

TECHNICAL NOTE

Job Name: Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield
Job No: 48494/2002
Note No: TN002A
Date: January 2022
Prepared By: Lewis Derrick
Subject: Updated Surface Water Drainage Strategy following Infiltration Testing

1. Introduction

- 1.1. Stantec has been instructed to prepare this Technical Note to describe and summarise the updated Surface Water Drainage Strategy (SWDS) following infiltration testing undertaken on site in January 2022. This Technical Note had been produced to support outline planning application WD/2021/2198/MAO, which is currently under consultation at the time of writing.
- 1.2. This Technical Note should be read in conjunction with the submitted Flood Risk Assessment (FRA) (ref: 48494/2002/C, date: 29 April 2021), as well as the separate Technical Note also produced by Stantec; "Ground Conditions and Infiltration Assessment" (ref: 332510180/3500/tn001/Rev0, date 26 January 2022).
- 1.3. The information in this Technical Note supersedes some of the information contained in the FRA. **Primarily, the SWDS has been updated to promote the discharge of surface water runoff via infiltration. Therefore, the SWDS will have no interaction nor impact on the designated Ancient Semi-Natural Woodland.** Reference will be made to the relevant sections and paragraphs in the FRA. It should be noted that these changes will be limited to Sections 6 to 9 of the FRA.

2. Surface Water Drainage Parameters

- 2.1. This section of this Technical Note indicates what changes are made to Section 6 of the FRA.

Outfall Destination

- 2.2. Paragraphs 6.2.4 to 6.2.13 in the FRA set out the application of the hierarchy of drainage (itself set out in 6.2.2) regarding the proposed development. The conclusions of paragraphs 6.2.5, 6.2.6, 6.2.8 and 6.2.9 are now superseded by the information contained within this Technical Note.
- 2.3. Infiltration testing in accordance with BRE Soakaway Design (DG 365) was undertaken on site in January 2022, the results and assessment of this testing are described in Stantec's Ground Conditions and Infiltration Assessment. However, below is a short summary:
 - 13no. trial pits were excavated (referenced as TP01 to TP13) across the site and infiltration testing was undertaken at each location between 1.0 and 2.0m depth below ground level (bgl).
 - The trial pits were situated across the site where shallow infiltration is proposed i.e. the areas of permeable paving set out in the FRA, whilst for TP05 corresponded with the proposed basin location also set out in the FRA.
 - An additional trial pit (TP05A) was excavated to 3.0m depth bgl adjacent to TP05 to investigate the presence of groundwater.

TECHNICAL NOTE

- Groundwater was not encountered in any of the locations, with the exception of TP13 where seepage was recorded at about 1.0m bgl. Water was recorded just above the based of excavation in TP05A.
 - Most locations did not yield sufficient infiltration rates, except for TP05 and TP07, which demonstrated rates of 1.0×10^{-5} m/s and 5.1×10^{-6} m/s respectively.
- 2.4. The Ground Conditions and Infiltration Assessment concluded that shallow infiltration features i.e. the permeable paving areas, are unlikely to be suitable based on the recorded infiltration rates. However, infiltration systems at TP05's location would be viable.
- 2.5. It was noted that concentrated ingress of water into Lower Tunbridge Wells Sand Formation could trigger surface instability as this material is easily eroded, but that no signs of instability were noted during the ground investigation. An offset of 5.0m from any structures or infrastructure and the infiltration surface/face is recommended to minimise this risk.
- 2.6. Following the assessment of the infiltration testing undertaken on site, it is now proposed that surface water is discharged from the proposed development via infiltration. This supersedes the conclusion of paragraph 6.2.9 of the FRA where it was recommended that surface water runoff was discharged to the adjacent Framfield Stream via a route through Ancient Semi-Natural Woodland.

Surface Water Outfall

- 2.7. Section 6.3 of the FRA outlines the key surface water drainage parameters e.g. discharge rate and volume, that the proposed SWDS complies with. However, the updated SWDS now proposes that surface water runoff is discharged via infiltration, so that the calculated discharge rates and volumes are no longer applicable nor necessary. The control of surface water outflow from the proposed development will be dictated by the recorded infiltration rate (see above), which in turn will determine the storage volume required on site. Therefore, Section 6.3 of the FRA is now redundant.

