



Lydhurst Estate Replacement Dwelling Flood Risk Assessment & Drainage Strategy

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1 INTRODUCTION

This report has been written to support a planning application associated with a replacement dwelling at the Lydhurst Estate, Haywards Heath, West Sussex. The new dwelling comprises the replacement of the existing principal house which has been unoccupied for a number of years.

The new dwelling will be of exceptional quality and design, integrated into the wider site and parkland garden whilst also taking advantage of the distant views to the south.

The new family dwelling will use Passivhaus design to achieve a Net Positive Energy Building (NPEB).

1.1 Existing Site

1.1.1 Site Address & Location

The application site is located within the Lydhurst Estate, Warninglid, West Sussex, RH17 5TG, 10km to the south east of Horsham. The Lydhurst Estate is adjacent to Warninglid Lane to the North and The Street to the East. The local authority area is Mid-Sussex District Council.

The application boundary extends to circa 1.71ha with the wider estate extending to circa 90ha.

The proposed new residential dwelling house is to be located on the footprint of the existing Georgian style main house known as 'Lydhurst' which is to be demolished.

The existing dwelling is a four-storey property which has been unoccupied for many years and is now dilapidated, suffering from significant degradation and would require major renovation works to rectify the damage and make it habitable.

The location of the application site in the context of the wider estate is indicated below and on the drawings in Appendix A.



Figure 1.0 – Site Location Plan

1.1.2 Topography

A topographic survey of the estate and application site has been undertaken by Murphy Surveys and is provided in Appendix B. The survey indicates that the on site levels vary from 112m above ordnance datum (AOD) at the entrance to the estate from The Street down to 85m AOD to the north at the Warninglid Lane access. Within the site itself, the existing main residence sits elevated at a level of around 111m AOD with levels surrounding the property falling to the north and south.

1.1.3 Geology

British Geological Survey (BGS) published records for the site indicate that the bedrock and superficial geology is formed by Upper Tunbridge Wells Sand - Sandstone and Siltstone. Sedimentary Bedrock formed approximately 134 to 139 million years ago in the Cretaceous Period. There are no recorded superficial desposits.

The LANDIS soils database indicates that the soils are slightly acid loamy and clayey with impeded drainage.

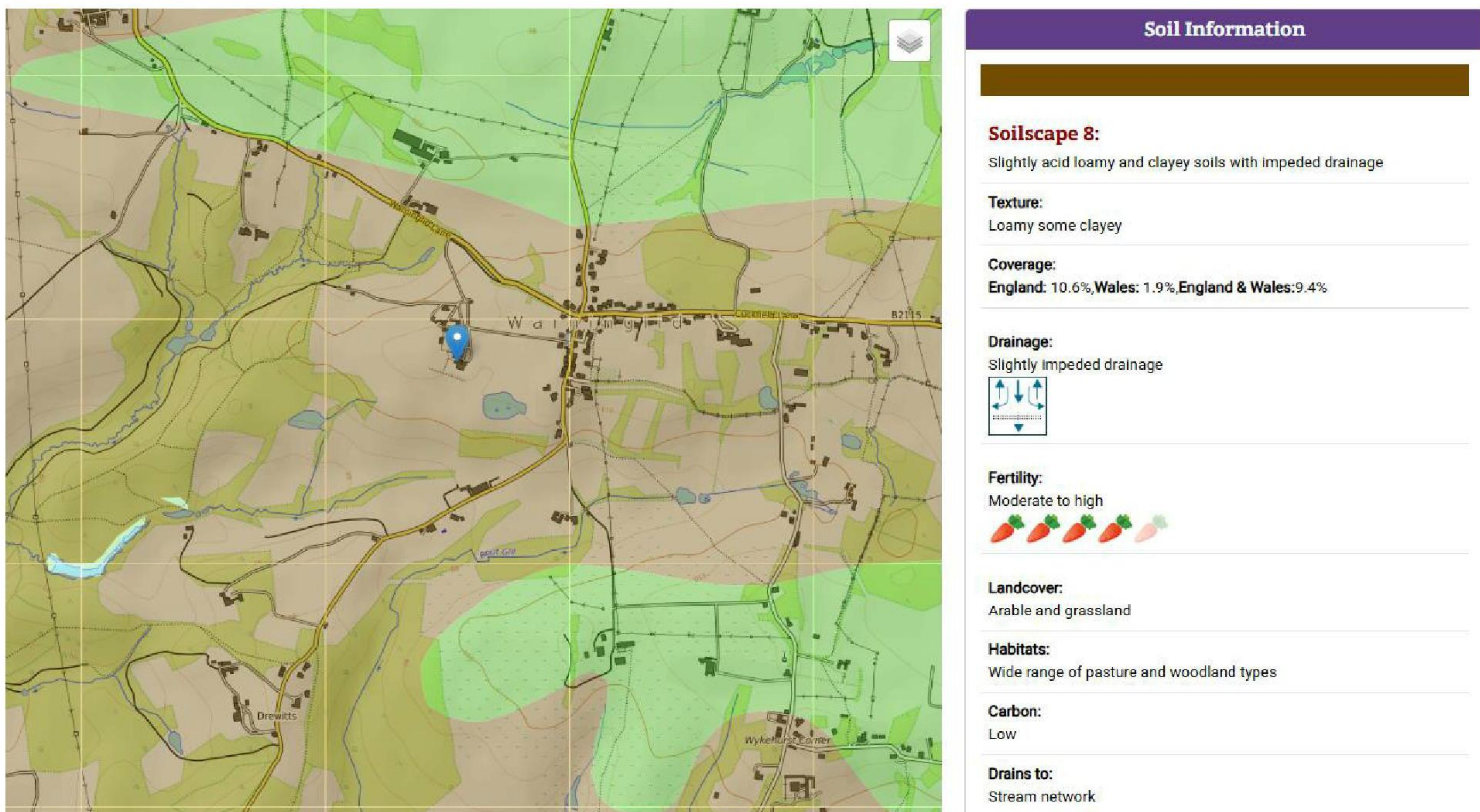


Figure 1.1 – Landis Soilscape Viewer

The Winter Rainfall Acceptance Potential (WRAP) mapping designates that the application site is in a Soil Type 4 area, this is classed as heavy clay and has a Standard Percentage Runoff (SPR) value of 0.47. This indicates that the catchment has a high percentage of rainfall that would likely exceed the infiltration capacity of the underlying geology, therefore leading to runoff.

