paving for the pipe to run underneath between permeable sections can be provided.

Point 10 from Drainage Engineer email dated 22 October 2021

Open suds features are encouraged

Linear rain gardens are included in the proposed public open space and are a key element to the landscaping proposals that will assist with creating a sense of place within the proposed development. Consideration was given to the use of further open features, but the need to avoid placing these over sewers and other services and the wish to retain useable open spaces (as required by the Council Greenspace Officer) has resulted in the open SuDS features proposed.

Benefits of the Scheme and the Planning Balance

Outside of completion of the S106 the case officer has confirmed that drainage is the only competing factor within the determination of this application against the material benefits of the proposal:

- Redevelopment of previously developed site in a sustainable location close to Littlehampton town centre that would deliver much needed housing against the district's identified housing need, lack of a 5 year housing land supply and persistent underdelivery that would assist with relieving pressure on greenfield, unallocated, less sustainable sites and sites at greater risk of flooding within Arun.
- Making efficient use of land through relatively high density development that has been informed by and taken inspiration from surrounding development (as set out in the DAS).
- Connection to Rosemead Park that would support and enhance that important green space.
- Delivery of much needed affordable housing that would make a significant contribution towards meeting Arun's identified affordable housing needs.
- Use of a highly sustainable, innovative product and material palette that through consideration of layout and urban design principles would create a real sense of place and foster a sustainable new community.

We recognise the importance of ensuring that the proposed drainage solution adequately meets the requirements of criteria f to j of Policy W DM3. In light of the material benefits of the proposed development that we consider should be given significant weight, we propose that the completion of further monitoring above that already undertaken on the site to inform an updated drainage strategy based on the current layout could be dealt with by the suitable wording of a condition. With specific regard to the drainage engineer's email of 27 October 2021 we would happily agree the location of future testing locations. We request a meeting to discuss this approach at the earliest opportunity to avoid further delay in bringing this important site forward for the people of Littlehampton and Arun.

Yours sincerely,



Oliver Woolf
Savills Planning