3. Managing Surface Water

- 3.1. This section of this Technical Note indicates what changes are made to Section 7 of the FRA.

Surface Water Drainage Strategy

- 3.2. Section 7.3 of the FRA describes the proposed SWDS to serve the development. This section remains largely still true apart from instead of a "detention basin", the updated SWDS converts this to an "infiltration basin".
- 3.3. Owing to the conclusions of the Ground Conditions and Infiltration Assessment, it is not recommended that the permeable paving areas described in paragraphs 7.3.5 to 7.3.7 are updated to utilise infiltration. Therefore, this information remains valid.
- 3.4. Paragraphs 7.3.8 to 7.3.13 describe the former detention basin which is now proposed as an infiltration basin. The form of the basin described in 7.3.8 will remain the same in the updated SWDS, however 7.3.9 to 7.3.12 are now superseded.
- 3.5. Based on an upstream impermeable area of development of 5.192ha (Table 7.2 of the FRA) and an infiltration rate of 1.0×10^{-5} m/s, a new storage volume of 3,775m³ is required for up to the 1 in 100 year storm event (plus 40% additional allowance for climate change). This has been calculated using MicroDrainage and the methodology set out in CIRIA R156, whereby infiltration through the sides and base of the basin is permitted and a factor of safety of 1.5 is applied. A lower factor of safety is appropriate for this calculation as the risk to people or property in the unlikely event that the basin fails or is exceeded is very low (the basin would overflow south and west away from the proposed development and towards the Framfield Stream).

TECHNICAL NOTE

- 3.6. Based on the base of the infiltration basin being at least 1.6m bgl (including 1.0m surface water storage depth and 0.6m freeboard) and the measured groundwater level in TP05A being slightly less than 3.0m bgl, it is indicated that there is at least 1.0m between the base of the infiltration basin and groundwater levels at this stage. It should be noted that the detailed design of the basin and a future reserved matters application will need to be informed by groundwater level monitoring to ensure that the base of the infiltration basin is 1.0m above or higher than a recorded seasonally high groundwater level. This may result in the depth of the basin being altered in a future reserved matters application.
- 3.7. It is proposed that groundwater monitoring is undertaken between early November and the end of May to demonstrate a clear seasonal peak groundwater level. It is also proposed that this requirement is dealt with by means of an appropriately worded pre-commencement condition to this outline planning application.
- 3.8. The updated storage calculations (Infiltration Basin IB-1 1 in 100 year (plus 40% Climate Change) Mode) and a plan indicating the updated SWDS (48494/2002/510) can be found attached to this Technical Note. It should be noted that these now supersede and replace the calculations (Detention Basin DB-1 1 in 100 year (plus 40% Climate Change) Model) and plan (48494/2002/500) found in Appendix G of the FRA. Drawing 48494/2002/SK01, also found in Appendix G of the FRA, is also superseded and redundant to this application, as the updated SWDS does not require a surface water outfall to the Framfield Stream.

4. Residual Risk

- 4.1. This section of this Technical Note indicates what changes are made to Section 8 of the FRA.

Pollution Control

- 4.2. Section 8.3 of the FRA considers whether the SWDS provides sufficient water quality treatment, based on the Simple Indices Approach set out in CIRIA C753. This assessment was based on a controlled discharge to a surface water body, therefore is no longer valid.
- 4.3. The hazard indices indicated in Table 8.1 of the FRA remain true, whilst the majority of table 8.2 also remains true except for the mitigation indices given for the detention basin. This is because all other SuDS features proposed in the SWDS will remain as per the FRA in that they will not proactively discharge runoff via infiltration. However, by converting the detention basin to an infiltration basin, it is the characteristics of the underlying soil and vegetation which will determine the level of mitigation provided. Therefore, Table 8.1 should supersede and be replaced by Table 1 below:

