

LAND AT WOODGATE NURSERIES
LIDSEY ROAD, WOODGATE
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY
JULY 2024

FortRidge
Consulting Limited

For

HANBURY PROPERTIES



STATUS OF REPORT

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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
WSSC	West Sussex County Council (LLFA)

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 (WSSC) 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.

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.

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 (Easting) 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:

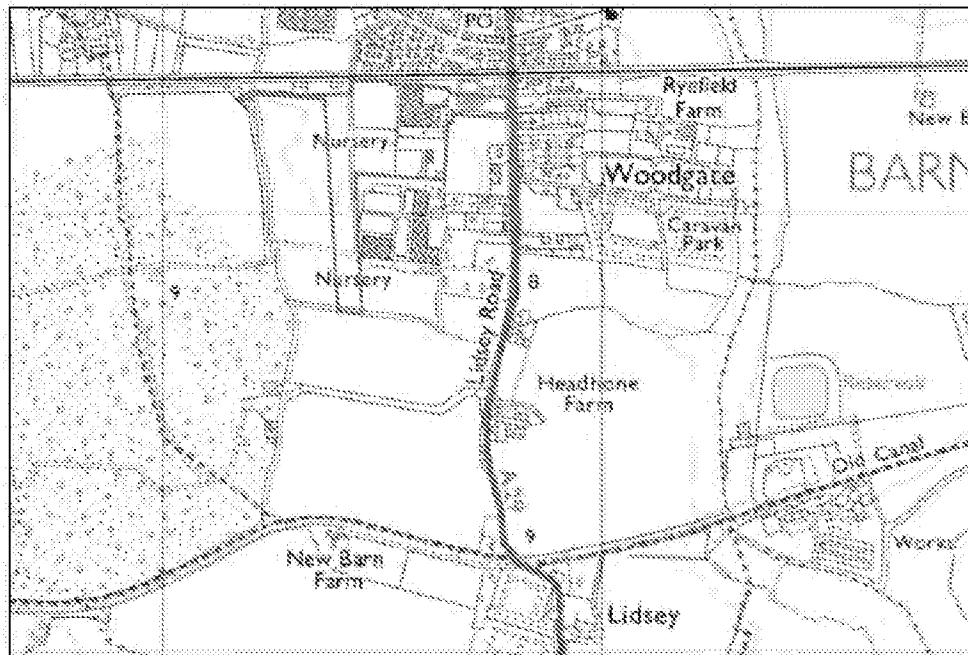


FIGURE 1: LOCATION PLAN

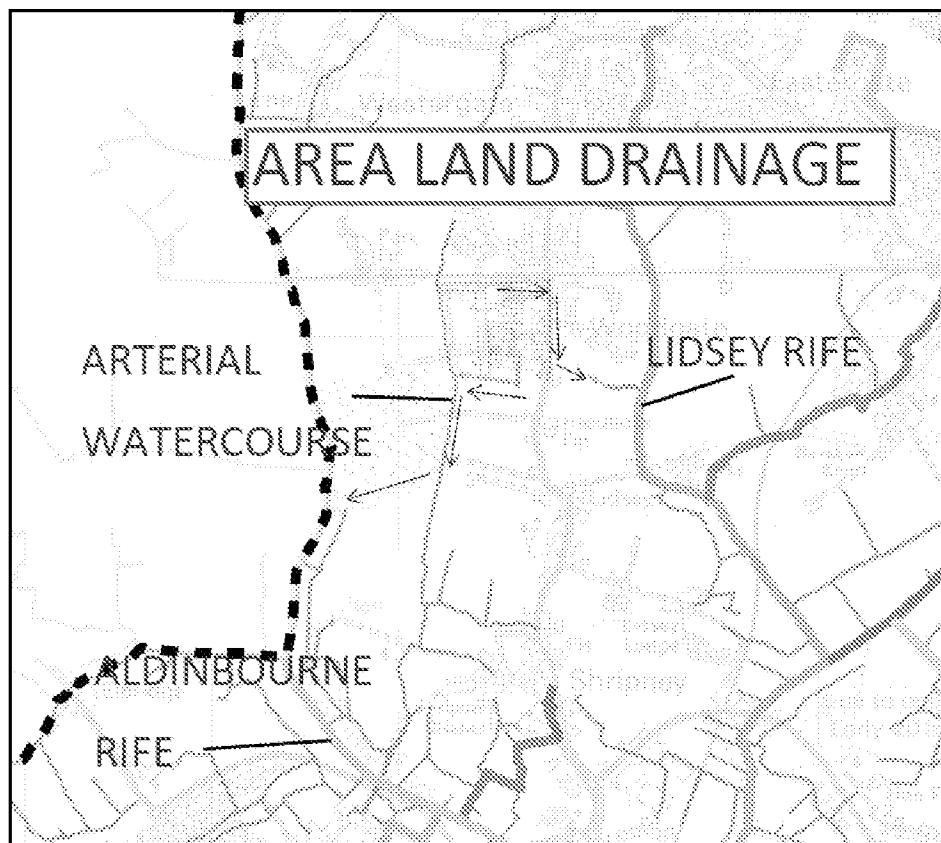
OS X (Easting) 493549
OS Y (Northings) 104238
Nearest Post Code: PO20 3YR

SITE LOCATION

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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 10.393m AOD in the west of the site to 8.062m AOD 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.

- 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."

- 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 Soils 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 ($\geq 75\%$). Groundwater flooding is known to affect huge parts of Arun. This is reflected in the SFRA.

- 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:

