

Kingscote Place

Drainage Strategy Report

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Rangeford Villages

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Contents

1	Introduction.....	2
1.1	Scope of The Report.....	2
1.2	Limitations of The Report.....	2
1.3	References / Design Codes.....	2
2	Site Information.....	3
2.1	Site Location.....	3
2.2	Site Topography.....	4
2.3	Geology.....	4
2.4	Hydrology & Hydrogeology.....	5
2.5	Fluvial Flood Risk.....	5
2.6	Proposed Development.....	6
3	Pre-Development Surface Water Management Strategy.....	7
3.1	Existing Surface Water Drainage Network.....	7
3.1.1	Existing Public Drainage.....	7
3.1.2	Existing Private Drainage.....	7
3.2	Pre-Development Surface Water Catchment Areas.....	7
3.3	Pre-Development Surface Water Run-Off Rates.....	8
3.3.1	Greenfield Run-Off Rates.....	8
3.3.2	Brownfield Run-Off Rates.....	8
3.4	Pre-Development Flood Exceedance.....	8
4	Surface Water Management and SuDS Assessment.....	9
4.1	Run-off Destinations.....	9
4.2	SuDS Assessment.....	10
4.2.1	Overview of SuDS.....	10
4.2.2	Suitability of SuDS Elements.....	10
4.2.3	Interception Storage.....	13
5	Post-Development Surface Water Management Strategy.....	14
5.1	Proposed Surface Water Drainage Strategy.....	14
5.2	Post-Development Surface Water Catchment Areas.....	14
5.3	Post-Development Surface Water Run-Off Rates.....	15
5.3.1	Greenfield Run-Off Rates.....	15
5.3.2	Brownfield Run-Off Rates.....	15
5.3.3	Allowance for Climate Change and Urban Creep.....	15
5.3.4	Post-Development Surface Water Storage.....	15
5.4	Post-Development Flood Exceedance.....	16
5.5	Summary of Post-Development Flows.....	16
5.6	Water Quality.....	16
5.6.1	Quality of Surface Water Run-off: Post-Development.....	19
5.6.2	Quality of Surface Water Run-off: During Construction.....	19
5.7	Design Standards for Surface Water Drainage.....	20
6	Foul Water Management Strategy.....	21
6.1	Pre-Development Foul Water Drainage.....	21
6.1.1	Existing Public Drainage:.....	21
6.1.2	Existing Private Drainage:.....	21
6.2	Post-Development Foul Water Drainage.....	21
6.3	Post-Development Foul Water Flow Rates.....	22
6.3.1	Peak onsite flow rate.....	22
6.3.2	Offsite flow rate assessment.....	23



7	Ownership and Maintenance	23
8	Consent / Planning.....	28
9	Conclusions	28

Tables

Table 2.1: Site Referencing Information	3
Table 2.2: Flood Zones Probability of Flooding.....	6
Table 3.1: Pre-Development Catchment Areas	7
Table 3.2: Pre-Development Greenfield Run-Off Rates	8
Table 4.1: Review of the Drainage Hierarchy	9
Table 4.2: Suitability of SuDS Components.....	10
Table 4.3: Interception Storage Systems	13
Table 5.1: Pre vs Post-Development Catchment Areas	14
Table 5.2: Pollution Hazards	17
Table 5.3: Pollution Mitigation.....	17
Table 7.1: Proposed Schedule of Maintenance for Below Ground Drainage.....	24
Table 7.2: Proposed Operational Schedule for Below Ground Drainage.....	27

Figures

Figure 1: Site Location with Approximate Red Line Boundary	3
Figure 2: EA Flood Map for Fluvial Flooding	6

Appendices

Appendix A	Topographical Survey
Appendix B	Architect's Proposed Site Layout
Appendix C	Sewer Asset Map
Appendix D	Existing Drainage Layout
Appendix E	Pre / Post Development Catchemnts
Appendix F	Calculations
Appendix G	Overland Flow Routes
Appendix H	Proposed Drainage Strategy Layout



1 Introduction

1.1 Scope of The Report

Stantec have been appointed by Rangeford Villages to provide a Drainage Strategy report for the approval of West Sussex County Council Lead Local Flood Authority. This report has been submitted to support the reserved matters submission and the discharge of Condition 36 of the hybrid planning permission DM/23/2699.

The proposed drainage strategy will be in accordance with national guidelines and will incorporate a 'best practice' approach in reducing the impact of the flooding caused by the new development.

The report is based upon sewer asset information provided by the sewerage undertakers Southern Water in relation to assets within the vicinity of the development site.

The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified, thereby reducing the impact of potential damage caused by flooding.

1.2 Limitations of The Report

This report has been prepared in connection with the scope as described above and considers the instructions and requirements of the client's needs. It is not intended for and should not be relied upon by any third party.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Stantec accepts no responsibility for any direct and/or consequential loss that may occur as a result.