The nearest publicly available BGS historical boreholes are located to the east, a copy of which are appended to this report. The boreholes suggest that silty/sandy clay is present up to depths of around 10m overlying the sandstone bedrock below.

1.1.4 Hydrogeology

Reference to the DEFRA 'Magic Map' online Aquifer Designation Map indicates the following:

- The site is underlain by a Secondary A aquifer relating to the Tunbridge Wells Sand bedrock formation.

Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.

The anticipated depth to groundwater is unknown although the presence of ponds around the site suggests the presence of a relatively high water table, potentially associated with the clay layer that may be present across the site.

1.1.5 Groundwater Protection Zones

The Environment Agency have defined Source Protection Zones (SPZs) for 2,000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause

pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer, and total catchment) and a fourth zone of special interest, which the Environment Agency occasionally applies, to a groundwater source.

The site is not located in a Groundwater Protection Zone.

1.1.6 Watercourses, Land Drainage & other Waterbodies

The Lydhurst Estate is located in the Adur and Ouse River basin catchments. Based on the topography of the estate, the site drains to the River Adur which has a catchment of just over 500km² in West Sussex. The catchment is largely rural, although contains some large towns such as Henfield, Burgess Hill and Worthing alongside the smaller settlements of Cowfold, West Grinstead, Bramber and Steyning.



Figure 1.2 – Ouse & Adur River Basin Catchment

There are no watercourses present within the application site itself, however there are ordinary watercourses present to the north and southwest of the wider estate which form part of the Upper Adur catchment.

There are a number of existing pond features scattered about the wider estate. It is not known whether any of these have connectivity to the watercourse network.

1.1.7 Existing Drainage

There are no public foul and surface water sewers within the site or surrounding area.

Foul water generated by the existing estate is treated via package treatment plants which is then believed to discharge to the local watercourse network.

Surface water runoff from roof areas and external hardstanding is understood to discharge either to ground or the local watercourse network. Some of the discharge to the watercourse network is believed to be via the foul system. It is also understood that one of the existing pond features receives surface water discharge from the main house prior to discharging to watercourse.

No official drainage records for the site were available for review and the above was based on anecdotal information. A drainage survey has been undertaken at the site; however, this simply consisted of lifting manhole covers and recording pipe/ chamber details. A full and comprehensive CCTV & tracing survey will therefore be required to establish the existing drainage regime.

A copy of the existing manhole survey is included in Appendix D.

1.1.8 Historical Flood Records

No records of historic flooding have been recorded at, or in the immediate vicinity of the site in the Mid Sussex Strategic Flood Risk Assessment. An internet-based search uncovered reports of flooding to Warninglid Lane which is located to the north of the Lydhurst Estate however, this appears to have been wholly contained within the carriageway and did not encroach onto adjacent land or property.

1.2 **Proposed Development**

The proposed development comprises a new high quality, sustainable residential dwelling which will replace the existing Georgian main house.

The dwelling will be arranged over two floors with access via the north facing front door at the upper level. This provides access to the primary and family bedrooms, guest bedroom and study area.

The lower level contains the main living accommodation which includes kitchen, dining area, living room, sitting room, laundry, and staff accommodation alongside entertainment area, swimming pool, gym and MEP plant. The dwelling also has an undercroft parking area which is accessed externally from the north and also provides covered access directly into the property.

The property has a number of flat green roof areas alongside sunken courtyards which help provide enhanced ecological habitat and reduce rainfall generated run-off.

The proposed gross internal area is 1,392 sqm with a footprint of 1,054 sqm. Copies of the architectural site layout and floor plans are provided in Appendix E & F.

2 POLICY & GUIDANCE

2.1 National Planning Policy Framework

The NPPF was published in England in March 2012 and most recently revised in December 2024 before being further amended in February 2025.

This revised framework replaces the previous NPPF, revised in July 2018, updated in February 2012, revised in July 2021, updated in September 2023 and revised in December 2023.

The key aim of the NPPF is to ensure sustainable development through the planning process, taking into account the risks from climate change, flood risk and coastal change to avoid inappropriate development in areas at risk and directing development away from areas of high risk.

It advises that where development is necessary in areas of high risk, it should be safe, and that flood resilience should also be incorporated into the design. It also advises of the fact that new developments should not increase flood risk elsewhere and new developments should aid in mitigating flood risk to the wider area.

The NPPF's advice on climate change, flooding and coastal change is set out in section 14 paragraphs 161-186, with the approach to planning for flood risk between paragraphs 170-182.

In March 2014 the Planning Practice Guidance web resource was launched to support the NPPF. A specific Flood Risk and Coastal Change PPG was published which provides guidance on how flood risk should be assessed during the planning and development process. This document was last updated in August 2022.

2.2 Planning Practice Guidance – Flood Risk & Coastal Change

The Planning Practice Guidance, Flood Risk & Coastal Change, advises how to take account of and address the risks associated with flooding and coastal change in the planning process.

The document gives further context and detail to local authorities and developers about how national policy with respect to Flood Risk is to be understood and implemented.

A significantly revised PPG on Flood Risk & Coastal Change was released in August 2022 to reflect changes to the NPPF (made in 2018, 2019 and 2021) whilst also incorporating learning from practice that has been gathered since the PPG was first published in 2014.

In particular, more clarity was provided around when and how the sequential and exception tests should be applied, making roles and responsibilities for carrying out the tests clearer along with advice on how planning authorities can apply the tests more consistently and efficiently.

2.3 Mid Sussex District Council Level 1 Strategic Flood Risk Assessment

The Mid Sussex District Council (MSDC) Level 1 SFRA was first published in 2015 and has recently been updated in March 2024 by Aegaea to align with changes to the NPPF and associated PPG. The report has gone through a number of additional updates since this date with the most recent version completed in July 2024 to incorporate external consultation feedback.

