LAND AT WOODGATE NURSERIES

LIDSEY ROAD, WOODGATE

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

JULY 2024

FortRidge
Consulting Limited

For

HANBURY PROPERTIES

HANBURY
PROPERTIES

ARUN DISTRICT COUNCIL AL/89/24/OUT

STATUS OF REPORT

Revision	Document Note or Changes	Prepared or Revised By	Date
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Contents

1.	Introduction	3
2.	The Site	5
3.	Proposed Development	12
4.	Flood Risk Assessment	14
5.	Surface Water Drainage Strategy and Flood Mitigation	21
6.	Foul Water Drainage Strategy	29
7.	Summary and Conclusions	32

FIGURES and APPENDICES

Figure 1	Location Plan
Figure 2	BGS Geology Map
Figure 3	EA Bedrock Map
Figure 4	Soilscapes map (Magic maps)
Figure 5	EA Flood Map
Figure 6	EA Surface Water Flood Map
Figure 7	EA Reservoir Flood Map
Appendix 1	Topographical Survey
Appendix 2	SFRA Mapping
Appendix 3	Proposed Development
Appendix 4	Storage Calculations
Appendix 5	Sewer Records – utility search
Appendix 6	Foul water and surface water drainage strategies
Appendix 7	West Sussex County Council Developer's Guidance Note and other guidance
Appendix 8	Southern Water Pre-development capacity check
Appendix 9	Site Investigation Information WS101, WS102, WS502, WS503, WS622, WS711
Appendix 10	Correspondence with Arun District Council and Plans
Appendix 11	Correspondence with The EA concerning surface water flood risk

ARUN DISTRICT COUNCIL AL/89/24/OUT

ACRONYMS AND ABBREVIATIONS

ACRONYM	Description
AOD	Above Ordnance Datum
ADC	Arun District Council
AStGWF	Areas Susceptible to Groundwater Flooding (map produced by the EA)
BGS	British Geological Survey
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
FFL	Finished Floor Level
ha	Hectares
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
m	Metres
mm	Millimetres
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
QBAR	Mean Annual Flood (IoH Report No. 124 Flood Estimation for Small Catchments)
SFRA	Strategic Flood Risk Assessment
WSCC	West Sussex County Council (LLFA)

ARUN DISTRICT COUNCIL AL/89/24/OUT

1. Introduction

1.1 FortRidge Consulting Limited was commissioned by Hanbury Properties, to prepare a Flood Risk Assessment and Drainage Statement in support of an outline planning application for land at Woodgate Nurseries. This assessment summarises the approach to be taken in developing the drainage strategy for the site.

1.2 The requirements and policies of Arun District Council (ADC), West Sussex County Council as Lead Local Flood Authority (WSCC) and the Environment Agency (EA) have been taken into account when considering flood risk at the Site.

1.3 The purposes of the Report are:

- to confirm that the proposed development will not be subject to unacceptable flood risk or to show that flood risk can be managed acceptably.
- to provide strategies and mitigation proposals for site drainage

1.4 The Report presents a preliminary assessment of flood risk in accordance with the National Planning Policy Framework (NPPF), July 2021 and its supporting Planning Practice Guidance (PPG), published by the Department of Communities and Local Government.

1.5 EA Climate Change Allowances for Flood Risk Assessments were updated in May 2022. This advice updates previous climate change allowances to support the NPPF.

1.6 The NPPF and supporting PPG provide guidance on how flood risk should be considered during planning and development processes. The requirement to protect both new and established development from increased risk of flooding forms an essential part of the guidance.

1.7 The Parish Council is Aldingbourne.

1.8 Arun District Council is the Local Planning Authority (LPA), controlling flood risk and water environment issues, through policies and guidance presented in the ADC Strategic Flood Risk Assessment, Final report dated August 2016.

ARUN DISTRICT COUNCIL AL/89/24/OUT

1.9 WSCC, in its role as Lead Local Flood Authority (LLFA), are a statutory consultee for all major applications. Guidance published by WSCC (Revised November 2018) and ADC have been referred to in compiling this report.

1.10 Southern Water is the sewerage undertaker for the area.

Pre-application consultation

1.11 A pre-application submission was made to ADC. A Drainage response was prepared by ADC.

1.12 The response made is clear that West Sussex County Council would be responding on drainage matters at application stage.

1.13 In addition, ADC provided local information concerning underground drainage features as recorded in Appendix 10 that shows how drainage crosses Lidsey Road.

1.14 A pre-development capacity check has been made to Southern Water. The response is shown in Appendix 8.

ARUN DISTRICT COUNCIL AL/89/24/OUT

2. The Site

2.1 The site is located adjacent to the settlement of Woodgate, to the west of the A29, Lidsey Road, that runs north/south through the village. The site extent, shown below, sits to the south of the railway line. The site cannot be described as greenfield for the purposes of this assessment; it is mostly developed, with derelict glasshouses, other structures, and hardstanding covering significant areas.

2.2 The ordnance survey reference for the site is OS X (Eastings) 493549 and OS Y (Northings) 104238.

2.3 The overall site application area is approximately 8 hectares including open space and access provisions.

2.4 A site location plan is shown below and at Figure 1 at the end of the report:

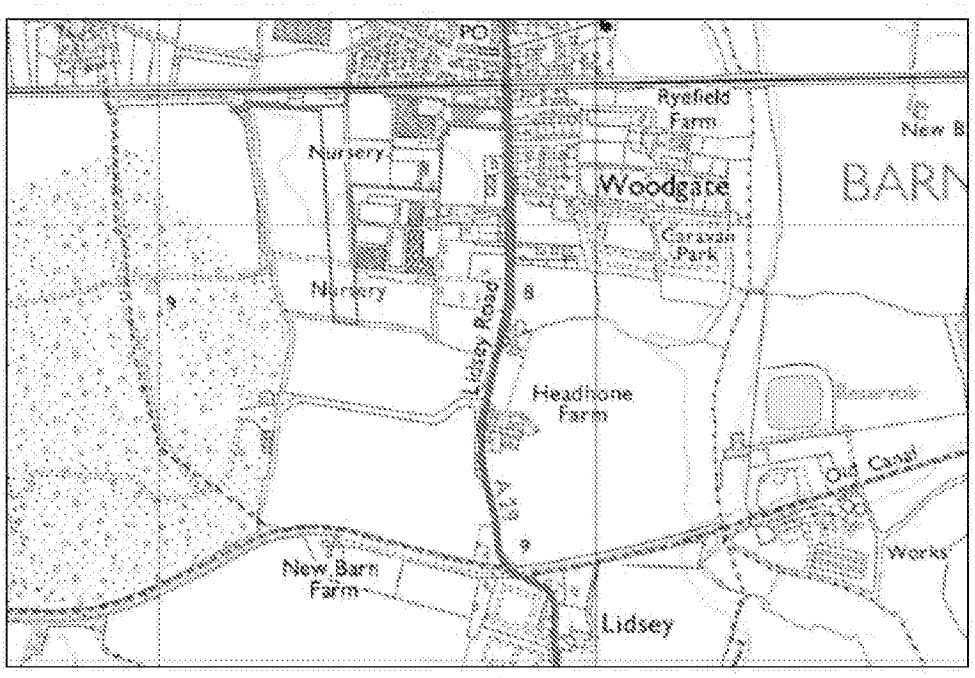


FIGURE 1: LOCATION PLAN

OS X (Eastings) 493549
OS Y (Northings) 104238
Nearest Post Code PO20 3YR

SITE LOCATION

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ARUN DISTRICT COUNCIL AL/89/24/OUT

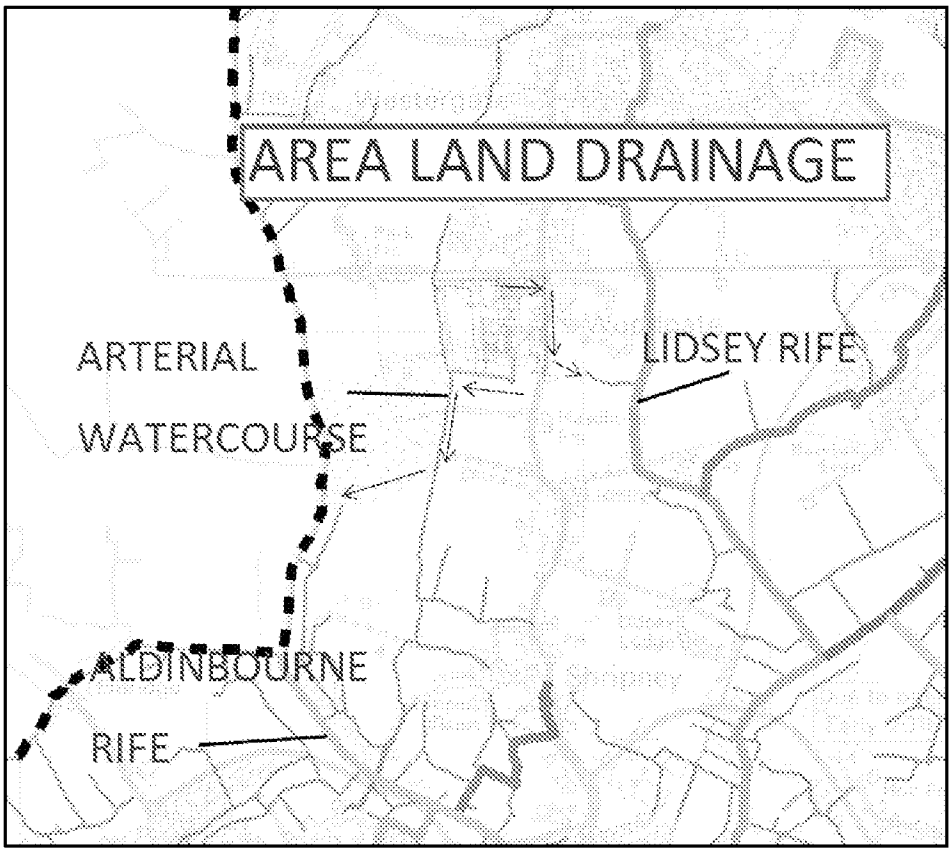
Topography

2.5 A Topographical survey has been carried out. A copy is shown at Appendix 1.

2.6 The site is relatively flat with levels varying from 10.393mAOD in the west of the site to 8.062mAOD in the east of the site, excluding ditch bed levels.

2.7 The main ditch running through the site drains out into Lidsey Road and discharges to the ditch adjacent to the A29 Lidsey Road.

2.8 The ditch on the western side of Lidsey Road connects under the road to a culvert that flows to the east and connects to the Lidsey Rife.



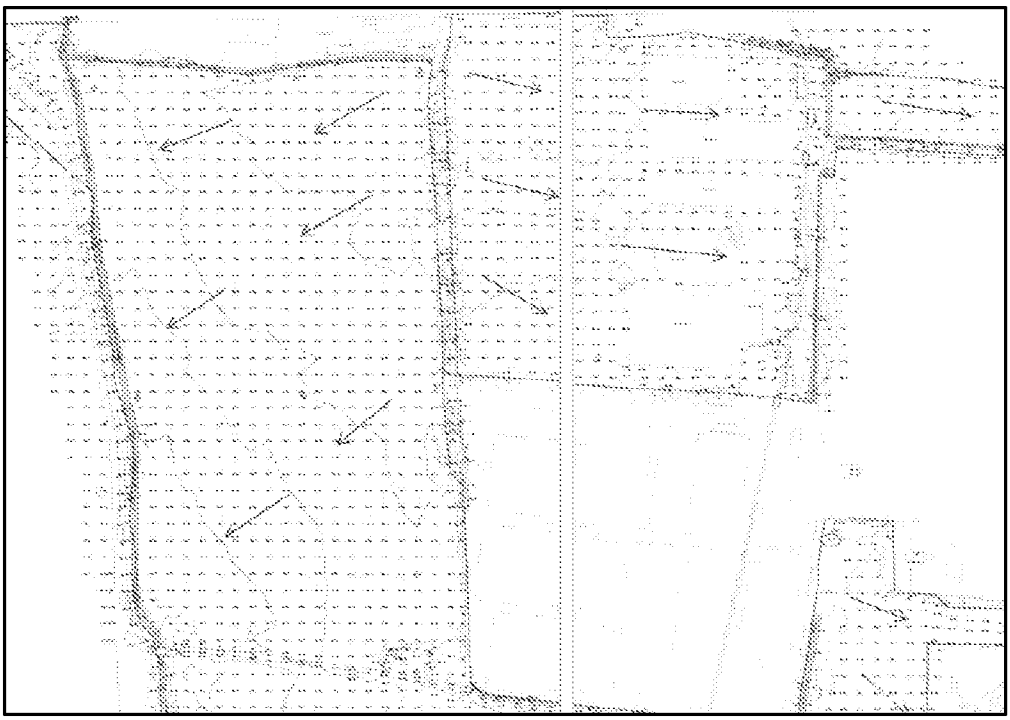
EXISTING RUNOFF-AREA LAND DRAINAGE

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2.9 The area land drainage maps from the Arun District Council Strategic Flood Risk Assessment show the area drains in two directions, to the west via the watercourse to the west of the site to the Aldingbourne Rife to the west and south of the site and to the east, under Lidsey Road and to the Lidsey Rife.

ARUN DISTRICT COUNCIL AL/89/24/OUT

2.10 The existing runoff within the site is indicated below. The site is relatively flat with a high point running north to south through the middle of the area. The land to the west of the ridge line drains to the west to the Aldingbourne Rife via piped connections to and from the old canal. The land to the east drains to the east under Lidsey Road and to the Lidsey Rife.



EXISTING RUNOFF-Arrows show direction of surface runoff

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Geology and Hydrogeology

2.11 British Geological Survey (BGS) mapping indicates the superficial geology in the area to be: "1:50 000 scale superficial deposits description: River Terrace Deposits (undifferentiated) - Sand, Silt And Clay. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U)"

2.12 British Geological Survey (BGS) mapping indicates the bedrock geology in the area to be: "1:50 000 scale bedrock geology description: London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas."

ARUN DISTRICT COUNCIL AL/89/24/OUT

2.13 The BGS map is reproduced as Figure 2.

2.14 The bedrock geology beneath the whole Site comprises solid geology of the Kellaway Clay Member and The Oxford Clay Formation.

2.15 Soilscapes information indicates that the soil underlying the Site comprises loamy soils with naturally high groundwater, draining to local shallow groundwater.

2.16 Host soil classification shows the soils to be: 'Soils seasonally waterlogged by fluctuating groundwater and with relatively slow lateral saturated conductivity.'

2.17 The Wallingford SuDS Tools show the site to be Soil Type 2.

Ground Investigation

2.18 A geotechnical site investigation (SI) has been carried out by Ashdown Site Investigation Limited. The window samples in close proximity are:

2.19 WS503 is within the boundary of the site and WS102 and WS103 are located in adjacent land. WS101 is to the west of the site, WS102 is south of the site and WS502 is to the west of the site.

2.20 Groundwater monitoring was undertaken in the winter both for 2020-21 and for 2023-24. The results are shown in Appendix 9, together with the associated borehole logs.

2.21 Based on the SI and the BGS information infiltration drainage will not be possible across the site and can be ruled out; therefore attenuated surface water drainage will be employed and designed to connect to the watercourse to the west of the site to release at appropriate run off rates.

Groundwater

2.22 The EA Groundwater Vulnerability Map shows that the Site is not underlain by an aquifer.

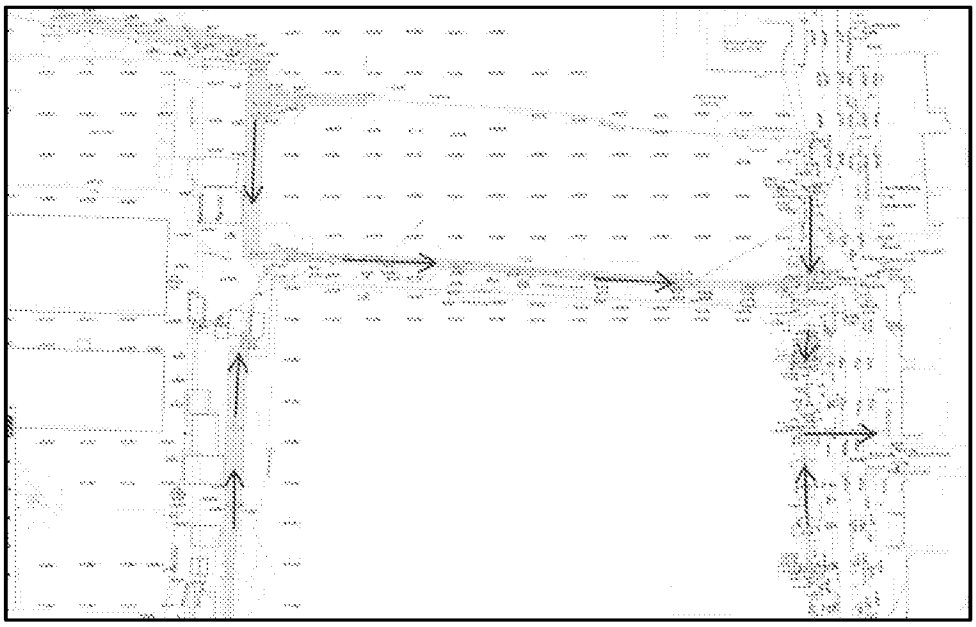
2.23 The area is shown on SFRA mapping to be at risk from groundwater flooding (>=75%). Groundwater flooding is known to affect huge parts of Arun. This is reflected in the SFRA.

ARUN DISTRICT COUNCIL AL/89/24/OUT

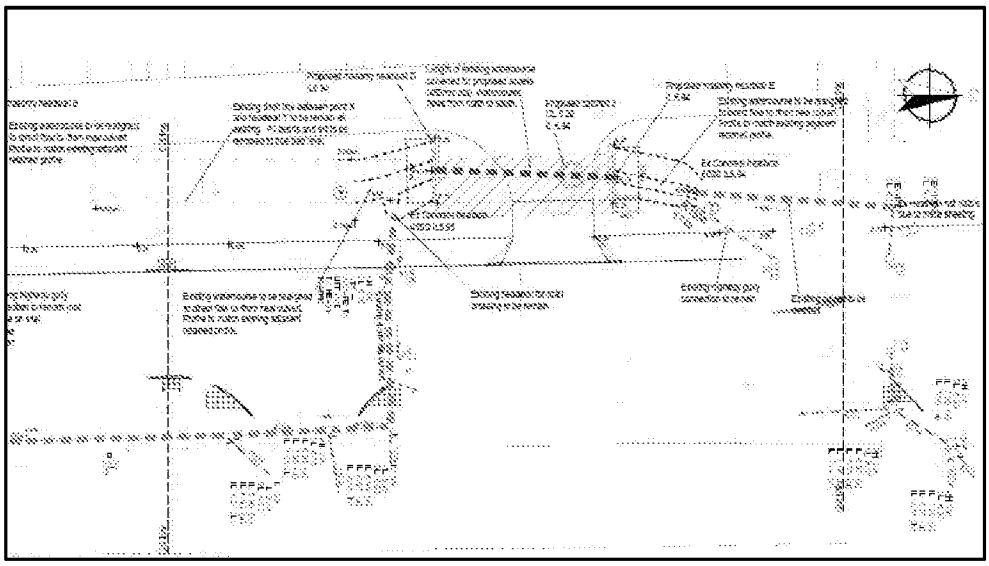
2.24 Winter groundwater monitoring showed occasional high groundwater levels during the particularly wet winter of 2023-24.

Watercourses

2.25 The ditch within the site drains west towards the drainage ditches adjacent to Lidsey Road. The land which form the east parts of the site drains to the east under Lidsey Road and to the Lidsey Rife. The two extracts below from information provided by Arun DC, show how surface water passes beneath Lidsey Road.



Plan showing how the site surface water drains towards Lidsey Road



Plan showing surface water crossing beneath Lidsey Road (see Appendix 10)

ARUN DISTRICT COUNCIL AL/89/24/OUT

2.26 The land to the west of the ridge line drains the west to the Aldingbourne Rife via the arterial watercourse that flows north to south with piped connections to and from the old canal.

Existing Drainage

2.27 The SFRA map documents of the area around the Site confirm there are no known sewer flooding problems. There is a record of surface water flooding adjacent to Wings Nursery.

Existing Sewers

2.28 The site is adjacent to existing sewers that drain to the Lidsey Wastewater Treatment Works Catchment area.

2.29 The closest foul sewer is an existing 225mm diameter in Lidsey Road that crosses part of the site.

2.30 The foul sewer is not very deep, the depths at various manholes are shown below:

MH7201 is 1.61m deep
MH7102 is 1.93m deep

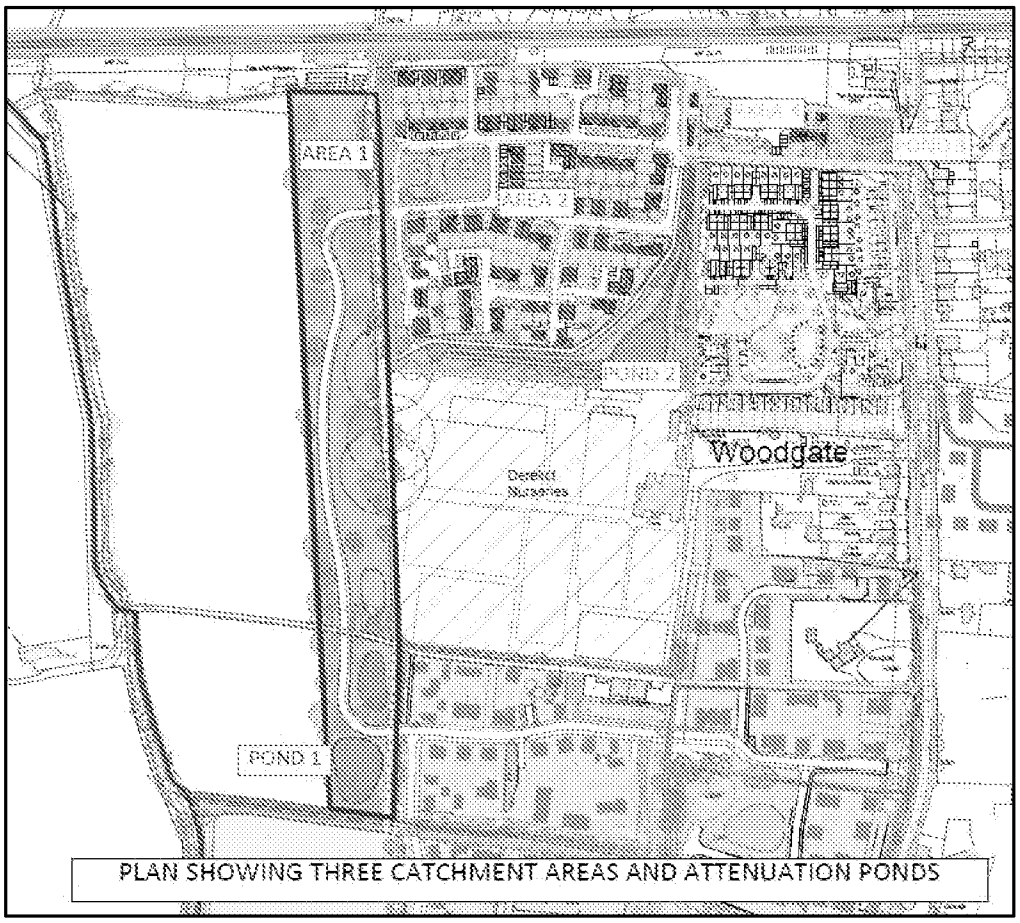
There are no surface water sewers shown on the sewer records in the vicinity of the site.

Site Walkover

2.31 Site visits have been made on December 2020 and on May 2021 and November 2023 following a very large storm event with extensive surveys to identify the surface water drainage connections to and from the old canal and ultimately into the Aldingbourne Rife.

2.32 The plan below shows one way the site can be sub-divided to make use of the existing surface water drainage features. Area 1 is self-explanatory in that attenuation is only required for the new road before it discharges to the watercourse that crosses from east to west. It is possible to vary the catchment areas for Area 1 and Area 2.

ARUN DISTRICT COUNCIL AL/89/24/OUT



PLAN SHOWING THREE CATCHMENT AREAS AND ATTENUATION PONDS

Area	Pond Volume	Area at design storm	Available
1	307m^3	550 m^2	1,200 m^2
2	2706m^3	3,200 m^2	3,800 m^2
3	214m^3	796 m^2	900 m^2

Assessment of 1 in 100yr+CC attenuation volumes and achievability in layout

ARUN DISTRICT COUNCIL AL/89/24/OUT

3. Proposed Development

3.1 The development proposals as shown on the Illustrative Masterplan Plan presented in Appendix 3. This site specific Flood Risk Assessment and Drainage Strategy supports an outline planning application with all matters reserved (except access) for residential development of the site with up to 130 dwellings (Use Class C3), informal and formal public open space, landscaping, drainage, and other associated works.



ILLUSTRATIVE PROPOSALS (See Appendix 3)

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Site Access

3.2 The proposed site access comprises a new junction arrangement off the main A29, Lidsey Road. The access has previously been granted planning permission with the support of WSCC (see both AL/129/21/OUT and AL/70/23/OUT) to serve other residential development of upto 95 and upto 155 dwellings respectively.

Vulnerability Classification

3.3 As per Annex 3 of the NPPF (The framework), a **More Vulnerable** classification applies to the proposal which comprises residential dwellings, while the public open space is defined as being 'Water Compatible'. Having regard to Table 2 in the Planning Practice Guidance (PPG) defines the suitability of these within Flood Zone 1.

ARUN DISTRICT COUNCIL AL/89/24/OUT

4. Flood Risk Assessment

Context

4.1 National Planning Policy is clearly established and governs that through the sequential approach inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Flood Zones defined by the Environment Agency and shown via its Flood Map for Planning service are the principal sources of flooding / flood constraint used to inform the LPA when to consult the EA and LLFA on flood risk in development control decisions.

4.2 The Flood Zones refer to the probability of flooding and this varies depending on the source of flooding being fluvial or tidal. Flood Zones 1, 2 and 3 refer to low, medium and high risk of flooding respectively. These zones for fluvial risks of flooding correspond to the Annual Exceedance Probabilities (AEP) of less than 0.1%, in the range of 0.1-1% and greater than 1% in any given year, respectively.

4.3 The Flood Zones, as described in the PPG, indicate the probability of flooding without the presence of defences and significant manmade structures such as bridges, culverts, and rail or motorway embankments. They show areas that may be at risk from flooding and where further investigation in the form of a Site Specific Flood Risk Assessment is necessary to ascertain the probable risk of flooding on site. National policy requires that consideration is also given to other sources of flooding [NPPF173 and Footnote 59].

Fluvial Flooding

4.4 An extract from the Flood Map (for the Site) is presented as Figure 5. This indicates that the Site is entirely located within Flood Zone 1 (Low probability) defined as:

"Flood Zone 1 – Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

ARUN DISTRICT COUNCIL AL/89/24/OUT

Tidal Flooding

4.5 The Site is not at risk from tidal flooding. It sits at an elevation of circa 8-9mAOD and is not located within any tidal areas. This is confirmed in present and future scenarios by ADC's SFRA.

Climate Change

4.6 EA Climate Change Allowances for Flood Risk Assessments were updated in May 2022. This advice updates previous climate change allowances to support the NPPF. The site is located in the Arun and Western Streams Management Catchment and the peak rainfall allowance for the 1% annual exceedance rainfall event is 45%.

4.7 Having regard to ADC's SFRA review of Climate Change and future flood risk the site remains in Flood Zone 1 in future scenarios.

Groundwater Flooding

4.8 Groundwater flooding occurs where groundwater levels rise sufficiently to intersect the ground surface and flow onto low-lying areas. Generally, groundwater flooding may be a problem where developments are over permeable soils or rocks.

4.9 The Arun DC SFRA map documents show the area to be at high risk from groundwater flooding (>=75%).

4.10 The SFRA notes that: mapping suggests that there is a high risk of groundwater flooding at this location. Therefore, it is likely infiltration techniques will not be suitable. However, this should be confirmed via a site investigation and the potential for infiltration techniques should be assessed.

4.11 The SFRA also notes that: compared with other sources, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Under the Flood and Water Management Act (2010), LLFAs have powers to undertake risk management functions in relation to groundwater flood risk. Groundwater level monitoring records are available for areas on Major Aquifers. However, for low lying valley areas, which can be susceptible to groundwater flooding caused by a high water table in mudstones, clays and superficial

ARUN DISTRICT COUNCIL AL/89/24/OUT

alluvial deposits, very few records are available. Additionally, there is increased risk of groundwater flooding where long reaches of watercourse are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas. Section 5.2.2 reports on the bedrock geology and superficial deposits within the district, and summarises that the geology of the district indicates susceptibility to groundwater emergence and flooding, a fact identified in the historical record.

4.12 As part of the SFRA deliverables, mapping of the whole District has been provided showing the Areas Susceptible to Groundwater Flooding (AStGWF). This information is provided in Appendix F. The AStGWF is a strategic-scale map showing groundwater flood areas on a 1km square grid.

4.13 The data was produced to annotate indicative Flood Risk Areas for Preliminary Flood Risk Assessment (PFRA) studies and allow the LLFAs to determine whether they may be at risk of flooding from groundwater.

4.14 This data shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring, nor does it take account of the chance of flooding from groundwater rebound (rising groundwater levels resulting from a reduction in abstraction rates from groundwater). This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

4.15 The AStGWF data should be used only in combination with other information, for example local or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. It should be noted that although an area may be designated as susceptible to groundwater flooding, this does not mean that groundwater flooding will definitely be a problem within these areas, rather it provides an indication of potential risk. This is all clarified on the "Notes" set out by the SFRA itself.

4.16 Significant events of groundwater flooding reported in West Sussex are reported to have occurred in:

ARUN DISTRICT COUNCIL AL/89/24/OUT

* 1974
* Winter 1993–1994
* Winter 2000–2001
* Winter 2002–2003
* Westergate/Barnham area
* 2013/14 –Westergate/Barnham area
* 2014 – Northfields Lane/Nyton Road/Level Mere Lane, Aldingbourne

4.17 It was observed that the extensive groundwater flooding of winter 2000 / 2001 followed a period of exceptionally high rainfall, but the direct source was not identified and therefore it may be that flooding was caused by a burst underground pipe rather than flooding from hard rock aquifers or superficial deposits.

4.18 Developers planning to build within groundwater emergence zones should still investigate whether groundwater flooding is likely to be a problem locally.

4.19 The Lidsey SWMP identified that groundwater flooding has been reported in Elm Grove in Barnham,Northfields Lane/Nyton Road in Westergate, and Wandleys Lane in Eastergate.

4.20 There is no historical record of groundwater flooding in Woodgate. The area is located on the edge of the identified groundwater emergence zone.

Surface Water Flooding

4.21 Surface Water Flooding occurs when the intensity of rainfall exceeds ground infiltration. Typically, this happens where the ground surface is impermeable, such as roads and paved areas within urban development and where there are impermeable soils, such as clay.

4.22 The Environment Agency's 'Flood risk from surface water' shows that the Site is primarily at a low risk of surface water flooding.

4.23 The Environment Agency's surface water flood risk map indicates little potential for surface water flood risk on or near the site. The surface water flood map is reproduced as Figure 6. A limited area in front of the site and on the A29 is shown to be at a medium/high risk but only a small area would be to more than negligible depth and the extent where depths exceed low levels are not shown to affect either the existing access into the site (retained as a pedestrian/cycle link), or the A29 itself.

ARUN DISTRICT COUNCIL AL/89/24/OUT

4.24 It is noted that surface water flood risk mapping is also deficient because it does not include important local drainage features, such as the 450mm diameter pipe crossing Lidsey Road. Indeed the Environment Agency has confirmed:

"The Risk of Flooding from Rivers and Sea map is based on a national surface water mapping project completed in 2013. As this modelling was part of a national project it did not include local drainage features such as the pipe mentioned in your email below. The results are based mainly on ground levels estimated using LiDAR. The grey image below shows ground levels in the area and that the water is accumulating against an area of high ground." (See Appendix 11)

Flooding from Infrastructure Failure

4.25 Where infrastructure retains, transmits or controls the flow of water, flooding may occur if there is a structural, hydraulic, geotechnical, mechanical or operational failure. There are three main categories of infrastructure associated with this mechanism of flooding:

- Failure of infrastructure designed to store or carry water (e.g. dam break, canal leak, burst water mains).
- Failure of infrastructure designed to protect an area from flooding (e.g. breached flood defences, flap valve or penstock failure, pumping station failure).
- Failure of a pipe, bridge or culvert due to blockage.

4.26 There is no major infrastructure that could affect the site due to failure. Therefore, the risk of flooding from this mechanism of flooding is considered low. SFRA Climate Change modelling (scenarios at Appendix D) are already based upon worse case 'undefended' scenarios, in any event.

Flooding from Reservoirs

4.27 The Environment Agency's map 'Flood Risk from Reservoirs' shows that the Site is not within an area at risk of reservoir flooding. The reservoirs flood risk map is reproduced as Figure 7.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Historical Flooding

4.28 There are no records of historical flooding on the site.

Sequential and Exception Tests

4.29 The Site is classified as Flood Zone 1 (low risk) for the purposes of fluvial or tidal flooding, and will remain so having regard to available future scenario modelling (SFRA). The sequential and exception tests are not required having regard to government policy in the NPPF and guidance on the PPG. Indeed, this is a location which is sequentially preferable for development due to the low risk categorisation.

4.30 Further regard has been paid to other potential sources of flooding and risk, with particular note to the initial pre-application response from ADC officers. As correctly pointed out by ADC's response (Mead Realisations Limited v The SoS for DLUHC & Anor, EWHC 279 (Admin)) determined (inter alia) that Planning Practice Guidance should have the same status as government policy as the NPPF. However, it was already common practice, with reference to newer NPPF policy at paragraphs 167 and 168, that the goal of a sequential test was to steer development to the areas at "lowest risk of flooding from any source" and that SFRA would provide the basis for applying this test.

4.31 In this case there are no parts of the site that are affected by surface water flooding per EA and SFRA mapping (see ADC 2016 Level 1 SFRA: Appendix E Surface Water Flood Risk - Tile 31 of 46). Limited areas adjacent to the site do not affect its development and or access into or out of the development. There is no evidence to suggest there is risk from surface water flooding on the site.

4.32 The extent to which the potential for groundwater flooding is present in the district of Arun is reflected by the SFRA mapping and discussed above. As explained above, however, the scenarios in the SFRA do not present risk or likelihood of groundwater flooding occurring. No historical records of groundwater flooding on the site suggest it to be a problem or risk to development, while notably the installation of positive drainage through development will attenuate the combined effects of very slow or no infiltration of rainfall during storm events, serving to improve the baseline situation.

ARUN DISTRICT COUNCIL AL/89/24/OUT

4.33 For this reason there is no need to undertake a Sequential Test to compare the site with other low risk (Flood Zone 1) sites in the district as the site is already in the category of lowest risk.

ARUN DISTRICT COUNCIL AL/89/24/OUT

5. Surface Water Drainage Strategy and Flood Mitigation

5.1 Having regard to the detailed findings in the Ashdown SI Ltd. Site investigation report, due to the presence of a seasonally high water table within the site, infiltration drainage will not be feasible. Attenuation drainage will be provided on the site in accordance with planning and drainage policy requirements.

5.2 The site topography is such that the site drains towards the south and west of the site. The site is relatively flat and drains towards the main ditch running through the site and the ditch along the southern boundary adjacent to the road. The surrounding ditches all drain to the west as indicated on the SFRA mapping included in Appendix 2.

5.3 The three coloured areas show the catchment areas used in the storage calculations, as indicated in Section 2.

5.4 Attenuation within the proposed surface water drainage strategy will be provided by detention basins and/or other shallow SuDS features on Site, before discharging to new or existing ditches within the site connecting to the existing watercourses adjacent to the site that drain to the west.

5.5 The discharge rate will be restricted to the Greenfield runoff rate (QBAR), in accordance with Arun DC policy. It is noted that Qbar calculations relate to only the positively-drained impermeable surfaces. Having regard to the existing extent of hardstanding within the site as well as the benefits of a positive attenuation strategy it is expected the development of the site will secure betterment in terms of surface water drainage.

5.6 It is anticipated that swales, filter strips and filter drains will feature extensively within the SuDS scheme, together with other shallow conveyance systems. Taking into account the potential for flotation and groundwater infiltration components will need to be lined and weighted sufficiently to withstand flotation pressures. These are considered to be feasible when having regard to the aforementioned detailed site investigation.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Greenfield Ruoff and Outfalls

5.7 The existing site greenfield runoff rates for the main catchment draining to the east have been calculated using HR Wallingford Greenfield Runoff estimation tool. The catchment area was assessed at 5.3Ha for the greenfield runoff calculation. It is noted that LLFA policy is to allow Qbar discharge based on the impermeable area draining to SUDs attenuation components.

5.8 Soil conditions are of low permeability, a soil (SPR) value of 0.3 has been used (soil type2). The existing site runoff rates are summarised in the table below:

QBAR	10.4l/s
1 in 1 year	8.9 l/s
1 in 30 years	24.1 l/s
1 in 100 years	39.1 l/s
QBAR/Ha	1.96l/s/ha
	2l/s/ha (default)

5.9 The calculated QBAR per unit area of impermeable area is therefore 1.96l/s/ha.

5.10 The development of the site will inevitably result in the generation of additional surface water runoff **if** the proposed measures are not taken to mitigate the impact of introducing impermeable surfaces.

5.11 The proposed site surface water drainage strategy will therefore utilise a scheme of sustainable drainage systems (SuDS) to control runoff rates and mitigate against the impact of increased runoff volumes. It is noted at Arun policy is for permitted discharge to be the QBAR rate for the impermeable areas of the site only.

5.12 Greenfield runoff has been assessed for the whole site and Qbar has been assessed as 2l/s/ha as shown in the table above.

5.13 Storage volumes have been assessed as follows using Infodrainage software with 45% climate change allowance and using the 2022 FEH method of calculation.

ARUN DISTRICT COUNCIL AL/89/24/OUT

5.14 Greenfield runoff has been assessed for the whole site and Qbar has been assessed as 2l/s/ha as shown in the table below.

Greenfield runoff calculations to evaluate Qbar/ha	
Drained Area	8.5ha
Greenfield Runoff Rate (QBAR)	16.5 l/s
1 in 1-year runoff	14.0 l/s
1 in 30-year runoff	40.0 l/s
1 in 100-year runoff	61.7 l/s
Qbar/ha (based on connected impermeable area)	2l/s/ha (default)

5.15 Storage volumes have been assessed as follows using Infodrainage software with 45% climate change allowance and using the 2022 FEH method of calculation.

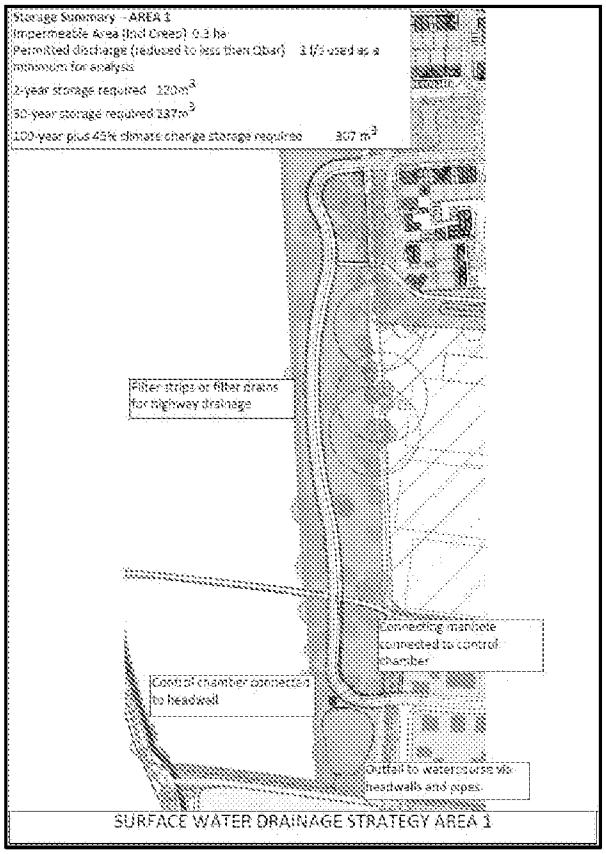
Storage Summary – AREA 1	
Impermeable Area (Incl Creep)	0.3 ha
Permitted discharge (reduced to less than Qbar)	1 l/s used as a minimum for analysis
2-year storage required	120m^3
30-year storage required	237m^3
100-year plus 45% climate change storage required	307 m^3

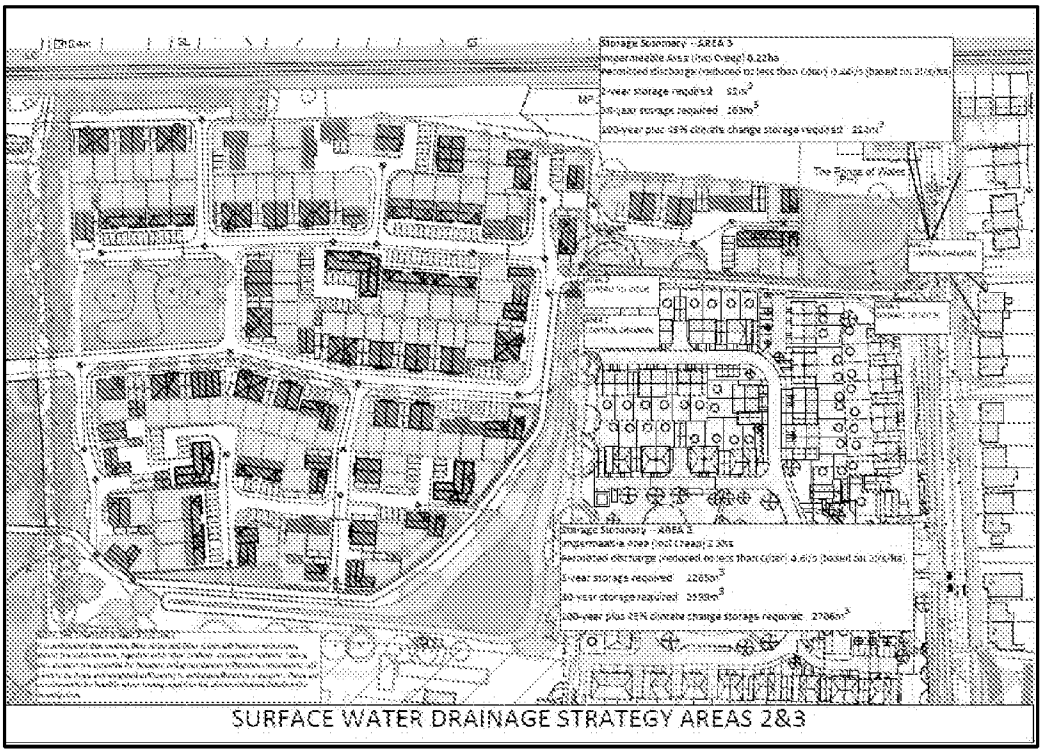
Storage Summary – AREA 2	
Impermeable Area (Incl Creep)	2.3ha
Permitted discharge (reduced to less than Qbar)	4.6l/s (based on 2l/s/ha)
2-year storage required	1265m^3
30-year storage required	2199m^3
100-year plus 45% climate change storage required	2706m^3

Storage Summary – AREA 3	
Impermeable Area (Incl Creep)	0.22ha
Permitted discharge (reduced to less than Qbar)	0.44l/s (based on 2l/s/ha)
2-year storage required	83m^3
30-year storage required	163m^3
100-year plus 45% climate change storage required	214m^3

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5.16 The proposed surface water drainage strategy is shown below and in more detail at Appendix 6. This shows the preferred solution:





SURFACE WATER DRAINAGE STRATEGY (see Appendix 6)

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5.17 There is no historical record of flooding in proximity to the site. Groundwater measurements have indicated that groundwater can be close to the surface.

5.18 It will therefore be necessary to design all underground components, including SuDS components to take account of the potential high water table / groundwater levels.

5.19 Mitigation measures to be considered should include sealed SuDS components to avoid the risk of groundwater infiltration, elevated finished floor levels and elevated road levels.

5.20 SuDS components will need to be designed to withstand flotation pressures.

Water Quality

5.21 Water Quality assessment should be in compliance with the guidance in The SuDS Manual, CIRIA Repot C753.

5.22 Surface water generated from the site will be accommodated through a drainage treatment train, which will include the use of SuDS. The approach to water quality risk management is the Simple Index Approach. This approach is defined in Table 26.2 of the SuDS Manual.

5.23 The approach is a simple stepped system as follows:

Step 1- Allocate suitable pollution hazard indices for the proposed land use
Step 2 - select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.
Step 3 – Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach.

5.24 The pollution hazard indices are defined in table 26.2 of the SuDS Manual.

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TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.6 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways'	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites, trunk roads and motorways'	High	0.8[2]	0.8[2]	0.9[2]

5.25 The total pollution hazard index for the site is:

Land Use	Pollution hazard level	TSS	Metals	Hydro-carbons
Residential Roofs	Very Low	0.2	0.2	0.05
Drives and low traffic roads	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45

5.26 The SuDS mitigation indices are defined in Table 26.3 of the SuDS Manual:

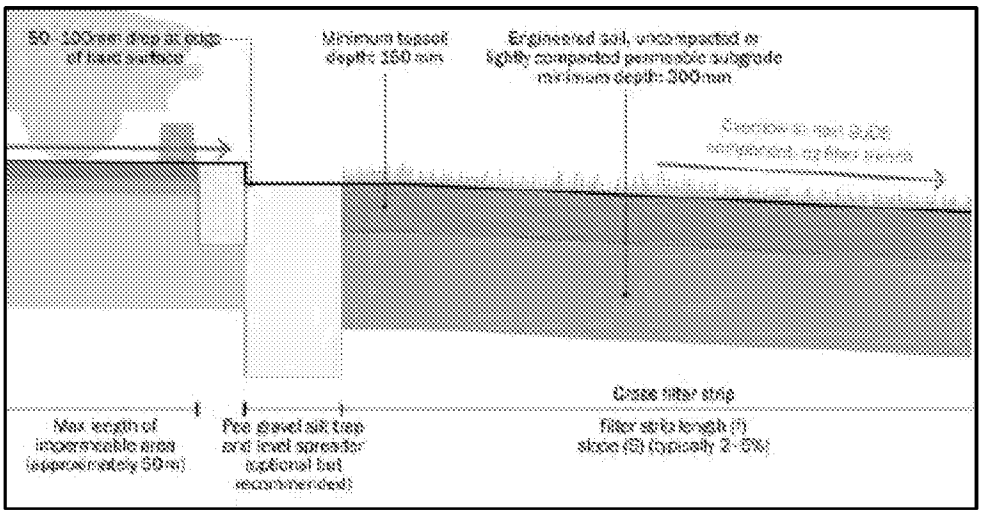
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TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[2]	0.7	0.8
Wetland	0.8[2]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

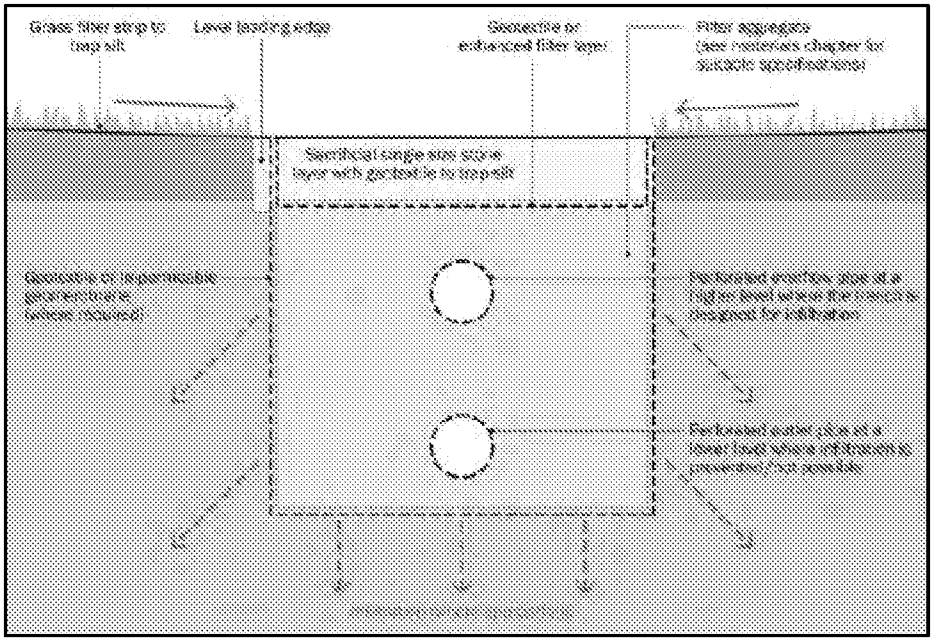
5.27 The Hazard Index and the proposed mitigation methods are shown in the table below:

SuDS Component	TSS	Metals	Hydrocarbons
Detention basin	0.5	0.5	0.6
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Mitigation totals	**1.3**	**1.3**	**1.5**
Hazard Index Total	0.7	0.6	0.45



Filter Strip Schematic (SuDS Manual)

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Filter Drain Schematic (SuDS Manual)

5.28 Therefore, the proposed Drainage Strategy including SuDS components consisting of filter strips and filter drains for the road drainage and piped drainage for roof and plot drainage all routed through a detention basin will achieve the required level of water quality improvement. These should be incorporated at detailed design stage, by way of discharge of suitable planning conditions.

ARUN DISTRICT COUNCIL AL/89/24/OUT

6. Foul Water Drainage Strategy

6.1 A Developer has the right to communicate with public sewers, as prescribed in the Water Industry Act 1991, s106.

6.2 Southern Water has a statutory duty to ensure that any flows connected from the Site do not add to any pre-existing flood risk. When a site is connected to the existing public sewer network Southern Water is responsible for any flooding from its sewers.

6.3 Any necessary mitigation in the form of network reinforcement, as a consequence of the development, must be provided by Southern Water and this is funded by Infrastructure Charges (section 146(2) of the Water Industry Act 1991) as detailed in the current charging regime and in line with Ofwat's charging rules.

6.4 The Ofwat Charging Rules sets out a definition for Network Reinforcement:

Network Reinforcement *refers to work other than Site Specific Work, as defined below, to provide or modify such other: i. Water Mains and such tanks, service reservoirs and pumping stations, or ii.* ***Sewers and such pumping stations as is necessary in consequence of the Site Specific installation*** *or connection of Water Mains, Service Pipes, Public Sewers and Lateral Drains pursuant to an agreement with, or a duty owed under the Water Industry Act 1991 to, a person other than a relevant undertaker, including a requisition (under sections 41(1), 98(1) or 98(1A)), under an agreement for adoption (under sections 51A or 104), under a section 66D of or a section 117E agreement, pursuant to section 45(1) (Duty to make connections with main) or in accordance with another duty imposed by the Act,* ***or in consequence of the exercise of rights under section 106(1) (Right to communicate with public sewers****), or pursuant to an agreement for bulk supplies of water or bulk discharge with a New Appointee. It also includes the additional capacity in any earlier Water Main or Sewer that falls to be used in consequence of the provision or connection of a new Water Main or Sewer.*

6.5 The charging rules are embodied in Southern Water's charging regime.

6.6 The assessment of any necessary network reinforcement that may be required is carried out using a sewer modelling process and can result in solutions involving storage or increased pipe sizes.

ARUN DISTRICT COUNCIL AL/89/24/OUT

6.7 Southern Water, as the sewerage undertaker, has a statutory duty to effectually drain its area as required by the Water Industry Act 1991, s94, including wastewater treatment.

6.8 Southern Water's Charging document "Development Services and New Connection Charging Arrangements" sets out the company's policy on Infrastructure Charges as follows:

The Infrastructure Charge

Under the Water Industry Act (1991) ***and in line with Ofwat's Charging Scheme Rules water*** *companies are able to recover costs from developers for work that is required on the company's existing network to provide for new development-related growth. These costs are recovered through the infrastructure charges which provide the income that water companies require to ensure that the network can cater for the newly connected properties.*

6.9 It is now a requirement of all sewerage undertakers to prepare wastewater management plans (DWMP). As with water resource management plans one of the over-riding principles in their DWMP is planning for growth.

Foul Point of Connection

6.10 The development will take advantage of the public sewer network serving Woodgate. A copy of the local sewers records is shown in Appendix 5. The proposed strategy is illustrated by the extract below, including in full at Appendix 6.

6.11 It is envisaged that the site will drain to the existing foul sewer network to the east of the site in in Lidsey Road.

6.12 The sewer in Lidsey Road is a 150mm diameter vitrified clay pipe.

6.13 Subject to final design, gravity sewers will serve the site draining to the existing foul sewer network via a new point of connection between manhole MH7201 and MH7102. (see sewer records at Appendix 2).

6.14 A pre-development capacity check has been made to Southern Water. The response is shown in Appendix 8.

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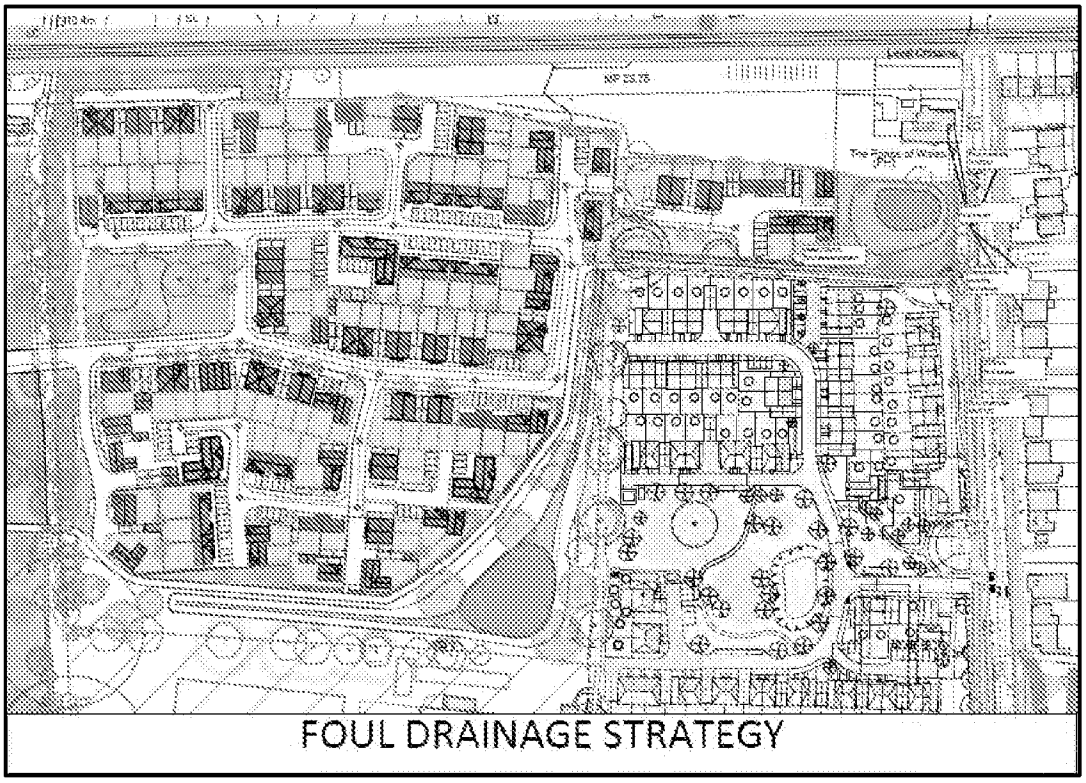
6.15 The foul sewer depths at the two manholes are shown below:

MH7201 is 1.61m deep

MH7102 is 1.93m deep

6.16 At the position of the proposed new manhole the approximate depth of the sewer will be 1.73m deep.

6.17 Subject to final levels design it may be possible to connect directly to the 225mm diameter pipe, if required.



FOUL WATER DRAINAGE STRATEGY (see Appendix 6)

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7. Summary and Conclusions

7.1 FortRidge Consulting Limited was commissioned by Hanbury Properties, to prepare a Flood Risk Assessment and Drainage Statement in support of an outline planning application for land west of Lidsey Road (A29), Woodgate. This Flood Risk Assessment and Drainage Statement summarises the approach taken in developing the drainage strategy for the site.