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1.3 References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Sewers for Adoption (where applicable).
- Local Authority Guidance.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.



2 Site Information

2.1 Site Location

The site is currently an undeveloped greenfield located on the western edge of East Grinstead. It lies to the west of Imberhorne Lane, which connects to London Road and provides access to the surrounding highway network, including East Grinstead and Felbridge. To the north, the site is bounded by an existing bridleway and the adjacent Vistry Homes residential development. Imberhorne Lane forms the eastern boundary, while Imberhorne Farm and two existing ponds lie to the west. To the south, the site is bounded by an existing bridleway and adjoining agricultural land.

Table 2.1: Site Referencing Information

Site Address	
Address	Imberhorne Lane, East Grinstead
Postcode	RH19 1TY
National Grid Reference	TQ 37508 38016

Figure 1: Site Location with Approximate Red Line Boundary



2.2 Site Topography

The site slopes overall from east to west, with elevations reducing from approximately 123m AOD in the east to 112m AOD in the west. The northwestern and southwestern corners lie at around 114m AOD and exhibit a gentle fall towards the centre of the site.

See **Appendix A** for Topographical Survey

2.3 Geology

Available British Geological Survey mapping and the Ground Investigation Report indicate that Made Ground is present across the central area of the site. The Made Ground generally comprises variable clay, silt and sand with anthropogenic material, resulting in permeability that is likely to range from low to moderate.

Beneath the Made Ground, the northern part of the site is underlain by the Upper Tunbridge Wells Sand Formations, with the Grinstead Clay Member underlying the southern part of the site. The Upper Tunbridge Wells Sand Formation is classified as a Secondary A aquifer and is expected to exhibit moderate to high permeability where sand and gravel layers are present, whilst the Grinstead Clay Member is classified as Unproductive Strata and is anticipated to have generally low permeability.

Infiltration testing was not undertaken as part of the 2026 Stantec Ground Investigation. However, soakaway testing completed by Harrison Group Environmental in 2021 (3.8.2 GL24233 - Imberhorne Farm – GIR) recorded no measurable infiltration at the three test locations. On this basis, infiltration-based surface water drainage is not currently considered to be a feasible drainage solution for the proposed development

See report 333701759-STN-XX-RP-GE-0001 for Ground Investigation Report.

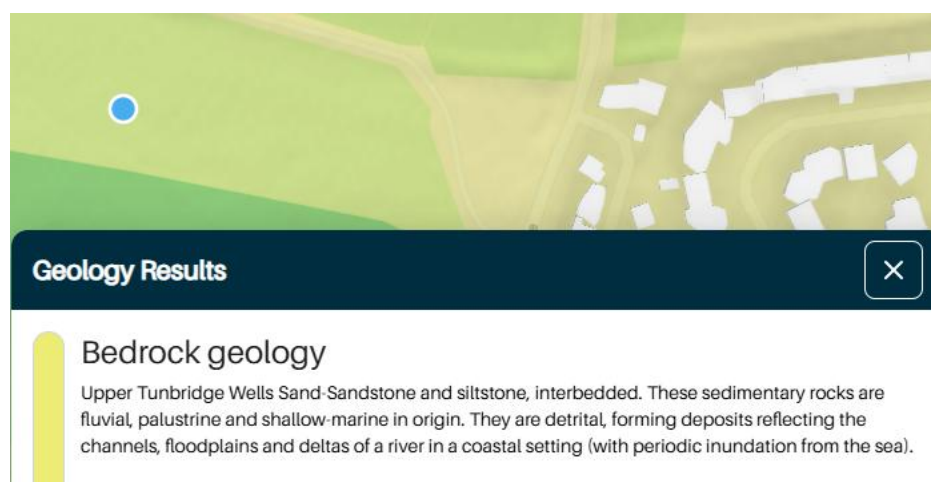


Figure 2: BGS Geology Map - North

(Source: [BGS Lexicon of Named Rock Units - Result Details](#))

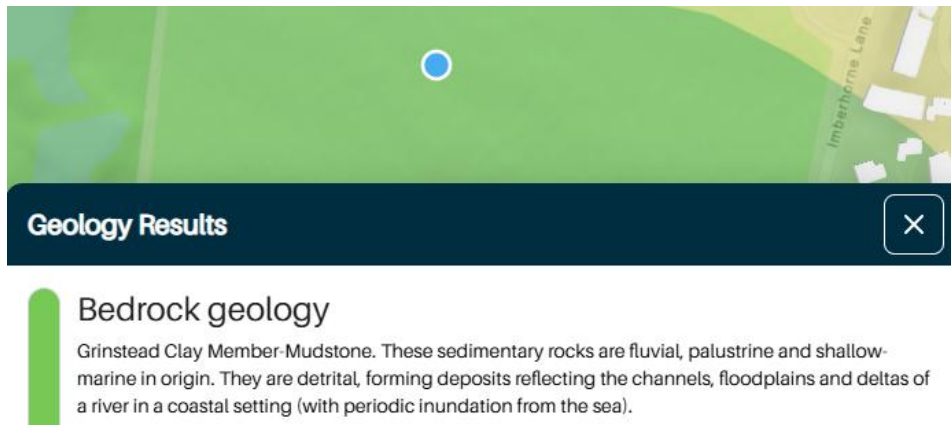


Figure 3: BGS Geology Map - South

(Source: [BGS Lexicon of Named Rock Units - Result Details](#))