The Level 1 SFRA provides the latest up-to-date analysis of flood risk from rivers, surface water and groundwater across the administrative areas of Mid Sussex District Council. It is a planning tool that assists local councils in their selection and development of sustainable development sites away from vulnerable flood risk areas in accordance with the NPPF and its associated PPG.

The SFRA provides the council with a robust evidence base to inform the application of the Sequential and, of necessary, Exception Tests to inform the future development strategy for the district.

The main objectives of the SFRA are to:

- Inform the sustainability appraisal of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies;

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- Apply the Sequential Test and, where necessary, the Exception Test;
- Inform the allocation of land to safeguard it for flood risk management infrastructure;
- Inform policies for change of use and reducing the causes and impact of flooding;
- Identify the requirement for site-specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding;
- Determine the acceptability of flood risk in relation to emergency planning capability; and,
- Help demonstrate how the adaptation to climate change has been met.

2.4 River Adur Catchment Flood Management Plan

The River Adur Catchment Flood Management Plan (December 2009) aims to deliver sustainable long term flood risk management for the catchment area by identifying flood risk management policies to assist decision making. The main sources of flood risk in the Adur catchment area are from both localised river flooding and surface water flooding, including flooding in urban areas due to under capacity of, or blockages in, the drainage network.

There have been several serious flood events in the catchment area over the last century caused by surface water run-off from the South Downs. The Plan is intended to inform local authority spatial planning activities, as well as informing project and investment plans for the Environment Agency, utility companies, transport planners, businesses and landowners/managers whilst assisting the public.

2.5 Southern Water Drainage & WasteWater Management Plan

Southern Water's regional Drainage and Wastewater Management Plan (DWMP) provides a long term approach to ensure that drainage and wastewater services are resilient, sustainable, and affordable, from 2025 till 2050. The plan explains what challenges the drainage and wastewater systems are facing, and outlines ways Southern Water will prepare for those challenges.

Southern Water's DWMP includes the Adur and Ouse Catchment, Arun and Western Streams Catchment, and Medway Catchment plans, that were published in October 2022. These provide a specific look at the drainage and wastewater systems within each catchment and hold records of flooding incidents that have happened in the catchment area.

2.6 Mid Sussex District Plan

The Mid Sussex District Plan (2021-2039) aims to set out the vision for the area by outlining policies that will help to achieve the strategy. Of relevance to the development is Policy DPS4.

Policy DPS4 Flood Risk and Sustainable Drainage, outlines the need for development to follow a sequential risk-based approach, while using the SFRA to identify present and future flood risk from sources. This policy also outlines how Sustainable Drainage Systems (SuDS) should be implemented

DPS4: Flood Risk and Sustainable Drainage

Flood Risk

Proposals for development will need to follow a sequential risk-based approach directing development away from areas at highest risk (whether existing or future risk), ensure development is safe across its lifetime and not increase the risk of flooding elsewhere. All development should consider flood risk in line with national guidance at the time of assessment, including the need to consider and assess flood risk from all sources consistently.

Environment Agency or site-specific flood mapping and the District Council's Strategic Flood Risk Assessment (SFRA) should be used to identify areas at present and future flood risk from a range of sources including fluvial (rivers and streams), pluvial (surface water), groundwater, infrastructure and reservoirs. The cumulative impacts of all sources of flooding should be considered.

Where possible, development proposals should reduce overall flood risk. Particular attention will be paid to those areas of the district that have experienced flooding in the past.

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Development proposals must, where required by national policy, be accompanied by a site-specific flood risk assessment. Development in areas of flood risk will, where relevant, be required to meet national sequential and exceptional tests.

Development classified as 'Highly vulnerable' will not be permitted within areas at 1:100 or greater flood extents now or in the future (flood zone 3a, 3b and equivalent). Development classified as 'more vulnerable' will not be permitted within areas of 1:30 flood extents now or in the future (flood zone 3b and equivalent).

Where flood management and mitigations are proposed to be utilised within a development, soft flood management methods are preferred over hard engineered solutions.

Sustainable Drainage

Surface water drainage schemes must be implemented in all new development, including replacement structures and brown field development unless demonstrated to be inappropriate, to avoid any increase in flood risk and protect surface and ground water quality. Wherever possible, Sustainable Drainage Systems (SuDS) should be utilised within these surface water systems. SuDS must be incorporated into major development surface water drainage schemes. To mitigate flood risk both on and off-site, surface water drainage system discharge rates should be restricted to the equivalent Greenfield Qbar runoff rate or as close as practically possible, but never greater than 2 litres per second per hectare (21/s/Ha).

Arrangements for the maintenance and management of drainage systems for their lifetime must also be identified through a maintenance and management plan, to be secured by condition at planning application stage.

New development will be required to make suitable provision for surface water drainage to ground, watercourses or surface water sewer. Surface water drainage to the foul sewer will be resisted in order to maximise the capacity of foul sewage to reduce the risk of sewer flooding. For the redevelopment of brown field sites, any surface water drainage to the foul sewer should be disconnected, unless it can be shown no other feasible drainage option is available and that the Water Authority agree to the connection.

Surface water drainage should be sensitively designed and located, wherever possible, to promote the improvement of biodiversity, enhance landscape and create good quality spaces that improve public amenities. Green infrastructure will be incorporated, where possible, to improve biodiversity and water quality. Where relevant, proposed surface water drainage would need to be carefully designed to ensure that the bird strike risk to Gatwick airport is not increased and the safety of the airport is not compromised.

The preferred hierarchy of managing surface water drainage from any development is:

1. Infiltration Measures,
2. Attenuation and discharge to watercourses; and if these cannot be met,
3. Discharge to surface water only sewers.

Land that is considered to be required for current and future flood management and/or sustainable drainage will be safeguarded from development and proposals will have regard to relevant flood risk plans and strategies. Any land located within the functional flood plan (1:30-year flood extent from any source) will be safeguarded from development.

2.7 C753 The SuDS Manual

This document provides best practice guidance on the planning, design, construction, operation, and maintenance of sustainable drainage systems (SuDS). This document provides detail on all the typical sustainable drainage systems and details on how they can be interconnected to not only provide the required drainage performance but also act as pollution control whilst enhancing the site wide Masterplan proposals.