Flood Risk

7.2 This Report presents an assessment of flood risk in accordance with the guidelines set out in the NPPF and the supporting PPG, as well as the policies of ADC and the EA. It also provides a statement of the means of foul and surface water drainage.

7.3 The Report confirms that the Site is suitable for the development proposals and complies with planning policies.

7.4 The EA (Gov.uk) Maps indicate that the Site is at a low risk of fluvial flooding, and a low risk of surface and reservoir water flooding.

7.5 The Arun DC SFRA map documents show the area to be at high risk from groundwater flooding (>=75%). Groundwater flooding potential affects the large majority of the district, as shown by SFRA mapping. As the SFRA clarifies however, the AStGWF data on which it relies should be used only in combination with other information, for example local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. There is no historical record of groundwater flooding in Woodgate. The area is located on the edge of the identified groundwater emergence zone.

7.6 The SFRA indicates that there have been no historical surface water flood events at, or in proximity of the Site, and along with EA mapping both show the site is not at risk.

7.7 The Report demonstrates that the proposed development will remain at a low risk of flooding due to the nature of the site. For this reason the site can be considered to be within Flood Zone 1 and at the lowest risk of flooding. Accordingly neither the Sequential Test or the Exceptions Test are required for reasons set out in the National Planning Policy Framework or PPG.

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7.8 To mitigate against the effects of increased runoff SuDS attenuation drainage will be provided limiting flows to Qbar. The site is within Flood Zone 1 and therefore sequentially preferable for development, including more vulnerable development such as housing.

Surface Water Strategy

7.9 Having regard to the detailed findings in the Ashdown SI Ltd. Site investigation report due to the presence of high groundwater within the site infiltration drainage will not be possible. Attenuation drainage will be provided on the site in accordance with planning and drainage policy requirements.

7.10 Attenuation within the proposed surface water drainage strategy will be provided by detention basins or other shallow SuDS features on Site, before discharging to new or existing ditches within the site connecting to the existing watercourse adjacent to the site that drains to the east and west.

Foul Drainage Strategy

7.11 It is proposed that the site will drain to the existing foul main sewer network that serves the area. Connecting to a new manhole constructed downstream of MH7201 or MH7102.

7.12 A pre-development capacity check has been made to Southern Water. The response is shown in Appendix 8.

Conclusion

7.13 In summary, the proposed development is located in an area at low risk of flooding and mitigation measures have been recommended in order to ensure that the site does not increase the risk of flooding elsewhere.

7.14 It is concluded that the proposed development complies with ADC, EA, and NPPF policies and guidance.

7.15 The proposed development will connect to the existing foul sewer crossing the east of the site.

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Figure 1

Location Plan

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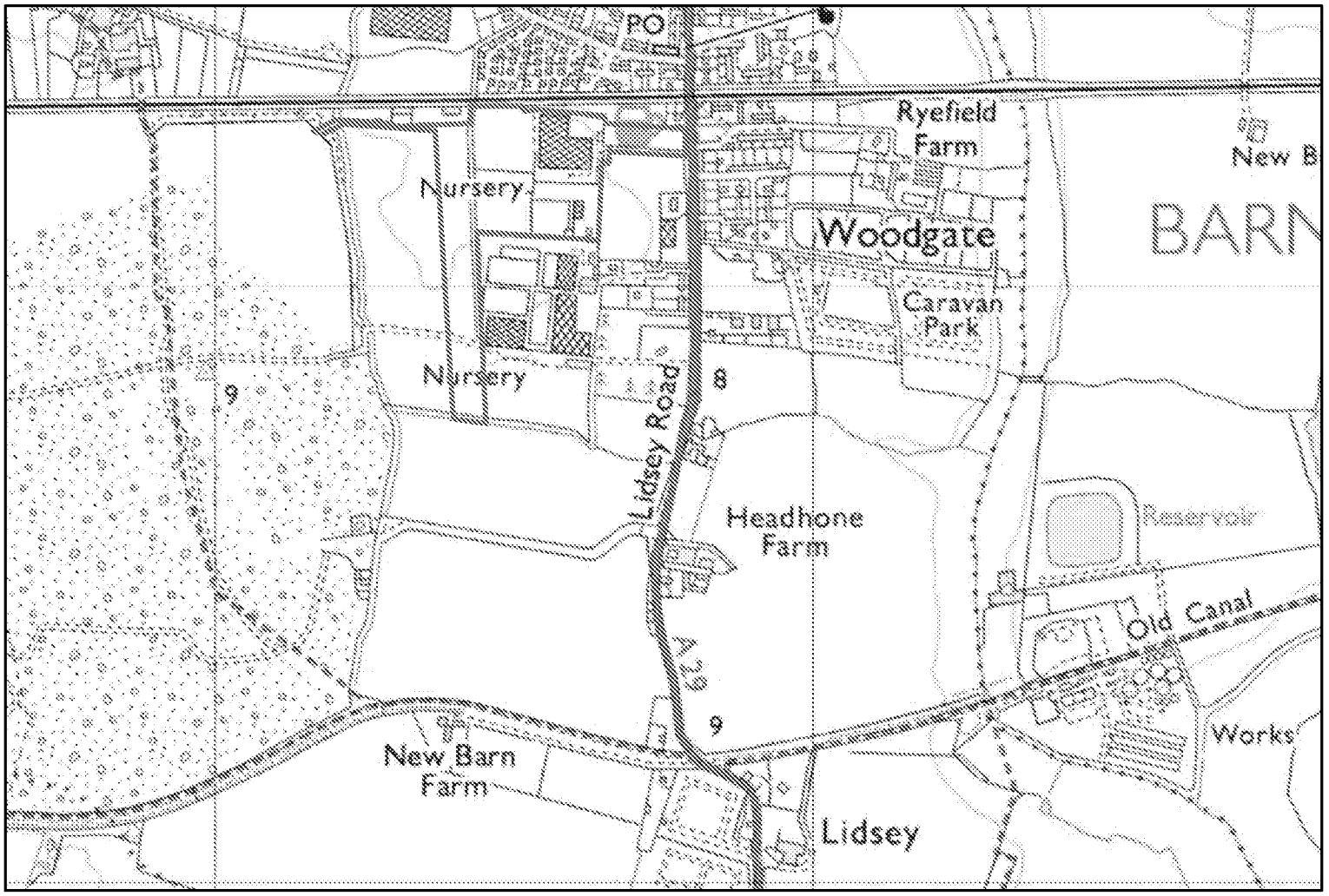


FIGURE 1: LOCATION PLAN

OS X (Eastings) 493549
OS Y (Northings) 104238
Nearest Post Code PO20 3YR

Figure 2

BGS Geology Map

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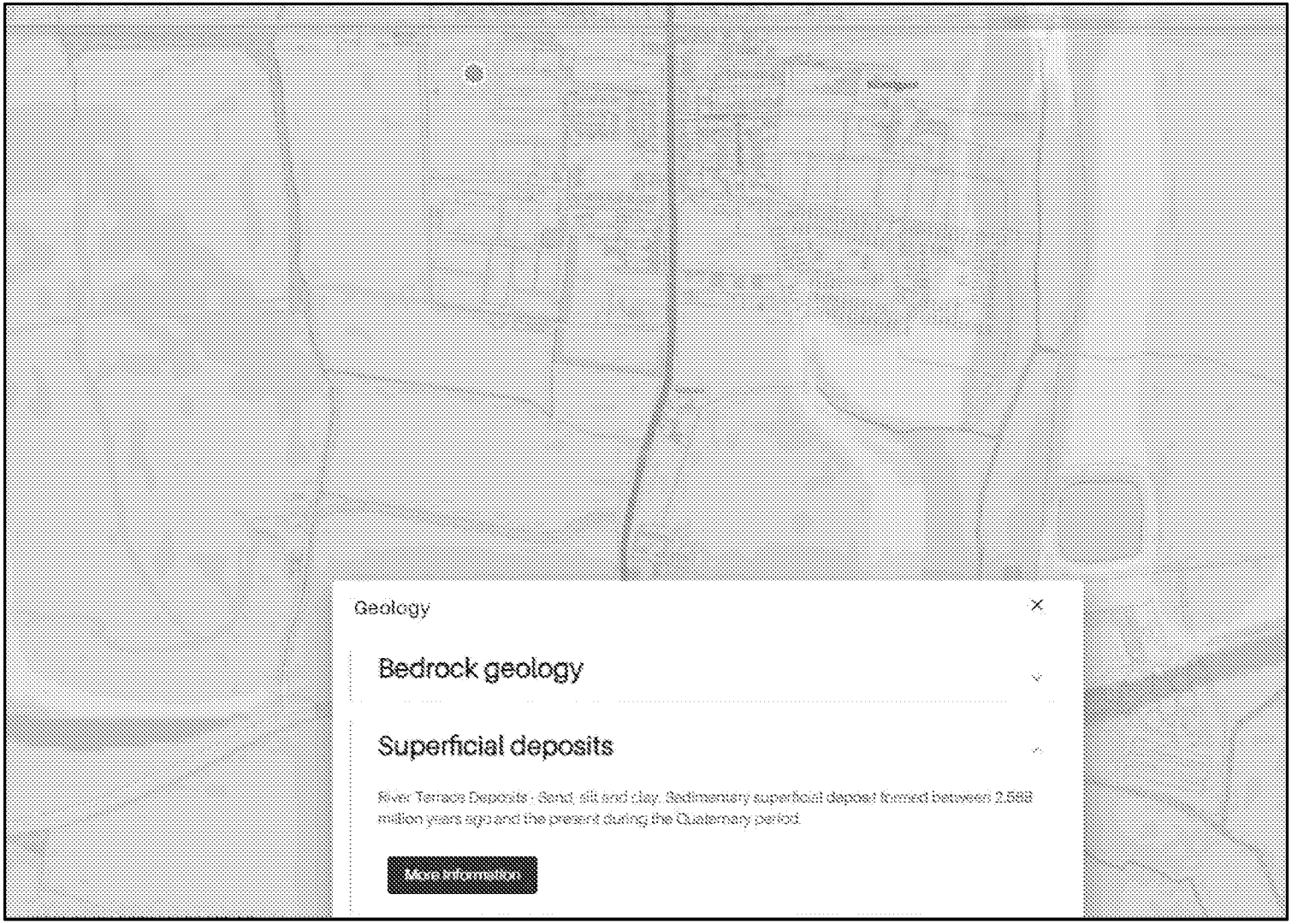


FIGURE 2.1: BGS Geology map - Superficial

River Terrace Deposits - Sand, silt and clay. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

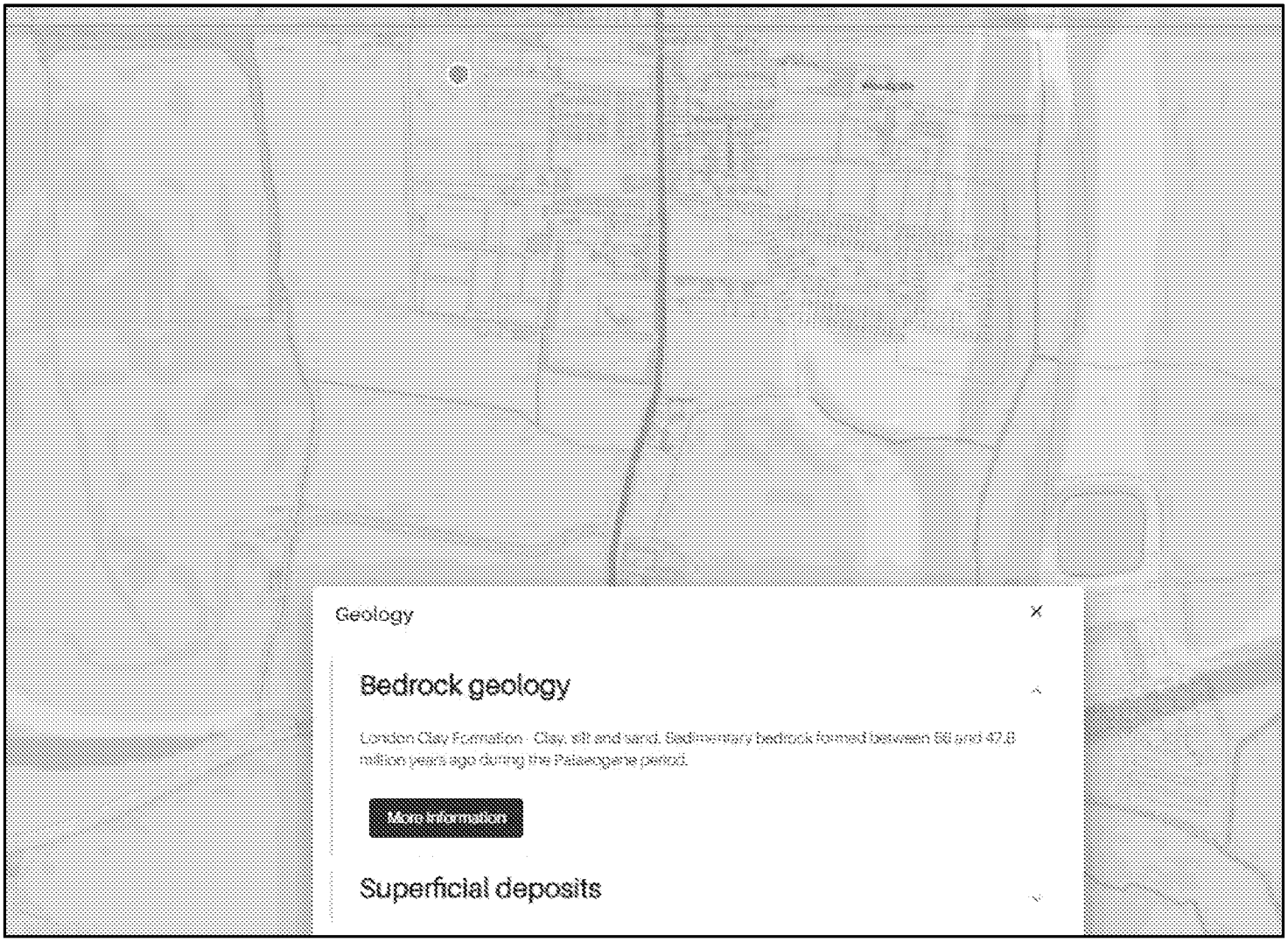


FIGURE 2.2: BGS Geology map – Bedrock

London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.

Figure 3

EA Bedrock Map

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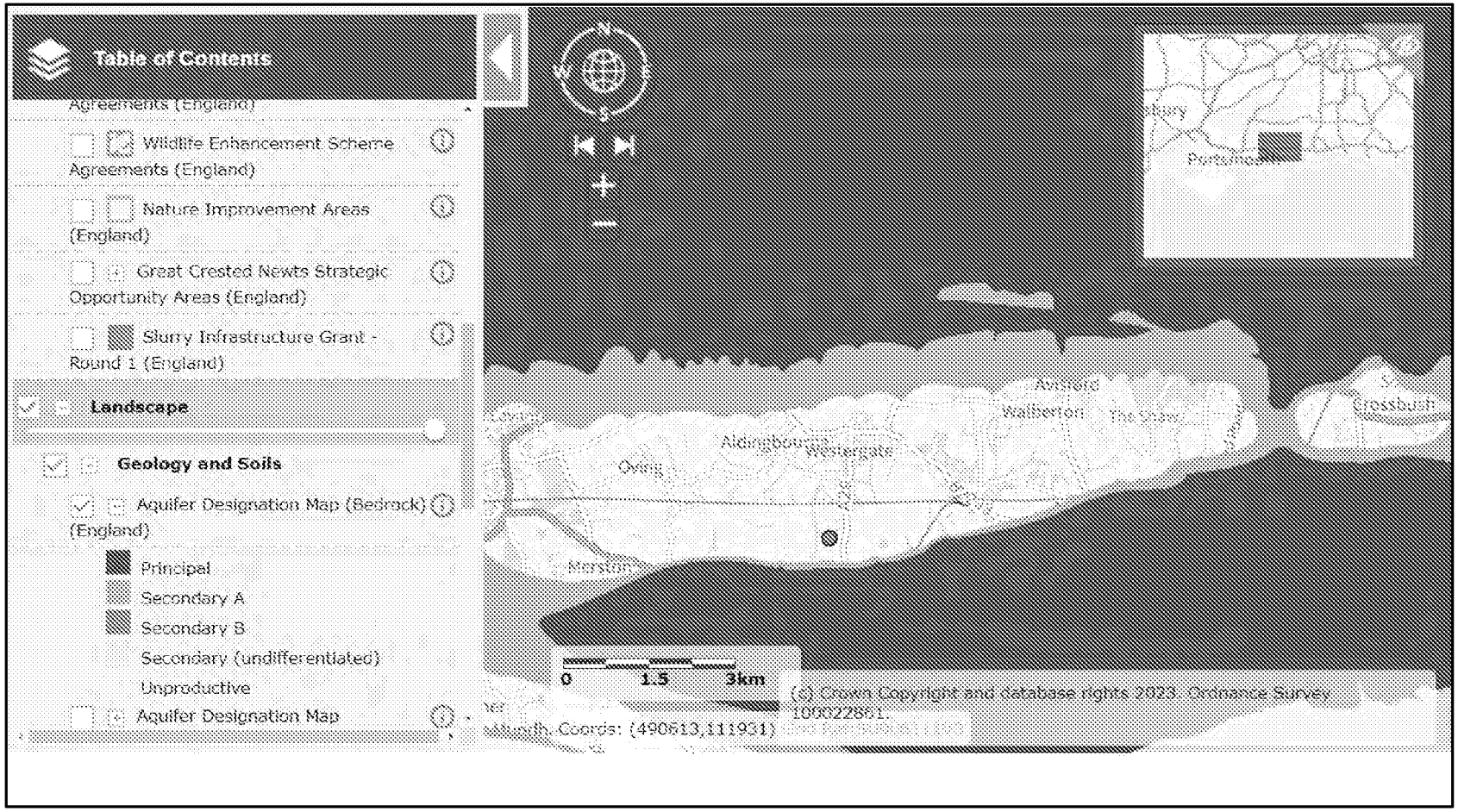


FIGURE 3: EA Bedrock Map

Figure 4

Soilscapes map (Magic maps)

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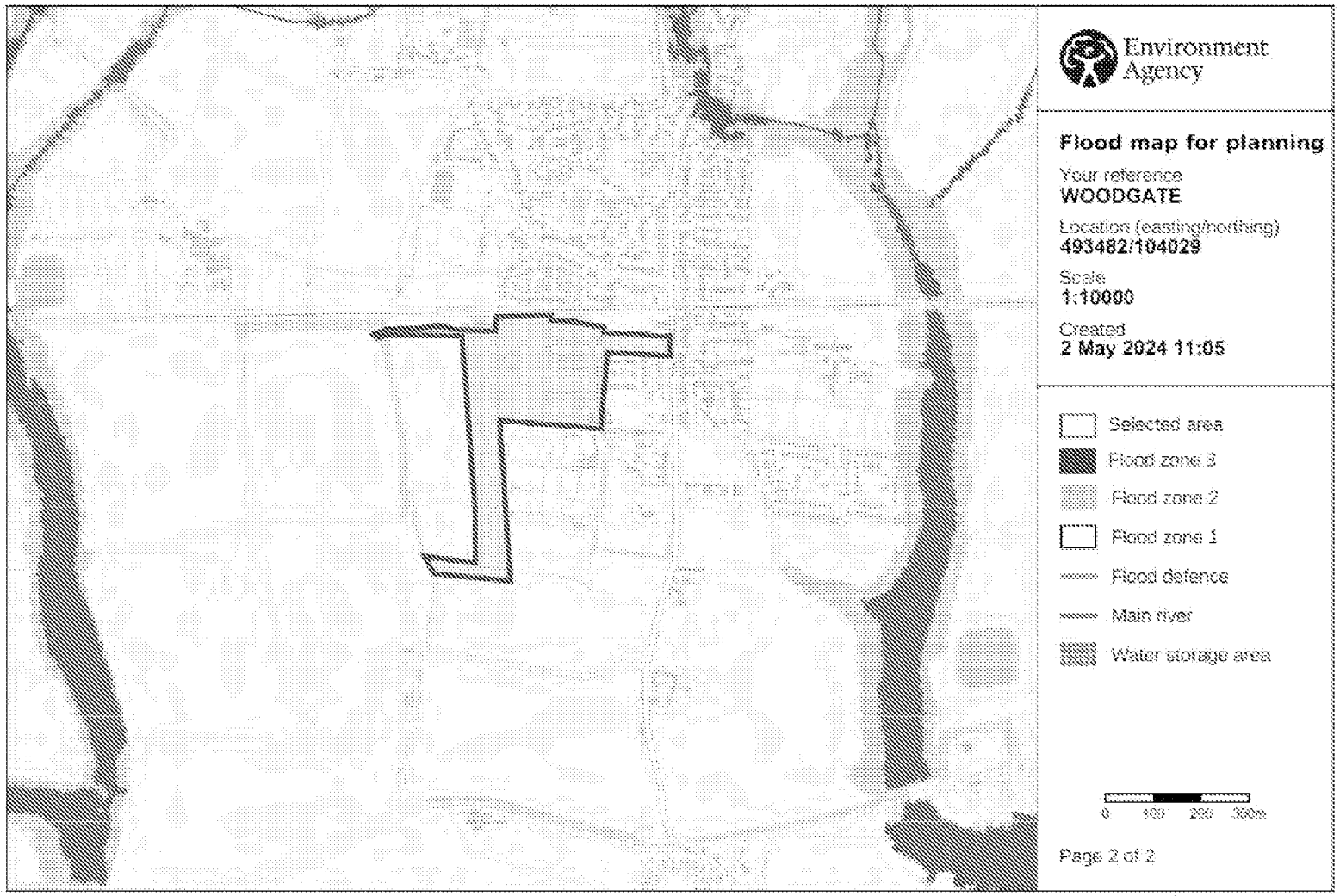


FIGURE 4: Soilscapes Map

Figure 5

EA Flood Map

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FIGURE 5: GOVERNMENT FLOOD MAP FOR PLANNING-FLOOD ZONE 1

Figure 6

EA Surface Water Flood Map

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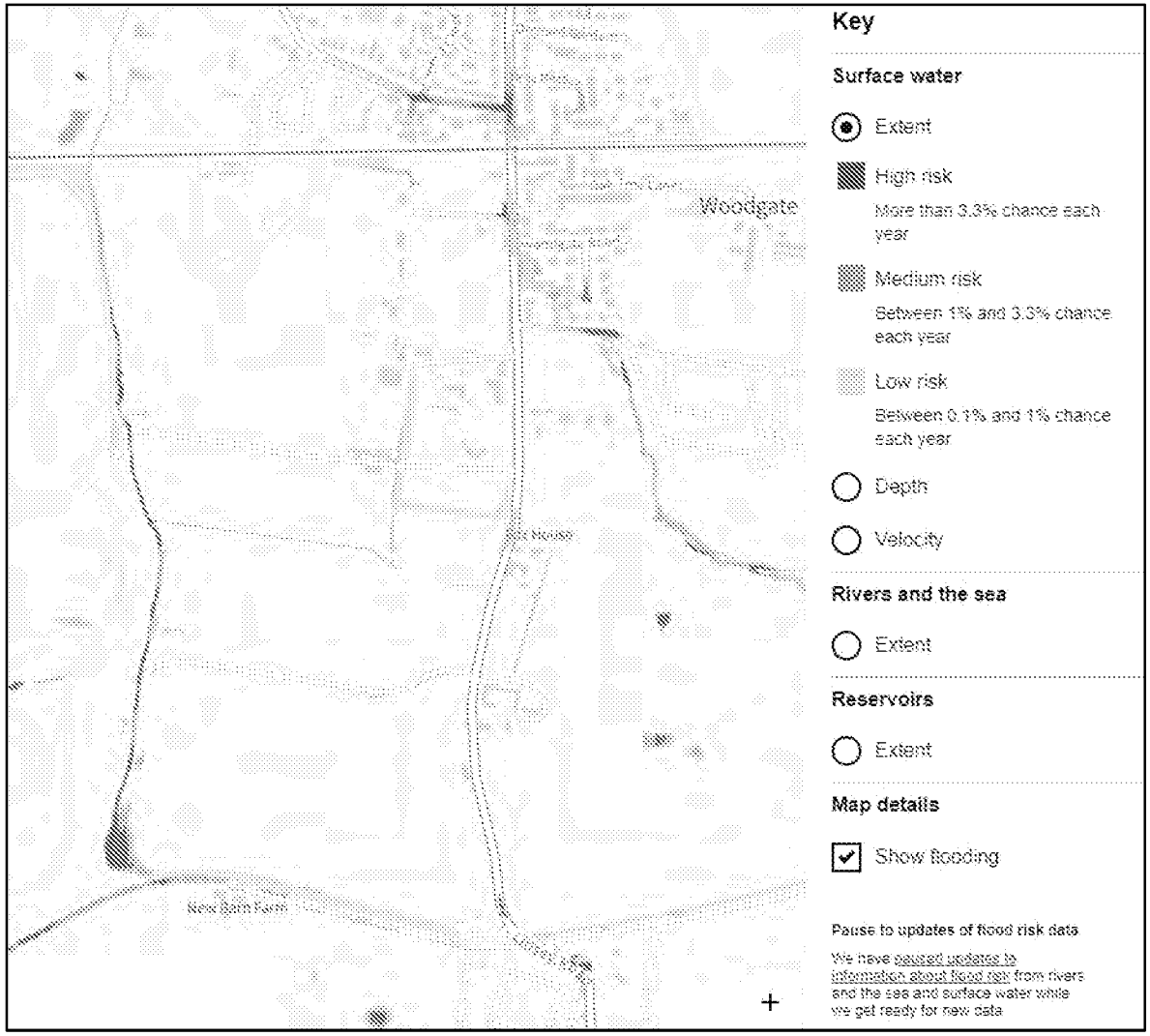


FIGURE 6: GOVERNMENT SURFAC E WATER FLOOD MAP - VERY LOW RISK

Figure 7

EA Reservoir Flood Map

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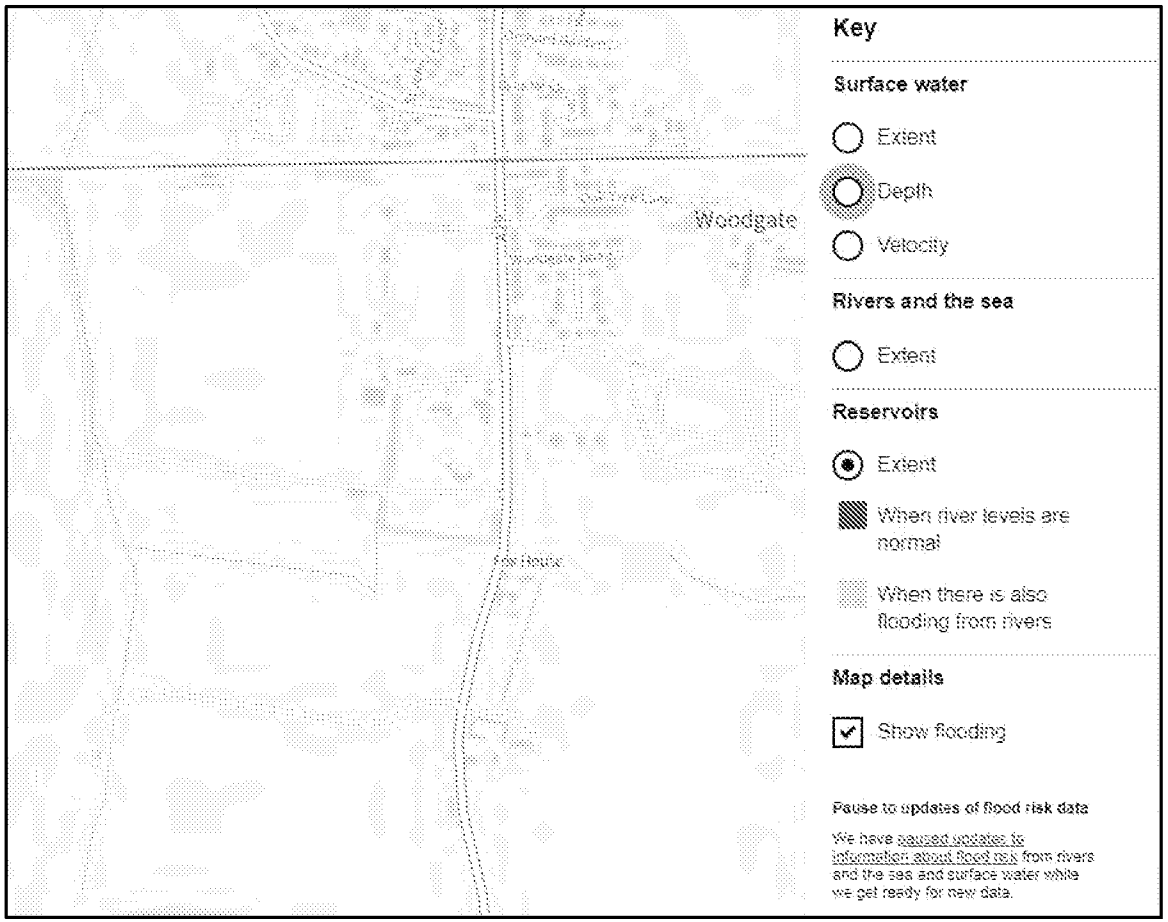


FIGURE 7: GOVERNMENT RESERVOIR FLOOD MAP-NONE

Appendix 1

Topographical Survey

ARUN DISTRICT COUNCIL AL/89/24/OUT

Offington

Plans you can build on ®

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Offington Land Surveys Ltd
15 Cherry Tree Close
Worthing
West Sussex, BN13 3QJ

Tel 01903 267685
surveyors@offington.com

Job: LAND WEST OF LIDSEY ROAD
WOODGATE
WEST SUSSEX

Drawing No: 17681120/TS

Client: HANBURY PROPERTIES

Version: 6.0
Publication Date: 08/05/2024
Plot Scale: 1:500
Sheet Size: A0 Portrait
Sheet: 1 of 4
Survey Date(s): 17/11/20-10/12/20, 07/04/21, 05/07/22, 05/11/23, 10/11/23, 14/11/23, 02/05/24 & 06/05/24
Surveyor: GT

STANDARD REFERENCE

Datum Used: Horizontal: OSGB
Grid: Vertical: OSGB36(15). See Notes for modelling.

Survey Station Ground Truth
Water Drainage
Bandle Parcel 1
Bandle Parcel 2
Electricity Cable
British Telecom Cable
Chromacon Survey Map Line
Chromacon Survey Water Main Line
Land Registry General Boundary 'T'
Land Registry Boundary Ringing
Highway Extent

The details shown thereon relating to all underground services are as obtained by normal above-ground survey observations and methods and where indicated also by reference to available utility records. Although all reasonable efforts have been made no guarantee can be given for the completeness or accuracy of this information. Assume drainage pipes 150mm∅ unless stated.

* where different to Chromacon Survey map limits

ABBREVIATIONS

BL	Bed Level	IC	Inspection Cover
BT	British Telecom IC	IL	Invert Level
CATV	Television Cable Pit	LP	Lamp Post
CL	Cover Level	MH	Manhole
CM	Cable Marker	OHC	Overhead Cable
CP	Catch Pit	PG	Post Gully
dp	Depth	RS	Road Sign
ECP	Electricity Cable Pit	SH	Service Housing
EP	Electricity Pole	SV	Stop Valve
FH	Fire Hydrant	SW	Storm Water
FP	Footpath	TP	Telegraph Pole
G	Gully	WM	Water Meter

FENCES

PCB	Close Boarded	PMP	Metal Palisade
PCL	Chain Link	PPA	Panel
PIR	Iron Railings	PPP	Post & Rail
PPW	Post & Wire		

STATION SCHEDULE

Station	Eastings(m)	Northings(m)	Level(m)
1	493014.992	103767.597	7.749
2	493022.899	103793.221	8.870
3	493029.768	103839.446	9.058
4	493041.226	103881.354	9.088
5	493036.993	103902.926	8.853
6	493050.977	103909.012	8.852
7	493065.665	103955.957	8.817
8	493057.149	103993.590	8.282
9	493045.414	103979.938	7.897
10	493016.815	103993.535	8.474
11	492779.078	103997.871	7.228
12	492747.464	103988.214	7.461
13	492668.527	103923.233	8.197
14	492411.028	103912.342	9.816
15	492425.005	104085.260	10.724
16	492215.535	104283.671	9.224
17	492242.269	104778.781	8.821
18	493362.324	104778.178	9.436
19	493338.302	104270.566	10.017
20	493413.145	104270.642	10.359
21	493163.597	104288.693	9.546
22	493536.188	103951.499	9.426
23	493936.574	103971.949	9.509
24	493902.912	103862.245	8.946
25	493905.248	104099.729	8.421
26	493902.842	104224.188	8.114
27	493781.160	104251.920	8.410
28	493833.472	104200.155	9.574
29	493834.106	104176.419	9.837
30	493816.976	104200.128	10.025
31	493772.191	103796.992	8.533
32	493827.945	104134.162	7.913
33	493786.206	104224.557	8.828
34	493828.877	104229.630	10.043
35	493812.666	104103.429	7.941
36	493770.211	103711.213	8.707
37	493806.681	103795.962	8.838

TREE SCHEDULE

No.	ID	S	H	Notes
T.1	G.2	8	6	
T.2	G.2	8	6	
T.3	G.3	6	8	
T.4	Ave. G.3	6	8	2no.
T.5	G.5	12	10	
T.11	G.7	10	12	
T.12	Ave. G.5	8	12	2no.
T.14	G.3	6	10	
T.16	G.3	6	10	
T.17	G.45	8	10	
T.18	G.5	10	10	
T.20	Ave. G.4	10	12	2no.
T.21	G.4	8	10	
T.22	G.4	12	12	
T.23	G.3	4	12	
T.24	G.4	10	12	
T.25	G.5	12	12	
T.26	G.3	4	12	
T.27	G.5	12	12	
T.28	G.3	8	6	
T.29	G.45	8	8	
T.30	G.3	6	8	
T.31	G.7	6	10	
T.32	G.8	6	10	
T.33	G.5	6	8	
T.34	G.4	8	8	
T.35	G.3	6	8	
T.36	G.45	8	10	
T.37	G.2	8	6	
T.38	G.3	6	8	
T.39	G.3	6	8	
T.40	G.5	10	12	
T.41	Ave. G.5	10	12	2no.
T.42	G.65	10	14	
T.43	G.3	6	10	
T.44	G.3	8	8	
T.45	G.45	8	8	
T.46	G.8	8	10	
T.47	G.45	6	8	
T.48	G.3	4	8	
T.49	G.3	4	6	
T.50	G.4	4	6	
T.51	G.1	14	14	
T.52	G.8	10	12	
T.53	G.3	6	12	
T.54	G.3	6	12	
T.55	G.6	10	12	
T.56	G.5	10	12	
T.57	G.5	10	12	
T.58	G.4	10	12	
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T.62	G.4	10	12	
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T.65	G.4	6	12	
T.66	G.5	12	12	
T.67	G.4	6	8	
T.68	G.4	6	10	
T.69	G.9	12	12	
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T.72	G.7	14	14	
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T.74	G.7	14	14	
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T.76	G.1	14	14	
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T.79	G.6	8	10	
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T.81	Ave. G.6	10	14	2no.
T.82	G.6	12	12	
T.83	G.4	8	10	
T.84	G.4	8	10	
T.85	G.2	14	14	
T.86	G.8	10	10	
T.87	G.8	12	12	
T.88	G.6	14	14	
T.89	G.6	14	14	2no.
T.90	Ave. G.9	16	14	
T.91	G.6	10	12	
T.92	G.8	14	14	
T.93	G.9	14	14	
T.94	G.8	14	14	
T.95	G.8	14	14	
T.96	G.4	8	12	
T.97	G.2	14	14	
T.98	G.2	14	14	
T.99	G.2	8	10	4no.
T.100	Ave. G.4	10	8	3no.
T.101	Ave. G.8	18	12	
T.102	G.4	6	6	
T.103	G.4	6	8	
T.104	G.8	8	12	
T.105	Ave. G.4	8	6	4no.
T.106	G.6	10	12	
T.107	G.8	10	12	
T.108	G.5	10	12	
T.109	G.6	14	14	
T.110	G.5	10	10	
T.111	Ave. G.5	10	10	2no.
T.113	Ave. G.5	10	10	
T.114	G.1	14	14	
T.115	G.8	14	14	
T.116	G.8	14	14	
T.117	G.7	14	14	
T.118	G.7	14	14	
T.119	G.7	14	14	
T.120	G.7	14	14	
T.121	G.8	12	14	
T.122	G.1	12	14	
T.123	G.4	8	6	
T.124	G.4	6	8	
T.125	G.8	12	12	
T.126	G.8	12	12	
T.127	G.6	12	12	
T.128	G.1	12	12	
T.129	G.8	12	12	
T.130	G.1	14	14	
T.131	G.1	14	12	
T.132	G.4	6	6	
T.133	G.2	12	12	
T.134	G.1	14	14	
T.135	G.7	12	10	
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T.137	G.3	4	8	
T.138	G.5	10	10	
T.139	G.5	10	10	
T.140	Ave. G.7	12	12	2no.
T.141	G.2	6	8	
T.142	G.3	6	8	
T.143	G.5	8	8	
T.144	G.5	8	8	
T.145	Ave. G.5	12	12	3no.
T.146	Ave. G.5	12	12	2no.
T.147	G.5	12	12	
T.148	G.5	12	10	
T.149	G.2	8	8	
T.150	G.3	6	8	
T.151	G.8	10	10	
T.152	G.4	8	6	
T.153	Ave. G.5	12	12	2no.
T.154	Ave. G.5	12	12	2no.
T.155	G.4	12	12	
T.156	G.4	12	12	
T.157	G.5	12	12	
T.158	G.5	12	12	2no.
T.159	Ave. G.5	10	12	2no.
T.160	G.5	12	12	
T.161	G.4	10	12	
T.162	Ave. G.4	12	12	2no.
T.163	G.45	10	12	
T.164	G.5	10	12	
T.165	G.3	10	12	
T.166	G.3	4	6	
T.167	G.3	4	6	

No.	ID	S	H	Notes
T.168	G.3	8	6	
T.170	G.7	12	10	
T.171	G.3	6	8	
T.172	G.3	6	8	
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T.175	G.3	6	8	
T.176	G.3	6	8	
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T.183	1	10	8	
T.184	Ave. G.4	8	14	2no.
T.185	G.4	8	12	
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T.189	G.7	10	12	
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T.192	G.4	10	8	
T.193	G.3	10	6	
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T.195	G.3	6	8	
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T.197	G.4	6	6	
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T.199	G.3	8	8	
T.200	G.2	8	8	
T.201	G.4	6	8	
T.202	G.3	6	8	
T.203	G.4	8	12	
T.204	G.4	8	12	
T.205	G.32	6	8	
T.206	G.3	8	6	
T.207	G.3	8	8	
T.208	G.3	6	8	
T.209	G.3	6	8	
T.210	Ave. G.3	10	10	5no.
T.211	G.45	8	10	
T.212	G.6	12	12	
T.213	G.7	16	14	
T.214	Ave. G.4	14	14	3no.
T.215	Ave. G.55	18	14	2no.
T.216	G.5	12	12	
T.217	Ave. G.55	14	14	2no.
T.218	G.8	16	16	
T.219	G.3	8	12	
T.220	G.4	10	12	
T.221	G.4	8	12	
T.222	G.3	8	12	
T.223	G.3	8	12	
T.224	G.3	8	12	
T.225	G.4	8	12	
T.226	G.3	8	12	
T.227	G.3	8	12	
T.228	G.3	8	12	
T.229	G.3	8	12	
T.230	G.3	8	12	
T.231	G.3	8	12	
T.232	Ave. G.3	10	8	5no.
T.233	G.3	8	12	
T.234	G.4	8	12	
T.235	G.3	8	12	
T.236	G.4	8	12	
T.237	G.5	10	12	
T.238	G.45	8	12	
T.239	G.3	8	12	
T.240	G.4	8	12	
T.241	Ave. G.4	8	10	2no.
T.242	G.3	8	12	
T.243	G.3	6	12	
T.244	Ave. G.4	6	10	2no.
T.247	G.3	8	12	
T.248	G.3	8	12	
T.249	G.3	8	12	
T.250	G.8	12	12	
T.251	Ave. G.5	12	14	2no.
T.252	G.6	14	14	
T.253	G.8	8	8	
T.254	G.7	10	10	
T.255	G.5	8	6	
T.256	G.5	6	6	
T.257	G.8	8	8	
T.258	G.1	8	8	
T.259	G.3	6	8	
T.260	G.4	8	12	
T.261	Ave. G.4	8	10	2no.
T.262	G.3	8	12	
T.263	G.3	6	12	
T.264	G.3	12	12	
T.265	Ave. G.5	12	14	2no.
T.266	G.4	6	8	
T.267	G.45	10	10	
T.268	Ave. G.8	12	12	2no.
T.269	G.3	4	6	
T.270	G.3	6	8	
T.271	G.7	10	12	
T.272	Ave. G.8	10	6	2no.
T.273	G.5	10	8	
T.274	G.8	10	10	
T.275	G.5	10	8	
T.276	G.5	10	8	
T.277	Ave. G.5	12	12	3no.
T.278	Ave. G.5	12	12	2no.
T.279	Ave. G.4	12	12	2no.
T.280	Ave. G.6	10	10	2no.
T.281	G.5	12	12	
T.282	G.6	10	10	
T.283	G.8	10	10	
T.284	G.5	10	10	
T.285	G.5	10	8	
T.286	G.5	8	8	
T.287	G.7	12	12	
T.288	G.7	12	12	
T.289	Ave. G.8	10	10	2no.
T.290	G.5	10	10	
T.291	Ave. G.4	4	8	2no.
T.292	G.8	10	10	
T.293	G.6	6	6	
T.294	G.4	6	6	
T.295	G.2	6	6	
T.296	G.8	8	8	
T.297	G.5	6	10	
T.298	Ave. G.5	8	8	2no.
T.299	G.6	8	8	
T.300	Ave. G.5	8	8	2no.
T.301	G.4	6	8	
T.302	G.5	6	6	
T.303	Ave. G.5	8	10	2no.
T.304	G.3	8	8	
T.305	G.8	10	10	
T.306	G.8	10	10	
T.307	G.4	8	8	
T.308	G.4	6	8	
T.309	G.8	8	8	
T.310	G.8	10	10	
T.311	G.4	10	10	
T.312	G.2	8	6	
T.313	Ave. G.5	8	12	4no.
T.314	Ave. G.4	8	12	4no.
T.315	G.5	10	10	
T.316	G.5	8	10	
T.317	G.8	10	8	
T.318	Ave. G.4	10	12	2no.
T.319	G.8	10	8	
T.320	G.5	12	12	
T.321	G.5	12	12	
T.322	G.3	6	12	
T.323	G.3	8	12	
T.324	G.3	8	10	

D = Diameter(m), S = Spread(m), H = Height(m)
Tree spread and height are approximate. If priced, agreed values should be inspected and recorded and/or verified by a qualified expert.

NOTES

Ordnance Survey data may date variation under licence no 100022432
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Ordnance Survey Level Rules

173 Level Points (approx. centre of photo area)

Eastings(m)	Northings(m)	Equiv. OSGB36 Lat. & Long(DD)	Equiv. OSGB36 Lat. & Long(DMS)
492900	103700	50.8194, -0.40700	50°49'9.84" -0°24'25.20"

OS Local Grid: OSGL or Local Plane: 2.1937 ft
National OS Grid: 1000.000 m
Ellipsoidal Above Ground Level Correction: 1010.291 m
Divergence over Projection: 0.291 m

Table adopted to ground based survey (OSGL): 0.2937 %
Scale to apply to true ground distances (OSGL): 1.0010 %
Scale factor over OS Local Plane:

Local HTRN transformation model fitted then corrected to OSTN15 RTK control network.

Levels

The CAD model of this drawing operates 3D data as follows.

Layer	Type	Description	Invisible
ajdpm	Point	ground spot height	No
cntr_feature	Note	non-ground spot height	No
cntr_marker	Point	control station spot height	Yes
TPI	Line	tertiary form ground spot heights	No
contour	Line	0.5m interval polyline from TIN	Yes
contourmajor	Line	1.0m interval polyline from TIN	Yes
contourtext	Text	contour height annotation	Yes
contourtextmajor	Text	major contour height annotation	Yes

Titles

These drawings contain are marked with dynamic boundary extents.

Normal set points - consultant at 10m, (NEA2969) & (NEA2971)
Northwest and South points - consultant at site (NEA2541)

Highway Search Indices

Highway search and Ordnance Survey data lines version 2.2 is still held in CAD in this version but the levels are switched off from viewing/plotting to not confuse the clarity.

VERSION HISTORY

Version	Date	Description
1.0	11/12/2020	Original drawing study
2.0	11/12/2020	Survey plan
2.1	11/12/2020	Corrected some detail in verses CAD layers
2.2	30/03/2021	Interspersed Highway Splash Extent
3.0	09/04/2021	Revision of area at proposed entrance
4.0	06/07/2022	More detail opposite proposed entrance
5.0	26/07/2023	Overlay of Estate parcels
6.0	17/11/2023	Resurvey of road levels
7.0	20/11/2023	Superseded & check levels of 4 removed
8.0	08/05/2024	New topography to frontage of WINGS development by new road junction & drainage

N

0m 25m

SCALE 1:500

Offington

Plans you can build on

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Worthing
West Sussex, BN13 3QJ

Tel: 01903 267633
surveyors@offington.com

Job: LAND WEST OF LIDSEY ROAD
WOODGATE
WEST SUSSEX

Drawing No.: 17531120/TS

Client: HANBURY PROPERTIES

Version:	8.0
Publication Date:	09/05/2024
Plot Scale:	1:500
Sheet Size:	A0 Portrait
Sheet:	2 of 4
Survey Date(s):	17/11/20-10/12/20, 07/04/21, 05/07/22, 08/11/23, 10/11/23, 14/11/23, 05/05/24 & 06/05/24
Surveyor:	GT

STANDARD REFERENCE

Datum Used: Newlyn ODN
Grid: OSGB36(15). See Notes for scaling

Survey Station Shown Thus:
Water Drainage:
Bayliss Parcel 1
Bayliss Parcel 2
Electricity Cable
British Telecom Cable
Cirrbourne Survey Map Line
Cirrbourne Survey Water Map Line
Land Registry Defined Boundary Line*
Land Registry Boundary Edging
Highway Extent

The details shown hereon relating to all underground services are as obtained by external above-ground survey observation and methods and where indicated also by reference to available utility records. Although all reasonable efforts have been made no guarantee can be given for the completeness or accuracy of this information. Assume drainage pipes 100mm if unless stated.

* where different to Cirrbourne Survey map limits

ABBREVIATIONS

BL	Bird Level	IC	Inspection Cover
BT	British Telecom IC	IL	Invert Level
CATV	Television Cable Pit	LP	Lamp Post
CL	Cover Level	MH	Manhole
CM	Cable Marker	OHP	Overhead Cable
CP	Catch Pit	RG	Road Gully
dp	Depth	RS	Road Sign
ECP	Electricity Cable Pit	SH	Service Hooding
EP	Electricity Post	SV	Stop Valve
FH	Fire Hydrant	uhV	Storm Valve
FP	Footpath	TP	Telegraph Pole
G	Gully	WM	Water Meter

FENCES

FCB Close Boarded	FPal Metal Palisade
FCL Chain Link	FPan Panel
FIR Iron Railings	FPR Post & Rail
FPW Post & Wire	

STATION SCHEDULE

Station	Eastings(m)	Northings(m)	Levels(m)
1	493314.993	103197.597	7.748
2	493222.193	103183.221	8.670
3	493233.388	103038.448	9.680
4	493211.293	103581.954	9.690
5	493528.939	103582.386	8.280
6	493299.977	103802.012	8.652
7	493285.085	103481.887	9.617
8	493237.148	103303.860	9.852
9	493513.434	103278.006	7.597
10	493518.818	103406.026	8.474
11	493379.978	103207.871	7.229
12	493147.414	103383.216	7.841
14	493268.227	103602.226	9.467
15	493411.828	103812.242	9.549
16	493623.808	104080.206	9.764
17	493218.528	104280.671	9.934
18	493242.259	104076.761	8.561
19	493342.804	104076.179	9.436
20	493338.302	104270.096	10.017
21	493412.149	104272.840	10.150
22	493180.897	104388.693	9.546
23	493539.195	103681.490	9.408
24	493692.874	103471.943	9.593
25	493802.012	103862.240	8.948
26	493666.262	104099.239	8.421
28	493664.642	104226.168	8.514
27	493781.406	104251.793	8.410
29	493624.472	104250.155	9.874
30	493624.192	104176.413	9.837
31	493815.674	104203.138	10.028
34	492772.101	103795.588	8.890
38	492627.845	104195.182	9.813
39	493765.905	104226.357	8.828
40	493526.571	104259.880	10.041
41	493518.586	104163.628	9.241
51	492775.231	103711.213	8.797
53	492660.091	103795.962	8.830

TREE SCHEDULE

No	D	S	H	Notes
T 1	W	E	6	
T 2	0.3	E	6	
T 3	0.5	E	6	
T 4	av. 0.3	E	6	2no.
T 5	0.8	E	12	
T 6	0.7	E	12	
T 7	av. 0.5	E	6	2no.
T 8	0.3	E	6	
T 9	0.3	E	6	
T 10	0.9	E	10	
T 11	0.45	E	10	
T 12	0.35	E	10	
T 13	av. 0.4	E	12	2no.
T 14	0.3	E	10	
T 15	0.5	E	12	
T 16	0.8	E	12	
T 17	0.7	E	12	
T 18	0.6	E	12	
T 19	0.7	E	12	
T 20	0.85	E	6	
T 21	0.3	E	6	
T 22	0.7	E	10	
T 23	0.5	E	10	
T 24	0.6	E	10	
T 25	0.5	E	12	
T 26	0.5	E	12	
T 27	0.8	E	12	
T 28	0.3	E	6	
T 29	0.85	E	6	
T 30	0.3	E	6	
T 31	0.7	E	10	
T 32	0.8	E	10	
T 34	0.3	E	6	
T 35	0.45	E	10	
T 37	0.3	E	6	
T 38	0.3	E	6	
T 39	0.3	E	6	
T 40	0.8	E	12	
T 41	av. 0.5	E	12	2no.
T 42	0.55	E	14	
T 43	0.3	E	10	
T 44	0.3	E	6	
T 45	0.45	E	8	
T 46	0.6	E	8	
T 47	0.45	E	6	
T 48	0.3	E	6	
T 49	0.3	E	6	
T 50	0.3	E	6	
T 51	1	E	14	
T 52	0.8	E	12	
T 53	0.3	E	6	
T 54	0.5	E	12	
T 55	0.8	E	12	
T 56	0.8	E	12	
T 57	0.8	E	12	
T 58	0.6	E	12	
T 59	0.6	E	12	
T 60	0.6	E	12	
T 61	0.6	E	12	
T 62	0.6	E	12	
T 63	0.8	E	12	
T 64	0.6	E	12	
T 65	0.4	E	6	
T 66	0.6	E	12	
T 67	0.6	E	12	
T 68	0.6	E	12	
T 69	0.6	E	12	
T 70	1	E	14	
T 71	0.7	E	14	
T 72	0.7	E	14	
T 73	0.8	E	14	
T 74	1.2	E	14	
T 75	1.2	E	14	
T 76	1.2	E	14	
T 77	1.2	E	14	
T 78	1.2	E	14	
T 79	1	E	14	
T 80	0.6	E	12	
T 82	0.55	E	12	
T 83	av. 0.4	E	12	2no.
T 84	av. 0.55	E	12	2no.
T 85	0.6	E	12	
T 86	0.5	E	10	
T 87	0.5	E	10	
T 88	0.5	E	10	
T 89	0.7	E	12	
T 90	av. 0.9	E	14	2no.
T 91	0.6	E	12	
T 92	0.9	E	14	
T 93	0.8	E	14	
T 94	0.8	E	14	
T 95	0.8	E	14	
T 96	0.6	E	12	
T 97	0.6	E	12	
T 98	0.6	E	12	
T 99	0.9	E	12	
T 100	av. 0.4	E	10	4no.
T 101	av. 0.6	E	12	3no.
T 102	0.9	E	6	
T 103	0.4	E	6	
T 104	0.8	E	12	
T 105	av. 0.4	E	12	4no.
T 106	0.5	E	10	
T 107	0.5	E	12	
T 108	0.8	E	12	
T 109	0.5	E	12	
T 110	0.8	E	14	
T 111	0.5	E	12	
T 112	0.5	E	10	
T 113	av. 0.5	E	10	2no.
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T 115	0.6	E	14	
T 116	0.6	E	14	
T 117	0.7	E	14	
T 118	0.7	E	14	
T 119	0.7	E	14	
T 120	0.7	E	14	
T 121	0.8	E	14	
T 122	1.1	E	14	
T 123	0.4	E	6	
T 124	0.4	E	6	
T 125	0.6	E	12	
T 126	0.8	E	12	
T 127	0.8	E	12	
T 128	1	E	12	
T 129	0.8	E	12	
T 130	1	E	12	
T 131	1	E	12	
T 132	0.4	E	6	
T 133	1.2	E	12	
T 134	1	E	14	
T 135	0.7	E	12	
T 136	0.9	E	6	
T 137	0.4	E	6	
T 138	0.8	E	10	
T 139	0.5	E	10	
T 140	av. 0.7	E	12	3no.
T 141	0.5	E	8	
T 142	0.5	E	8	
T 143	0.5	E	8	
T 144	0.5	E	8	
T 145	av. 0.5	E	12	2no.
T 146	av. 0.5	E	12	2no.
T 147	0.5	E	12	
T 148	0.5	E	12	
T 149	0.5	E	12	
T 150	0.4	E	8	
T 151	0.8	E	10	
T 152	0.4	E	8	
T 153	av. 0.5	E	12	2no.
T 154	av. 0.8	E	12	2no.
T 155	av. 0.3	E	12	2no.
T 156	0.4	E	6	
T 157	0.5	E	8	
T 158	av. 0.3	E	12	2no.
T 159	av. 0.5	E	12	2no.
T 160	0.5	E	12	
T 161	0.4	E	10	
T 162	av. 0.4	E	12	2no.
T 163	0.6	E	12	
T 164	0.5	E	10	
T 165	0.5	E	10	
T 166	0.4	E	8	
T 167	0.3	E	6	

No	D	S	H	Notes
T 168	0.3	E	6	
T 170	0.7	E	12	
T 171	0.5	E	8	
T 172	0.3	E	6	
T 173	0.5	E	8	
T 174	0.3	E	6	
T 175	0.4	E	6	
T 176	0.5	E	8	
T 177	0.3	E	6	
T 178	0.3	E	6	
T 179	0.3	E	6	
T 180	0.5	E	8	
T 181	0.4	E	6	
T 182	0.4	E	6	
T 183	1	E	14	
T 184	av. 0.4	E	8	2no.
T 185	0.4	E	6	
T 186	0.4	E	6	
T 187	0.4	E	6	
T 188	0.7	E	12	
T 189	0.7	E	12	
T 190	0.7	E	12	
T 191	0.4	E	6	
T 192	0.3	E	6	
T 193	0.3	E	6	
T 194	0.3	E	6	
T 195	0.3	E	6	
T 196	0.3	E	6	
T 197	0.4	E	6	
T 198	0.3	E	6	
T 199	0.3	E	6	
T 200	0.4	E	6	
T 201	0.4	E	6	
T 202	0.4	E	6	
T 203	0.3	E	6	
T 204	0.4	E	6	
T 205	0.22	E	6	
T 206	0.4	E	6	
T 207	0.3	E	6	
T 208	0.3	E	6	
T 209	0.3	E	6	
T 210	av. 0.3	E	10	5no.
T 211	0.5	E	8	
T 212	0.5	E	12	
T 213	0.7	E	14	
T 214	av. 0.4	E	14	3no.
T 215	av. 0.65	E	14	3no.
T 216	0.55	E	10	2no.
T 217	av. 0.55	E	10	2no.
T 218	0.4	E	10	
T 219	0.3	E	6	
T 220	0.6	E	12	
T 221	0.3	E	6	
T 222	0.3	E	6	
T 223	0.3	E	6	
T 224	0.3	E	6	
T 225	0.3	E	6	
T 226	0.3	E	6	
T 227	0.3	E	6	
T 228	0.3	E	6	
T 229	0.3	E	6	
T 230	0.3	E	6	
T 231	0.3	E	6	
T 232	av. 0.5	E	10	5no.
T 233	0.5	E	8	
T 234	0.5	E	8	
T 235	0.5	E	8	
T 236	0.45	E	6	
T 237	0.6	E	8	
T 238	0.4	E	6	
T 239	0.4	E	6	
T 240	0.4	E	6	
T 241	av. 0.4	E	10	3no.
T 242	0.3	E	6	
T 243	0.3	E	6	
T 244	av. 0.4	E	10	3no.
T 245	0.3	E	6	
T 246	0.3	E	6	
T 247	0.3	E	6	
T 248	0.6	E	12	
T 249	0.8	E	12	
T 250	0.8	E	12	
T 251	0.7	E	12	
T 252	0.8	E	12	
T 253	0.3	E	6	
T 254	0.7	E	12	
T 255	0.5	E	8	
T 256	0.45	E	6	
T 257	0.6	E	8	
T 258	1.1	E	8	
T 259	0.3	E	6	
T 260	0.7	E	8	
T 261	0.6	E	10	
T 262	0.4	E	6	
T 263	0.5	E	8	
T 264	0.7	E	10	
T 265	0.3	E	6	
T 266	av. 0.6	E	12	2no.
T 267	0.45	E	10	
T 268	0.3	E	6	
T 269	0.3	E	6	
T 270	0.3	E	6	
T 271	0.7	E	12	
T 272	av. 0.6	E	10	3no.
T 273	0.5	E	10	
T 274	0.5	E	10	
T 275	0.5	E	10	
T 276	0.5	E	10	
T 277	av. 0.8	E	12	3no.
T 278	av. 0.5	E	12	2no.
T 279	av. 0.6	E	12	2no.
T 280	av. 0.5	E	10	2no.
T 281	0.5	E	10	
T 282	0.5	E	10	
T 283	0.5	E	10	
T 284	0.5	E	10	
T 285	0.5	E	10	
T 286	av. 0.8	E	10	2no.
T 287	0.7	E	12	
T 288	0.7	E	12	
T 289	av. 0.6	E	12	2no.
T 290	0.5	E	10	
T 291	0.5	E	8	
T 292	0.4	E	6	
T 293	0.4	E	6	
T 294	0.4	E	6	
T 295	0.3	E	6	
T 296	0.3	E	6	
T 297	0.5	E	8	
T 298	0.6	E	10	
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T 302	0.8	E	10	
T 303	0.6	E	10	
T 304	0.6	E	10	
T 305	0.4	E	6	
T 306	0.8	E	10	
T 307	0.4	E	6	
T 308	0.4	E	6	
T 309	0.4	E	6	
T 310	0.5	E	10	
T 311	0.4	E	6	
T 312	0.3	E	6	
T 313	av. 0.5	E	8	4no.
T 314	av. 0.8	E	12	4no.
T 315	0.5	E	10	
T 316	av. 0.4	E	10	5no.
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T 318	0.8	E	12	
T 319	av. 0.6	E	12	2no.
T 320	0.6	E	12	
T 321	0.5	E	10	
T 322	0.5	E	8	
T 323	0.5	E	8	
T 324	0.3	E	6	

E - Elevation(m), S - Spread(m), H1 - Height(m)
Tree crown and height are approximate. It should, however, normally be regarded as accurate unless verified by a qualified expert.