SuDS Measure	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Permeable paving	0.7	0.6	0.7
Bioretention system	0.8	0.8	0.8
Swale	0.5	0.5	0.6
Infiltration basin - with a soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3

TECHNICAL NOTE

Table 1 – Updated SuDS Mitigation Indices

- 4.4. Through applying the equation set out in section 26.7.1 of CIRIA C753, Table 8.3 of the FRA should be superseded and replaced with Table 2 below:

Land Use	SuDS Component	Resultant Indices		
		TSS	Metals	Hydro carbons
Residential Roof	Swales	0.5	0.6	0.6
	Infiltration basin	0.2	0.15	0.15
	Total	$0.7 > 0.2 =$ Sufficient	$0.75 > 0.2 =$ Sufficient	$0.75 > 0.05 =$ Sufficient
Individual property highways, car parks, low traffic roads.	Swales	0.5	0.6	0.6
	Infiltration basin	0.2	0.15	0.15
	Total	$0.7 > 0.4 =$ Sufficient	$0.75 > 0.4 =$ Sufficient	$0.75 > 0.4 =$ Sufficient

Table 2 – Updated SuDS Treatment Sufficiency

- 4.5. Paragraph 8.3.8 remains mostly true and valid in stating that all runoff generated on site will flow through one of the swales before the basin, and as such these are the only to SuDS features that can be considered for mitigation. However, some other areas of the site will also drain via permeable paving, filter strips and bioretention (where provided). This would improve upon the mitigation demonstrated in Table 2 above.
- 4.6. Therefore, the updated SWDS still provides sufficient water quality treatment of surface water runoff.

5. Operation and Maintenance

- 5.1. This section of this Technical Note indicates what changes are made to Section 9 of the FRA.

Operation and Maintenance

- 5.2. Much of Section 9 of the FRA remains correct and valid following the updated SWDS. The only exception between Table 9.5, which outlines the recommended operation and maintenance requirements for a detention basin. By converting the detention basin to an infiltration basin, the operation and maintenance requirements vary slightly. Therefore, Table 9.5 of the FRA is superseded by and should be replaced by Table 3 below:

TECHNICAL NOTE

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim any trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

Table 3 – Updated Infiltration Basin Recommended Operation and Maintenance Schedule

6. Conclusions

- 6.1. Following the completion of infiltration on site, this Technical Note demonstrates the discharge of surface water runoff via infiltration is possible at one location. This location corresponds with that of the proposed detention basin as described in the submitted FRA. However, **it is now proposed that this detention basin becomes an infiltration basin for the means of discharging surface water runoff from the proposed development.**

TECHNICAL NOTE

- 6.2. Based on the infiltration test results, calculations have been undertaken to update the required storage volume of the basin and its updated size has been demonstrated in a plan attached to this Technical Note. An assessment has also been undertaken to confirm that the conversion from a detention basin to an infiltration basin still provides adequate surface water quality treatment.
- 6.3. The detailed design of the infiltration basin and a future reserved matters application will need to be informed by groundwater level monitoring to ensure that the base of the infiltration basin is 1.0m above or higher than the recorded seasonally high groundwater level. It is proposed that groundwater monitoring is undertaken between early November and the end of May to demonstrate a clear seasonal peak groundwater level. It is proposed that this requirement is dealt with by means of an appropriately worded pre-commencement condition to this outline planning application.

Attachments:

- **Infiltration Basin IB-1 1 in 100 year (plus 40% Climate Change) Model**
- **48494/2002/510 – Indicative Surface Water & Foul Drainage Discharging Surface Water via Infiltration**

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
48494/2002/TN002	-	28/01/2022	LWD	ET	ET	ET
	A	31/01/2022	LWD	ET	ET	ET