2.4 Hydrology & Hydrogeology

The nearest surface water feature to the site is an existing pond located approximately 20m south of the wider development boundary. No watercourses are present within the site boundary. The nearest licensed surface water abstraction is located approximately 420m north-west of the site.

Both available British Geological Survey data and Ground investigations indicate no presence of groundwater.

See report 333701759-STN-XX-RP-GE-0001 for Ground Investigation Report.

2.5 Fluvial Flood Risk

Fluvial flood risk is the risk of flooding from the overbank flow of rivers and watercourses.

Within England, the risk of fluvial flooding is defined by Flood Zones (FZs) which indicate the potential extent of flooding for a given Annual Exceedance Probability (i.e., the potential for of an occurrence within any one year (AEP) without considering the benefits from flood defences, other manmade structures, or channel improvement works.

The [EA Flood Map for Planning](#) indicates that the entirety of the site extent is located within Flood Zone 1 and is therefore considered to be at low risk (less than 0.1% AEP) of fluvial flooding (see Figure 4). In addition, the site does not benefit from flood defences nor is it within the vicinity of a Flood Zone 2 area. As the site lies entirely in Flood Zone 1, the provisions of Condition 44 of the hybrid planning permission (ref: DM/23/2699) are satisfied.

Figure 4: EA Flood Map for Fluvial Flooding

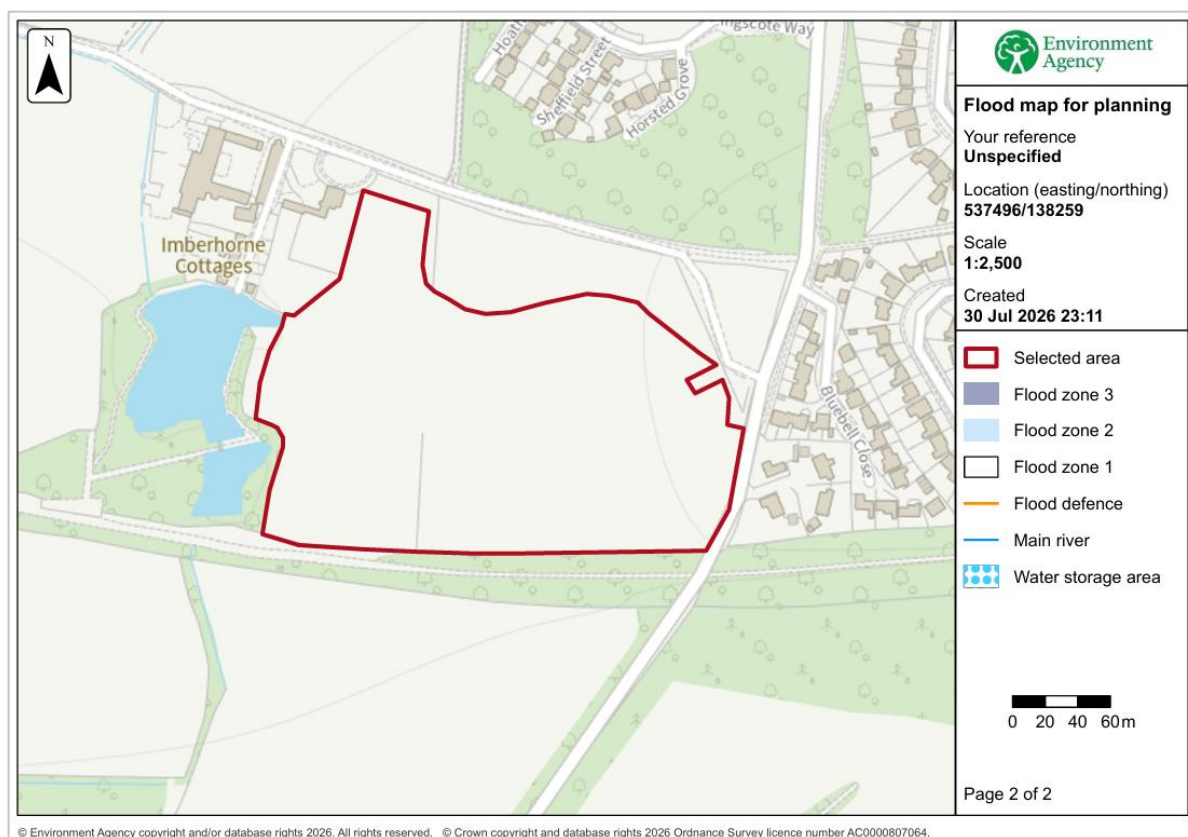


Table 2.2: Flood Zones Probability of Flooding

NPPF – Flood Zones		
Flood Zone 1	Low Probability	Less than 1 in 1000 (< 0.1%) chance of flooding occurring each year
Flood Zone 2	Medium Probability	Between 1 in 100 and 1 in 1000 (1% - 0.1%) chance of flooding occurring each year
Flood Zone 3a	High Probability	Greater than 1 in 100 (> 1%) chance of flooding occurring each year
Flood Zone 3b	Functional Floodplain	Land where water has to be stored in times of flood

2.6 Proposed Development

The proposed development comprises of 17 residential buildings, including a mix of bungalows, apartment blocks and a clubhouse. The development also includes permeable paved parking areas, associated access roads connecting to Imberhorne Lane, together with additional hardstanding and landscaping works within the site boundary.

See **Appendix B** for Architect's Proposed Site Layout.



3 Pre-Development Surface Water Management Strategy

3.1 Existing Surface Water Drainage Network

3.1.1 Existing Public Drainage

Review of Southern Water's sewer asset maps confirm that existing public surface water sewers are present within Imberhorne Lane heading into Bluebell Close, which is adjacent to the site. However, the levels of the existing sewer network are unsuitable for a gravity connection from the site.

See **Appendix C** for the Sewer Asset Map.

3.1.2 Existing Private Drainage

A topographical survey of the site was undertaken in July 2021 by Maltby Land Surveys which showcases potential drainage features on or surrounding the site.

These surveys identified that there is no existing private drainage within the site boundary.