SuDS should not be thought of as an individual component, but as an interconnected system designed to manage, treat, and make best use of surface water, from where it falls as rain to the point at which it is discharged into the receiving environment beyond the boundaries of the site.

A central design concept for SuDS is the SuDS Management Train. This describes the use of a sequence of components that collectively provides the necessary processes to control the frequency of runoff, the flow rates and the volumes of runoff, and to

reduce concentrations of contaminants to acceptable levels. There are six specific functions provided by SuDS components. They are not independent, and one component may provide two or more functions.

2.8 Non-Statutory Technical Standards for SuDS, 2015

This document sets out the non-statutory technical standards for sustainable drainage systems. They should be used in conjunction with the National Planning Policy Framework and associated Planning Practice Guidance.

The technical standards prescribe requirements for both Peak Flow and Volume Control with an emphasis on ensuring that these do not exceed the pre-development case and, where practicable, should not exceed greenfield rates and volumes for the 1 in 1 year and 1 in 100-year rainfall events.

Peak Flow Control

S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume Control

S4. Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event should never exceed the greenfield runoff volume for the same event.

S5. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6. Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

2.9 Mid Sussex Flood Risk & Drainage Information Checklist

Mid Sussex District Council have developed a checklist that is designed to support applicants within the planning process by providing the information required by the flood risk and drainage team to appropriately assess the scheme and facilitate a consultation response.

The level of detail provided to address each information point should reflect the scale and complexity of the development. Receipt of this information does not guarantee the flood risk and drainage team will support an application nor does it prevent a request for further information. It does, however, ensure the team has sufficient information to undertake a full review and provide detailed consultation response.

A copy of the completed checklist is provided in Appendix G

3 FLOOD RISK

3.1 Potential Sources of Flood Risk

The table below summarises the potential sources of flood risk to the proposed development which are then discussed in greater detail in the following section.

Sources of Flood Risk				
Source	Potential Risk			
	High	Medium	Low	None
Fluvial			X	
Pluvial			X	
Tidal				X
Groundwater			X	
Canals				X
Sewers			X	
Reservoirs & Waterbodies			X	

3.2 Fluvial Flood Risk

The closest Main River to the site is the River Adur which is located approximately 5km to the south. Notwithstanding, tributaries of the river extend northward with the closest watercourse, Cowfold Stream, situated circa 1km to the southwest.

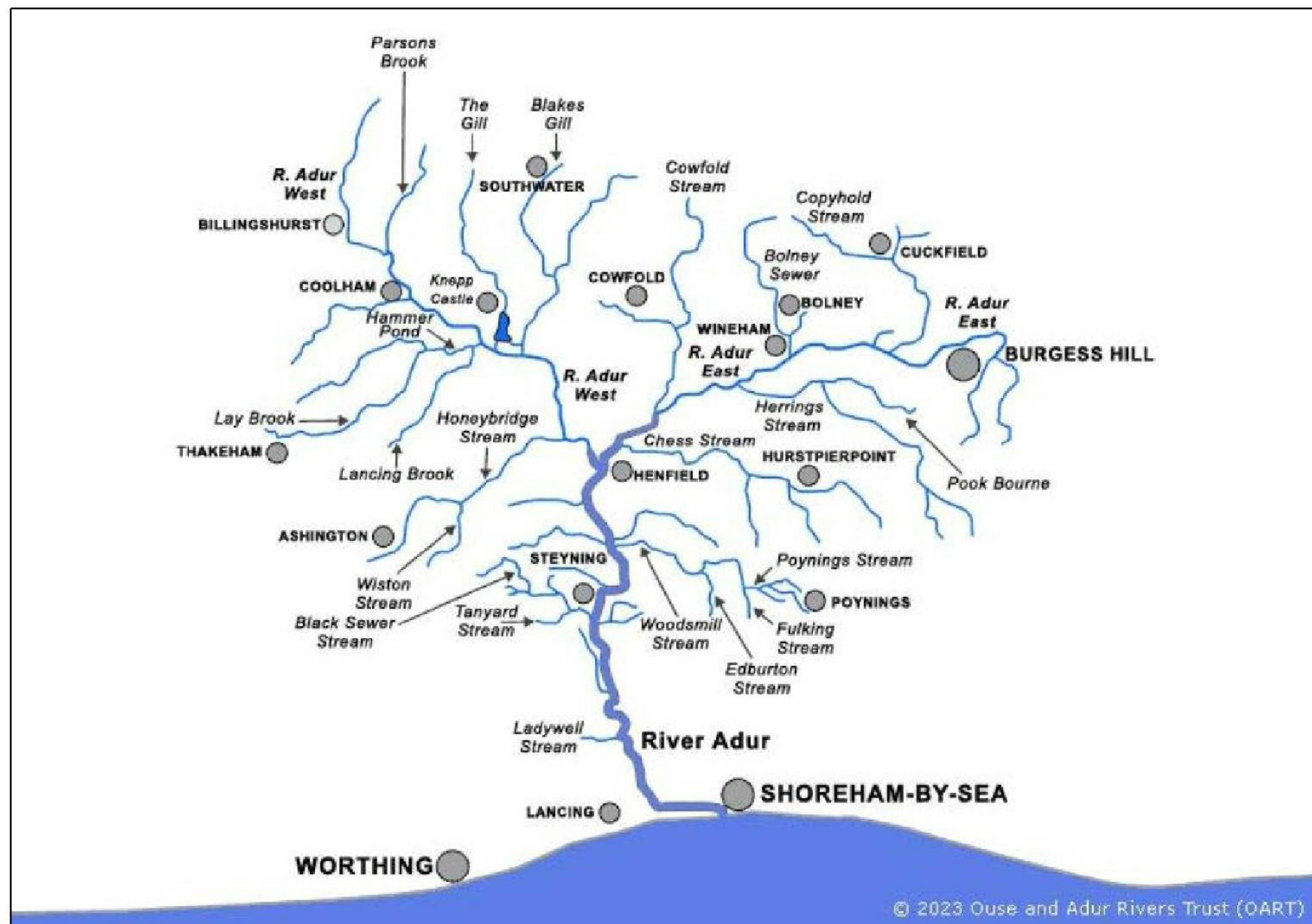


Figure 3.0 – Adur River Network

Environment Agency Flood Mapping (Figure 3.1) that the site is located wholly within Flood Zone 1. Flood Zone 1 is defined within the NPPF as a site that has a greater than 1 in 1000 (>0.1%) probability of flooding in any one year.