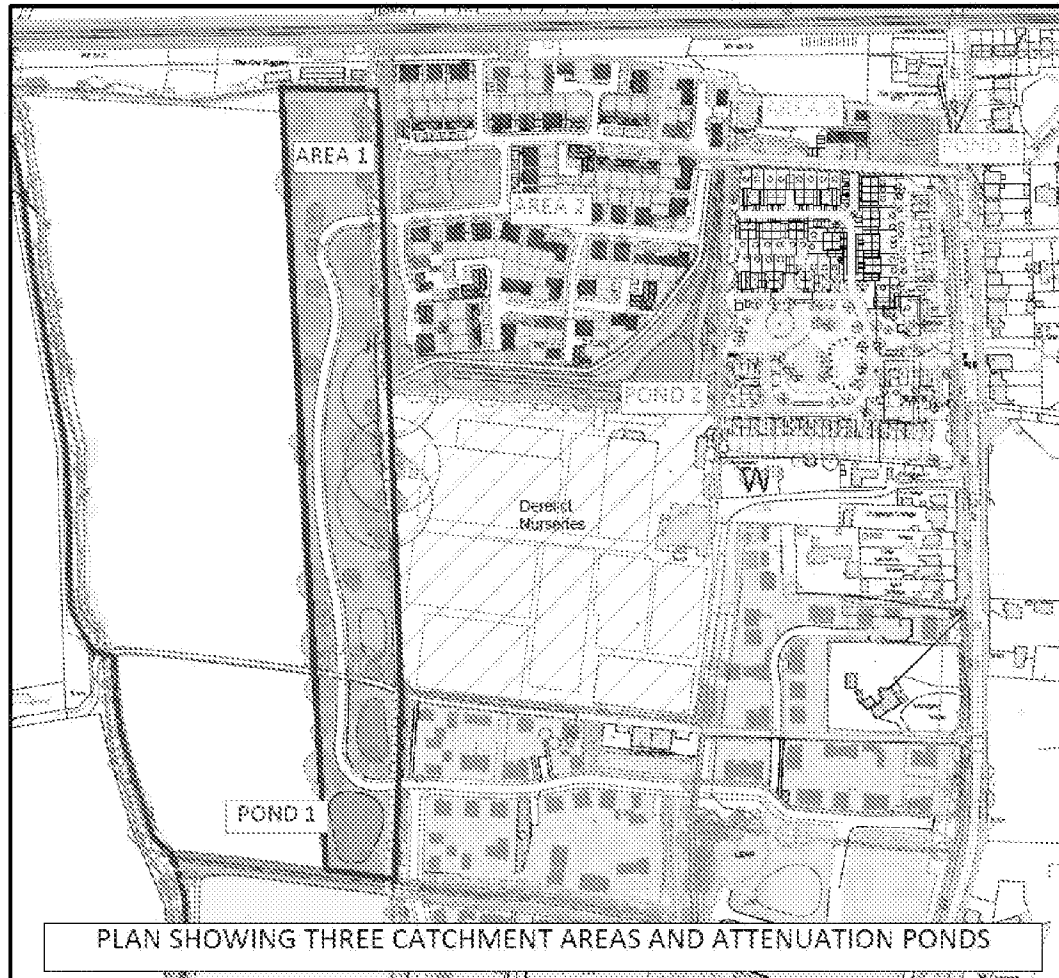
MH7201 is 1.61m deep

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.



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	677m ³	796 m ²	900 m ²

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

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.

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)

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 ($\geq 75\%$).
- 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

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:

- * 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.

- 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.

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.

- 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.

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.

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.

- 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 (including allowance for creep)	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)

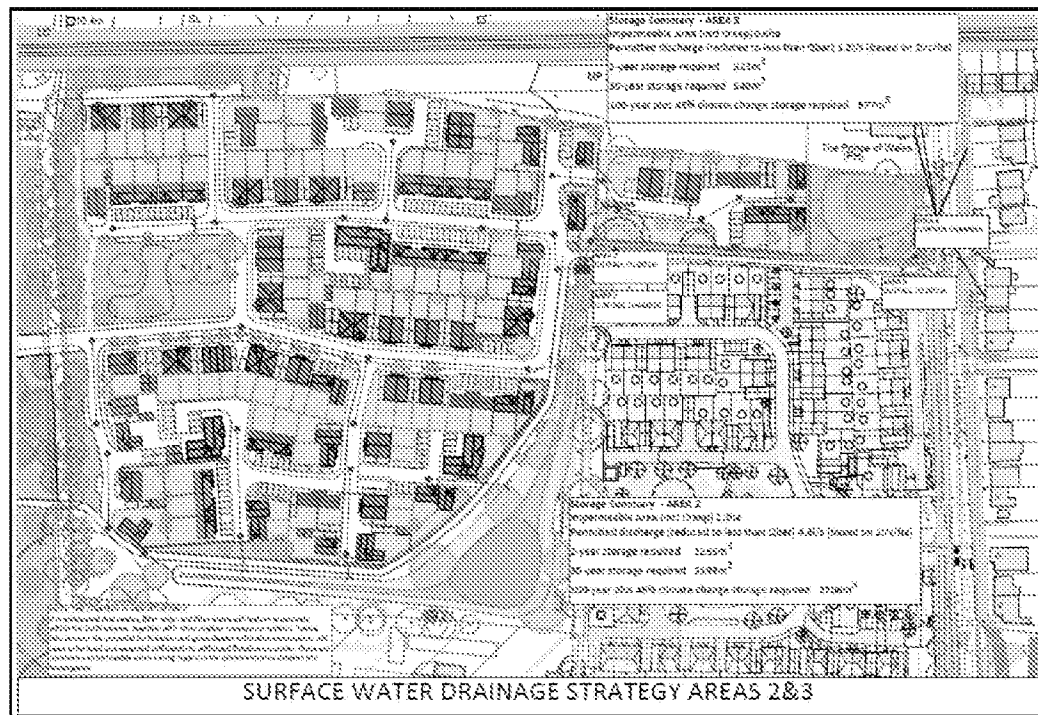
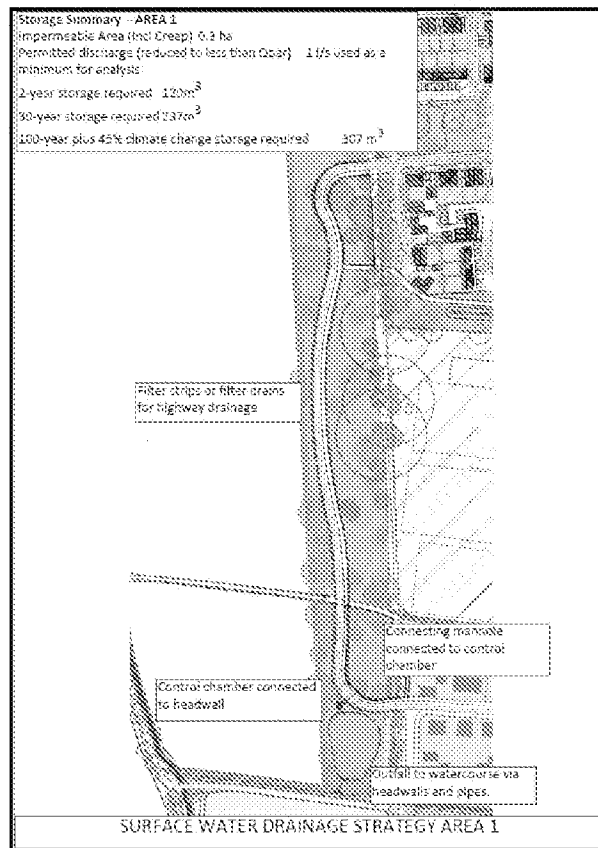
- 5.15 Storage volumes have been assessed as follows using Infodrainage software with 45% climate change allowance and using the 2022 FEH method of calculation.

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)	0.6ha
Permitted discharge (reduced to less than Qbar)	1.2l/s (based on 2l/s/ha)
2-year storage required	323m ³
30-year storage required	540m ³
100-year plus 45% climate change storage required	677m ³

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.

