PROPOSED REDEVELOPMENT
NO.3 LAVANT ROAD
CHICHESTER
PO19 5QY

# FLOOD RISK ASSESSMENT & DEVELOPMENT DRAINAGE STRATEGY

HESTIA HOMES

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# 1 Introduction

## 1.1 Scope

Hestia Homes is seeking planning permission for the redevelopment of land at No.3 Lavant Road in Chichester.

The redevelopment proposals represent 'Minor Development' and comprise the demolition of the existing single residential dwelling and associated outbuildings within the site for the construction of an apartment building containing up to 6No. dwellings and associated car parking provisions.

1.2 MJA Consulting has been appointed to undertake a Flood Risk Assessment and Development Drainage Strategy to determine the potential flood risks associated with the site and to provide a suitable strategy for the disposal of surface and foul water from the proposed development.

## 1.3 Report Structure

The National Planning Policy Framework (NPPF) and the Flood Risk and Coastal Planning Practice Guidance (PPG) are the current guidance on development and flood risk in England and Wales. The Flood Risk technical guidance for the National Planning Policy Framework requires a Flood Risk Assessment (FRA) to be carried out on sites over 1ha to consider all potential forms of flooding including that from river, sea, estuarial, land drainage, groundwater, overland flow, surface water run-off, sewer systems, and artificial water bodies (lakes, reservoirs, canals etc.) to both the development site and offsite parties and land.

1.4 This report will take the structure of a 'Flood Risk Assessment' in accordance with the NPPF (2023), the FRC PPG (2014), the Environment Agency's Flood Risk Assessment Guidance and CIRIA Report 624 'Development and Flood Risk.

1.5 The objectives of this report are:

- To confirm whether the proposed development site is affected by current or anticipated future flooding from all sources for the lifetime of the site.
- To confirm that this development will not increase the risk of flooding to any offsite properties and land or increase the population within a floodplain.
- To undertake calculations to establish the foul and surface water runoff rates from the existing site and to assess the potential foul and surface water runoff from the proposed development.
- To detail a suitable strategy for the management of foul and surface water generated from the proposed development allowing for future climate change.
- To satisfy the approving planning authority that the most sustainable foul and surface water drainage solutions have been considered, in line with Environment Agency guidance, The Building Regulations (Document H 2002) and government legislation such as the Flood and Water Management Act 2010 (Defra) and The National Planning Policy Framework (NPPF 2023 & FRC PPG 2014) and the local surface water management plan.

# 2 The Development Site

**Figure 1: Site location** Image courtesy of: Bing Maps, 2024 Microsoft Corporation Image courtesy of Ordnance Survey


**Figure 2: Development boundary** Image courtesy of: Google Maps, 2024 Microsoft Corporation

## 2.1 Site Location and Description

The application site is located at land associated with No.3 Lavant Road, towards the northwest of the city of Chichester in West Sussex.

2.2 The 1330m² (0.133 ha) parcel of brownfield land comprises the existing two-storey residential dwelling, garage, and various outbuildings, with gravel surfacing to the front of the site and grass/landscape surfacing to the remainder of the site.
The site is accessed from Lavant Road to the east of the site.
The site is centred on National Grid Reference SU 85838 06680.

## 2.3 Topography

A topographical survey of the site indicates the site is predominantly flat with levels ranging from 32.30 to 32.50mAOD.

## 2.4 Geology

At the time of writing, no intrusive site investigations have been carried out within the site. The following information has been obtained from desktop data where applicable.
It is recommended that intrusive investigations are undertaken within the site to confirm the underlying geology, soil permeability and groundwater levels for the detailed design of the proposed surface water drainage system.

2.5 Due to the existing developed nature of the site, localised areas of made ground will be present.
Information published by the British Geological Survey (BGS), indicates that the site is anticipated to be directly underlain by a superficial layer of Head deposits (sand, gravel and clay) overlying a bedrock of the Lambeth Formation (Clay, silt and sand).

2.6 An existing borehole investigation (SU80NE310, BGS, Nov 2005) was carried out within the site, confirming the presence of a thin layer of made ground overlying sandy gravels to a depth of 8.3mBGL overlying sandy clay soils to a maximum investigation depth of 10mBGL.

## 2.7 Soil Permeability

Soil infiltration testing has not been carried out at this site to date.
Infiltration testing to BRE365 methodology shall be carried out at the site to confirm soil permeability.

2.8 With reference to the BGS data, the underlying geology at the site is sand and gravel head deposits to approximately 8mBGL overlain the Lambeth Formation.
It would be generally expected for sand and gravel soils to be relatively free draining and exhibit good permeability characteristics, although the potential for clay and silt content within these river terrace deposits can reduce permeability.
The soils of the Lambeth Formation generally exhibit medium to low permeability.

2.9 For preliminary design purposes, an infiltration rate of 1.0 x10-5 m/s, typical of sandy gravels shall be used.

2.10 On the basis of the current understanding of site conditions it is recommended that point flow soakaways (traditional ringed, stone pit or cellular crates) should be sited a minimum of 5m away from any structural foundations in accordance with part H of the Building Regulations.
Spread flow infiltration features such as permeable paving that serve only to drain the paved area are suitable for use in closer proximity to and against buildings.

2.11 The published geology would indicate that the likelihood of solution features is extremely low, however, this is to be confirmed by the site-specific ground investigation report.

## 2.12 Groundwater

Groundwater monitoring has not been carried out at the site to date.
Investigations will be carried out during the intrusive geological site survey to ascertain exact groundwater levels across the site and to confirm the presence of any perched groundwater.

2.13 The historic borehole record (SU80NE310) within the site, encountered groundwater at circa 5.5mBGL.
It is therefore anticipated that groundwater will not be encountered at shallow depths during construction.

2.14 Whilst the risk of groundwater flooding from underground aquifers is very low, due to the presence of high permeable head deposits overlying lower permeability bedrock geology, there is the potential for 'perched' groundwater to be encountered.

2.15 The consideration of encountering groundwater during the construction of the development and the vulnerability of the site and proposed SuDS to high groundwater levels is to be considered during detailed design.
The base of any infiltrating SuDS structures are to be at least 1m above the maximum groundwater level or be lined to prevent interaction with any underlying groundwater.

## 2.16 Hydrogeology, Hydrology and Existing Site Drainage Characteristics

The Environment Agency has classified the site as not located within a Groundwater Source Protection Zone.

2.17 The superficial head deposits and bedrock of the Lambeth formation are classified as 'Secondary A' aquifers.
These are layers of rock that are capable of supporting water supplies at a local rather than strategic scale, and in some cases are part of an important source of base flow to rivers.

2.18 It is believed that all surface water runoff from roofed areas is drained via a dedicated private on-site drainage system discharging to on-site soakaways. Rainfall that falls on the gravel driveway infiltrates at source into the underlying soils.

2.19 All foul water flows generated from the existing site discharge into the Southern Water foul sewer network within Lavant to the east of the site.

2.20 The site is within the hydrological catchment of the River Lavant an open ‘main river’ that flows 1km beyond the east of the site and continues in a southerly direction to its outfall into the Fishbourne Channel.

It would be expected that the flow of groundwater beneath the site be consistent with the local surface topography and flow towards the River Lavant corridor.

### 2.21 Ground Contamination

Due to the historical use of the site, there is a very low risk of contamination such as elevated levels of hydrocarbons, oils and other pollutants within the made ground. This is to be confirmed by the site-specific ground investigation report.

# 3 Flood Risk Assessment

3.1 The assessment of flood risk to the site requires that all potential forms of flooding be considered.
In accordance with the Environment Agency's Flood Risk Assessment Guidance, NPPF, PPG and CIRIA Report 624, sources of flooding to be assessed include tidal, fluvial (rivers, streams and watercourses), pluvial (overland rainfall runoff), groundwater, artificial sources (canals and reservoirs) and existing/proposed sewerage and water mains infrastructure.

3.2 In relation to the proposed development site, there is an established body of policy and guidance documents which are of particular importance when considering development and flood risk.

