

**FLOOD RISK ASSESSMENT
& SURFACE WATER DRAINAGE STRATEGY
FOR THE PROPOSED RESIDENTIAL DEVELOPMENT
OF LAND AT**

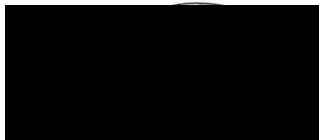
**ELMFIELD HOUSE
PETERSFINGER ROAD
SALISBURY
WILTSHIRE
SP5 3BZ**

NOVEMBER 2023

Issue Record

Project No.	Document Title
23010	Flood Risk Assessment & Surface Water Drainage Strategy

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1.0 INTRODUCTION

1.1 Brief

- 1.1.1 TDS Consultancy Ltd has been appointed by James Burton Construction & Management Ltd on behalf of their client to prepare a formal Flood Risk Assessment & Surface Water Drainage Strategy in support of a Planning Application for the proposed residential development of land at Elmfield House, Petersfinger Road, Salisbury, Wiltshire, SP5 3BZ.

1.2 Report Structure

- 1.2.1 This report has been prepared for exclusive use by James Burton Construction & Management Ltd and their Client for the purpose of assisting them in evaluating the potential risk of flooding associated with the site and in support of the planning application. TDS Consultancy accepts no liability for any use of this document other than by its client and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the client may copy (in whole or in part), use or rely on the contents of this document without the prior written permission of TDS Consultancy Ltd. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole.
- 1.2.2 TDS Consultancy has endeavoured to assess information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

This information includes:

- Proposed Site Plan 963-07 provided by Paul Stevens Architecture Ltd
 - Existing Topographic Survey provided by Paul Stevens Architecture Ltd
 - Environment Agency Flood Mapping and Flood Risk Assessment protocol
 - Infiltration testing and groundwater monitoring carried out by James Burton Construction & Management Ltd
 - Wiltshire Council - Control of Surface Water Discharge from New Developments Betterment Policy
 - British Geological Survey Mapping
- 1.2.3 This flood risk assessment addresses the flood risk posed to and from the proposed Development. This report has been undertaken with the assumption that the site will be developed in accordance with the proposals detailed in Section ?? without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.
- 1.2.4 The comments and opinions contained in this report including any conclusions are based on the information available to TDS Consultancy Ltd during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. TDS Consultancy Ltd. accept no liability should

this prove to be the case, nor if additional information exists or becomes available with respect to this site.

- 1.2.5 TDS Consultancy Ltd. makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, TDS Consultancy Ltd. are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.
- 1.2.6 This report is a Flood Risk Assessment and Sustainable Drainage strategy of flooding and drainage related issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2.0 SITE CONTEXT

2.1 Site Location

- 2.1.1 The site is located at Elmfield House, Petersfinger Road, Salisbury, Wiltshire, SP5 3BZ. The National Grid Reference for the site is centred on 416268E, 129190N. A site location plan is provided in Appendix 1.

2.2 Site Characterisation / Land-Use

- 2.2.1 Elmfield House is an existing residential property fronting Petersfinger Road. This is connected to Yew Tree Cottage. The latter is to be retained by the Client as their personal dwelling and falls outside of the planning application red line boundary.
- 2.2.2 The property is accessed off the southern side of Petersfinger Road via a private gravel driveway that sweeps round to the northeast elevation of Elmfield House.
- 2.2.3 The remainder of the site within the redline planning boundary is made up of paddocks containing grass, trees and dense vegetation. There is a dry watercourse that splits the site in half with a bridge over to provide access to the paddocks.
- 2.2.4 The dry watercourse runs west to southeast through the site of dense vegetation and trees and then beneath Southampton Road before reemerging in Petersfinger Farm and then continues south and then west along the southern boundary of the Farm prior to discharging to the River Avon, approximately 290m south of the Farm.
- 2.2.5 This watercourse noted above forms part of a wider system of watercourses and ditches downstream used to provide a water source for the historical agricultural land. Water is no longer fed into this watercourse or ditches which took water back to the River Avon system to the south. As such this system now simply drains the land over which it covers.
- 2.2.6 Other than the water and drain system in the area and the River Avon mentioned above, there are no significant surface water features in the vicinity of the site.
- 2.2.7 To the south/southeast, the site is bounded by Southampton Road (the A36), with Petersfinger Farm located to the southeast with the remainder of land being paddocks and open grassland.
- 2.2.8 To the north/northeast, the site is bounded by several residential dwellings on the northern side of Petersfinger Road.
- 2.2.9 To the west / northwest, the site is bounded by Salisbury “Park and Ride” car park.
- ### **2.3 Topography**
- 2.3.1 A topographic survey of the site was produced by Paul Stevens Architecture Ltd dated April 2023. The survey is provided in Appendix 1.

- 2.3.2 The overall fall of the site is in a south/south westerly direction from levels of around 46.8m above Ordnance Datum (AOD) along the northern and northeastern boundary to levels of 43.8m along the southern boundary. Levels along the south east boundary are around 44.5m.

Land along the south / southeastern boundary of the site is then banked up towards Southampton Road, which is at levels of between 45.0m and 45.8m AOD adjacent to the northeastern part of the site.

2.4 **Geology**

- 2.4.1 British Geological Survey mapping shows the site to be underlain by a bedrock geology of the Newhaven Chalk Formation, with a superficial geology of clay, sand and gravel present.
- 2.4.2 This is generally a permeable geology; thus, a ground investigation has taken place at the site with a copy of the trial pit logs and test locations provided in Appendix 3.
- 2.4.3 3 trial holes were excavated across the site and show after the initial 600mm of dark loamy topsoil and chalk was removed, the underlying formation was a mixture of loose chalk and waterlogged gravel to a depth of between 0.7m to 1.5m below ground level. The trial holes also recorded groundwater strikes, with groundwater levels in all trial holes settling at 0.7m below ground level.
- 2.4.4 It should however be noted that these trial holes were excavated in May 2023 and whilst outside of the time year where wet conditions could generally be expected, there had been a period of prolonged wet weather, thus the groundwater strike are likely to be above normal levels.
- 2.4.5 The testing concluded that infiltration tests for surface water design and percolation tests for foul drainage field design had to be aborted given the higher than expected groundwater levels.

2.5 **Hydrogeology**

- 2.5.1 Based on information obtained through the British Geological Surveys website the site is located on a Principal Aquifer, with the Newhaven Chalk formation being classed as a Principal Aquifer.
- 2.5.2 There are a number of groundwater abstractions located within 1km of the site and the site is not within a Source Protection Zone (SPZ).

2.6 **Hydrology**

- 2.6.1 The River Avon is located to the south of the site, approximately 650m from the southern boundary of the site.

2.7 Public Sewers

2.7.1 Foul Sewers

There are no foul sewers in the vicinity of the site and most properties in this location are served by private foul treatment systems.

Wessex Water have advised that the closest point of discharge from this site is to the Salisbury, Petersfinger Sewage Treatment Works.

2.7.2 Surface Water Sewers

There are no surface water sewers in the vicinity of the site.

Wessex Water and the Lead Local Flood Authority (LLFA) advise that surface water run-off will need to be managed in accordance with the SuDs hierarchy and National Planning Policy Framework (NPPF). This involves considering a suite of SuDs components to be considered and included in the proposals for the capture, storage and discharge of surface water run-off. Discharge rates and volumes will need to be agreed and approved by the LLFA.