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 (to 0.8 where there is potential for metals to leech 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 ¹	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 ¹	High	0.8 ²	0.8 ²	0.9 ²

5.25 The total pollution hazard index for the site is:

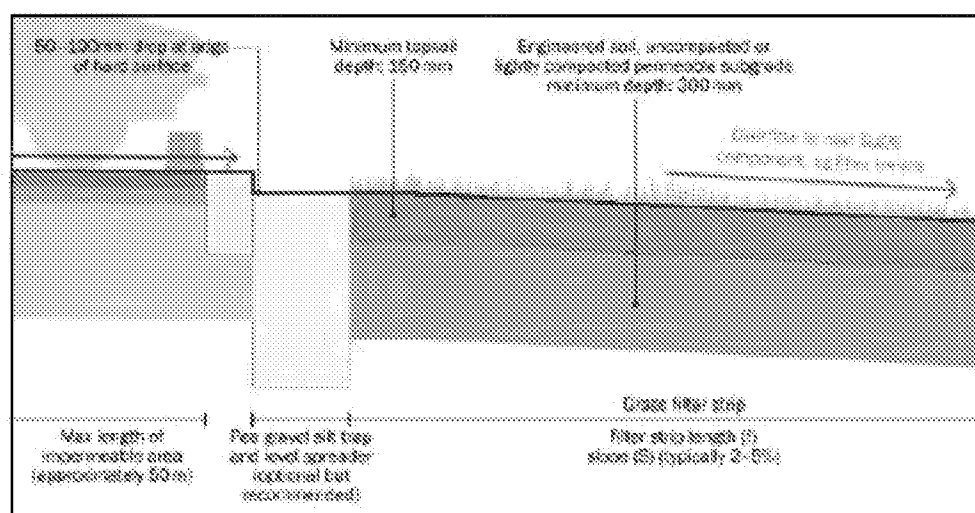
Land Use	Pollution hazard level	TSS	Metals	Hydro-carbons
Residential Roofs	Very Low	0.2	0.2	0.05
Drives and low traffic roads	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45

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

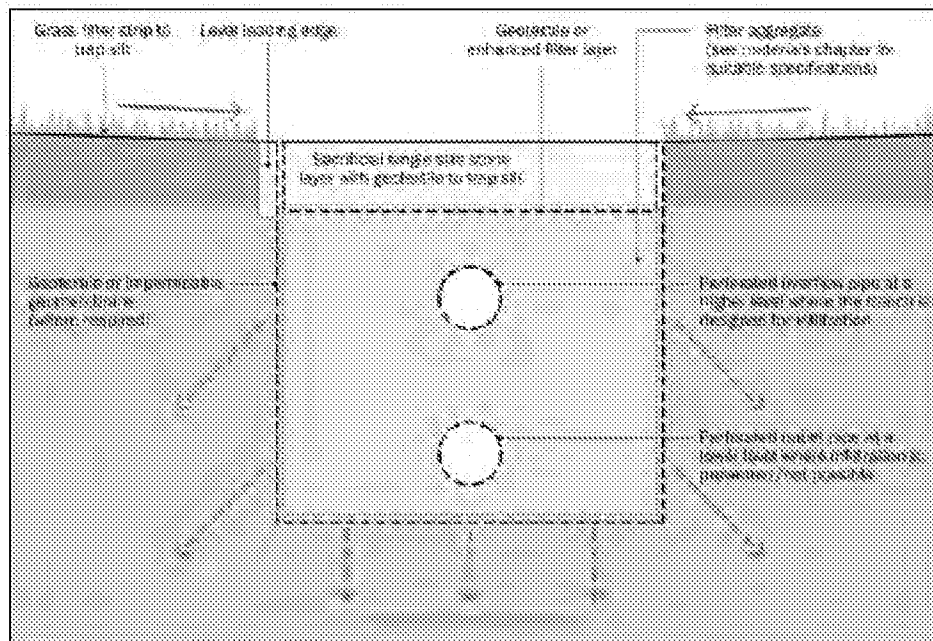
TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices ¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.5	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ³	0.7 ²	0.7	0.5	
Wetland	0.8 ²	0.8	0.8	
Proprietary treatment systems ^{4*}	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)



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.

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.

- 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.

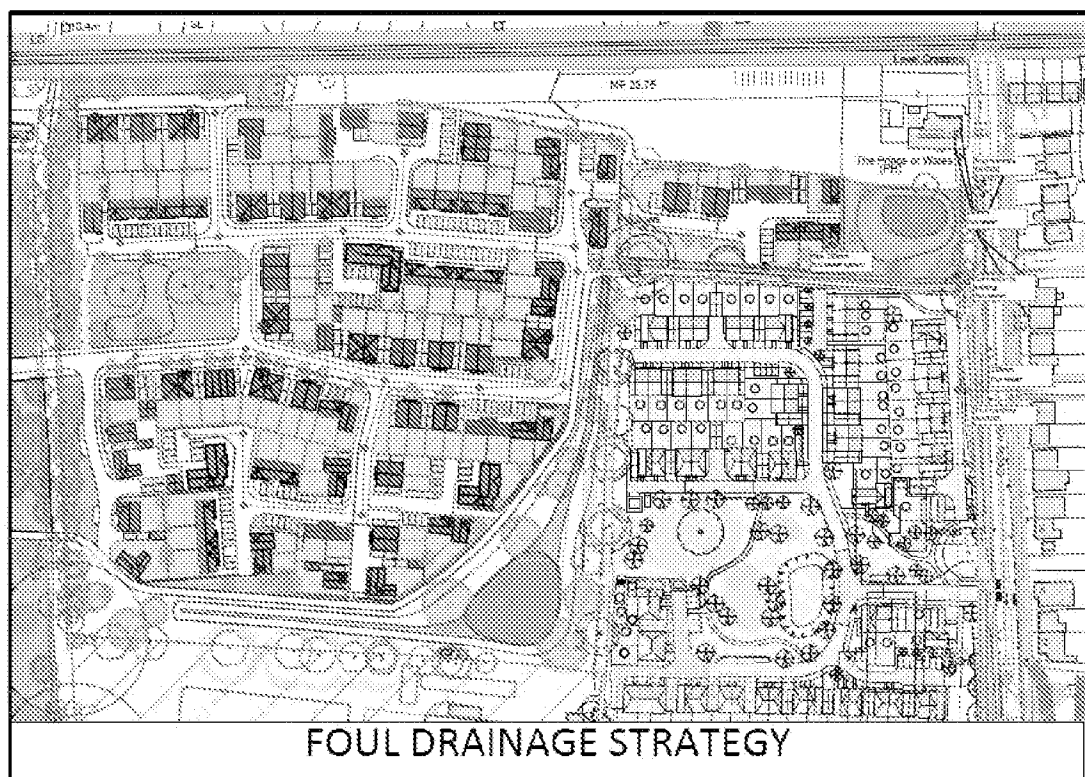
6.15 The foul sewer depths at the two manholes are shown below:

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 ($\geq 75\%$). 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.