National Legislative and Policy Documents

- Flood Risk Regulations (2009)
- Flood and Water Management Act (2010)
- Flood Risk and Coastal Change Planning Practice Guidance (2014)
- National Planning Policy Framework (NPPF) (2023)

Regional Flood Risk Policy

- Draft West Sussex Local Flood Risk Management Strategy (2021-2026)
- West Sussex Preliminary Flood Risk Assessment (PFRA) (WSCC, 2011)

Local Documents and Strategies

- Chichester District Council: Level 1 Strategic Flood Risk Assessment (JBA, Dec 2022)
- Chichester District Council –Local Plan 2021-2039 (July 2023).
  - Policy NE15 Flood Risk and Water Management.
  - Policy NE16 Water Management and Water Quality.

## 3.3 History of Flooding

During the data collection process, it is important to consider the information which already exists for the site location with respect to flood risk. The main source of data for flood risk and recorded incidents of flooding for this site has been the Chichester District Council SFRA (JBA, Dec 2022).
Additional information has been obtained from The Environment Agency, Southern Water, Portsmouth Water, West Sussex County Council and Chichester District Council, the British Society Chronology of Extreme Hydrological Events, local news and media outlets.

3.4 With reference to the above, and in the context of the proposed development, there are no historic issues of flooding from the following potential sources including:

- ♣ Fluvial (Rivers and Sea).
- ♣ Tidal.
- ♣ Groundwater.
- ♣ Pluvial (Surface water runoff).
- ♣ Existing foul, storm and combined sewers or potable water main infrastructure.
- ♣ Artificial infrastructure.

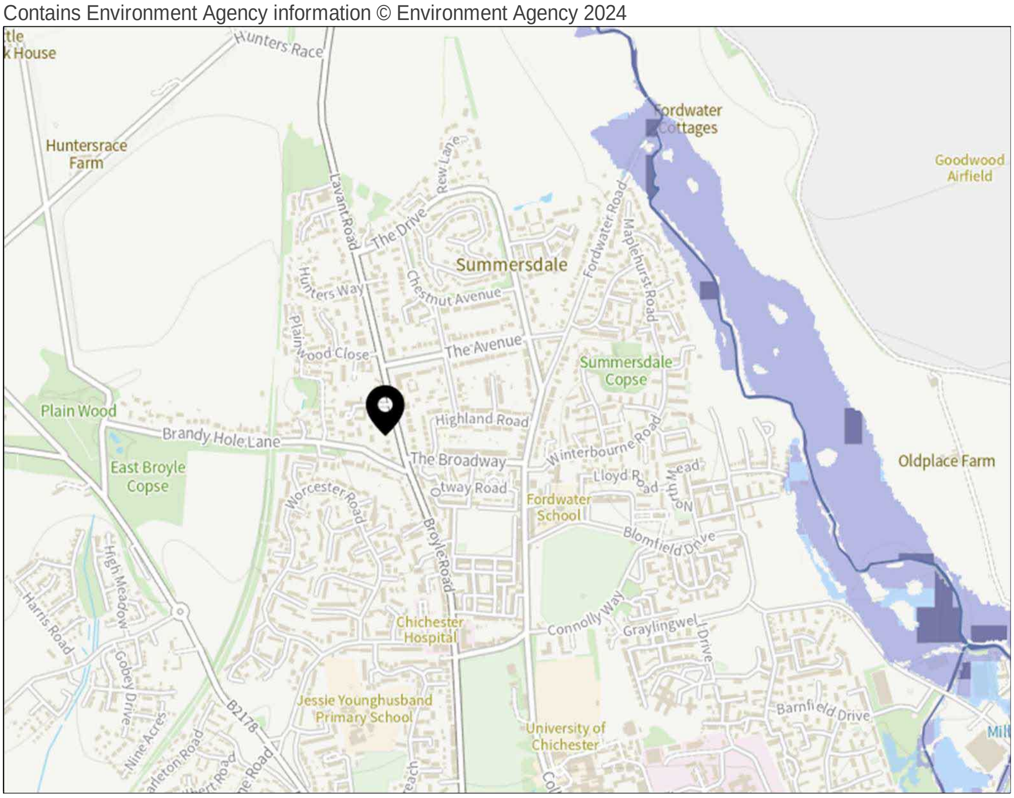
## 3.5 Fluvial

The nearest source of fluvial flood risk to the site is from the River Lavant and its tributary located 1km east of the site.

3.6 The Environment Agency is the principal flood risk management operating authority in England. The EA has carried out a national flood risk assessment (NaFRA) which assesses the probability of flooding to land from all main rivers in England.
The results of this modelling are combined and calibrated against data from recorded flood events to produce the Environment Agency's Flood Zone Map (Figure 3).

**Figure 3: Extract from Environment Agency River and Sea Water Flood Map (March 2024)**

Contains Environment Agency information © Environment Agency 2024




Key:

Main Rivers

**Dark Blue**: (Flood Zone 3)
Shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded: from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

**Light Blue**: (Flood Zone 2)
Shows the additional extent of an extreme flood from rivers or the sea.
These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year.
These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

**Clear**: (Flood Zone 1)
Shows the area where flooding from rivers and the sea is very unlikely.
There is less than a 0.1% (1 in 1000) chance of flooding occurring each year.

3.7 The latest Environment Agency ‘Flood Zone Map’ (March 2024) indicates the site is located within the lowest risk category - Flood Zone 1.
Flood Zone 1 is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding from a main river each year and is not within an area of recorded river flooding.
The site is located over 850m from the floodplain of the River Lavant.

3.8 West Sussex County Council as the Lead Local Flood Authority (LLFA) are responsible for assessing the flood risk from all other ordinary watercourses (non-main rivers) in the area, with this information detailed in the PFRA/SFRA reports.
These studies have concluded that there have been no recorded incidents of flooding from this watercourse and that the site is not at risk of flooding from all ordinary watercourses within the locality of the development.

### 3.9 Climate Change

It should be noted that the current outlines indicated on the flood map do not include an allowance for a future increase in peak river flows due to the effects of climate change.
The National Planning Policy Framework (NPPF) requires that the effects of climate change should be taken into account when assessing the flood risk to a site for the lifetime of the development.

3.10 The NPPF has been updated to revise the climate change allowances when determining peak river flows.
This site is located within the ‘Arun and Western Streams Management Catchment’ and as such it is assessed that up to a 64% (Upper end) increase in peak river flows up to the year 2125 should be anticipated, an increase from the previous 20% allowance.

3.11 The Environment Agency has been consulted to provide updated hydraulically modelled flood level data for the River Lavant at this location allowing for the revised climate change allowances however to date, no detailed flood levels are available.
In the absence of a hydraulic model to apply the increase in flows, the EA have produced indicative guidance as to the application of allowances to be used within flood risk assessments to determine the potential flood levels for the lifetime of the development.
This guide suggests that as a basic approach, an appropriate allowance of up to 1m is added to the current 1:100 (1%) AEP flood level to allow for potential climate change effects on peak river flows up to 2125.

3.12 With reference to the EA flood maps, it is best assumed that the 1:100 year flood level of the River Lavant peaks at approximately 25.0mAOD closest to the site.
Therefore, the 100year+cc (1%AEP+cc) flood level is estimated at 26.0mAOD closest to the site.
With the lowest ground level on the site at approximately 32.3mAOD, it can be concluded that due to ground levels and physical distance from this main river, the site would not be affected by fluvial flooding for the lifetime of the development.

3.13 It is demonstrated that safe and dry access and egress at the site is achievable to a publicly accessible location outside the 1:100 year (plus climate change) flood event extent, in accordance with DEFRA Report FD2320/TR2 - ‘Flood Risk Assessment Guidance for New Developments’. All site entrances provide a safe egress.

## 3.14 Tidal

The EA flood modelling has confirmed that the site and upstream watercourses are not affected by tidal flooding.

## 3.15 Surface Water

The Environment Agency's 'uFMfSW' (updated Flood Map for Surface Water) (Figure 6) is an assessment of potential overland flow paths, ground levels and drainage systems using information from the LLFA to indicate areas that have previously been affected and that may be susceptible to surface water flooding in the future.

**Figure 6: Extract from Environment Agency Surface Water Flood Map (March 2024)**

Contains Environment Agency information © Environment Agency 2024


Key:

High (Greater than 1:30(3.3%) chance of flooding)

Medium (Between 1:100(1%) and 1:30(3.3%) chance of flooding)

Low (Between 1:1000 (0.1%) and 1:100 (1%) chance of flooding)

Very Low (Less than 1:1000 (0.1%) chance of flooding)

3.16 The latest mapping indicates that the site has a very low risk (less than a 1:1000 to or 0.1%AEP) of flooding from surface water.

