

[REDACTED]

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**From:** Hannah Riddle on behalf of Planning.Responses  
**Sent:** 26 April 2022 16:09  
**To:** Planning Scanning  
**Subject:** FW: Planning Re-Consultation on: Y/32/22/DOC

[REDACTED]

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**From:** Laura Gibbons [REDACTED]  
**Sent:** 26 April 2022 10:02  
**To:** Planning.Responses [REDACTED] <[REDACTED]@arundel.gov.uk>  
**Cc:** Simon Davis [REDACTED]  
**Subject:** RE: Planning Re-Consultation on: Y/32/22/DOC

Key

*ADC comments 11/01/22*

*CR response 25/01/22*

*ADC comments 08/02/22*

*CR response 08/02/22*

*ADC comments 30/03/22*

*CR response 08/04/22*

*ADC Comments 26/04/22*

Engineers Comments Regarding Condition 8

1. *Please supply results of winter groundwater monitoring and winter infiltration testing.* Winter groundwater monitoring and infiltration/percolation testing was undertaken on several occasions previously. Details and results are contained within Land Quality Statement submitted as part of original application (ref 13591-CRH-XX-XX-RP-GE-0002 Revision D02), relevant extracts attached to this letter. Previous correspondence between ADC Drainage Engineer and Campbell/Keith is also enclosed for context.

As per WSCC policy for the management of surface water policy 1- design must follow the hierarchy for sustainable drainage. Locations of groundwater monitoring and infiltration testing have not been provided. It is noted that groundwater was found to peak at circa 1m depth. Shallow infiltration testing was completed and gave rates which do not preclude the use of infiltration. Please supply evidence why the sole use of infiltration is not acceptable here. E.g. a design with infiltrating permeable paving, swales and shallow infiltration basin. A full review of responses to our other comments has not been completed as this fundamental issue must be addressed first before reviewing details. Please find attached layout plan showing location of the boreholes/ percolation test together with details of results -

As noted from the test results, the lowest value is  $2.37 \times 10^{-6}$  m/s, which when the appropriate factor of safety (in this case the lower factor of safety in accordance with CIRIA SuDS Manual is 5 for areas greater than 1,000m<sup>2</sup>) is applied would yield a percolation rate of  $4.74 \times 10^{-7}$  m/s and at this rate no infiltration system would pass the half drainage time requirements not even for a ten year storm return period - however for absolute clarity, please see attached calculation extract demonstrating same.

It should be noted that percolation testing (despite having been requested by ADC) is not appropriate for use in the design of infiltration drainage systems. Percolation test should only be used for determination of drainage fields for foul drainage (please refer to Building Regulations Part H for guidance on this). CIRIA SuDS Manual C753, Section 25.3 states that infiltration testing should be undertaken following the BRE method and BRE 365 tests have been undertaken for this site and yielded no infiltration. Please see attached for further details relating to those tests.