2.8 Site Drainage

2.8.1 Foul Drainage

Foul drainage from Elmfield House / Yew Tree Cottage currently discharges to a septic tank.

2.8.2 Surface Water Drainage

It is assumed that surface water from the undeveloped area of the site currently drains primarily via infiltration and evapotranspiration, whilst the existing impermeable area of 445m² associated with existing buildings, namely Elmfield House and outbuildings (Appendix 2) discharges through infiltration to ground.

3.0 SCOPE OF FLOOD RISK ASSESSMENT

3.1 Scope of Assessment

3.1.1 The detail and complexity of a Flood Risk Assessment should reflect the level of risk to the site and:

- be proportionate to the risk and appropriate to the scale, nature and location of the site;
- consider the risk of flooding arising from development in addition to the risk of flooding to the site;
- take the impacts of climate change into account;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- consider the vulnerability of those that could occupy and use the site, taking account of the vulnerability, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development or land use;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of development may affect drainage systems;
- be supported by appropriate data and information, including historical information on previous events.

4.0 FLOOD STATUS (Sources of Flooding to NPPF)

- 4.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

These are noted as:

- Fluvial (Rivers)
- Flooding from the Sea (Tidal Flooding)
- Flooding from Land
- Flooding from rising groundwater
- Flooding from blocked, overloaded, or burst sewers and water mains
- Flooding from Reservoirs, Canals, or other artificial sources

4.2 Fluvial Flooding

- 4.2.1 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding.
- 4.2.2 The Environment Agency's Flood Map for Planning (Appendix 3) indicates that the site lies completely in Flood Zone 1, thus at low risk of fluvial flooding (less than 1 in 1000) with no areas of Flood Zone 2 or Flood Zone 3 in the vicinity of the site.
- 4.2.4 The overall fluvial flood risk to the site is therefore considered to be low.

4.3 Flooding from the Sea

- 4.3.1 The second form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from the sea.
- 4.3.2 The site is located well inland and with ground levels in excess of 43.5m AOD is not considered to be at significant risk of flooding from the sea.

4.4 Flooding from Land

- 4.4.1 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.
- 4.4.2 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.
- 4.4.3 Petersfinger Road lies immediately north of the site and surface water from the road is drained to a highway drainage system through road gullies. There is an

embankment rising up from the road on the northside with residential properties beyond. There is a low risk of surface water run-off entering the site in the event the highway drainage system became overwhelmed or blocked through lack of maintenance, although flows are likely to travel in a northwest to southeast direction along the road.

- 4.4.4 Southampton Road along the southern boundary of the site is higher than this site and would channel any flows into the highway drainage. Land to the south of Southampton Road is lower and largely permeable agricultural land where significant overland flows are unlikely to develop or if they did, would be flowing away from this site.
- 4.4.5 Land to the west and northwest of the site is the Salisbury "Park and Ride" car park and it must be assumed has a surface water drainage system suitable to contain peak rainfall events within the boundary of the site and designed drainage system.
- 4.4.5 The Environment Agency Surface Water Flood Risk Map indicates the site to be at a very low risk of flooding from surface water.

4.5 Flooding from Rising Groundwater

- 4.5.1 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.
- 4.5.2 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land.
- 4.5.3 The underlying geology is a permeable geology and groundwater water noted at a depth of 0.7m below ground level during the ground investigation undertaken at the site (Appendix 4). It is however considered unlikely that groundwater levels would rise to surface level under any circumstances. Should groundwater levels rise outflow would currently occur to the south of the site which would take water towards the dry watercourse.
- 4.5.4 It is not considered that the site is at any significant risk of flooding from rising groundwater.

4.6 Flooding from blocked, overloaded, or burst sewers and water mains

- 4.6.1 The fifth form of flood risk to be considered in accordance with the National Planning Policy Framework is the risk of flooding from blocked, overloaded, or burst sewers and water mains.
- 4.6.2 Should a sewer become blocked or overloaded, or should a water main burst on Petersfinger Road any water would simply flow northwest to southeast along the

road to a low point where the end of the road meets Southampton Road. Thus, no significant impact upon the site, in a similar way as detailed in relation to any potential overland flows.

- 4.6.3 Should a sewer become blocked or overloaded, or should a water main burst on Southampton Road any water would simply flow south away from the site, without having any significant impact upon the site, in a similar way as detailed in relation to any potential overland flows.
- 4.6.4 The overall risk of flooding from blocked, overloaded, or burst sewers and water mains is therefore considered to be low.

4.7 Flooding from Reservoirs, Canals or other artificial Watercourses

- 4.7.1 The last form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from reservoirs, canals or other artificial sources.
- 4.7.2 There are no reservoirs or artificial sources of water in the vicinity of the site considered to pose a flood risk to the site, and Environment Agency mapping indicates that the site is not at a significant risk of flooding from any reservoir.

5.0 DEVELOPMENT AND FLOOD RISK GUIDANCE

5.1 CIRIA Guidance

5.1.1. CIRIA publication 'C624 Development and Flood Risk – Guidance for the Construction Industry', defines three levels of FRA which can be undertaken:

FRA Level	Description / Scope
Level 1	Screening Study to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information, including the SFRA, Environment Agency Flood Map and Standing Advice. The Screening Study will ascertain whether a FRA is required.
Level 2	Scoping Study to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding or that the site may increase flood risk due to increased run-off. This Study should confirm the sources of flooding which may affect the site and should include the following: an appraisal of the availability and adequacy of existing information; a qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere; an appraisal of the scope of possible measures to reduce the flood risk to acceptable levels. The Scoping Study may identify that sufficient quantitative information is already available to complete a FRA appropriate to the scale and nature of the development.
Level 3	Detailed Study to be undertaken if the Level 2 FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site. The Study should include: quantitative appraisal of the potential flood risk to the development; quantitative appraisal of the potential impact of development site on flood risk elsewhere; quantitative demonstration of the effectiveness of any proposed mitigation measures.

Table 1: Levels / Scope of Flood Risk Assessment

This is a Level 1 report.

6.0 SOURCES OF INFORMATION

6.1 Records Reviewed

6.1.1 The information contained in this report is based on a review of existing information.

6.1.2 The following key reports and websites have been reviewed as part of this study:

Report/Website	Author	Date
Wiltshire Council Level 1 Strategic Flood Risk Assessment (SFRA)	JBA Consulting	May 2019
Salisbury District Council Level 2 Strategic Flood Risk Assessment (SFRA)	Halcrow Group Ltd	September 2009
Salisbury Surface Water Management Plan, intermediate Assessment of Groundwater Flooding Susceptibility, Phase 2, and plans	URS Scott Wilson	November 2011
Flood map for planning on the Environment Agency's website	Environment Agency	Accessed: 16 October 2023