See **Appendix D** for Existing Drainage Layout.

3.2 Pre-Development Surface Water Catchment Areas

Below is an indication of the pre-development catchment type area.

Table 3.1: Pre-Development Catchment Areas

Catchment	Area (m ²)
<u>Impermeable</u>	
Building / Roof	0
Roads / Hardstanding	0
<u>Permeable</u>	
Soft Landscaping	46,055
Total Area	46,055

See **Appendix E** for Pre-Development Catchment Plans.



3.3 Pre-Development Surface Water Run-Off Rates

In order to determine the post-development surface water flows, an assessment has been carried out on the pre-development to ensure that the run-off from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network. This run-off will be limited by the existing greenfield or brownfield run-off rates, as explained below:

3.3.1 Greenfield Run-Off Rates

In line with the [Non-Statutory Technical Standard for Sustainable Drainage S2 \(Peak Flow Control\)](#) it is a requirement that, on new developments, consideration is to be given to limit discharge as close as reasonably practical to the equivalent 'Greenfield' rate for the corresponding storm event. Below considers what the maximum surface water discharge from the site would be if the site was 'Greenfield' i.e., not developed:

Table 3.2: Pre-Development Greenfield Run-Off Rates

Storm Event	Maximum Run-Off Rate (l/s) Greenfield
Q1 Year (1 in 1 Year)	8.2
Q30 Year (1 in 30 Year)	21.8
Q100 Year (1 in 100 Year)	30.6
Qbar	9.6

See **Appendix F** for Calculations.

3.3.2 Brownfield Run-Off Rates

As the site is Greenfield this method has not been considered.

3.4 Pre-Development Flood Exceedance

Topographical survey information indicates that, should the existing drainage network fail or otherwise have its capacity exceeded, overland flows would follow the site topography and be directed towards the western boundary of the site where two ponds are located.



4 Surface Water Management and SuDS Assessment

4.1 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in *Part H of Building Regulations and the National Planning Policy Framework (NPPF)*:

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Table 4.1: Review of the Drainage Hierarchy

Method	Reasoning	Suitability
Interception / Reuse	Has been deemed not suitable for this scheme	X
Infiltration	Site geology has been confirmed to not be suitable	X
Surface Water Body	Out falling to a nearby watercourse north west of the site	✓
Surface Water Sewer	More suitable options available	X
Combined Sewer	More suitable options available	X
Foul Water Sewer	More suitable options available	X



4.2 SuDS Assessment

4.2.1 Overview of SuDS

The design of the surface water drainage system should seek to implement and maximise the use of Sustainable Drainage Systems (SuDS) where possible.

The primary purpose of a SuDS system is to manage surface water run-off within a development via mimicking natural methods, attenuating additional water volume generated by the introduction of impermeable areas whilst providing a degree of water treatment to run-off alongside amenity and biodiversity benefits to the local community.