3.17 The development of this site will fundamentally alter the existing brownfield runoff regime, via the implementation of a robust SuDS scheme to manage surface water runoff to current design standards.
This will provide a level of betterment over existing conditions by ensuring all runoff from impermeable areas at the site is attenuated, preventing onsite flooding and uncontrolled runoff onto Lavant Road.

3.18 Notwithstanding the proposed alterations to the site layout and construction of a new drainage system, to mitigate the risk of surface water flooding no basement or cellar levels are proposed.

## 3.19 Groundwater

The PFRA, SFRA and the Environment Agency confirm that no recorded events of groundwater flooding have been identified at or within the vicinity of the site.

3.20 The JBA Groundwater Flood risk map presented in Appendix G of the Chichester District Council SFRA indicates that the site lies within an area where groundwater could be expected to be between 0.025 and 0.5 below the surface after an extreme winter recharge season with a 1%AEP.

3.20 Investigations will be carried out during the intrusive geological site survey to ascertain exact groundwater levels across the site and to confirm the presence of any perched groundwater.

3.21 The historic borehole record (SU80NE310) within the site, encountered groundwater at circa 5.5mBGL.
It is therefore anticipated that groundwater will not be encountered at shallow depths during construction and the overall risk from groundwater is considered to be low.

3.22 The consideration of encountering groundwater during the construction of the development and the vulnerability of the site and proposed SuDS to high groundwater levels is to be considered during detailed design.
The base of any infiltrating SuDS structures are to be at least 1m above the maximum groundwater level or be lined to prevent interaction with any underlying groundwater.

3.23 Under the development proposals, no basement or cellar levels are proposed.
As this redevelopment will not involve the creation of deep foundations or basement levels, the proposals will not affect the site-wide and offsite groundwater flow regime and overall flood risk from groundwater.

## 3.24 Artificial Sources

With reference to the SFRA/PRFA there have been no recorded incidents of flooding to the site or surrounding areas from artificial sources.

3.25 There are no additional artificial sources of flooding, such as that from canals, reservoirs and sewage treatment works within a 1 km radius of the site.

## 3.25 Overland Flood Flow / Exceedance

The occurrence of overland flooding at the site due to an extreme rainfall event exceeding the design capacity of the drainage system and SuDS, or a failure of the associated flow controls have been considered both during the construction and operational phase of the development.

3.27 If SuDS or the piped drainage system becomes overwhelmed by exceptional rainfall then exceedance routes are proposed to protect people and property by providing unobstructed overland flow routes across the development.

3.27 The design levels of hard paved and landscaped areas will aim to contain and convey flood flows through areas of the site to cause minimum flood risk to properties and residents such as parking areas and low-lying open space.

3.28 All proposed attenuation features within the development are designed to manage the 1 in 100 year return storm (1% chance of occurrence each year) plus an extra allowance of 45% for the potential increase in peak rainfall predicted up to 2115.

3.29 The described protection measures ensure that properties both within the proposed development and any offsite parties and land will not be affected by overland runoff in the event of a reasonably extreme rainfall event exceeding the design storm or a failure or a blockage of the SuDS structures within the system.

## 3.30 Existing Sewers & Water Mains

With reference to the SFRA and Southern Water's DGS Register, there have been no recorded incidents or properties at risk of flooding from public sewers within the vicinity of the site.

No incidents of potable water main flooding have been recorded by Portsmouth Water in the area.

3.31 Southern Water will be consulted to confirm that there is adequate capacity for the proposed development surface and foul flows with the local public sewerage system.
If required, reinforcement of the sewer networks will be undertaken by Southern Water to ensure that the proposed development will have a 'no detriment' impact and does not create an increase in flood risk.

3.32 An existing DN225 foul sewer and 180mm and 300mm dia water mains are located within Lavant Road to the east of the site.

3.33 Under the development proposals, all offsite public sewers and potable water infrastructure within the vicinity of the development will be suitably protected during all construction activities and afforded the required easements specified by the water authority.
This will prevent the risk of flooding and allow unrestricted access for any future maintenance and repairs.

## 3.34 Proposed Site Drainage

A Flood Risk Assessment requires that an evaluation of all proposed artificial drainage systems and infrastructure within, or in close proximity to the site is carried out. In the context of this development, the following systems are to be installed which need to be assessed in terms of potential flooding through the capacity of the systems being exceeded or the structural, hydraulic, mechanical or operational failure of the system occurring during the lifetime of the development:

- Piped foul water sewers, manholes and potable water mains.
- SuDS for the conveyance, attenuation and disposal of surface water.

3.35 All adoptable foul and surface water drains, sewers and manholes will be designed and constructed to the DCG (2021) with all private drainage constructed in accordance with *The Building Regulations Part H, BS EN 752 or BS EN 12056-2* as appropriate, ensuring adequate design capacity and robust structural integrity for the lifetime of the development.

3.36 This will not only prevent the risk of flooding to both the development and offsite parties but will avoid the potential contamination of groundwater by preventing the ingress of groundwater into the pipework and the egress of sewage into the underlying soils.

3.37 All SuDS within the drainage system will be sized to manage the runoff from the exceptionally rare 1 in 100 storm event (1% AEP), plus an additional 45% allowance for predicted future climate change effects (in accordance with EA recommendations up to the year 2115).

3.38 The new development as a whole must not create or exacerbate existing flood risk elsewhere and in particular to properties, land and highways downstream of the site. During the design of the proposed development careful consideration has been given to the most sustainable method of surface water disposal and strict controls have been imposed to limit the peak rate and volume of runoff generated from the developed site.

3.39 All surface water runoff from impermeable areas on the proposed development will be attenuated and safely disposed of via on-site infiltration to replicate the existing brownfield runoff regime for the site. This will ensure that the risk of flooding to properties and land downstream of the site will not increase as a result of this proposed development.

## 3.40 Planning Policy

In accordance with the Flood Risk and Coastal Planning Practice Guidance (PPG); *Table 3 - Flood risk vulnerability and flood zone 'compatibility'*; (Figure 4) development classed as 'more vulnerable' is considered appropriate within Flood Zone 1.

Figure 5 - DGLC Flood risk and coastal change Table 3: flood risk vulnerability and flood zone 'compatibility' DGLC Flood risk and coastal change

| Flood Zones | Flood Risk Vulnerability Classification | | | | |
|---|---|---|---|---|---|
| | Essential infrastructure | Highly vulnerable | More vulnerable | Less vulnerable | Water compatible |
| Zone 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Zone 2 | ✓ | Exception Test required | ✓ | ✓ | ✓ |
| Zone 3a † | Exception Test required † | ✗ | Exception Test required | ✓ | ✓ |
| Zone 3b * | Exception Test required * | ✗ | ✗ | ✗ | ✓* |

Key:

✓ Development is appropriate

✗ Development should not be permitted.

## 3.41 Sequential Test

The flood risk technical guidance to the National Planning Policy Framework (NPPF) categorises residential developments as 'More Vulnerable' within the risk classification. 'More vulnerable' developments located within Flood Zone 1 are considered appropriate under the NPPF.

3.42 The NPPF guidance states that planning authorities should complete a risk-based 'Sequential Test' at all stages of the planning process, to steer new development to areas with the lowest probability of flooding. Under the requirements of the 'Sequential Test' and as the proposed development is already located within Flood Zone 1 (lowest risk), there are no more suitable, developable and deliverable alternative sites, better located from a flood risk perspective which could accommodate the proposed development.

# 4 Existing and Proposed Site Runoff

4.1 This section calculates the peak rate and volume of surface water runoff from the existing site. These discharge figures are then used to establish the post-development constraints to inform the preliminary design of the site surface water drainage strategy.

## 4.2 Catchment Areas

The existing and proposed permeable and impermeable areas are listed in the table below.

| Site Catchme | Impermeable | Permeable | Total |
|---|---|---|---|
| Existing Site Area | 510 m² | 820 m² | 1330 m² |
| Proposed Site Area | 580 m² | 750 m² | 1330 m² |

4.3 This development represents an overall increase of 70m² in impermeable area post-development.
As the development proposals comprise an apartment building, there has been no allowance for urban creep in accordance with best practice.