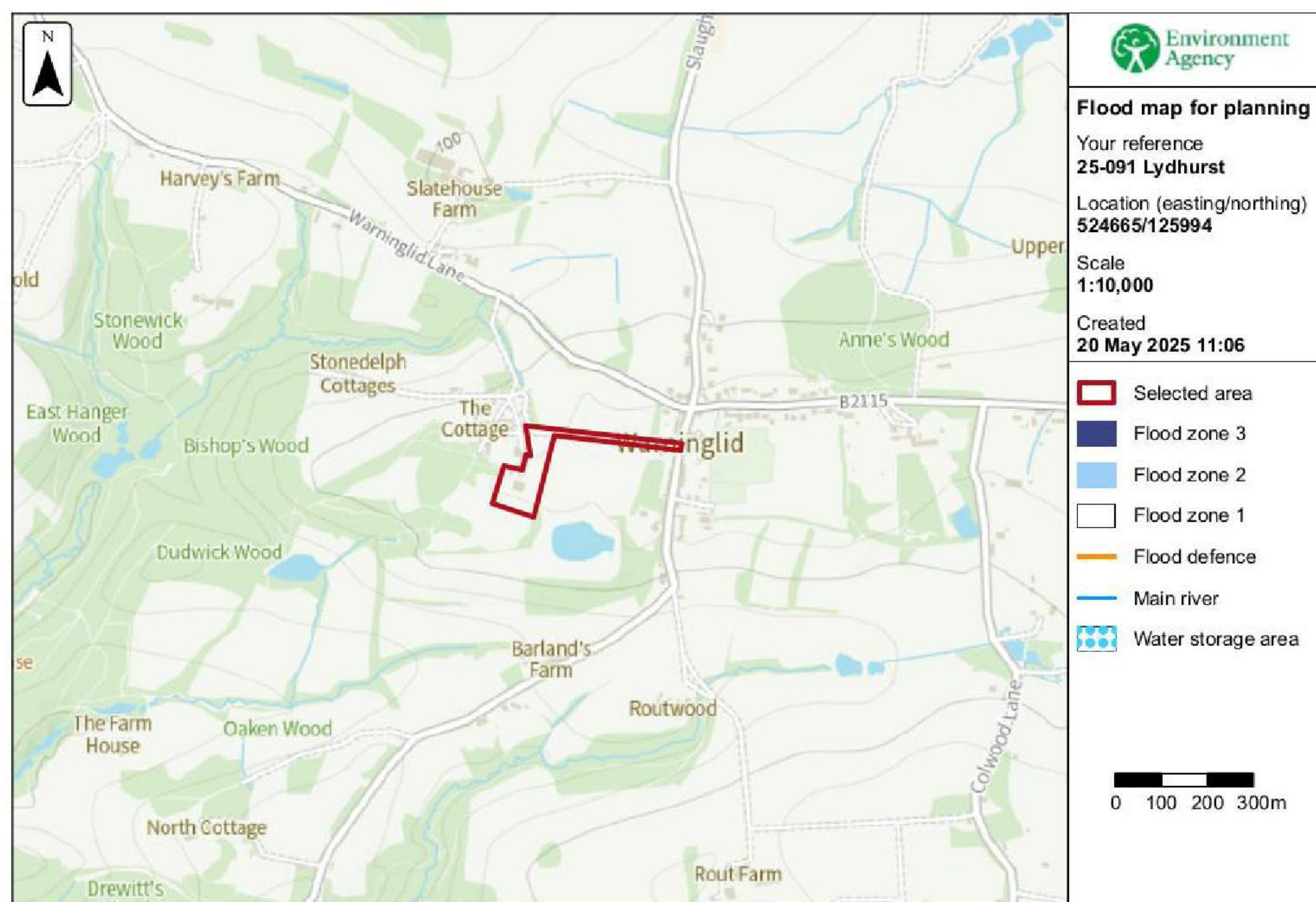


Figure 3.1 – Flood Map for Planning

Given the distance of the site from the River Adur and its tributaries coupled with the intervening topography, flood risk from fluvial sources can be considered to be **LOW**.

3.3 Pluvial Flood Risk

Pluvial flooding is defined as flooding resulting from rainfall generated overland flow before run-off enters any watercourse or sewer.

It is usually associated with high intensity rainfall events but can also occur with low intensity rainfall or melting snow where ground is saturated, frozen, developed or otherwise has low permeability resulting in overland flow and ponding in depressions in the topography. Large catchment areas are particularly prone to this type of flooding.

The Environment Agency pluvial flood data indicates that the site is at Very Low risk of surface water flooding.



Figure 3.2 –Pluvial Flood Risk

In the event that any surface water flow paths do manifest on site, it is expected that the existing and proposed drainage systems would manage this exceedance flow and therefore it is unlikely that pluvial flows would impact on the development.

It is therefore considered that the risk to the development from surface water is **LOW**.

3.4 Tidal Flood Risk

The site is not considered to be at risk of tidal flooding due to its inland location.

3.5 Groundwater Flood Risk

In general terms, groundwater flooding can occur from three main sources, raised water tables, seepage and percolation, and groundwater recovery or rebound. If groundwater levels are naturally close to the surface, then this can present a flood risk during intense rainfall.

British Geological Survey (BGS) mapping shows the site to be underlain by the Upper Tunbridge Wells Sand – Sandstone and Siltstone. The Environment Agency classifies this as a Secondary (A) Aquifer which can be described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The nearest BGS borehole information indicates groundwater was struck at circa 3.9m and 8.5m below ground level. Notwithstanding, the presence of ponds around the estate suggests a potentially relatively high perched water table, which could be associated with the clay layer that may be present across the site.

No intrusive investigation has been undertaken to date however, this will be completed to inform the design process, and the presence of any ground water will be established. Where necessary, measures will be implemented in the design to mitigate any risk associated with ground water.

Taking all of the above into consideration, the probability of groundwater emergence across the site, and therefore the risk to the development from groundwater flooding, is considered to be **LOW**.