NOTES

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Ordnance Survey Data Style

GB United Kingdom (OSGB) all United Kingdom

Eastings	Northings	Easting OSGB36	Easting OSGB36 Lon
489900	103750	N 103750.442	W 1489900.442

OS Transformation (OSTN15) at Ground Point	0.2997	m
Scale factor OS Grid error	1.000 000	m
Distribution Arun District Council Derived Distance	1.000 291	m
Combination over distance	0.291	m
Easting applied to ground based survey (GE) to	0.2997	m
Scale to apply for true ground distances (TGD) to	1.0005	m
Scale value to the OS Grid Point		

Level differences to survey have been derived from observed to OSGB, RTK vertical network.

Terrain

The CAD model of this drawing contains 3D terrain as follows:

Layer	Type	Description	Printable
xpoint	data	ground spot height	No
xphoto_feature	Photo	non ground spot height	No
zworld_vegtop	Node	point where soil height	No
TIN	Line	Irregular triangulated spot heights	No
Contour	Line	0.5m interval derived from TIN	Yes
ContourMajor	Line	1.0m interval derived from TIN	Yes
Unnamed	Text	Contour height annotation	Yes
zwallsegment	Text	Boiler vertical height information	Yes

Title

These internal borders are marked with general boundary edging.

Title Plan - Surrendered at HMLR SY800 & WSX224171
Northeast and South parcels - Surrendered at HMLR WSX234170

Highway Search Information

Highway extract and Ordnance survey map from version 2.2 is still held in CAD in the version but the layers are switched off from viewing/printing in this version for clarity.

VERSION HISTORY

Version	Date	Description
1.0	11/12/2020	Original desktop study
2.0	11/12/2020	Survey plan
2.1	11/12/2020	Corrected some detail in wrong CAD layers
3.0	20/02/2021	Trim revised Highway Branch Extent
4.0	06/04/2021	Proximity of trees at proposed entrance
4.0	05/07/2022	More detail opposite proposed entrance
5.0	26/07/2022	Overlay of Bayliss parcels
6.0	17/11/2023	Resurvey at road levels
7.0	20/11/2023	Supersede & check levels of 45 remainder
8.0	09/05/2024	New topography by fine-tape at WINGS, development inv, new road junction & drainage

levels to North surveyed 2020
levels to South surveyed 2021

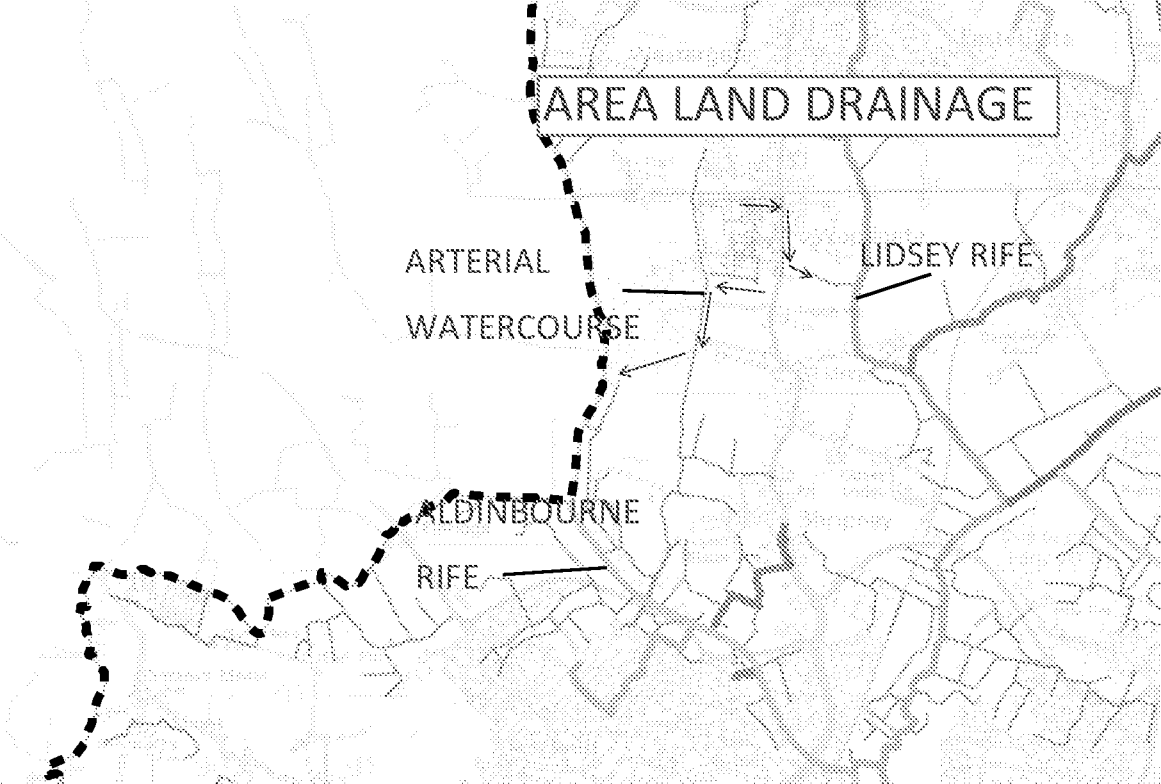
levels to North surveyed 2021
levels to South surveyed 2023

SCALE 1:500

Appendix 2

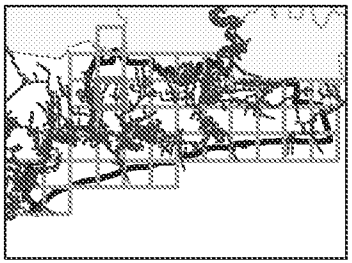
SFRA Mapping

ARUN DISTRICT COUNCIL AL/89/24/OUT


AREA LAND DRAINAGE
ARTERIAL
WATERCOURSE
LIDSEY RIFE
ALDINBOURNE
RIFE



Key Plan



Legend

- Arun District CFRA Boundary
- Main Rivers
- Aldingbourne Rife
- Ash Canal
- Barnham & Eastergate Main
- Binsted Rife
- Black Ditch
- Bailey Pond & Ditch
- East Aldingbourne Rife
- East Walberton Ditch
- Fishbourne Rife
- Hothbridge Rife
- Lidsey Rife
- Little Paddington Stream
- North Bersted Drain
- Pagham Harbour Channels
- Pagham Rife
- River Arun
- Ryebank Rife
- Shripney Manor Ditch
- Tidal Flood Gates
- Tangmere Rife
- Walberton Arboretum

0 0.175 0.35 0.7 km

REF	Date	Comments
A	xxx 2012	
B		
C		

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ARUN DISTRICT COUNCIL

LEVEL 1 SFRA: APPENDIX B WATERCOURSES

Sheet No: 31 of 45 Issue Number: ADC_31

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ARUN DISTRICT COUNCIL

ARUN DISTRICT COUNCIL_ALL800_ALL.dgn

N

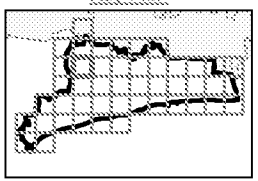
Notes

The Arun Borough Council Groundwater Flooding (GWF) SPD is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to underpin Level 1 Strategic Flood Risk Assessments (SFRA) studies and advise the Lead Local Flood Authorities (LLFA) to determine whether there may be a risk of flooding from groundwater.

The data covers the proportion of each 1km grid square where modelled and recorded groundwater levels show that groundwater is at surface. It does not show the likelihood of groundwater flooding occurring. It does not take account of the chance of flooding from groundwater rising. This dataset covers a large area of land, and may contain errors within the overall accuracy and we actively seek to further our understanding of groundwater flooding.

The GWF SPD data should be used only to contribute with other information, for example local knowledge, historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. It cannot be used to rule on, deny or recommend at a local scale where new development should occur.

Key Plan



Legend

Arun District (GWF) boundary

< 25%

>= 25% <50%

>= 50% <75%

>= 75%

0 0.125 0.25 0.5 Km

Drawn	Date	Amendments
JD	xx.xx.2015	
JD		
JD		

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ARUN DISTRICT COUNCIL

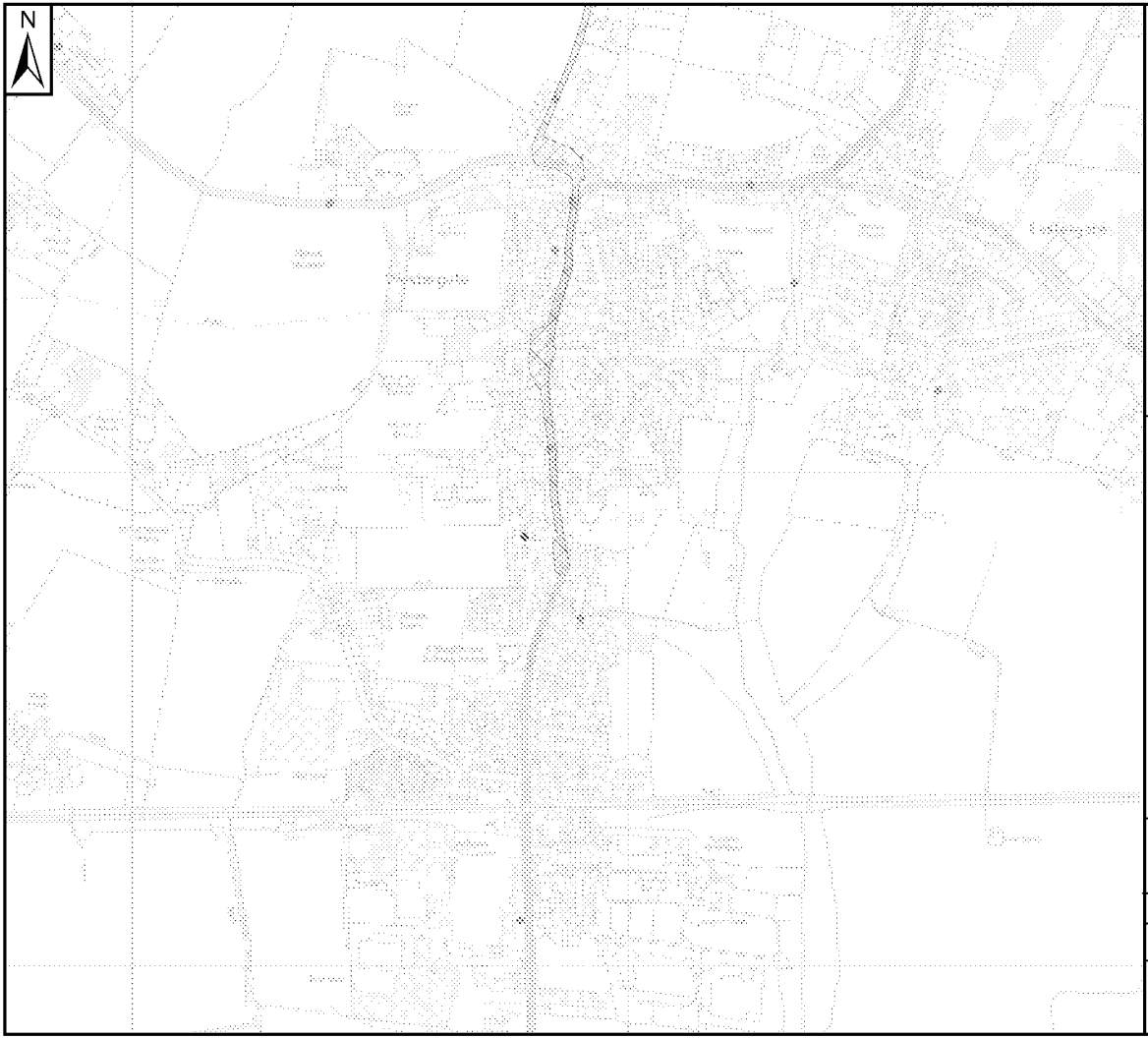
LEVEL 1 SFRA APPENDIX F

AREAS SUSCEPTIBLE TO GROUNDWATER

Drwg. No: xx-xx-xx Scale / Format: 1:50,000

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ARUN



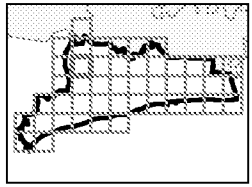
Notes

The historic flooding map shows the recorded locations and flood outlines provided by Arun District Council, West Sussex County Council, Southern Water and Environment Agency. Historical flood extent was digitised from the Environment Agency.

Flooding however, could occur in other locations than shown upon the records provided to the mapping. Additional flood events could occur in undefined areas. No assurances are given and liability cannot be accepted in relation to it.

Please note that not all historical flooding may be shown on the map, and that it is based on records provided and digitised. Council for updated information, June 2015.

Key Plan



Legend

Area Outline of this Boundary

Historic flood outline

Source of Flooding

- Fluvial
- Ground
- Surface water
- Pluvial
- Overspill

0 0.25 0.5 1 Km

REF	Date	Comments
a	June 2015	-
b		
c		

For more information, please contact the Planning Policy Team at Arun District Council, Civic Centre, Maltravers Road, Littlehampton, West Sussex, BN17 5LF or email planningpolicy@arun.gov.uk or telephone 01903 737839

ARUN DISTRICT COUNCIL

LEVEL 1 SFRA APPENDIX H

HISTORIC FLOODING RECORDS

Drawing No: 01 of 05 Map Number: MD_01

Whilst every care has been taken to ensure the accuracy of the material contained in this publication, the Council cannot accept responsibility for any errors or omissions or for any loss or damage arising from interpretation or use of the information contained herein.

ARUN

Appendix 3

Proposed Development

ARUN DISTRICT COUNCIL AL/89/24/OUT



DAVIES LANDSCAPE ARCHITECTS

Suite F1, Stroud House, Russell Street, Stroud, Gloucestershire, GL5 3AN
w. www.d-la.co.uk e. info@d-la.co.uk t. 01453 760380

KEY: Application Boundary

Rev	Date	Details	By	QA
S07	12.06.24	Tracking Changes	MD	MD
S06	30.05.24	Layout amendments and Design Freeze	MD	MD
S05	18.03.24	Access priority changed to QW2	MD	MD
S04	11.03.24	Red Line Boundary changes	MD	MD
S03	26.02.24	Layout changes	MD	MD
S02	22.02.24	Layout changes	MD	MD
S01	05.02.24	Access alignment changes	MD	MD

V:\Data\Server DATA\PROJECT FILES\2222 Woodgate South QW3\Landscape\Drawings\Sketch\DLA.2222.L.01.S00 Block Plan\DLA.2222.L01.S07 Block Plan - QW3.dwg

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CLIENT: Hanbury Properties

PROJECT: Woodgate QW3

TITLE: Block Plan

STATUS: Sketch

NUMBER

Project	Origin	Volume	Level	Type	Discip	Number	Rev
2222	DLA	XXX	XXX	DR	L	L01	S07

Job Number 2150 Scale NTS @ A3 Size A3 Date 18.03.2024

Appendix 4

Storage Calculations

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	0.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	9.000
Depth (m)	1.000
Base Level (m)	8.000
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.10
Total Volume (m³)	331.110

Depth (m)	Area (m²)	Volume (m³)
0.000	400.00	0.000
0.700	550.00	331.110
1.000	650.00	510.901

Inlets

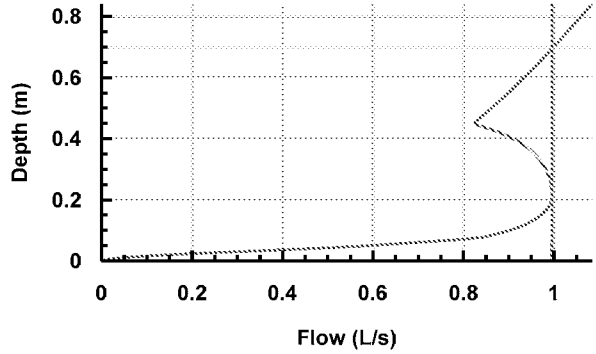
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.000
Design Depth (m)	0.700
Design Flow (L/s)	1.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1000-0700-1000



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 2 years: +45 %: 15 mins: Summer	0.30	92.6	41.160

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 2 years: +45 %: 960 mins: Winter	8.281	8.281	0.281	0.281	7.1	120.483	0.000	0.000	1.0	98.332	63.612	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

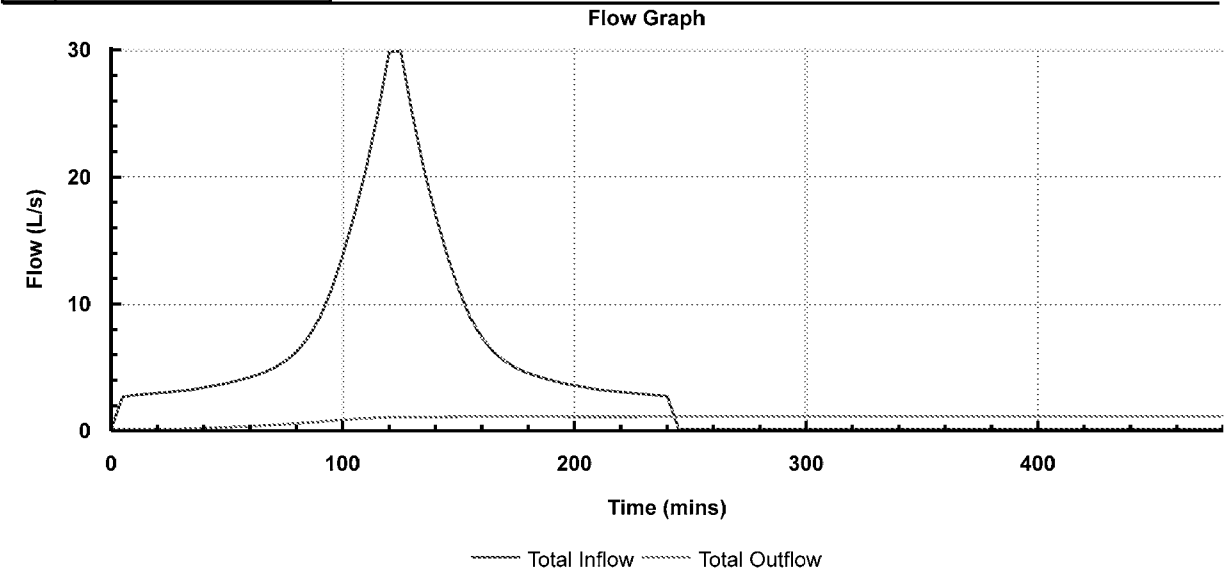
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

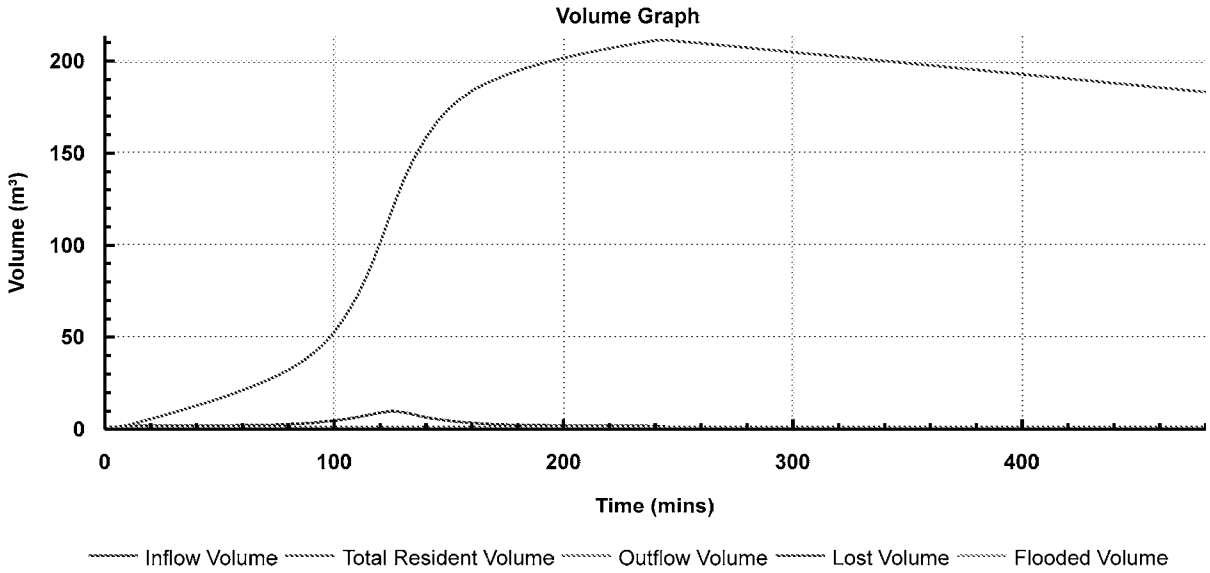
Phase
FEH: 2 years: Increase Rainfall (%): +45: 240 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	23.903
TOTAL	29.9	115.432	1.0	23.903

Graphs





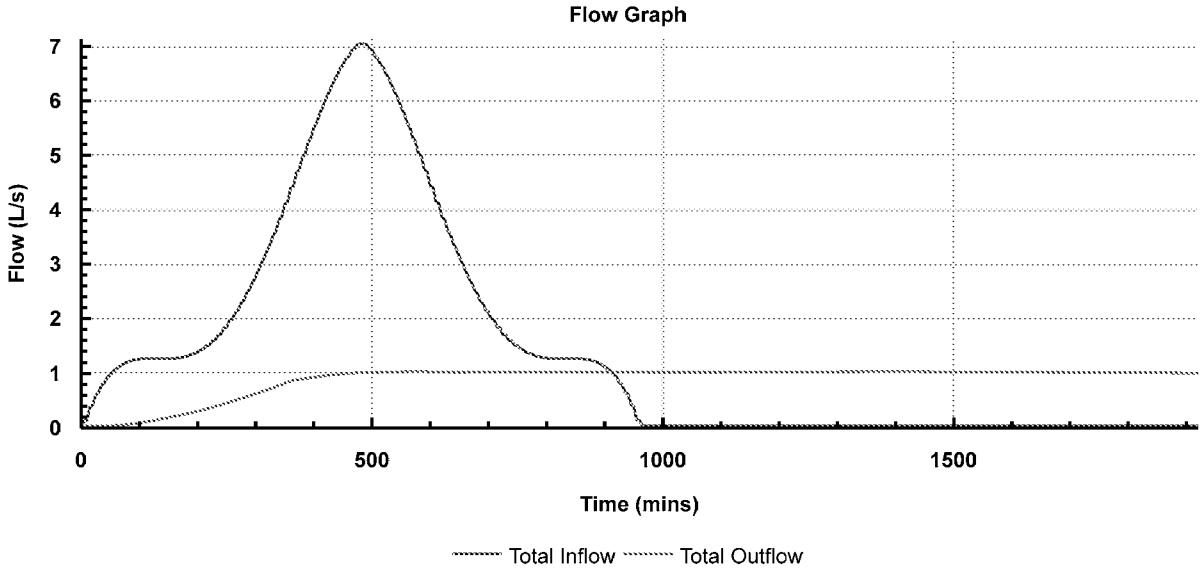
ARUN DISTRICT COUNCIL AL/89/24/OUT

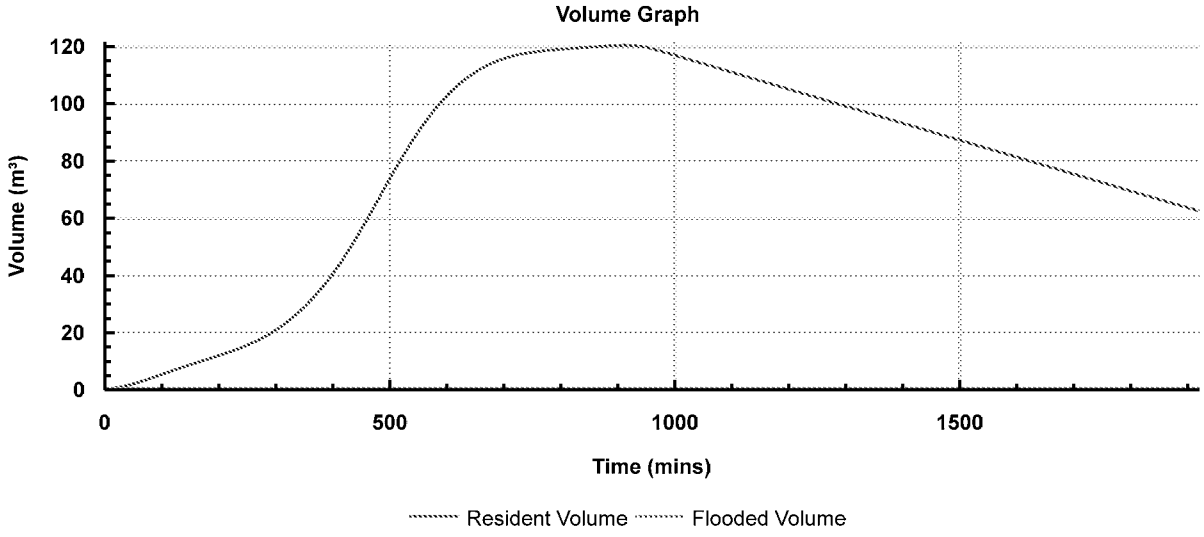
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 2 years: Increase Rainfall (%): +45: 960 mins: Winter

Type : Pond

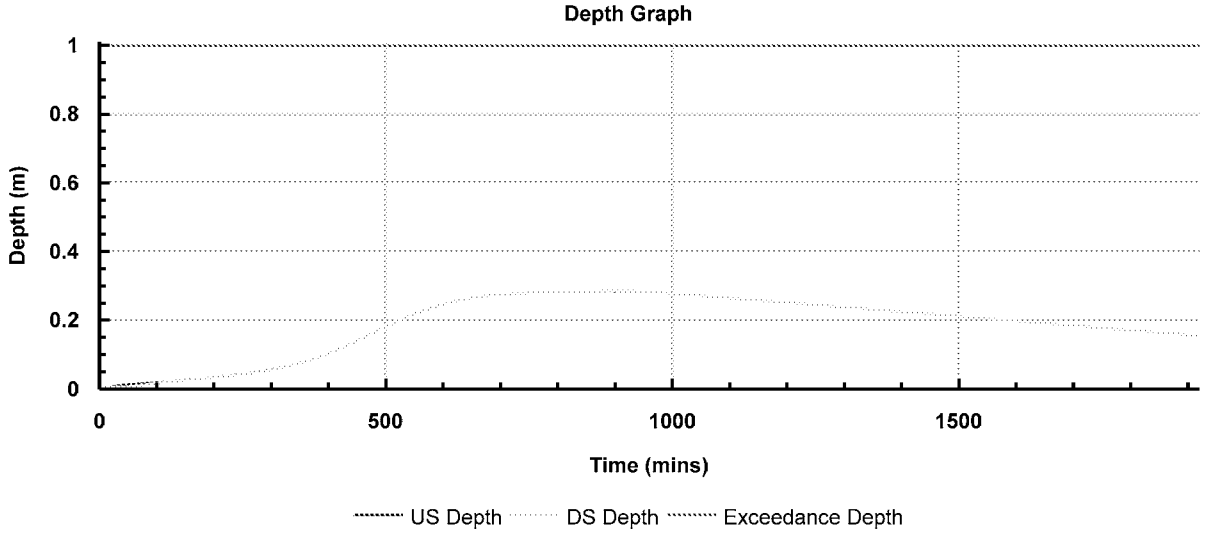
Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	0.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	9.000
Depth (m)	1.000
Base Level (m)	8.000
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.10
Total Volume (m³)	331.110

Depth (m)	Area (m²)	Volume (m³)
0.000	400.00	0.000
0.700	550.00	331.110
1.000	650.00	510.901

Inlets

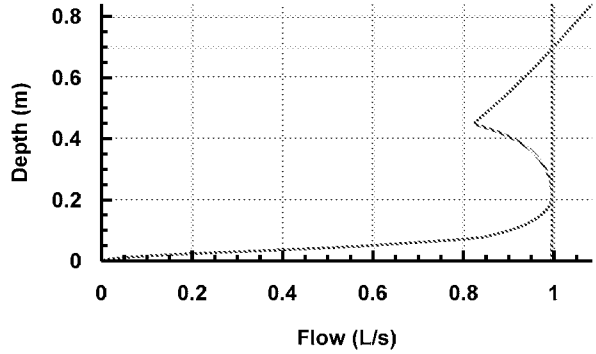
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.000
Design Depth (m)	0.700
Design Flow (L/s)	1.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1000-0700-1000



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
30.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 30 years: +45 %: 15 mins: Summer	0.30	199.9	88.116

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +45 %: 960 mins: Winter	8.523	8.523	0.523	0.523	12.3	237.292	0.000	0.000	1.0	91.457	28.334	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

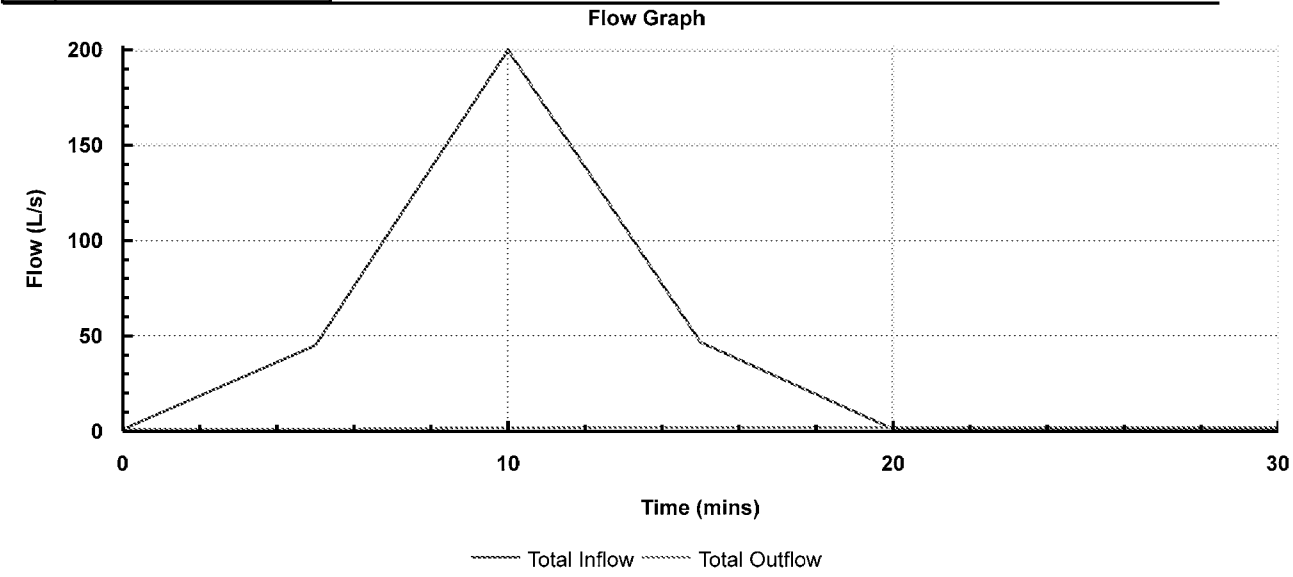
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

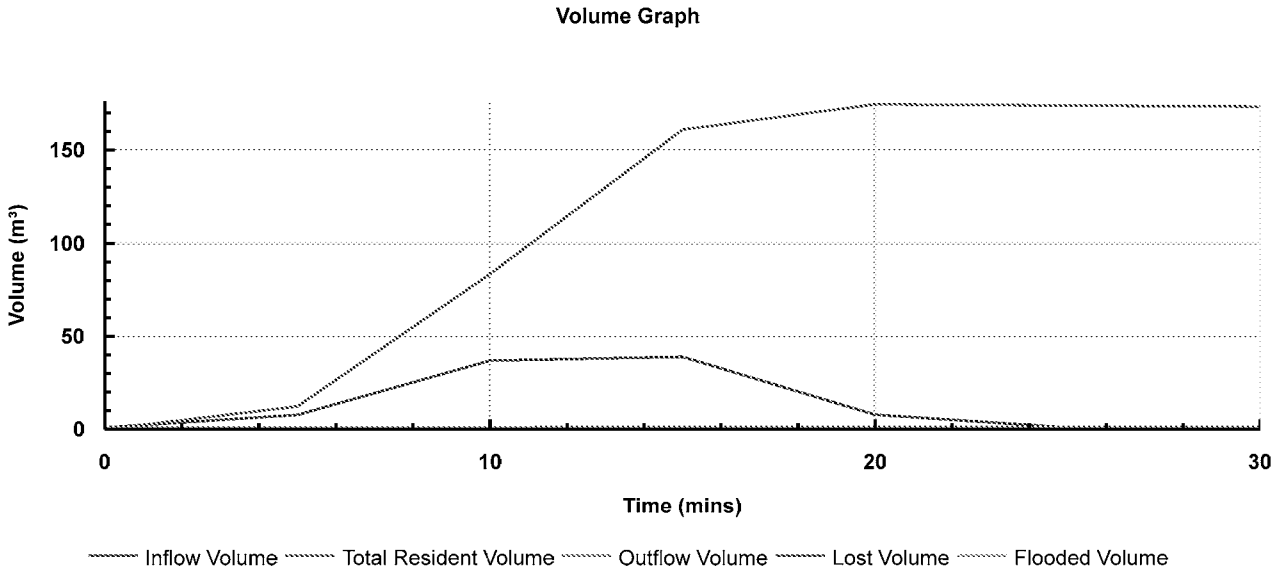
Phase
FEH: 30 years: Increase Rainfall (%): +45: 15 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	1.277
TOTAL	200.0	88.116	1.0	1.277

Graphs





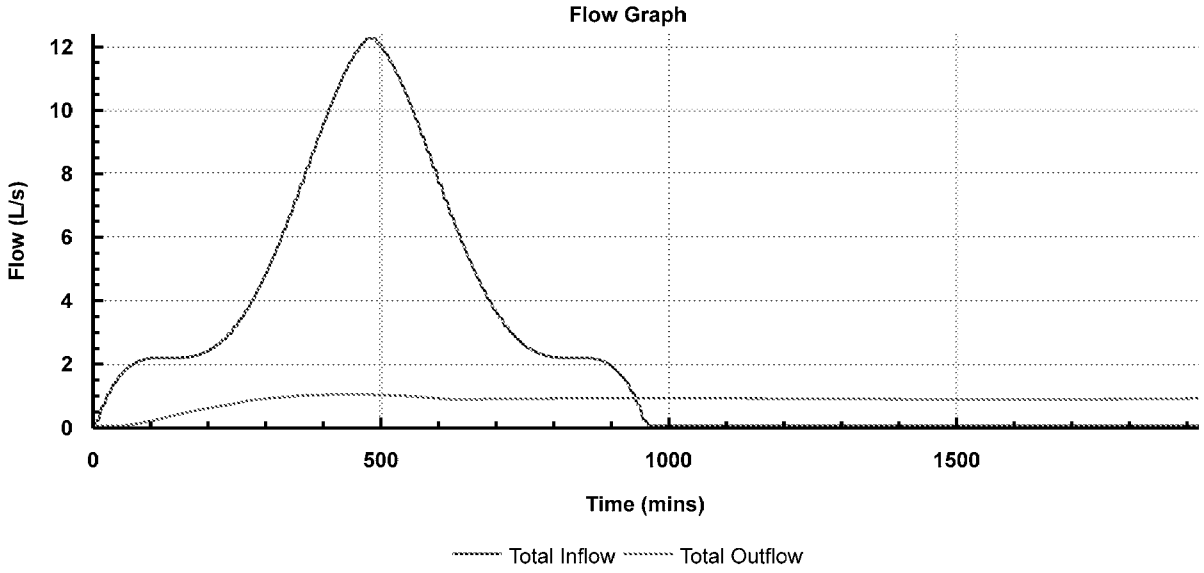
ARUN DISTRICT COUNCIL AL/89/24/OUT

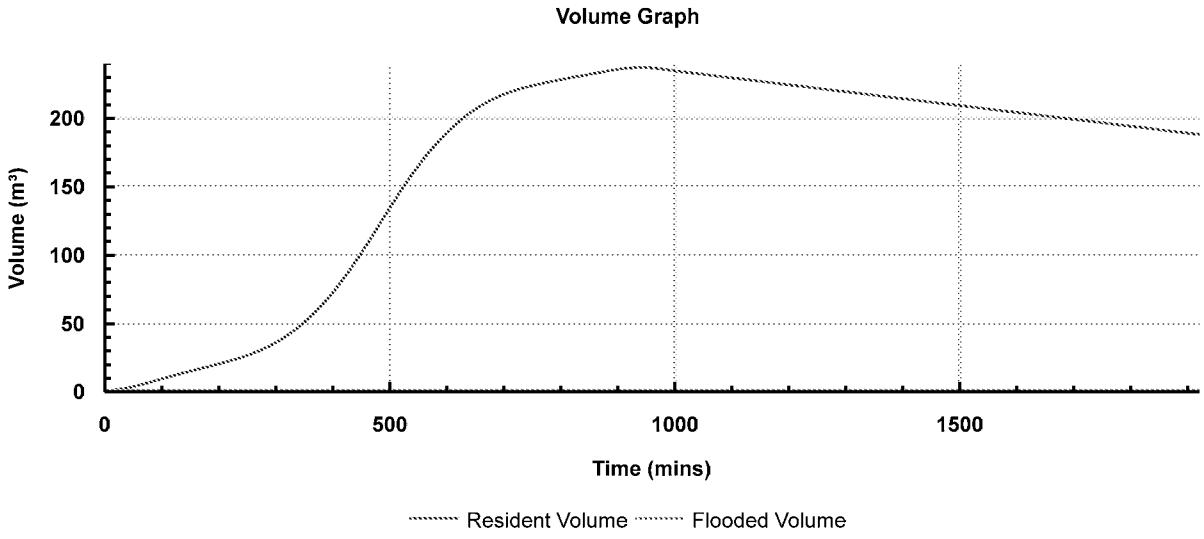
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 30 years: Increase Rainfall (%): +45: 960 mins: Winter

Type : Pond

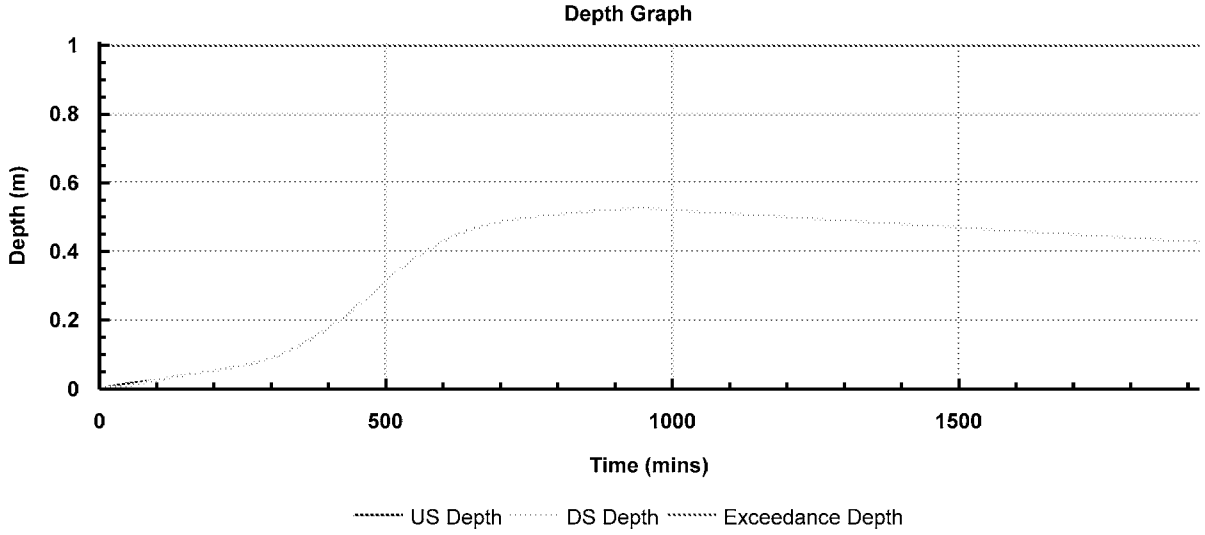
Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	0.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	9.000
Depth (m)	1.000
Base Level (m)	8.000
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.10
Total Volume (m³)	331.110

Depth (m)	Area (m²)	Volume (m³)
0.000	400.00	0.000
0.700	550.00	331.110
1.000	650.00	510.901

Inlets

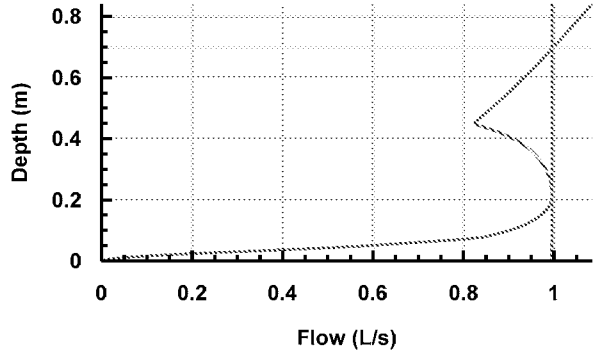
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.000
Design Depth (m)	0.700
Design Flow (L/s)	1.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1000-0700-1000



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 100 years: +45 %: 15 mins: Summer	0.30	251.9	110.719

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +45 %: 1440 mins: Winter	8.655	8.655	0.655	0.655	11.0	306.768	0.000	0.000	1.0	147.608	7.351	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

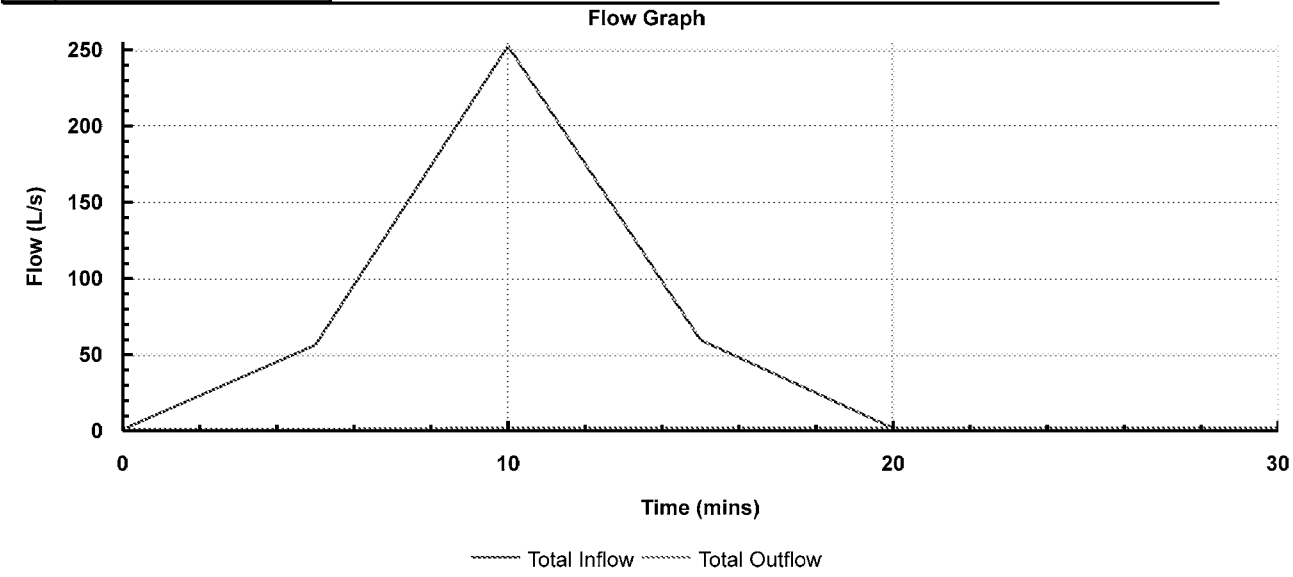
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

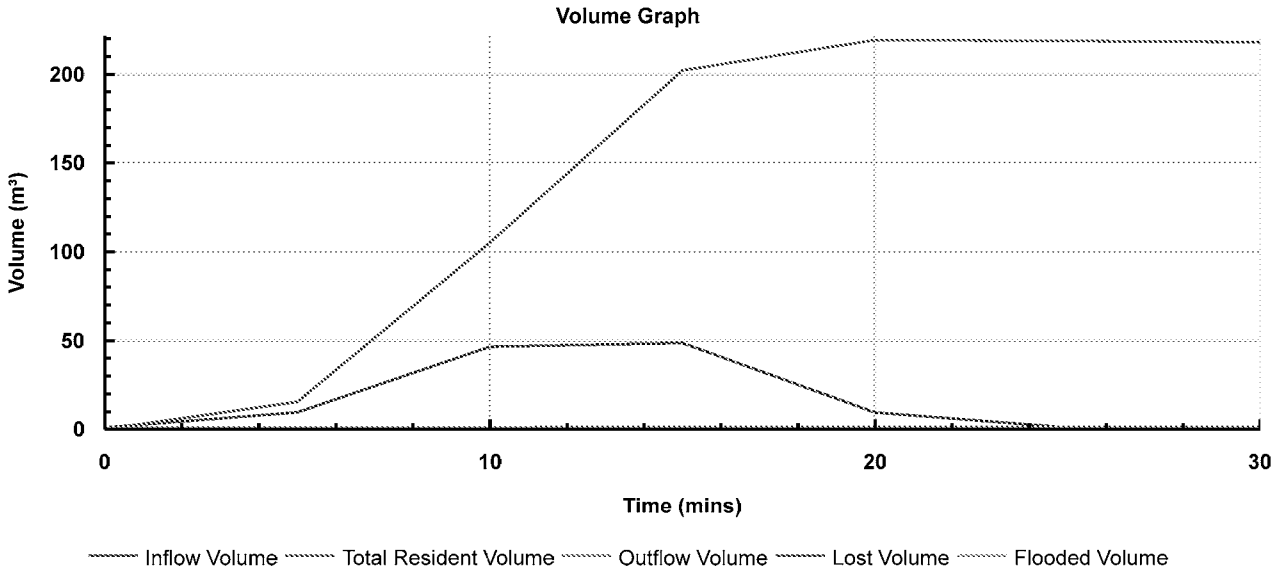
Phase
FEH: 100 years: Increase Rainfall (%): +45: 15 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	1.308
TOTAL	252.6	110.719	1.0	1.308

Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

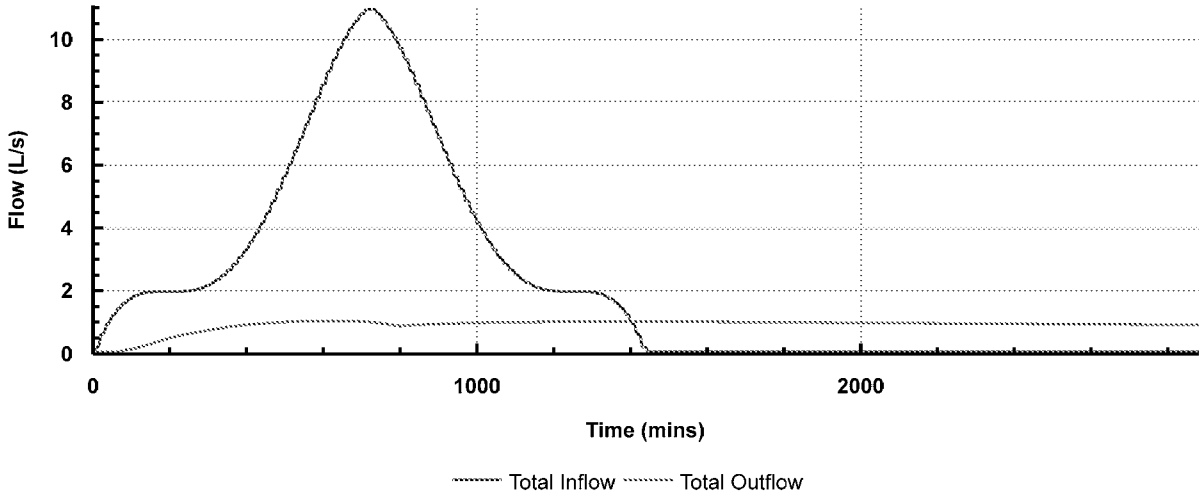
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 100 years: Increase Rainfall (%): +45: 1440 mins: Winter