The suitability and benefits of the various potential SuDS systems for the proposed development should be considered, which will aim to maximise the 4 pillars of SuDS:

1. Water Quantity (Controlling runoff);
2. Water Quality (Managing quality of runoff);
3. Amenity (Create and sustain better places for people);
4. Biodiversity (Create and sustain better places for nature).

The implementation of SuDS can be divided into the management of sources and of the wider site and even region, with preference given to source control.

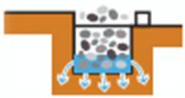
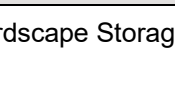
4.2.2 Suitability of SuDS Elements

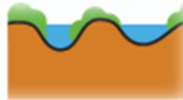
The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity. The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Table 4.2: Suitability of SuDS Components

Hierarchy	System	Description	Suitability
Source Control	Green Roofs 	A planted soil layer on the roof of a building: stores water in the soil layer to be absorbed by vegetation. Reduces runoff and treats pollutants.	No. Type of building structure makes this system unsuitable.
	Rainwater Harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally.	No. Not proposed, as there is

			limited space to include this. Not in keeping with Architect requirements.
	Permeable Surfaces 	Surfaces that allow water to penetrate into underlying layers to be stored, collected or made to infiltrate to groundwater.	Yes To be located beneath available car parking space.
	Bioretention Area 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically, to then be stored, collected or made to infiltrate to groundwater.	No. Not proposed due to use of other SuDS systems.
Hierarchy	System	Description	Suitability
Site and Regional Control	Filter Strip 	Grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	No. Not proposed due to use of other SuDS systems.
	Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	No. Not used due to unsuitable infiltration rates.
	Swale 	Shallow depressions to convey and filter water. May be 'wet' with above ground attenuation or 'dry' with a gravel layer. Can be made to infiltrate to groundwater.	Yes. A swale has been proposed along a portion of the main road edge.
	Hardscape Storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	No. Not proposed due to use of

			other SuDS systems.
	Pond / Basin 	Store and treat water. Ponds have a level of standing water whereas basins are generally dry. Can be made to infiltrate to groundwater.	Yes Two dry basins has been implemented for attenuation.
	Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	No. Not proposed due to use of other SuDS systems.
	Underground Storage 	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Yes Attenuation tanks have been utilised throughout to provide storage.

4.2.3 Interception Storage

Interception can be defined as the capture and retention on site of the first 5mm of the majority of all rainfall events. Interception mechanisms have been assessed to show the site is compliant for zero run-off from the first 5mm for 80% of events during the summer and 50% in winter. (Ciria)

Table 4.3: Interception Storage Systems

System	Reasoning	
Green Roofs	All surfaces that have green / blue roofs	X
Rainwater Harvesting	All surfaces drained to RWH systems designed whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water	X
Soakaways / Infiltration	Areas of the site drained to systems that are designed to infiltrate run-off for events greater than a 1 month return period.	X
Permeable Pavements	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.	✓
Filter Strips / Swales	Roads drained by filters strips / swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for interception delivery for impermeable areas up to 5 times the base of the vegetated surface area receiving the runoff.	✓
Infiltration Trenches	Roads drained by infiltration trenches can be considered to provide interception	X
Detention Basins	Areas of the site drainage to detention basin with a flat base can be assumed to comply. The area of the basin that is assumed to contribute to interception of run-off should be below the outlet of the basin.	X
Bioretention / Rain Gardens	Areas of the site drainage to unlined bioretention components can be assume to comply where the impermeable area is less than 5 times the vegetated surface area receiving run-off/ They can be designed to deliver interception for larger areas, where suitable infiltration capacity is available.	X
Ponds	Areas drained by ponds (with a permanent water pool that is effectively maintained by the outlet structure) are not assumed to deliver interception	✓



5 Post-Development Surface Water Management Strategy

5.1 Proposed Surface Water Drainage Strategy

The proposed surface water drainage strategy comprises a gravity-fed below-ground drainage network which connects runoff from the proposed buildings via rainwater downpipes and manholes before conveying flows through the site. Surface water runoff from the proposed parking areas will be managed through permeable paving, providing source control and attenuation within the pavement sub-base.

The drainage network conveys surface water towards the western boundary of the site, with additional attenuation provided by two proposed ponds, that are connected by a pipe and headwalls, as well as attenuation tanks across the site. They will provide attenuation storage before discharging at the greenfield run-off rate via a below-ground drainage network to the existing watercourse located north-west of the site as shown in drawing 49426-SN-XX-C-DR-GA-0110, which was previously submitted for the wider site strategy (ref: DM/26/0131).

It will be a gravity system without the need for pumping.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) that does not adversely impact flood risk either within the site or beyond the development boundary.