3.6 Canal Flood Risk

Generally, canals are owned and operated by the Canal & Rivers Trust (CRT). Water levels are regulated between normal and statutory levels by means of weirs and sluice gates and whilst a breach or overtopping of the structure is unlikely, the possible flood risk needs to be assessed.

There are no canals in close proximity to the site. There is therefore not considered to be any risk of flooding to the site from this source.

3.7 Sewer Flood Risk

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked, or it cannot discharge due to a high-water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. Water then begins to back up through the sewers and surcharge through manholes, potentially flooding highways, and properties.

No public sewers are present within or in the vicinity of the site. The SFRA does not make any reference incidents of historical sewer flooding in the immediate vicinity of the site.

Foul water generated by the existing estate is treated via package treatment plants which is then believed to discharge to the local watercourse network. Surface water runoff from roof areas and external hardstanding is understood to discharge either to ground or the local watercourse network.

No official drainage records for the site are available however, a full drainage survey will be undertaken as part of the detailed design process to establish the site regime. New foul and surface water drainage systems will be installed to serve the new dwelling and associated hard landscaping. This will be designed to maintain flows below ground with an appropriate management and maintenance strategy put in place to mitigate the risk of any blockages/ failure which could lead to flooding.

Taking the above into consideration, the risk of flooding to the development from surcharged sewers or drains is considered to be **LOW**.

3.8 Reservoir Flood Risk

The site is not located in an area that is potentially at risk and therefore the risk of flooding to the site from this source is considered to be **LOW**.

3.9 Flood Risk Vulnerability Classification

The proposed development comprises a new replacement residential dwelling. Residential development is classified as 'More vulnerable' and in accordance with Table 2: Flood Risk Vulnerability Classification in the NPPF, this type of development is considered appropriate in Flood Zone 1.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

Figure 3.3 – Table 2 Flood Risk Vulnerability Classification

4 DRAINAGE PROPOSALS

4.1 Surface Water Management

There are three methods that were reviewed for the management and discharge of surface water for the development which are detailed below.

- Discharge via infiltration;
- Discharge to watercourse;
- Discharge to surface water drain or sewer.

4.1.1 Discharge via Infiltration

Based on the anticipated ground conditions, it is anticipated that discharge via infiltration is potentially not a feasible method of surface water disposal. However, this is contrary to our understanding of the existing site regime which is believed to rely on infiltration as a method of surface water disposal.

As noted earlier in this report, a drainage CCTV and tracing survey is to be undertaken to establish the sites precise drainage arrangement. Furthermore, infiltration testing is to be completed to confirm the sites infiltration potential.

It is therefore intended that the proposed development will, where possible, discharge run-off via infiltration. This is expected to comprise a combination of utilising existing drainage features alongside new SuDS measures such as permeable pavements.

4.1.2 Discharge to Watercourse

There are two ordinary watercourse features present within the wider Lydhurst Estate boundary. These are located to the north and southwest of the application site. It is understood that one or more of these features are utilised by the estate for the discharge of surface water and treated foul effluent. However, this will need to be confirmed.

Should infiltration not be considered feasible, either due to poor permeability of the existing ground or a high perched water table, then the proposed new development drainage will discharge to the local watercourse network at a restricted rate. Where possible, this would make use of existing outfall points.

4.1.3 Discharge to Surface Water Drain or Sewer

There are no public surface water sewers within the immediate vicinity of the development site. As suggested above, it is understood that the application site and wider estate are served by private surface water drainage which either discharge direct to ground or has connectivity to the wider ordinary watercourse network.

Should discharge via infiltration not be feasible then it is intended that the proposed development will utilise the existing private drainage systems on site. However, this will need to be confirmed pending further survey work.

4.2 Existing & Proposed Catchment Areas

An assessment of the existing pre and post development impermeable areas has been undertaken and are presented on the drawings in Appendix H and summarised in the table below.

Impermeable Areas		
Gross Area (ha)	Existing Impermeable Area (ha)	Proposed Impermeable Area (ha)
1.71	0.274	0.295

The pre and post development catchment areas indicate that there will be a slight increase in drained of approximately 210m² which represents an additional 7%. The wider application area is either unpaved or will not be modified and so will continue to drain as per the existing site regime.

4.3 Surface Water Drainage Strategy

It is proposed that a new surface water drainage system will be installed to serve the new dwelling and associated hard landscaped areas. The new drainage will discharge via infiltration and/or connect into an existing pond feature to the south of the application site. This is subject to the CCTV and tracing survey along with infiltration testing.

In principle, there will be two separate systems.

1. A permeable pavement forming the access route, turning and delivery area to the front of the property. This is intended to drain directly into the underlying ground via infiltration.
2. A gravity drainage system conveying run-off from the roof areas and remaining hardstanding to the existing pond feature located to the south of the application site. This is understood to be the existing primary site regime.

On the basis that there is a slight increase in impermeable area over existing, introducing a permeable pavement for the access route/ turning area and allowing this to drain independently from the rest of the site effectively reduces the catchment area draining to the pond by circa 918m² and therefore reduces the impact on the downstream watercourse network.

Should infiltration testing prove this not to be achievable then a connection will be made to the drainage system serving the main dwelling at a maximum rate of 2.0 l/s. This would also ensure that the impact of the development on the downstream network is reduced when compared to existing.

In addition to the permeable pavement, it is intended that the new dwelling will be provided with flat green roof areas alongside sunken courtyards which help provide enhanced ecological habitat and reduce rainfall generated run-off.

A rainwater harvesting system is also intended to be installed which will retain roof run-off for irrigation purposes, thereby reducing potable water use and surface water discharge from the development.

By reducing the area draining to the existing pond, and utilising green roof areas in conjunction with rainwater harvesting, it is expected that any surface water attenuation requirement will be met by the permeable pavement and no modifications to the pond will be required to provide further storage.

Detailed hydraulic calculations will be undertaken for both the existing and proposed drainage networks as part of the detailed design process and following completion of the additional survey work identified above. It is expected that these will demonstrate that the proposed development offers a significant betterment in terms of surface water discharge rates and volumes when compared to existing.