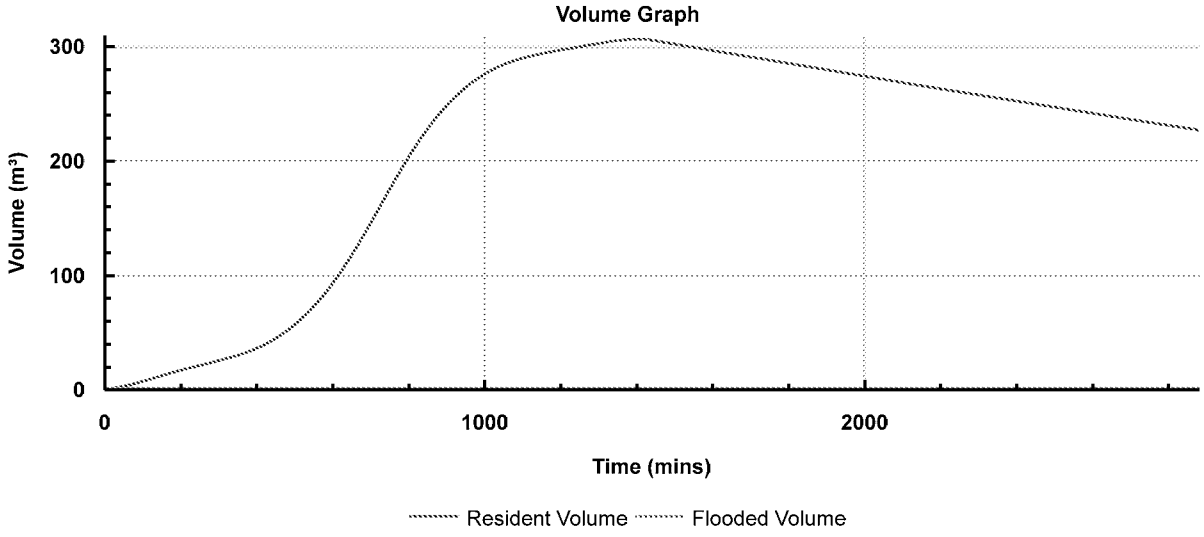
Type : Pond

Graphs

Flow Graph

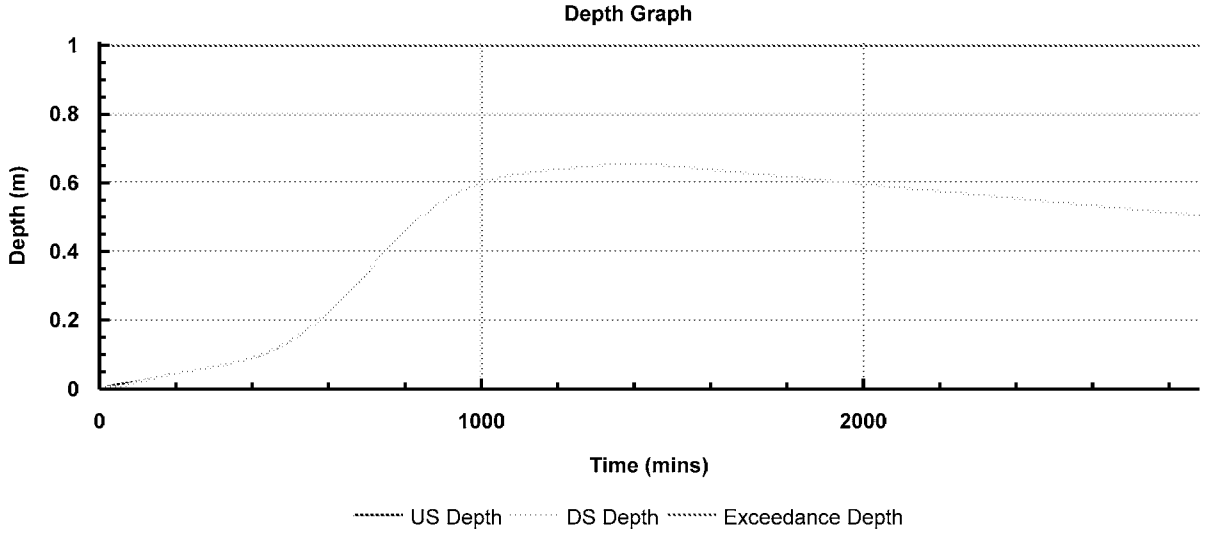


Volume Graph



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	2.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond

Type : Pond

Dimensions

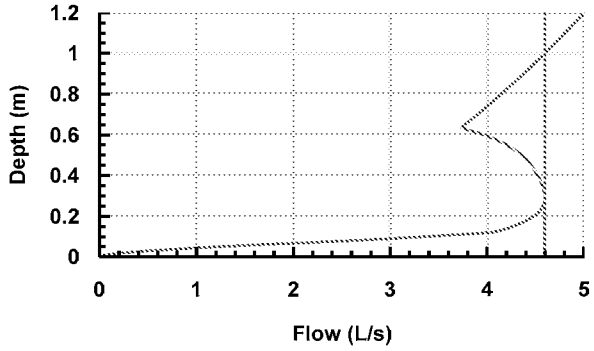
Exceedance Level (m)	10.000
Depth (m)	1.250
Base Level (m)	8.750
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	4.00
Total Volume (m³)	3138.677

Depth (m)	Area (m²)	Volume (m³)
0.000	2750.12	0.000
1.000	3543.99	3138.677
1.250	3758.16	4051.315

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.750
Design Depth (m)	1.000
Design Flow (L/s)	4.6
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0101-4600-1000-4600



Advanced

Perimeter	Circular
Length (m)	20.000
Friction Scheme	Manning's n
n	0.3

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	2.30	100	0	100	2.30
TOTAL		**0.0**		**2.30**				**2.30**

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

Rainfall Details FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	✔
Winter	✔

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	Rainfall Details FEH: 2 years: +45 %: 15 mins: Summer	2.30	714.7	314.736

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	Rainfall Details FEH: 2 years: +45 %: 10080 mins: Summer	9.184	9.184	0.434	0.434	17.6	1265.946	0.000	0.000	4.6	2695.134	59.666	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

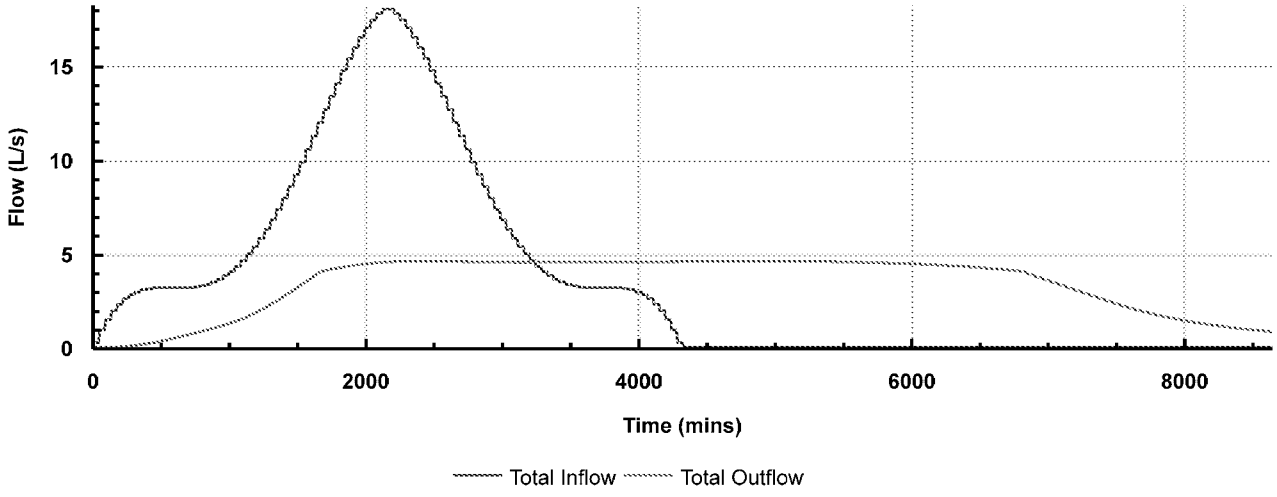
Phase
Rainfall Details FEH: 2 years: Increase Rainfall (%): +45: 4320 mins: Winter

Tables

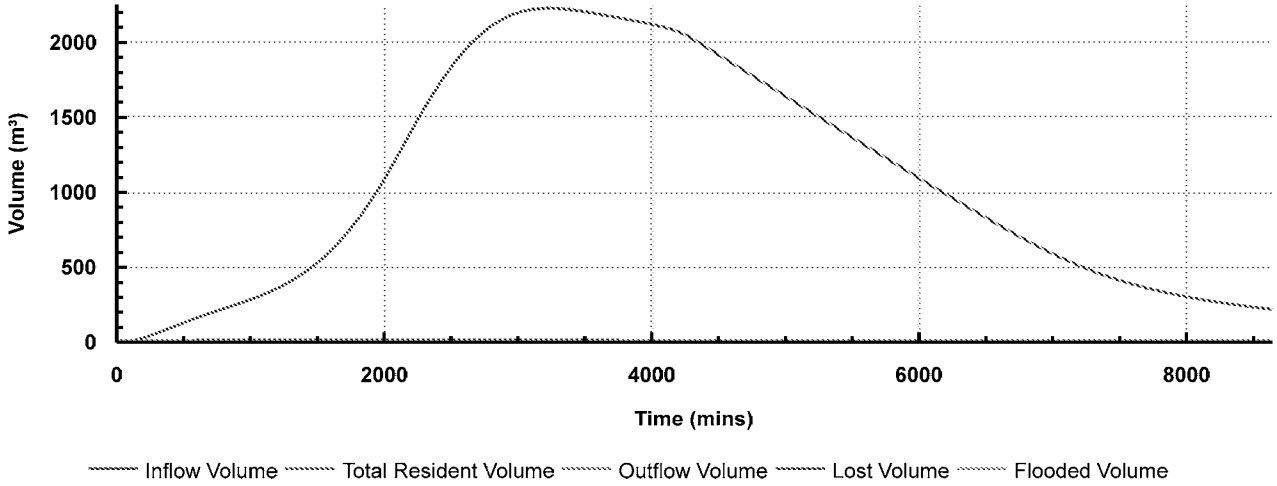
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			4.6	1741.419
TOTAL	18.1	1851.830	4.6	1741.419

Graphs

Flow Graph



Volume Graph



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		

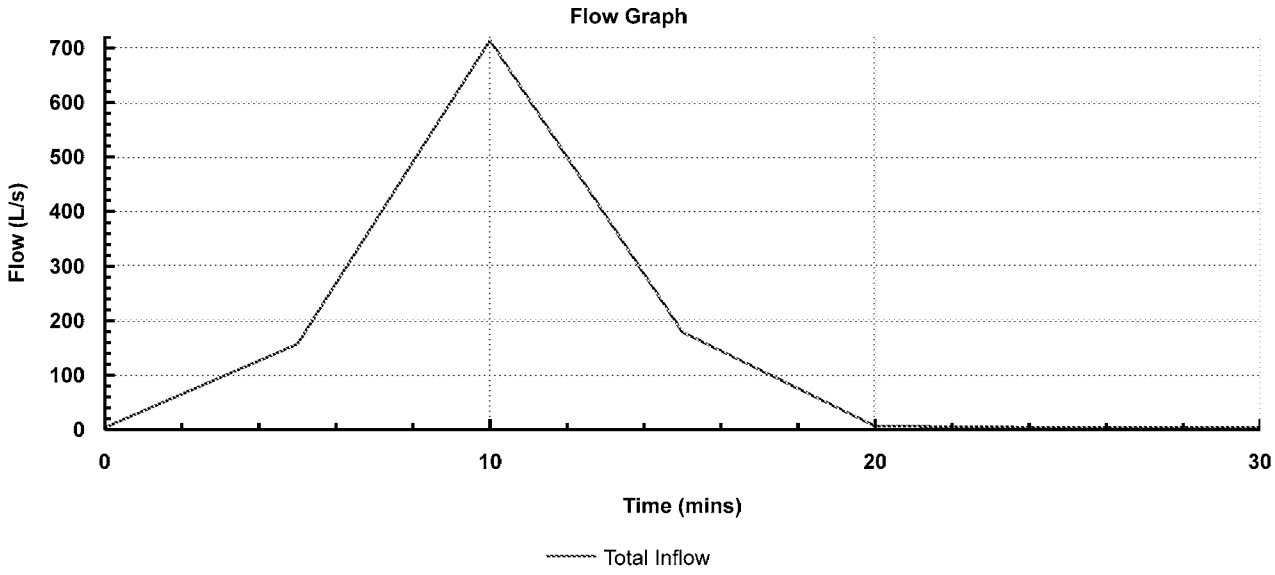
Catchment Area Type : Catchment Area

Critical Storm: Rainfall Details FEH: 2 years: Increase Rainfall (%): +45: 15 mins: Summer

Inflow

Max. Inflow (L/s)	714.7
Total Inflow Volume (m³)	314.736

Graphs



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	2.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond

Type : Pond

Dimensions

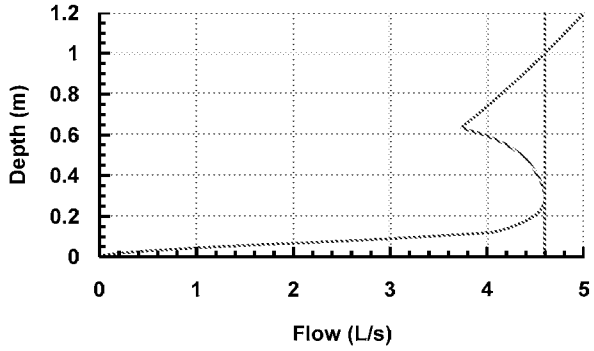
Exceedance Level (m)	10.000
Depth (m)	1.250
Base Level (m)	8.750
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	4.00
Total Volume (m³)	3138.677

Depth (m)	Area (m²)	Volume (m³)
0.000	2750.12	0.000
1.000	3543.99	3138.677
1.250	3758.16	4051.315

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.750
Design Depth (m)	1.000
Design Flow (L/s)	4.6
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0101-4600-1000-4600



Advanced

Perimeter	Circular
Length (m)	20.000
Friction Scheme	Manning's n
n	0.3

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	2.30	100	0	100	2.30
TOTAL		**0.0**		**2.30**				**2.30**

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

Rainfall Details FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
30.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	✔
Winter	✔

Return Period

Return Period (years)	Increase Rainfall (%)
30.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	Rainfall Details FEH: 30 years: +45 %: 15 mins: Summer	2.30	1538.4	674.370

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	Rainfall Details FEH: 30 years: +45 %: 10080 mins: Summer	9.476	9.476	0.726	0.726	25.6	2199.514	0.000	0.000	4.6	3887.923	29.922	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

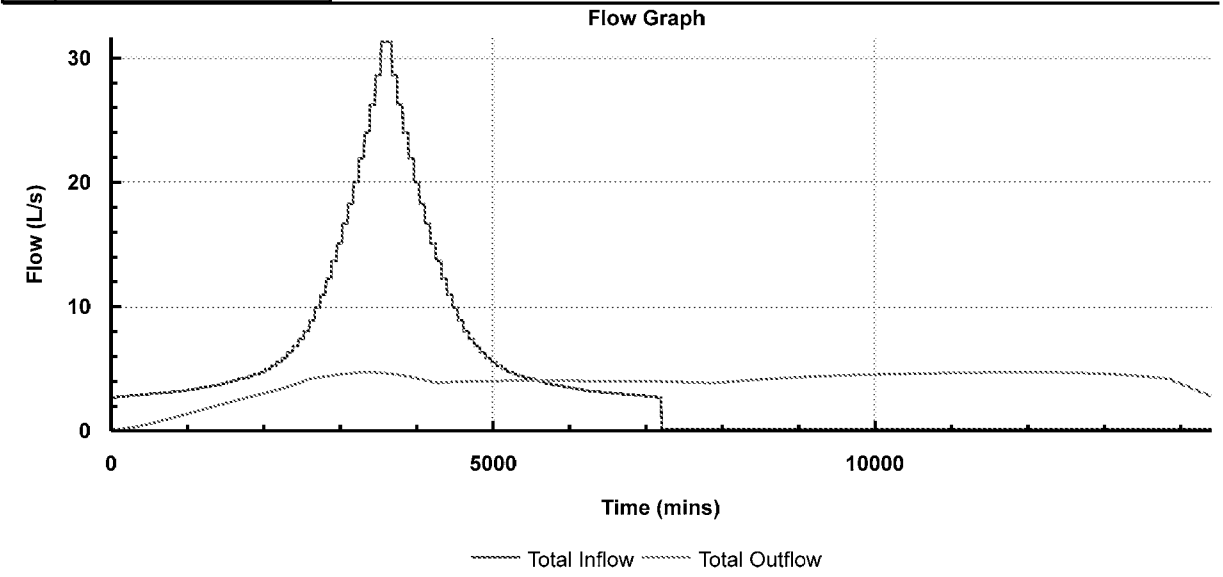
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	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

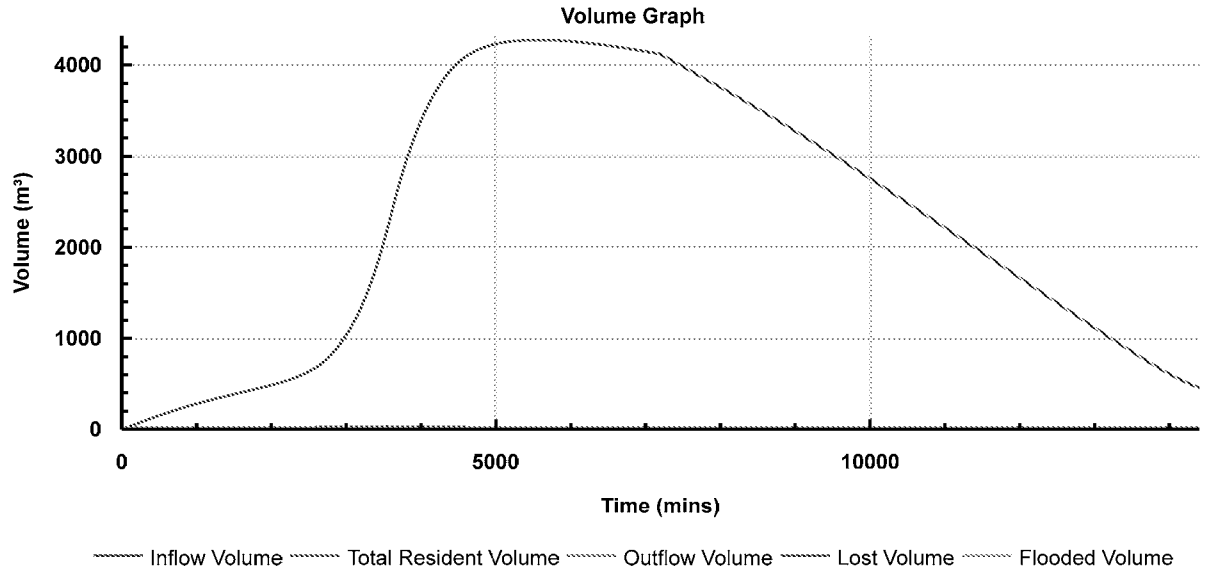
Phase
Rainfall Details FEH: 30 years: Increase Rainfall (%): +45: 7200 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			4.6	3222.593
TOTAL	31.3	3450.493	4.6	3222.593

Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		

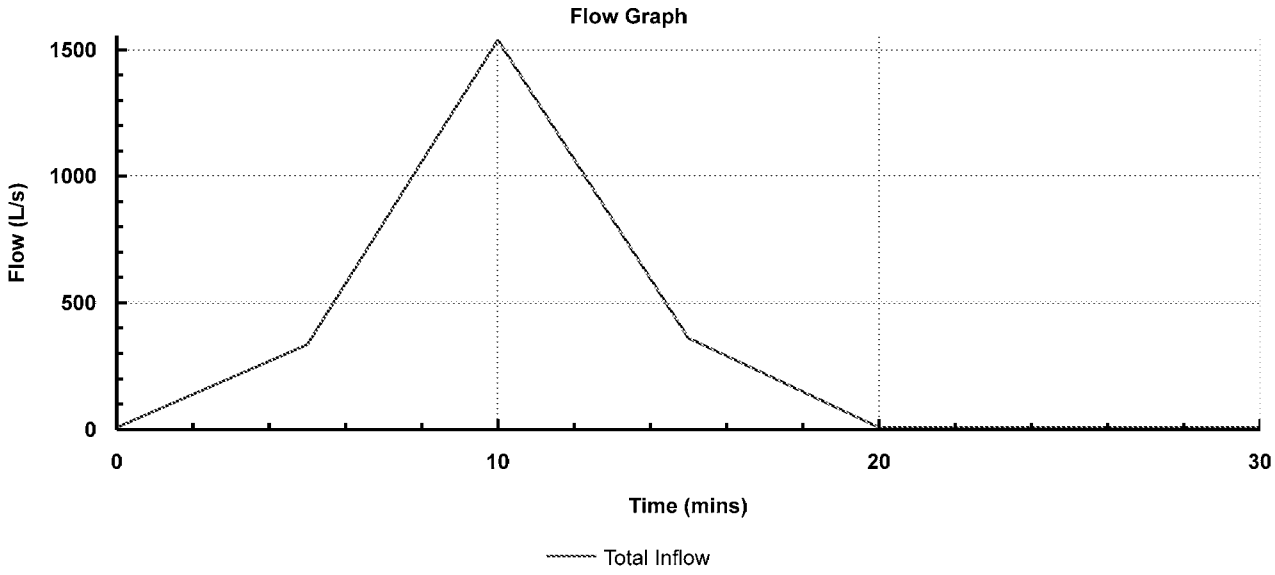
Catchment Area Type : Catchment Area

Critical Storm: Rainfall Details FEH: 30 years: Increase Rainfall (%): +45: 15 mins: Summer

Inflow

Max. Inflow (L/s)	1538.4
Total Inflow Volume (m³)	674.370

Graphs



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Catchment Area

Type : Catchment Area

Area (ha)	2.30

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond

Type : Pond

Dimensions

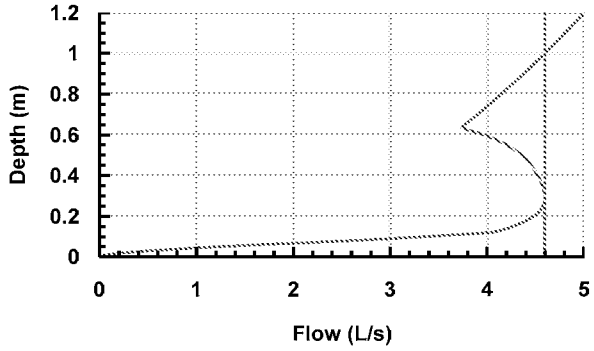
Exceedance Level (m)	10.000
Depth (m)	1.250
Base Level (m)	8.750
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	4.00
Total Volume (m³)	3138.677

Depth (m)	Area (m²)	Volume (m³)
0.000	2750.12	0.000
1.000	3543.99	3138.677
1.250	3758.16	4051.315

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	8.750
Design Depth (m)	1.000
Design Flow (L/s)	4.6
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0101-4600-1000-4600



Advanced

Perimeter	Circular
Length (m)	20.000
Friction Scheme	Manning's n
n	0.3

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	2.30	100	0	100	2.30
TOTAL		**0.0**		**2.30**				**2.30**

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

Rainfall Details FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	✔
Winter	✔

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	Rainfall Details FEH: 100 years: +45 %: 15 mins: Summer	2.30	1936.8	848.636

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Percentage Available (%)	Status
Pond	Rainfall Details FEH: 100 years: +45 %: 10080 mins: Summer	9.626	9.626	0.876	0.876	30.0	2706.691	0.000	0.000	4.6	4500.348	13.763	OK

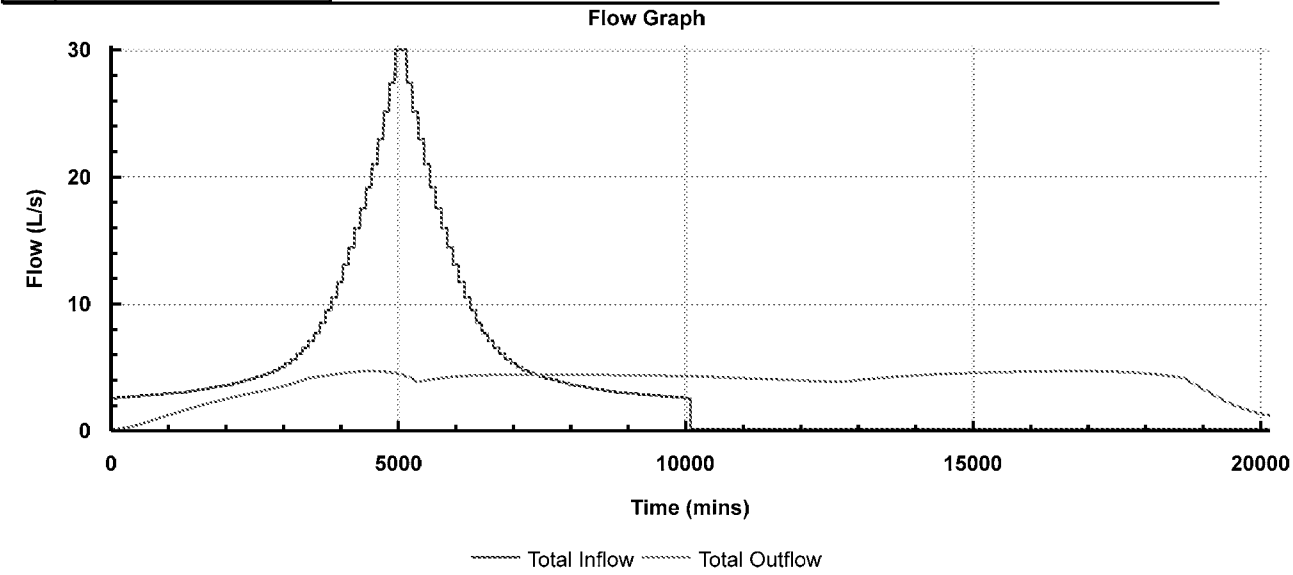
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Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

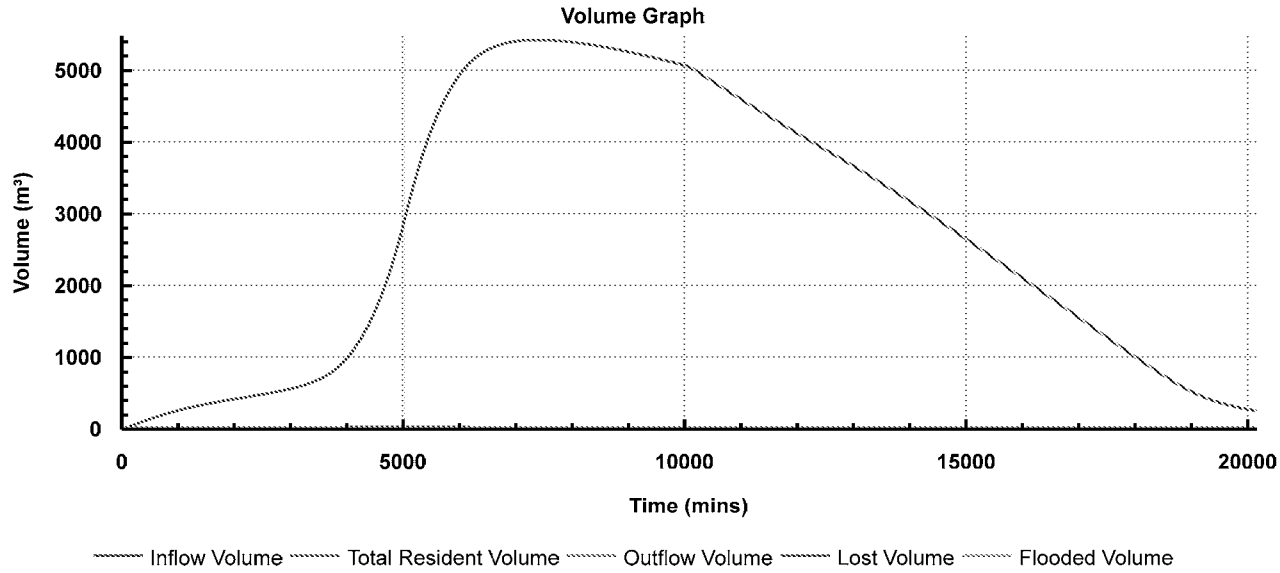
Phase
Rainfall Details FEH: 100 years: Increase Rainfall (%): +45: 10080 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			4.6	4500.348
TOTAL	30.0	4629.226	4.6	4500.348

Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		

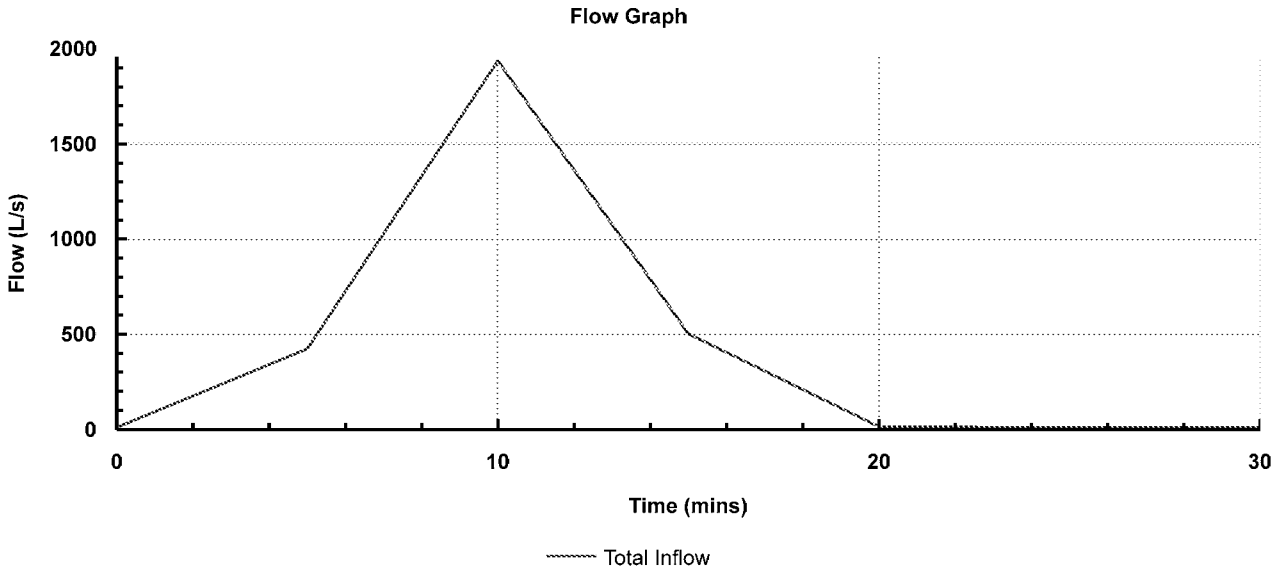
Catchment Area Type : Catchment Area

Critical Storm: Rainfall Details FEH: 100 years: Increase Rainfall (%): +45: 15 mins: Summer

Inflow

Max. Inflow (L/s)	1936.8
Total Inflow Volume (m³)	848.636

Graphs



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		



Catchment Area

Type : Catchment Area

Area (ha)	0.22

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	8.700
Depth (m)	1.000
Base Level (m)	7.700
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	5.197
Total Volume (m³)	372.600

Depth (m)	Area (m²)	Volume (m³)
0.000	361.30	0.000
0.700	624.08	340.717
1.000	796.28	553.248

Inlets

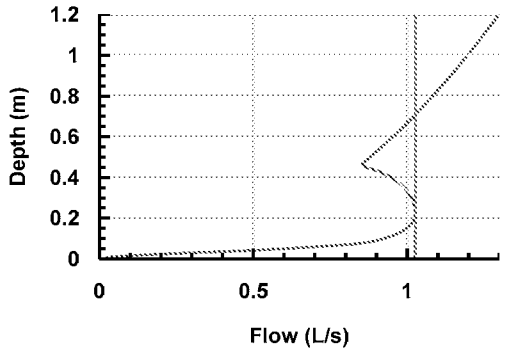
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	7.700
Design Depth (m)	1.000
Design Flow (L/s)	1.2
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1200-1000-1200



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 2 years: +45 %: 15 mins: Summer	0.22	67.6	30.188

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 2 years: +45 %: 600 mins: Winter	7.908	7.908	0.208	0.208	7.5	82.262	0.000	0.000	1.0	60.949	77.922	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

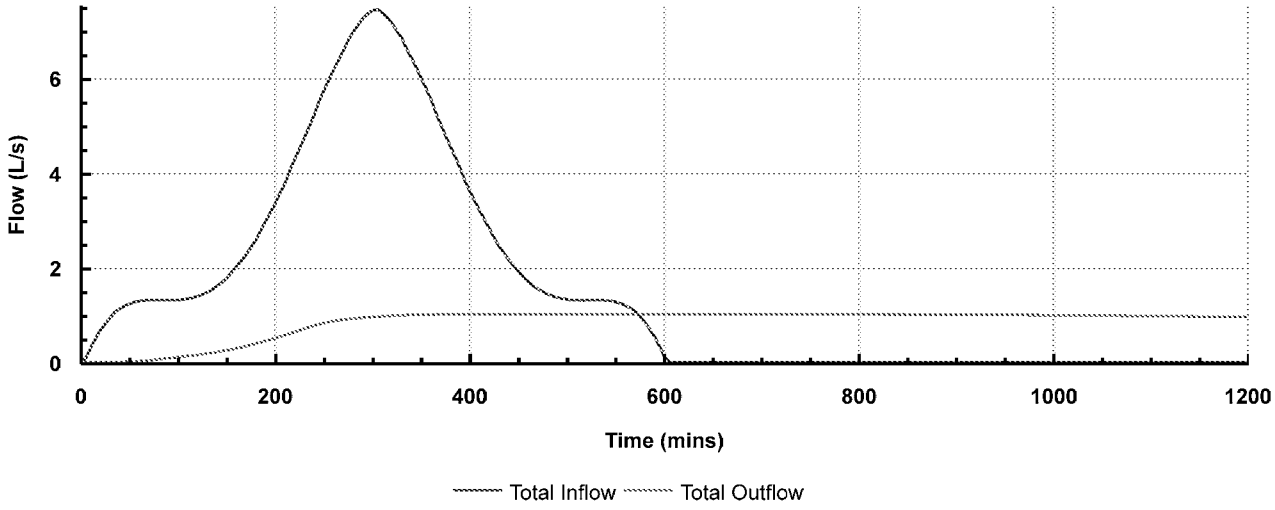
Phase
FEH: 2 years: Increase Rainfall (%): +45: 600 mins: Winter

Tables

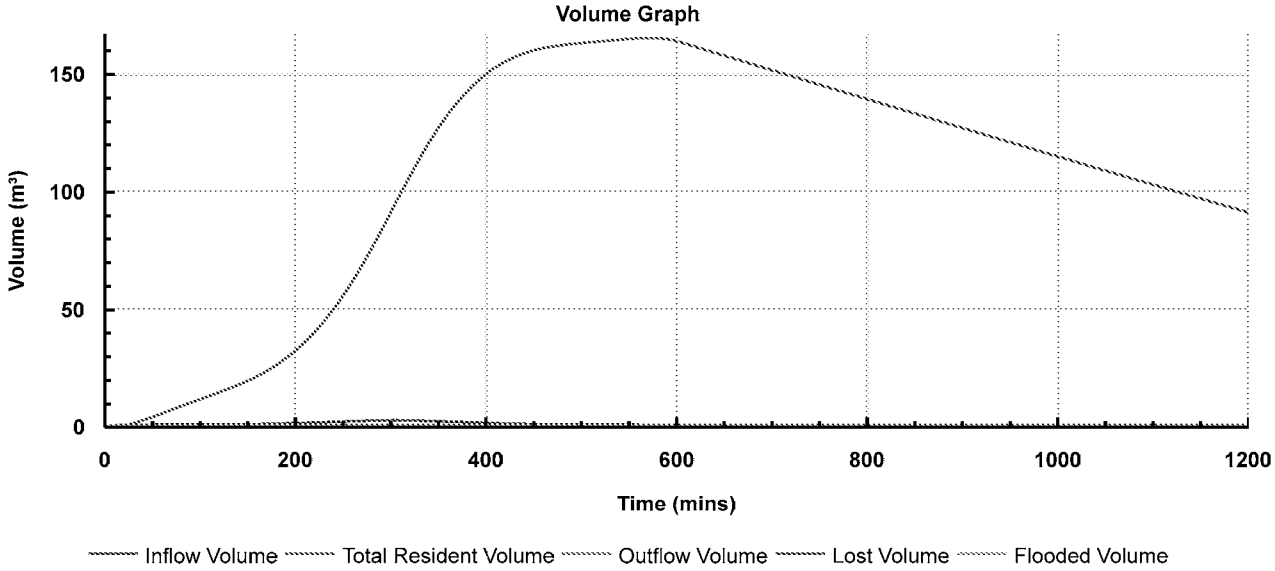
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	60.949
TOTAL	7.5	106.491	1.0	60.949

Graphs

Flow Graph



Volume Graph



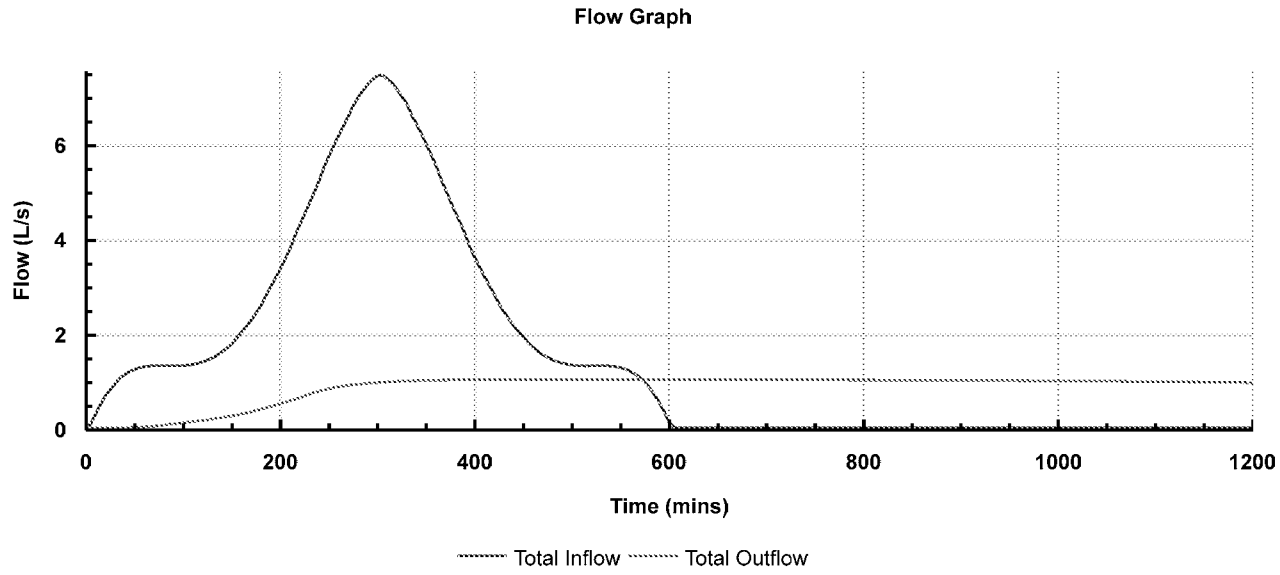
ARUN DISTRICT COUNCIL AL/89/24/OUT

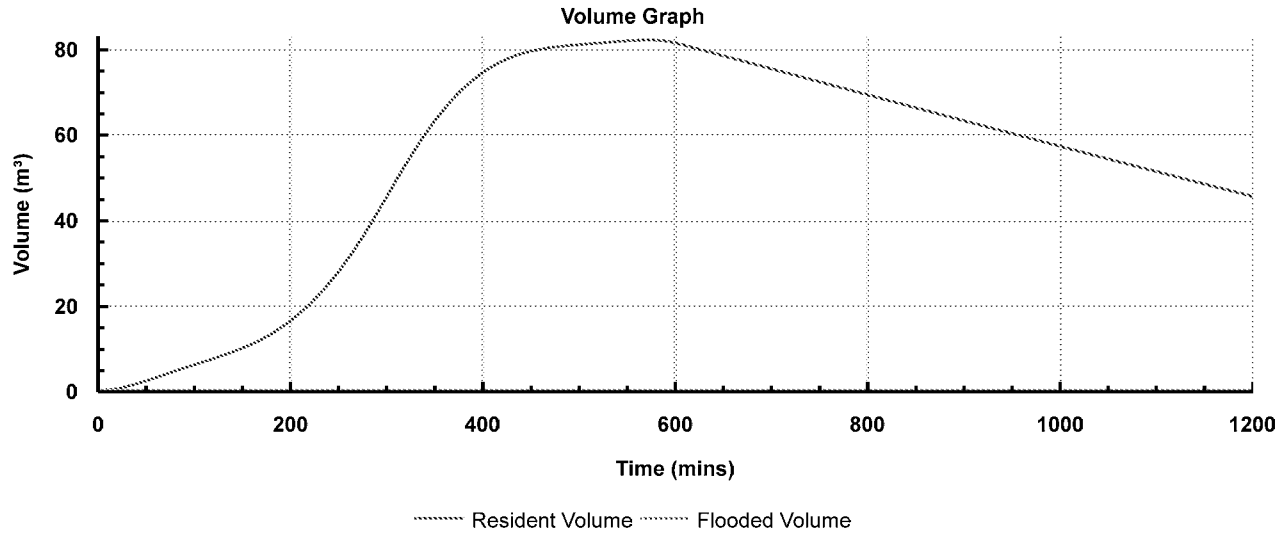
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 2 years: Increase Rainfall (%): +45: 600 mins: Winter

Type : Pond

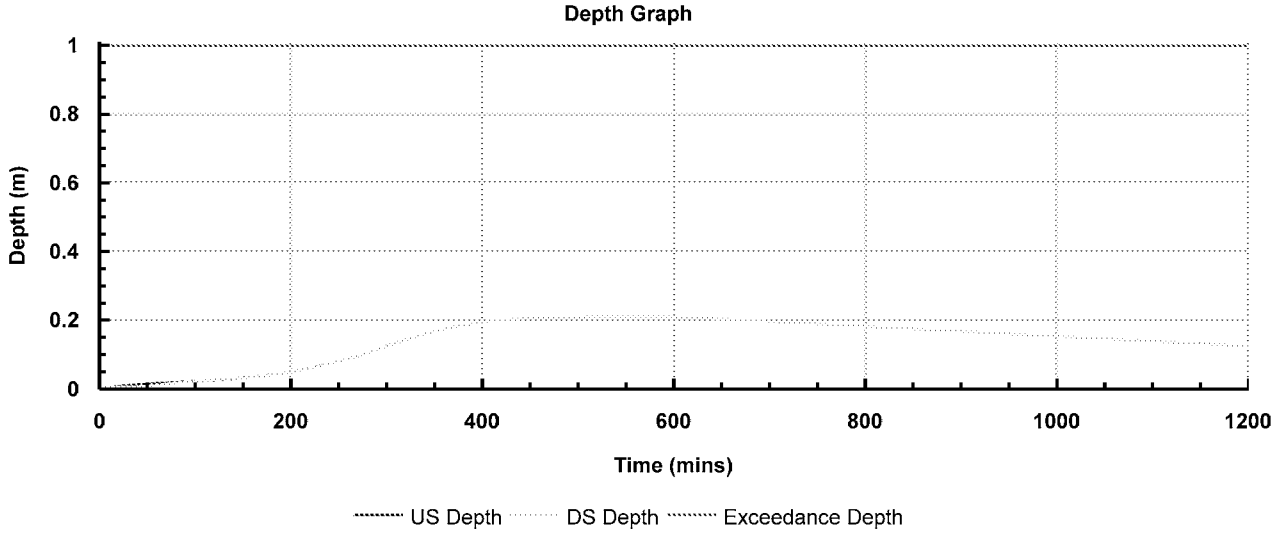
Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		



Catchment Area

Type : Catchment Area

Area (ha)	0.22

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	8.700
Depth (m)	1.000
Base Level (m)	7.700
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	5.197
Total Volume (m³)	372.600

Depth (m)	Area (m²)	Volume (m³)
0.000	361.30	0.000
0.700	624.08	340.717
1.000	796.28	553.248

Inlets

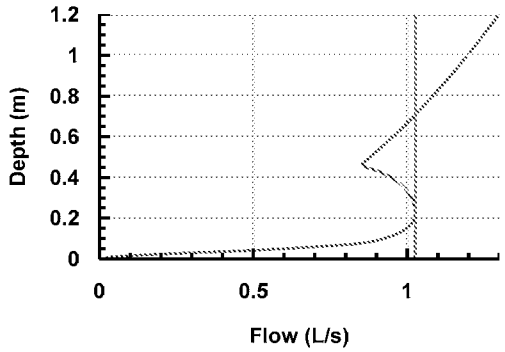
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	7.700
Design Depth (m)	1.000
Design Flow (L/s)	1.2
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1200-1000-1200



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	0.22	100	0	100	0.22
TOTAL		**0.0**		**0.22**				**0.22**

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 30 years: +45 %: 15 mins: Summer	0.22	146.2	64.591

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Percentage Available (%)	Status
Pond	FEH: 30 years: +45 %: 720 mins: Winter	8.081	8.081	0.381	0.381	11.4	162.441	0.000	0.000	1.0	76.186	56.403	OK

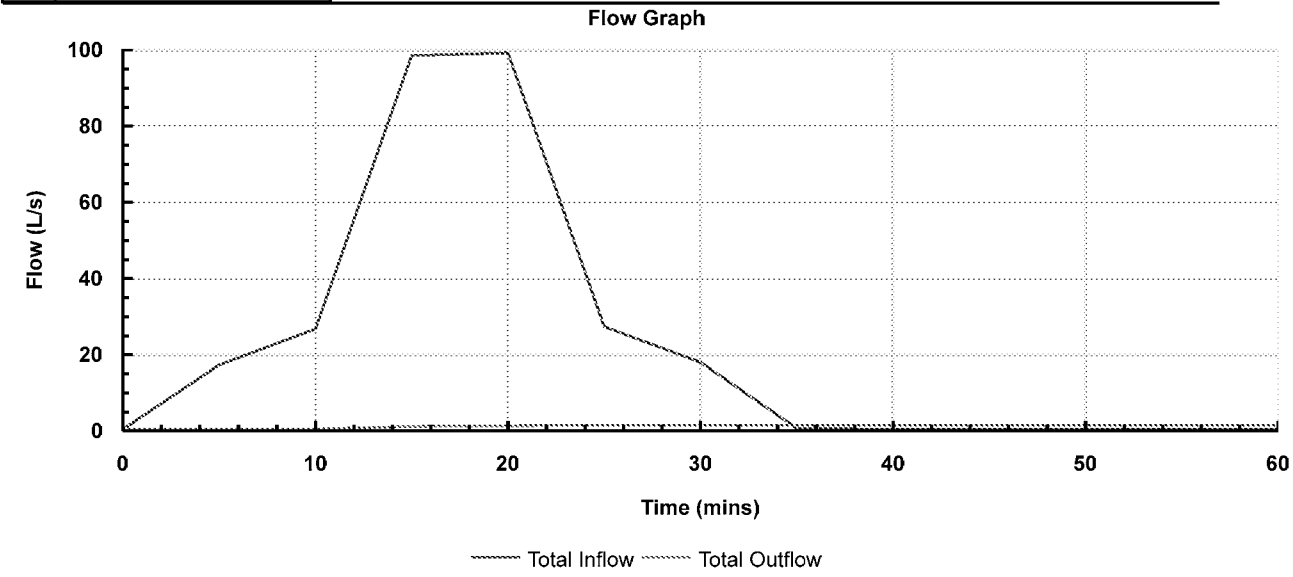
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	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

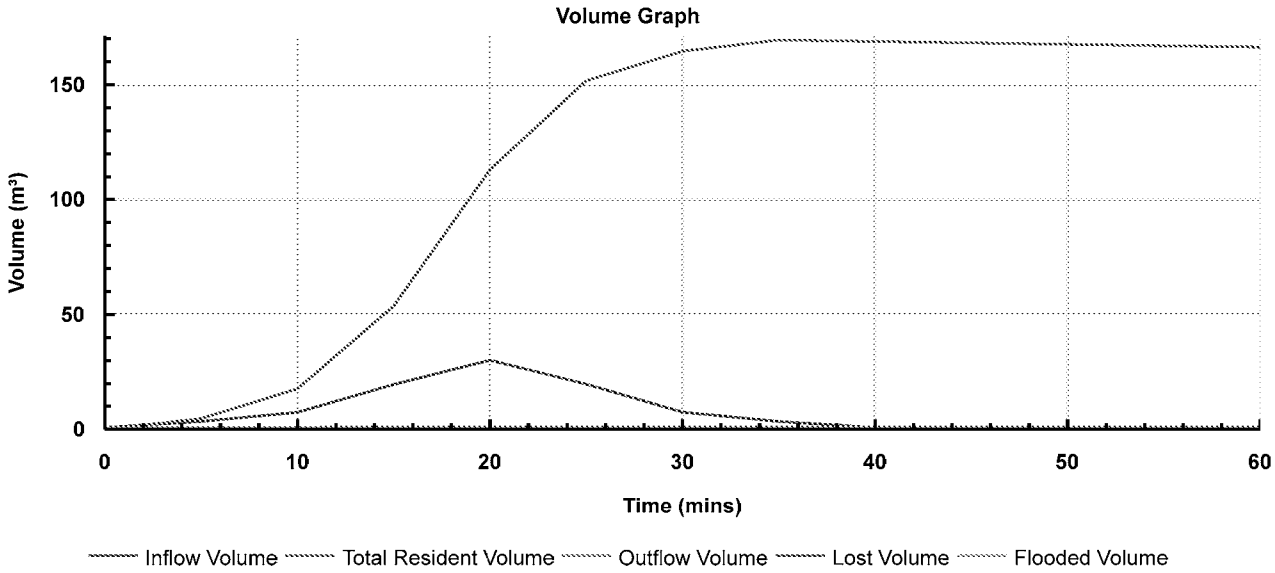
Phase
FEH: 30 years: Increase Rainfall (%): +45: 30 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	2.836
TOTAL	99.2	85.834	1.0	2.836

Graphs





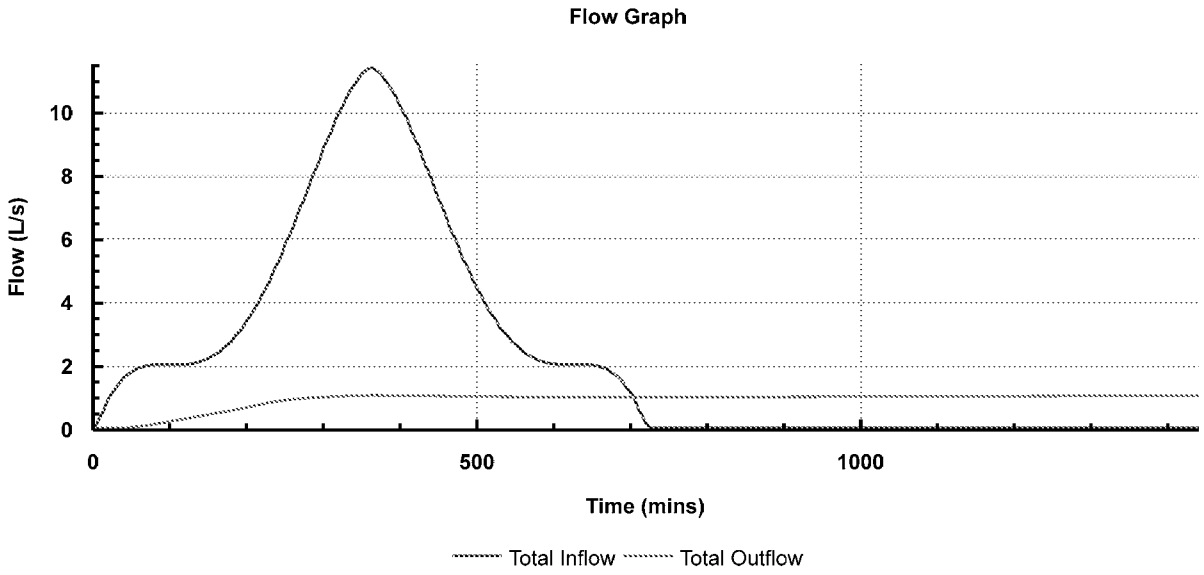
ARUN DISTRICT COUNCIL AL/89/24/OUT

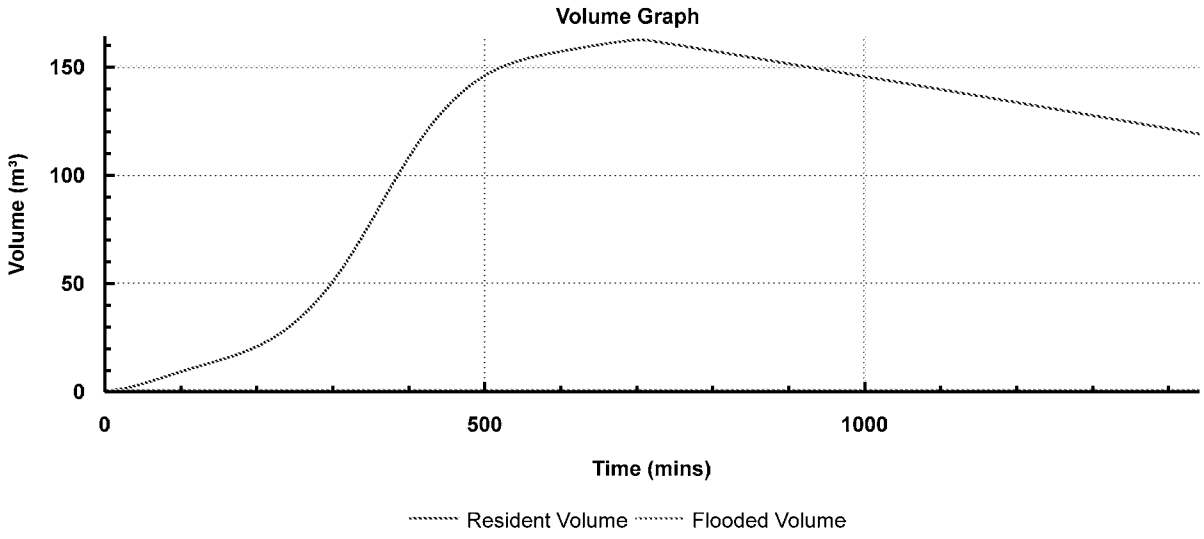
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 30 years: Increase Rainfall (%): +45: 720 mins: Winter

Type : Pond

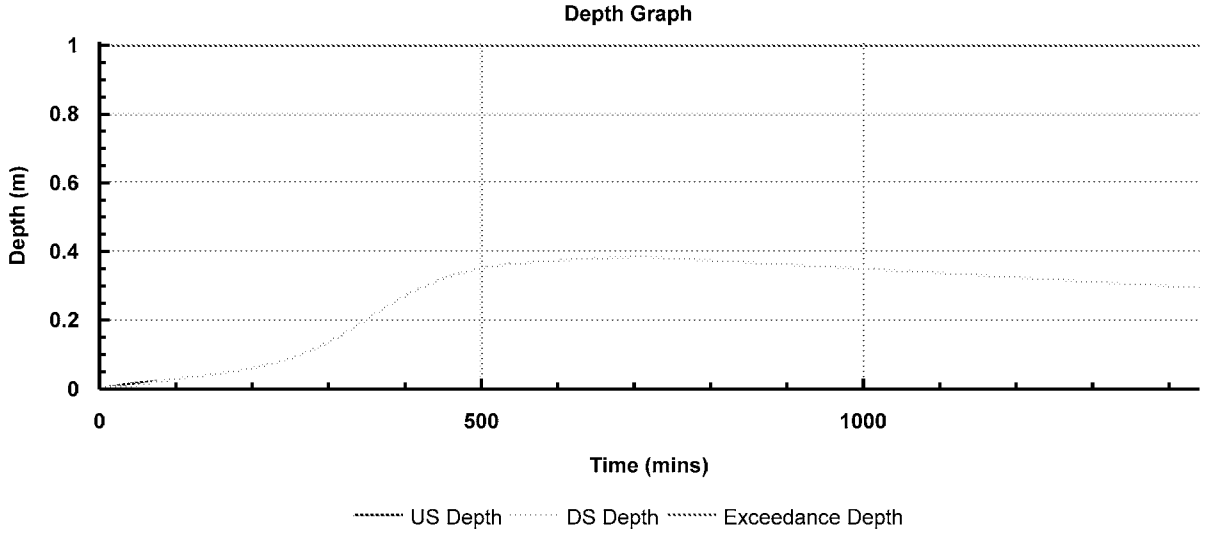
Graphs





ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		



Catchment Area

Type : Catchment Area

Area (ha)	0.22

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond Type : Pond

Dimensions

Exceedance Level (m)	8.700
Depth (m)	1.000
Base Level (m)	7.700
Freeboard (mm)	250
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	5.197
Total Volume (m³)	372.600

Depth (m)	Area (m²)	Volume (m³)
0.000	361.30	0.000
0.700	624.08	340.717
1.000	796.28	553.248