7.0 DEVELOPMENT PROPOSALS

7.1 Proposed Scheme (Paul Stevens Architecture Ltd Drawing Reference: 963-07)

- 7.1.1 The proposal involves a Full Planning Application for the erection of 15 dwellings for C3 use, and conversion of the existing Elmfield House building to provide an additional 6 dwellings for C3 use, along with the development of associated access roads and parking areas on land at Elmfield House, Petersfinger Road, Salisbury. A copy of the proposed site layout is provided in Appendix 5.
- 7.1.2 As detailed in Section 4 there are no significant sources of flood risk to the site, and therefore specific finished floor levels are not required on flood related grounds and no flood resistant or resilient construction is required for the new buildings.
- 7.1.3 General good practice will however be followed during the detailed design phase with finished external levels designed to ensure that flow paths are available around and between buildings with finished floor levels set sufficiently above adjacent ground levels in order that water will not pond in the vicinity of access points or enter the dwellings under any circumstances.
- 7.1.4 The main flood risk related issue associated with the proposed development is therefore ensuring that there is no adverse impact upon the off-site risk of flooding as a result of the impermeable area to be provided at the site increasing run off onto surrounding land, and thereby increasing the offsite risk of flooding.
- 7.1.5 To ensure this does not occur the use of Sustainable Urban Drainage Systems (SuDS) has been considered at an early stage. Details of the proposed system and associated calculations are provided in Section 8.0 for the drainage areas based upon the development layout which is shown on the proposed drainage area plan provided in Appendix 6 and are tabulated as follows:

IMPERMEABLE AREAS		
CATCHMENT 1	ROOF AREAS	1154m ²
	ACCESS ROAD	531m ²
	FOOTWAYS	78m ²
	PRIVATE DRIVEWAYS (INC. FOOTPATHS)	445m ²
	COMMUNAL GRAVEL FOOTPATH	131m ²
	PATIOS	521m ²
	TURNING HEAD / PARKING	500m ²
	TOTAL	3360m²

IMPERMEABLE AREAS		
CATCHMENT 2	ROOF AREAS	690m ²
	ACCESS ROAD	216m ²
	FOOTWAY	62m ²
	PRIVATE DRIVEWAYS	278m ²
	PATIOS	333m ²
	TURNING HEAD / PARKING	259m ²
	TOTAL	1838m²

7.1.6 The impermeable areas have been detailed as two catchments given the dry watercourse (drain) divides the site and this methodology best reflects pre and post development.

8.0 SUSTAINABLE DRAINAGE STRATEGY

8.1 Point of Discharge

- 8.1.1 In line with the surface water run off hierarchy, the preferable means of disposal for surface water is via infiltration or re-use.
- 8.1.2 An attempt was made to undertake infiltration testing at the site, with test holes excavated at three locations as detailed in Appendix 4. These had to be aborted after the excavations were completed, as groundwater was encountered which eventually settled at a depth of 0.7m below ground level. Photographs of the trial holes can be viewed in Appendix 4.
- 8.1.3 Given that 1 m freeboard is required as a minimum between the base of any infiltration system and the groundwater table, the use of infiltration systems would be unsuitable on this site. As such, an alternative discharge point should be considered in line with the drainage hierarchy.
- 8.1.4 The second preferable discharge point in line with the drainage hierarchy is to discharge to a watercourse. Surface water discharge from the site will therefore be made to the existing watercourse that runs through the site from the northwest to the southern boundary.
- 8.1.5 Further details relating to the proposed discharge rates, attenuation volumes, sustainable drainage systems, pollution treatment, and future management/maintenance are provided in the following sections.

8.2 Proposed Discharge Rates

- 8.2.1 The method used to calculate the greenfield run-off rate to use for assessing the requirements for limiting discharge flow rates and attenuation storage for the site has been determined from the total site area defined by the “redline” boundary being considered for planning and development. It is not possible to consider a relationship between the pre and post development impermeable areas, given large areas of public open space cannot be removed from the calculations due to proposed landscaping which could affect run-off characteristics.
- 8.2.2 The total site area of 1.05Ha has initially been used to obtain the greenfield run-off rate for assessing the requirements for limiting discharge flow rates and attenuation storage. This is detailed in 7.2.3 below. However, the site is divided into two catchments, either side of the dry watercourse running through the site.

Catchment 1 has a total area of 0.642Ha

Catchment 2 has a total area of 0.363Ha

The dry watercourse has a total plan area of 0.045Ha.

- 8.2.3 Drainage calculations (Appendix 7) for the total site area of 1.05 Ha show the 1 in 1 year greenfield discharge rate from the site to be 2.013 litres per second (l/s), rising to 5.280 l/s during a 1 in 30 year event and 7.458 l/s during a 1 in 100 year event. The rural QBAR discharge rate is 2.37 l/s and the urban QBAR discharge rate is 2.37 l/s.
- 8.2.4 Drainage calculations (Appendix 8) for Catchment 1 show the 1 in 1 year greenfield discharge rate from this area to be 1.23 l/s, rising to 3.23 l/s during a 1 in 30 year event and 4.56 l/s during a 1 in 100 year event. The rural QBAR discharge rate is 1.45 l/s and the urban QBAR discharge rate is 1.45 l/s.
- 8.2.5 Drainage calculations (Appendix 9) for Catchment 2 show the 1 in 1 year greenfield discharge rate from this area to be 0.70 l/s, rising to 1.83 l/s during a 1 in 30 year event and 2.58 l/s during a 1 in 100 year event. The rural QBAR discharge rate is 0.82 l/s and the urban QBAR discharge rate is 0.82 l/s.
- 8.2.6 Wiltshire Council state that for development that were previously developed, the peak runoff rate from the development must be as close as reasonably practicable to the greenfield runoff rate from the development but should not exceed the rate of discharge from the development prior to redevelopment. Generally, a 20% betterment is expected.
- 8.2.7 It is therefore considered appropriate to restrict post development discharge rates to the greenfield QBAR discharge rate of 2.0 l/s during all events up to and including a 1 in 100 year plus 40% climate change event.
- Restricted discharge rate for Catchment 1 – 1.45 l/s
 - Restricted discharge rate for Catchment 2 – 0.82 l/s

Consideration will need to be made during the detailed drainage design stage on the optimum discharge rates for any flow control device. All parties should adopt a risk-based approach: what is the risk of flooding downstream versus the risk of blockage. Is the risk of blockage greater than the risk of downstream flooding? The answer to this will determine the minimum flow rate and flow control device to be specified.

- 8.2.8 Based upon the development layout, post development the proposed vehicular access, pedestrian access ways, communal parking, roof areas, private driveways and patios will occupy a total area of approximately 0.52Ha.
- 8.2.9 Drainage calculations (Appendix 10) indicate that to restrict discharge from an impermeable area within Catchment 1 of 0.34Ha to a maximum discharge rate of 1.45

l/s during a 1 in 100 year plus 45% climate change, 6 hour storm event will require an attenuation volume of 301m³ to be provided at the development.

8.2.10 Drainage calculations (Appendix 11) indicate that to restrict discharge from an impermeable area within Catchment 2 of 0.18Ha to a maximum discharge rate of 0.82 l/s during a 1 in 100 year plus 45% climate change, 6 hour storm event will require an attenuation volume of 162m³ to be provided at the development.

8.3 SuDS Systems Proposed and Infiltration Calculations

8.3.1 Living/green roof systems are a preferred SuDS technique, as they are not just a flood reduction measure but also reduce pollution through filtration and provide a landscape and wildlife benefit. The design of the buildings will have pitched roofs, thus green roofs will not be suitable in this instance, whilst roofs may also be designed as lightweight structures which would also prevent the use of green roofs.