The proposed drainage system will be designed to ensure that all surface water is retained below ground for storm events up to and including the 100-year return period plus climate change. Whilst it is considered acceptable in planning terms to permit some surface flooding for events beyond the 30-year return period, it is considered impractical to allow significant areas of flooding on a development of this nature.

A copy of the preliminary proposed drainage general arrangement is provided in Appendix I.

4.4 Sustainable Drainage Systems

The Environment Agency recommends that “surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. This approach involves using a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site.

As indicated above, it is considered that infiltration-based drainage solutions may be practicable however this is subject to testing on site to confirm. Should infiltration not prove to be viable then non-infiltration-based methods will still be employed alongside traditional channels, gullies and gravity pipework.

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The table below summarises the potential SuDS solutions that could be employed within the development drainage system and will be explored further during detailed design.

SUDS MATRIX		
SUDS Technique	Description	Commentary
Wetlands	Similar to ponds, but the runoff flows slowly and continuously through aquatic vegetation that attenuates and filters the flow. Typically shallower than normal ponds.	It is intended that an existing vegetated pond feature within the site will be utilised as part of the development drainage design.
Ponds	Depressions used for storing and treating water. They have a permanent pool and bankside emergent and aquatic vegetation.	It is intended that an existing vegetated pond feature within the site will be utilised as part of the development drainage design.
Bioretention Areas	Vegetated areas for collecting and treating water before discharge downstream, or to the ground via infiltration.	It is intended that an existing vegetated pond feature within the site will be utilised as part of the development drainage design.
Green Roofs	Vegetation roofs that reduce run off volume and rate.	Development proposals incorporate green roof areas and sunken courtyards within the building footprint.
Permeable Pavements	Allow inflow of rainwater into underlying construction / soil.	Potential to use for the driveway/ access road/ parking/ turning area as permeable pavement. Where infiltration is not viable then this will discharge at a restricted rate to the wider drainage system.
Swales Shallow	Vegetated channels that conduct and / or retain water (and can permit infiltration when un-lined). The vegetation filters particulates.	Considered not to be particularly appropriate for the site due to the extensive tree cover and space required to implement.
Infiltration Basins	Depressions that store and dispose of water via infiltration.	It is intended that an existing vegetated pond feature within the site will be utilised as part of the development drainage design.
Filter Strips	Vegetated steps of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and other particulates.	Considered potentially viable and may be utilised to drain proposed footpath areas in lieu of drainage channels/ gullies. To be explored further during detailed design.
Detention Basin	Dry depressions designed to store water for a specified retention time.	Whilst this is considered potentially feasible, there are more appropriate SuDS techniques that could/ will be utilised for the development.
Infiltration Trenches	As filter drain, but allowing infiltration through trench base and sides.	Whilst this is considered potentially feasible, there are more appropriate SuDS techniques that could/ will be utilised for the development.
Filter Drain	Linear drains / trenches filled with a permeable material, often with a perforated pipe in the base of the trench.	Considered potentially viable and may be utilised to drain proposed footpath areas in lieu of drainage channels/ gullies. To be explored further during detailed design.
Sand Filters	Treatment devices using sand beds as filter media.	Whilst this is considered potentially feasible, there are more appropriate SuDS techniques that could/ will be utilised for the development.
Soakaways	Sub-surface structures that store and dispose of water via infiltration.	Whilst this is considered potentially feasible, there are more appropriate SuDS techniques that could/ will be utilised for the development.
Pipes, Subsurface Storage	Conduits and their accessories as conveyance measures and / or storage. Water quality can be targeted using sedimentation and filter media.	Considered viable and will be required in some form to drain the proposed development in conjunction with other SuDS techniques.
Silt Removal Devices	Manhole and / or proprietary devices to remove silt.	Where possible, SuDS techniques should be utilised to remove silts and hydrocarbons from surface water run-off and improve water quality prior to discharge. However, proprietary devices may be used in conjunction to provide a robust solution.
Rainwater Harvesting	Storage tank for interception & retention of surface water run-off.	It is intended that a rainwater harvesting system will be installed for irrigation purposes

4.5 Foul Water Management

It is intended that a new foul water drainage system will be installed to serve the proposed residential dwelling which will be treated on site via a new package treatment plant, sized to suit the anticipated population with an allowance for potential future growth.

It is understood that the existing dwelling is served by a treatment plant, the condition of this is unknown. It is considered unlikely that this would be suitable for retention and re-use as part of the new drainage system and therefore this will be removed and disposed of.

Existing treated effluent is believed to discharge to the local watercourse network however this will need to be confirmed. At this stage it is assumed that the proposed new drainage system will discharge treated effluent to a new soakaway, subject to infiltration testing. Should the proposed drainage survey determine the presence of an existing connection to watercourse, then this will be utilised instead.

Details of foul flows that will be generated by the development are not currently available and will need to be confirmed as the scheme is progressed. However, based on the anticipated population the volume of sewage is expected to be circa 1.35m³/day

It is expected that the Environment Agencies General Binding Rules for small sewage discharges will apply, whether the site currently discharges to ground or watercourse. Notwithstanding, this will be confirmed during detailed design and where if considered necessary an Environmental Permit will be applied for.

It should be noted that the proposed development comprises a swimming pool which is to be located on the lower level of the dwelling. It will not be possible to discharge any drain down/ backwash water directly to the treatment plant and therefore alternative means of disposal will be required. The current strategy is to discharge this via a soakaway on site; however, this will be subject to infiltration testing and would require the water to be de-chlorinated before doing so. Should this prove not to be feasible then the water may need to be stored temporarily and then tankered away for disposal off-site.

The design of the swimming pool and associated plant is subject to specialist design and therefore the final solution will be developed at detailed design stage.

A copy of the preliminary proposed drainage general arrangement is provided in Appendix I.

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5 MANAGEMENT & MAINTENANCE

The proposed drainage system for the development adopts a series drainage measures and It is important that these are maintained to ensure that all elements operate effectively for their lifetime.

Maintenance is a necessary and important consideration. If systems are properly monitored and maintained, any deterioration in performance can often be managed out.

Effective maintenance will help to ensure that the drainage features continue to function as they were intended and keep hydraulic capacity and any pollutant removal efficiency at design levels.