5.2 Post-Development Surface Water Catchment Areas

Below is an indication of the post-development catchment type area.

Table 5.1: Pre vs Post-Development Catchment Areas

Catchment	Area (m ²)
<u>Impermeable</u>	
Building / Roof	9,602
Roads / Hardstanding	9,767
<u>Permeable</u>	
Permeable Paving	1,829
Soft Landscaping	24,857
Total Area	46,055



5.3 Post-Development Surface Water Run-Off Rates

In order to determine the post-development surface water flows an assessment has been carried out to ensure that the flows from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

5.3.1 Greenfield Run-Off Rates

Due to the nature of the development and its current arrangement, it is considered feasible for this site to reduce to Greenfield Run-off Rates and restricting to 9.6l/s.

5.3.2 Brownfield Run-Off Rates

As the site is Greenfield this method has not been considered.

5.3.3 Allowance for Climate Change and Urban Creep

In accordance with EA guidance, an allowance for climate change has been incorporated into the design to ensure that the proposed surface water network has a suitable degree of resilience. These allowances vary with the expected lifetime of the development.

Urban Creep Factor (UCF) is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, such as the construction of patios, small extensions, etc.

Given the managed nature of the site and the limited potential for future increase in impermeable areas, this factor is not applied for this development.

5.3.4 Post-Development Surface Water Storage

In line with the [Non-Statutory Technical Standard for Sustainable Drainage S7 & S8 \(Flood Risk\)](#), all storm events up to and including the 1 in 30 AEP storm event will be retained within the proposed surface water drainage network and exceedance volumes from all other storm events up to and including the 1 in 100 AEP plus 40% allowance for climate change will be retained within the site and managed to minimise the risk to people and property.

Attenuation flood storage will be distributed across the development with Permeable Paving and Dry Basins attenuating at source. In the event that one part of the system fails through blockage the remainder of the system will still be able to function effectively.

Expected attenuation requirements are shown below:



Table 5.6: Attenuation Requirements

Type of Storage Structure	Dimensions (m)	Void Ratio	Total Attenuation Volume (m ³)
Pond – PO-01	1429m ² x 2.1m Deep	1	1619
Pond – PO-02	723m ² x 2.1m Deep	1	738
Permeable Paving	1830m ² x 0.4m Deep	0.3	219
Attenuation Tank – AT-01	18m x 6.5m x 0.75m Deep	0.95	168
Attenuation Tank – AT-02	20m x 9m x 1.5m Deep	0.95	257
Attenuation Tank – AT-03	24 x 15m x 1.5m Deep	0.95	513

5.4 Post-Development Flood Exceedance

In line with the [Non-Statutory Technical Standard for Sustainable Drainage S9 \(Flood Risk\)](#), in the event that there is a failure of the surface water drainage network beyond the design storm or through other circumstances, exceedance flows will be directed away from buildings and towards the western boundary

See **Appendix G** for Overland Flow Routes

5.5 Summary of Post-Development Flows

It has been determined that the post-development surface water flow rates have been restricted to the greenfield run-off rate in accordance with national guidelines and non-statutory technical standards so as to not adversely impact downstream flooding of the site as a result of the new development.

See **Appendix H** for the Drainage Strategy Layout.

5.6 Water Quality

Consideration must be given both during construction and post-development to ensure that water quality is not negatively impacted.

Table 26.2 of The SuDS Manual provides various mitigation indices for discharge to surface waters. The mitigation indices for SuDS elements that are included within the proposed development are shown below



Table 5.2: Pollution Hazards

Land Use	Hazard Level	TSS	Metal	Hydro-carbons	On-site
Residential roofs	Very Low	0.2	0.2	0.05	✓
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2-0.8	0.05	X
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., <300 traffic movements/day	Low	0.5	0.4	0.4	✓
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads / motorways	Medium	0.7	0.6	0.7	X
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9	X

Table 26.3 of The SuDS Manual provides various mitigation indices for discharge to surface waters. The mitigation indices for SuDS elements that are included within the proposed development are shown below.

Table 5.3: Pollution Mitigation

Indicative SuDS mitigation indices for discharge of surface water			
Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6



Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately 1 in 1 year return period event, for inflow concentration relevant to the contributing drainage area		

Refer to below tables for a summary comparing the mitigation and pollution indices for each identified land usage classification.

Residential Roofs	TSS	Metals	Hydrocarbons
Pollution Index	0.2	0.2	0.05
Mitigation Index	0.7	0.7	0.5
Net Pollution	-0.5	-0.5	-0.45
Comments	Due to very low risk of pollution from residential roofs, no mitigation solution proposed.		

Residential Carpark	TSS	Metals	Hydrocarbons
Pollution Index	0.5	0.4	0.4
Mitigation Index (Permeable Paving)	0.7	0.6	0.7
Net Pollution	-0.2	-0.2	-0.3
Comments	Permeable paving effectively mitigates the pollution risk from the residential car park.		