- 7.8 To mitigate against the effects of increased runoff SuDS attenuation drainage will be provided limiting flows to Q_{bar} . 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.

Figure 1

Location Plan

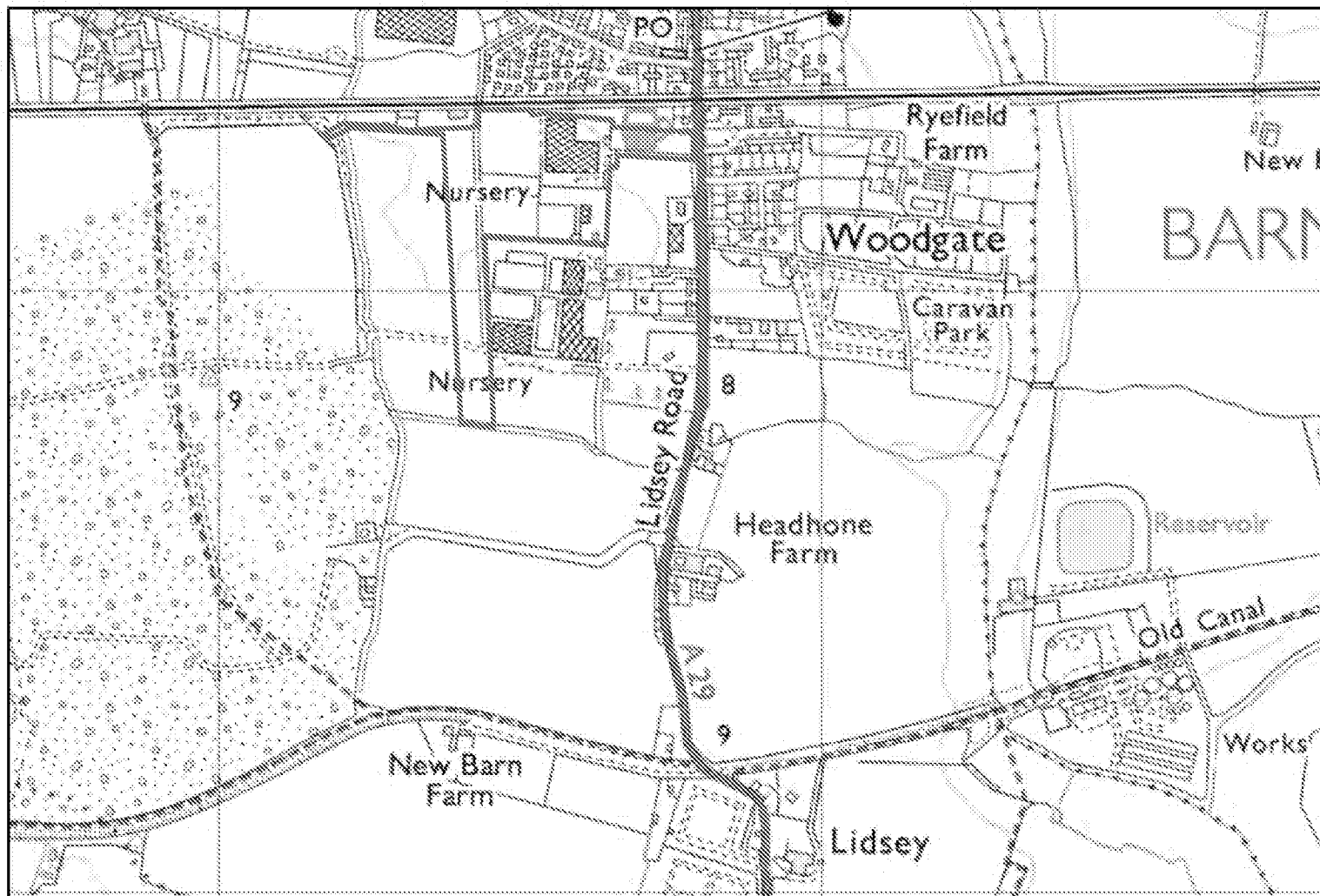


FIGURE 1: LOCATION PLAN