The following table sets out typical maintenance requirements for the various drainage features serving the development.

Drainage Feature		Action Required	Typical Frequency
Gully's & Channels	Occasional Maintenance	Inspect cover and frame for any defects, repair and replace as necessary.	Quarterly
		Inspect channels for the build-up of silt and debris. Removal of silt and debris by means of vacuum suction and or jetting/ rodding.	
		Inspect sumps and outgoing pipework for the build-up of silt and debris. Removal of silt and debris by means of vacuum suction and or jetting/ rodding.	
Manholes/ Catchpits	Occasional Maintenance	Inspect chamber cover and frame for any defects, repair and replace as necessary. Inspect chamber interior and incoming/ outgoing pipes for the build-up of silt and debris. Removal of silt and debris by means of vacuum suction and or jetting/ rodding. Ensure manhole access steps/ ladders are secured and inspect for corrosion.	Quarterly
Permeable Pavements	Regular Maintenance	Remove litter (including leaf litter) and debris from the surface	As required
		Inspect permeable surfacing and rake/ scarify any granular areas which become over compacted to improve performance. Make good any defects to the surface ensuring consistent even gradients	Monthly for 3 months then 6 monthly
	Occasional Maintenance	Manage other vegetation and remove nuisance plants/ weeds	Monthly then as required
Ponds/ Basins	Regular Maintenance	Inspect and identify any areas that are not operating correctly e.g. clogging or other blockages. If required take remedial actions	Monthly for 3 months then 6 monthly.
		Remove debris from the invert area e.g. leaf litter	Monthly
		Vegetation management e.g. grass cutting, pruning etc	Monthly
	Occasional Maintenance	Monitor health of vegetation/ planting & replace as necessary	Quarterly/ As needed
		Inspect/ check all inlets/ outlets to ensure they are in good condition and operating as designed.	Quarterly
		Remove sediment from low flow channels where applicable	As required
Green Roof	Regular Maintenance	Inspect and identify any areas that are not operating correctly e.g. blocked outfall points, bare patches/ plant loss. If required take remedial action.	Monthly for 3 months then 6 monthly.

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		Remove weeds, especially deep-rooted plants that could damage the waterproofing and insulation.	Inspect monthly, remove as required
		Remove debris (including leaf litter) from the surface	Inspect monthly, remove as required
	Occasional Maintenance	Water roof area during dry spells e.g. if without rain for more than two - three weeks. Repeat every 2-3 days at nighttime until wet weather returns.	As required during dry spells
		Fertilize once per annum during the spring.	12 monthly
Rainwater Harvesting	Regular Maintenance	Inspection of the tank for debris and sediment buildup. Inlets/ outlets/ withdrawal devices, overflow areas, pumps, filters, mains top-up.	Annually (and following poor performance)
		Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris.	Annually (and following poor performance)
		Cleaning and/ or replacement of any filters	Three monthly (or as required)
	Occasional Maintenance	Pump / controller repairs	As required

6 SUMMARY

6.1 Flood Risk

The application site is located in Flood Zone 1. This is an area that is defined within the NPPF as having a greater than 1 in 1000 (>0.1%) probability of flooding in any one year.

This report has reviewed all relevant sources of flood risk to the application site including fluvial, tidal, pluvial, groundwater and sewers. It has been demonstrated that there is no significant flood risk to or as a result of the development, nor will there be any increase in flood risk off-site.

The development is always accessible for emergency access and egress as the floodplain does not extend into the area proposed for development.

6.2 Surface Water Drainage

It is intended to install new surface water drainage to serve the new dwelling and associated hard landscaped areas. This will discharge via infiltration and/or connect into an existing pond feature to the south of the application site; subject to a CCTV and tracing survey along with infiltration testing.

In principle, there will be two separate systems.

1. A permeable pavement forming the access route, turning and delivery area to the front of the property. This is intended to drain directly into the underlying ground via infiltration.
2. A gravity drainage system conveying run-off from the roof areas and remaining hardstanding to the existing pond feature.

On the basis that there is a slight increase in impermeable area over existing, introducing a permeable pavement for the access route/ turning area and allowing this to drain independently from the rest of the site effectively reduces the catchment area draining to the pond by circa 918m² and therefore reduces the impact on the downstream watercourse network.

In addition to the permeable pavement, it is intended that the new dwelling will be provided with flat green roof areas alongside sunken courtyards which help provide enhanced ecological habitat and reduce rainfall generated run-off.

A rainwater harvesting system is also intended to be installed which will retain roof run-off for irrigation purposes, thereby reducing potable water use and surface water discharge from the development.

By reducing the area draining to the existing pond, and utilising green roof areas in conjunction with rainwater harvesting, it is expected that any surface water attenuation requirement will be met by the permeable pavement and no modifications to the pond will be required to provide further storage.

Detailed hydraulic calculations will be undertaken for both the existing and proposed drainage networks as part of the detailed design process and following completion of the additional survey work identified above. They will be submitted for approval to the LLFA as part of a future condition discharge application.

6.3 Foul Water Drainage

It is intended that a new foul water drainage system will be installed to serve the proposed residential dwelling which will be treated on site via a new package treatment plant, sized to suit the anticipated population with an allowance for potential future growth.

Existing treated effluent is believed to discharge to the local watercourse network however this will need to be confirmed. At this stage it is assumed that the proposed new drainage system will discharge treated effluent to a new soakaway, subject to infiltration testing. Should the proposed drainage survey determine the presence of an existing connection to watercourse, then this will be utilised instead.

The proposed development comprises a swimming pool which is to be located on the lower level of the dwelling. It will not be possible to discharge any drain down/ backwash water directly to the treatment plant and therefore alternative means of disposal will be required. The current strategy is to discharge this via a soakaway on site; however, this will be subject to infiltration testing.

and would require the water to be de-chlorinated before doing so. Should this prove not to be feasible than the water may need to be stored temporarily and then tankered away for disposal off-site.

It is expected that the Environment Agencies General Binding Rules for small sewage discharges will apply, whether the site currently discharges to ground or watercourse. Notwithstanding, this will be confirmed during detailed design and if considered necessary an Environmental Permit will be applied for.

APPENDIX A – LOCATION PLAN