

Westbury Road, Warminster

BDW Trading Ltd

**Flood Risk Assessment
&
Drainage Strategy**

December 2025



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Executive Summary

This site-specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance (PPG), and EA advice notes, and demonstrates that the proposed development will be safe from flood risk and that it will not increase flood risk elsewhere.

The site is located mostly within Flood Zone 1 with a low flood risk (less than 1:1,000 or 0.1% annual probability of flooding from rivers). The low parts of the site adjacent to the watercourse are Flood Zones 2 and 3 having a high risk of flooding. The proposed built development, access and level raising will only be in Flood Zone 1.

The proposed residential development is classified as 'More Vulnerable' and is in Flood Zone 1; the proposed residential development is suitable in this zone and the NPPF Sequential and Exception Tests are not required. Other less vulnerable uses will be in Flood Zones 2 and 3 in accordance with the NPPF/PPG compatibility.

The floor levels of all dwelling will be set a minimum of 600mm above the Flood Zone 2 flood level (0.1% or 1:1,000 annual probability flood event) and safe dry access/egress provided to all dwellings. Development levels will be designed to route surface water flows away from dwellings to protect them from flooding.

Flood risk from fluvial, pluvial, sewers, surface water, groundwater and artificial sources has been assessed and it has been demonstrated that the proposed development will not be at risk from flooding from all sources.

Surface water from the proposed development will discharge into the watercourse running through the site with the discharge limited to Qbar for events up to and including the 1:100 + 45% climate change/urban creep allowance event with 30% betterment provided for greenfield rates. This will ensure that flood risk is not increased in the receiving watercourses downstream of the development for the lifetime of the development.

Attenuation will be provided in a pond or basin with sewers discharging directly into it via precast concrete headwalls. Bank slopes will be 1 in 3 in accordance with The SuDS Manual Ciria C753. The maximum depth of attenuation available is 1.2m

Flood routes will be provided for exceedance events, or for local failure of the drainage system (blockage, damage, etc.), and will ensure that flood flows are directed safely through or around the development to the downstream drainage system and watercourse.

The use of SuDS will remove pollution from surface water run-off and improve water quality with additional SuDS features provided with practical.

The foul flows from the site will be pumped to the existing sewage network to the south in Westbury Road as confirmed by Wessex Water; full details of the connection will be agreed with Wessex Water.

The foul sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker to ensure that they will be maintained for the lifetime of the development.

The Flood Risk Assessment and Drainage Strategy demonstrate that the proposed development meets with all the national and local policy requirements and satisfies all the criteria of the Planning Authority, Lead Local Flood Authority, and Environment Agency.

The Flood Risk Assessment concludes that the site can be safely developed without flood risk and without increasing flood risk elsewhere through the use of an appropriately designed and maintained Sustainable Drainage System.

1. Introduction

This Flood Risk Assessment (FRA) has been prepared by Phoenix Design Partnership Limited on behalf of BDW Trading Ltd to support an Outline Planning Application for the proposed residential development at Land West of Westbury Road, Warminster.

The proposed development is approximately 10.4Ha and will involve the construction of a residential development of up to 205 no. dwellings, community hub, public open space, access, infrastructure and associated works with access from Westbury Road. See the Indicative Masterplan in Appendix A for details.

This site specific Flood Risk Assessment (FRA) has been produced in accordance with the National Planning Policy Framework document, Section 14 'Meeting the challenge of climate change, flooding and coastal change' and Planning Practice Guidance document 'Flood Risk and Coastal Change' together with Environment Agency FRA Guidance Notes.

A Flood Risk Assessment was previously prepared as part of a planning application ref PL/2021/09013. This new Flood Risk Assessment has been revised as follows:

- Latest Flood Maps from the Government website and Strategic Flood Risk Assessment
- Current Wiltshire LLFA guidance for drainage strategies
- Rainfall data changed to FEH
- Foul drainage strategy to show pumped connection to Wessex Water sewers
- Updated Flood Modelling for the existing watercourse
- Drainage strategy drawing to demonstrate that no built development is proposed within flood risk areas.
- Nutrient Mitigation ponds removed
- Updated National Planning Policy Framework (December 2024)
- Updated Planning Practice Guidance (September 2025)
- National standards for sustainable drainage systems

The FRA demonstrates that the site is suitable for development without flood risk and without causing an increase in flood risk to others, including allowances for climate change. It also demonstrates how SuDS will be used to manage surface water from the development, and to ensure that water quality is not adversely affected.

2. Policy & Guidance

2.1. National Planning Policy Framework (NPPF): 2024

As set out in paragraph 170 of the NPPF, all strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. Footnote 62&63 in the NPPF states that a site specific Flood Risk Assessment should be provided for all developments in Flood 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified within a strategic flood risk assessment as being at increased flood risk in the future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to caravan, camping or chalet site, or to a mobile home or park site, where the sequential and exception tests should be applied as appropriate.

Section 14 'Meeting the challenge of climate change, flooding and coastal change' sets out the government policies on development and flood risk.