As previously noted, the drainage basin (and none of the drainage features) are to be lined - i.e. during summer / low groundwater table, the drainage features will allow natural dispersal by infiltration. The drainage basin has been designed assuming worst case scenario that ensures sufficient buffer for drainage in all scenarios and is fully compliant with the requirements under NPPF. In effect there is over provision of storage within the drainage features to cater for the worst case scenario. CIRIA SuDS Manual does not state that when determining if infiltration is viable that a factor of safety should first be applied to obtained infiltration rates, it is therefore unclear why this has been completed. The calculations submitted apply infiltration to the base of the pond only, as indicated in previous responses a design utilising permeable paving should be investigated. BRE DG 365 does not state a minimum acceptable depth of test pits, applying BRE DG365 calculations to the percolation tests provides the same results as using the equations as defined in Approved Document H. Approved Document H 3.28- surface water drainage design states that percolation test results can be used in the design of infiltrating surface water drainage systems, it advises using BRE DG 365 for larger sites. It is also worth noting that the BRE DG 365 tests referred to as yielding no infiltration were completed below peak groundwater level- so this is to be expected. We do not believe that sufficient evidence has been presented to demonstrate that the hierarchy has been followed, however the below comments are based on the attenuation design as proposed. The SuDS manual states in Section 25.6 that the infiltration coefficient should be calculated by 'dividing the infiltration rate found from field tests by the appropriate factor of safety'. In this instance, as per table 26.2, a safety factor of 5 has been used (as explained above). The use of safety factors in infiltration comes from the previous CIRIA report 156: Infiltration Drainage - Manual of Good Practice and states the following in Section 4.4.2: "(b) Factors of safety In any design of an infiltration system it is not possible to have complete confidence in the specification of all the parameters. While some parameters, such as the area to be drained, will be known with some accuracy, others, such as the infiltration coefficient, will not be known with the same degree of confidence. In fact, one of the largest uncertainties is associated with the infiltration coefficient which may reduce over time, particularly if maintenance is poor. To account for this, a factor of safety is introduced into the design procedure which reduces the observed value of the infiltration coefficient. The factor of safety to be used depends upon the consequences of failure and engineering judgement is therefore required as to the factor to be used. The quoted factors of safety (see Table 4.6) take account of the possible loss of infiltration capacity throughout the design life of the system. Little information is available on such a loss of performance and so the figures given are suggestions rather than figures based on historic data."

CIRIA report 156 goes on to say: "The observed infiltration coefficient should be divided by the factor of safety to obtain the effective infiltration coefficient to be used in the hydraulic design." In terms of shallow percolation, Building Regulations Part H states that the percolation test method is suitable only for soakaways serving areas up to 100m<sup>2</sup> (Section H3 3.26). For larger areas, Part H refers to report BE756 which in itself refers back to CIRIA Report 156 above. The key point to re-emphasise is that the drainage basin, swales and permeable paving are not to be lined - i.e. during summer / low groundwater table, the drainage features will allow natural dispersal by infiltration but will provide the additional security from flooding in that they will function as attenuation features with a positive restricted outfall to watercourse during times of high groundwater. Instead of providing select paragraphs from CIRIA etc. please provide evidence to support the key point raised: The calculations previously submitted apply infiltration to the base of the pond only, as indicated in previous responses please supply calculations utilising permeable paving for infiltration also.

## ***2. Please supply calculations to support design.***

Please see enclosed drainage calculations (13591-CRH-XX-XX-CA-C-0005 Revision P1) showing proposed attenuation and discharge volumes. Total storage requirement is equivalent to approximately 530m<sup>3</sup>. The results show how this

equates to an average depth of no more than 350mm over the whole basin footprint of 1,400m<sup>2</sup> and accounting for the banks. The volume of storage takes account of the high groundwater and only refers to available volume above the highest recorded groundwater level. Note that the volume of storage provided within the basin does not account for the upstream storage within the permeable paving (112 m<sup>3</sup>) and swales (240 m<sup>3</sup>) in the calculations. In dry conditions, taking account of upstream storage there is more than sufficient volume to accommodate all storms up to and including the 1 in 100 year storm +40% climate change with runoff restricted to QBar for all events. A source control results file has been provided, this evidences a maximum water level of 3.947mAOD, this is above the cover level of several car park gullies and channel drains. To determine degree of site flooding and adequacy of design please provide a network model. The source control model does not account for inlets to the basin being below the outlet, the impact of surcharging these networks should be evidenced within calculations. Without this information it is not possible to establish if a policy compliant design is being provided. Please see attached drainage network calculations 13591-CRH-XX-XX-CA-C-0007-P1 which contains full details of the drainage scheme including storage features, pipes, flow controls and outfall. The results show that in all storms the restricted flow limit is maintained and that there is no flooding of any form in all storms up to the 1 in 30 year storm event. There is very minor ponding of surface water (equating to less than 0.4m<sup>3</sup>) during the 1 in 100 year +40%CC event, however, this is located away from pedestrian areas or buildings. The excess runoff will drain to the nearest gully/permeable parking bay once capacity is available as is acceptable under the non-statutory technical standards for SuDS. The network model has a number of inconsistencies between layout and calculations, these should be corrected. For example invert levels of pipes, invert level of outfall from swale, formation levels of permeable paving, slope of permeable paving, etc. Furthermore, printouts should include modelled cover levels. Please include inflow to network from package treatment plant within calculations. Please also label pipes with micro drainage pipe reference numbers, it does not appear that standard naming convention has been fully followed making it more challenging to review.