OS X (Eastings) 493549

OS Y (Northings) 104238

Nearest Post Code PO20 3YR

Figure 2

BGS Geology Map

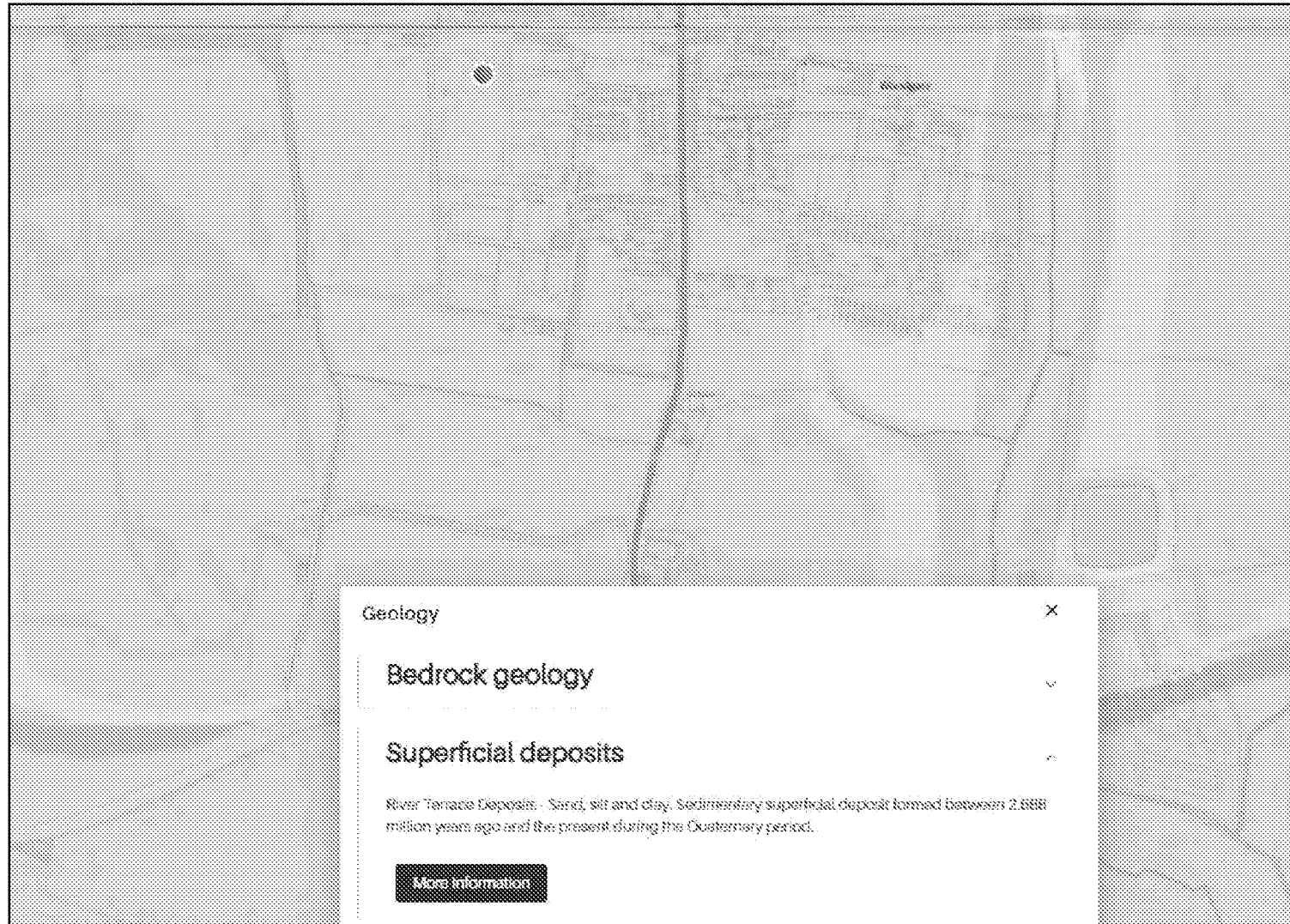


FIGURE 2.1: BGS Geology map - Superficial

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