## 4.4 Existing and Proposed Surface Water Peak Runoff Rate and Volume (Brownfield)

An appropriate method of establishing the peak runoff rates from the existing and proposed brownfield site is via the Modified Rational Method 'Q=2.78 Cv Ci I A':

*Where:*
*Q = Peak discharge (l/s)*
*Cv = Rational method runoff coefficient (roof/hardstanding use 0.84)*
*Cr = Routing Coefficient (use 1.3)*
*I = Average Rainfall Intensity, (mm/hr) (equal to time of concentration for site, use 15mins)*
*A = Contributing area (0.094ha)*

| Return Period (year) | Duration (mins) | Ave.I (mm/hr) | Ave.I +45%cc (mm/hr) |
|---|---|---|---|
| 1 | 15 | 32 | 46 |
| 30 | 15 | 78 | 113 |
| 100 | 15 | 101 | 146 |
| 100 | 360 | 10.1 | 14.6 |

(0.051ha Existing catchment)

| | |
|---|---|
| 1 Year | 5.0 l/s |
| 30 Yea | 12.1 l/s |
| 100 Year | 15.6 l/s |
| Volume 100y 6hr | 30.9 m³ |

(0.058ha Proposed catchment)

| | |
|---|---|
| 1 Year | 8.2 l/s |
| 30 Yea | 19.9 l/s |
| 100 Year | 25.8 l/s |
| Volume 100y 6hr | 50.8 m³ |

## 4.5 Post-Development Surface Water Runoff Peak Runoff Rate & Volume

The procedure for surface water management in accordance with 'Rainfall runoff management for developments' (DEFRA/EA Report –SC030219 E, 2013) and the 'Non-statutory technical standard for sustainable drainage systems' (DEFRA, 2015) are set out below.

In the case of brownfield sites, drainage proposals will be measured against the existing performance of the site.

### 4.6 Peak Flow

For brownfield developments, the peak runoff rate from the redevelopment to any drain, sewer or surface water body up to the 1 in 100 year rainfall event including an appropriate allowance for climate change, must be no greater than the existing runoff rate.

### 4.7 Volume Control

For brownfield developments, the runoff of volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event including an appropriate event, must be no greater than the existing pre-developed greenfield volume. Where it is not reasonably practicable to constrain the volume of runoff (i.e. via infiltration) the runoff volume must be discharged at a rate that does not adversely affect flood risk (i.e. QBar / 2.3year runoff).

4.8 The National Planning Policy Framework requires that consideration be given to the effect of climate change on the surface water flows generated by any new development.
DEFRA specifies that within Arun and Western Streams Management Catchment, an assessment of a 45% increase in rainfall intensity allowance is made when calculating post-development runoff rates for the site with a design lifespan of approximately 100 years.

4.9 As a result of this development and the proposed increase in impermeable areas, the peak rate and volume of surface water that could potentially runoff the proposed site if not effectively managed, could be greater than in its current state.

4.10 To mitigate this increase, it is proposed that all surface water runoff from impermeable areas at the proposed development for up to the 1:100year +45%cc rainfall event will be managed on-site via the use of sustainable drainage systems (SuDS).

# 5 Surface Water Drainage Strategy

5.1 The National Planning Policy Framework (NPPF) requires that developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to control surface water drainage and overland runoff to ensure there are no increases in peak rates and volumes of runoff as a result of the development.

5.2 Environment Agency guidance and government legislation such as the Flood and Water Management Act (Defra 2010) require surface water drainage strategies for new developments to be in accordance with the ideals of 'sustainable development' via the provision of Sustainable Drainage Systems (SuDS).

5.3 SuDS are more sustainable than conventional drainage methods because they can mitigate many of the adverse effects of urban stormwater runoff on the environment. This can be achieved through reducing peak runoff rates and volumes to sewer networks and watercourses, reducing the risk of downstream flooding.

5.4 The Building Regulations Document H (2015) and The SuDS Manual CIRIA 753 (2015) detail the appropriate hierarchy of potential methods for disposing of surface water from a development:

1. Discharge to ground via infiltration.
2. Discharge to a surface water body such as a watercourse.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

5.5 Following a review of the permeable geology, groundwater levels and soil permeability at the site, infiltration as a method of disposing of the surface water runoff generated from the proposed development is considered to be feasible, subject to infiltration testing to BRE365 to confirm soil permeability rates.

5.6 Infiltration is a sustainable drainage technique that enables stormwater to be managed within the site rather than discharging offsite into a watercourse or sewer network.
This method of disposal improves the quality of the stormwater runoff while maintaining the existing natural hydrological drainage regime and the pre-development rates of runoff and volumes.

5.7 All SuDS will be sized to manage the runoff from the 1 in 100 rainfall event (1% AEP), plus an additional 45% allowance for predicted future effects of climate change (in accordance with EA recommendations up to the year 2115).

5.8 The proposed surface water drainage strategy offers a sustainable, safe and robust system that will afford complete flood risk protection to the occupants of the proposed dwellings and the existing properties and land within the vicinity of the site.
This strategy replicates the natural drainage regime for the greenfield site and ensures that the peak rate and volume of surface water runoff will be no greater than the existing greenfield runoff rate for the site for all rainfall events up to the 100 year +50% rainfall event. This ensures compliance with the Policy NE15 '*Flood Risk and Water Management*' of the Chichester District Council Local Plan.

## 5.9 SuDS Selection

A range of SuDS types and components have been assessed to identify the suitability for use at this development in terms of the requirements to manage water quality, water quantity and amenity provision within the constraints and opportunities of the site.

*Table 1 - SuDS Selection Matix*

| SuDS Type | Description | Suitable for this site | Comments |
|---|---|---|---|
| Green/Blue Roofs | Green roofs comprise a multi-layered system that covers the roof of a building with vegetation cover over a drainage layer. They are designed to intercept and retain rainfall, reducing the volume of runoff and attenuating peak flows. | ✓ ✗ | Living Roofs and podium deck (blue roofs) could be incorporated into this development where technically feasible subject to factors such as loadings, roof pitch, visual impact and maintenance burden. To be assessed by a specialist. |
| Rainwater Harvesting | Re-using rainwater for non-potable purposes such as irrigation and toilet flushing. | ✓ | Rainwater harvesting techniques can be utilised for non-potable (greywater) re-use subject to factors such as spatial constraints, whole-life costs and maintenance burden. The watering of landscaped areas by connecting RWP's to planters can easily be achieved at this site to reduce potable water demand at the development. |
| Soakaways | Soakaways provide stormwater attenuation, stormwater treatment and groundwater recharge. | ✓ | Subject to BRE365 infiltration testing and groundwater level confirmation. |
| Filter Strip / Trenches / Swales | Filter strips are linear grassed or vegetated strips of land / channels designed to accept runoff as overland sheet flow from impermeable surfaces usually located adjacent road or parking areas and used to treat infiltrated or convey runoff. | ✗ | Limited space on urban site to incorporate swales or filter strips. |
| Permeable Paving | Pervious pavements provide a pavement suitable for pedestrian and vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored before infiltration to the ground, reuse, or discharge to a watercourse or other drainage system. | ✓ | Permeable surfacing with stone (Type 3 OGCR 4/20mm) sub-base would be suitable for this development. Testing to BRE365 is required to confirm. |
| Bio Retention | Bioretention areas are shallow landscaped depressions which are typically under-drained and rely on engineered soils and enhanced vegetation and filtration to remove pollution and reduce runoff downstream. They are aimed at managing and treating runoff from frequent rainfall events. | ✗ | No green open space to incorporate on this development. |
| Ponds / Basins | Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge. | ✗ | No green open space to incorporate on this development. |
| Underground Storage | Underground Concrete or Geocellular Tanks to reduce and attenuate peak flows | ✓ | The use of underground storage to attenuate and infiltrate runoff would be suitable for this development. |

5.10 It is proposed that surface water runoff from the apartment roof is drained into a cellular soakaway.

The proposed car park will be surfaced with permeable gravel, block paving, resin-bound gravel or porous tarmac with runoff infiltrating into the aggregate stone sub-base.

This sub-base provides attenuation and treatment to the runoff prior to infiltrating into the underlying soils.