**3. Please supply an impermeable area catchment plan.** Please see enclosed impermeable area plan 13591-CRH-XX-XX-DR-C-5250 Revision P1. Okay. We have also included the additional detailed sub-catchment plan 13591-CRH-XX-XX-DR-C-5260-P1 to accompany the drainage calculations and provide absolute clarity as to which areas contribute to the model. To be further reviewed once points 1 and 2 are addressed.

**4. Please label all pipes with diameter and fall.** Additional pipe labels have been added to drainage layout plans 13591-CRH-XX-XX-DR-C-5050 Revision P6 and 5051 Revision P5. Gradients for short (<5m) pipe lengths have not been shown. Pipe sizes, maximum grades and materials are to be as specified on drainage notes drawing 13591-CRH-XX-XX-DR-C-5300 Revision P1 previously provided. Okay.

**5. Hydrobrake unit references should be included on layout plans.** Details have been added to updated drainage layout plan 13591-CRH-XX-XX-DR-C-5051 Revision P5. Okay, but please see comment above for more detailed calculations to evidence a compliant design. Hydrobrake reference on plans matches the calculations.

**6. Please label finish and formation level of permeable paving.** Permeable pavement details have been previously provided on detail drawing 13591-CRH-XX-XX-DR-C-5350 Revision P2. This includes depths of proposed pavement build-up. The proposed surface levels can be obtained from levels plan 13591-CRH-XX-XX-DR-C-5200 Revision P3 and sub base levels inferred (Minor updates to Revision P3 enclosed for completeness). Finish and formation levels of permeable paving must be detailed, thank you for providing a finished levels plan, please provide formation levels on layout plan, this is required to evidence adequacy of proposed connections from permeable paving. And to ensure correct construction. Formation levels of porous sub base of permeable paving have been added in green text to drawings DR-5050 and 5051 as requested. Formation levels do not match modelled invert levels or slopes. Please label invert levels of fin drains.

**7. Gullies and channel drains should be labelled with cover levels.** Cover levels have been provided for proposed gullies on updated drainage layout plan 13591-CRH-XX-XX-DR-C-5050 Revision P6 and 5051 Revision P5. Channel drain cover levels will necessarily vary along the length and hence have not been provided. Exact levels will be

determined by contractor to suit the finished levels as shown on levels plan 13591-CRH-XX-XX-DR-C-5200 Revision P3. Levels should be provided on plan to ensure construction is carried out in accordance with proposals. Channel drain cover levels have been added to drawings DR-5050 and 5051 as requested. To be reviewed once an updated set of calculations is provided.

8. *The gabion outfall construction detail drawing is unclear. Is it proposed to have buried pipes discharging to the basin?* The gabion basket is to be built into the embankment and to be exposed so as to be accessible for maintenance. The pipework will be within the basket and wrapped in a permeable membrane to prevent build-up of fines. The gabion provides siltation protection as well as dispersal of incoming flow to reduce scour. The gabion basket also removes the need for a traditional headwall and grille, reduces the maintenance requirements and provides a bigger area of contact/surface flow. *Pipework should be exposed and within headwalls. To bury pipework within a gabion will prevent visual inspections for blockage being undertaken. The permeable membrane surrounding the pipe and gabion will likely silt up. Design must be maintainable. The gabion basket headwall is designed to minimise impact to the visual impact vs traditional precast concrete headwall units while allowing free flow of water. The headwalls proposed have been successfully utilised on other schemes and have been encouraged by other drainage authorities; an example can be found on page 76 of the Cambridge SuDS design and Adoption Guide (attached for reference). We do not accept the proposals, as detailed previously "Pipework should be exposed and within headwalls. To bury pipework within a gabion will prevent visual inspections for blockage being undertaken. The permeable membrane surrounding the pipe and gabion will likely silt up. Design must be maintainable"*