8.3.2 Water re-use systems such as water butts are a preferred drainage system as they reduce the demand upon potable water. As such the inclusion of such systems will be considered further at the detailed design phase.

8.3.3 Attenuation provided in such systems will however not be counted towards that required to accommodate the design rainfall event prior to infiltration as the systems may already be full at the time a rainfall event occurs.

8.3.4 Basins, ponds and swales are considered a preferred SuDS feature as they provide both a flood and pollution reduction measure whilst also giving rise to a landscape/wildlife benefit.

8.3.5 No swales will be provided on the site given the only location deemed suitable and in keeping with the landscaping and site layout would mean encroaching on tree root protection zones. The groundwater level in these locations would also hinder storage and flow routes.

8.3.6 Permeable paving is a SuDS technique that is appropriate to use at most developments, and provides both a flood reduction benefit due to the attenuation provided in the sub-base and a pollution reduction benefit due to the filtration of water as it passes through the permeable surfacing.

8.3.7 In Catchment 1, permeable paving (block pavers) will be used on the lower section of the access road (232m²) and the private driveways (320m²). The turning head / parking will be gravel filled permeable stabilisation grid (500m²). In Catchment 2, permeable paving (block pavers) will be used on the private driveways (278m²). The turning head / parking (259m²) will be gravel filled permeable stabilisation grid.

- 8.3.8 In Catchment 1, the main access road (288m²) from the entrance to the bridge and Catchment 2 (278m²) from the bridge to the turning head / parking near Plots 5 & 6 will be constructed using an impermeable tarmac surface for structural reasons. However, this will drain via a conventional drainage system such as trapped gullies to the sub-base below, which will act in the same manner as the permeably surfaced sub-base. The sub-base is to be lined with an impermeable membrane in order to ensure that there is no ingress of water to the groundwater table below.
- 8.3.9 Discharge from the impermeable areas in Catchment 1 (3405m²) will be drained to the sub-base of the access road and turning head / parking. There will be some attenuation volume provided in the private driveways and footpaths to accommodate additional flows. This will either be directly or through a shallow below ground surface water drainage system.
- 8.3.10 The impermeable tarmac section of the access road in Catchment 1 will provide 56.5m³ of attenuation volume using a base material with a minimum void space of 30% and sub-base thickness of 600mm. The permeable block paved section of access road will provide 41.8m³ of attenuation volume using a base material with a minimum void space of 30% and sub-base thickness of 600mm. The turning head / parking area will utilise a 400mm deep attenuation crate system beneath providing an attenuation volume of 190m³.
- 8.3.11 The private driveways in Catchment 1 (320m²) will have a sub-base thickness of 350mm, thus based upon a void space of 30%, will provide an attenuation volume of 33.6m³, whilst the 131m² of footpaths will have a sub-base thickness of 230mm (similar to that required for structural reasons) and will provide an additional attenuation volume of 9m³ based upon a void space of 30%.
- 8.3.12 As such a total attenuation volume of 330.1m³ can be provided by the proposed sustainable drainage systems, which exceeds the 301m³ drainage calculations indicate is required to sufficiently restrict discharge from an impermeable area of 0.34Ha to 1.45 l/s during a 1 in 100 year plus 45% climate change, 6 hour event.
- 8.3.13 Discharge from the impermeable areas in Catchment 2 (1838m²) will be drained to the sub-base of the access road and turning head / parking. There will be some attenuation volume provided in the private driveways and footpaths to accommodate additional flows. This will either be directly or through a shallow below ground surface water drainage system.
- 8.3.14 The impermeable tarmac section of the access road in Catchment 2 will provide 166.8m³ of attenuation volume using a base material with a minimum void space of 30% and sub-base thickness of 600mm. The turning head / parking area will provide 46.6m³ of attenuation volume using a base material with a minimum void space of 30% and sub-base thickness of 600mm.

- 8.3.15 The private driveways in Catchment 2 (278m²) will have a sub-base thickness of 350mm, thus based upon a void space of 30%, will provide an attenuation volume of 29.1m³.
- 8.3.16 As such a total attenuation volume of 242.5m³ can be provided by the proposed sustainable drainage systems, which exceeds the 162m³ drainage calculations indicate is required to sufficiently restrict discharge from an impermeable area of 0.18Ha to 0.82 l/s during a 1 in 100 year plus 45% climate change, 6 hour event.
- 8.3.17 The Surface Water Drainage Strategy (Appendix 10) outlines the proposals for this development. Full detailed design of the surface water drainage system will only take place once conditional planning approval has been granted. The final detailed design will however be based upon this Sustainable Drainage Strategy and designed to accommodate all rainfall during a 1 in 100 year plus 45% climate change rainfall event whilst infiltration takes place. It has been clearly demonstrated that the proposed development can be drained in accordance with all national and local requirements.

8.4 SuDs Treatment Stages

- 8.4.1 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge.
- 8.4.2 Drainage from all parking areas will initially be through permeable paving which provides a filtration system removing pollutants such as hydrocarbons and provides the first treatment stage for drainage from all lightly trafficked areas.
- 8.4.3 A second treatment stage will then be provided by filtration through the geotextile (such as Terram) in which the storage beneath will be wrapped in an impermeable membrane, removing further pollutants from discharge and ensuring that surface water from these areas is suitably treated in line with requirements prior to discharge.
- 8.4.4 Surface water from roof areas is considered clean discharge, thus only requires one treatment stage. Surface water from roof areas discharging to the sub-base of the access roads and permeable paved driveways will be treated by filtration through the geotextile in which the storage beneath the permeable surfaced areas will be wrapped in an impermeable membrane.
- 8.4.5 Discharge from the main access road which may be impermeable for structural reasons will be through conventional drainage systems incorporating features such as smart sponges located within gullies or deep pot trapped gullies absorbing pollutants such as hydrocarbons and oils prior to discharge.

- 8.4.6 Appropriate treatment will therefore be provided to all surface water discharge from the proposed development.

8.5 Exceedance Flows

- 8.5.1 On the occasion that a rainfall event exceeding the design 1 in 100 year plus climate change rainfall event occurs, external levels will be designed to ensure additional water is channelled in the direction of the dry watercourse and to the lower sections of the site allowing ponding along the southern boundary for a short time whilst flows recede by entering the section of open dry watercourse downstream of the new culvert and through the onsite drainage system.
- 8.5.2 During the detailed design stage of the drainage system, finished floor levels of the new dwellings will be set at a higher level than the routes indicated to control exceedance flows. Special attention will be paid to kerb heights, vehicle crossing and property boundaries, to ensure conveyance of surface water is managed with minimal impact on the development.

8.6 Maintenance of SuDS Systems

- 8.6.1 A Management Company will be employed to work together with several other responsible bodies for various aspects of the proposed surface water drainage system to be provided at the development with a full maintenance plan provided in Appendix 12.
- 8.6.2 Property owners / tenants / agents will be provided with their role and responsibilities for maintaining the individual drainage elements on their property to ensure continued performance of the surface water drainage system with clear guidance on the operational practices that are permitted for mitigating risk to the wider surroundings.