## 5.11 Attenuation Requirements

For preliminary design purposes, an infiltration rate of 1.0 x10-5 m/s, typical for sandy gravels shall be used.
Infiltration testing to BRE365 methodology shall be carried out at the site to confirm soil permeability at the detailed design stage.

Roof Runoff

For the proposed impermeable area of 320m2, the required volume of attenuation to store the 1:100y+45% rainfall event, infiltrating at a rate of 1.0 x$10^{-5}$ m/s is approximately 27m³. This can be managed within a cellular soakaway 36m2 x 0.8m deep.

Carpark Runoff

For the proposed impermeable area of 260m2, the required volume of attenuation to store the 1:100y+45% rainfall event, infiltrating at a rate of 1.0 x$10^{-5}$ m/s is approximately 12m³. This can be managed within a permeable stone (Type 3 / 4-20mm OGCR, 30% voids) 150mm deep.

## 5.12 Pollution Prevention and Groundwater Protection

It is important that the development of this site does not adversely affect the existing hydrological conditions and impact the quantity and quality of runoff from the site.
As such, all surface water runoff from impermeable areas at this development will receive an appropriate level of treatment to remove hydrocarbons and other contaminants prior to discharge from the site.
This ensures compliance with Policy NE16 ‘*Water Management and Water Quality*’ of the Chichester District Council Local Plan.

5.13 In terms of water quality, the proposed surface system offers a suitable level of mitigation in accordance with the Environment Agency pollution prevention guidance GP3, CIRIA C753 and DEFRA guidance.

5.14 The pollution hazard of surface water runoff from residential roofs is very low and the hazard of surface water runoff from residential car parks, and low-traffic roads (e.g. cul-de-sacs, home zones, general access roads) is low.

5.15 The CIRIA SuDS Manual 2015 details an approach for establishing the hazard posed by the intended land use activities and the extent to which the proposed SuDS components can reduce and mitigate the contamination risk to the receiving waterbody.

5.16 Referring to Table 26.2 –‘Pollution hazard indices for different land use classifications’ the proposed development and land use results in a low pollution hazard, therefore a ‘Simple Index’ method can be used to make a qualitative assessment of the proposed SuDS management.

Table 2 - Table 26.2 –'Pollution hazard indices for different land use classifications' CIRIA C753, 2015

**TABLE 26.2 Pollution hazard indices for different land use classifications**

| Land use | Pollution hazard level | Total suspended solids (TSS) | Metals | Hydro-carbons |
|---|---|---|---|---|
| Residential roofs | Very low | 0.2 | 0.2 | 0.05 |
| Other roofs (typically commercial/ industrial roofs) | Low | 0.3 | 0.2 (up to 0.8 where there is potential for metals to leach from the roof) | 0.05 |
| Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day | Low | 0.5 | 0.4 | 0.4 |

5.17 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index that equals or exceeds the pollution hazard index:

*Total SuDS mitigation index ≥ pollution hazard index*
*For the development site: TSS = 0.5, Metals = 0.4, Hydrocarbons = 0.4*

Table 3 - Table 26.4 –'Indicative SuDS mitigation indices for discharges to groundwaters' CIRIA C753, 2015

**TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater**

| Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1] | TSS | Metals | Hydrocarbons |
|---|---|---|---|
| A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3] | 0.6[4] | 0.5 | 0.6 |
| A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3] | 0.4[4] | 0.3 | 0.3 |
| Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3] | 0.4[4] | 0.4 | 0.4 |
| Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3] | 0.7 | 0.6 | 0.7 |
| Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3] | 0.8[4] | 0.8 | 0.8 |
| Proprietary treatment systems[5, 6] | These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area. | | |

5.18 The proposed development surface water drainage system consists of the following SuDS components:

Primary Treatment –Permeable Paving
Using mitigation Indices:
TSS = 0.7 which is > 0.5 therefore ok.
Metals = 0.6 which is > 0.4 therefore ok.
Hydrocarbons = 0.7 which is > 0.4 therefore ok.

5.19 Runoff from residential roofs is considered clean and therefore does not require further treatment prior to discharge via infiltration.
Inspection chambers prior to the cellular soakaway will be catchpits to capture sediments and debris.

## 5.20 SuDS Management and Maintenance

It is envisaged that the maintenance liability of all private drainage infrastructure including permeable surfacing, cellular soakaway and ancillary drainage components will be by a dedicated facilities management company in perpetuity, funded through an annual maintenance fee levied against the residents.
The developer will provide a SuDS maintenance and management plan to the management company, detailing the location of all SuDS components and the ongoing maintenance requirements to ensure the optimum operation of the surface water drainage network in perpetuity.

5.21 Stormwater pipework and Inspection Chambers
The key maintenance requirement for the upstream surface water drainage system includes the removal of sediments and debris from the system as required.

5.22 All stormwater pipework should be visually inspected a minimum of monthly for the first three months after installation and then a minimum of once a year.
As road gullies are the first on the treatment train and susceptible to higher silt loadings, these will need to be inspected a minimum of monthly for the first three months after installation and then a minimum of every four months.

5.23 During this inspection identify any gully pots or pipes that require remedial maintenance such as removal of sediment, debris, leaves and litter as required. This involves the removal of all protective covers and grids and the cleaning out of channels or gully pots by hand or with suitable jetting equipment.
CCTV inspection is to be carried out and reviewed to confirm no root ingress from adjacent trees. Should roots be encountered then further investigation of the root barrier to be undertaken with the view to remedial action or replacement of the tree barriers in accordance with the tree root barrier manufacturer's requirements and specifications.

5.24 During the inspections the general operation and structural integrity of all components should be recorded and repaired as required.

5.25 Permeable Block Paving

Routine visual inspections

A major benefit of permeable paving is the ability to quickly and cost-effectively assess that it is working correctly. This can be done by visually inspecting the paving during heavy rainfall or following heavy rainfall.

In general, routine visual inspections are all that is required to determine whether or not remedial maintenance is required.

Any infiltration issues are shown up by water ponding on the surface of the paving.

If ponding is not visible then remedial action is not required.

In the unlikely event that individual blocks are damaged, these should be removed and replaced.

Note that any materials which may clog up the permeable joints such as soil and mulch should not be stored on top of the paving without protection.

*Frequency: Once a year during or following heavy rainfall.*

5.26 Remedial maintenance for ponding.

If surface water ponding is visible the joints should be manually brushed to remove moss, leaves, weeds or other debris and agitate the jointing material.

Brushing should be carried out in a manner which ensures that the paving blocks are not damaged and that jointing material is not completely removed from the joints.

Any jointing material which is removed must be replaced with 2-6mm grit in accordance with BSEN7533.

Weeds tend not to establish in areas which receive regular trafficking by vehicles. If weeds are an issue they can be dealt with by using a weed killer containing Glyphosate. The manufacturer's instructions should always be followed and adequate Health and safety measures should also be put in place when handling chemicals.

Frequency: As and when required.

5.27 Maintenance for aesthetics of the paving blocks.

Brushing with soapy water and a stiff brush will revive the colour of concrete block permeable paving. For a deeper clean of the block surface, a pressure washer can be used to maintain the appearance and colour of the paving blocks.

A pressure washer set to a light/medium pressure should be all that is required to remove general dirt and grime. High pressure should not be used as this can damage the surface of the blocks.

After cleaning is finished ensure that any jointing material which has been removed is topped up with the correct material (2-6mm grit).

5.28 Maintenance during the winter months.

Permeable Paving generally requires less de-icing than conventional concrete block paving. The controlled use of conventional road de-icing techniques can be used without affecting the overall performance of the paving. Some de-icing salts may leave temporary discolouration after the thaw. Normal weathering should soon remove this discolouration from the paving. De-icing salts should be applied before snow or ice develops as this helps protect the concrete surface. It is unlikely that the levels of chloride in the ground will increase significantly by employing conventional de-icing techniques.

Frequency: As required during winter

5.29 Structural Maintenance.

If a visual inspection has indicated that individual blocks have been damaged these blocks should be removed and replaced with new blocks. If rutting of the surface has occurred the area needs to be lifted and reinstated immediately as it may be a hazard to users.

Any blocks which are removed need to be reinstated correctly ensuring that the correct sub-base, bedding and jointing aggregates are used.

The installation method should be in accordance with BS 7533 Part 3. In particular, the joints should be filled to the top to ensure structural integrity.