9. *Please supply site specific construction details of the attenuation basin, showing invert level, top of bank level, width at bed and width at bank. Please see enclosed basin detail drawing 13591-CRH-XX-XX-DR-C-5310 Revision P1. To be reviewed once principals are agreed.*

#### Engineers Comments Regarding Condition 9

1. *Please supply evidence of consent applications for the new ditch, and headwall to the existing ditch.* OWC application for the discharge headwall from the basin was formally submitted in September 2021 together with all information requested by Paul Cann as per his email of 11<sup>th</sup> August 2021. Referring to Land Drainage Act 1991 Section 23(3), could you please confirm when consent letter will be issued? *This is with Paul Cann.* The OWC consent for the new ditch is as shown on the attached consent (Consent Number LDC/ARUN/2021/015) Okay. *This text appears to imply the approval has been granted? Could you please confirm and forward the approval letter if correct? As per the consent supplied by you LDC/ARUN/2021/015 granted on 1st November 21, but with a six month validity, this may need to be extended, please liaise with Paul Cann.*

2. *Please supply a buffer plan to show that at least 3m is being provided between top of bank of watercourses and obstructing features, such as fences, buildings, and basins.* A suitable buffer has been provided between top of basin and edge of watercourse to allow for maintenance, as shown on drawing 13591-CRH-XX-XX-DR-C-5051 Revision P5. *Buffer not clearly shown, please show the buffer on a plan. A buffer has been shown on drawings DR-5050 and 5051 as requested. Okay.*

#### Engineers Comments Regarding Condition 10

1. *Review of the maintenance manual will occur once the drainage design has been agreed.* Noted, but please let us know if there are any comments once you have reviewed the information provided. *Original comment stands.*

Kind regards,

**Laura Gibbons**

Drainage Engineer

Engineering Services

Please note that I work Tuesdays 08:00-16:00 for Arun only.



Arun District Council, Civic Centre, Maltravers Rd, Littlehampton, West Sussex, BN17 5LF

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**From:** Planning.Response [REDACTED]  
**Sent:** 11 April 2022 14:03  
**To:** Land Drainage [REDACTED]  
**Subject:** Planning Re-Consultation on: Y/32/22/DOC

To: **Engineers (Drainage)**

## NOTIFICATION FROM ARUN DISTRICT COUNCIL

### TOWN AND COUNTRY PLANNING ACT 1990

**Application No:** Y/32/22/DOC  
**Registered:** 8th March 2022  
**Site Address:** 10 Acre Field Grevatts Lane West Yapton Bognor  
**Grid Reference:** 498000 101780  
**Category:** Discharge of Condi  
**Description of Works:** Approval of details reserved by condition imposed under ref W/4000394 (Y/102/18/PL) relating to Condition Nos 8 - surface water drainage and 10 - maintenance & management of surface water drainage system.

I am able to inform you that I have received an amendment to the above application dated 11th April 2022 relating to: Response to Drainage Comments

[Click here to view the plans and documents](#)

If you should wish to make further representations as a result of this amendment you should click the link below and then click on 'Enter comment'.

[Click here to make further comments](#)

Please make any further comment by **27th April 2022**.

**Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.**

Yours sincerely

Mr S Davis

Planning Case Officer-Arun District Council

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PURECON\_DOC (055) 2620