Our Ref: TSWC-L-0010-001
Your Ref: FRM/EC/1380/2024

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30 April 2024

Devon County Council
Flood and Coastal Risk Management Team
Room 120
County Hall
Topsham Road
Exeter EX2 4QD

FAO: Hock Lee

RE: Land to the North of Exeter, Stoke Hill, Exeter
Outline Planning Application for up to 85 dwellings (35% affordable), community hub and associated infrastructure (All matters reserved except access)
(ECC Ref: 23/1380/OUT)

We refer to your statutory consultee response dated 28 February 2024 [REF: FRM/EC/1380/2024] in regard to the above application. We are pleased to see that the Lead Local Flood Authority (LLFA) has no in-principle objection to the proposals subject to the submission of additional information as outlined in your response as observations.

This letter sets out our response to each DCC LLFA observation providing additional detail where required or clarification where appropriate.

Observation 1: *"The applicant have carried out infiltration testing which concluded that soakaway is not suitable for the proposed development site. However, the submitted Soakaway Test Results only completed soakaway tests within the west of the site (TP01, TP02 and TP03). It is unclear from the submitted Exploration Hole Location Plan (Drawing No. 20311/04, Rev. -, dated March 2021) as to whether other trial pits (TP04 to TP09) have been carried out to the northern part of the site. The applicant shall complete further infiltration tests to demonstrate the viability of infiltration in a later stage should they are not planning to carry out further testing at this stage."* ***(verbatim)***

Response 1: **Section 9 of the 'Sustainable Drainage System – Guidance for Devon (2023)'**[1] [hereafter referred to as 'the Guidance'] published 23/08/2023 and last updated 14/03/2024, identifies the LLFA's surface water drainage requirements for different stages of the planning process.

Section 9.1 – Information Required for Outline Planning Applications, does not list infiltration testing or seasonal groundwater monitoring as a requirement for an Outline Application.

However, to ensure that robust evidence was provided to demonstrate that the Drainage Hierarchy had been followed during the evolvement of the surface water management strategy, the Applicant instructed three preliminary infiltration tests on the site at TP01, TP02 and TP03. No further testing or intrusive ground investigations were undertaken at that time. Trial pits TP04 to TP09, shown on Ruddlesden Geotechnical Ltd drawing 20311/04 and contained at Appendix D of the submitted FRA, were suggested locations of trial pits for future investigations.

[1] https://www.devon.gov.uk/floodriskmanagement/document/sustainable-drainage-system-guidance-for-devon-2023/

It is quite evident from the testing undertaken in trial pits TP01, TP02 and TP03 that infiltration will not be a suitable method for the disposal of surface water from the proposed development. At the three test locations water levels within the test pit fell between 1mm and 6mm during the course of almost 5-hours.

In addition, BRE 365: Soakaway Design states that in addition to the soil infiltration rate, other factors, including ground and slope instability, need to be considered in the assessment of soakaway drainage suitability. Given that some areas of the site have a slope of approximately 10° (1 in 5 or 20%), soakaway drainage may result in downslope re-emergence of water and/or slope instability.

Furthermore, it is a DCC LLFA requirement (Paragraph 5.2 of 'the Guidance') that the base of any infiltration device must also be at least 1.0m above the seasonal groundwater table. Based on the site's geomorphological setting, and the presence of surface water features and hydrophilic vegetation, near surface groundwater is anticipated to be present particularly in the lower parts of the site which may limit the inclusion of soakaways.

As this is an Outline Application, the Applicant does not need to undertake further infiltration testing or seasonal groundwater monitoring at this stage and any requirement to do so should be conditioned for a future Reserved Matters Application.

Actions 1: **No further review required.**

Observation 2: *"The applicant divided the site into Catchment 1 - Southern (2.73ha) and Catchment 2 - Northern (2.15ha). The current proposed impermeable areas are 0.605ha and 0.533ha respectively. The submitted model output results however show an area of 0.665ha and 0.586ha respectively. The applicant shall review this information."* ***(verbatim)***

Response 2: **Section 9.1 – Information Required for Outline Planning Applications,** requires surface water drainage calculations to incorporate an allowance of 10% for urban creep.