Inlets

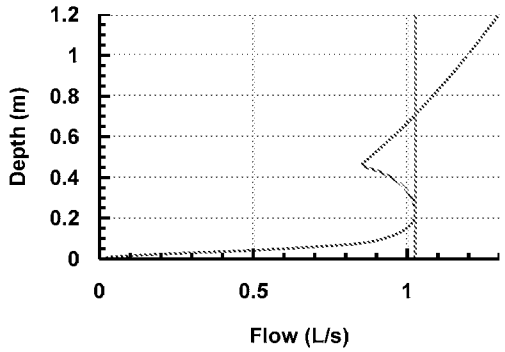
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	7.700
Design Depth (m)	1.000
Design Flow (L/s)	1.2
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0051-1200-1000-1200



ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Advanced

Perimeter	Circular
Length (m)	10.000
Friction Scheme	Manning's n
n	0.3

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 493499 103762 SU 93499 03762
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FEH: 100 years: +45 %: 15 mins: Summer	0.22	184.3	81.304

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Percentage Available (%)	Status
Pond	FEH: 100 years: +45 %: 960 mins: Winter	8.179	8.179	0.479	0.479	11.3	213.195	0.000	0.000	1.0	95.646	42.782	OK

ARUN DISTRICT COUNCIL AL/89/24/OUT

Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

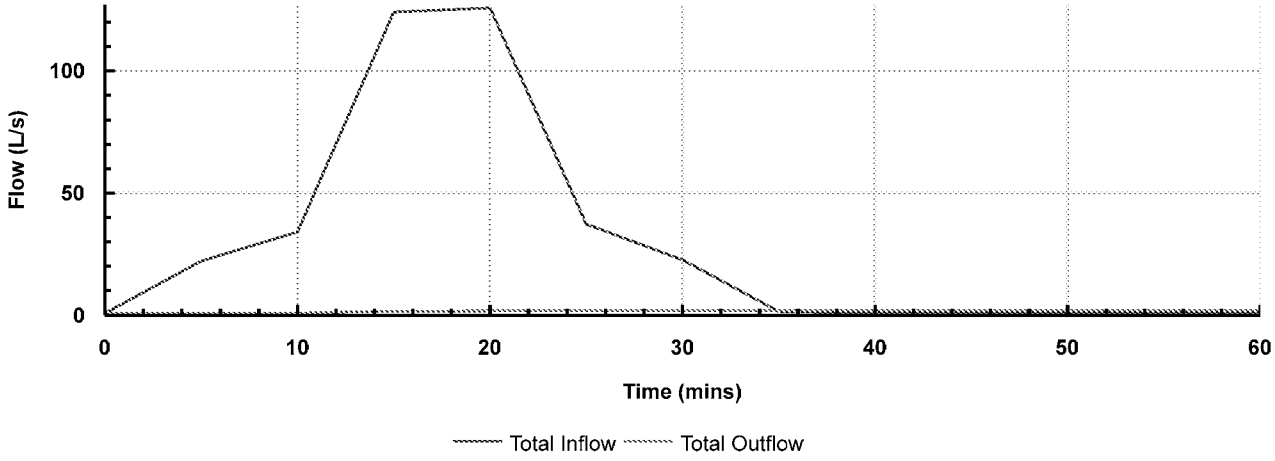
Phase
FEH: 100 years: Increase Rainfall (%): +45: 30 mins: Summer

Tables

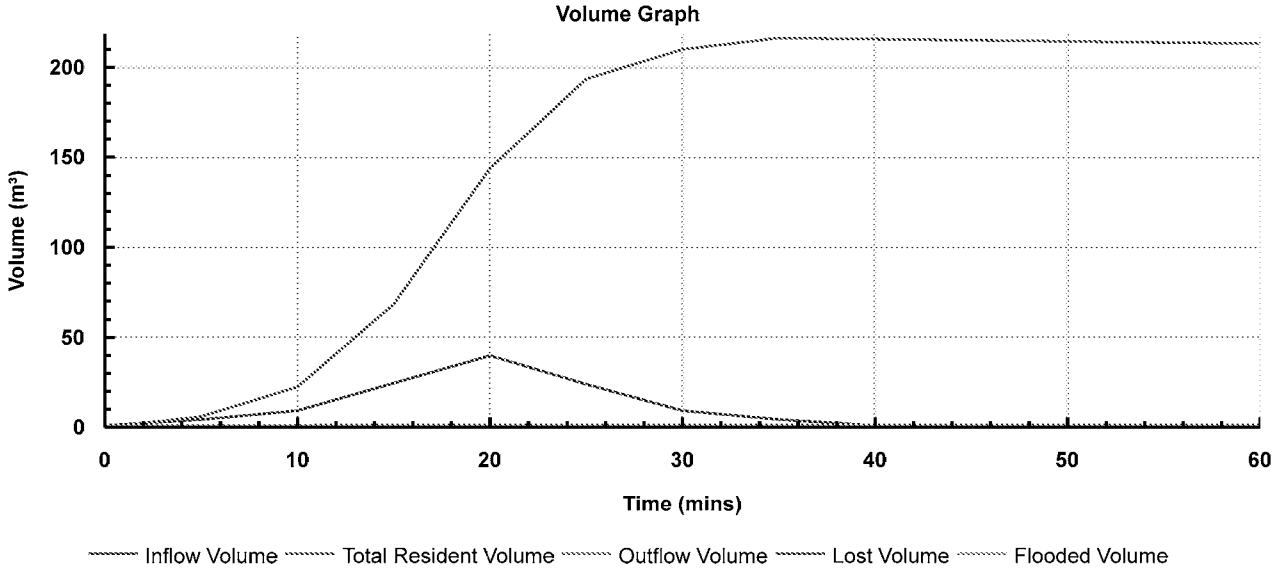
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Pond			1.0	2.896
TOTAL	125.9	108.994	1.0	2.896

Graphs

Flow Graph



Volume Graph



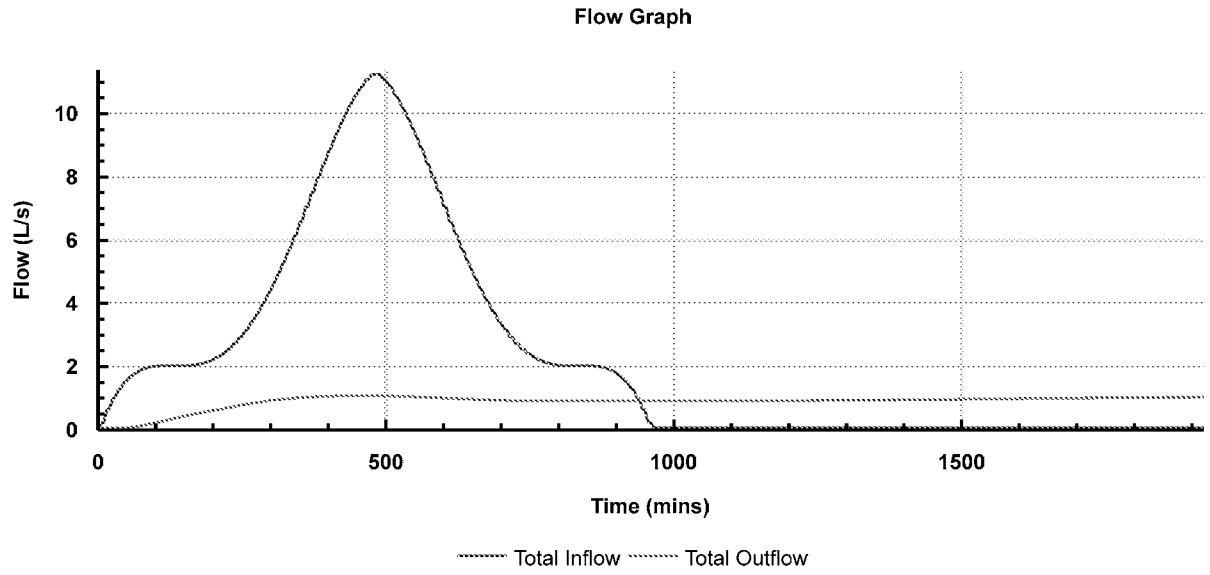
ARUN DISTRICT COUNCIL AL/89/24/OUT

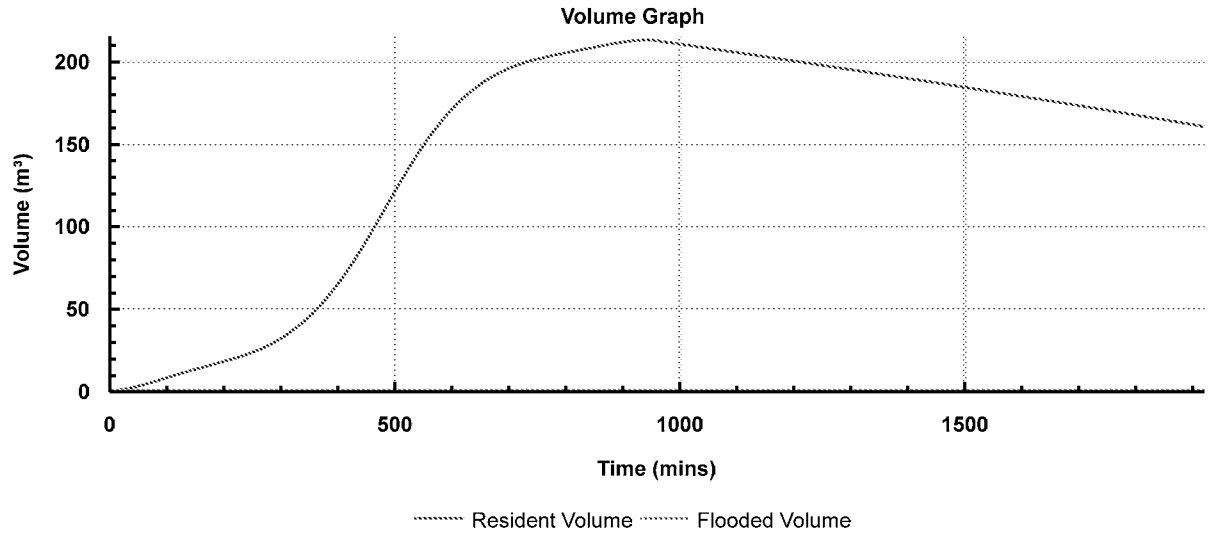
Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Pond
Critical Storm: FEH: 100 years: Increase Rainfall (%): +45: 960 mins: Winter

Type : Pond

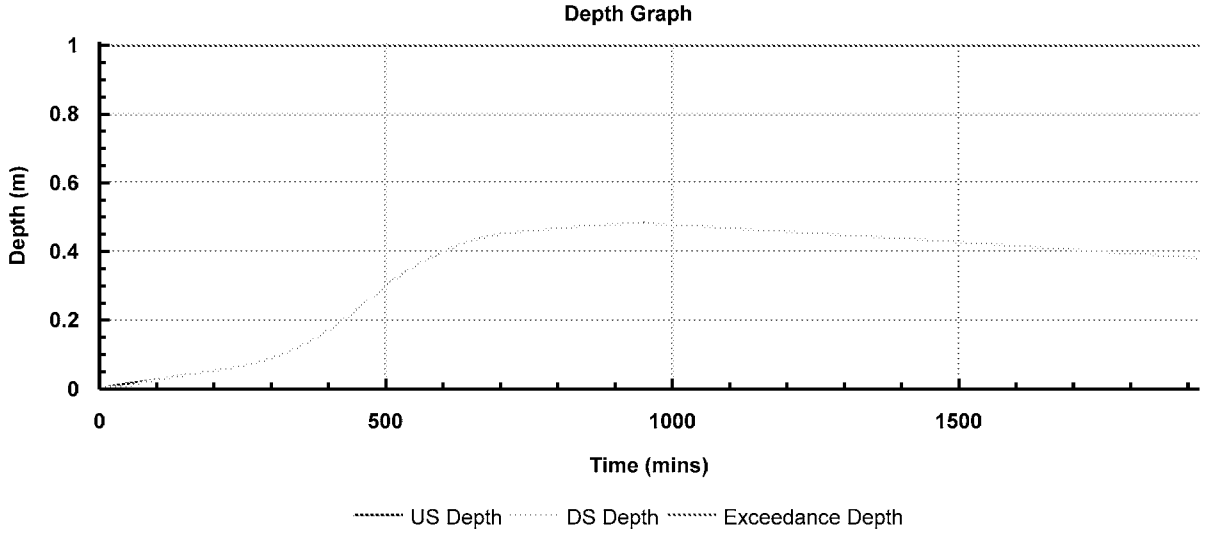
Graphs





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Project:	Date: 10/06/2024		
	Designed by: Alistair	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



ARUN DISTRICT COUNCIL AL/89/24/OUT

Appendix 5

Sewer Records – utility search

ARUN DISTRICT COUNCIL AL/89/24/OUT

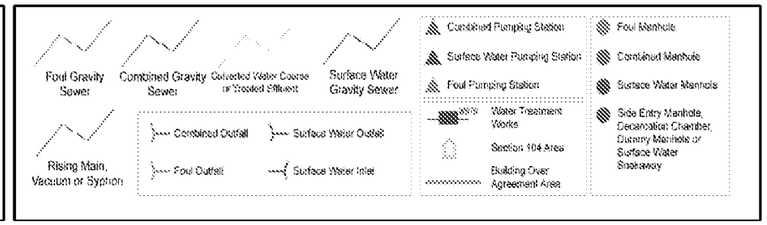


(c) Crown copyright and database rights 2020 Ordnance Survey 100031673 | Date: 10/12/20 | Scale: 1:2700 | Map Centre: 493556,104084 | Data updated: 16/11/20 | Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



Southern Water.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0102	F	8.99	5.36	
6307	F	0.00	0.00	
6308	F	0.00	0.00	
630D	F	0.00	0.00	
7001	F	9.33	8.08	
7002	F	8.98	6.83	
7003	F	8.90	6.75	
7101	F	8.90	6.48	
7102	F	8.23	6.30	
7201	F	8.46	6.85	
7301	F	9.14	7.99	
7302	F	8.77	6.86	
7303	F	8.84	6.66	
7304	F	9.14	7.93	
7305	F	9.14	7.81	
7306	F	9.00	7.72	
7901	F	9.41	8.33	
7902	F	9.02	7.97	
7903	F	9.32	7.32	
790D	F	0.00	0.00	
8001	F	8.24	6.39	
8101	F	8.05	6.18	
8102	F	8.31	5.99	
810D	F	8.75	5.83	
8202	F	8.85	7.47	
8203	F	8.53	7.20	
8204	F	9.14	7.25	
8205	F	9.42	7.88	
8206	F	9.48	7.81	
8301	F	9.61	8.05	
8901	F	8.95	8.21	
9101	F	7.89	6.48	
9102	F	8.98	5.72	
9103	F	9.16	5.52	
9202	F	9.48	8.35	
9301	F	9.97	8.76	
9302	F	10.01	8.45	
9150	S	0.00	0.00	
915D	S	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix 6

Foul water and surface water drainage strategies

ARUN DISTRICT COUNCIL AL/89/24/OUT

Storage Summary - AREA 1

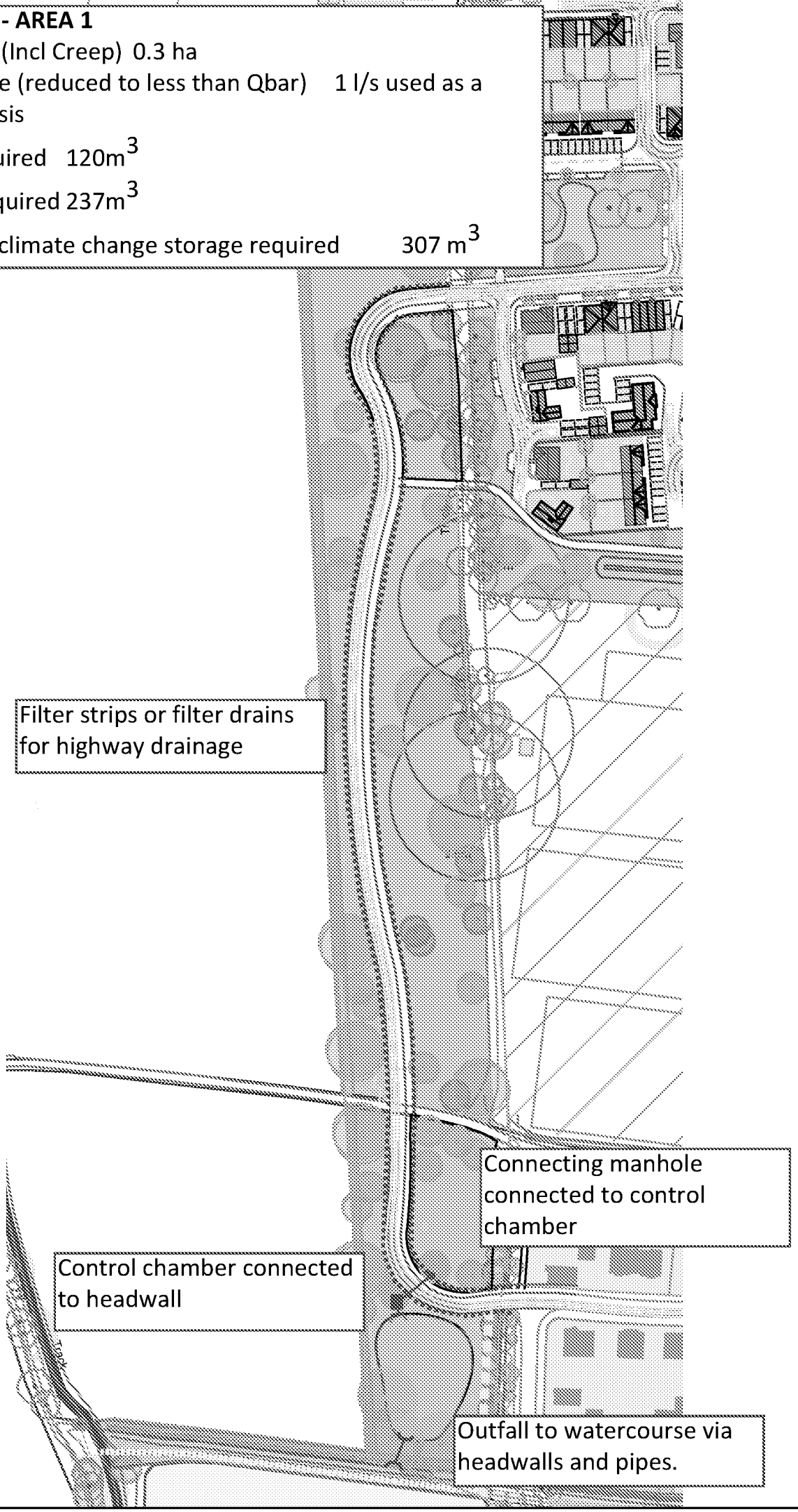
Impermeable Area (Incl Creep) 0.3 ha

Permitted discharge (reduced to less than Qbar) 1 l/s used as a minimum for analysis

2-year storage required 120m^3

30-year storage required 237m^3

100-year plus 45% climate change storage required 307 m^3



SURFACE WATER DRAINAGE STRATEGY AREA 1

Storage Summary - AREA 3

Impermeable Area (Incl Creep) 0.22ha

Permitted discharge (reduced to less than Qbar) 0.44l/s (based on 2l/s/ha)

2-year storage required 83m^3

30-year storage required 163m^3

100-year plus 45% climate change storage required 214m^3

Storage Summary - AREA 2

Impermeable Area (Incl Creep) 2.3ha

Permitted discharge (reduced to less than Qbar) 4.6l/s (based on 2l/s/ha)

2-year storage required 1265m^3

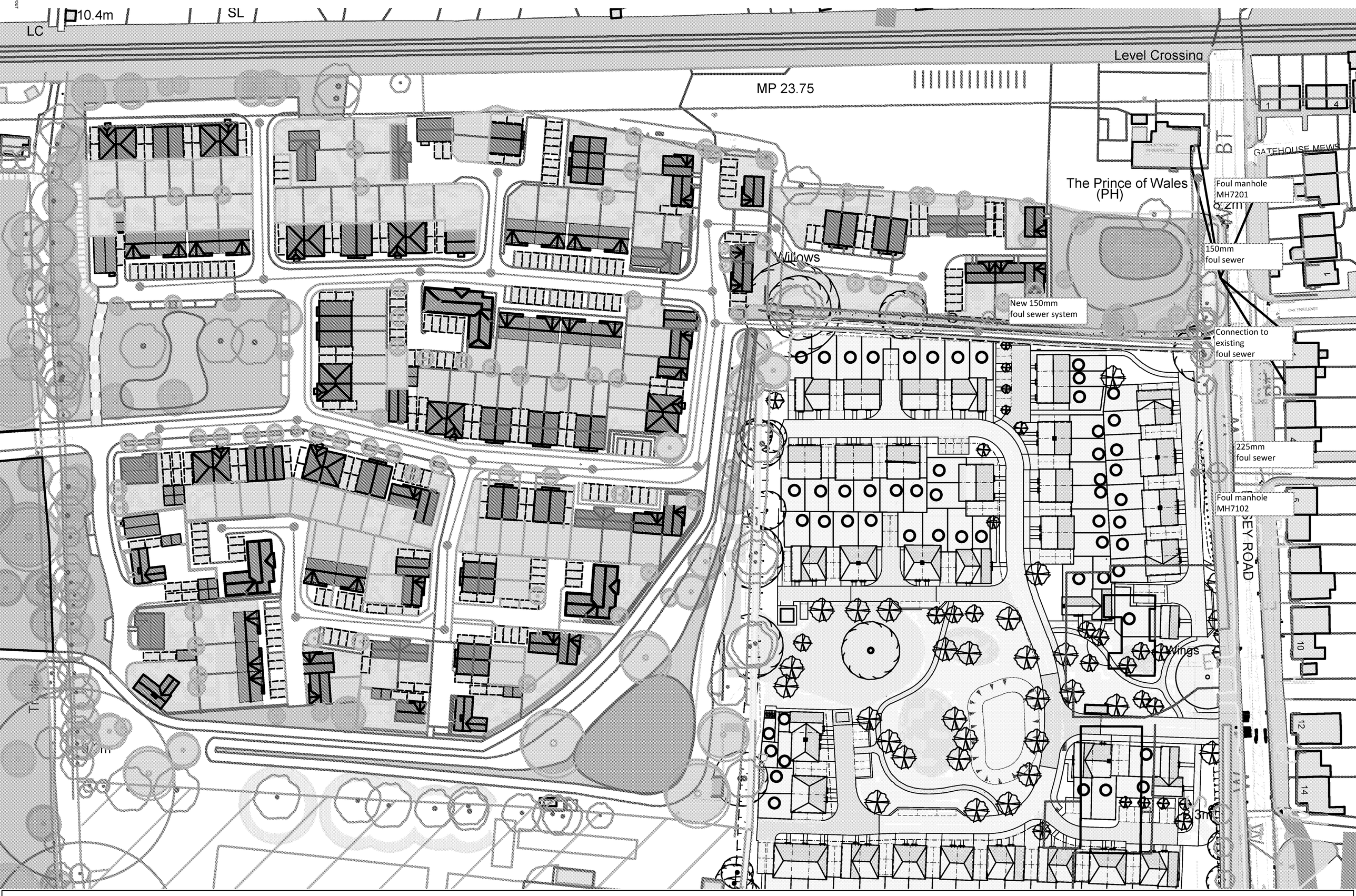
30-year storage required 2199m^3

100-year plus 45% climate change storage required 2706m^3

NOTE: THE STRATEGY IS INDICATIVE ONLY

It is anticipated that swales, filter strips and filter drains will feature extensively within the SuDS scheme, together with other shallow conveyance systems. Taking into account the potential for flotation and groundwater infiltration components will need to be lined and weighted sufficiently to withstand flotation pressures. These are considered to be feasible when having regard to the aforementioned detailed site investigation.

SURFACE WATER DRAINAGE STRATEGY AREAS 2&3



FOUL DRAINAGE STRATEGY

Appendix 7

West Sussex County Council Developer's Guidance Note and other guidance

ARUN DISTRICT COUNCIL AL/89/24/OUT

West Sussex LLFA Policy for the Management of Surface Water

Updated November 2018.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Planning Context

West Sussex County Council (WSCC), as Lead Local Flood Authority (LLFA) is the risk management authority responsible for local flood risk defined as flooding from surface water, groundwater and ordinary watercourses (2.1.1). Hereafter we will refer to either West Sussex LLFA or more simply as the LLFA.

The LLFA is required to provide consultation responses on the surface water drainage provisions associated with major development (2.2.2). This policy statement sets out the requirements that the LLFA has for drainage strategies and surface water management provisions associated with applications for development.

For all developments, even small, we would expect the principles of this policy & drainage strategy to be considered. For all major developments, we would expect adherence to the full scope of this policy; the drainage strategy is to consider the topics set out in the table below and be consistent with the Sustainable Drainage Systems (SuDS) policies in Sections 5 and 6 of this document.

Scope for Drainage Strategy	**Relevant sections of document**
Drainage Catchment & Impermeable area (pre- and post-development)	5.2.1
Discharge location	5.2.1; 5.2.5
Infiltration capacity	5.2.2-5.2.3
Design calculations for peak flow, volume control and greenfield runoff, and/or brownfield runoff where appropriate	5.3
Inclusion of climate change & future development allowances	5.2.2; 5.3.2; 5.3.5;; 5.4.4; Policy 5; 5.6.1
Topographical survey of the site	5.3.1; 5.4.1
Details of any adjacent watercourse	5.3.1;5.4.1
Areas of flood risk	4.2; 5.5
Quantification of any surface water flows on-site from off-site locations	5.3

ARUN DISTRICT COUNCIL AL/89/24/OUT

Exceedance routes	5.3.5; Policy 2
Offsite works	5.3.1; 5.5.2
Consents	3.2; 4.3
Any constraints which affect the proposed development	5.3.8; 6.1
Locations of sensitive receptors, including source protection zones, habitat designations or archaeological features	6.1.7
Principles of temporary drainage during construction	6.1.2
Proposed extent of adoption strategy	5.7.6
A Strategic Surface Water Management Strategy for large sites for which the development is to be phased.	5.3.11
Correspondence from any receiving authority or permitting authority	Section 4; 5.2.5

Section 2 provides the regulatory context for this policy and Section 3 summarises specific guidance that informs LLFA consideration of surface water management.

Section 4 describes the consultation process and LLFA expectations for how developers should engage in this process.

This policy statement is consistent with the National Planning Policy Framework (NPPF) National Planning Practice Guidance and Defra Non-Technical Standards for Sustainable Drainage. However, it does not supplant this or any other non-statutory best practice guidance to which this document refers.

Input to the development management process by the LLFA is not restricted to major development applications. LLFA advice should be sought on other planning applications which raise surface water or other local flood risk issues; the basis of consultation between the LLFA and planning authorities can be the subject of pre-arranged protocols (see also planning practice guidance paragraph: 045 reference ID: 7-045-20150323).

Section 7 of this policy relates to management of surface water flood risk for developments smaller developments including homeowner extensions and alterations and commercial developments less than 0.5ha or comprising fewer than 10 properties.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Table of Contents

1 Role of this Policy Statement 1

2 Introduction 1

2.1 Background 1

2.2 Use of Sustainable Drainage Systems: Policy and Legislative Requirements 2

2.3 Sustainable Drainage in Planning 3

2.4 Drainage Strategies 3

2.5 Strategic Consultation 3

3 Planning policy and regulatory guidance for drainage 4

3.1 National Planning Policy Framework (NPPF) 4

3.2 Watercourse Regulation 4

3.3 Non-statutory technical standards for sustainable drainage 5

3.4 Local Authority Guidance 5

3.4.1 Local Plans 5

3.4.2 Strategic Flood Risk Assessments (SFRA) 6

3.5 West Sussex County Council Guidance 6

3.5.1 Water. People. Places a guide for master planning sustainable drainage into developments 6

3.5.2 The Updated Flood Map for Surface Water & Long term flood risk information 6

..... 7

3.5.4 Culvert Policy 7

3.6 Other Guidance 7

3.6.1 CIRIA SuDS Manual (C753), 2015 8

3.6.3 Building Research Establishment, Soakaway Design – Digest 365 (BRE DG 365 (2016)) 8

3.7 Wider Duties as a Public Body under other Environmental Regulatory Mechanisms 9

3.7.1 Water Framework Directive (WFD) 9

3.7.4 The Conservation of Habitats and Species Regulations 2010 9

3.7.6 The Countryside and Rights of Way Act 2000 10

4 Drainage Consultation 11

ARUN DISTRICT COUNCIL AL/89/24/OUT

4.1 Introduction 11
4.2 Critical Drainage Areas and Areas of High Local Flood Risk 11
4.3 Ordinary Watercourses 12
4.4 Consultation on Planning Applications 13
4.4.1 Overview 13
4.4.2 Pre Application Advice 13
4.4.3 Planning Application Submission 13
4.5 Drainage Strategy Development 13
5 Policies for Sustainable Drainage 16
5.1 Introduction 16
5.2 SuDS Policy 1: Discharge Hierarchy 17
5.3 SuDS Policy 2: Manage Flood Risk through Design 19
5.4 SuDS Policy 3: Mimic Natural Flows and Drainage Flow Paths 21
5.5 SuDS Policy 4: Seek to Reduce Existing Flood Risk 24
5.6 SuDS Policy 5: Maximise Resilience 24
5.7 SuDS Policy 6: Design to be Maintainable 26
6 Environmental Policies 28
6.1 SuDS Policy 7: Safeguard Water Quality 28
6.2 SuDS Policy 8: Design for Amenity and Multi-functionality 29
6.3 SuDS Policy 9: Enhance Biodiversity 30
6.4 SuDS Policy 10: Link to Wider Landscape Objectives 30
7 Flood Risk / Surface Water Management: Standing Guidance for Smaller Developments 32
7.1 Introduction 32
7.2 Homeowners 33
7.3 Developers 36

ARUN DISTRICT COUNCIL AL/89/24/OUT

1 Role of this Policy Statement

1.1 This policy statement sets out how West Sussex LLFA, as a statutory consultee, will review drainage strategies and surface water management provisions associated with applications for development. It is consistent with the Non-Statutory Technical Standards for Sustainable Drainage (as published by Defra in March 2015), and sets out the policy requirements West Sussex County Council has for sustainable drainage. It should be read in conjunction with:

- the NPPF;
- Gov.UK Guidance for the Preparation of Flood Risk Assessments; https://www.gov.uk/guidance/flood-risk-assessment-standing-advice; and
- any specific policy set out by the relevant Local Planning Authority in their Local Plan.

Where Local Plan policies have stronger requirements in terms of need for FRA/drainage strategy or restricting runoff rates, they will take precedence over this policy.

1.2 This policy statement should be used by:

- Developers when considering their approach to the development of new sites or redevelopment of brownfield sites;
- Developers or their consultants when preparing drainage submissions to support a planning application for development;
- Homeowners when considering alterations / extensions to their home that affect surface water run-off (Section 7);
- Professionals involved in developing drainage schemes including engineering, urban and landscape professionals;
- Development Management officers when considering development applications; and
- Local Authorities when developing local planning and land-use policy.

2 Introduction

2.1 Background

2.1.1 West Sussex County Council was made LLFA for West Sussex by the Flood and Water Management Act 2010 (the Act). As LLFA, West Sussex County Council has a strategic overview of 'local flooding.' Local flooding is defined by the Act as flooding which is caused by:

ARUN DISTRICT COUNCIL AL/89/24/OUT

- Surface water; and/or
- Groundwater; and/or
- Ordinary Watercourses.

The management of surface water for new developments is a key factor in managing local flood risk.

2.2 Use of Sustainable Drainage Systems: Policy and Legislative Requirements

2.2.1 National planning policy directs new development wherever possible away from areas at risk of flooding. This notwithstanding, new development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems (SuDS). When considering major development, SuDS should be provided unless demonstrated to be inappropriate (Planning Practice Guidance paragraph 079 ID: 7-079-20150415).

2.2.2 As the LLFA, West Sussex County Council is required under Article 18 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (the Development Management Procedure Order) to provide consultation response on the surface water drainage provisions associated with major development.

2.2.3 Major development is defined within the Development Management Procedure Order as development that involves any one or more of the following:

(a) the winning and working of minerals or the use of land for mineral-working deposits;

(b) waste development;

(c) the provision of dwelling houses where:

(i) the number of dwelling houses to be provided is 10 or more; or

(ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);

(d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or

(e) development carried out on a site having an area of 1 hectare or more.

2.2.4 Input to the development management process by the LLFA is not restricted to major development applications. LLFA advice should be sought on other planning applications which raise surface water or other local flood risk issues; consultation can be on the basis of pre-arranged protocols (see also planning practice guidance paragraph: 045 reference ID: 7-045-20150323).

2.3 Sustainable Drainage in Planning

2.3.1 SuDS are designed to control surface water as close to its source as possible. They should also aim to closely mimic the natural, pre-development drainage across a site, wherever possible. Well-designed SuDS also provide opportunities to:

- reduce the causes and impacts of flooding;
- remove pollutants from urban run-off at source; and
- combine water management with green space yielding benefits for amenity, recreation and wildlife.

2.4 Drainage Strategies

2.4.1 Development has the potential to change surface water and groundwater flows, depending upon how the surface water is managed within the development proposal.

Planning applications for development should therefore be accompanied by a site-specific drainage strategy that demonstrates that the drainage scheme proposed is in compliance with West Sussex County Council's sustainable drainage policies, as outlined within this document.

The drainage strategy must also demonstrate that the proposed surface water management proposal is consistent and integrated with any other appropriate planning policy and flood risk management measures that are required.

2.5 Strategic Consultation

2.5.1 As the LLFA, West Sussex County Council has a consultation role in relation to the preparation of local plans, neighbourhood plans, strategic flood risk assessments and other planning instruments produced by Local Planning Authorities. West Sussex County Council will provide advice and guidance on local flood risks and appropriate policy for the plan area upon request.

2.5.2 Upon request, West Sussex County Council will provide information with respect to drainage and local flood risk for individuals and other organisations to utilise in preparation of planning documents.

ARUN DISTRICT COUNCIL AL/89/24/OUT

3 Planning policy and regulatory guidance for drainage

3.0 This section sets out the sources of planning policy relevant to the management of surface water. These will form the basis of West Sussex County Council's assessment of any submitted drainage strategy. The drainage strategy will need to demonstrate how the development meets these requirements.

3.1 National Planning Policy Framework (NPPF)

3.1.1 The National Planning Policy Framework (NPPF) was published on 27 March 2012; it sets out the Government planning policies for England and how these are expected to be applied. Planning law requires that applications for planning permission must be determined in accordance with the relevant Local Development Plan, following public consultation and with due regard to other material considerations. Flooding and drainage policy within the NPPF is a material consideration which states that planning authorities should:

- direct development away from areas at highest flood risk;
- take the impacts of climate change into account;
- use opportunities offered by new development to reduce the causes and impacts of flooding;
- ensure flood risk is not increased elsewhere;
- give priority to the use of sustainable drainage systems;
- enhance the natural and local environment; and,
- look to improve discharged water quality.

3.1.2 Paragraphs 155 to 165 of the NPPF have particular relevance to flooding and drainage.

3.1.3 The NPPF is supported by the Planning Practice Guidance[1] which provides further advice on how planning can take account of the risks associated with flooding in plan-making and the application process.

3.2 Watercourse Regulation

3.2.1 Under Section 23 of the Land Drainage Act, 1991 No person shall—

(a) erect any mill, dam, weir or other like obstruction to the flow of any ordinary watercourse or raise or otherwise alter any such obstruction; or

(b) erect any culvert that would be likely to affect the flow of any ordinary watercourse or alter any culvert in a manner that would be likely to affect any such flow,

[1] The Planning Practice Guidance is a web-based resources which can be accessed from the Planning Portal at: http://planningguidance.planningportal.gov.uk/?s=Drainage&post_type=guidance

ARUN DISTRICT COUNCIL AL/89/24/OUT

without obtaining the consent of the Internal Drainage Board (where one exists), the Environment Agency (if the watercourse is designated as a Main River) or the LLFA.

3.2.2 Where Section 23 of the Land Drainage Act 1991 applies to a development, grant of planning permission, in itself, does not allow construction to commence without grant of an Ordinary Watercourse Consent (OWC) or Environmental Permit (EP) where development affects Main Rivers.

3.2.3 For further details see: https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/dealing-with-flooding/flood-risk-management/ordinary-watercourse-land-drainage-consent/

3.3 Non-statutory technical standards for sustainable drainage

3.3.1 To support the LLFA consultee role, Defra published the Non-Statutory Technical Standards for Sustainable Drainage Systems on 23 March 2015. These standards provide advice and guidance for the design, maintenance and operation of sustainable drainage systems[2].

3.3.2 Further guidance on the application of the Non-Statutory Technical Standards will be provided by Defra and associated stakeholders.

3.3.3 The policies in this policy statement are consistent with the Non-Statutory Technical Standards.

3.4 Local Authority Guidance

Local Planning Authorities are ultimately responsible for determining planning applications and have numerous statutory and non-statutory planning policy documents to support the delivery of sustainable development within their districts.

3.4.1 Local Plans

National planning policy places Local Plans at the heart of the planning system. Local Plans set out a vision and a framework for future development of the area. Local Plans should be based upon and reflect the presumption in favour of sustainable development. The Local Plans will address housing, the economy, community infrastructure and environmental issues such as adapting to climate change and ensuring high quality design.

[2] The Non-statutory Technical Standards are published at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

ARUN DISTRICT COUNCIL AL/89/24/OUT

The management of flood risk and surface water can be dealt with through policies for sustainable construction, flood risk, open space, landscape character and green infrastructure. These policies may be supported by further Supplementary Planning Documents (SPD) or guidance notes.

Any drainage strategy should make reference to the relevant Local Plan policy and may also have to provide evidence which supports delivery of biodiversity, amenity and other benefits.

3.4.2 Strategic Flood Risk Assessments (SFRA)

Strategic Flood Risk Assessments are required to inform the development of Local Plans, as stated within the NPPF. A SFRA assesses the risk to an area from flooding from all sources, now and in the future, taking into account climate change and assesses the impact that land use changes and development in the area will have on flood risk. Each Local Planning Authority within West Sussex has prepared and referenced a SFRA within their planning documents. These documents provide key information on sources of flooding and may provide information for specific site allocations.

3.5 West Sussex County Council Guidance

The Local Flood Risk Management Strategy sets out how we as a LLFA will work alongside other risk management authorities to deliver improvements together to reduce flood risks. The strategy acknowledges that it is currently surface water flooding that causes the most regular impact to communities across West Sussex.

When considering surface water drainage within new developments in West Sussex, it is recommended that reference is made to:

3.5.1 Water. People. Places a guide for master planning sustainable drainage into developments

available at:
https://www.westsussex.gov.uk/media/2270/suds_design_guidance.pdf

This guidance outlines the process for integrating sustainable drainage systems into the master planning of large and small developments. This guidance should be used as part of the initial planning and design process for all types of development.

3.5.2 The Updated Flood Map for Surface Water & Long term flood risk information

available at: https://www.gov.uk/government/publications/flood-maps-for-surface-water-how-they-were-produced

Long term flood risk information is provided via the following link;

https://flood-warning-information.service.gov.uk/long-term-flood-risk

3.5.3 Surface Water Management Plans

Surface water management plans outline how surface water will be managed in a given area that experiences flooding from surface water runoff. Existing plans can be viewed via the following link: https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/dealing-with-flooding/flood-risk-management/flood-reports-projects-and-policies/

Any drainage strategy should incorporate data from the updated Flood Map for Surface Water and if the site falls within an area covered by a SWMP the drainage strategy should include consideration of any relevant findings and recommendations.

3.5.4 Culvert Policy

West Sussex Local Authorities are in general opposed to the culverting of watercourses because of the adverse effect on flood defence and ecology. Approval, therefore, will only be granted for an application to culvert an ordinary watercourse if there is no reasonably practicable alternative or if the detrimental effects of culverting would be so minor that they would not justify a more costly alternative. The West Sussex Culvert Policy can viewed here:

3.5.5 Land Drainage & Consenting Enforcement Policies

WSCC LLFA's Land Drainage & Consenting Enforcement Policies are currently awaiting final approval. The guiding principle of these policies is to inform and educate landowners, developers, farmers, and other businesses to facilitate a greater level of compliance. WSCC LLFA recognises that a collaborative approach to prevention is better than cure. However, it will take action where it is suspected that an offence has occurred or is reasonably foreseeable. This may range from providing advice and guidance; serving notices; through to prosecution for failure to comply with notices; or any combination that achieves the desired outcome. In order to improve land drainage and seek 'betterment', WSCC LLFA will use its powers of enforcement under the Flood & Water Management Act and LDA91 to require a watercourse to be cleared if matters cannot be resolved by the provision of advice and guidance.

3.6 Other Guidance

In approaching or reviewing design, technical aspects may need further clarification and detailed specification in order to satisfy the LLFA that the design meets the required standard.

West Sussex LLFA will make reference to good practice presented within the following documents, and would recommend that any designer also refers to:

3.6.1 CIRIA SuDS Manual (C753), 2015

This guidance document provides comprehensive information on all aspects of the life cycle of sustainable drainage from initial planning, design through to construction and future management including landscaping, waste management and costs. It reinforces the multi-functional nature of SuDS in meeting a range of policy goals within different regulatory areas: planning; flood risk management; water quality management; and water resource management. This interrelationship between SuDS and key regulatory frameworks is further depicted in Figure 1 below.

3.6.2 BS 8585:2013 Code of practice for surface water management for development sites

The British Standard gives recommendation on the planning, design, construction and maintenance of surface water management systems for new development and redevelopment sites. It gives recommendations for minimizing and/or mitigating flooding and maximizing the social and environmental benefits of development.

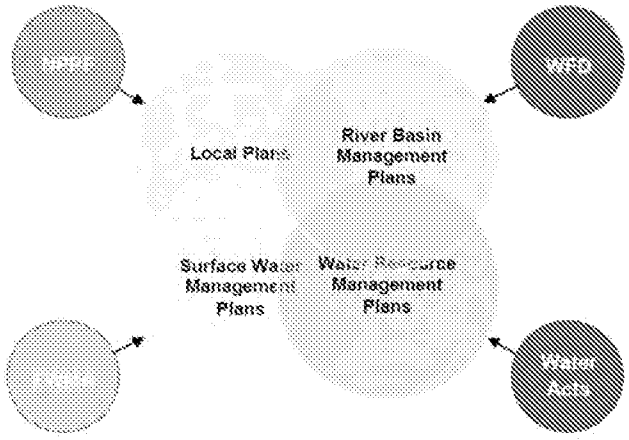


Figure 1: Inter-relationships between different areas of water policy (Planning Advice for Integrated Water Management, Cambridge Natural Capital Leaders Platform, 2014).

3.6.3 Building Research Establishment, Soakaway Design - Digest 365 (BRE DG 365 (2016))

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the

proposed structures. The percolation tests must be carried out in accordance with DG 365 (or similar approved method) and the test pits should be above an agreed maximum annual groundwater level based upon best available data.

3.7 Wider Duties as a Public Body under other Environmental Regulatory Mechanisms

West Sussex LLFA as a public body has a duty under other regulatory mechanisms to raise environmental issues with the Local Planning Authority.

3.7.1 Water Framework Directive (WFD)

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 3242) (WFD) became UK law in December 2003. The aim of the WFD is to provide the opportunity to plan and deliver a better water environment, focusing on ecology. The WFD aimed for the water environment to reach good chemical and ecological status in inland and coastal waters by 2015. Planning and improvement programmes are continuing in six year cycles until 2027.

3.7.2 The WFD drives water quality improvement planning along total river catchment areas, through the production of River Basin Management Plans by the Environment Agency. The directive puts a duty on public bodies to have regard to River Basin Management Plans (and associated supplementary plans) when exercising their functions where it may affect a river basin catchment.

3.7.3 Controlling water is inherent in the WFD's objectives as uncontrolled surface flow or flooding can cause unmanageable quality problems. Sustainable drainage principles are a major contributor in meeting the objectives of the WFD in its continuing cycles.

3.7.4 The Conservation of Habitats and Species Regulations 2010

The Conservation of Habitats and Species Regulations 2010 transpose Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law consolidating all amendments made to the earlier 1994 regulations.

3.7.5 Under section 9(5) of the above regulations, a LLFA, in exercising any of their functions, must have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of those functions.

3.7.6 The Countryside and Rights of Way Act 2000

This act (section 74) places a duty on duty on public authorities to have regard for the conservation of biodiversity[3] and on government departments to maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

[3] Amended by section 40,41 and 42 of the Natural Environment and Rural Communities (NERC) Act, 2006.

4 Drainage Consultation

4.1 Introduction

A drainage strategy should be submitted to the relevant Local Planning Authority along with the planning application for any development.

4.1.1 It is important that the consultation reflects the level of risk. Consequently consultation may also occur for development, other than major development in areas of local flood risk, as described in Section 4.2 and Section 7.

4.1.2 Irrespective of whether or not formal consultation is required, all Developers are encouraged to consider the policies outlined in this document with respect to their site drainage design.

4.1.3 Consultation on flood risk will also occur with other risk management authorities. For example, the management of tidal and fluvial flood risk and the prevention of inappropriate development in the flood-plain remains the responsibility of the Environment Agency. The Environment Agency is also responsible for the management of permitting regulations which may affect discharge to water bodies or the ground. Similarly, if any drainage scheme requires connection to a public sewer, approval will be required from the appropriate sewerage undertaker.

4.2 Critical Drainage Areas and Areas of High Local Flood Risk

The Town and Country Planning (General Development Procedure Amendment No. 2, England) Order 2006 introduces the concept of Critical Drainage Areas as *an area within Flood Zone 1 which has* ***critical drainage*** *problems and which has been notified [to] the local planning authority by the Environment Agency*.

4.2.1 West Sussex LLFA will work with the Local Planning Authorities to identify Areas of High Local Flood Risk for their districts. These areas will be based upon the Surface Water Management Plans that it has developed in partnership with other risk management authorities and on the Surface Water Flood Maps (see paragraphs 3.5.2 and 3.5.3). Where these areas are identified, all planning applications with potential surface water management implications will need to be submitted with a more rigorous justification of the chosen drainage system and an assessment of its associated impact.

Any drainage strategy submitted to accompany a planning application for major development should make full reference to the Surface Water Flood Map and the most recent available Surface Water Management plan for the area in which the development is planned.

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4.3 Ordinary Watercourses

An 'ordinary watercourse' is defined as any channel capable of conveying water that is not part of a 'main river'; it may not have a permanent water level. Small rivers, streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) can all be classified 'ordinary watercourses'

When considering the development/redevelopment of any site, existing ordinary watercourses should be identified and accommodated within any drainage strategy design. Culverting (piping) a watercourse is not advised unless there is no alternative. The resulting reduction in storage volume, flow capacity and habitat potential would be unacceptable.

Access to facilitate future maintenance of drainage infrastructure and ordinary watercourses must be incorporated in the drainage strategy irrespective of whether the watercourses are culverted or not.

4.3.1 Existing watercourses should preferably be retained as open features within a designated corridor, and ideally as public open space. It is recommended that any discharge to an ordinary watercourse or any modification to an ordinary watercourse be identified and agreed in principle with West Sussex LLFA prior to submission of any planning application. The ability of a watercourse to convey water (and to function as an effective exceedance flow route, where appropriate) will always need to be maintained.

4.3.2 For ordinary watercourses, Ordinary Watercourse Consent (Land Drainage Consent) must be sought from the LLFA (West Sussex County Council) or its agent, prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, channel diversion, the construction of new surface water outfalls and the installation of trash screens. If the watercourse affected is a main river, this would require an Environmental Permit under the Environmental Permitting Regulations and guidance should be sought from the Environment Agency in the first instance.

4.4 Consultation on Planning Applications

4.4.1 Overview

Consultation with West Sussex LLFA will occur through the planning process. West Sussex LLFA will be notified of the submission of a major planning application by the Local Planning Authorities within West Sussex. A substantive response to the LPA is legally required from West Sussex LLFA within 21 days of consultation.

4.4.2 Pre Application Advice

Incorporating appropriate drainage is easier and more sustainable if it is planned and designed from the start of a development. Pre-application advice on drainage is strongly encouraged by the LLFA and should normally be arranged with the District / Borough Drainage Engineer via the Local Planning Authority. If an application is submitted which does not comply with the Non-Statutory Technical Standards , NPPF, and / or this policy West Sussex LLFA may object to the application. Pre-application discussions are advocated to avoid this situation. The SuDS Manual, in particular Table B1, provides further guidance for the content of pre-application discussions.

4.4.3 Planning Application Submission

Major applications and other development applications in areas at risk from flooding will, once validated by the Local Planning Authority, be referred for technical review to the District / Borough Drainage Engineer who will identify site specific land use considerations that affect surface water management. West Sussex LLFA will also be reviewing these applications for compliance with this policy statement, considering the implications of flood risk and any Surface Water Management Plan that may apply; and will consider adherence to wider environmental principles of the NPPF that may have a bearing on drainage design (for example, water quality, biodiversity and landscape). Consultation responses from both the District / Borough Engineer and the LLFA will be returned via the Local Planning Authority within the required 21 days following receipt of a suitably detailed submission. Consultation responses may result in a request for further information or for planning conditions for subsequent determination.

4.5 Drainage Strategy Development

The drainage strategy will need to incorporate the policies set out in Section 5.

4.5.1 The required scope for a Drainage Strategy is set out in Table 1 below. Amplifying detailed notes follow Table 2 so a developer is left in no doubt as to the requirements.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Scope for Drainage Strategy	Relevant sections of document
Drainage Catchment & Impermeable area (pre- and post-development)	5.2.1; 5.6.4; 5.3.1
Discharge location(s)	5.2.1; 5.2.5
Infiltration capacity	5.2.2-5.2.3
Design calculations for peak flow, volume control and greenfield runoff, and/or brownfield runoff where appropriate	5.3
Inclusion of climate change & future development allowances	5.2.2; 5.3.2; 5.3.4; 5.3.6; Policy 5; 5.6.1
Topographical survey of the site	5.3.1; 5.4.1
Details of any adjacent watercourse	5.3.1;5.4.1
Areas of flood risk	4.2; 5.5
Quantification of any surface water flows on-site from off-site locations	5.3
Exceedance routes	5.3.4; Policy 2
Offsite works	5.3.1; 5.5.2
Consents	3.2; 4.3
Any constraints which affect the proposed development	5.3.8; 6.1
Locations of sensitive receptors, including source protection zones, habitat designations or archaeological features	6.1.7
Principles of temporary drainage during construction	6.1.2
Proposed extent of adoption strategy	5.7.6
A Strategic Surface Water Management Strategy for large sites for which the development is to be phased.	5.3.9
Correspondence from any receiving authority or permitting authority	Section 4; 5.2.5

4.5.2 Proportionality in compiling a drainage strategy

The drainage strategy needs to follow the above guidance but should be proportionate to the size of the development. A residential development of several houses will be expected to provide appropriate modelled run-off and detailed drawings for how run-off is being attenuated; for a small home-owner extension, architect's drawings annotated with proposed drainage arrangements may suffice.

5 Policies for Sustainable Drainage

5.1 Introduction

5.1.1 West Sussex LLFA has adopted the policies summarised in Table 5.1 to conform to statutory policy and best practice. Policies 1 to 6 set out the requirements for a drainage strategy to be compliant with the NPPF and Non-Statutory Technical Standards for Sustainable Drainage. Policies 7 to 10 set out expectations to be considered within a drainage strategy in response to environmental legislation and guidance that West Sussex County Council and the Local Planning Authorities have a duty to comply with.

5.1.2 All the policies reflect the requirements of the Local Flood Risk Management Strategy, Surface Water Management Plans and Local Planning Authority Local Plans. Sufficient information must be submitted to demonstrate compliance.

Table 5.1: West Sussex LLFA SuDS Policies

Policy	**Summary**
SuDS Policy 1	Follow the drainage hierarchy
SuDS Policy 2	Manage Flood Risk Through Design
SuDS Policy 3	Mimic Natural Flows and Drainage Flow Paths
SuDS Policy 4	Seek to Reduce Existing Flood Risk
SuDS Policy 5	Maximise Resilience
SuDS Policy 6	Design to be Maintainable
SuDS Policy 7	Safeguard Water Quality
SuDS Policy 8	Design for Amenity and Multi-Functionality
SuDS Policy 9	Enhance Biodiversity
SuDS Policy 10	Link to Wider Landscape Objectives

SuDS Policy 1: Follow the drainage hierarchy

1. **Surface runoff not collected for use must be discharged according to the following discharge hierarchy:**
   - **to ground,**
   - **to a surface water body,**
   - **to a surface water sewer, highway drain, or another drainage system, or**
   - **to a combined sewer where there are absolutely no other options, and only where agreed in advance with the relevant sewerage undertaker.**
2. **The selection of a discharge point should be clearly demonstrated and evidenced.**

5.2 SuDS Policy 1: Discharge Hierarchy

5.2.1 When development occurs, the urbanisation process within a catchment affects the natural hydrology; if the destination of the water is altered this may result in:

- a reduced supply of rainfall to groundwater;
- an accelerated passage of flow to the receiving watercourses; and
- water directed away from existing receiving catchments.

In order to maintain the natural balance of the water cycle, the above discharge hierarchy[4] must be observed. Where development results in changes in runoff destinations, the design must account for how the surface flows are managed and demonstrate it does not exacerbate off-site flood risk.

5.2.2 Infiltration structures (to ground) include soakaways, basins, swales and permeable paving. Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE DG 365, CIRIA R156 or a similar approved method, and cater for the 1 in 10 year design storm event[5] between the invert of the lowest entry pipe into the infiltration structure and the base. Tests should be undertaken during winter / early spring when ground water levels are typically highest; if groundwater levels are influenced by the tide then tests should be undertaken over a high-water spring tide.

[4] SuDS selection hierarchy based on: CIRIA C753 - The SuDS Manual; BS8582:2013 – Code of Practice for Surface Water Management for Development Sites; and Approved Document H of the Building Regulations.

[5] The design event will vary according to the storage design and the contribution the storage component makes to the overall SuDS for the site; as a minimum for traditional soakaways the design event will be for a 1:10 year event plus allowance for climate change.

ARUN DISTRICT COUNCIL AL/89/24/OUT

For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero, unless otherwise agreed with the LPA engineer. This does not apply to infiltration basins or permeable pavements, whereby the percolation rate is applied to the base only. The infiltration structure should drain 50% of its total volume in 24 hours or less for the 1 in 10 year event and for the 1 in 100 year event (unless otherwise agreed with the LPA engineer) in order to provide spare capacity for subsequent storms. Flood risk assessments: climate change allowances can be viewed via the following link: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

5.2.3 Any infiltration drainage design must include adequate winter groundwater monitoring data in areas of known groundwater issues, to determine the highest winter groundwater table. Residential developments in excess of five properties will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the District or Borough Council Engineers. Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location; ideally this should be 1m where possible.

5.2.4 Deep bore soakaways should only be considered after other forms of infiltration attenuation have been explored and in all cases, the applicant will be required to consult the EA hydrogeologist before their inclusion in a drainage strategy.

5.2.5 Infiltration is not always appropriate, and the advice of the drainage engineer should be sought: for developments in or close to source protection zones (SPZs); in areas with a known history of land contamination; or in areas with known high seasonal groundwater levels.