Based on the above tables the water quality criteria of document [Ciria C753 - The SuDS Manual](#) is satisfied.

Although potential SuDS options have been stated, alternative options may be considered provided that the management train meets or exceeds the water quality requirements.



Provided that the mitigation indices of the various treatment trains meet or exceed the requirements of each pollutant, it is expected that there will be no reduction in the quality of water being discharged into the public sewer network.

5.6.1 Quality of Surface Water Run-off: Post-Development

In line with the SuDS suitability, the design should seek to provide an appropriate level of water treatment to effectively mitigate the pollution risk associated with the site and not affect the quality of water downstream.

The proposed layout has one primary driver of pollutant risks to the discharge point. The sources, pollutants and mitigations are as follows:

Residential Carparks

The car park is proposed to have an oil interceptor before the surface water run-off discharges to the downstream network. Permeable paving has also been proposed which will contribute as a treatment method as per table 5.6.

Gullies

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

5.6.2 Quality of Surface Water Run-off: During Construction

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

Some pollution mitigation techniques that are to be considered include:

- Monitoring and managing disposal of site waste. Make sure all waste is correctly dealt with to stop it from spreading.
- Keeping materials such as sand and cement secure. Materials should be located where there isn't risk of them being washed into the drainage system.
- Covering up all drains to prevent waste from ending up in the system.
- Keep the road and paths to the site clean at all times. This will prevent silt and other pollutants from running off into any bodies of water.
- Properly collect and treat any wastewater that is produced.
- Temporary installation of screens within manholes to capture any debris.



5.7 Design Standards for Surface Water Drainage

The surface water drainage strategy for the new development should aim to deliver a safe, functional, cost effective and, as far as possible, sustainable drainage system (SuDS) which considers the following design principles to ensure:

- That natural drainage features are protected;
- That public health and safety risks are taken into account and managed;
- The constructability of the surface water system;
- The maintainability of the surface water system;
- The long-term economic viability of the system;
- That sustainability issues are taken into account;
- That the information requirements of stakeholders are adequately addressed;
- That the potential value of the surface water system, in enhancing the rural and urban environment is recognized and optimized.

The surface water below ground gravity drainage system is to provide connections from all new rainwater pipes, channels, gullies and road gullies at ground floor level. The locations of the drainage components are to be fully coordinated with all relevant architectural, landscaping and services drawings. All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

- | | |
|--|--|
| 1 in 2-year storm return period: | Pipes running under full conditions with no surcharge. |
| 1 in 30-year storm return period: | No flooding. |
| 1 in 100-year storm: | Extreme flooding to be retained on site. |



6 Foul Water Management Strategy

6.1 Pre-Development Foul Water Drainage

6.1.1 Existing Public Drainage:

Review of Southern Water's sewer asset maps confirm that existing public surface water sewers are present within Imberhorne Lane heading into Bluebell Close, which is adjacent to the site. However, the levels of the existing sewer network are unsuitable for a gravity connection from the site.

See **Appendix C** for the Sewer Asset Map.

6.1.2 Existing Private Drainage:

A topographical survey of the site was undertaken in July 2021 by Maltby Land Surveys which showcases potential drainage features on or surrounding the site.

These surveys identified that there is no existing private drainage within the site boundary.

See **Appendix D** for Existing Drainage Layout.

6.2 Post-Development Foul Water Drainage

To meet the requirement set out within [Building Regulations: Approved Document Part H - Drainage and Waste Disposal](#), any drainage management strategy proposed should adhere to the following foul discharge hierarchy in the following preferential order:

1. Discharge to local foul water sewer network.
2. Discharge to local combined water sewer network
3. Onsite treatment and discharge of foul effluence through drainage field or watercourse
4. Storage of produced effluence and removal offsite

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge into neighbouring Vistry homes residential site to the north as shown in drawing 49426-SN-XX-C-DR-GA-0110, which was previously submitted for the wider site strategy (ref: DM/26/0131).

It is intended that only waste flows considered to be 'Domestic' shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system then it will be required to make a formal application to the Sewerage Undertaker accordingly. It will be a gravity system without the need for pumping.

The design of all foul sewers and lateral drains must conform to [BS EN 752](#), [BS EN 16933](#), [Building Regulations 2010 Part H](#), [planning policy](#) and best practice guidelines (such as [SSG Appendix C – Design and Construction Guidance](#)) wherever applicable. Sanitary systems within building should be designed in accordance with [BS EN 12056-2](#).

See **Appendix H** for the Drainage Strategy Layout.