Catchment	Catchment Area (hectares)	Impermeable Area (hectares)	10% Urban Creep (hectares)	Revised Area (hectares)
1 (southern)	2.730	**0.605**	0.060	**0.665**
2 (northern)	2.150	**0.533**	0.053	**0.586**

Table 1: Catchment Areas and Urban Creep

As required by DCC, the impermeable areas of the two catchments (1 and 2) are 0.605ha and 0.533ha respectively, the submitted model outputs show areas of 0.665ha and 0.586ha respectively as this includes a 10% allowance for urban creep.

Actions 2: **No further review required.**

Observation 3: *"The greenfield runoff rates have been calculated using the FEH method. The applicant must submit a screenshot of the FEH web service to evidence the values used. The derived Q1 appears to be high at 5.52l/s/ha. The applicant shall check against the IH124 method."* ***(verbatim)***

Response 3: As requested, a screenshot of the FEH web service evidencing the BFI and SAAR used in the calculations to determine Greenfield Runoff is presented below.

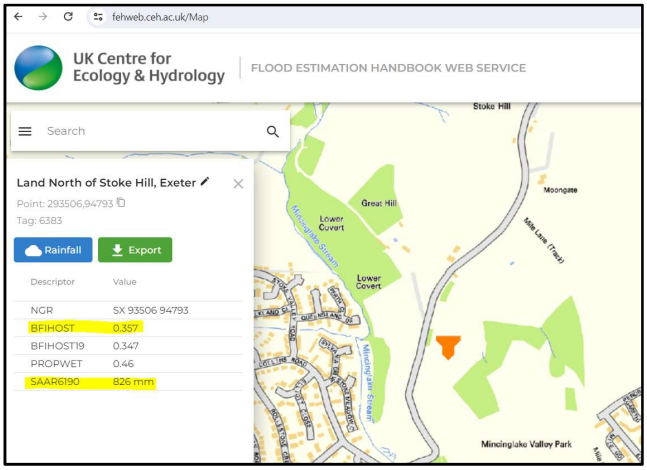
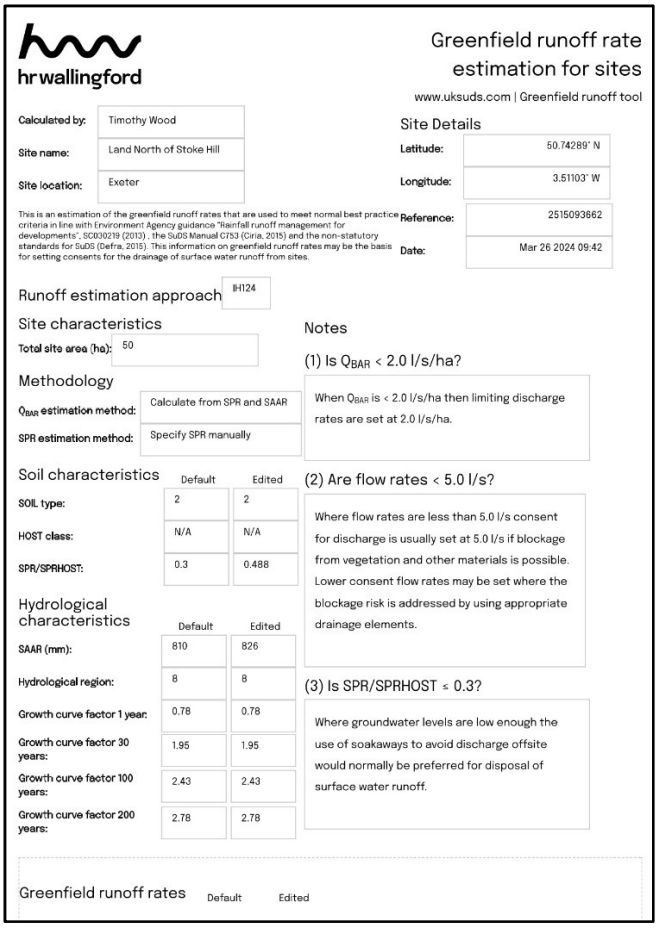


Figure 1: Screenshot of CEH FEH Web Service

As requested, a comparison of the IH124 method and FEH method for estimating Greenfield Runoff has been carried out using the UKSUDS Greenfield Runoff Tool. A screenshot of which is presented below. According to 'the Guidance' (Section 9.1), this 'Tool' for estimating Greenfield Runoff is acceptable for Outline Applications.