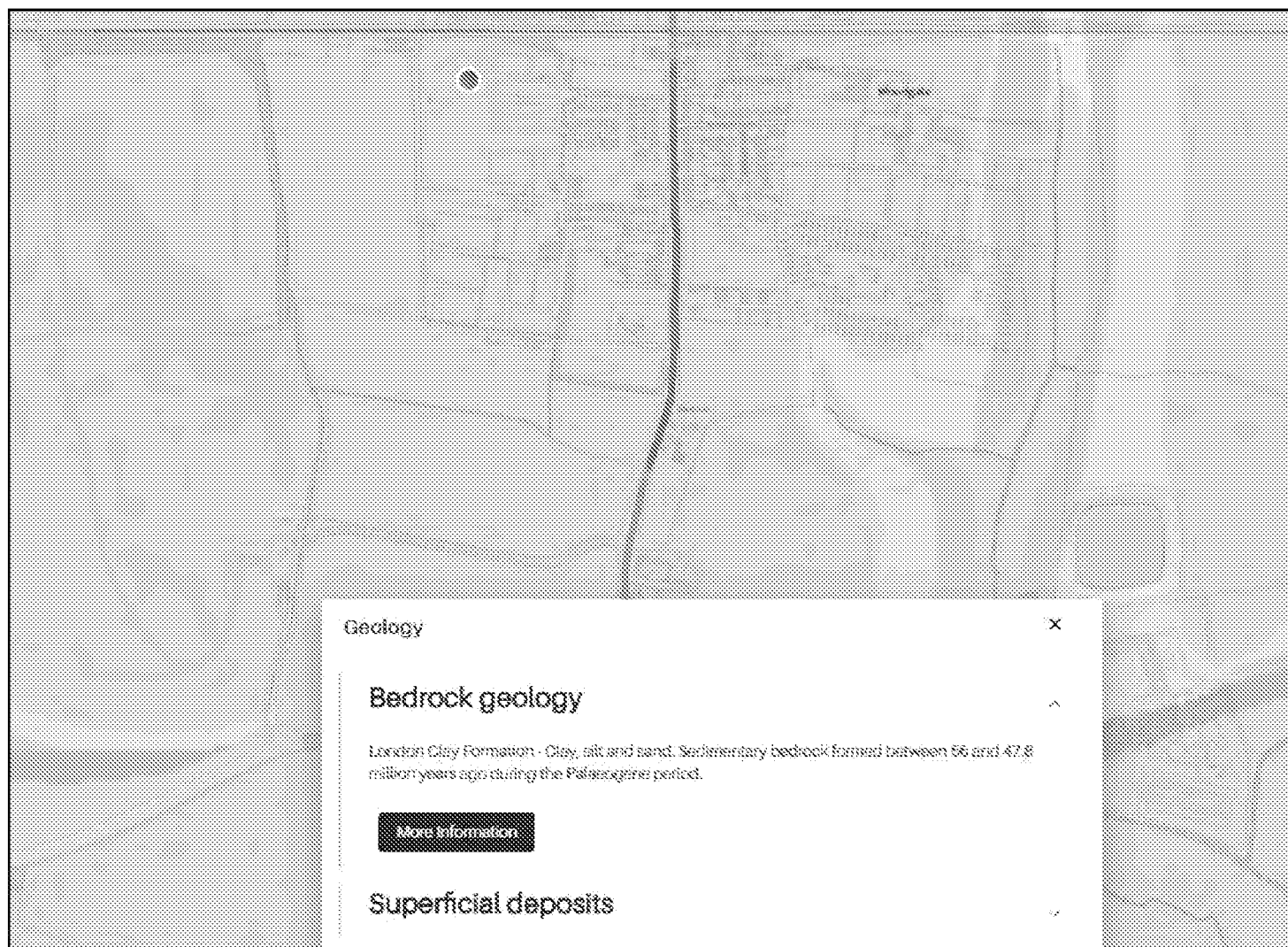


FIGURE 2.2: BGS Geology map – Bedrock

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

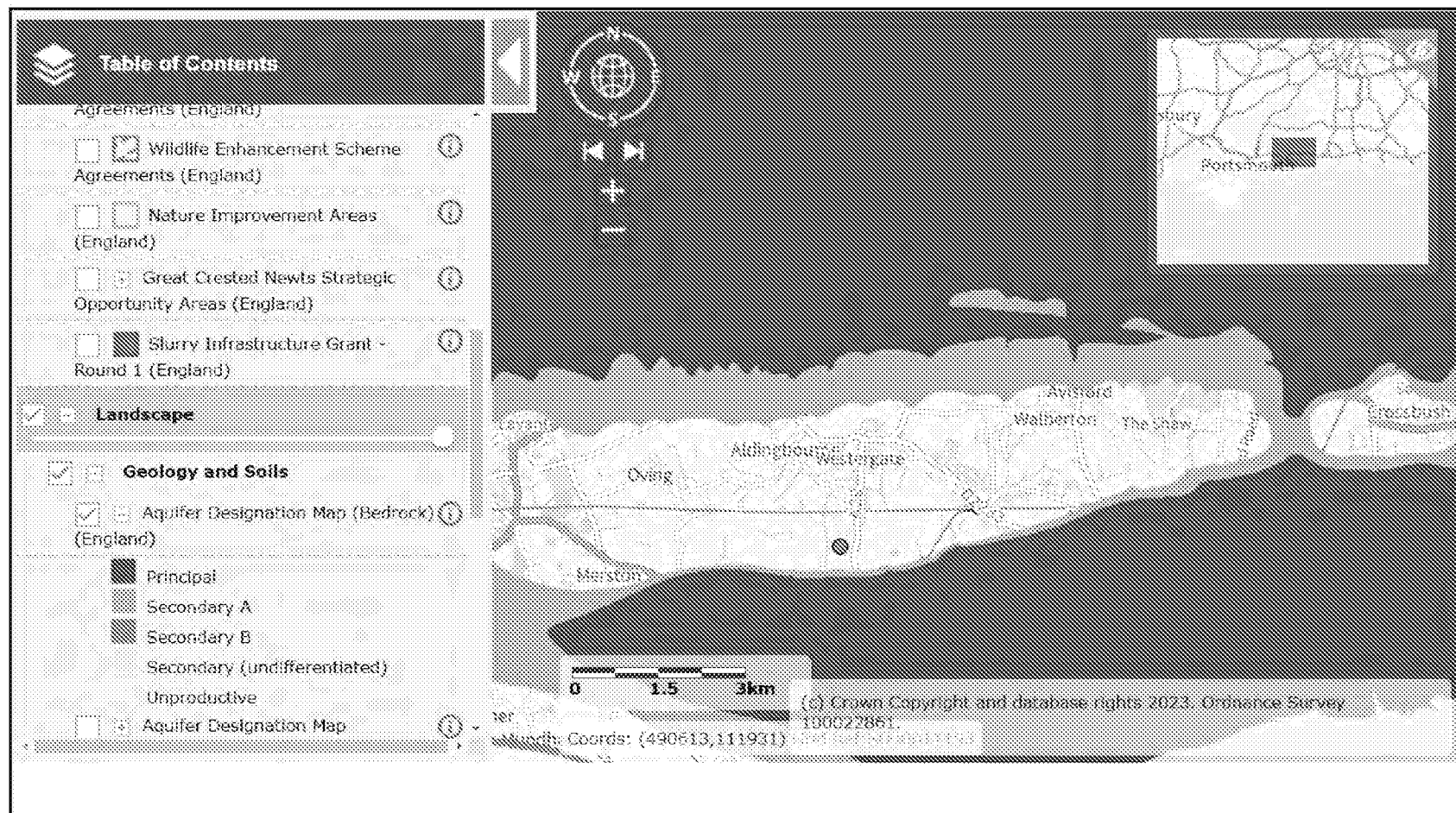
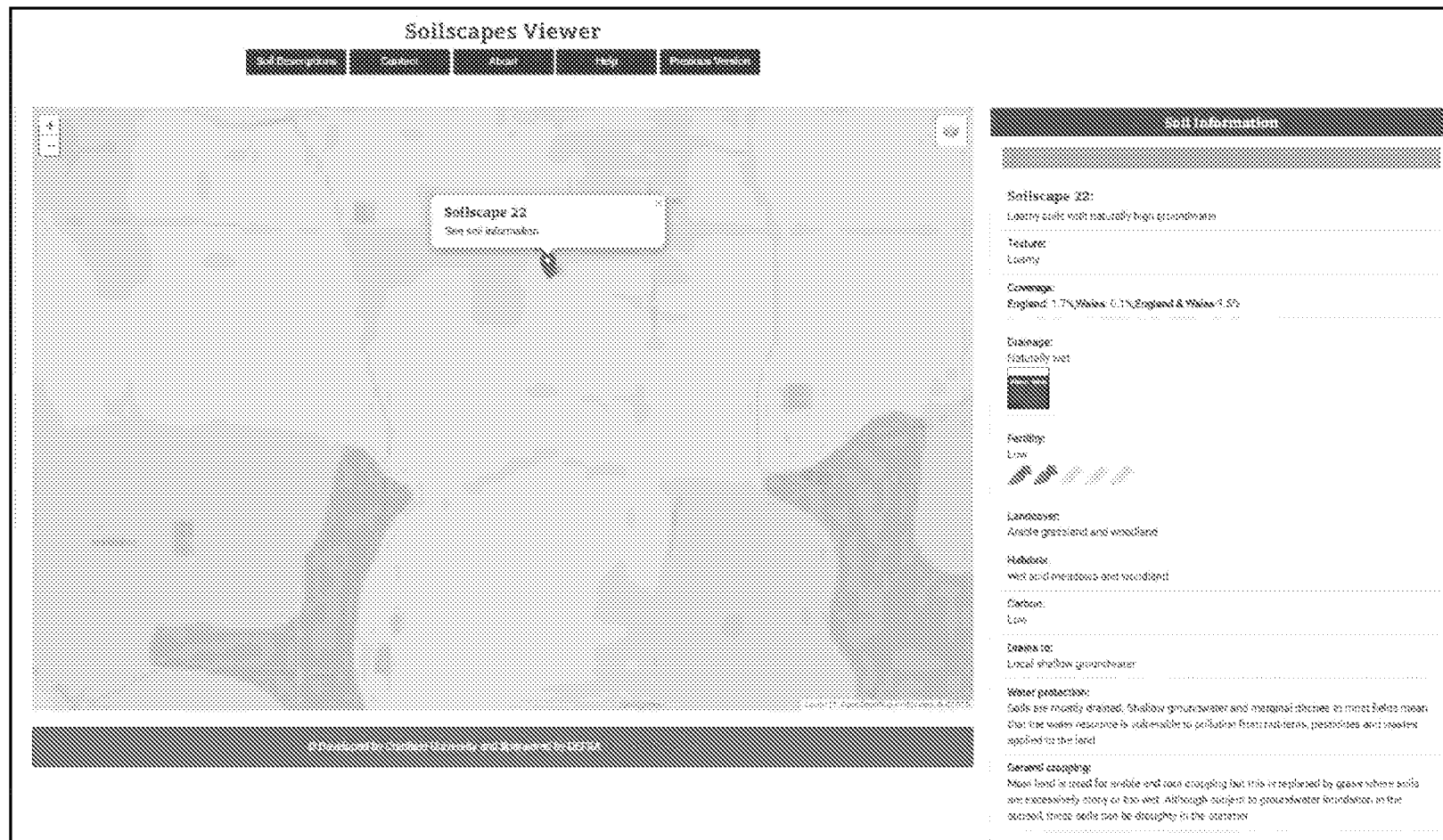


FIGURE 3: EA Bedrock Map

Figure 4

Soilsclapes map (Magic maps)