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 990 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.411	0.411	27.6	1444.3	O K
30 min Summer	0.538	0.538	29.1	1922.5	O K
60 min Summer	0.670	0.670	30.7	2430.7	O K
120 min Summer	0.759	0.759	31.8	2784.0	O K
180 min Summer	0.808	0.808	32.4	2979.7	O K
240 min Summer	0.838	0.838	32.8	3101.1	O K
360 min Summer	0.869	0.869	33.2	3229.3	O K
480 min Summer	0.879	0.879	33.3	3271.7	O K
600 min Summer	0.879	0.879	33.3	3270.8	O K
720 min Summer	0.872	0.872	33.2	3243.2	O K
960 min Summer	0.856	0.856	33.0	3176.8	O K
1440 min Summer	0.822	0.822	32.6	3036.4	O K
2160 min Summer	0.783	0.783	32.1	2880.9	O K
2880 min Summer	0.752	0.752	31.7	2754.1	O K
4320 min Summer	0.693	0.693	31.0	2523.1	O K
5760 min Summer	0.639	0.639	30.4	2310.2	O K
15 min Winter	0.458	0.458	28.2	1619.9	O K
30 min Winter	0.600	0.600	29.9	2158.3	O K
60 min Winter	0.746	0.746	31.7	2732.2	O K
120 min Winter	0.847	0.847	32.9	3140.0	O K
180 min Winter	0.903	0.903	33.6	3369.9	O K
240 min Winter	0.939	0.939	34.0	3516.4	O K
360 min Winter	0.978	0.978	34.5	3682.2	O K
480 min Winter	0.995	0.995	34.7	3752.8	O K
600 min Winter	1.000	1.000	34.8	3774.8	O K
720 min Winter	0.999	0.999	34.8	3767.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	19
30 min Summer	101.080	0.0	34
60 min Summer	64.792	0.0	64
120 min Summer	38.150	0.0	124
180 min Summer	27.925	0.0	182
240 min Summer	22.344	0.0	242
360 min Summer	16.277	0.0	362
480 min Summer	12.968	0.0	482
600 min Summer	10.865	0.0	600
720 min Summer	9.403	0.0	714
960 min Summer	7.495	0.0	818
1440 min Summer	5.444	0.0	1066
2160 min Summer	3.997	0.0	1472
2880 min Summer	3.231	0.0	1900
4320 min Summer	2.409	0.0	2724
5760 min Summer	1.967	0.0	3520
15 min Winter	150.752	0.0	19
30 min Winter	101.080	0.0	33
60 min Winter	64.792	0.0	62
120 min Winter	38.150	0.0	122
180 min Winter	27.925	0.0	180
240 min Winter	22.344	0.0	238
360 min Winter	16.277	0.0	354
480 min Winter	12.968	0.0	468
600 min Winter	10.865	0.0	582
720 min Winter	9.403	0.0	692

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
960 min Winter	0.984	0.984	34.6	3707.0	O K
1440 min Winter	0.942	0.942	34.1	3528.9	O K
2160 min Winter	0.890	0.890	33.4	3313.7	O K
2880 min Winter	0.841	0.841	32.8	3115.4	O K
4320 min Winter	0.747	0.747	31.7	2735.9	O K
5760 min Winter	0.659	0.659	30.6	2388.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	904
1440 min Winter	5.444	0.0	1126
2160 min Winter	3.997	0.0	1596
2880 min Winter	3.231	0.0	2048
4320 min Winter	2.409	0.0	2940
5760 min Winter	1.967	0.0	3800

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.192

Time (mins)	Area
From:	To: (ha)
0	4 5.192

Model Details

Storage is Online Cover Level (m) 1.600

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 1.5
Infiltration Coefficient Base (m/hr) 0.03672 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.03672

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3347.0	1.000	4217.6	1.600	4788.2



- | | |
|---|---|
| Key: | |
|  | Application Boundary |
|  | Ancient Woodland 15m Buffer Zone |
|  | Tree Root Protection Area |
|  | Proposed Surface Water Drainage Sewer (indicative only) |
|  | Proposed Foul Drainage Sewer (indicative only) |
|  | Proposed Surface Water Drainage Headwall |
|  | Proposed Permeable Paving |
|  | Proposed Swale |
|  | Proposed Infiltration Basin |
|  | MicroDrainage Model Reference Code |

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Land at Bird in Eye Farm
South of Bird in Eye Hill, Uckfield
Indicative Surface Water & Foul Drainage
Discharging Surface Water via Infiltration