9.0 CONCLUSIONS

- 9.1 The proposal involves a Full Planning Application for the erection of 15 dwellings for C3 use, and conversion of the existing Elmfield House building to provide an additional 6 dwellings for C3 use, along with the development of associated access roads and parking areas on land at Elmfield House, Petersfinger Road, Salisbury.
- 9.2 The site is shown on the Environment Agency Flood Map as lying completely in Flood Zone 1.
- 9.3 In accordance with The National Planning Policy Framework the development is of a 'less vulnerable' classification, which is appropriate in Flood Zone 1 without the need for an Exception Test whilst the Sequential Test is automatically passed.
- 9.4 All sources of potential flood risk to the proposed site have been considered in Section 4, and there are no significant risks of flooding to the site, thus minimum finished floor levels are not necessary and no flood resilient or resistant construction is required.
- 9.5 Trial hole data confirms a perched water table of 0.7m below ground level in the southern section of the site so it is considered that infiltration systems will not be feasible in this instance as no systems could achieve the clear 1m freeboard from the base.
- 9.6 Surface water discharge from the proposed development will be to the dry watercourse (drain) running through the site in line with the Drainage Hierarchy.
- 9.7 Post development discharge rates will be restricted to the urban QBAR discharge rate for each catchment either side of the dry watercourse. Catchment 1 – 1.45 l/s and Catchment 2 – 0.82 l/s during all events up to and including a 1 in 100 year event with a 40% allowance for climate change, with details of systems provided and attenuation required provided in Section 7.
- 9.8 The greenfield run-off rate for the whole site of 1.05Ha contained within the redline planning boundary calculated a QBAR of 2.37 l/s and a rate of 2.013 l/s for the 1 in 1 year event. The catchment rates in 9.7 above, have been applied for attenuation volume calculations. The LLFA may require these to be adjusted pro-rata to reflect a maximum 2 l/s discharge rate. However, it was decided that the low discharge rates could increase the risk of blockages occurring in any flow control device.
- 9.10 Adequate treatment will be provided to all surface water prior to discharge.
- 9.11 Details of maintenance of all drainage systems are detailed in the maintenance plan provided in Appendix 12.
- 9.12 Full detailed drainage design will take place once conditional planning approval has been granted.

- 9.13 There are no flood risk or drainage related grounds under The National Planning Policy Framework on which to object to the proposed C3 residential development at Elmfield House, Petersfinger Road, Salisbury.

APPENDIX 1
SITE LOCATION PLAN
& TOPOGRAPHIC SURVEY

APPENDIX 2

EXISTING IMPERMEABLE AREAS PLAN

APPENDIX 3
ENVIRONMENT AGENCY
FLOOD MAPPING

Flood map for planning

Your reference	Location (easting/northing)	Created
23010	416276/129192	16 Oct 2023 9:21

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

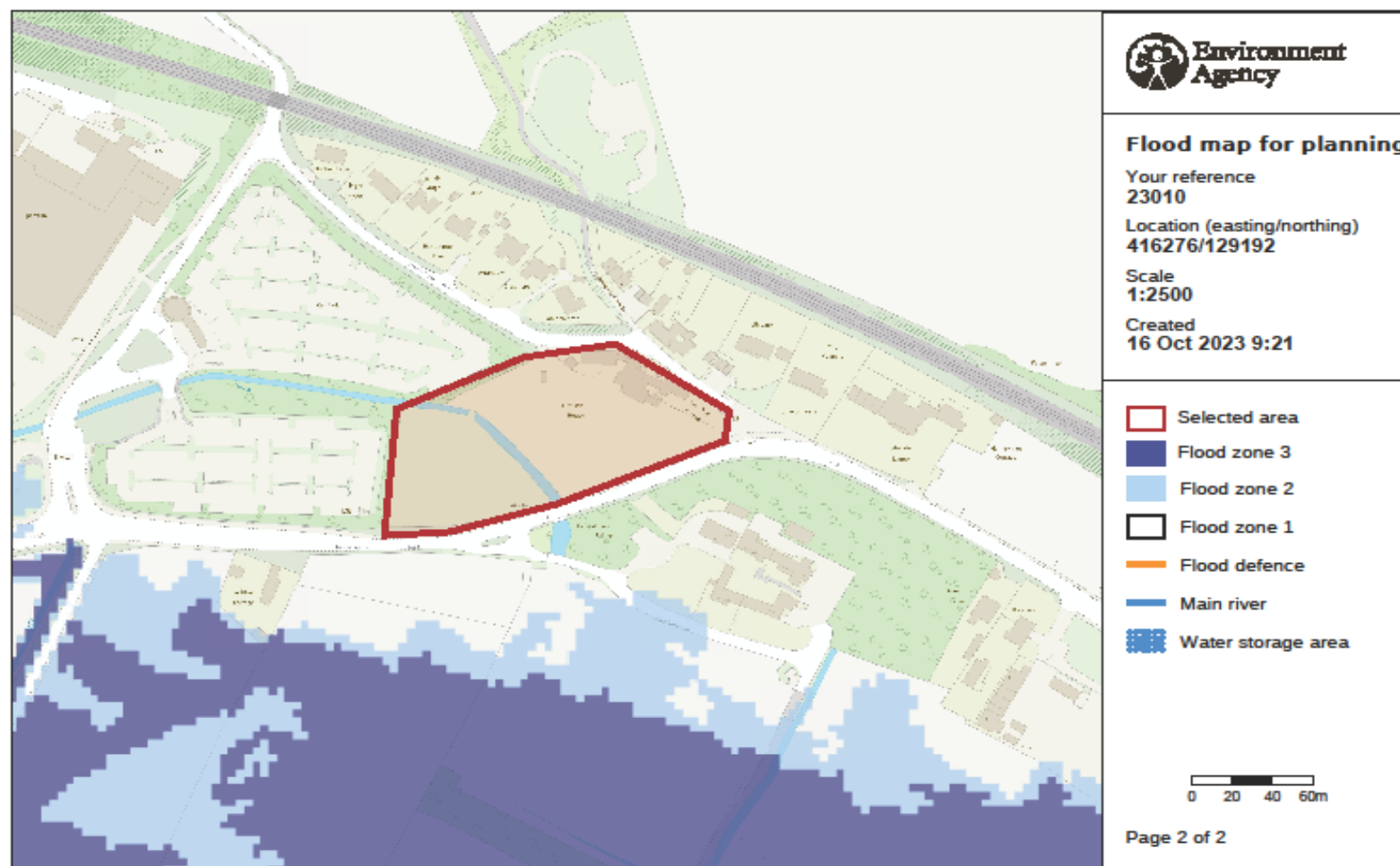
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

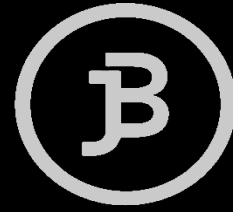
Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