6.3 Post-Development Foul Water Flow Rates

The assessment of the proposed foul flow rates considers both daily average volumes and estimated peak flow rates. Main criteria outlined below:

Type	Occupancy	No. Units
Residential	550	134

6.3.1 Peak onsite flow rate

The peak onsite design flow rates have been calculated using one of the below methods

Method 1 – Sewerage Sector Guidance

In the [Sewerage Sector Guidance, Appendix C](#), B3.1 the below values are given to calculate the peak flow rate from the development:

No. Units	Flow (l/h/d)	Flow (l/s)	Total
134	4000	0.046	6.16l/s

Note: This is a design peak flow rate not a daily average water usage and represents the peak flow rate from a number of appliances.

Method 2 – 'Estimated' F&L Peak

It is widely used practice to estimate the peak flows by concentrating the average daily usage over an 8-hour period (i.e., assuming total daily flows only happen during the day), and applying an additional multiplier.

Therefore: Units x Occupancy x LHD / 28800 x DWF.

Residential

No. Units	Occupancy (per unit)	Flow (l/h/d)	Hours	Peak Factor	Total
134	4.1*	150	8	3	8.58l/s

* taken from average across all units



6.3.2 Offsite flow rate assessment

Further assessment will have to be carried out by the offsite consultant to determine the capacity of the connection point and its potential for connection as part of the foul water drainage strategy for the new development.

Any capacity improvements to the sewerage undertaker's network to accommodate new developments will be managed, prioritised, and funded by them from their overall infrastructure charging arrangements.

7 Ownership and Maintenance

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company. All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.



Table 7.1: Proposed Schedule of Maintenance for Below Ground Drainage

Underground Cellular Tanks - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually.
	Remove sediment from pre-treatment structures and / or internal forebays.	Annually, or as required.
Remedial actions	Repair / rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

Reference should be made to the manufacturer recommendations where applicable

Permeable Paving - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.



	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

Reference should be made to the manufacturer recommendations where applicable

Swale - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual

<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.



	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Ponds - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual

<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Remove litter and debris	Monthly (or as required).
	Cut the grass – public areas	Monthly (during growing season), or as required.
	Cut the meadow grass	Half yearly (spring - before nesting season, and autumn).
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years).	Monthly (at start, then as required).
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly.
	Inspect water body for signs of poor water quality	Monthly (may-October).
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, e.g. penstocks	Half yearly.
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface).	Annually.
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level.	Annually.
	Tidy all dead growth (scrub clearance) before start of growing season Note tree maintenance is usually part of overall landscape management contract).	Annually.
	Remove sediment from any forebay.	Every 1–5 years, or as required.
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required.



Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%.	With effective pre-treatment, this will only be required rarely, e.g. every 25–50 years.
Remedial actions	Repair erosion or other damage.	As required.
	Replant, where necessary.	As required.
	Aerate pond when signs of eutrophication are detected.	As required.
	Realign riprap or repair other damage.	As required.
	Repair / rehabilitate inlets, outlets and overflows.	As required.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 7.2: Proposed Operational Schedule for Below Ground Drainage

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

Provided that the surface and foul water strategies as set out in this report, are implemented, it is expected that the primary residual failure would be as a result of some form of failure of the site drainage system during the life of the development. Therefore, regular, ongoing maintenance as set out in the [Operations and Maintenance Manual](#), will be required to ensure that the capacity of the system is maintained as designed.



8 Consent / Planning

Summary of expected consents required:

- Ordinary Watercourse Consent – To be confirmed.
- Sewerage Undertaker Consent – Southern Water.
- Section 104 / 106 Drainage Adoption – Not applicable.
- Build Over / Build Near – Not applicable.

In addition to the above it is anticipated that details of the drainage scheme will need to be approved by Surrey County Council Lead Local Flood Authority (LLFA) through a formal planning application.

9 Conclusions

This report concludes that the foul and surface water drainage strategy for the development will be designed in accordance with both national and local standards and best practice. The following key items have been summarised below:

- The foul and surface water drainage systems for the new development will be designed to accommodate the required flows for the lifetime of the development.
- It has been determined that the post-dev surface water flow rates can be restricted to 9.6l/s in accordance with national guidelines and non-statutory technical standards, so as to not adversely impact downstream flooding of the site as a result of the new development.
- All surface water run-off from storm events up to and including the 100-year plus 40% climate change will be retained within the overall site.
- Attenuation provided 'at source' by way of dry basins and permeable paving prior to discharging into the main drainage system in addition to attenuation tanks to meet the required flow rates for the whole site.
- In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away from buildings and/or critical infrastructure.
- The use of dry basins and permeable paving for rainwater run-off mitigation, satisfies the water quality criteria of document Ciria C753 - The SuDS Manual.
- Ownership and maintenance liabilities for the foul and surface water drainage system will be clearly defined so that in the event of failure the drainage system appropriate action can be taken to ensure that the drainage system continues to work efficiently.



Appendices



Appendix A Topographical Survey