5.2.6 Surface water must not be discharged into the foul sewer system. Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q1) by means of a controlled outflow (but see paragraph 5.4.4 regarding restrictions on runoff rates for brownfield sites). Flood Estimation Handbook (FEH) methods should be the preferred approach for developing runoff estimates used in surface water design[6]. There is also a tool available on www.ukSuDS.com that allows calculation of Q1 by both FEH and IH124. Both the point of connection and discharge rate must be agreed with the relevant owner or

[6] SuDS Manual paragraph 24.3.

responsible body including internal drainage boards, highway authorities, sewerage undertakers, riparian owner, Environment Agency, Canals and River Trust and others (see also paragraph 4.3 Ordinary Watercourses).

SuDS Policy 2: Manage Flood Risk Through Design

1. **The drainage scheme proposed is to:**
    a. **protect people and property on the development site from flooding; and,**
    b. **avoid creating any additional flood risk outside of the development in any part of the catchment, either upstream or downstream.**
2. **Any drainage scheme must manage all sources of surface water, including exceedance flows and surface flows from offsite, provide for emergency ingress and egress and ensure adequate connectivity.**
3. **For large sites where development is to be phased, there will need to be a strategic site surface water management system that allows different parts of the site to be developed at different times while ensuring that each of the design criteria can be met.**

5.3 SuDS Policy 2: Manage Flood Risk through Design

5.3.1 The natural drainage catchment for the site needs to be mapped including the water that drains down into / through the site from outside the site boundary. The pre and post development drainage is to be based upon the whole catchment demonstrating how off-site drainage is being managed within the proposed strategy.

5.3.2 The drainage system must be designed to operate without any flooding occurring during any rainfall event up to (and including) the critical 1 in 30 year storm (3.33% AEP). The system must also be able to accommodate the rainfall generated by events of varying durations and intensities up to (and including) the critical, climate change adjusted 1 in 100 year storm (1% AEP) without any on-site property flooding and without exacerbating the off-site flood-risk. Sufficient steps are to be taken to ensure that any surface flows between the 1 in 30 and 1 in 100 year events are retained on site. Storage should be based upon analyses of a range of winter and summer storm profiles to determine a critical storm event.

5.3.3 The LLFA will wish to review the input values and calculations for storage design and the greenfield run-off rates upon which they are based. Where computer models have been used to underpin design, the drainage strategy should be accompanied by the full results and design criteria.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Where calculations involve use of the **Coefficient for Volumetric Run-off** (**Cv**) Sewers for Adoption (7th Edition) recommends that a Cv of 1.0 should be used whenever calculating runoff from impermeable surfaces (roofs and paved areas should have an impermeability of 100%). When making an application the designer should demonstrate to the LLFA that Cv has been suitably determined.

5.3.4 The choice of where storage volumes are accommodated may be within the drainage system itself or within other areas designated within the site for conveyance and storage.

5.3.5 The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

1. Low flow routes

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2. Overflows

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the main SuDS drainage system when conditions return to normal.

3. Exceedance routes

Should SuDS be overwhelmed by exceptional rainfall (1:100 + allowance for climate change) then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

5.3.6 The primary consideration shall be risks to people and property on and off site.

5.3.7 Wholesale land raising should not be undertaken, for example, by the spreading of excavated material on site or the importation of additional fill. Such action increases the possibility of changing natural flows and increasing flood risk beyond the development area.

5.3.8 Access should be maintained into and through the site for emergency vehicles. The drainage application must give consideration to flood risk vulnerability classifications (as defined through Planning Practice Guidance to the NPPF), as specific measures or protections may be necessary and need to be agreed with the appropriate authority.

5.3.9 The time required for the storage to accept further storm flows should be considered, especially if downstream flood levels can affect the outfall. Attenuation storage volume provided by any drainage area should half empty within 24 hours so that it can receive runoff from subsequent storms. If the drain down time (full to empty) is more than 24 hours, then long duration events should be assessed to ensure that drainage is not compromised by inundation.

5.3.10 If the proposed system connects to an existing drainage system, whether it is a sewer, highway drain, water body or sustainable drainage system, consideration must be given to the operational capacity and functionality of the existing system to ensure that no adverse impacts result or flood risk is increased either on-site or off-site.

5.3.11 For large sites involving phased development, the strategic surface water management system will need to be designed to manage the flows from the final developed site, and specific conditions will need to be set for each development plot so that the original design assumptions are not invalidated[7].

SuDS Policy 3: Mimic Natural Flows and Drainage Flow Paths

1. **Drainage schemes should be designed to match greenfield discharge rates and follow natural drainage routes as far as possible; pumps should therefore not form part of drainage schemes.**
2. **Greenfield runoff should be calculated from FEH or a similar approved method. SAAR and any other rainfall data used in run-off storage calculations should be based upon FEH rainfall values.**

5.4 SuDS Policy 3: Mimic Natural Flows and Drainage Flow Paths

5.4.1 Runoff rates should match Greenfield runoff rates, follow natural or existing drainage routes, utilise existing natural low-lying areas or conveyance pathways, and match infiltration rates and discharges as far as possible for all events up to and including the climate-change adjusted 1 in 100 year (1% AEP) design event.

[7] For further details on this subject, see chapter 7 of the SuDS manual.

ARUN DISTRICT COUNCIL AL/89/24/OUT

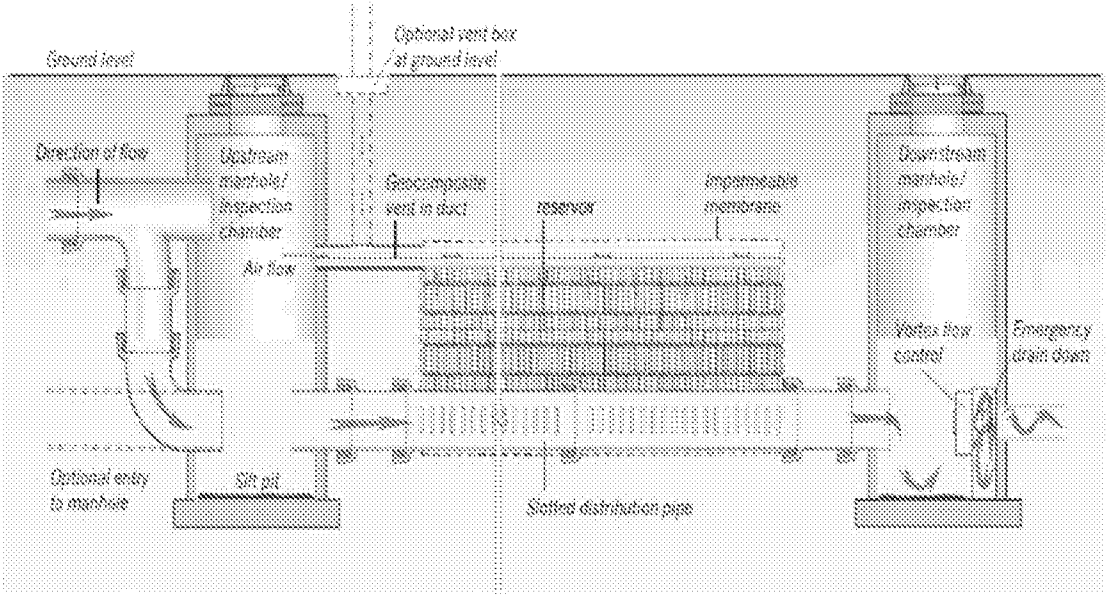
5.4.2 By mimicking the natural drainage flow paths and working within the landscape, more effective and cost-efficient design can be developed and drainage systems can be kept shallower.

5.4.3 Working with existing natural gradients also avoids any reliance on pumped drainage, with its associated energy use and failure risk. The natural environment including woods, trees and hedgerows can play a part in water management.

5.4.4 Redevelopment on brownfield land has the potential to rectify or reduce flood risk. In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. An alternative approach would be for discharge rates to be limited to a range of greenfield rates, based on the 1 in 1, 1 in 30 and 1 in 100 year storm events. However, the use of this method to restrict discharge rates requires the inclusion of on-line long-term storage, sized to take account of the increased post development volumes, discharging at no greater than 2l/s/ha. While discharging at no greater than 2 l/s/ha is acceptable, it is still the LLFA's preference that the former approach is used wherever possible. If it is deemed that this is not achievable, evidence must be provided and developers should still seek to achieve no increase in runoff from greenfield sites and a 50% betterment of existing run off rates on brownfield sites (provided this does not result in a runoff rate less than greenfield). For further guidance see Susdrain Fact sheet on Designing attenuation storage for redeveloped sites: http://www.susdrain.org/files/resources/fact_sheets/01_15_fact_sheet_attenuation_for_redeveloped.pdf

5.4.5 Storage, where space permits, should be on or as close to the surface as possible. Where cellular storage is opted for then the system should be designed in such a way as to minimise the risk of siltation e.g. by incorporating silt traps and to be filled via a distribution pipe to stop silt entering the units or by incorporating the storage tank off line whereby it only fills when the system surcharges. The cellular units should be manufactured from a recycled material such as PVC.

Long Section



Cross Section

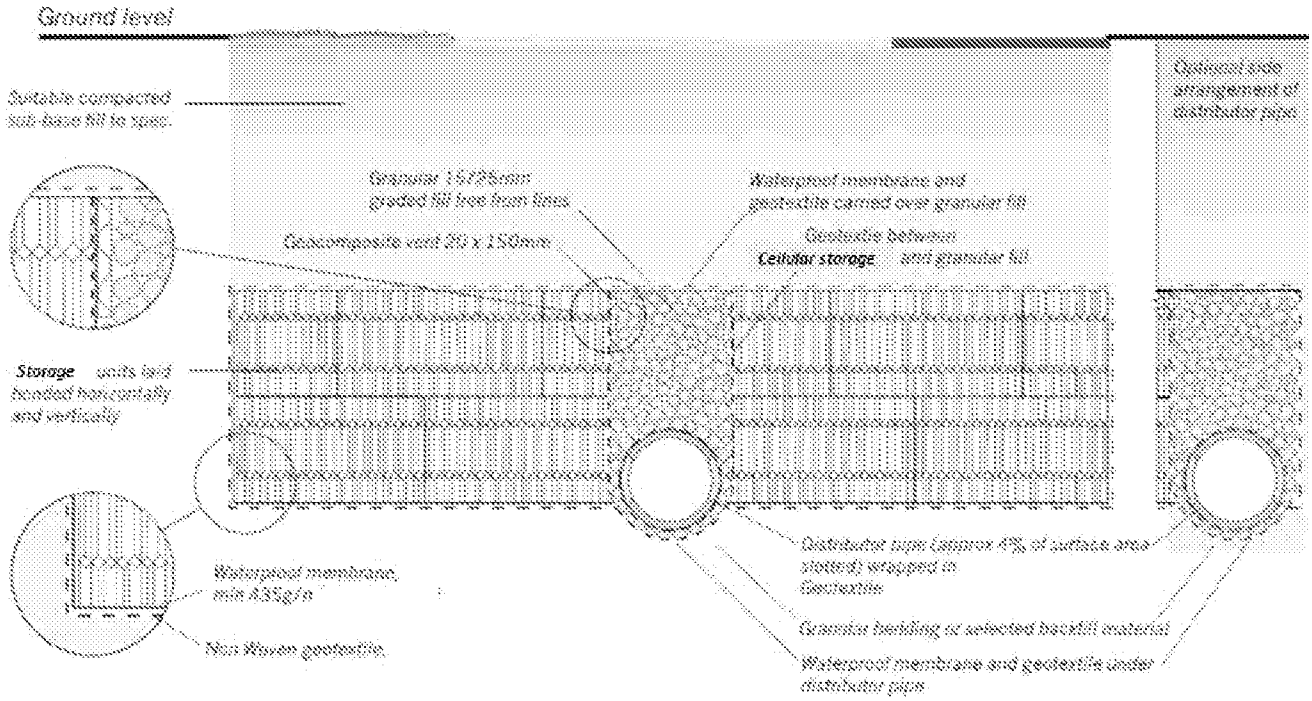


Figure 5.1 Consumer Recycled PVC Storage System minimising risk of siltation.

SuDS Policy 4: Seek to Reduce Existing Flood Risk

1. **New development should be designed to take full account of any existing flood risk, irrespective of the source of flooding.**
2. **Where a site or its immediate surroundings have been identified to be at flood risk, all opportunities to reduce the identified risk should be investigated at an early stage and subsequently incorporated at the detailed design stage.**

5.5 SuDS Policy 4: Seek to Reduce Existing Flood Risk

5.5.1 Paragraph 157 of the NPPF outlines how flood risk management bodies should seek to manage flood risk through using opportunities offered by new development to reduce the causes and impacts of flooding, taking the predicted effects of climate change into account.

5.5.2 As LLFA, West Sussex County Council will endeavour to ensure that this principle is applied across the County. Where a developer's Surface Water Management Strategy has identified that there are existing flood risks affecting a site or its surroundings, there would be an expectation that the developer manages the identified risk appropriately to ensure that there are no on-/off -site impacts as a result of any development. Similarly, where there are opportunities to reduce the off-site flood risk through carefully considered on-site (or off-site) surface water management, the LLFA will encourage developers to explore these fully.

SuDS Policy 5: Maximise Resilience

1. **The design of the drainage system must account for the likely impacts of climate change and changes in impermeable area over the design life of the development. Appropriate allowances should be applied in each case.**
2. **A sustainable drainage approach which considers control of surface runoff at the surface and at source is preferred and should be explored prior to other design solutions.**
3. **Culverting an existing watercourse should only be considered if there is no feasible alternative.**

5.6 SuDS Policy 5: Maximise Resilience

5.6.1 The Environment Agency published updated Flood risk assessments: climate change allowances in February 2016. Further advice on the interpretation of these allowances is available via the following link:

Flood risk assessments: climate change allowances
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

5.6.2 Design of drainage systems utilising a sustainable drainage design and reducing reliance on below ground systems such as pipes and tanks, provides greater flexibility to accommodate changes in surface water peak flows and volumes. Sustainable measures that control flow rates near to the source and maximise natural losses through infiltration and evaporation are preferred. Surface systems are preferred as their function can be more easily observed and maintenance is generally easier. If underground storage tanks are used, they should have easily accessible surface inspection points to allow maintenance checks / silt removal (see also Section 5.4.5).

5.6.3 Culverting (piping) a watercourse is not advised unless it is for access purposes or there is no reasonable alternative; the resulting reduction in storage volume, flow capacity, habitat potential and ease of access for maintenance is likely to be unacceptable (see also Section 3.5.4).

5.6.4 Development results in the conversion of permeable surfaces to impermeable over time (e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas). The consideration of urban creep should be assessed on a site by site basis but is limited to residential development only. The allowances set out in Table 5.2 must be applied to the impermeable area within the property curtilage according to the proposed development density.

Table 5.2: Impermeable Area Allowances for Urban Creep

Residential development density (Dwellings per hectare)	Change allowance (% of impermeable area)
≤25	10
30	8
35	6
45	4
≥50	2
Flats & Apartments	0

SuDS Policy 6: Design to be Maintainable

1. **No building is to be occupied until a Verification Report pertaining to the surface water drainage system, carried out by a Chartered Engineer, has been submitted to the Local Planning Authority which demonstrates the suitable operation of the drainage system such that flood risk is appropriately managed, as approved by the Lead Local Flood Authority. The Report shall contain information and evidence (including photographs) of earthworks; details and locations of inlets, outlets and control structures; extent of planting; details of materials utilised in construction including subsoil, topsoil, aggregate and membrane liners; full as built drawings; and topographical survey of 'as constructed' features..**
2. **The Verification Report should also include an indication of the adopting or maintaining authority or organisation and may require inclusion within a register of drainage features.**

5.7 SuDS Policy 6: Design to be Maintainable

5.7.1 The drainage system must be designed to take account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any personnel, vehicle or machinery access required to undertake this work. Standard 10 of the Defra Non-Statutory Technical Standards states: *S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.*
Ditches and watercourses (including culverts) should retain as a minimum a three and a half metre[8] easement with access that allows for its future maintenance by people / equipment in perpetuity. Without maintenance, the function of drainage systems may alter. Increased leaf litter, sediments and colonisation of vegetation may clog drainage measures or impact the characteristics of operational controls. Consideration should also be given to the Construction Design and Management regulations for health and safety purposes.

5.7.2 Design considerations will need to address the practicalities and funding arrangements for lifetime maintenance, identifying the body responsible and ensuring that financial mechanisms are in place such as bonded maintenance arrangements via S106 agreements and planning conditions. The Verification Report shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life.

[8] Paragraph 23.12 of the SuDS Manual (2015).

ARUN DISTRICT COUNCIL AL/89/24/OUT

5.7.3 Wherever possible, it is preferable that drainage schemes should be designed at the surface to allow easy inspection and maintenance. Drainage maintenance can usually be incorporated as part of a typical landscape maintenance specification.

5.7.4 With surface water drainage systems, a careful balance must be struck between functionality and the creation of habitats. The encouragement of certain protected species or creation of protected habitats may conflict with the regular maintenance works essential to ensuring long term functionality of the drainage measures. An awareness of any biodiversity objectives should be considered as part of a Management & Maintenance Plan for the drainage measures; specifically timing of vegetation cuts and silt removal to ensure no conflict with nesting or specific life stages of biota.

5.7.5 The Verification Report to be provided should indicate schedules and times of activities, as well as critical controls or components of the drainage scheme. This plan should include an indication of the roles and responsibilities for each authority or organisation which may have a responsibility for maintenance activities. Any interconnectivity with or reliance upon other drainage systems should be indicated. Where automatic systems form part of the operational functionality of a drainage system, then processes should be in place to allow immediate action in terms of restoration of performance.

5.7.6 As LLFA, West Sussex County Council has a duty to maintain a register of structures or features which are likely to have a significant effect on flood risk. SuDS features where they have a significant effect on flood risk would be designated under Section 21 of the Flood and Water Management Act 2010. Drainage schemes within new developments may include structures or features that will be required to be included within the register.

6 Environmental Policies

The policies in this section provide local interpretation of the environmental legislation and guidance that West Sussex County Council and the Local Planning Authorities have a duty to comply with, including the regulations referred to in Section 3.7 of this document.

SuDS Policy 7: Safeguard Water Quality

1. **When designing a surface water management scheme, full consideration should be given to the system's capacity to remove pollutants and to the cleanliness of the water being discharged from the site, irrespective of the receiving system.**
2. **Interception of small rainfall events should be incorporated into the design of the drainage system.**

6.1 SuDS Policy 7: Safeguard Water Quality

6.1.1 Paragraph 170 of the NPPF states that the planning system should contribute to/enhance the natural and local environment by preventing both new and existing development from contributing to (or being put at unacceptable risk from) unacceptable levels of soil, air, water or noise pollution or land instability. The Water Framework Directive Regulations (see paragraph 3.7.1) is the principle statutory instrument that applies.

6.1.2 The design of any drainage proposal should therefore ensure that surface water discharges do not adversely impact the water quality of receiving water bodies, both during construction and when operational. Sustainable drainage design principles have the potential to reduce the risk of pollution, particularly through managing the surface water runoff close to the source and on the surface. Below ground pipes and tanks which are efficient for drainage purposes may not provide appropriate water quality treatment.

6.1.3 Runoff from small rainfall events can pose a particular problem for water quality. The 'first flush' of runoff contains the initial flush of pollutants that has built-up on surfaces during the preceding dry period. It is, therefore, possible to get a high initial pollution concentration for relatively small rainfall events.

6.1.4 Rainfall events that are less than or equal to 5mm in depth also comprise more than half of the rainfall events across the UK. The volume of runoff from these small events therefore can cumulatively contribute significantly to total pollutant loadings from a site over a specified period of time. Interception of an initial rainfall depth of 5 mm would mimic greenfield response characteristics in that small rainfall events do not generally produce any run-off.

ARUN DISTRICT COUNCIL AL/89/24/OUT

6.1.5 West Sussex LLFA expects developers to demonstrate that the first 5 mm of any rainfall event can be accommodated and disposed of on-site, rather than being discharged to any receiving watercourse or surface water sewer. This can frequently be achieved through the inclusion of sustainable drainage measures such as infiltration systems, rain gardens, bioretention systems, swales, and permeable pavement.

6.1.6 Where it proves exceptionally difficult to achieve this principle, it must be demonstrated that any water leaving the site has been appropriately treated to remove potential pollutants.

6.1.7 When discharging to the ground, ground conditions and locations of any source protection zones should be confirmed.

SuDS Policy 8: Design for Amenity and Multi-Functionality

Drainage design should from the outset consider opportunities for inclusion of amenity and biodiversity objectives and thus provide multi-functional use of open space with appropriate design for drainage measures within the public realm.

6.2 SuDS Policy 8: Design for Amenity and Multi-functionality

6.2.1 Multi-functional use of land constitutes best practice and is underpinned by paragraph 10.1.1 of The SuDS Manual (2015):

The challenge for designers and planners is to create integrated urban spaces that include SuDS in creative and innovative ways, taking into consideration their potential contribution to a range of functions such as flood risk management, water supply, green infrastructure, habitat provision, transport corridors, climate proofing, community identity, recreation and tourism.

6.2.2 Applications of this policy include:

- the use of park areas as temporary flood storage during heavy rainfall events;
- wetlands being used to deliver amenity value and habitat as well as water treatment;
- use of permeable paving, rain gardens and tree pits to improve the design quality of the public realm, while improving permeability.

6.2.3 SuDS should form an integral component of networks of high quality open space which adapt for attenuation of surface water, sports and play and enhancement of biodiversity. A range of other considerations apply to creation of wetland areas / features which can generally be addressed through careful design. Refer to the SuDS Manual for detailed guidance.

SuDS Policy 9: Enhance Biodiversity

Drainage design should from the outset consider opportunities for biodiversity enhancement, through optimising the scope for surface systems, consideration of connectivity to adjacent water bodies or natural habitats, and appropriate planting specification.

6.3 SuDS Policy 9: Enhance Biodiversity

6.3.1 All public authorities have a duty to conserve biodiversity under the Countryside and Rights of Way Act (CROW) 2000 (see paragraph 3.7.4 of this document). The NPPF requires that Local Planning Authorities set out a strategic approach to plan positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure (NPPF para 171). Maximising the ecological value of drainage systems is consistent with national and local policies which aim to conserve and enhance biodiversity.

6.3.2 Drainage Strategies should draw upon best practice guidance clearly signposted in chapter 6 of The SuDS Manual.

SuDS Policy 10: Link to Wider Landscape Objectives

Drainage design should from the outset consider opportunities to contribute to the wider landscape and ensure proposals are coherent with the surrounding landscape character area.

6.4 SuDS Policy 10: Link to Wider Landscape Objectives

6.4.1 The landscape character of West Sussex is defined by its topography, flora and fauna, land use and cultural associations. The West Sussex Landscape Strategy, 2005 aims to protect and enhance the landscape of West Sussex as an asset for future generations. Integral to this is ensuring that new development is well designed and fits sympathetically with the differing character of localities and ensures that natural and historic landscape features are conserved and enhanced.

6.4.2 The form of drainage provision for any new development within or adjacent to any of these areas has the potential to contribute to or detract from the wider landscape. Working with the landscape to provide drainage may promote other opportunities to deliver benefits for biodiversity and also enhance the aesthetic character of these areas. The linear nature of many SuDS features can help create green corridors through

ARUN DISTRICT COUNCIL AL/89/24/OUT

developments; these are important for wildlife and ensure that the associated development is connected with its surrounding environment.

6.4.3 When assessing drainage design, particularly surface systems, it is important to consider the drainage scheme in the context of the surrounding landscape character area. Landscape Character Assessments are valuable in understanding how to create a landscape with its proposed sustainable drainage scheme for a development so it fits into the landscape and townscape of the area. Effective integration will also require carefully researched and selected plants, which work to improve the local green infrastructure.

7 Flood Risk / Surface Water Management: Standing Guidance for Smaller Developments

7.1 Introduction

7.1.1 All development, regardless of its size, has the potential to be affected by surface water run-off or have an impact upon existing surface water flow routes. Surface water flooding, as distinct from other sources of flooding, currently causes the most regular impact to communities across West Sussex as evidenced by the extensive property flooding that occurred during 2012. This section provides guidance on managing surface water for smaller developments to minimise flood risk; guidance is directed both at home owners considering extensions / alterations and to developers for smaller (non-major) commercial developments. Sections 7.2 and 7.3 provide guidance to home-owners and commercial developers, respectively.

7.2 Homeowners

7.2.1 The following paragraphs set out what you as a home-owner are legally required to do if you make changes to your home or garden that will affect the management of surface water and also what measures you can take to mitigate the management of surface water issues and the reduction of flood risk. Two flow charts to summarise the guidance for homeowners are provided at the end of this section.

What do you want / intend to do?

7.2.2 *Paving of a front garden / driveway;*

If you intend to pave your front garden or driveway involving an area of more than $5m^2$, you will require planning permission if free draining ground is being replaced with an impermeable material that will create run off. One of the main reasons for the new legislation is that the conversion of gardens to driveways in urban areas has increased the amount of water that goes into the storm drains when it rains, and this has contributed to the increase in flooding.

7.2.3 From a flood risk and drainage perspective, planning permission is not required if you are creating a driveway from a semi-permeable or permeable material, or if the water is directed to a lawn, border or soakaway to drain naturally with no increase in flow resulting to highway drainage. If you are in any doubt about whether or not planning permission is required, contact your LPA.

7.2.4 In order to help and advise householders of the options for achieving permeability and meeting the condition for permitted development status the Department for Communities and Local Government (CLG) has produce guidance on permeable paving which can be found on the following link https://www.gov.uk/government/publications/permeable-surfacing-of- front-gardens-guidance

7.2.5 *Install a subterranean/basement extension*

Due to the risk of rapid inundation by floodwater basements should be avoided in areas at risk of flooding. Self-contained basement dwellings are 'highly vulnerable' developments and should not be permitted in Flood Zone 3. The Environment Agency is opposed to these developments unless there is adequate protection from flooding and safe means of escape. Detailed technical advice should be sought from your District / Borough planning authority before considering an application in an area at increased risk of flooding.

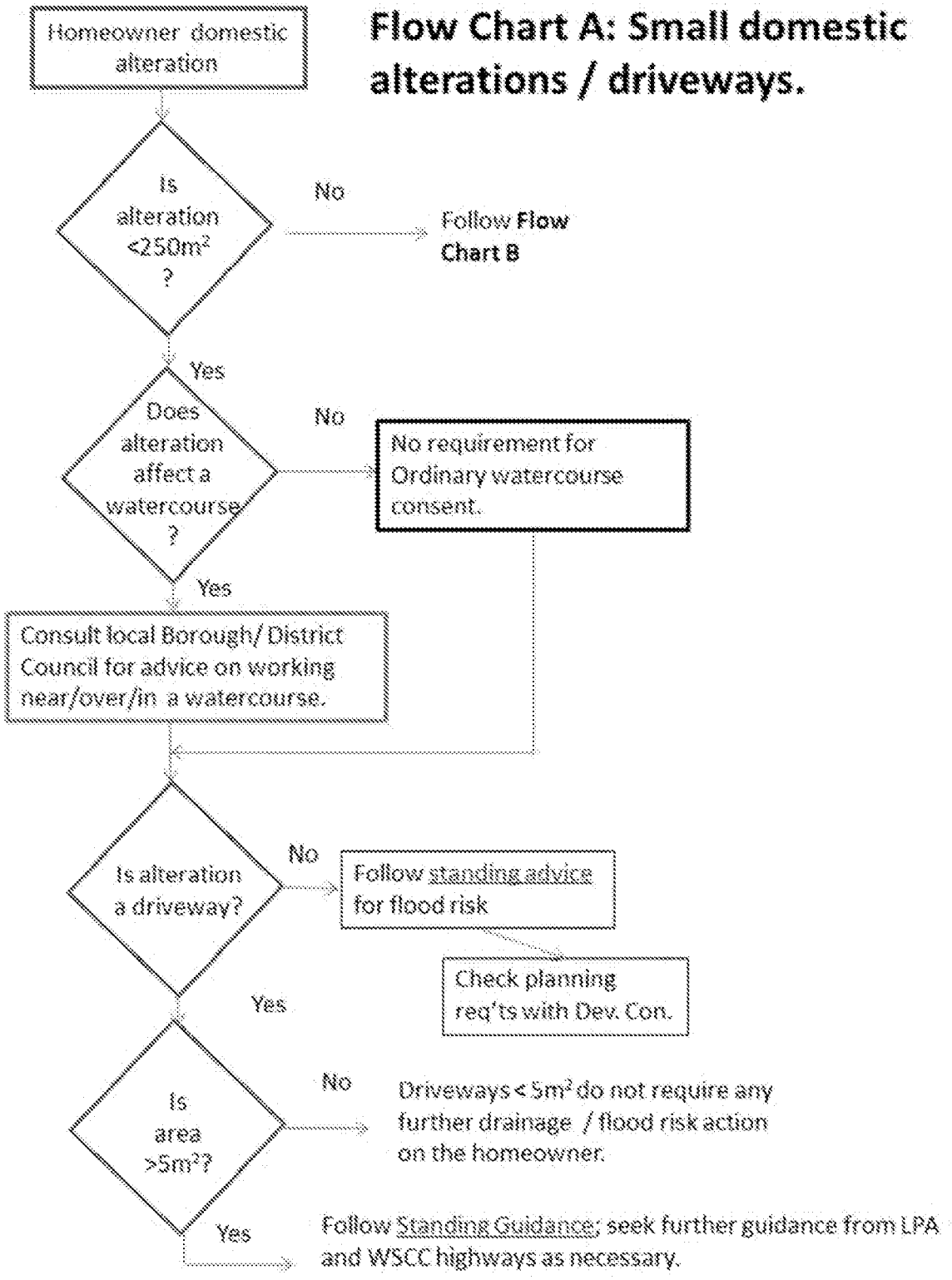
7.2.6 *Extend my home by no more than 250m^2*

LLFA standing advice (adapted from government guidance) on managing flood risk for minor extensions of less than 250m^2 that can be found in **Appendix B**. This advice is additional to any requirement for obtaining planning permission and the guidance of the local planning authority should always be sought at the outset of the process. If an existing property is located within flood zones 2 or 3 or in a flood pathway, the extension unless designed to be flood resilient as opposed to flood resistant, has the potential to remove floodwater storage. In this scenario, specific guidance from the District Engineer should be sought before finalising a design.

7.2.7 *Alter the nature of a watercourse running through or adjacent to my property.*

No alteration should be made to an existing watercourse running through or adjacent to your property without first consulting the Borough or District Council. This includes the bridging of an existing watercourse (and any associated culverting) to provide access to / from your property (see also Section 4.3.1 of the West Sussex LLFA Policy for the Management of Surface Water).

Flow Chart A: Small domestic alterations / driveways.



ARUN DISTRICT COUNCIL AL/89/24/OUT

7.3 Developers

Minor developments of more than 250m^2 but not categorised as major development.

7.3.1 Developments up to 250m^2 is covered by the above paragraphs.

7.3.2 Major development is defined in paragraph 2.2.3 of this policy.

7.3.3 Currently, there appears to be no government guidance specifically informing the management of flood risk for developments greater than 250m^2 but less than 0.5 ha in area or less than 10 houses in total[9]. Given the scarcity of suitable development sites within West Sussex, a high proportion of planning applications are submitted for development that falls within this category, usually referred to as incremental development. Collectively, and over time, incremental development can have a very significant impact upon flood risk from surface water run-off. For this reason, the Lead Local Flood Authority is stipulating local requirements that need to be met by developers to minimise flood risk both to the development itself and to surrounding areas.

7.3.4 The key requirements are:

1. **Establish the existing flood risk from all sources;**
   A suggested starting point is: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
   Nb. Selecting the detailed view on the map yields information on depths and flow velocities of flood water. Reference should also be made to any surface water management plans (SWMPs published by the Lead Local Flood Authority – see Section 4.5 of the main document) and to relevant SFRAs published by the District / Borough that include the proposed area of development.

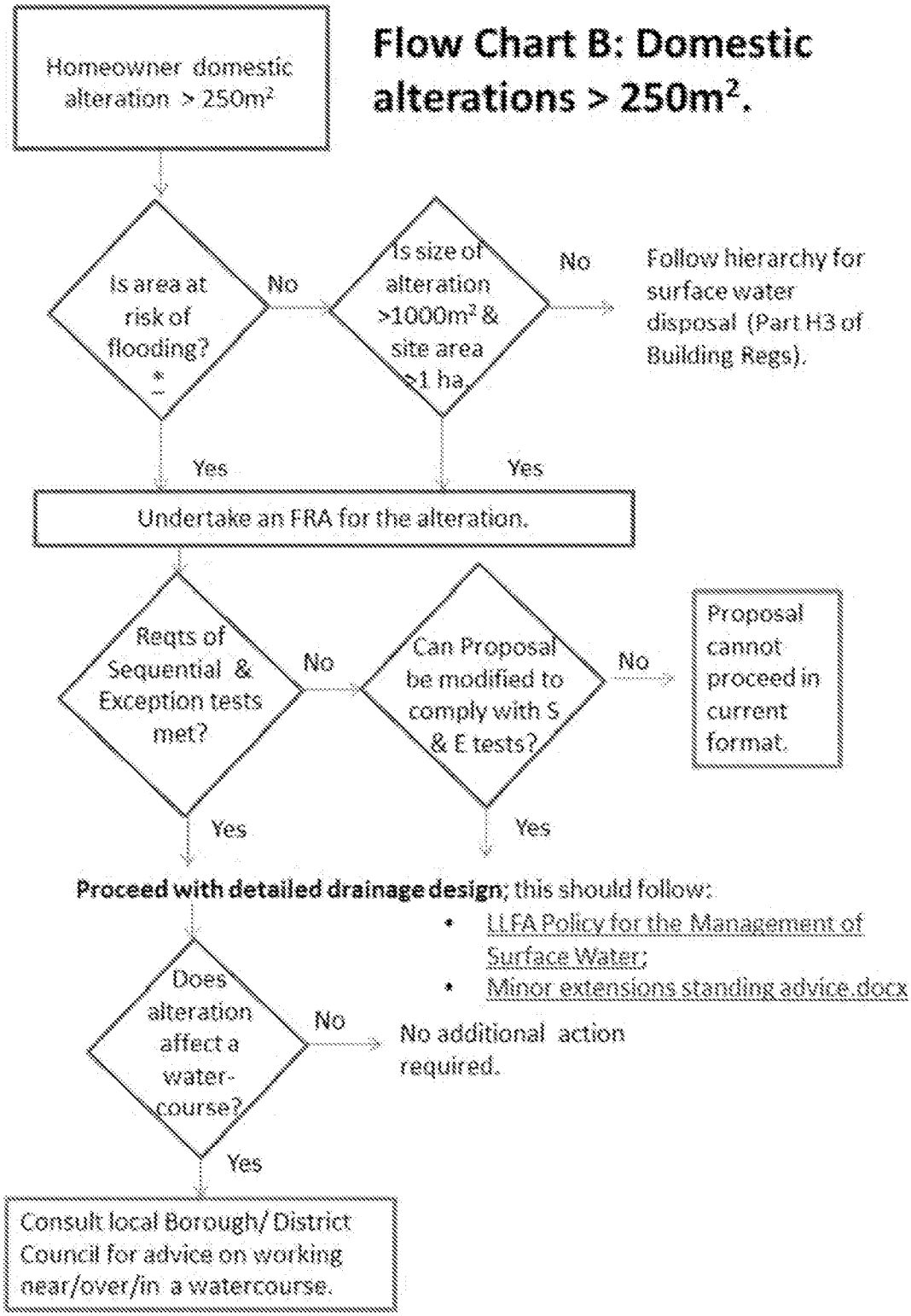
2. **If the area is at significant (medium or high) risk of flooding undertake a Flood Risk Assessment;**
   https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities This will need to demonstrate that the sequential and exception tests have been completed and needs to incorporate a drainage strategy for the site. Section 5.1 of the West Sussex LLFA Policy for the Management of Surface Water provides detailed guidance but contact the planning or drainage staff at your local authority if you require further clarification.

[9] The LLFA Policy for the Management of Surface Water requires all major development to be accompanied by a Drainage Strategy. The LLFA view is that a meaningful Drainage Strategy needs to be informed by a Flood Risk Assessment, notwithstanding that there are circumstances under which major development **may not** require an FRA if site size thresholds is <1ha and in flood zone 2 according to current government guidance.

3. **Is the new development on the site of an existing development, i.e. brownfield?**
   If the development constitutes redevelopment of an existing brownfield site, the detailed guidance provided in paragraph 5.4.4 of this policy should be adhered to.

7.3.5 The flow chart below summarises the guidance to developers.

Flow Chart B: Domestic alterations > 250m².



ARUN DISTRICT COUNCIL AL/89/24/OUT

References

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Report 124 Marshall, D.C.W. & Bayliss, A.C. ISBN: 0948540621, 1994

CIRIA C697 The SUDs Manual Woods-Ballard, B.; Kellagher, R. et al
ISBN: 978-0-86017-697-8, 2007

CIRIA R156 Infiltration Drainage – Manual of Good Practice Bettess, R.
ISBN: 0 86017 457 3

British Standards Institution BS8582:2013 – Code of Practice for Surface Water
Management for Development Sites ISBN: 978 0 580 76700 5

Glossary

AEP Annual Exceedance Probability	This is the probability of a flood event being exceeded within a given year. Expressed in percentage terms it is the inverse of the maximum return period. For example, the 100-year flood can be expressed as the 1% AEP flood, which has a 1% chance of being exceeded in any year.
Attenuation	Attenuation is the process of water retention on site and slowly releasing it in a controlled discharge to a surface water or combined drain or watercourse. The amount of discharge will vary depending whether it is a brown or Greenfield site. For brownfield sites the developer must determine the likely run off and agree an acceptable discharge with the LLFA, environment agency or water authority.
Biodiversity	The diversity of plant and animal life in the world, an area or a particular habitat – a high level of which is considered to be important or desirable.
Biota	The animal and plant life of a particular region or habitat.
Brownfield site	Any land or site that has been previously developed.
Catchment	The area contributing surface water flow to a point on a drainage or river system.
CIRIA	Construction Industry Research and Information Association. www.ciria.org
Climate change	Long-term variations in global temperature and weather patterns both natural and as a result of human activity (anthropogenic) such as greenhouse gas emissions
Culvert	A structure which fully contains a watercourse as it passes through an embankment or below ground.
Development	The undertaking of building, engineering, mining or other operations in, on, over or under land or the making of any material change in the use of any buildings or other land.
EA	Environment Agency. Government Agency responsible for flooding issues from Main River, and strategic overview of flooding.
Easement	The right to use the real property of another for a specific purpose. The easement is itself a real property interest, but legal title to the underlying land is retained by the original owner for all other purposes.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Exceedance Route	A pre-determined route for flows that exceeds the flood event that the drainage system has been designed to accommodate.
FEH	The Flood Estimation Handbook, produced by the Institute of Hydrology in 1999; an accepted method for estimating runoff.
Flood event	A flooding incident usually in response to severe weather or a combination of flood generating characteristics.
Flood risk	The combination of the flood probability and the magnitude of the potential consequences of the flood event.
Flood Risk Assessment	An appraisal of the flood risks that may affect development or increase flood risk elsewhere.
Freeboard	A vertical distance that allows for a margin of safety to account for uncertainties.
Flood and Water Management Act	The Flood and Water Management Act clarifies the legislative framework for managing surface water flood risk in England.
Greenfield	Undeveloped land.
Greenfield runoff rate	The rate of runoff which would occur from a site that was undeveloped and undisturbed.
Groundwater	Water that exists beneath the ground in underground aquifers and streams.
Groundwater flooding	Flooding caused by groundwater rising and escaping due to sustained periods of higher than average rainfall (years) or a reduction in abstraction for water supply.
IH124	A report published by the Institute of Hydrology in 1994 that was specifically produced to address the runoff from small catchments; it provides an accepted method for estimating runoff from catchments.
Impermeable	Will not allow water to pass through it.
Infiltration	Infiltration or soakaway is the temporary storage of water to allow it to naturally soak away into the ground. Because water soaks into the ground gradually, reduces the risk of flooding downstream. Infiltration may be used where there is no surface water sewer or where existing systems are at full capacity. Infiltration helps to recharge natural ground water levels.
Internal Drainage Board (IDB)	Internal drainage boards (IDB) are public bodies that Boards manage water levels in some areas where there is a special

	need for drainage. These areas are known as internal drainage districts (IDD). IDBs undertake works to reduce flood risk to people and property, and manage water levels for agricultural and environmental needs.
LLFA	Lead Local Flood Authority is the risk management authority responsible for local flood risk defined as flooding from surface water, groundwater and ordinary watercourses. In West Sussex, the LLFA is West Sussex County Council.
Local Flood Risk Management Strategy	Strategy outlining the Lead Local Authority's approach to local flood risk management as well as recording how this approach has been developed and agreed.
Main River	A watercourse designated on a statutory map of Main rivers, maintained by Department for Environment, Food and Rural Affairs (Defra).
Mean Annual Flood	Referred to as QBAR, or the mean annual flood, is the value of the average annual flood event recorded in a river. This flow rate is used to provide a measure of the Greenfield runoff performance of a site in its natural state to enable flow rate criteria to be set for post development surface water discharges for various return periods.
On-line	A part of the drainage system that receives flows during all frequent events.
Ordinary Watercourse	An ordinary watercourse is a watercourse that is not part of a main river.
Overland Flow	Flooding caused by surface water runoff when rainfall intensity exceeds the infiltration capacity of the ground, or when the soil is so saturated that it cannot accept any more water.
Percolation	The passing of water (or other liquid) through a porous substance or small holes e.g. soil or geotextile fabric. A percolation (or infiltration) test is used to assess the rate of flow through the soil; see chapter 25 of SuDS Manual.
Qbar	(See Mean Annual Flood)
Q1	The Greenfield runoff for a 1:1 year flood event. This is derived from standard growth curves being applied to Qbar.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
SAAR	Standard Annual Average Rainfall; SAAR is the standard average annual rainfall for the period 1941 to 1970 in mm[10].
Source Protection Zone	Defined areas showing the risk of contamination to selected groundwater sources used for public drinking water supply.
Strategic Flood Risk Assessment	A study to examine flood risk issues on a sub-regional scale, typically for a river catchment or local authority area during the preparation of a development plan.
Supplementary Planning Documents (SPD)	Documents which add further detail to the policies in the Local Plan. They can be used to provide further guidance for development on specific sites, or on particular issues, such as design. Supplementary planning documents are capable of being a material consideration in planning decisions but are not part of the development plan.
Surface water flooding	Flooding caused by the combination of pluvial flooding, sewer flooding, flooding from open channels and culverted urban watercourses and overland flows from groundwater springs
Surface Water Management Plan	A study undertaken in consultation with key local partners to understand the causes and effects of surface water flooding and agree the most cost effective way of managing surface water flood risk for the long term.
SuDS	Sustainable drainage systems. A sequence of management practices and control structures that are designed to drain surface water in a more sustainable manner.
Topography	The topography of a place or region is the description of its physical features, both geographical and man-made. It is usually represented on a topographical map.
Urban creep	The increasing density of development due to extensions, paving over of gardens, and other permeable area, and the addition or extension of roads or buildings, which increases the impermeability of developed areas and causes rates and volumes of runoff to increase.
Watercourse	A term including all rivers, streams, ditches drains cuts culverts dykes sluices and passages through which water flows.

[10] SAAR 61-90, which was analysed for the Flood Estimation Handbook (FEH) for rainfall from 1961 - 1990, is virtually the same and can also be used in runoff calculations.

ARUN DISTRICT COUNCIL AL/89/24/OUT

Appendix A to West Sussex Lead Local Flood Authority Policy for the Management of Surface Water dated July 2017

Links to Further Information

Introduction

West Sussex County Council as the Lead Local Flood Authority (LLFA) benefits from working in partnership with Drainage Engineers within the Districts and Boroughs throughout the County. These engineers undertake technical review of drainage proposals and act as Agents to the LLFA for the review / granting of Ordinary Watercourse Consents under the Flood and Water Management Act, 2010.

Technical queries relating to individual developments should in the first instance be directed to these officers as they have a greater level of local knowledge than staff at the LLFA. Contact Details for the Engineering staff at respective authorities are set out below, together with links to standing advice (where appropriate) which may serve to answer initial queries).

Adur-Worthing Councils - Drainage Engineer

Contact Tel No: 01903 221374

Contact email: planning@adur-worthing.gov.uk

Standing advice is available via the following web link: https://www.adur-worthing.gov.uk/severe-weather/flooding-and-heavy-rain/

Arun District Council - Drainage Engineer : Contact Tel No: 01903 737819

Contact email: engineering.services@arun.gov.uk

Standing advice is available via the following web link:

http://www.arun.gov.uk/drainage

http://www.arun.gov.uk/surfacewater

http://www.arun.gov.uk/planning-obligations

http://www.arun.gov.uk/making-a-planning-application

Chichester District Council - Drainage Engineer

ARUN DISTRICT COUNCIL AL/89/24/OUT

Contact Tel No [redacted]

Contact email: [redacted]

Standing advice is available via the following web link:

Surface Water and Foul Drainage SPD

http://www.chichester.gov.uk/CHttpHandler.ashx?id=26891&p=0

Crawley Borough Council

Contact Tel No: [redacted]

Standing advice is available via the council's planning portal following web link:
http://www.crawley.gov.uk/pw/Planning_and_Development/index.htm

Policies pertinent to surface water management – Local Plan policies: Policies ENV8 (Development and Flood Risk) and ENV9 (Tackling Water Stress)

http://www.crawley.gov.uk/pw/web/pub271853

Strategic Flood Risk Assessment

http://www.crawley.gov.uk/pw/web/PUB228566

Horsham District Council

Contact Tel No: [redacted]

Contact email: [redacted]

Standing advice is available via the following web link:
https://www.horsham.gov.uk/planning/development-management

- Surface Water Drainage Advice Note;
- Surface Water Drainage Statement;
- Adoption and Maintenance of SuDS.

Mid Sussex District Council - Drainage Engineer(s)

Contact Tel No [redacted]

Contact email: [redacted]

Mid Sussex District Council Strategic Flood Risk Assessment and a guide to master planning sustainable drainage into developments can be found via the following link:

https://www.midsussex.gov.uk/planning-building/evidence-supporting-documents/

Development Contributions

https://www.midsussex.gov.uk/planning-building/development-contributions/

Local List giving validation requirements for planning applications:

https://www.midsussex.gov.uk/media/1976/validation-criteria-for-planning-applications.pdf

South Downs National Park Authority

Contact Tel No: 01730 814810

Contact email: planning@southdowns.gov.uk

Standing advice is available via the following web link:

Water Cycle Study and SFRA Level 1

https://www.southdowns.gov.uk/planning/planning-policy/national-park-local-plan/evidence-and-supporting-documents/water-cycle-study/

Local List giving validation requirements for planning applications:

https://www.southdowns.gov.uk/planning/making-an-application/local-validation-list/

Appendix B

Minor extensions standing advice

[advice adapted from www.gov.uk/guidance]

You need to provide a plan showing the finished floor levels and the estimated flood levels.

Make sure that floor levels are either no lower than existing floor levels or 300 millimeters (mm) above the estimated flood level. If your floor levels aren't going to be 300mm above existing flood levels, you need to check with your local planning authority if you also need to take flood **resilience** measures.

State in your assessment all levels in relation to Ordnance Datum (the height above average sea level). You may be able to get this information from the Ordnance Survey. If not, you'll need to get a land survey carried out by a qualified surveyor.

Your plans need to show how flood risk for the development is minimized and that there is no increase in flood risk for people / property outside of the development. If the proposed extension to your property is in an area that is affected by surface water flooding or is on a flood plain, the avoidance of increased flood risk should consider how flows can be routed through / under the extension to avoid loss of flood storage capacity in the immediate vicinity by incorporating flood **resilience** measures. These measures allow water to pass through the property to avoid structural damage by:

- using materials that are flood resilient not flood resistant;
- making it easy for water to drain away after flooding;
- making sure there's access to all spaces to enable drying and cleaning.

Specific guidance on flood **resilience** can be found in improving the flood performance of new buildings. Flood resistance for new extensions in areas prone to flooding should be avoided. Further advice on this issue can be sought from the Drainage Engineer at your local authority.

Supplementary Requirements for Surface Water Drainage Proposals

Any proposed surface water scheme must consider sustainable drainage principles.

SuDS Selection

The following destinations must be considered for surface runoff in order of preference:

1. Discharge into the ground (infiltration).

2. Controlled discharge to a surface water body.

3. Controlled discharge to a surface water sewer.

Surface water must not be discharged into the foul sewer system. Infiltration structures include soakaways, basins, swales and permeable paving. Open Suds features are encouraged. Structures that span individual property boundaries are discouraged. Discharge to surface water bodies and surface water sewers must be restricted to an agreed rate.

SuDS selection hierarchy based on:
CIRIA C753 - The SuDS Manual
BS8582:2013 – Code of Practice for Surface Water Management for Development Sites
Approved Document H of the Building Regulations

For additional guidance, please refer to the ' West Sussex County Council (Lead Local Flood Authority) Policy For The Management of Surface Water'
https://www.westsussex.gov.uk/media/12230/ws_llfa_policy_for_management_of_surface_water.pdf

Infiltration Drainage Design

Any infiltration drainage design must include adequate winter groundwater monitoring data to determine the highest winter groundwater table. Residential developments of ten properties or more will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the Council's Engineers but will need to capture likely peak groundwater levels during the winter period. This is likely to be during January/February but is dependent on the weather, etc up to that point.

Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location.

Infiltration rates for soakage structures are to be based on percolation tests undertaken at an agreed time during the winter period and at the location and depth of the proposed structures. The percolation test depth is also dependent on the peak groundwater levels recorded at that location, ensuring that the test depth does not exceed the depth to the peak

ARUN DISTRICT COUNCIL AL/89/24/OUT

groundwater level recorded. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method. For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero, unless otherwise agreed. In respect to infiltration basins or permeable pavements, the percolation rate is generally applied to the base only.

There must be provision to ensure that there is capacity in the system to contain the 1 in 100 year storm event plus 40% on stored volumes/rainfall intensity, as an allowance for climate change and cater for the 1 in 10 year storm event plus climate change between the invert of the lowest entry pipe into the infiltration structure and the base The infiltration structure should also drain 50% of its total volume in 24 hours or less for both the 1 in 10 (plus 40%) and 1 in 100 year (plus 40%) storm events, in order to provide spare capacity for subsequent storms.

Restricted Discharge

Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q_{bar}) for all design storm events, using the impermeable area (and including other permeable areas that are positively drained) of the site to be developed as the basis for the calculations rather than the entire greenfield site area. For brownfield sites, the above criteria also applies, but if this cannot be achieved, then a minimum 50% reduction in existing peak runoff rate should be considered. Flow restriction is to be achieved using a suitable controlled outflow with a minimum outflow of 2 l/s, unless otherwise agreed, with satisfactory blockage mitigation measures specified. Greenfield runoff rates can be derived from IH124 or a similar approved method. Any storage design must be submitted with winter groundwater monitoring data where applicable to ensure there will be no detrimental effect on the structure or storage.

Flow Exceedance Routes

The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

1. Low flow routes

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2. Overflows

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.

3. Exceedance routes

When SuDS are overwhelmed by exceptional rainfall, then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the

ARUN DISTRICT COUNCIL AL/89/24/OUT

development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

Culverting a Watercourse

Culverting (piping) a watercourse is not advised unless there is no alternative. The resulting reduction in storage volume, flow capacity and habitat potential would be unacceptable. Culverted watercourses are also more difficult to maintain due to the limited accessibility.

Land Drainage Consent must be sought from the Lead Local Flood Authority (West Sussex County Council), or its agent (Arun District Council – land.drainage@arun.gov.uk), prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, channel diversion, discharge of flows, connections, headwalls and the installation of trash screens.

Please also refer to the 'culvert policy' and consent application form available on the West sussex County Council website; https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/dealing-with-flooding/flood-risk-management/ordinary-watercourse-land-drainage-consent/

The development layout must take account of any existing watercourses (open or culverted) to ensure that future access for maintenance is not restricted.

See also:
Land Drainage Act 1991 (amended 1994)

Maintenance and Management

Ditches and watercourses (including culverts) should retain a three metre easement with access that allows for its future maintenance.

Details of the maintenance and management of the SuDS system are to be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life. This document is then to be submitted as part of the planning process.

References

The Building Regulations 2000
Drainage and waste disposal
Approved document H
ISBN: 1-859462-08-1

Building Research Establishment,
Soakaway Design – Digest 365 (BRE 365)
ISBN: 978 1 84806 918 6, 2016

Centre for Ecology and Hydrology
Flood Estimation for Small Catchments - IH Report 124
Marshall, D.C.W. & Bayliss, A.C.
ISBN: 0948540621, 1994

CIRIA
C753 The SUDs Manual
Woods-Ballard, B.; Kellagher, R. et al
ISBN: 978-0-86017-760-9, 2015

CIRIA
R156 Infiltration Drainage – Manual of Good Practice
Bettess, R.
ISBN: 0 86017 457 3

British Standards Institution
BS8582:2013 – Code of Practice for Surface Water Management for Development Sites
ISBN: 978 0 580 76700 5

Surface Water Drainage Proposal Checklist

During the planning process, applicants are often required to submit surface water drainage proposals for appraisal by the Local Planning Authority's (LPA's) Drainage Engineers. This 'Surface Water Drainage Proposal Checklist' has been designed to clearly define the expectations and requirements that proposals, submitted to LPA's within West Sussex, need to satisfy.

It is recommended that applicants take time, at the outset of the planning process, to familiarise themselves with the requirements set out in this checklist.

The expectation is that applicants will include a completed checklist in the supporting documentation they submit to the LPA, during the planning process.

Applicants should be aware that:

- It is in an applicant's interest to provide all the information requested by the checklist, to enable the LPA's Engineers to quickly and efficiently appraise their proposals.
- The omission of information may lead to delays in the planning process.

However, if this checklist requests information that an applicant does not consider to be relevant to their application:

- In the first instance the applicant should discuss this with the LPA's Drainage Engineer. (The Planning Officer dealing with the application will be able to provide applicants with the appraising Engineer's contact details).
- Alternatively, the applicant can provide an explanation as to why they have omitted certain information in the 'Additional Information' section at the end of the checklist, quoting the relevant 'requirement number'. However, be aware; the decision whether or not certain information is required ultimately lies with the appraising Engineer (hence the above advice to consult them before omitting information).

The Town and Country Planning Regulations now require pre-commencement conditions to have the prior agreement of the applicant regarding their wording and use. Therefore, to avoid pre-commencement conditions relating to surface water drainage, applicants will need to submit proposals that provide the information requested in this checklist, and also align with the requirements of the following documents:

- The West Sussex Policy for the Management of Surface Water
- Any supplementary planning guidance issued by the respective LPA.

If surface water drainage conditions have been applied to a planning permission; this document will also help applicants prepare a 'Discharge of Conditions' application'.