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APPENDIX 4
SITE INVESTIGATION
TRIAL HOLE REPORT



JAMES BURTON
CONSTRUCTION

Percolation & Infiltration Test Report

The Paddocks- Elmfield Development Site
22nd May 2023

JAMES BURTON CONSTRUCTION AND MANAGEMENT LIMITED

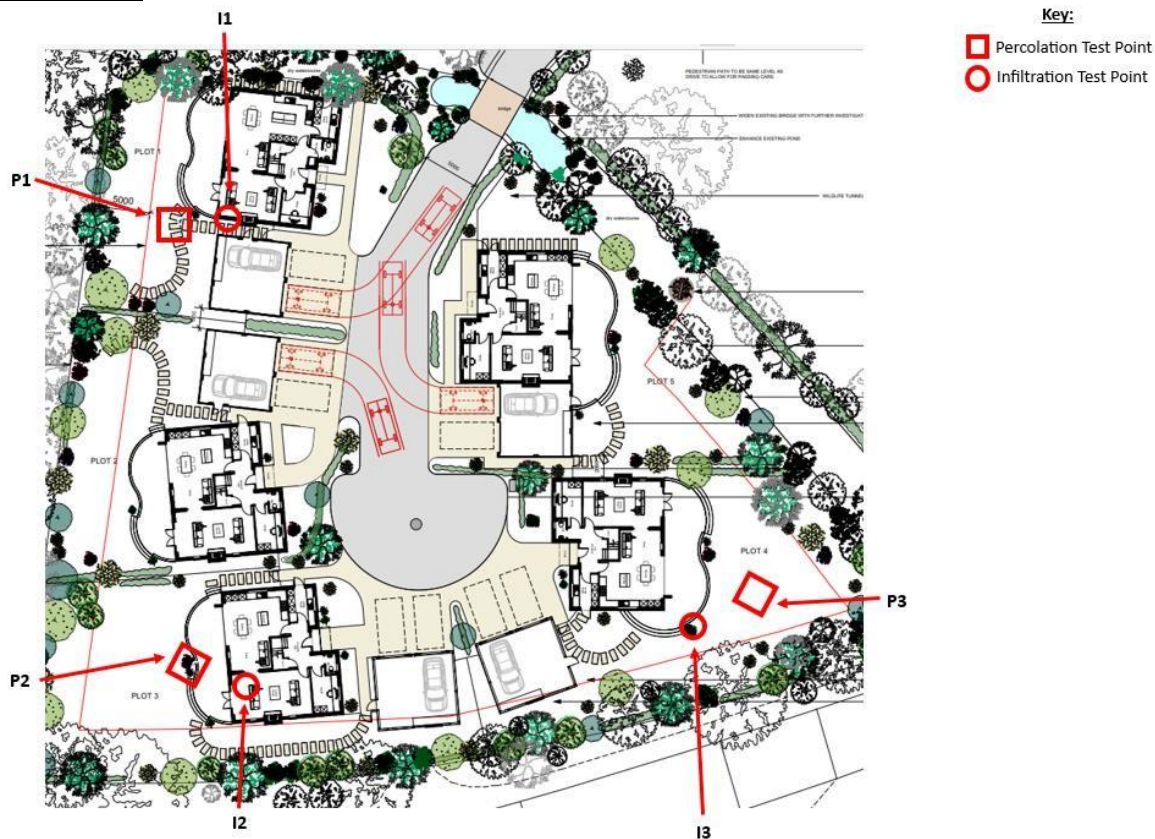
Overview

The following document outlines our findings while performing both percolation and infiltration tests at the Elmfield development site on the 22nd of May 2023.

The Elmfield site lies to the east of Salisbury and borders the A36 Southampton Road to the south and Petersfinger road to the north. The surrounding area comprises of mixed commercial, residential, and agricultural land.

Our tests were carried out in the area known as the paddocks, which is the lowest lying part of the development on the southernmost point of the site. The area in which our test holes were excavated is enclosed on all sides with established native trees, with a clearing in the centre earmarked for the construction of 5 detached dwellings. The ground itself is covered in scrub vegetation.

Test Locations



Three locations were chosen within the paddock area where possible soakaways may be installed, for the infiltration tests to be carried out. These are marked as P1-P3 on the above map and suitable locations no closer than 6m were selected to perform percolation tests to deem the feasibility of any foul drainage field should the need arise. These are marked as I1-I3 accordingly.

Industry Standard Methods Used Soakaway

Infiltration test

Excavate a soakage trial pit to the same depth as anticipated for the full-size soakaway, for initial trial.

This will be 1 to 1.5 m below the invert level of the drain discharging to the soakaway.

If invert level is unknown, take invert level to be 600mm below ground level.

The trial pit should be in the same position or as near as possible to the same position as the proposed soakaway.

If groundwater is encountered in the trial pit, the depth to groundwater should be recorded.

Groundwater should not encroach within 1m of the base of a soakaway.

If groundwater is found, adjust the depth of the trial pit to be 1m above groundwater level.

The trial pit should be 1.5m wide and 1.5 m long. It should have vertical sides trimmed square.

Measure the pit carefully before trials.

The inflow should be rapid so that the pit can be filled to its maximum effective depth in a short time, i.e.: to the design invert level of the drain to the soakaway.

A lot of water will be used to determine the soil infiltration rate so a water bowser may be needed. It may help to line the trial pit with plastic membrane to aid filling, this should be removed at the start of the test.

Fill the pit to the invert level and allow it to drain three times to near empty, the three fillings should be on consecutive days but can be on the same day.

Record the time taken for the water to drain from the trial pit.

This should be at regular intervals sufficiently close together to clearly define water level versus drainage time.

The easiest way to record empty time is to use a measuring rod marked off at equal 10% intervals.

The measurable length should be the same as the depth between the proposed invert level and the base of the soakaway.

As the water drains away record the time taken from start to finish.

Record cumulative time in minutes at each mark on the measuring rod, starting at 00:00.

The soil infiltration rate is calculated from the time taken for the water level to fall from 75% to 25% of the effective storage depth in the pit.

If a large area is proposed for use as a soakaway field a series of trial pits should be used at 10m spacing.

Record the weather conditions at the time of the test.

Percolation Test Method to Calculate Area of Drainage Field.

Step 1: Excavate a test hole 300mm square x 300mm deep below proposed invert level of the drainage field trench bottom.

Step 2: Fill the test hole with water and allow drain away overnight.

Step 3: Refill to a depth of 300mm and note time taken in seconds to drain away from 75% full to 25% full (i.e., 150mm drop in level from 225mm to 75mm)

Step 4: Repeat the procedure in two more test holes and calculate the average of the three results as follows: test 1 + test 2 + test 3 = average 3 time taken.

Step 5: Calculate the V_p (average time in seconds for the water to drop 1mm) as follows:

For example: If average time above took 2700 seconds.

(i) Divide 2700 seconds by 150mm depth of water

(ii) $2700 = 18 V_p^*$ (see note below*)

150

(iii) Area of trench = number of persons to use property $\times V_p \times 0.25$

Therefore: 5 persons $\times 18 \times 0.25 = 13.5\text{m}^2$ of effluent drain required.

(iv) To calculate actual length of trench, divide 13.5 by width of the trench required therefore: $13.5\text{m}^2 = 22\text{m}$
(Minimum permitted area is 30m 0.6m wide long x 0.6m wide)

* V_p should range between 12 and 100 to be successful, otherwise the system should be designed by a drainage specialist.

Infiltration Tests

Excavations of the test pit were done on Thursday 18th May 2023, as an invert level was unavailable the recommended 600mm below ground level was used, an area 3m x 3m was stripped off.

The invert level that will be used will be no deeper than 600mm but for the purpose of producing accurate results this depth was deemed appropriate.

The ground stripped of consisted of a dark rich loamy topsoil, at the depth of the intended invert the ground conditions changed to a loose bound chalk.