Any geotextiles or membranes which are damaged during the reinstating process should be replaced. If the blocks are not damaged they can be lifted, cleaned and re-used.

Frequency: As required

| SCHEDULE | ACTION | FREQUENCY |
|---|---|---|
| **Routine visual inspection** | Visually inspect the paving for ponding during heavy rainfall or following heavy rainfall. | Once a year |
| **Remedial maintenance for ponding** | Brush / vacuum joints<br>Replace any lost jointing material | As required |
| **Structural Maintenance** | Replace damaged blocks<br>Repair any rutting | As required |
| **Maintenance for aesthetics of the joints** | Brush / vacuum joints as required<br>Replace any lost jointing material | Recommended once a year |
| **Maintenance for aesthetics of the paving blocks** | Brush with soapy water<br>Light pressure wash | As required |
| **Weed control** | Treat with weedkiller | As required |
| **Maintenance during the winter months** | De-icing salts | As required during winter |
| **WARNING !** | Do not replace the jointing grit with kiln dried sand as this will block the joints and prevent infiltration. Do not store materials which may clog up the permeable joints such as soil and mulch on top of the paving. | |

5.30 Cellular Attenuation Tank

The key maintenance requirement for the cellular attenuation tank will be the visual inspection of the internal units via built-in access chambers and an integral maintenance tunnel for the removal of sediment and jetting as required. A visual inspection of the impermeable geomembrane that envelopes the structure should also be carried out to check for structural integrity.

5.31 The attenuation tank is to be constructed from cellular units that allow internal CCTV and jetting access for inspection and maintenance.

CCTV is to be reviewed to confirm no root ingress from adjacent trees. Should roots be encountered then further investigation of the root barrier to be undertaken with the view to remedial action or replacement of the tree barriers in accordance with the tree root barrier manufacturer’s requirements and specifications. The built-in modular inspection unit and maintenance tunnels within the attenuation tank allow almost the entire volume of the structure to be inspected via CCTV camera and flushed through. A catchpit chamber is to be installed immediately upstream of the attenuation tank to reduce the amount of silt entering the tank and it will generally only be necessary to ensure that the upstream catchpits / silt traps are free from debris such as leaves or sediment.

5.32 It is recommended that the attenuation tank system be inspected no less frequently than at monthly intervals for the first 3 months and thereafter at 6 monthly intervals.
In addition, it is suggested that the installation is inspected immediately following the first storm event, whenever this should occur post-installation.

5.33 It should also be noted that more regular inspections may be required should the catchpit(s) fill more frequently and/or if the initial inspections reveal that maintenance/cleaning will be required more regularly than at six-month intervals.

5.34 Flushing of the system can be achieved using a jetting system with a 150 bar pump pressure (ie. approximately 80 bar at the nozzle) at a discharge flow of 300 l/min.
The jet nozzle should be introduced to the system via the Inspection manhole and the integral inspection/maintenance tunnel.

5.35 Any silt & debris should be flushed to the inspection or catch-pit manhole and removed in accordance with the Management Company policy for waste management.

3.36 The tanks have a design life of greater than 100 years; greater than the design life of the development. The current product is ‘Wavin Aquacell Prime’. If inspections show any degradation to the system then any replacement should have a void ratio of >95%.

*Cellular Systems - Operation and Maintenance Requirements*

| *Maintenance Schedule* | *Action Required* | *Recommended Frequency* |
|---|---|---|
| *Regular Maintenance* | *Inspect and identify any areas that are not operating correctly. If required, take remedial action.* | *Monthly for 3 months, then 6 monthly* |
| | *Debris removal* | *Monthly (and after large storms)* |
| *Remedial actions* | *Repair/rehabilitation of inlets, outlets, overflows and vents* | *As required* |
| *Monitoring* | *Inspect/ check all inlets, vents and overflows to ensure that they are in good condition and operating as designed* | *Annually and after large storms* |
| | *Inspect Bentomat fleece liner for signs of degradation. See 3.38* | *Once a decade (replace after 100 years)* |
| | *Inspect root protection barrier for signs of degradation. See 3.39* | *Once a decade (replace after 50 years)* |

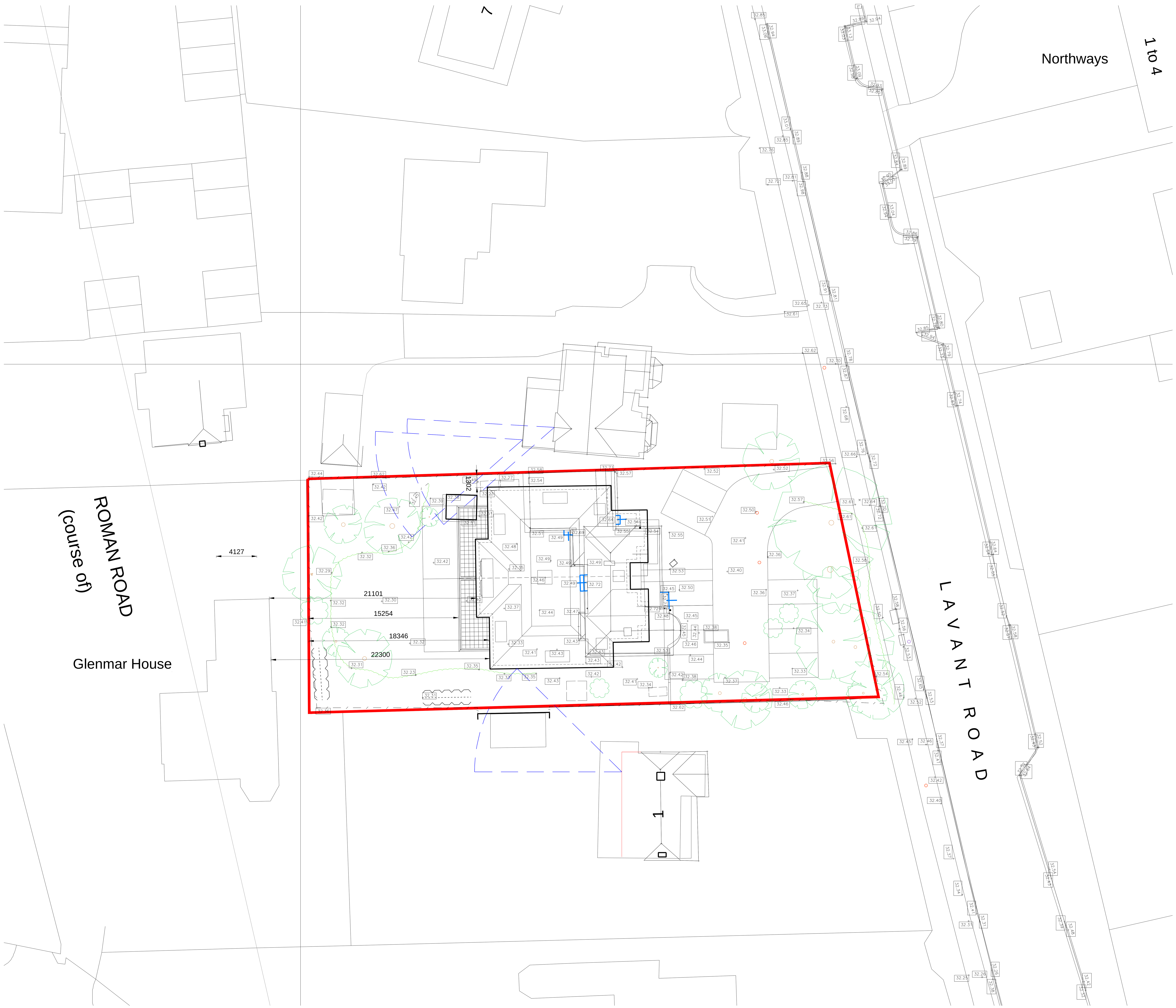
# 6 Foul Water Drainage Strategy

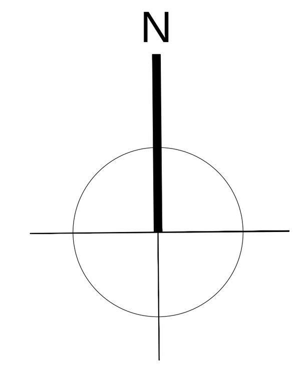
6.1 Foul water flows from the development will discharge via a new gravity pipe system, connecting into the existing private foul manhole within the site which connects to the Southern Water public foul sewer network within Lavant Road to the east of the site.