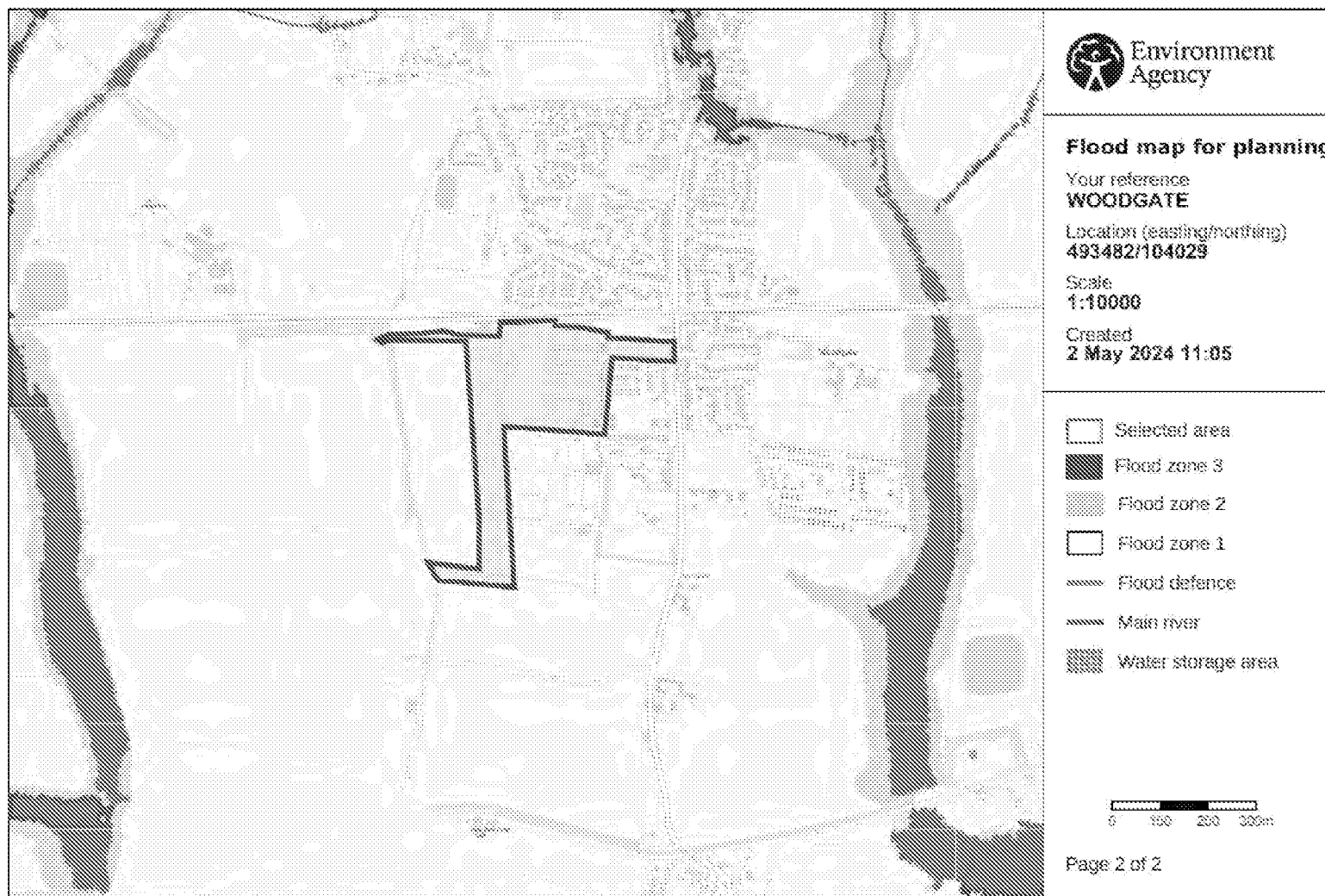


22 - Loamy soils with naturally high groundwater

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

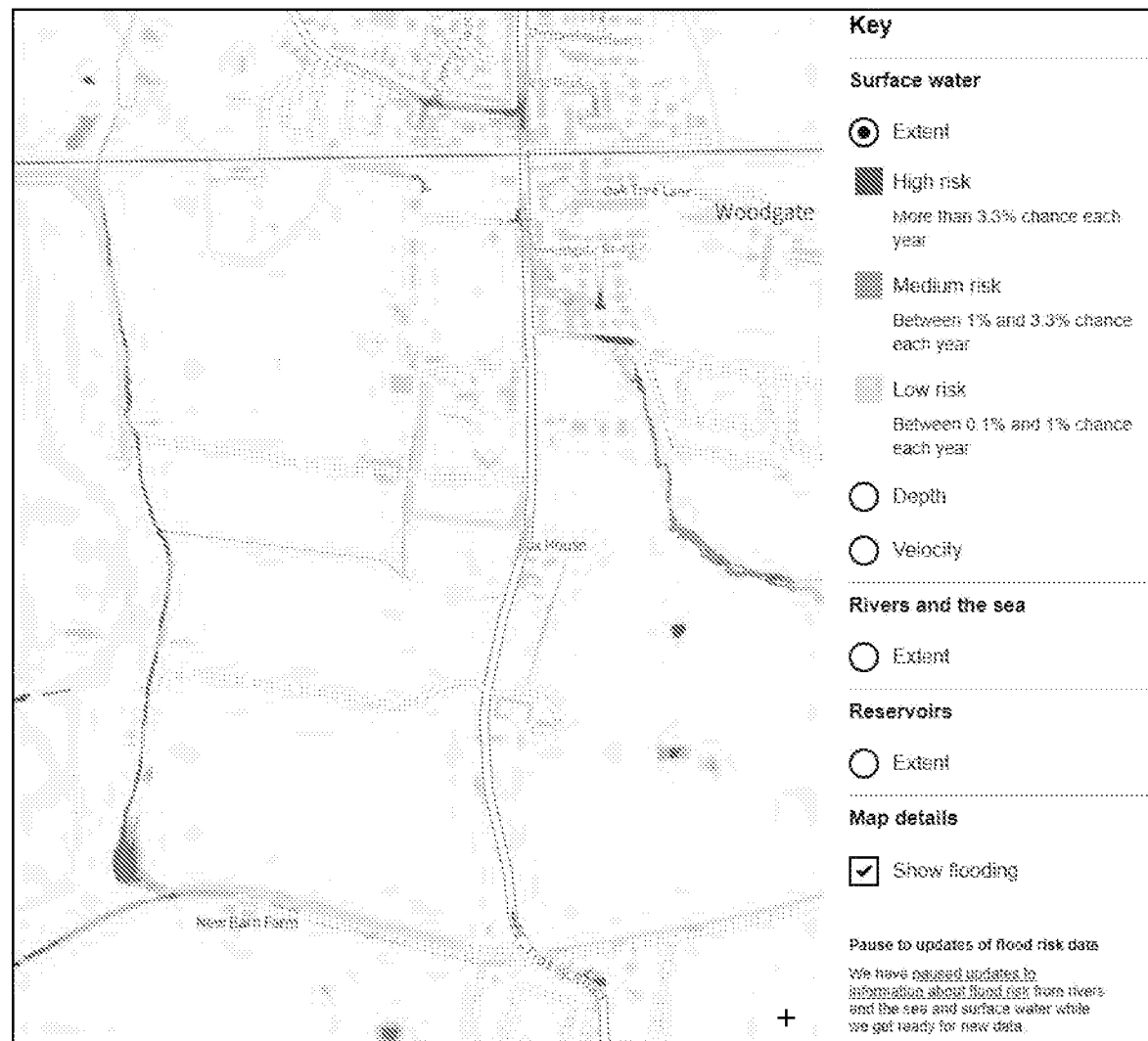


FIGURE 6: GOVERNMENT SURFACE WATER FLOOD MAP - VERY LOW RISK

Figure 7

EA Reservoir Flood Map

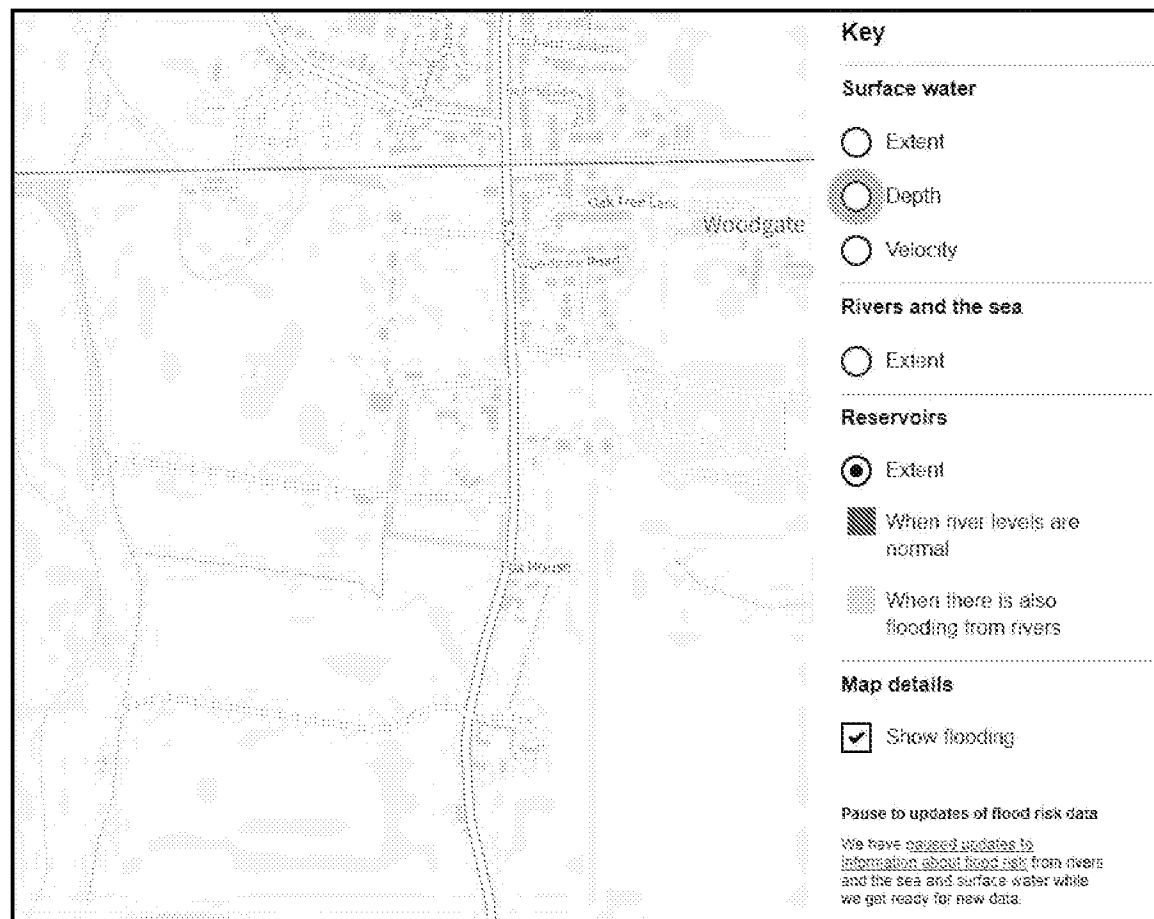


FIGURE 7: GOVERNMENT RESERVOIR FLOOD MAP-NONE

Appendix 1

Topographical Survey



Appendix 2

SFRA Mapping

AREA LAND DRAINAGE

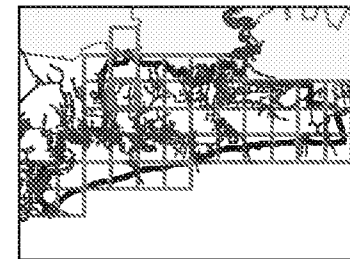
ARTERIAL
WATERCOURSE

LIDSEY RIFE

ALDINBOURNE
RIFE

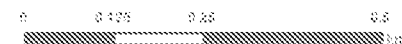


Key Plan



Legend

	Arun District SPPA boundary		Ditch/Rise
	Main Rivers		Little Tordington Stream
	Adjoining watercource		West Bignor Drain
	Art Drain		Registon Watercourse
	Barnham L. & R. Drain		Registon Rise
	Southgate Rise		Thorn River
	Wick Drain		Edgebrook Drain
	Denby Ponds Drain		Ryebank Farm
	East Peck Drain		Griffiths Water Drain
	East Bignor Drain		Old St. Mary's Church
	Parking Rise		Registon Rise
	Ryebank's Rise		Registon Watercourse



REP	Date	Comments
A	June 2017	
B		
C		

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ARUN DISTRICT COUNCIL

LEVEL 1 SPPA: APPENDIX B WATERCOURSES

Sheet No: 01 of 40 Sheet Number: ARUN_01

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APUN DISTRICT

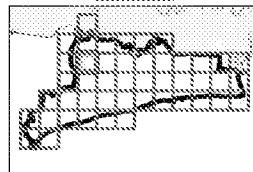
Notes