From the invert depth and area measuring 1.5m x 1.5m was again excavated to a depth of 1.5m as the ground was removed the chalk held together well although in pits P1 and P3 at a depth of 700mm we encountered pockets of loose waterlogged gravel. The video link below shows the excavation in progress.

<https://www.youtube.com/shorts/Bd8ciQoPiJ8>

All 3 test sites were excavated on the 18th May 2023 ready for test to be conducted over the period 19th May to the 21st May. Over the course of the excavation, water started to enter the test pits and within an hour of completing the first, pit it had filled with ground water. This was the same with all excavations P1, P2, and P3.



In normal circumstances should the levels allow us, we would increase the height of the proposed soakaway and carry out the tests 1m above the groundwater level. Unfortunately, in this instance ground water settled at a depth of 700mm below the current finished site level so the tests were unable to be performed.

Percolation Tests

Three areas were selected to perform the percolation tests. Due to site limitations on the 19th May (there were reptile mats in place across the site), the tests were located at a distance of 6m from each of the excavations that took place on the 18th of May.

We excavated the topsoil to the invert level, (600mm) giving us clear access to dig by hand a pit measuring 300mm x 300mm x 300mm.



As with the percolation tests, once we broke through the chalk subsoil the pits started to fill and within the hour ground water had settled to a depth consistently 700mm below the current finished site level.

Conclusion

In conclusion to both tests carried out, it is evident that a traditional surface water or foul water discharge system may not be achievable within the area of The Paddocks in its current form, the above findings will be passed to relevant parties and discussions opened about the options available to the Elmfield Development company.

APPENDIX 5
PROPOSED SITE LAYOUT

APPENDIX 6

PROPOSED HARDLANDSCAPING AREAS

& CATCHMENTS



- CATCHMENT 1
- CATCHMENT 2

P1 Issued for Planning		01/10/23	TDS
REV	DESCRIPTION	DATE	BY
Status			
PLANNING ISSUE			
TDS Civil Engineering Design Consultants		Norton House 12 Norton Road Basingstoke Hants RG24 0EX T: +44 (0)1252 805648 E: info@tdsconsultancy.com www.tdsconsultancy.com	
Client			
Elmfield Spinney Developments Ltd			
Job Title			
Elmfield House Petersfinger Salisbury SP5 3BZ			
Drawing Title			
PROPOSED HARDLANDSCAPING AREAS & CATCHMENTS			
Scale: 1:250 A1 1:500 A3		Date: OCTOBER 2023	
Drawn: TDS		Checked: Approved	
Dwg No: 23010 - 901		Rev: P1	

APPENDIX 7

DRAINAGE CALCULATIONS

GREENFIELD RUN-OFF RATE FOR THE WHOLE SITE
(REDLINE PLANNING BOUNDARY)



MasterDrain
HY 11.0

TDS Consultancy Limited

www.tdsconsultancy.co.uk

15 Newton Rd
Canford Cliffs,
Poole BH13 7EX
Tel: 01202 809548 Mob: 07894984828
email: tim@tdsconsultancy.co.uk

Job No.	23010		
Sheet no.	1		
Date	31/10/23		
By	Checked	Reviewed	
TDS			

Project Elmfield House, Petersfinger Road, Salisbury, SP5 3BZ

Title loH 124 (Qbar(urban))Runoff cales for TOTAL SITE (REDLINE BOUNDARY)

Hydrological Data:-

FSR Hydrology:-

Location = SALISBURY

Grid reference = SU1429

MS-60 (mm) = 19.3

x = 0.36

Soil runoff = 0.30

SAAR (mm/yr) = 840

WRAP = 2

Area = England & Wales

Hydrological area = 7

Hydrological zone = 8

Soil classification for WRAP type 2

- i) Very permeable soils with shallow ground water;
- ii) Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; (fragipan - a natural subsurface horizon having a higher bulk density than the solum above. Seemingly cemented when dry but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled and slowly or very slowly permeable to water. It is found in profiles of either cultivated or virgin soils but not in calcareous material).
- iii) Moderately permeable soils, some with slowly permeable subsoils.

Design data:-

Area = 0.010496 Km² - 1.05 Ha - 10496 m² % Urbanisation = 0.00%

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(urban)} = Q_{BAR(rural)} (1 + URBAN)^{2NC} [1 + URBAN \{ (21/CIND) - 0.3 \}]$$

where:-

NC varies with the value of SAAR:-

for 500<SAAR<1100 mm then NC = 0.92 - 0.00024SAAR

for 1100<SAAR<3000 mm then NC = 0.74 - 0.000082SAAR

$$CIND = 102.4SOIL + 0.28(CWI - 125) \quad CWI = \text{Catchment Wetness Index}$$

so

$$CIND = 20.975 \quad CWI = 90.198 \quad NC = 0.718$$

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.021

$$Q_{BAR(rural)} = 2.368 (1/s)$$

$$Q_{BAR(urban)} = 2.368 (1/s)$$

$Q_{BAR(urban)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication WS-074/A.



MasterDrain
HY 11.0
Calculated data:-

TDS Consultancy Limited www.tdsconsultancy.co.uk		15 Newton Rd Canford Cliffs, Poole BH13 7EX Tel: 01202 809548 Mob: 07894984828 email: tim@tdsconsultancy.co.uk	Job No. 23010
			Sheet no. 2
			Date 31/10/23
Project	Elmfield House, Petersfinger Road, Salisbury, SP5 3BZ		By
Title	IoH 124 (Qbar(urban))Runoff cales for SALISBURY		TDS
		Checked	Reviewed

Mean Annual Peak Flow $Q_{BAR(urban)} = 2.37 \text{ l/s}$

Values for $Q_{BAR(urban)}$

Ret. per.	m ² /hr	l/s	l/s/ha	Ret. per.	m ² /hr	l/s	l/s/ha
1yr	7.245	2.013	1.917	100yr+20%	32.219	8.950	8.527
2yr	7.501	2.084	1.985	100yr+30%	34.904	9.696	9.237
5yr	10.910	3.031	2.887	100yr+40%	37.589	10.441	9.948
10yr	13.808	3.836	3.654	200yr	31.537	8.760	8.346
30yr	19.008	5.280	5.030	200yr + 30%	40.999	11.388	10.850
50yr	22.332	6.203	5.910	500yr	38.271	10.631	10.128
100yr	26.849	7.458	7.106	1000yr	43.982	12.217	11.640

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.88	1.28	1.62	2.23	2.62	3.15	3.70	4.49	5.16

The above is based on the Institute of Hydrology Report 124 to which you are referred for further details (see Sect 7). Note that the 200 year growth curve was taken from W5-074/A.

For WRAP type 1 soils, CIND can become negative for lower values of SAAR. In this case the CIND value is multiplied by -1 to return a positive value (CIND is very small at this point).