Version 5.2 (03.08.2021)

Surface Water Drainage Proposal Checklist

Ground Investigation Results						
No.	**Requirement**	**Results/Information Provided?**				
1	**Winter groundwater monitoring results** Please refer to guidance note 'a' below.	**Yes**		**No**		
2	**Period of winter groundwater monitoring** Note 'a'	**From**	DD/MM/YYYY			
		To	DD/MM/YYYY			
3	**Maximum recorded groundwater level** Note 'a'	**mAOD**				
		mBGL				
4	**Winter infiltration test results** Notes 'b' and 'c'	**Yes**		**No**		
5	**Date of winter infiltration testing** Note 'b'	DD/MM/YYYY				
6	**Details of the location and depth of the infiltration testing** Notes 'b' and 'c'	**Yes**		**No**		
7	**Minimum infiltration rate** Note 'd'	**m/s**				

Guidance Notes

a. Groundwater monitoring should be undertaken during the winter period (October to March inclusive) to enable the peak annual groundwater levels to be established. The duration of monitoring required for smaller developments (e.g. those consisting of less than 10 properties) can be discussed with the LPA's Engineers as; for some locations, a shorter duration may be acceptable. However, unless dispensation is agreed in advance with the LPA's Engineers, a full winter season of monitoring should be undertaken. Groundwater on sites near the coast may be influenced by tidal conditions and therefore this consideration needs to be factored into the monitoring programme.

b. Infiltration testing should be undertaken during the wet winter months (typically January or February) and in line with BRE365 or a similar approved method, such as CIRIA R156. Infiltration testing needs to be carried out at the locations and depths of proposed infiltration structures, this must also be at a depth above the maximum recorded groundwater level in the vicinity of the test pit. Tests must be repeated 3 times consecutively, to replicate saturated ground conditions.

c. Deep-bore Soakaways: Where it is not possible to undertake conventional BRE365 or CIRIA R156 testing due to depth; advice should be sought from the Council's engineers. Please note that; deep-bore soakaways are generally resisted unless there is no alternative. Evidence of the Environment Agency's agreement with the principle of using deep-bore methods to drain the site must be provided within the submission.

d. The minimum infiltration rate obtained at the location and depth of the proposed infiltration structures should be used to inform the design of the infiltration structures. Please use the 'additional information' section at the end of this checklist if multiple infiltration structures are proposed, which utilise different minimum rates.

Proposed Method of Surface Water Disposal					
8	**Infiltration on-site**, via soakaway structures.	**Yes**		**No**	
9	**If on-site infiltration is not to be used, has justification for this decision been provided?** Note 'e'	**Yes**		**No**	
10	**Attenuation** (on-site) with a **restricted discharge to a watercourse** on, or adjacent to, the site.	**Yes**		**No**	
11	**Attenuation** (on-site) with a **restricted discharge to a surface water sewer** on, or adjacent to, the site.	**Yes**		**No**	
12	**Attenuation** (on-site) with a **restricted discharge to a foul water or combined sewer** on, or adjacent to, the site.	**Yes**		**No**	

Guidance Note

e. If on-site infiltration is deemed unviable; evidence supporting the move to the next step(s) of the drainage hierarchy must be provided, to the satisfaction of the LPA's Engineer.

Drainage Design: Supporting Calculations						
	No.	**Requirement**	**Provided?**			
Infiltration Structures	13	**Calculations demonstrating the 1 in 10 year event, plus climate change allowance (CCA), can be accommodated below the lowest incoming pipe within each structure.** Notes 'f' and 'g'.	**Yes**		**No**	
	14	**Calculations demonstrating the 1 in 100 year event, plus CCA can be accommodated on-site.** Notes 'f' and 'g'.	**Yes**		**No**	
	15	**Lowest base level of any infiltration structure**	**mAOD** **mBGL**			
	16	**Half-drain time for 10 year event (plus CCA)**	**Yes**		**No**	
			Hours			
	17	**Half-drain time for 100 year event (plus CCA)**	**Yes**		**No**	
			Hours			
	18	**Has the design sought to provide treatment of potential contaminants? E.g. hydrocarbons.**	**Yes**		**No**	
Attenuation / Restricted Discharge	19	**Pre-development run-off rate calculations** Note 'h'	**Yes**		**No**	
			l/s			
	20	**Proposed discharge rate** Note 'h'	**l/s**			
	21	**Calculations demonstrating the 1 in 100 year event, plus CCA can be accommodated on-site.** Note 'g' and 'h'	**Yes**		**No**	
	22	**Has the design sought to provide treatment of potential contaminants? E.g. hydrocarbons.**	**Yes**		**No**	
	23	**If the proposed scheme incorporates any impermeable lined attenuation features; calculations are required to demonstrate that appropriate resistance to floatation (due to groundwater levels) is catered for in the design.**	**Yes**		**No**	
	24	**Is a discharge into, or an alteration to, an ordinary watercourse is proposed? (If so, Ordinary Watercourse/ Land Drainage Consent will be required).** Note 'i'	**Yes**		**No**	
	25	**If discharging to a watercourse, piped system or the sea, has the proposed drainage network been modelled against predicted top water levels for the 1 in 100 year storm event, plus CCA, within the existing system?** Note 'j'	**Yes**		**No**	

Guidance Notes

f. The appropriate factor of safety from the table below must be applied to calculations to ensure the design is fully in accordance with CIRIA R156/CIRIA C753. This is applicable to infiltration systems, utilising the base area.

Factor of Safety Table						
Size of Area to be Drained	Consequences of failure					
	No damage or inconvenience		Minor inconvenience, e.g. surface water on car park		Damage to buildings, structures or roads.	
	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75
<100 m^2	1.5	2	2	3	10	13
100m^2 to 1000m^2	1.5	2	3	4	10	13
>1000m^2	1.5	2	5	6.5	10	13

g. Climate change allowance on peak rainfall intensities or stored volumes must take into account the lifetime of the development.

h. Calculations of Qbar are to be based upon the area to be positively drained. It is advised that agreement is sought with the LPA's Engineer, at an early stage, regarding the area to be considered for this calculation. Unless otherwise agreed; the minimum acceptable discharge rate is 2l/s when using formal flow control devices. For lower flow rates; evidence must be provided that adequate measures are in place to protect the flow control device from blockage. **For Greenfield sites**; run-off must be restricted to the Greenfield Qbar runoff rate during all events up to and including the 1 in 100 year rainfall event, including climate change allowance. **For Brownfield sites**; infiltration should be investigated as the first option, but where evidence can be provided that this is unviable, off-site flows from all events should also be restricted to Greenfield Qbar. If that is not possible; flow should be restricted to as close to Qbar as is achievable, with a minimum requirement of 50% betterment. Applicants are expected to provide fully detailed plans of the site's existing surface water drainage arrangements, including impermeable areas, gullies, outfalls, pipes & diameters, manholes, etc., to prove the extent of the existing positively drained areas and their associated points of discharge.

i. Ordinary Watercourse/Land Drainage Consent will need to be sought, ideally in parallel with planning permission, if the proposals incorporate discharge into, culverting or altering a watercourse.

j. Modelling is required to ensure that the effects of surcharged outfalls are taken into account.

Plans/Drawings/Diagrams					
No.	Requirement	Provided?			
26	**Plan detailing the location of groundwater monitoring and infiltration testing**	Yes		No	
27	**Detailed drainage layout plan** Note 'k'	Yes		No	
28	**Construction detail plans** Note 'l'	Yes		No	
29	**Exceedance flow route plans** Note 'm'	Yes		No	
30	**Impermeable area plan**	Yes		No	
31	**If ground levels are being raised ≥ 300mm above existing levels and is unavoidable, have fully detailed plans been provided, together with drainage proposals, to address any potential drainage related issues.**	Yes		No	

Guidance Notes

k. Drainage layout plans should include:
- All surface water drainage pipes labelled with: diameters, pipe materials, gradients and invert levels.
- All infiltrating and attenuating structures (including permeable paving) labelled with; dimensions, invert/base and cover levels.
- All manholes labelled with: a reference number, cover levels, invert levels, cover loading grade.
- All silt traps clearly labelled with sump depths.
- Control structures with discharge rates, hydraulic head and invert levels.
- Proposed/existing levels of any areas subject to ground raising, together with suitable measures/detailed drawings for the associated management of surface water runoff**. Please note that ground raising should be avoided unless there are exceptional circumstances**. In any instances where this is envisaged early consultation with the Council Engineer is recommended.

l. Site specific construction detail plans should be supplied. The following elements must be included (where applicable): infiltrating structures; attenuating structures; manholes; catch-pits/silt traps; flow control devices; permeable paving; headwalls; channel drains; gullies; pipe bedding and surround, etc.

m. Unless specifically requested by the Council's drainage Engineers 'Exceedance Flow Route Plans' are only required for developments of more than 10 residential properties or more than 0.5ha of commercial development.

Additional Information

The space below can be used to provide an explanation for any required information that has been omitted in the submission of this form or to raise specific queries seeking clarification. Please enter the appropriate line entry number to which the comments relate in the box at the left-hand side of the form.

West Sussex LLFA Culvert Policy

ARUN DISTRICT COUNCIL AL/89/24/OUT

Culvert[1] Policy – intended for use by Council officers, landowners and developers.

This document is an explanation of the agreed West Sussex County Council (LLFA) and District and Borough Council policy regarding the culverting of ordinary watercourses, and a guide to good practice and design principles.

Culverting of a watercourse, or the alteration of an existing ordinary watercourse, requires land drainage consent under Section 23 of the Land Drainage Act 1991 (and as amended). The District and Borough Councils under powers from the LLFA are responsible for processing ordinary watercourse consent applications.

The Environment Agency now regulates permits for works in / around watercourses designated as 'Main River' under the Environmental Permitting Regulations 2010 (EPR2010).

The following works require consent from District and Borough Authorities:

- Construction of any mill dam, weir or other similar obstruction to the flow of any ordinary watercourse or raising or otherwise altering any such obstruction;
- Installation of a culvert in any ordinary watercourse;
- Alteration of a culvert in a manner that would be likely to affect the flow of an ordinary watercourse;
- Installation of a structure within the watercourse that would be likely to affect the flow of said watercourse;
- Removal of a culvert within an ordinary watercourse;
- Diversion or filling of any ordinary watercourse;

The above list should not be considered exhaustive. If you are not sure if the work you are proposing requires a consent / permit please contact your local District or Borough Authority, EA office or Lead Local Flood Authority (LLFA).

1.0 Local Authority Policy

Watercourses fulfil many roles in today's environment. They provide drainage for developed and agricultural land and are vital water resources. They are important features of the landscape and provide habitats for a wide variety of wildlife. It is therefore important that watercourses and their associated habitats are protected and enhanced for the benefit of future generations. A watercourse includes all; rivers, streams, ditches, drains, cuts, dykes, culverts, sluices,

1. A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other side. Typically embedded so as to be surrounded by concrete, granular material, soil etc., a culvert may be made from a pipe, reinforced concrete or other material.

sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages through which water flows.

West Sussex Local Authorities are in general opposed to the culverting of watercourses because of the potential for adverse effect on flood risk and ecology. The Competent Authority will therefore adopt a precautionary principle and only approve an application to culvert an ordinary watercourse if there is no reasonably practicable alternative or if the potential negative impact of culverting would be so minor that they would not justify a more costly alternative.

However, a culvert will not be considered until alternatives have been considered, for example:

- Clear span bridges;
- Revision of the site layout to incorporate an open watercourse that can be easily maintained; or
- Diverting the watercourse without loss of its hydraulic flow characteristics.

In all cases and where it is appropriate to do so, compensation in full is to be provided for any loss in storage capacity or habitat.

2.0 Deculverting Policy

There are many benefits to deculverting, which include; the provision of valuable wetland habitat, increased storage capacity, educational opportunities, reduction of maintenance costs and ease of inspection

Deculverting requires consent as the removal of a culvert which previously constrained flow could increase the downstream flood risk; modelling should therefore be employed (where necessary) to ensure there is no adverse flood risk as a consequence of a particular activity. Some culverts may be formally listed or scheduled for their historic importance, therefore careful consideration is required. Appropriate ecological surveys should be provided in support of any deculverting activity.

The removal of culverts is actively encouraged by the council when:

- Removing the culvert is physically possible, and no ecological or historical damage will result;
- Flood risk may be reduced and a more natural flow regime restored; or
- The local environment would be enhanced significantly.

3.0 Impacts of Culverting

The Council's general opposition to culverting is a result of the legal requirements of the Water Framework Directive (2003) that the quality of a watercourse should not be reduced. Therefore, opposition is based on the detrimental effects that are likely to arise; these may include:

- Loss of environmental features; the continuity of the watercourse corridor is broken, causing an adverse impact on the ecological value of the watercourse, loss of habitat and inhibiting the migration of some species.
- Increased likelihood of blockages; the culvert itself or screens have an increased risk of blockage and require frequent maintenance.
- Loss of floodwater storage; open channels generally provide more storage capacity than culverts.
- Impact of flooding; increased overland flooding as a result of a culvert exceeding its capacity.
- Greater difficulties in providing for drainage connections; it is more difficult to provide for the addition of connections within a culvert; outfalls within culverts are prone to blockage.
- Difficulties in the repair, maintenance and replacement of culverts; the landowner or owner of the culvert is responsible for the condition and maintenance of a culvert. They must therefore ensure they are in good condition and free from obstructions. Failure to do so could result in the liability for any damage caused by flooding. Access into culverts is restricted and in some cases is classified as a confined space which requires trained operatives and specialist equipment.
- Development above or near a culvert; the presence of a watercourse is concealed by a culvert; this can lead to inappropriate land use above or near them, and could lead to structural failures, difficulties in future access for maintenance, etc.
- Culverts in urban areas are susceptible to pollution as a result of misconnected foul sewers, overflows from blocked sewers or discharge of contaminated surface water.
- Increase in erosion to the banks and beds of a watercourse where adjacent to a culvert entrance.

4.0 Culvert Design Requirements

Where culverting is unavoidable it is necessary to seek land drainage consent from the relevant District or Borough Council. It needs to be shown that steps have been taken to reduce the risk of flooding and to reduce or mitigate environmental degradation. Detailed guidance on the design of culverts can be found in Culvert Design and Operation Guide (CIRIA C689).

1. A detailed design will need to be submitted with your formal application for consent. Hydraulic calculations are to be submitted and include an allowance for climate change over the life time of the activity or development.
2. The environmental implications of all options of the works should be considered in order to determine the least environmentally damaging solution supported with evidence.
3. Culvert length should be kept as short as possible and diameter as large as possible. Depending on local circumstances, we require a minimum culvert diameter of 450mm or as agreed with the local authority depending on watercourse size and flow.
4. The design of the culvert should consider any impact on flood flow. They must not increase flood risk to property. Consideration should also be given to the alternative flow paths in the event of a culvert becoming obstructed.
5. The shape of the culvert and the materials used should be chosen to satisfy hydraulic requirements and have a design life exceeding that of the structure.
6. Pipes should be of a consistent cross-section within the culvert length unless adequate hydraulic transitions are incorporated into the design, this will be necessary when extending an existing culvert.
7. Appropriate inlet and outlet structures should be provided to ensure a smooth hydraulic transition and avoid erosion. Headwall arrangements at the upstream and downstream ends of a culvert should be suitably keyed into the bed and banks of the watercourse, and should be appropriate to the local environment.
8. Where there are safety concerns, headwalls will need to be fitted with safe guarding measures ie. handrails, etc.
9. Details should be stated of future maintenance and clearance arrangements, including access considerations. The responsibility for the maintenance of a culvert lies with the landowner or the person or management company who owns the culvert.
10. Sharp bends should be avoided and suitable access chambers provided at each change of direction in the culvert.
11. Inlet and outlet screens may be required to prevent debris entering the culvert and causing clogging, or where there is a danger to public safety. Screens need to be sized and designed to reduce the risk of blocking and provision made for clearing and maintenance, including allowance for a removable front section (fitted with a padlock); wing walls should be sufficiently high to prevent bank erosion in the event of a blockage; flat screens should be avoided as these are prone to blockage. Further guidance can be found in the Environment Agency Trash Screen and Security Screen Guide, 2009 https://www.gov.uk/government/publications/trash-and-security-screen-guide-2009



Figure 1-Culvert with Wingwalls and Trash Screen

12. Most culverts should be set so that the inlet/outlet is at the true bed level.

13. Applications with multiple small diameter culverts will generally be refused, only in exceptional circumstances where site constraints prevent a single pipe or box-culvert option being practical, will they be considered. This is a result of multiple culverts being more prone to blockage at the inlet.
14. Syphons are generally not acceptable.
15. Where watercourses are subject to severe erosion and siltation problems, consideration should therefore be given to the provision of silt traps upstream of the culvert.
16. Services (for example sewers, gas pipes, water mains, etc.) should not impinge into the cross-section of the culvert.
17. Vehicular loading needs to be considered where the culvert is located in trafficked areas and therefore suitable protection may be required.

5.0 Environmental Considerations

Each application for consent will be considered on its own benefits / disbenefits. Mitigation to reduce the impact to the natural environment will be taken into consideration when determining an application for culverting.

5.1 Environmental Mitigation:

- Increase the culvert diameter to slightly greater than that needed to accommodate the design flow and position the invert level at the true bed

level of the watercourse. This enables more natural bed features to form over time.

- Provide ledges above the water level in large culverts to allow for the passage of mammals. Or make provision for appropriately located animal underpasses close to the culvert.



Figure 2- Culvert with Ledges for Mammal Passage

- The invert level should not pose an obstruction to fish passage.
- Propose suitable environmental enhancements, for example opening up a length of previously culverted watercourse elsewhere on site, enhancing other lengths of watercourse, creation of ponds/marshy areas/ bays.
- Construct headwalls and wingwalls in 'soft-engineering' or natural materials in keeping with the natural channel without reducing the design life of the structure.

6.0 Consent Procedure

Advice should be sought as early as possible on any proposal, allowing sufficient time before the intended start date, so as to minimise any delays. The consent application form and details on how to apply and pay the appropriate fee are available on the West Sussex LLFA website;

https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/dealing-with-flooding/flood-risk-management/ordinary-watercourse-land-drainage-consent.

As part of the consent procedure we will consult where appropriate with the Environment Agency, Highway Authorities and Natural England.

7.0 Planning Application and Building Control Considerations

- The requirement for ordinary watercourse land drainage consent is independent of the need for planning permission and the granting of planning permission does not imply or guarantee that Land Drainage consent will be granted.
- Consideration must be given to any relevant planning conditions.
- Buildings and structure must not be sited within 5 metres from the outer edge of new or existing culverts/ watercourses.
- Any works must comply with the local council land drainage byelaws, if present.

A representative from the Council will inspect the culvert on completion of works to ensure that it has been installed as per the approved design.

8.0 Enforcement

When unconsented works are identified by a District or Borough Council, and they constitute a contravention of the Land Drainage Act (1991), enforcement action will be pursued. This will include site investigations and informal contact with the land owner to try to resolve the issue. If the obstruction is not removed or there is a failure to submit a consent application within the set period a legal notice will be issued. If the notice is not complied with, then the due legal process will be initiated. This could result in the Council carrying out work by default and recovering all associated costs including an administrative on-cost.

Appendix 8

Southern Water Pre-development capacity check

ARUN DISTRICT COUNCIL AL/89/24/OUT

Appendix 9

Site Investigation Information WS101, WS102, WS502, WS503, WS622, WS711

ARUN DISTRICT COUNCIL AL/89/24/OUT

Appendix 10

Plans provided by Arun District Council

ARUN DISTRICT COUNCIL AL/89/24/OUT

from Southern Water

Alistair Aitken
Stone House Business Centre
Market Place
Chipping Norton
Oxfordshire
OX7 5NH

Your ref

Our ref
15874

Date
12 July 2024

Contact
Te[redacted]

Dear Mr Aitken,

Level 1 Capacity Check Enquiry: Land at Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex, PO20 3SU.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

There is currently inadequate capacity within the foul sewerage network to accommodate a foul flow of **1.17 l/s** for the above development at manhole reference **SU93047102**. The proposed development would increase flows to the public sewerage system which may increase the risk of flooding to existing properties and land. Additional off-site sewers or improvements to existing sewers will be required to provide sufficient capacity to service the development. Southern Water has a duty to provide Network capacity from the point of practical connection (point of equivalent or larger diameter pipe) funded by the New Infrastructure Charge.

Southern Water aim to provide this within 24 months following the date that planning has been granted for developments not identified as strategic sites in our current business plan. Strategic sites are larger developments and will often take longer than 24 months for a full solution to be provided.

The nearest point where capacity is currently available is at manhole reference **Lidsey WTW** which is located approximately **1.2 km to southwest** of the proposed development site. Rights are not issued for a direct connection to Wastewater Treatment Works (WTW). Please note that connection to the WTW will have to be agreed by Southern Water Services before being carried out.

New Infrastructure Charging

Please note as of 1st April 2018 we have moved to the "New Connections Services Charging Arrangements". We understand that this may cause uncertainty for customers, particularly where they may have already committed to a development based on previous charging arrangements. We have worked with our stakeholders and Water UK to agree a set of principles by which we will base

Southern Water Services Ltd. Registered Office: Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX Registered in England No. 2366670

ARUN DISTRICT COUNCIL AL/89/24/OUT

our charges. Please read through our new charging arrangement documents available at the following link: southernwater.co.uk/developing-building/connection-charging-arrangements

Alternatively, New Appointees and Variations (NAVs), also known as 'inset' companies, can provide new connection services or take ownership of the new water and wastewater connection infrastructure provided for a new development. NAVs are appointed by Ofwat and replace the regional water company. It is for the developer to choose whether to use a NAV or the regional water company to supply services for new sites, according to certain legal criteria.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: [redacted]

Please note the information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Please get in touch via the Get Connected customer dashboard if you have any queries.

Yours sincerely,

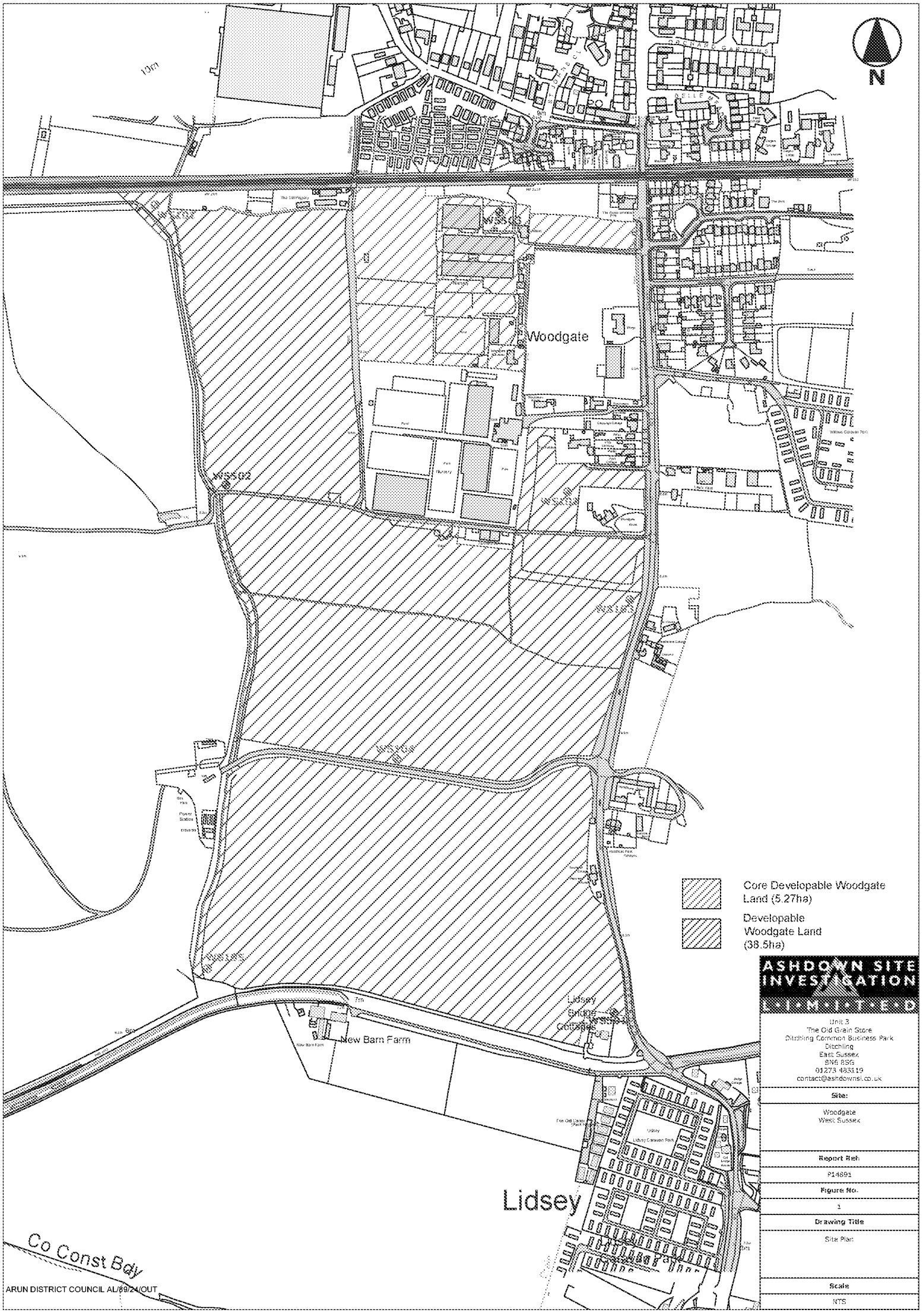
Future Growth Planning Team
Developer Services

[redacted]

Appendix 11

Correspondence with The EA concerning surface water flood risk

ARUN DISTRICT COUNCIL AL/89/24/OUT



ASHDOWN SITE INVESTIGATION LIMITED

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483319
contact@ashdownsi.co.uk

Site:

Woodgate
West Sussex

Report Ref:

P14891

Figure No.

1

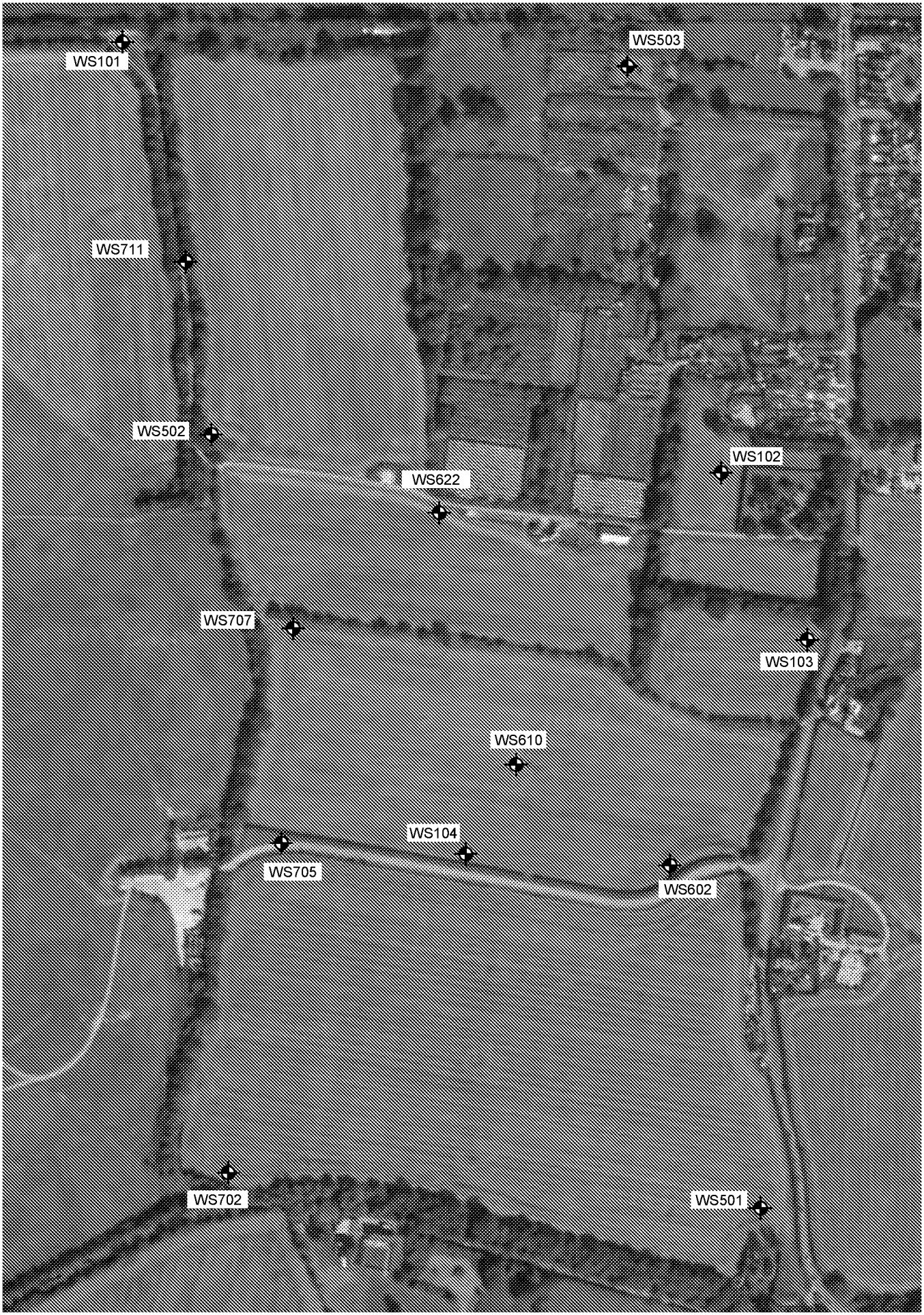
Drawing Title

Site Plan

Scale

NTS

ARUN DISTRICT COUNCIL AL/89/24/OUT

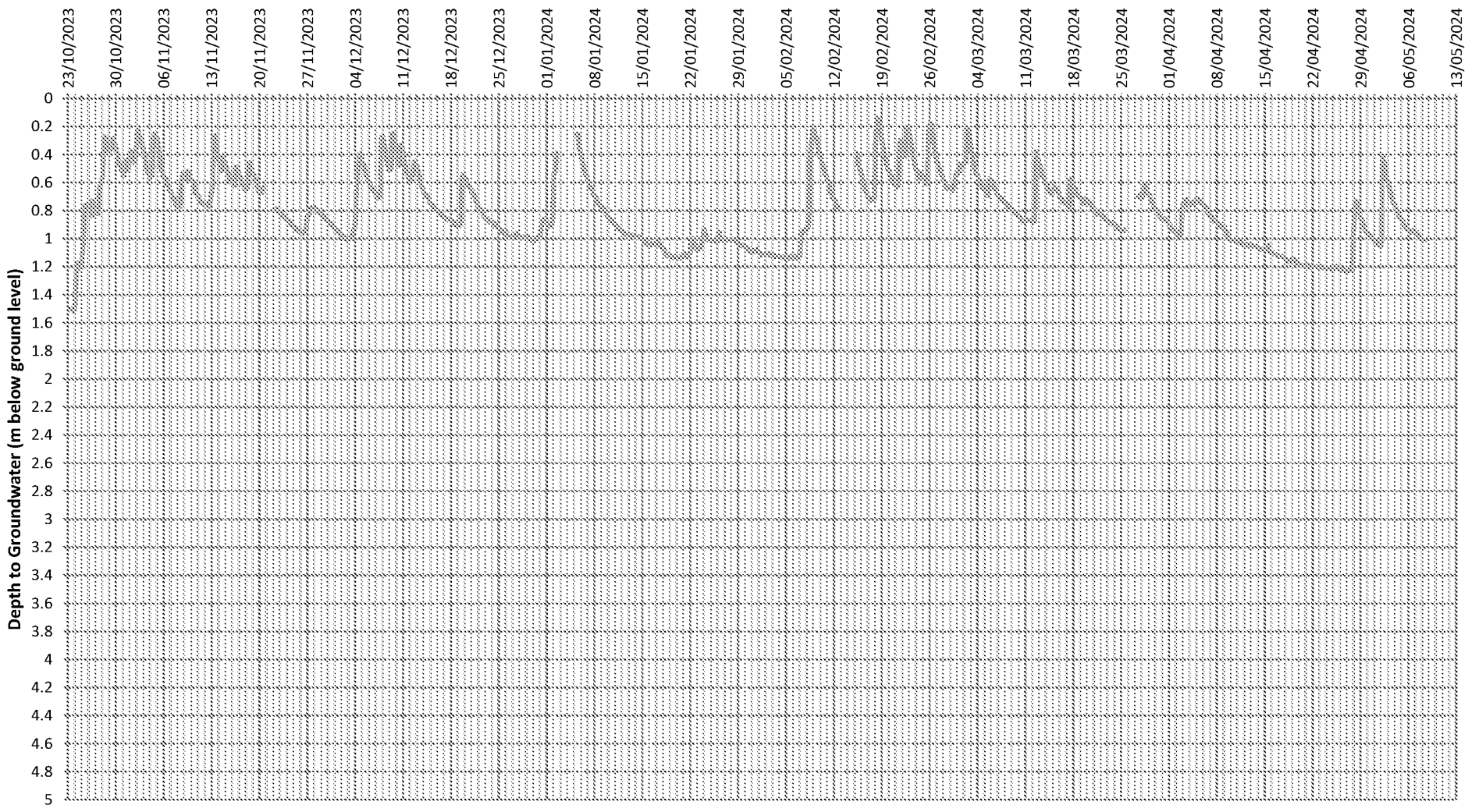


ASHDOWN SITE INVESTIGATION LIMITED	Site Plan	Site Name	Figure No.	Project Reference
		Woodgate Nurseries – Groundwater Monitoring Locations	1	P16339

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS101

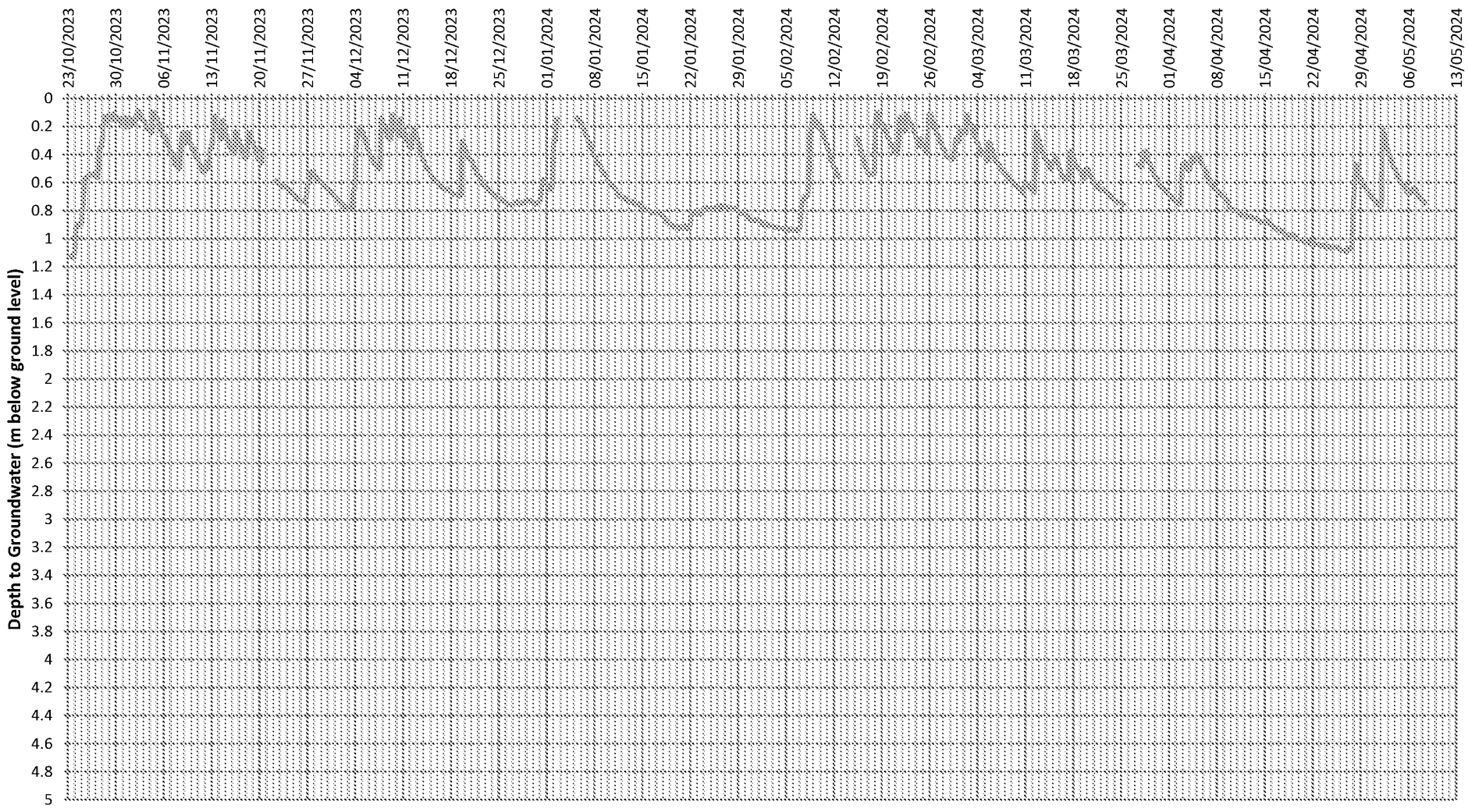


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS102

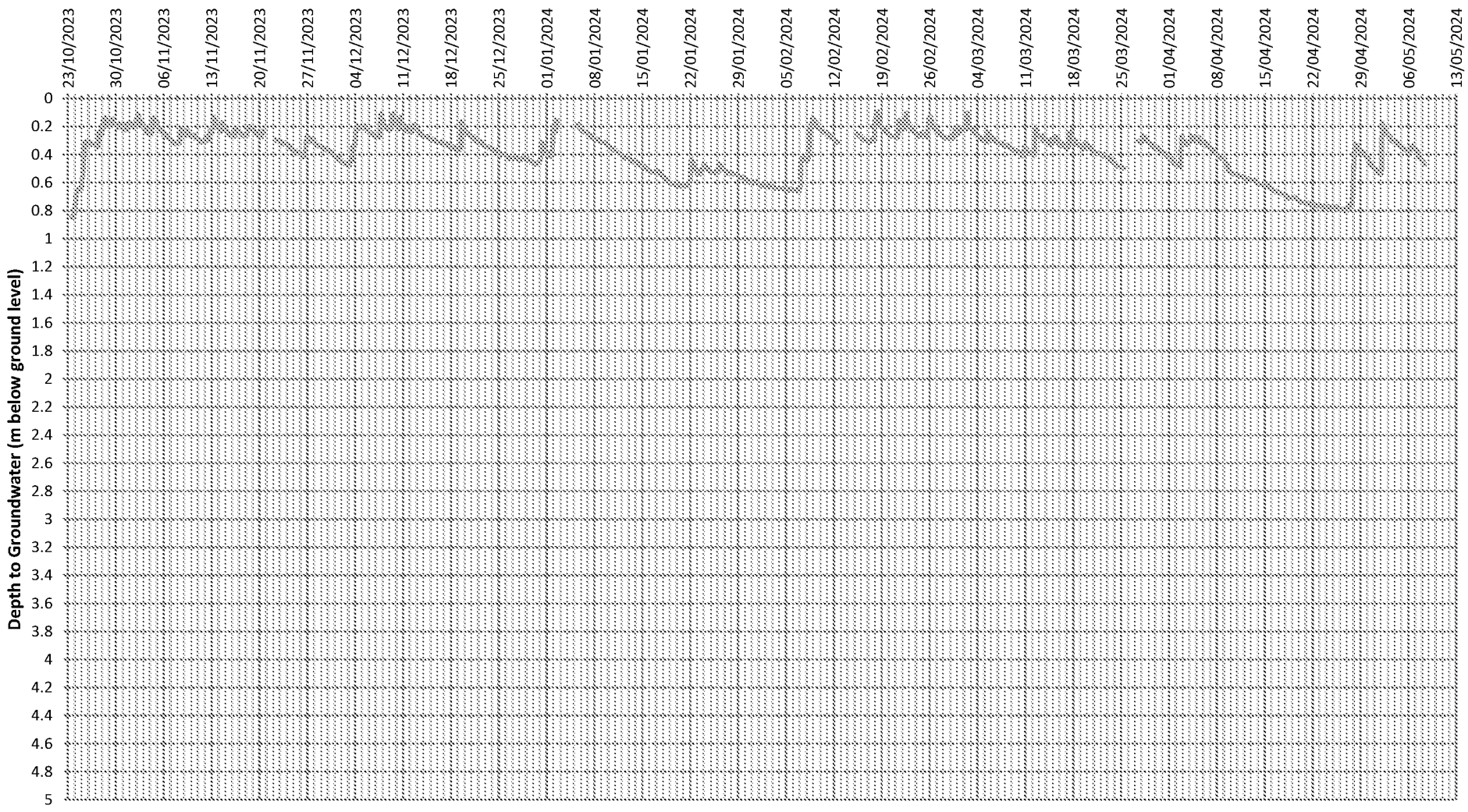


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS103

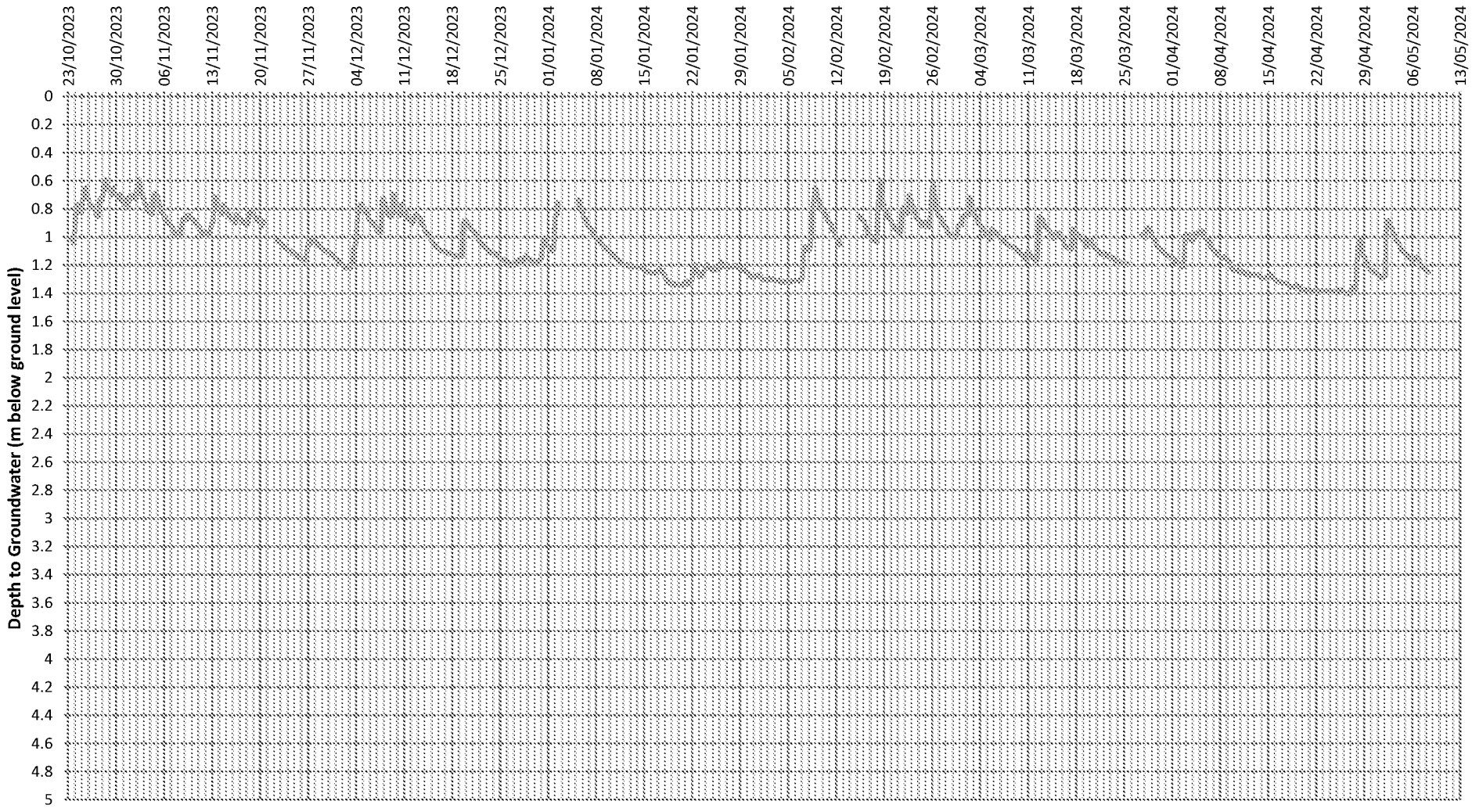


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS104

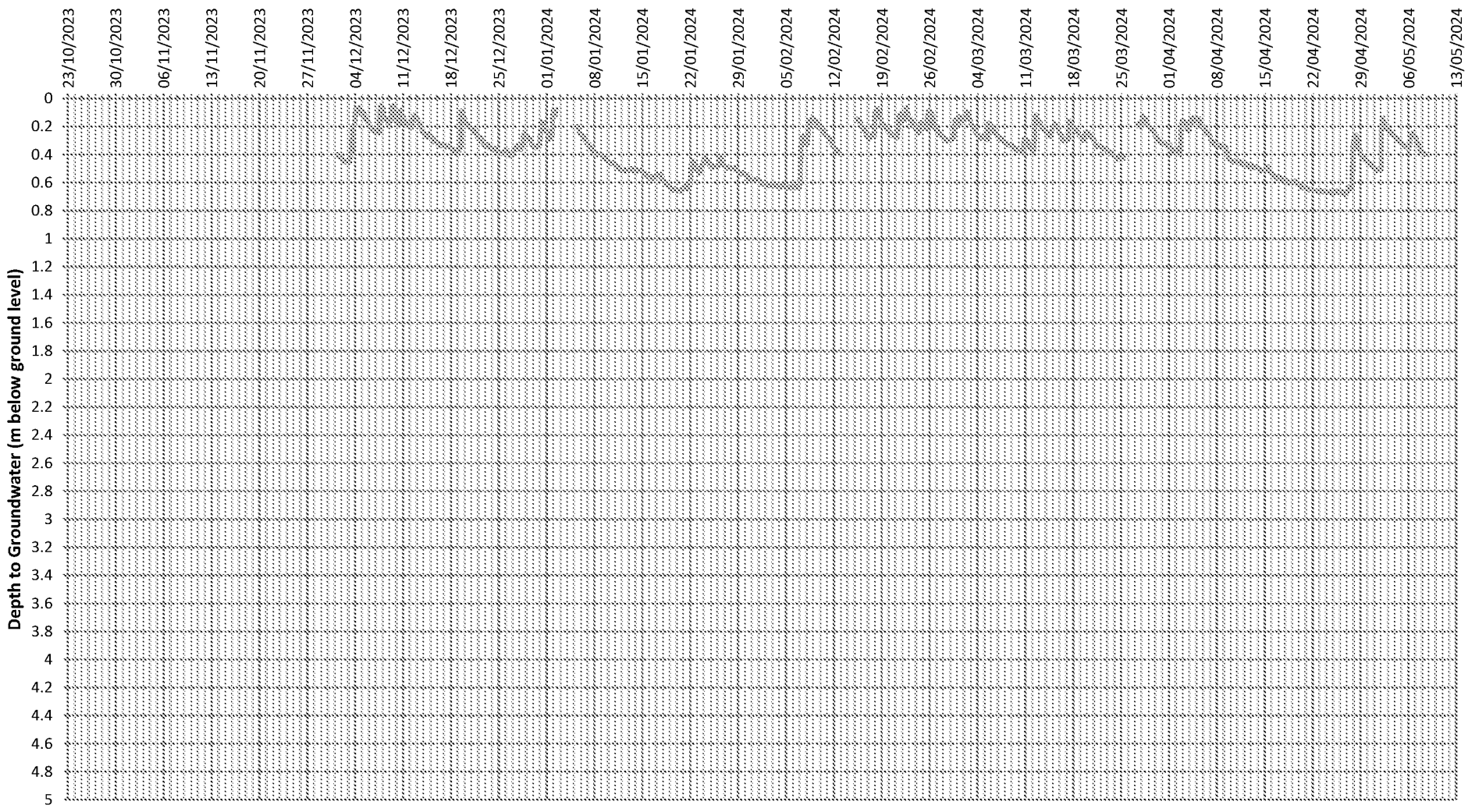


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS501

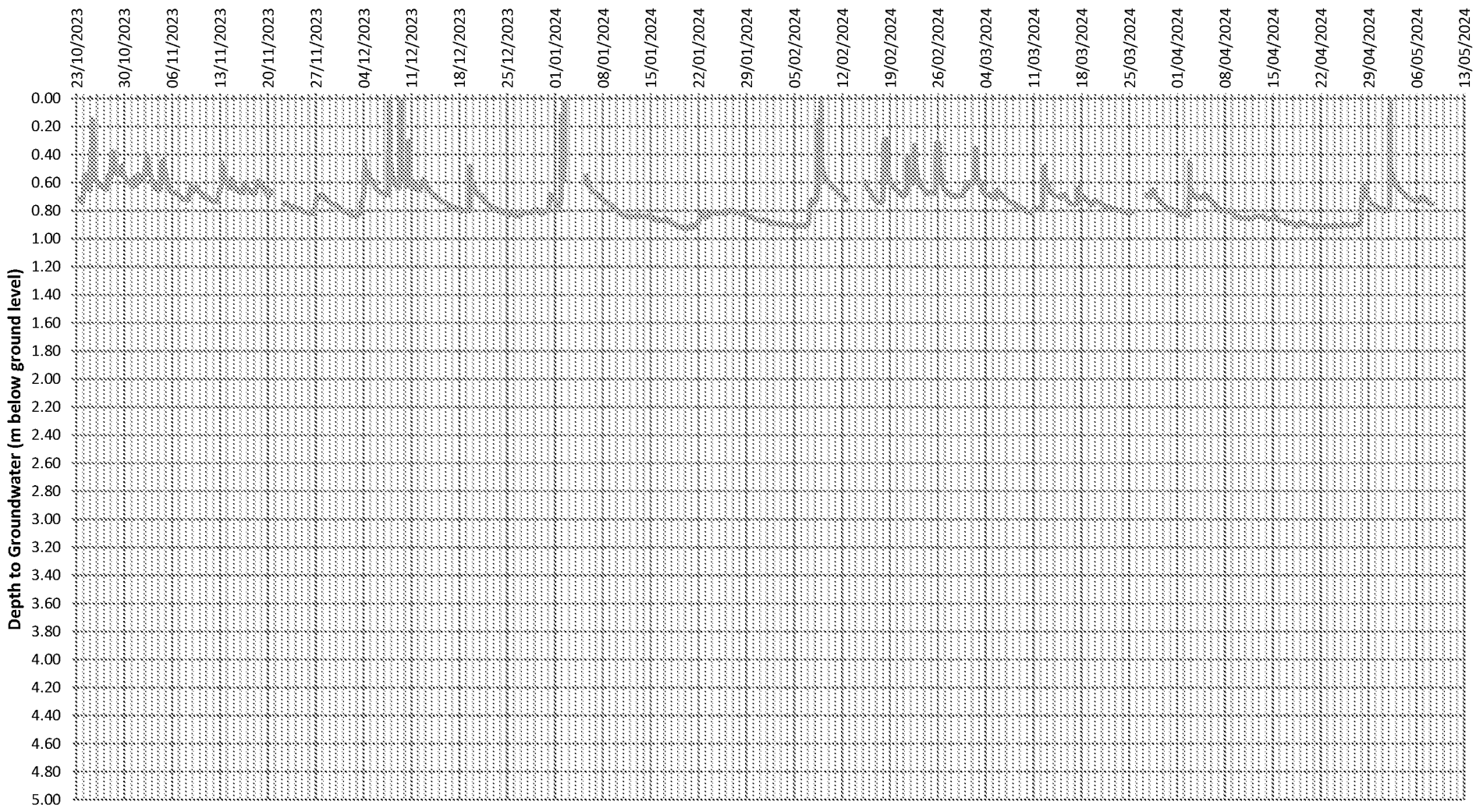


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS502

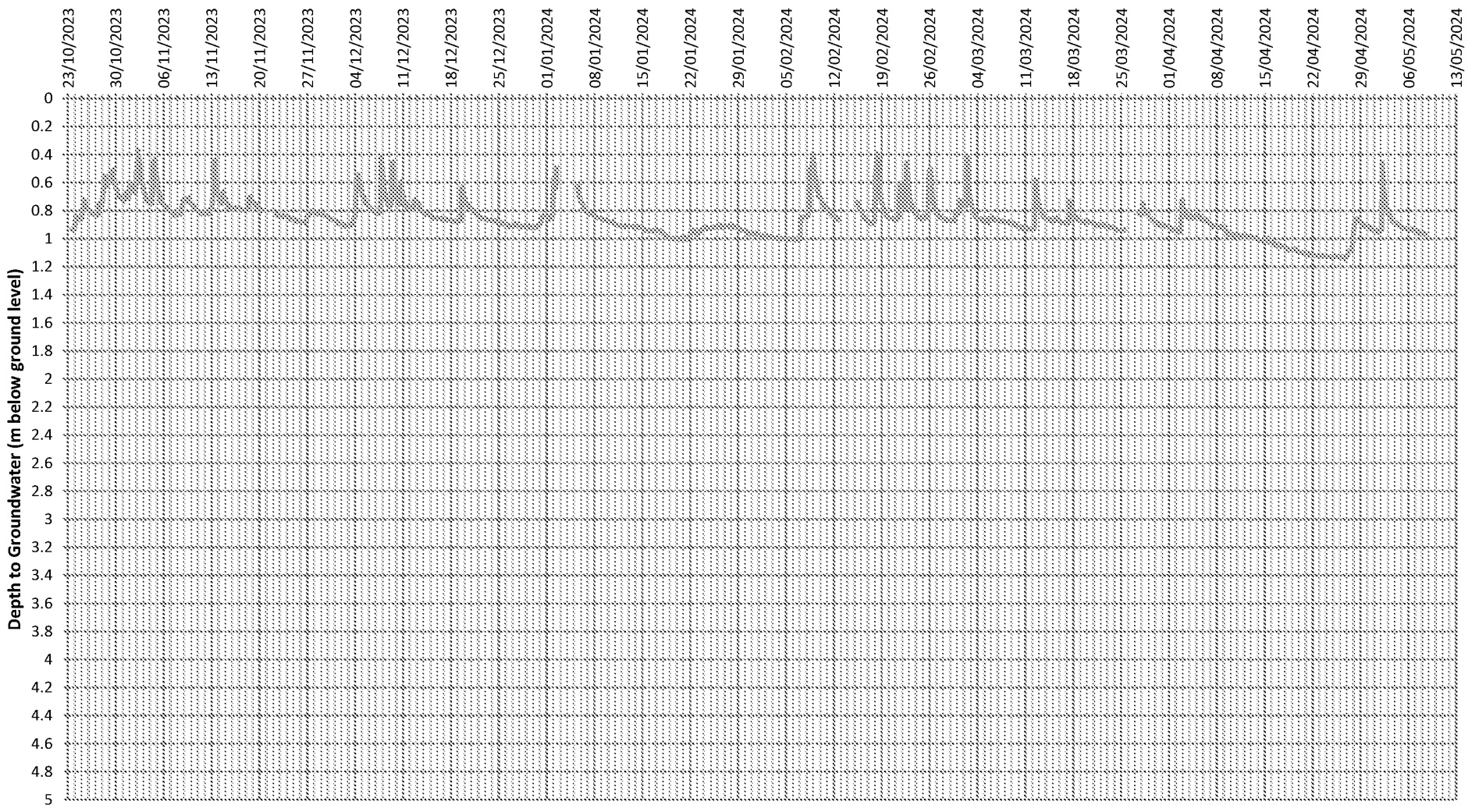


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS503

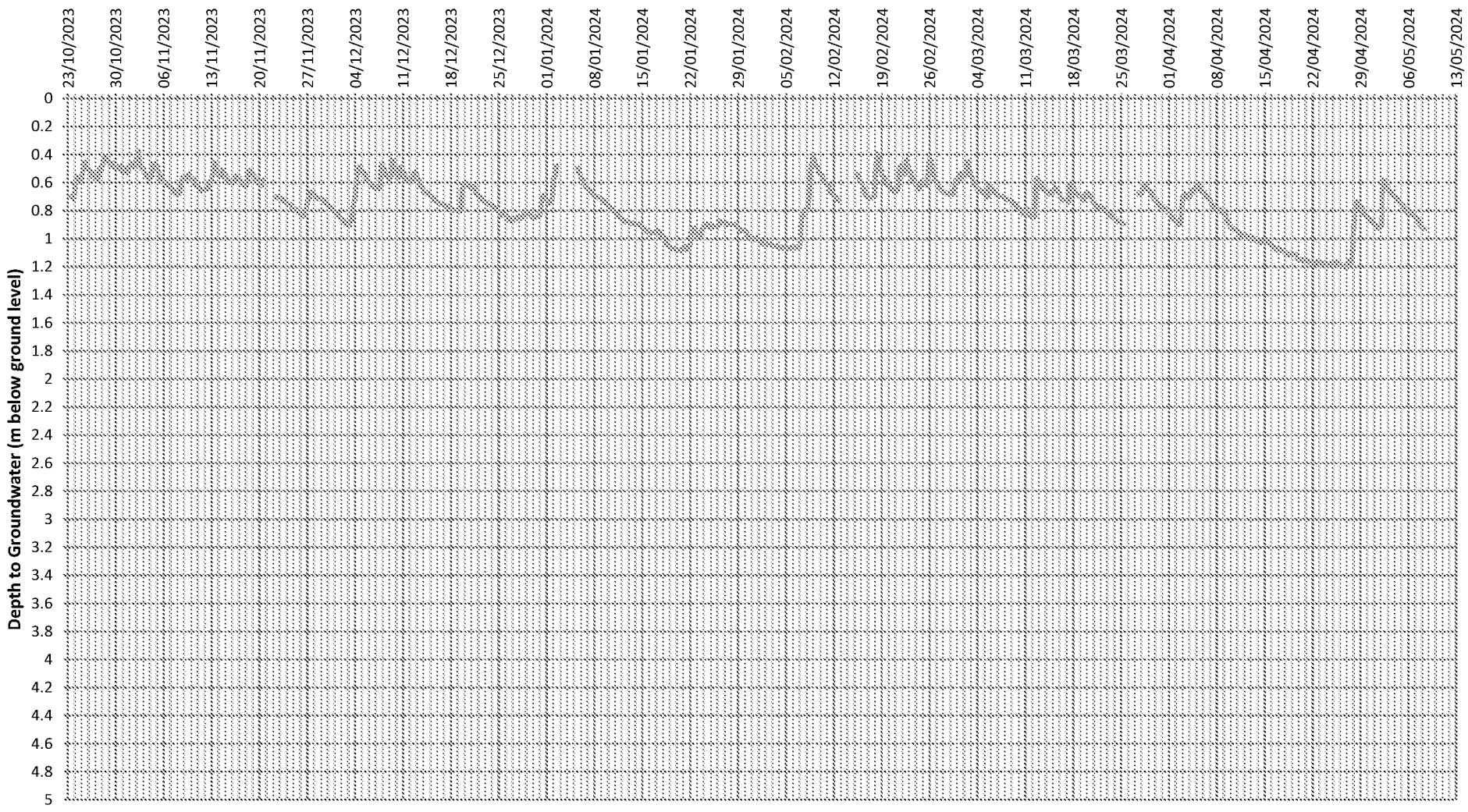


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Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS602