The Apun District Council Groundwater Study (2004/2005) is a strategic study into the groundwater resources of the Apun District. The data was collected in 2004/2005 and since that time, the Apun District Council has been working to improve the data and to update the groundwater study. The data is being updated and will be available in 2006/2007.

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Key Plan



Legend

Apun District Council Groundwater Study



0 0.125 0.25 0.5

Scale	Length	Groundwater
1:100,000	0.125	Groundwater
1:250,000	0.25	Groundwater
1:500,000	0.5	Groundwater

This map is based on the Apun District Council Groundwater Study (2004/2005) and is a strategic study into the groundwater resources of the Apun District. The data was collected in 2004/2005 and since that time, the Apun District Council has been working to improve the data and to update the groundwater study. The data is being updated and will be available in 2006/2007.

APUN DISTRICT COUNCIL

LEVEL 1 (GHA) APPENDIX 1 AREAS SUSCEPTIBLE TO GROUNDWATER

Scale: 1:100,000

Scale: 1:250,000

This map is based on the Apun District Council Groundwater Study (2004/2005) and is a strategic study into the groundwater resources of the Apun District. The data was collected in 2004/2005 and since that time, the Apun District Council has been working to improve the data and to update the groundwater study. The data is being updated and will be available in 2006/2007.



Appendix 3

Proposed Development



0m 50m 100m 150m

Appendix 4

Storage Calculations

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