APPENDIX 7

DRAINAGE CALCULATIONS

GREENFIELD RUN-OFF RATE FOR CATCHMENT 1

APPENDIX 12
SuDS MAINTENANCE PLAN

SuDS Maintenance Plan for the Proposed
Development at
Elmfield House, Petersfinger Road, Salisbury
SP5 3BZ

Contents

- 1 Introduction to SuDS
- 2 SuDS at Elmfield House, Petersfinger Road, Salisbury, SP5 3BZ
- 3 Managing the SuDS
- 4 Key Factors to be Considered During Maintenance
- 5 SuDS and Landscaping Maintenance - Summary
- 6 SuDS Features Checklist
- 7 Sustainable Drainage Maintenance Specification

1 Introduction to SuDS

SuDS are a new environmentally friendly approach to managing rainfall that uses landscaping features to deal with surface Water. SuDs aim to:

- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2 SuDS at Elmfield House, Petersfinger Farm, Salisbury, SP5 3BZ;

SUDS are engineered solutions that aim to mimic natural drainage processes. They help to reduce pollution of watercourses and localised flooding, as well as providing amenity benefit and biodiversity. Swales are open depressions in the landscape that collect, clean and store water in a natural way and can provide amenity and wildlife benefits for the community, a swale will therefore be provided in the landscaped area at the development.

Permeable surfaces allow water to percolate through a pervious surface into voided construction below to allow cleaning and storage

3 Managing the SuDS -

Communal SuDS — Drainage systems and SuDS serving the 15 dwellings in C3 use, along with drainage systems and SuDS located in communal areas of the development (shared private parking) will be the responsibility of a Management Company (TBC) to maintain.

Private Property SuDS — Drainage systems and SuDS located within property boundaries of C3 dwellings (permeable block paving) are the responsibility of the property owner.

Pervious surfaces combines hardstanding with SuDS and is designed to allow rainfall to percolate immediately through the surface near to where the raindrop lands. The water flows into a specially prepared sub-base, where the voids between the stones act as a temporary reservoir. Maintenance of the pavement is carried out to ensure the infiltration of the paving is not compromised as follow;

- A visual inspection of the paving should be carried out on a regular basis. This will confirm the effectiveness of the agitation maintenance due to variations between sites and allow any refinement of the regular agitation activity if necessary.
- The paving should be agitated (ie - brushed, vacuumed, etc) at least twice a year. This is to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this activity should be carried out in the spring and autumn seasons.

- The paving should be inspected after any heavy precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
- Where non-infiltration systems have been employed, the inspection of the outfalls should be undertaken initially on a twice-yearly basis.
- Weed growth — when sedimentation occurs in areas of permeable paving then there is the potential for weed growth, this will typically occur where there are overhanging trees or soft landscaping slopes down on to the paving or in areas which do not receive over run from vehicles particularly frequently. Weeds can be removed from the surface through the application of weed killers. Glyphosate based weed killers are the most common for general purpose use, they are most effective on grasses and perennial weeds with non-woody stems. Weeds should be sprayed when they are actively growing so that the Glyphosate will go down to the root and kill the weed completely

4 Key Factors to be Considered During Maintenance -

- Undesirable plants — all efforts should be made to prevent drains becoming blocked and the growth of unintentional vegetation which could be detrimental to the intentional plant regime, biodiversity aims and the building fabric.
- Regular site attendance for litter collection, grass cutting and checking of inlets, outlets and control structures.
- Occasional visits to remove silt from source control features.
- Drain heads and outlets — all drainage points must be checked every year and cleared out if necessary to ensure optimum performance.

4 SuDS and Landscaping Maintenance — Summary -

	REGULAR MAINTENANCE	Frequency	Unit Rate	Total
1	LITTER MANAGEMENT			
1.1	Pick up litter in SuDs and Landscape areas and remove from site.	12 visits monthly		
2	GRASS MAINTENANCE - all cutting to wildlife piles.			
2.1	Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ.	as required or monthly		
2.3	Wildflower areas strimmed to 50mm on 3 year rotation 30% each year.	1 visit annually		
3	INLET AND OUTLETS			
3.1	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access.	monthly visits		
4	HARD SURFACES			
4.1	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	1 visit		
	OCCASIONAL TASKS			
5	INSPECTION AND CONTROL CHAMBERS			
5.1	Annual inspection, remove silt and check free flow.	1 visit		
6	SITE MANAGEMENT			
6.1	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows spread, rake and overseed.	As required		
7	NATIVE PLANTING			

7.1	Remove lower branches where necessary to ensure good ground cover to protect soil profile erosion.	1 visit annually		
	REMEDIAL WORK			
8	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required		

SuDS Features Checklist -

SuDS techniques include landscape features and control structures to manage runoff as it flows to site outfalls. The following lists the features which may be found on a site.

- Permeable surfaces as permeable block paving, porous Asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc.
- Inlets and outlets structures are often conveyance pipes protected with mesh guards. They must be free from obstruction at all times to allow free flow through the SuDS.
- Inspection Chambers and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

SuDS design usually avoids below ground structures such as gully pots, oil separators and other sumps, which are a wildlife hazard, often ineffective and expensive to maintain. SuDS design also reduces pipework, manholes and interceptors. However water may be conveyed in surface features like rills and channels with changes in level managed in spouts or cascades. These hard landscape features require standard landscape maintenance.

5 Sustainable Drainage Maintenance Specification -

5.1 GENERAL REQUIREMENTS

Maintenance activities comprise • Regular Maintenance Occasional Tasks • Remedial Work	Frequency
Generally Litter Collect all litter or other debris and remove from site at each site visit	Monthly

- Avoid use of weedkillers and pesticides to prevent chemical pollution.
- Avoid de-icing agents wherever possible to allow bio-remediation of pollutants in permeable surfaces.
- Protect all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

Exclusions:

- Maintenance of rainwater harvesting chambers, pumps, etc.

Grass Mow amenity grass access paths and verges surrounding swales and filter strips at 35-50mm minimum and 75mm maximum or as specified. Mow filter strips and swales at 100mm with 150mm maximum to filter and control runoff in normal grass swales removing first and last cut in season if grass is longer than 150mm removing cuttings to wildlife piles on site. Where marsh or wetland develops in the swale due to wet conditions then cut annually, or as required, at 100mm removing cuttings to wildlife piles on site.	Monthly or as required Monthly or as required Monthly or as required
Occasional Tasks	Frequency

Where there is a build-up of silt on the filter strip, swale, under-drained swale or at inlets, i.e. 50mm or more above the design level, then remove and spread on site. Undertake when ground is damp in autumn or early spring and transplant turf and overseed to original design levels.	As required
---	-------------

Spread excavated material on site above SuDS design profile, e.g. top of banks, in accordance with E.A. Waste Exemption Guidance.	
Remedial Work	Frequency
All damage to be made good to design profile unless there is a design flaw.	As required

5.2 PERVIOUS SURFACES

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity.

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
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 manufactures recommendations.
Occasional Tasks	Frequency
Stabilise and mow contributing adjacent areas	As Required
Removal of weeds or management using glyphosate applied directly to weeds by an applicator rather than spraying	As required — once per year on less frequently used pavements
Remedial Work	Frequency
Remediate any landscaping which, through vegetation maintenance or soil slip has been raised to within 50mm of the level of paving.	As Required
Remedial work to any depressions or rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As Required
Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
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, 18 hours after large storm in first six months

Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
Monitor inspection chambers	Annually

5.3 INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS

- Inlets and outlets structures may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.
- Inspection Chambers and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris.	Monthly Monthly
Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn .	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage.	As necessary
Remedial Work	
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary. Repair physical damage if necessary.	As required As required

5.4 SPILLAGE - EMERGENCY ACTION

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s)

downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

Contact the Environment Agency immediately.