hr wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Timothy Wood
Site name:	Land North of Stoke Hill
Site location:	Exeter

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.74289° N
Longitude:	3.51103° W
Reference:	2515093862
Date:	Mar 26 2024 09:42

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 50

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Specify SPR manually

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.488

Hydrological characteristics

	Default	Edited
SAAR (mm):	810	826
Hydrological region:	8	8
Growth curve factor 1 year:	0.78	0.78
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.43	2.43
Growth curve factor 200 years:	2.78	2.78

Greenfield runoff rates Default Edited

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

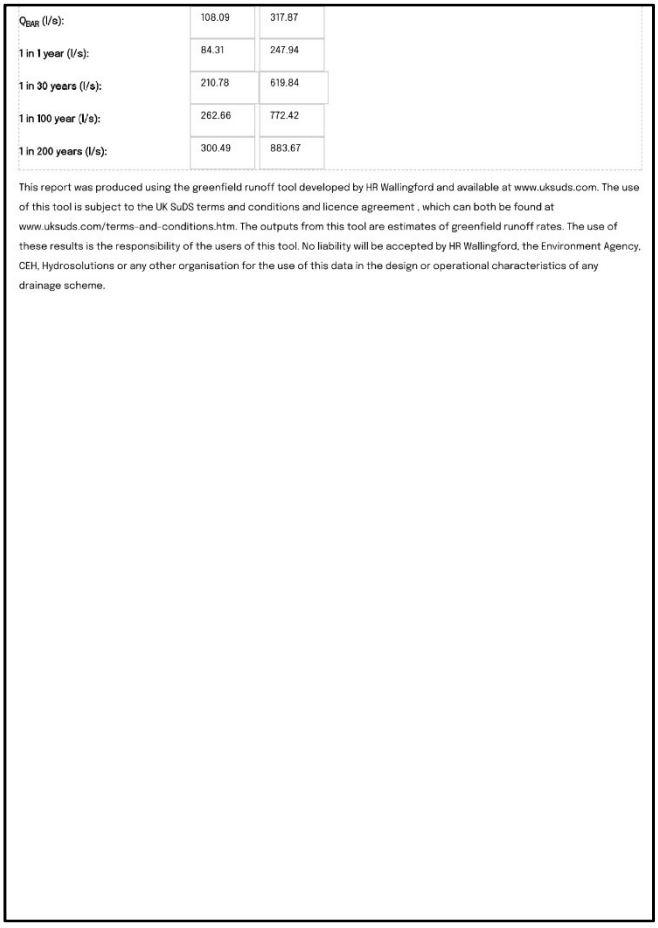
(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwaters levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Figure 2: Screenshot of UKSUDS IH124 Greenfield Runoff Calculation (Page 1)



Q_{BAR} (l/s):	108.09	317.87
1 in 1 year (l/s):	84.31	247.94
1 in 30 years (l/s):	210.78	619.84
1 in 100 year (l/s):	262.66	772.42
1 in 200 years (l/s):	300.49	883.67

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Figure 3: Screenshot of UKSUDS IH124 Greenfield Runoff Calculation (page 2)

Following the guidance for the Interim Code of Practice for SUDS (ICPSUDS), for sites of 50 ha or more, the outputs are calculated using the IH124 method directly. For sites smaller than 50 ha, the IH124 method is applied to a 50 ha site and the results divided by 50 to obtain the site runoff in litres per second per hectare (l/s/ha).

The IH124 Method suggest that the site has a SAAR = 810, SOIL Type = 2 and a SPR = 0.3, the two latter parameters would suggest a freely draining permeable substrata with low groundwater levels. However, as demonstrated above and based on engineering judgement, the site's geomorphological setting, the presence of surface water features, hydrophilic vegetation, near surface groundwater and zero infiltration capacity would suggest that these parameters do not accurately reflect the observed site conditions and therefore the percentage runoff that would be generated from this site.