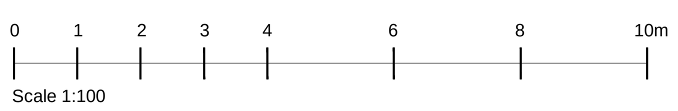
6.2 The predicted peak foul sewer discharge from the 6 dwellings based on the Sewers for Adoption guidance of 4000 l/dwelling/day will be 0.28 l/s.

6.3 Southern Water will be consulted to establish whether there is capacity within the existing network and to carry out any necessary sewer upgrading works to accommodate the proposed foul flows from the development.
This will be funded by infrastructure charges levied on the developer per proposed plot on the development.
This will ensure that the proposed development has a 'no detriment' impact on the local foul sewer system and does not create a flood risk.

# APPENDIX A
## SITE LAYOUT




## Schedule of accommodation:

| | | |
|---|---|---|
| Apartment 1 | 3 bed @ | 130.1m² |
| Apartment 2 | 3 bed @ | 130.1m² |
| Apartment 3 | 2 bed @ | 112.8m² |
| Apartment 4 | 2 bed @ | 112.8m² |
| Apartment 5 | 2 bed @ | 92.3m² |
| Apartment 6 | 2 bed @ | 92.3m² |

Total 6no Apartments / 670.4m² (7,216sqft)

Rev. Date Detail

Status
Draft Issue 11.03.24

HALO ARCHITECTS

Halo Architects Ltd.
The Old Fire Station, Pyrcroft Road, Chertsey, Surrey. KT16 9HL
Tel: 01344 592458 Email: admin@haloarchitects .co.uk
www.haloarchitects.co.uk

Client
Hestia Homes Ltd

Project Title
3 Lavant Road
Chichester
PO19 5QY

Drawing Title
Draft Floor Plans

| Scale | Date | Drawn |
|---|---|---|
| 1:200 @A1 | 03.2024 | CG |
| JOB No. HA24-276 | DRAWING No. S002 | Rev. |

# APPENDIX B
## TOPOGRAPHICAL SURVEY


| Rev. | Date | Detail |
|---|---|---|

Status: Client Issue 12.03.24

Halo Architects Ltd.
The Old Fire Station, Pyrcroft Road, Chertsey, Surrey. KT16 9HL
Tel: 01344 592458 Email: admin@haloarchitects .co.uk
www.haloarchitects.co.uk

Client: Hestia Homes Ltd

Project Title: 3 Lavant Road, Chichester, PO19 5QY

Drawing Title: Site Topographical Layout Plan

| Scale | Date | Drawn |
|---|---|---|
| 1:200 @A1 | 03.2024 | CG |

| JOB No. | DRAWING No. | Rev. |
|---|---|---|
| HA24-276 | S010 | |

# APPENDIX C
## FOUL AND SURFACE WATER DRAINAGE STRATEGY


| REV. No. | DATE | DESCRIPTION | DRAWN | CHECKED |
|---|---|---|---|---|

Client: Hestia Homes

Project: No.3 Lavant Road Chichester, PO19 5QY

Title: Foul and Surface Water Drainage Strategy


MJA CONSULTING
CIVIL & STRUCTURAL ENGINEERS
Ipsum Court, 24 The Quadrant,
Abingdon Science Park, Abingdon
Oxon, OX14 3YS
*Tel:* 01235 555173
*Email:* mail@mjaconsulting.co.uk


| Scale: | 1:100 @A1 | Status: | PRELIMINARY |
|---|---|---|---|
| Drawn: CP | Project Engineer: CP | MJA Project No: 7173 | Date: March '24 |
| Drawing Number: 7173–MJA–SW–XX–DR–C–001 | | Rev: – | |

# APPENDIX D
## POST DEVELOPMENT ATTTENUATION CALCULATIONS

CELLULAR SOAKAWAY

| Project: | Date: | | |
|---|---|---|---|
| No.3 Lavant Road<br>Chichester | 20/03/2024 | | |
| | Designed by:<br>chrisp | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows<br>Storm Phase: Phase | Company Address: | | |

**Catchment Area**

Type : Catchment Area

| | |
|---|---|
| Area (ha) | 0.032 |

## Dynamic Sizing

| | |
|---|---|
| Runoff Method | Time of Concentration |
| Summer Volumetric Runoff | 1.000 |
| Winter Volumetric Runoff | 0.840 |
| Time of Concentration (mins) | 5 |
| Percentage Impervious (%) | 100 |

| | | | |
|---|---|---|---|
| Project:<br>No.3 Lavant Road<br>Chichester | Date:<br>20/03/2024 | | |
| | Designed by:<br>chrisp | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address: | | |

**Cellular Storage**

Type : Cellular Storage

## Dimensions

| | |
|---|---|
| Exceedance Level (m) | 31.550 |
| Depth (m) | 0.800 |
| Base Level (m) | 30.750 |
| Number of Crates Long | 6 |
| Number of Crates Wide | 12 |
| Number of Crates High | 2 |
| Porosity (%) | 95 |
| Crate Length (m) | 1 |
| Crate Width (m) | 0.5 |
| Crate Height (m) | 0.4 |
| Total Volume (m³) | 27.360 |

## Inlets

### Inlet

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

## Advanced

| | |
|---|---|
| Base Infiltration Rate (m/hr) | 0.036 |
| Side Infiltration Rate (m/hr) | 0.036 |
| Safety Factor | 2.0 |

| Project: No.3 Lavant Road Chichester | Date: 20/03/2024 | | |
|---|---|---|---|
| | Designed by: chrisp | Checked by: | Approved By: |
| Report Title: Rainfall Analysis Criteria | Company Address: | | |

| | |
|---|---|
| Runoff Type | Dynamic |
| Output Interval (mins) | 5 |
| Time Step | Default |
| Urban Creep | Apply Global Value |
| Urban Creep Global Value (%) | 0 |
| Junction Flood Risk Margin (mm) | 300 |
| Perform No Discharge Analysis | ☐ |

## Rainfall

### FSR

Type: FSR

| | |
|---|---|
| Region | England And Wales |
| M5-60 (mm) | 20.1 |
| Ratio R | 0.332 |
| Summer | ☑ |
| Winter | ☑ |

### Return Period

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

### Storm Durations

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

| Project: | Date: | | |
|---|---|---|---|
| No.3 Lavant Road<br>Chichester | 20/03/2024 | | |
| | Designed by:<br>chrisp | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase | Company Address: | | |

**Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow | Storm Event | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume ($m^3$) |
|---|---|---|---|---|
| Catchment Area | FSR: 100 years: +45 %: 15 mins: Summer | 0.03 | 23.9 | 10.785 |

| Project: No.3 Lavant Road Chichester | Date: 20/03/2024 | | |
|---|---|---|---|
| | Designed by: chrisp | Checked by: | Approved By: |
| Report Details: Type: Stormwater Controls Summary Storm Phase: Phase | Company Address: | | |

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

| Stormwater Control | Storm Event | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cellular Storage | FSR: 100 years: +45 %: 600 mins: Summer | 31.547 | 31.547 | 0.797 | 0.797 | 3.9 | 27.261 | 0.000 | 17.550 | 0.0 | 0.000 | 0.362 | OK |

| Project: No.3 Lavant Road Chichester | Date: 20/03/2024 | | |
|---|---|---|---|
| | Designed by: chrisp | Checked by: | Approved By: |
| Report Details: Type: Inflows Storm Phase: Phase | Company Address: | | |

**Catchment Area**

Type : Catchment Area

| | |
|---|---|
| Area (ha) | 0.026 |

## Dynamic Sizing

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

PERMEABLE PAVING

| | | | |
|---|---|---|---|
| Project:<br>No.3 Lavant Road<br>Chichester | Date:<br>20/03/2024 | | |
| | Designed by:<br>chrisp | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address: | | |

**Porous Paving**

Type : Porous Paving

## Dimensions

| | |
|---|---|
| Exceedance Level (m) | 32.500 |
| Depth (m) | 0.480 |
| Base Level (m) | 32.020 |
| Paving Layer Depth (mm) | 130 |
| Membrane Percolation (m/hr) | 1.0 |
| Porosity (%) | 30 |
| Length (m) | 16.100 |
| Long. Slope (1:X) | 1000.00 |
| Width (m) | 16.200 |
| Total Volume ($m^3$) | 27.386 |