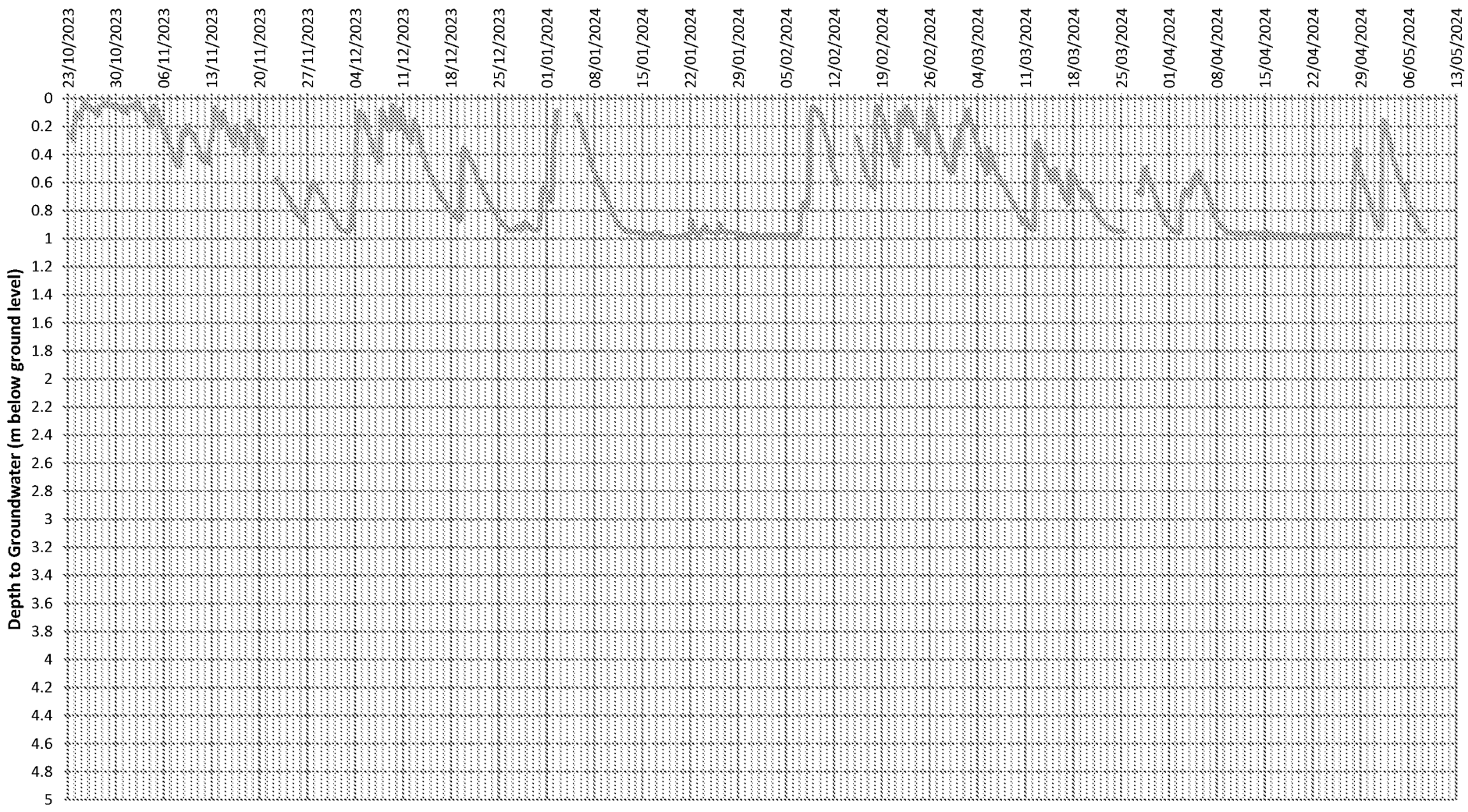


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS610

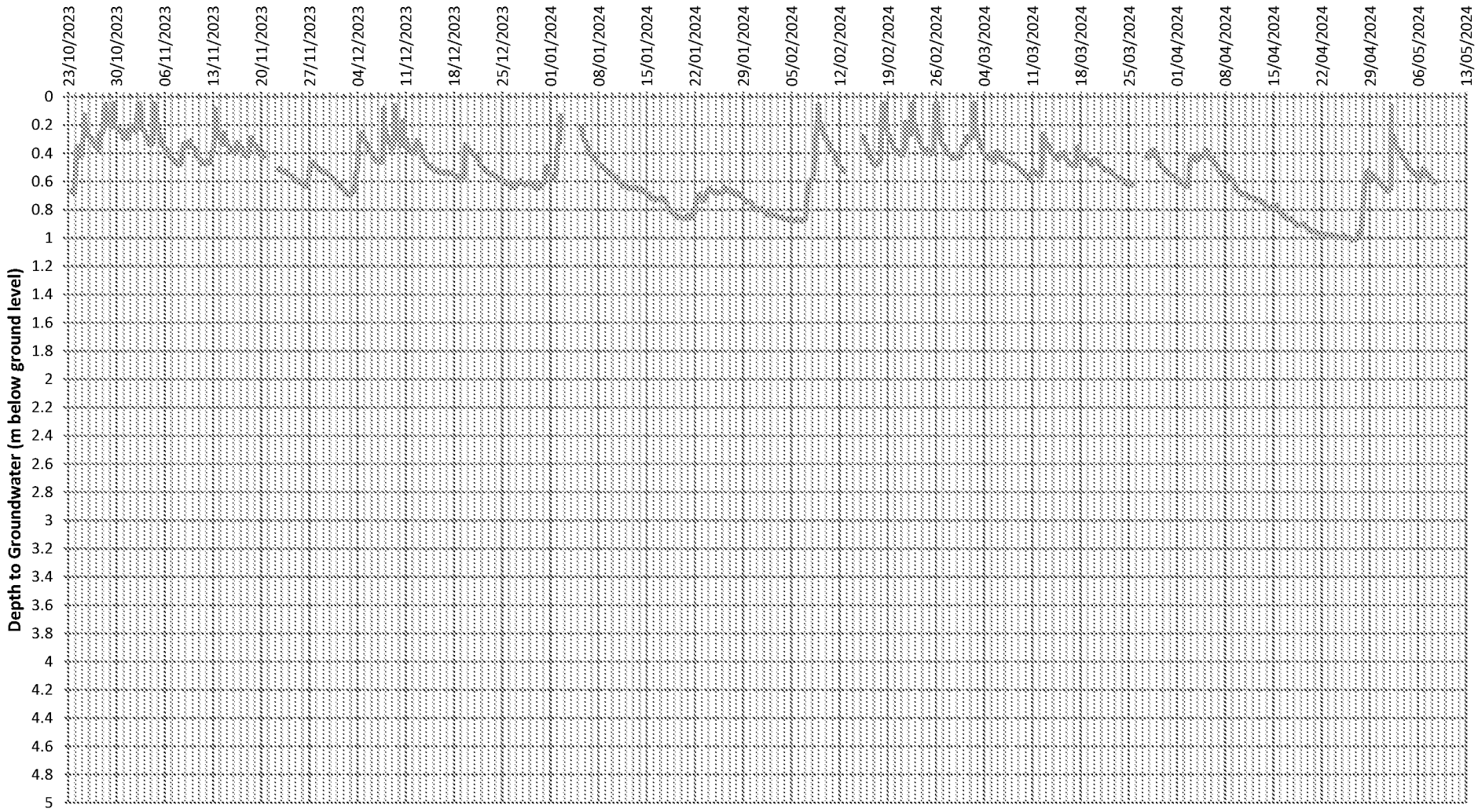


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS622

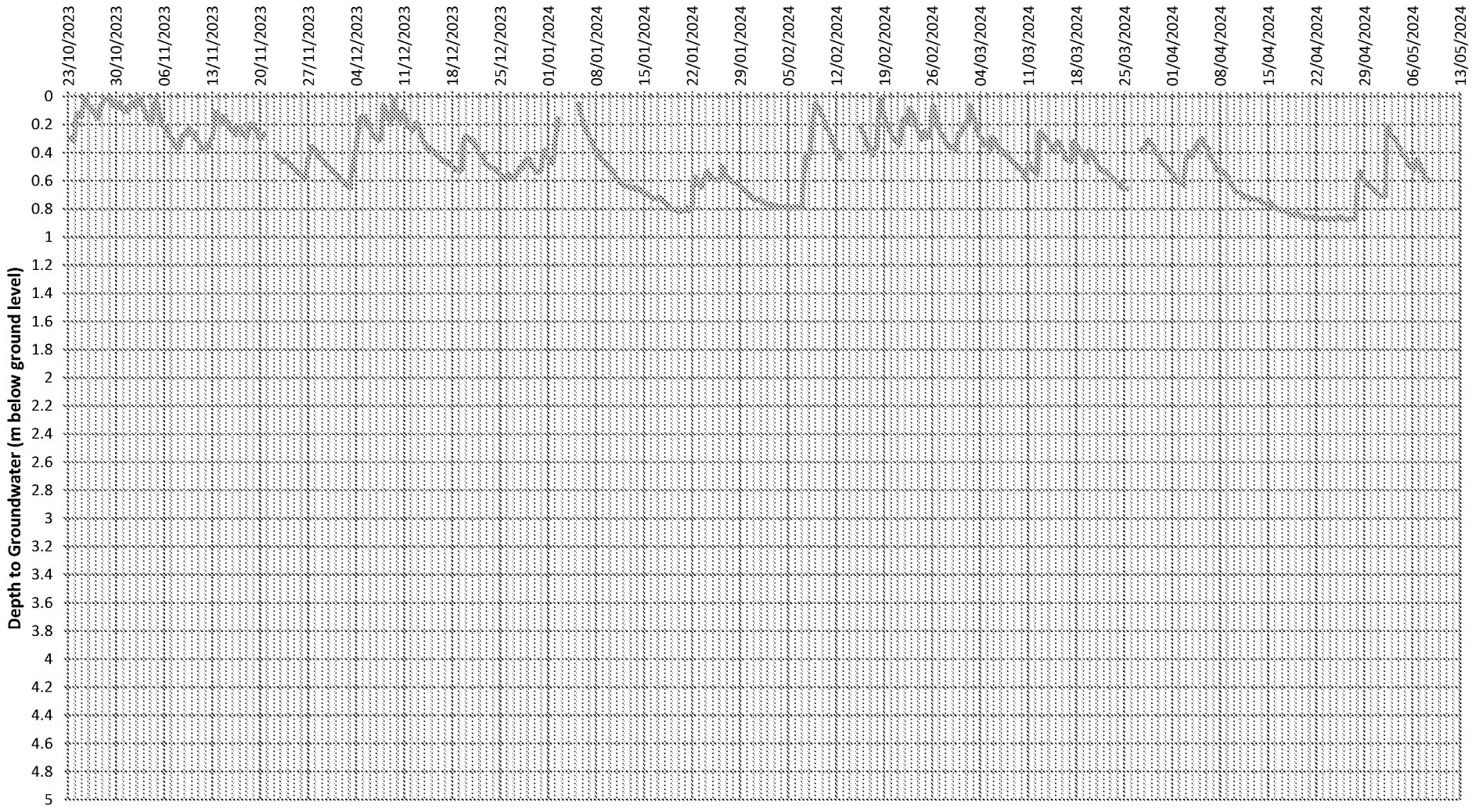


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS702

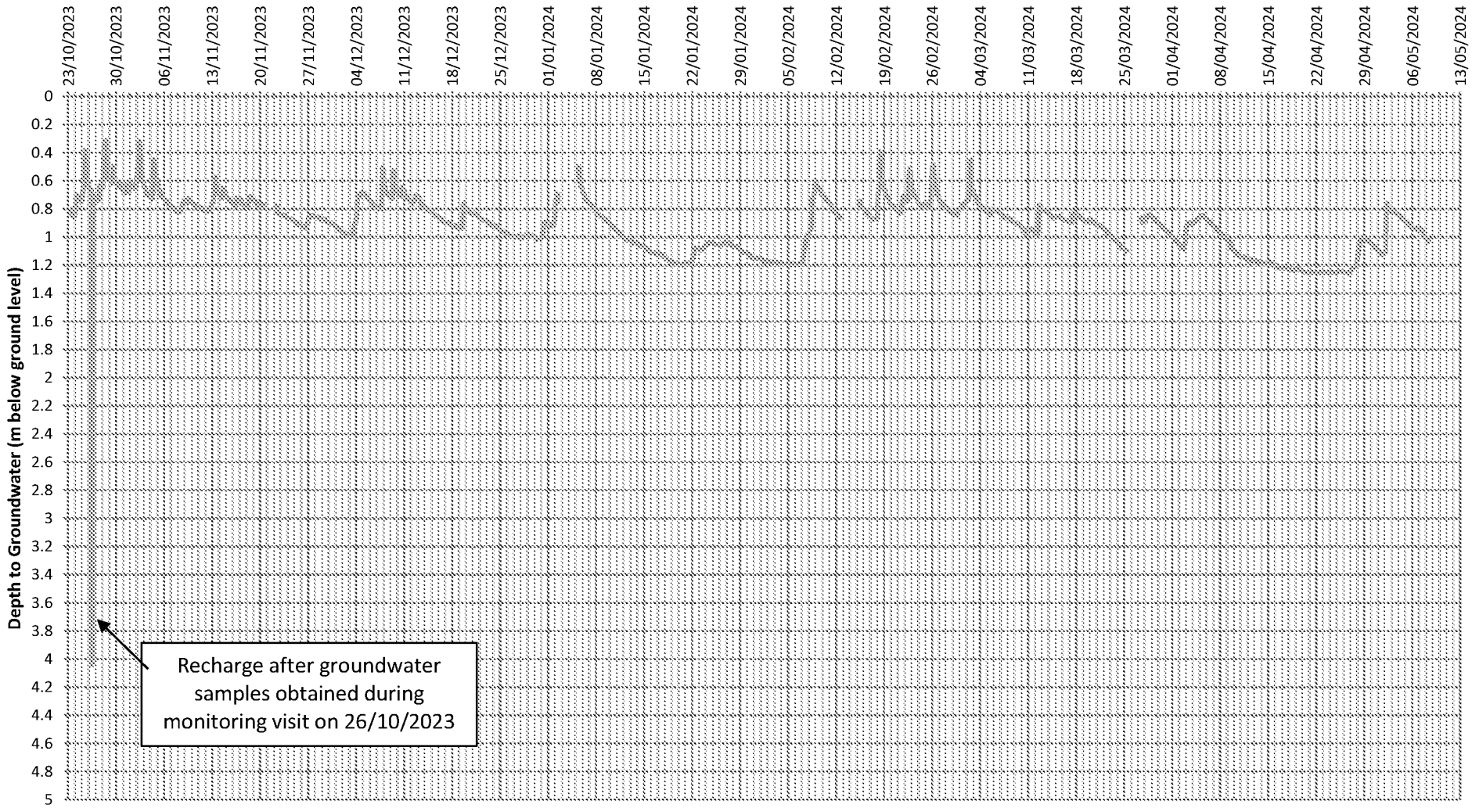


ARUN DISTRICT COUNCIL AL/89/24/OUT

Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

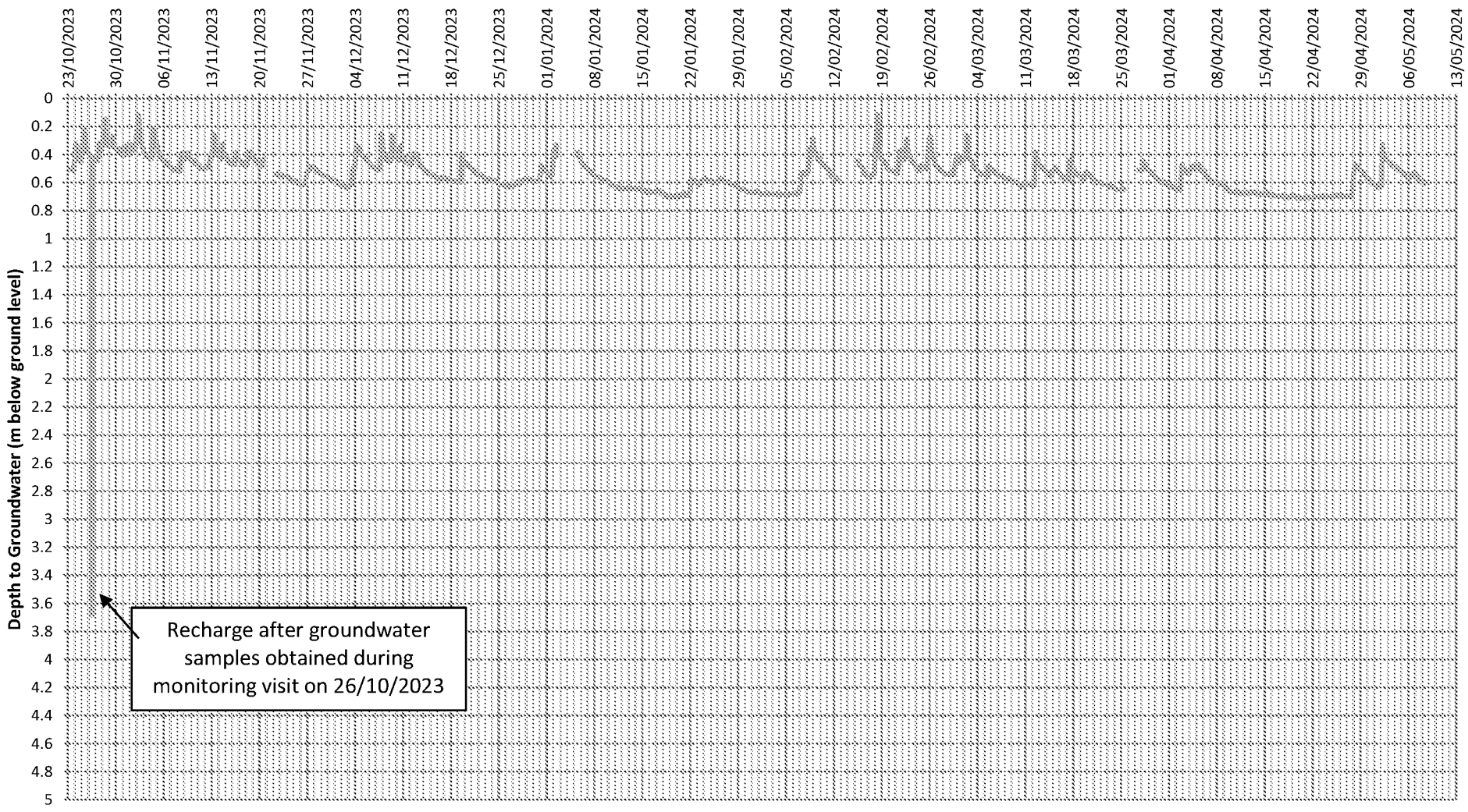
Groundwater Monitoring Results - WS705



Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

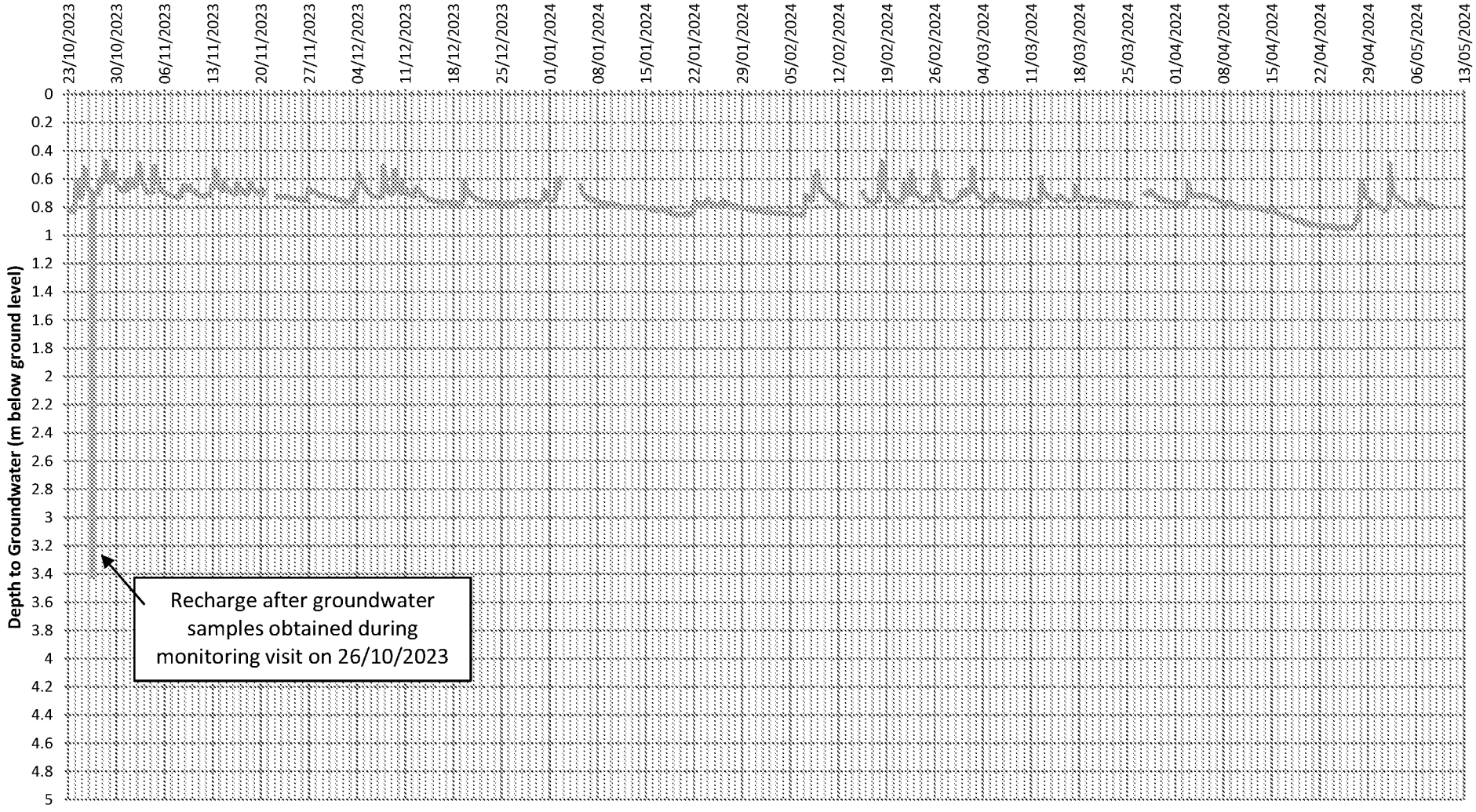
Groundwater Monitoring Results - WS707



Ashdown Site Investigation Limited

Site: Woodgate Nurseries, Lidsey Road, Woodgate, West Sussex	Project No. P16339

Groundwater Monitoring Results - WS711



Explanatory Notes

Symbols and abbreviations on Exploratory Hole Records

Samples

U 'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Pi Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D Disturbed Sample
R Root Sample
B Bulk Disturbed Sample
W Water Sample
ES Environmental Suite (on older records may be referenced J T)

In Situ Testing

S Standard penetration test (SPT): Using the split spoon sampler.
C Standard Penetration Test (SPT): Using a solid cone instead of the sampler – conducted usually in coarse grained soils or weak rocks.
V Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
P Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP Cable Percussion Borehole
RC Rotary Cored Borehole
WLS Dynamic Sampler Borehole using windowless sampler tubes
WS Dynamic Sampler Borehole using window sampler tubes
TP Trial Pit excavated using mechanic excavator
HDP Trial Pit excavated using hand tools

Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

In Situ Strength Testing

Standard penetration testing (SPT) carried out in accordance with BS EN ISO 22476-3:2005.

Continuous dynamic probe testing conducted using a super heavy DPSH-B (As defined by BS EN ISO 22476-2:2005) probing geometry. The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

Perth penetrometer tests carried out in accordance with Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes; no equivalent European or British Standard having been published to date.

Undrained shear strength determinations made in-situ using a Geonor hand shear vane or a hand penetrometer.

Testing to determine the in-situ California Bearing Ratio (CBR) of soils conducted at shallow depths using a hand-held Transport Research Laboratory (TRL) cone penetrometer.

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land West of Lidsey Road (A29), Woodgate, West Sussex

Job Number: P16305

Start Date: 26/09/2023

End Date: 26/09/2023

Borehole Number: **WS602** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil.
	ES	0.20					0.25	SUBSOIL: Light brown slightly gravelly silty clay with occasional rootlets. Gravel is subangular to round fine to medium chalk.
	ES	0.60						
	H	0.70		225			0.70	Stiff to very stiff light brown and orange brown slightly gravelly slightly sandy silty CLAY with rare rootlets and occasional iron staining. Gravel is subangular to subrounded fine to medium flint. (River Terrace Deposits)
	ES	0.80						
	D	0.90						
	V	1.00		>130				
	D	1.20						
	H	1.20		175				
	H	1.80		100				
	D	1.90						
	V	2.00		100			2.10	Medium dense orange brown silty fine to medium SAND. (River Terrace Deposits)
	D	2.20						becoming dense at 3.00m depth.
	D	2.70					3.20	Loose to medium dense orange brown gravelly silty fine to medium SAND. Gravel is Gravel is subangular to subrounded fine to medium flint. (River Terrace Deposits)
							3.70	End of borehole at 3.70m

Remarks

Groundwater: Groundwater recorded at 2.02m depth on completion of borehole.

Stability: Borehole collapsed to 2.90m depth on completion.

Notes: Borehole drilled to 3.00m depth but collapsed to 2.05m depth so redrilled to 3.70m depth.
Standpipe installed to 2.90m depth; 2.90m to 0.90m slotted pipe with gravel surround; 0.90m to ground level plain pipe with bentonite seal; completed with end cap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: GRD

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land West of Lidsey Road (A29), Woodgate, West Sussex

Job Number: P16305

Start Date: 29/09/2023

End Date: 29/09/2023

Borehole Number: **WS610** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	SUBSOIL: Brown slightly gravelly silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick and plastic.
	ES	0.20					0.30	Orange brown gravelly sandy CLAY with occasional iron staining and rare organic material. Gravel is subangular to subrounded fine to coarse flint. (River Terrace Deposits)
	ES	0.40						
	H	0.60		125			0.60	Firm to stiff orange brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse flint. (River Terrace Deposits)
	H	0.90		50				
	D	0.95						with a band of very gravelly sandy silty clay between 0.95m and 1.10m depth.
	H	1.20		150				becoming stiff light grey and orange mottled below 1.20m depth.
	D	1.40						
	H	1.50		150				
	H	1.75		175				
	D	1.90					1.80	Medium dense orange brown silty fine to medium SAND. (River Terrace Deposits)
	D	2.40						
	D	2.90						becoming very gravelly (flint) below 2.85m depth.
	H	3.40		75			3.10	Firm to stiff dark grey CLAY. (River Terrace Deposits)
	H	3.90		75			4.00	End of borehole at 4.00m

Remarks

Groundwater: Groundwater recorded at 1.04m depth on completion of borehole.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 4.00m depth; 4.00m to 2.00m slotted pipe with gravel surround; 2.00m to ground level plain pipe with bentonite seal; completed with end cap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: GRD

ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D

Site Name: Land West of Lidsey Road (A29), Woodgate, West Sussex

Job Number: P16305

Start Date: 05/10/2023

End Date: 05/10/2023

Borehole Number: **WS622** Sheet 1 of 1

Standpipe	Sample/ Test Type	Samples and In Situ Testing: Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
	ES	0.05					0.00	Topsoil.
	ES	0.20					0.10	SUBSOIL: Dark brown gravelly silty clay with rootlets. Gravel is subangular to subrounded fine to coarse flint, chalk and ironstone.
	H	0.40		150			0.35	Stiff light brown and orange brown mottled slightly gravelly slightly sandy silty CLAY with iron staining. Gravel is subangular fine flint. (River Terrace Deposits)
	D	0.80						
	H	0.80		110				
	V	1.00		100				
	H	1.15		110				becoming firm and grey below 1.30m depth.
	H	1.50		50			1.55	Medium dense orange brown and light brown silty fine to medium SAND. (River Terrace Deposits)
	D	1.70						
	D	2.30						becoming loose to medium dense between 2.60m and 3.00m depth.
	D	2.90	3.10					
								becoming dense below 3.70m depth.
	D	3.90						becoming very dense and gravelly below 3.90m depth. Gravel is subangular to subrounded fine to coarse flint
							4.00	End of borehole at 4.00m

Remarks

Groundwater: Groundwater recorded at 1.85m depth on completion of borehole.

Stability: Borehole cased to full depth and when casing pulled standpipe also pulled out of borehole to 3.00m.

Notes: Standpipe installed to 3.00m depth; 1.00m to 3.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with end cap and security cover concreted flush with ground surface.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: GRD

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land south of Woodgate and west of Lidsey Road/A29, West Sussex

Job Number: P16306

Start Date: 06/10/2023

End Date: 06/10/2023

Borehole Number: **WS702**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
	ES	0.15					0.00	SUBSOIL: Dark brown slightly gravelly silty clay with occasional iron staining. Gravel is subangular to subrounded fine to medium flint.
	ES	0.45					0.40	Stiff grey brown, light brown and occasionally orange brown slightly gravelly silty CLAY with occasional iron staining. Gravel is subangular to subrounded fine flint. (River Terrace Deposits)
	H	0.60		85				
	D	0.80						
	H	0.85		75				
	D	1.20						becoming slightly sandy between 1.10m and 1.40m depth.
								with no gravel recorded below 1.40m depth.
	H	1.70		50				
	D	1.80						
	V	2.00		80			2.00	End of borehole at 2.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 2.00m depth; 2.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: GRD

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land south of Woodgate and west of Lidsey Road/A29, West Sussex

Job Number: P16306

Start Date: 06/10/2023
End Date: 06/10/2023

Borehole Number: **WS705** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil with rare gravel of flint, brick, clinker-like material and chalk.
							0.10	MADE GROUND: Light brown slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare chalk, ash-like material and brick.
							0.75	Firm varying stiff grey, orange brown and grey brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint and ironstone. (River Terrace Deposits)
	V	2.00		70				
	D	2.30						
	H	2.50		40				
	ES	2.70	2.90				2.60	Stiff dark grey mottled brown slightly sandy CLAY with occasional shell fragments. (River Terrace Deposits/ London Clay Formation)
	H	2.90		75				
	D	3.10						
	H	3.10		75				
	H	3.50		185				
	ES	3.80	4.60					
	D	3.90						
	H	3.90		>225			4.00	End of borehole at 4.00m

Remarks

Groundwater: Groundwater encountered at a depth of 3.80m.

Stability: Borehole cased to 2.00m depth.

Notes: Standpipe installed to 4.00m depth; 4.00m to 2.00m slotted pipe with gravel surround; 2.00m to ground level plain pipe with bentonite seal; completed with end cap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land south of Woodgate and west of Lidsey Road/A29, West Sussex

Job Number: P16306

Start Date: 06/10/2023

End Date: 06/10/2023

Borehole Number: **WS707**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil with rare gravel of flint, brick and ash-like material.
							0.30	SUBSOIL: Brown slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium flint and ash-like material.
							0.50	Firm orange grey brown and brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint and ironstone. (River Terrace Deposits)
	H	0.80		60			0.90	Loose brown grey and orange brown mottled gravelly silty SAND. Gravel is subangular to subrounded fine to coarse flint. (River Terrace Deposits) becoming medium dense below 1.00m depth.
	ES	1.50						
	D	1.90					1.80	Firm brown slightly gravelly silty CLAY. Gravel is subangular to rounded fine to medium flint. (River Terrace Deposits)
							2.00	Medium dense brown grey and orange brown mottled gravelly silty SAND. Gravel is subangular to subrounded fine to coarse flint. (River Terrace Deposits)
	H	2.60		40			2.50	Firm orange brown and dark blue grey slightly sandy CLAY. (River Terrace Deposits/ London Clay Formation)
	D	2.70						
	H	2.90		50				
	H	3.10		225				becoming stiff to very stiff below 3.10m depth.
	H	3.50		175				
	D	3.70						
	ES	3.80	4.00					
	H	3.90		150				
							4.00	End of borehole at 4.00m

Remarks

Groundwater: Groundwater encountered at a depth of 1.10m.

Stability: Borehole cased to 3.00m depth.

Notes: Standpipe installed to 4.00m depth; 4.00m to 2.00m slotted pipe with gravel surround; 2.00m to ground level plain pipe with bentonite seal; completed with end cap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED

Site Name: Land south of Woodgate and west of Lidsey Road/A29, West Sussex

Job Number: P16306

Start Date: 04/10/2023
End Date: 04/10/2023

Borehole Number: **WS711** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	MADE GROUND: Brown gravelly sandy clay with rare roots. Gravel is subangular to subrounded fine to coarse flint and brick.
	ES	0.20					0.30	SUBSOIL: Brown slightly sandy slightly gravelly clay with rare roots. Gravel is subangular to subrounded fine to medium flint.
	ES	0.40						
	D	0.50					0.60	Firm to stiff light brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to medium flint and ironstone. (River Terrace Deposits)
	ES	0.90						
	H	0.90		>225				
	V	1.00		>130			1.10	Loose to medium dense orange brown clayey SAND. (River Terrace Deposits)
	H	1.10		175				
	D	1.50						becoming loose between 1.60m and 2.00m depth.
	ES	1.90						becoming medium dense below 2.30m depth.
	D	2.50					2.80	Stiff to very stiff grey brown slighty sandy CLAY. (River Terrace Deposits)
	ES	2.90					3.00	Medium dense orange brown very sandy clayey subangular to subrounded fine to medium GRAVEL of flint. (River Terrace Deposits)
	D	3.50						becoming loose to medium dense below 3.40m depth.
	H	3.80		85			3.70	Stiff grey CLAY. (River Terrace Deposits/ London Clay Formation)
	ES	3.90					4.00	End of borehole at 4.00m

Remarks

Groundwater: Groundwater encountered at a depth of 1.60m.

Stability: Borehole cased to 3.00m depth.
Borehole unstable below 1.10m depth.

Notes: Standpipe installed to 3.60m depth; 3.60m to 1.60m slotted pipe with gravel surround; 1.60m to ground level plain pipe with bentonite seal; completed with end cap and upstanding security cover.

Excava. on Method: WLS

Borehole Diameter: Various

Made By: JN

Appendix 10

Plans provided by Arun District Council

ARUN DISTRICT COUNCIL AL/89/24/OUT

Arun District Council Maps



Mapping produced by Arun District Council

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Production Date: 26 March 2024

Scale: 1:1000 @ A3

www.arun.gov.uk

ARUN DISTRICT COUNCIL

Arun District Council Maps



Mapping produced by Arun District Council

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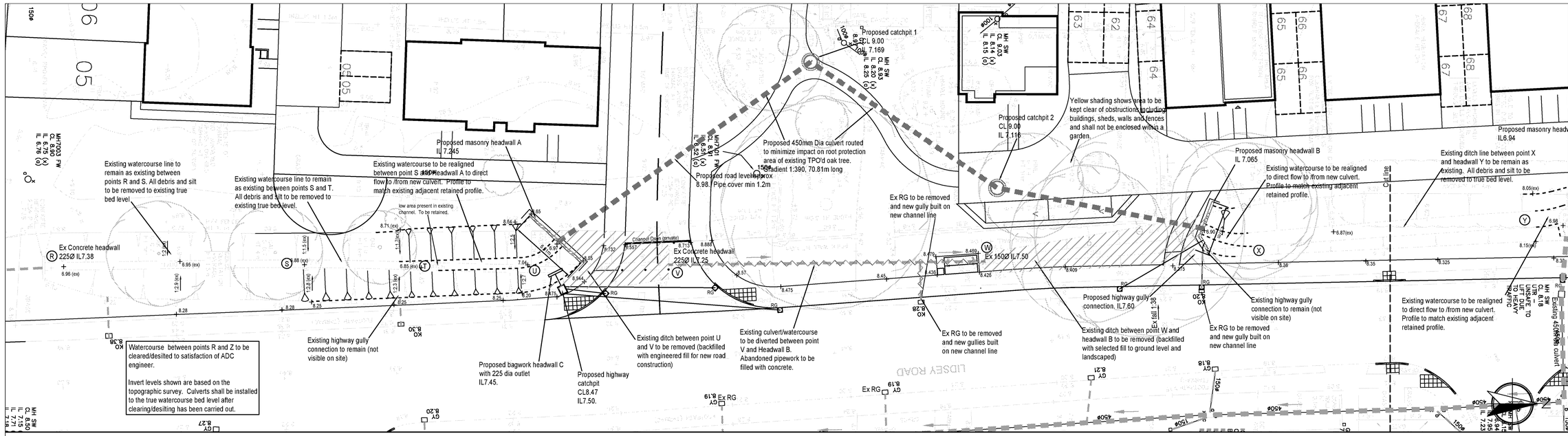
Production Date: 26 March 2024

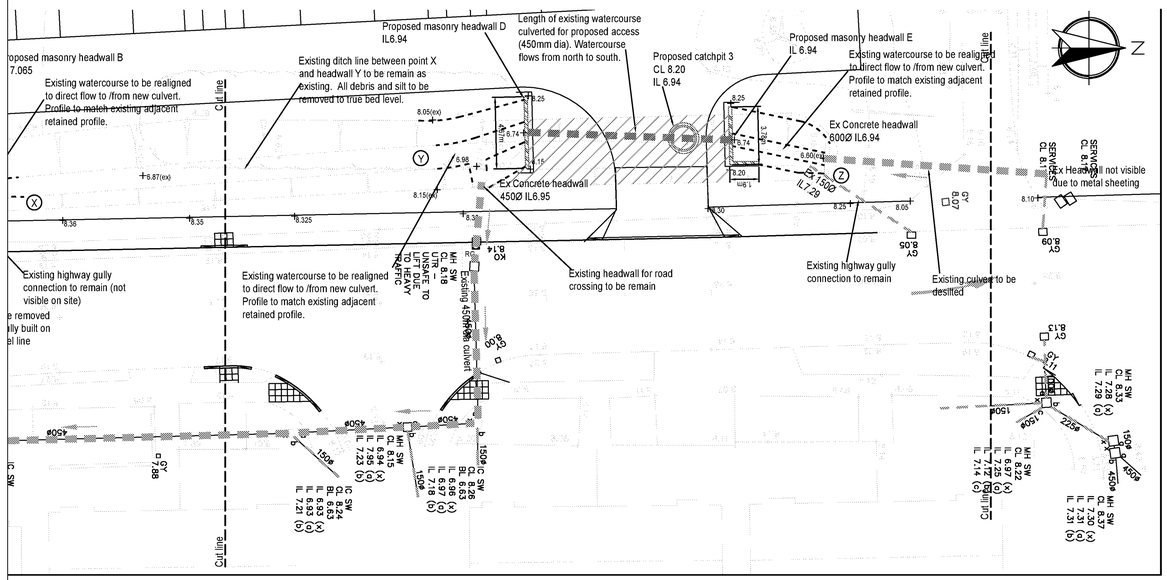
Scale: 1:1000 @ A3

www.arun.gov.uk

ARUN DISTRICT COUNCIL

ARUN DISTRICT COUNCIL AL/89/24/OUT





KEY

	Proposed masonry headwall
	Proposed precast concrete culvert
	Proposed precast concrete catchpit
	Extent of culverted/realigned watercourse
	Existing culvert/drainage to be abandoned
	Existing drainage



SITE LOCATION PLAN 1:1250

NOTES

A1

1. This drawing is to be read in conjunction with all other Bright Plan Civils drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
2. Bright Plan Civils accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.
3. Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.
4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain. The main contractor is responsible for checking all information on site prior to work commencing and taking due care whilst undertaking the works.
5. All dimensions to be checked on site. All details and dimensions relating to sub-contractors work must be checked and agreed between the sub-contractor or supplier and the general contractor.
6. The electronic information from this drawing can not be guaranteed as dimensionally drawn exact. Figured dimensions must be used for setting out and detailing. Bright Plan Civils logos and company information must be removed from copies if information is re-used.
7. The main contractor is responsible for the design of all temporary works, and is also responsible for the safe maintenance and stability of existing buildings at all times.
8. The main contractor is responsible for dealing with all occurrences of ground water during the construction period.
9. The contractor must comply with all current legislation relating to health & safety.
10. All products specified shall be installed in strict accordance with the manufacturers recommendations and instructions. If there are discrepancies between that information and the details on any Bright Plan Civils drawings, the manufacturers instructions must be used.

RESIDUAL HAZARDS

In addition to the hazards/risks normally associated with the type of work detailed on this drawing, note the following:

1. Buried services. Contractor to refer to record drawings and use CAT to locate existing services.
2. Working in live traffic. Contractor to ensure traffic management is designed, erected and maintained to protect the workforce and the public.
3. Working adjacent to existing watercourse. Contractor to ensure existing watercourse is protected from construction detritus and barrier off to protect the workforce if required.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved risk assessment and method statement

Rev.	Amendments	Date
C	CP3 & note regarding culvert desilting added	13/04/2021
B	Levels revised to suit updated survey	06/03/2021
A	Revised to suit ADC comments	17/02/2021

BRIGHT PLAN CIVILS
Transport Planning and Infrastructure Design Consultants
2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF
tel: 01243 210418
www.bpcivils.co.uk

Drawing Status	FOR APPROVAL
Client	Thakeham Client Limited
Project	Land at Lidsey Road, Woodgate, West Sussex
Drawing Title	Existing Watercourse Alterations General Arrangement and Levels

Scale	Date	Drawn By	Checked By
1:200	Apr' 2020	LDF	MJA

Drawing No.	Rev.
D1757-17-30	C

ARUN DISTRICT COUNCIL ALREADY OUT

Appendix 11

Correspondence with The EA concerning surface water flood risk

ARUN DISTRICT COUNCIL AL/89/24/OUT

From: PSO West Sussex
To: Alistair Aitken
Subject: RE: SSD335613 - Product 4 Data - Land at Woodgate, Bognor Regis, PO22 9TH
Date: 11 January 2024 09:42:46
Attachments: image008.png
image010.png
image016.png
image017.png

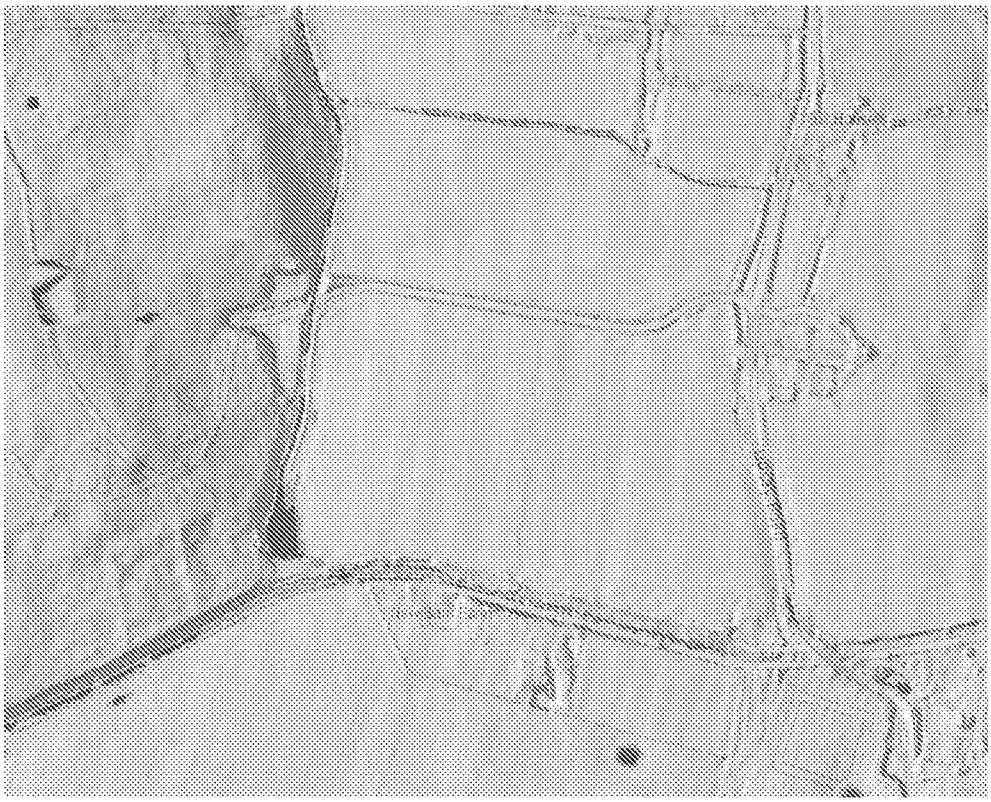
Hi Alistair,

Thanks for your email, and apologies for the delay in responding to you.

The Risk of Flooding from Rivers and Sea map is based on a national surface water mapping project completed in 2013. As this modelling was part of a national project it did not include local drainage features such as the pipe mentioned in your email below. The results are based mainly on ground levels estimated using LiDAR. The grey image below shows ground levels in the area and that the water is accumulating against an area of high ground.

If you have any further queries regarding surface water flood risk, please contact West Sussex County Council. As Lead Local Flood Authority, West Sussex County Council are the organisation responsible for managing surface water in this area.





I hope that we have answered your questions, but please do not hesitate to contact us again if you have any further queries about this request.

Kind regards,

Amy O'Donnell (*she/her*)
Partnership and Strategic Overview West Sussex, Solent and South Downs
Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD
[redacted]

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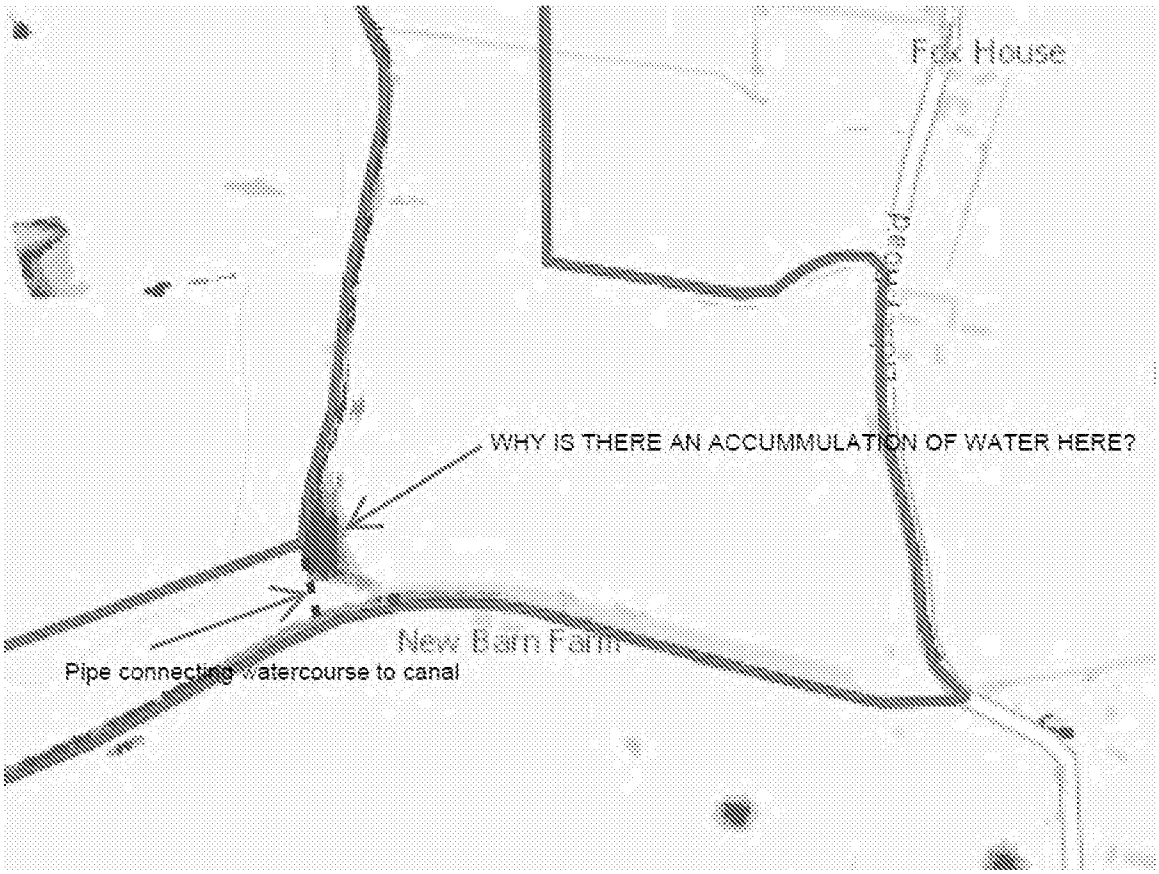
From: Alistair Aitken [redacted]
Sent: Monday, December 11, 2023 11:41 AM
To: PSO West Sussex [redacted]
Cc: SSD Enquiries [redacted]
Subject: RE: SSD335613 - Product 4 Data - Land at Woodgate, Bognor Regis, PO22 9TH

You don't often get email from alistairaitken@lorridge.co.uk. Learn why this is important

Hi Amy

Thank you for your comprehensive reply. It is very helpful.

We do have a query in relation to the surface water flood risk mapping and in particular why there is an accumulation of water in the area I have indicated below.
The watercourse is connected to the canal vie a pipe. Are you able to advise if a pipe , or any other form connection, was modelled?



Please do not hesitate to contact me if you have any queries.

Thanks

Kind regards

Alistair Aitken C Eng MICE MCIWEM C.WEM
Director, FortRidge Consulting Limited
[redacted]
FortRidge
Consulting Limited

From: PSO West Sussex [redacted]
Sent: Friday, December 8, 2023 4:26 PM

To: Alistair Aitken <[redacted]
Cc: SSD Enquiries <[redacted]
Subject: RE: SSD335613 - Product 4 Data - Land at Woodgate, Bognor Regis, PO22 9TH

Dear Alistair,

Thank you for your Product 4 data request for **Land at Woodgate, Bognor Regis, PO22 9TH.** Please see the attached Product data.

For reference, node points **11 and 12** on the FRA Site Boundary & Node Points map and Levels and Depths table are located outside of your site boundary, but lie either side of the point marked on our mapping as the disused canal. I hope that we have correctly interpreted your request, but if you do require levels for a different section of the Aldingbourne Rife, please do let us know.

For FRA and pre-planning advice please see attached 'FRA Advisory Text' and 'SSD Pre-app advice note September 2019'.

For information on flooding from other sources such as surface water please contact the Lead Local Flood Authority, West Sussex County Council.

Guidance on climate change allowances and how to use them in Flood Risk Assessments can be found here.

For future reference, detailed flood information and maps can be viewed using the Long Term Flood Risk Information service and Flood Map for Planning service. Flood and Coastal Risk Management asset information, and details of all planned maintenance activities can be viewed using the Asset Management Service.

If you have any further queries about this request, please do not hesitate to contact us at psowestsussex@environment-agency.gov.uk.

Kind regards,

Amy O'Donnell (*she/her*)
Partnership and Strategic Overview West Sussex, Solent and South Downs
Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD
[redacted]





From: Alistair Aitken [redacted]
Sent: Friday, November 17, 2023 10:40 AM

To: SSD Enquiries [redacted]
Cc: [redacted]
Subject: Land at Woodgate: Product 4 data

Dear EA

We are making an enquiry for Product 4 data relating to the Aldingbourne Rife at the following location:

OS X (Eastings)	492606
OS Y (Northings)	103124
Nat Grid	SU926031 / SU9260603124
Nearest Post Code	PO22 9TH

The site we are enquiring about is shown on the attached SITE ONLY flood map.

The watercourse adjacent to the site discharges to the abandoned canal to the south of the site and flows to the west for discharge into the Aldingbourne Rife. We therefore would like to know the 1 in 100 year and 1 in 1000 year flood levels at the point of discharge from the canal to the Aldingbourne Rife to ascertain if there might be backwater effects.

Kind regards

Alistair Aitken C Eng MICE MCIWEM C.WEM
Director, FortRidge Consulting Limited
[redacted]
FortRidge
Consulting Limited

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