In order to provide a more accurate estimation of Greenfield Runoff the standard percentage runoff (SPR) for the site was derived from the Baseflow Index (BFI). The Institute of Hydrology Report 126 Hydrology of soil types: a hydrologically based classification of the soils of the United Kingdom states at Paragraph 2.2.4 – Comparison of BFI and SPR:

"There is a good correlation between SPR and BFI (Boorman. 1985).
The Equation is:
***SPR = 72.0 – 66.5BFI**"*

Based on the above equation and a BFI of 0.35, the SPR is calculated as 0.488 or 48.8% which is much more realistic based on the observed and recorded ground data.

When used in the UKSUDS Greenfield Runoff Tool, the IH124 Method returns a Q1 rate of 4.96 l/s/ha (247.94/50), slightly less than the 5.52 l/s/ha calculated using the FEH statistical method.

This results in a maximum (Q1) discharge rate from Catchment 1 (southern) of 3.3 l/s (4.96 x 0.665) and from Catchment 2 (northern) of 2.9 l/s (4.96 x 0.586).

These are the discharge rates that have been used in developing the surface water drainage strategy as presented in the submitted FRA (Section 5) and clearly shown on the Proposed SuDS Strategy drawing (SMA Ref:6383.403.A) presented as Appendix H.

Furthermore, both detention basins have been designed to be 1.5m deep. The submitted calculations show that the maximum predicted depths during the 100-year +45% climate change event in Basin A is 1.155m and Basin B is 1.187m which shows that there is sufficient residual capacity within the system to account for any future changes and/or revised calculations at a later date.

The calculations and methodology submitted within the FRA are suitable and appropriate for an Outline Application. If the LLFA wishes to stipulate the methodology for estimating Greenfield Runoff then this should be conditioned for the Reserved Matters Application.

Actions 3: **No further review required.**

Observation 4: *"The applicant proposed to attenuate the flow via detention basins located in the low lying ground of each catchment adjacent to the outfalls. Further attenuation will be provided throughout the site in the form of porous paving where feasible. The applicant shall also consider some Natural Flood Management features within this site to improve the status of the Northbrook catchment."* ***(verbatim)***

Response 4: We believe that the consideration of Natural Flood Management (NFM) is excessive for a residential development of up to 85 units on a 4.75ha site. The EA and DEFRA define NFM as: "*… natural processes to reduce the risk of flooding. These processes protect, restore, and mimic the natural functions of catchments, floodplains and the coast to slow and store water and can include; soil and land management, river and floodplain management, woodland management, run-off management and coast and estuary management*."

If the Officer is referring to the consideration of additional SuDS features then of course these will be considered during the Reserved Matters stage of the application during the detailed development of the scheme layout.

If the LLFA wishes to encourage consideration of additional SuDS throughout the development then this should be conditioned for the Reserved Matters Application.

Actions 4: **No further review required.**

Observation 5: *"The detention basins for Catchment 1 is proposed to discharge into Northbrook. However, it is unclear as present as to whether the applicant have the permission to lay the pipe across a third party land to discharge the water. The applicant shall clarify this. For Catchment 2, it is proposed to discharge to an ordinary watercourse at the south east boundary of the development site. The applicant shall clarify as to whether the bio retention wetland area is an existing feature."* ***(verbatim)***

Response 5: There is a small parcel of land between the southern boundary of the site and Stoke Hill. The Applicant has rights to connect to the site from Stoke Hill across this land. Once on

Stoke Hill the pipework will be laid within the public highway and agreed with the Highway Authority as part of the Stoke Hill improvement works. Once on Stoke Hill this pipework will have a dual function of formalising and improving the existing highway drainage in this area.

Eventually the system will discharge into Northbrook, an Ordinary Watercourse, for which a Ordinary Watercourse Consent application will be submitted at the appropriate time during Reserved Matters.

For clarification, the wetland is a proposed feature to help manage exceedance runoff from the upper parts of the site.

Actions 5: No further review required.

We trust the above explanations and additional information clarifies the proposals, and addresses the questions raised by the LLFA.

Upon review of this response we would be grateful if the LLFA would advise the Local Planning Authority (Exeter City Council) that they have 'No Objection' to the proposed development subject to appropriately worded conditions.

If you have any questions, or wish to discuss the proposal, please telephone me on 07362 276031 or contact me by email at timwood@tswoodconsulting.co.uk.

We look forward to hearing from you.

Yours sincerely

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