## Inlets

### Inlet

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

## Advanced

| | |
|---|---|
| Base Infiltration Rate (m/hr) | 0.036 |
| Side Infiltration Rate (m/hr) | 0.036 |
| Safety Factor | 2.0 |
| Conductivity (m/hr) | 500.0 |

| Project: No.3 Lavant Road Chichester | Date: 20/03/2024 | | |
|---|---|---|---|
| | Designed by: chrisp | Checked by: | Approved By: |
| Report Title: Rainfall Analysis Criteria | Company Address: | | |

| | |
|---|---|
| Runoff Type | Dynamic |
| Output Interval (mins) | 5 |
| Time Step | Default |
| Urban Creep | Apply Global Value |
| Urban Creep Global Value (%) | 0 |
| Junction Flood Risk Margin (mm) | 300 |
| Perform No Discharge Analysis | ☐ |

## Rainfall

### FSR

Type: FSR

| | |
|---|---|
| Region | England And Wales |
| M5-60 (mm) | 20.1 |
| Ratio R | 0.332 |
| Summer | ☑ |
| Winter | ☑ |

## Return Period

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

## Storm Durations

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

| Project: No.3 Lavant Road Chichester | Date: 20/03/2024 | | |
|---|---|---|---|
| | Designed by: chrisp | Checked by: | Approved By: |
| Report Details: Type: Inflows Summary Storm Phase: Phase | Company Address: | | |

**Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow | Storm Event | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|---|---|---|---|---|
| Catchment Area | FSR: 100 years: +45 %: 15 mins: Summer | 0.03 | 19.4 | 8.765 |

| Project:<br>No.3 Lavant Road<br>Chichester | Date:<br>20/03/2024 | | |
|---|---|---|---|
| | Designed by:<br>chrisp | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase | Company Address: | | |

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

| Stormwater Control | Storm Event | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Porous Paving | FSR: 100 years: +45 %: 60 mins: Winter | 32.168 | 32.160 | 0.132 | 0.140 | 9.9 | 10.632 | 0.000 | 9.357 | 0.0 | 0.000 | 61.177 | OK |

# APPENDIX E
## PUBLIC SEWER RECORDS

0 50m Dig Sites Area: Line:

Measurements scaled from this plan may not match measurements between the same points on the ground.

Butterfly Valve

Pressure Flow Valve

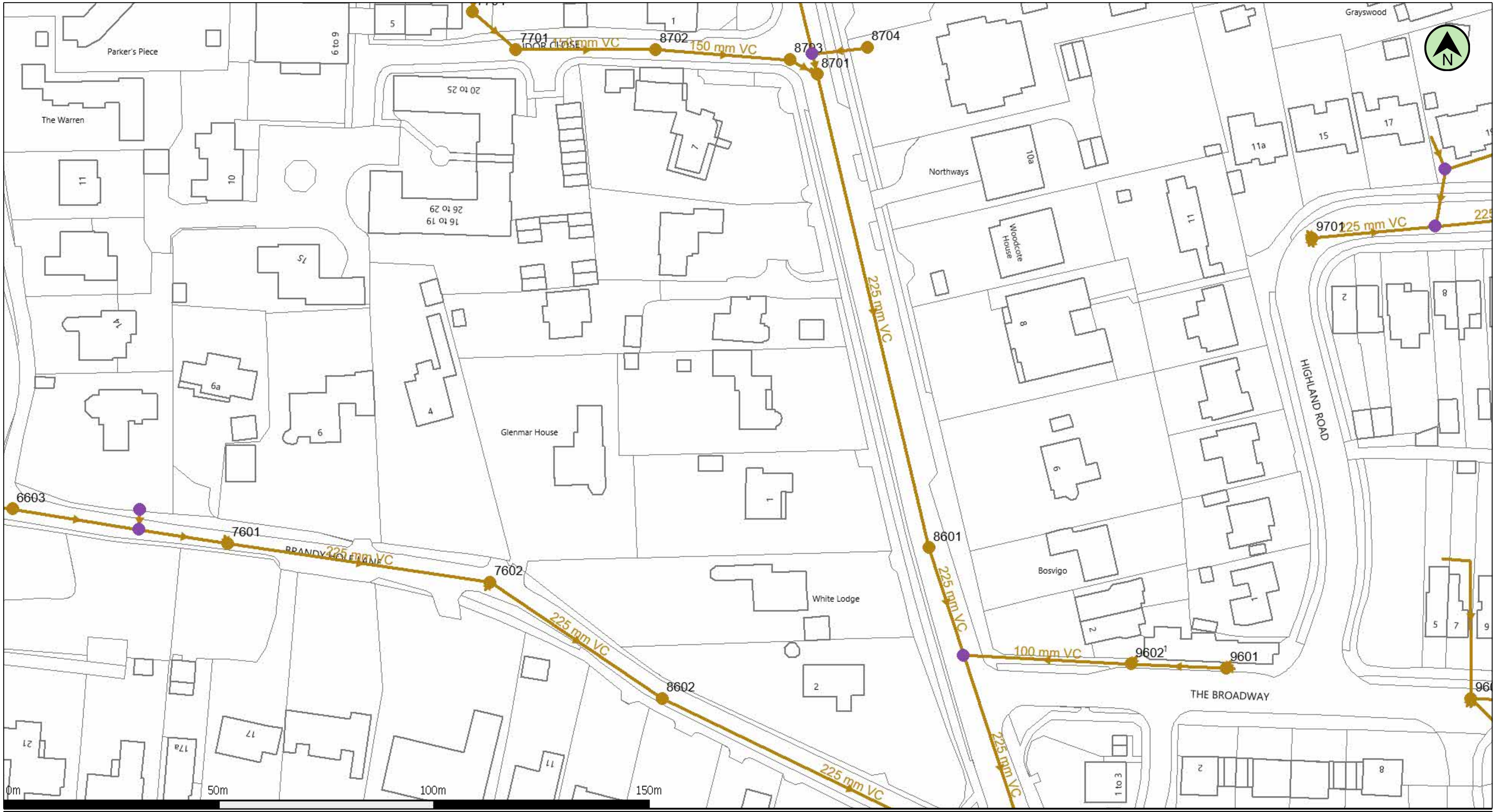
Meter

New Appointments & Variations
Assets within shaded area please contact: Leep Utilities
Email: water@leeputilities.co.uk
Tel: 0345 122 6780

The information supplied is given in good faith as a guide to locating underground apparatus. Its accuracy cannot be guaranteed, nor does it include comprehensive information about the existence or location of service pipes or cables to individual premises. The responsibility for locating and avoiding damage to apparatus on site shall be that of the person proposing to excavate in the street who shall be liable to the apparatus owner and any third party who may be affected in any way for any loss or damage caused by their failure to do so.

Portsmouth Water

Registered Office
P.O. BOX NO. 8, West Street, Havant,
Hampshire. PO9 1LG.
Registered in England No. 2536455
Telephone: (023) 9249 9888
Fax: (023) 9245 3632
Website: www.portsmouthwater.co.uk




 Date: 02/11/23 Scale: 1:1250 Map Centre: 485831,106676 Data updated: 21/08/23 Our Ref: 1311855 - 8 Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

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

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

payments.utilitysolutions@atkinsglob

213358

WATER for LIFE from Southern Water.

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 6603 | F | 32.21 | 0.00 | - |
| 7601 | F | 32.21 | 29.24 | - |
| 7602 | F | 32.08 | 29.01 | - |
| 7701 | F | 32.92 | 31.14 | - |
| 7704 | F | 0.00 | 0.00 | - |
| 8601 | F | 32.54 | 30.00 | - |
| 8602 | F | 32.07 | 28.85 | - |
| 8701 | F | 33.16 | 30.60 | - |
| 8702 | F | 32.94 | 30.90 | - |
| 8703 | F | 32.97 | 30.66 | - |
| 8704 | F | 0.00 | 0.00 | - |
| 9601 | F | 32.10 | 30.93 | - |
| 9602 | F | 32.16 | 30.62 | - |
| 9603 | F | 32.05 | 30.27 | - |
| 9701 | F | 32.53 | 30.65 | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|

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