2.2. Planning Practice Guidance: 2016 (Updated September 2025)

The Section 'Flood Risk & Coastal Change' (March 2014): The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are set out in the guidance which, in summary, are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

The section 'Climate Change' advises on how planning can identify suitable mitigation and adaptation measures in plan-making and the application process to address the potential impacts of climate change. Detailed guidance on climate change allowances for fluvial flows and rainfall intensity over the lifetime of development is included in the document 'Climate change allowances for planners' issued by the Environment Agency in September 2013.

The Section 'Water Supply, Wastewater & Water Quality' advises on how the Water Environment Regulations 2017 apply to surface waters (including some coastal waters) and groundwater (water below the surface of the ground). These regulations set out requirements to prevent the deterioration of aquatic ecosystems; protect, enhance and restore water bodies to 'good' status; and achieve compliance with standards and objectives for protected areas. Local planning authorities must, in exercising their functions, have regard to River Basin Management Plans. These plans contain the main issues for the water environment and the actions needed to tackle them.

Section 027 now states where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development.

2.3. Flood & Water Management Act 2010 (FWMA)

The FMWA provides legislation for better, more comprehensive management of flood risk. Changes to planning came in force in April 2015 requiring detail and SuDS now to be included in planning applications.

2.4. Wiltshire Core Strategy 2015

Core Policy 67: Flood Risk

Development proposed in Flood Zones 2 and 3 as identified within the Strategic Flood Risk Assessment will need to refer to the Strategic Housing Land Availability Assessment when providing evidence to the local planning authority in order to apply the sequential test in line with the requirements of national policy and established best practice.

All new development will include measures to reduce the rate of rainwater run-off and improve rainwater infiltration to soil and ground (sustainable urban drainage) unless site or environmental conditions make these measures unsuitable.

Core Policy 68: Water Resources

Development must not prejudice the delivery of the actions and targets of the relevant River Basin or Catchment Management Plan and should contribute towards their delivery where possible.

Non-residential development will be required to incorporate water efficiency measures. Developers will be expected to submit details of how water efficiency has been considered during the design of proposals.

Development proposals within a Source Protection Zone, Safeguard Zone or Water Protection Zone must assess any risk to groundwater resources and groundwater quality and demonstrate that these would be protected throughout the construction and operational phases of development.

2.5. Wiltshire Strategic Flood Risk Assessment (SFRA)

A Level 1 SFRA was undertaken by Scott Wilson with the final report data June 2009. The June 2009 SFRA was updated to reflect the amalgamation of the former districts into a single unitary authority Wiltshire Council and to reflect current guidance / policy. A Level 1 SFRA Update was produced by URS, dated July 2013.

The most recent Level 1 SFRA was produced by JBA, dated November 2024.

Further details of the findings of the SFRA are within Section 4 of this report.

2.6. National standards for sustainable drainage systems June 2025

National standards for SuDS were published in June 2025 for the application in the design of surface water drainage systems for new infrastructure and development. These state the criteria that a surface water drainage system should satisfy.

The guidance sets out details of 7 overriding standards that are complementary and provide multiple benefits. The guidance notes that there may be specific circumstances in which it is not possible to deliver one or more of the standards.

2.7. Ciria C753 'The SuDS Manual'

Ciria C753 'The SuDS Manual' published in 2015 (latest v6 2019) provides comprehensive guidance on the implementation of Sustainable Drainage Systems (SuDS) in the UK. C753 guidance should be used to help develop the strategy and design of the SuDS.

2.8. Ciria C635 'Designing for Exceedance'

Ciria C635 'Designing for Exceedance in Urban Drainage – Good Practice' published in 2006 provides guidance on the design and management of urban sewerage and drainage systems to reduce the impacts from drainage exceedance. C635 guidance should be used to help develop the strategy and design of the flood routes for the development.

2.9. Design and Construction Guidance

Sewers for Adoption 7th Edition published by Water UK in August 2012 has now been replaced by '*Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")*': November 2023 and provides guidance on the design and construction of foul and surface water drainage systems for adoption by Water Companies.

2.10. EA, Defra & DCLG

'Preliminary Rainfall Runoff Management for Developments' (R&D Technical Report W5-074/A/TR/1, Revision E) jointly published in January 2012 for the Department for Environment Food and Rural Affairs (Defra) and the Environment Agency (EA) provides advice on the Management of Stormwater Drainage for developments at Planning stage and in particular the preliminary sizing of storage for the control and treatment of storm water runoff.

2.11. Building Regulations Part H 2015 'Drainage & Waste Disposal'.

The above documents should be used to assist in the design of the drainage and SuDS.

2.12. BS 8582:2013 Code of practice for surface water management for development sites

'BS 8582:2013 Code of practice for surface water management for development sites' published in November 2013 by BSI Standards Limited gives recommendations on the planning, design, construction and maintenance of surface water management systems for new developments and redevelopment sites.

2.13. Non-Statutory Technical Standards for Sustainable Drainage Systems 2015

This document sets out the Non-Statutory Technical Standards for Sustainable Drainage Systems and should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance.

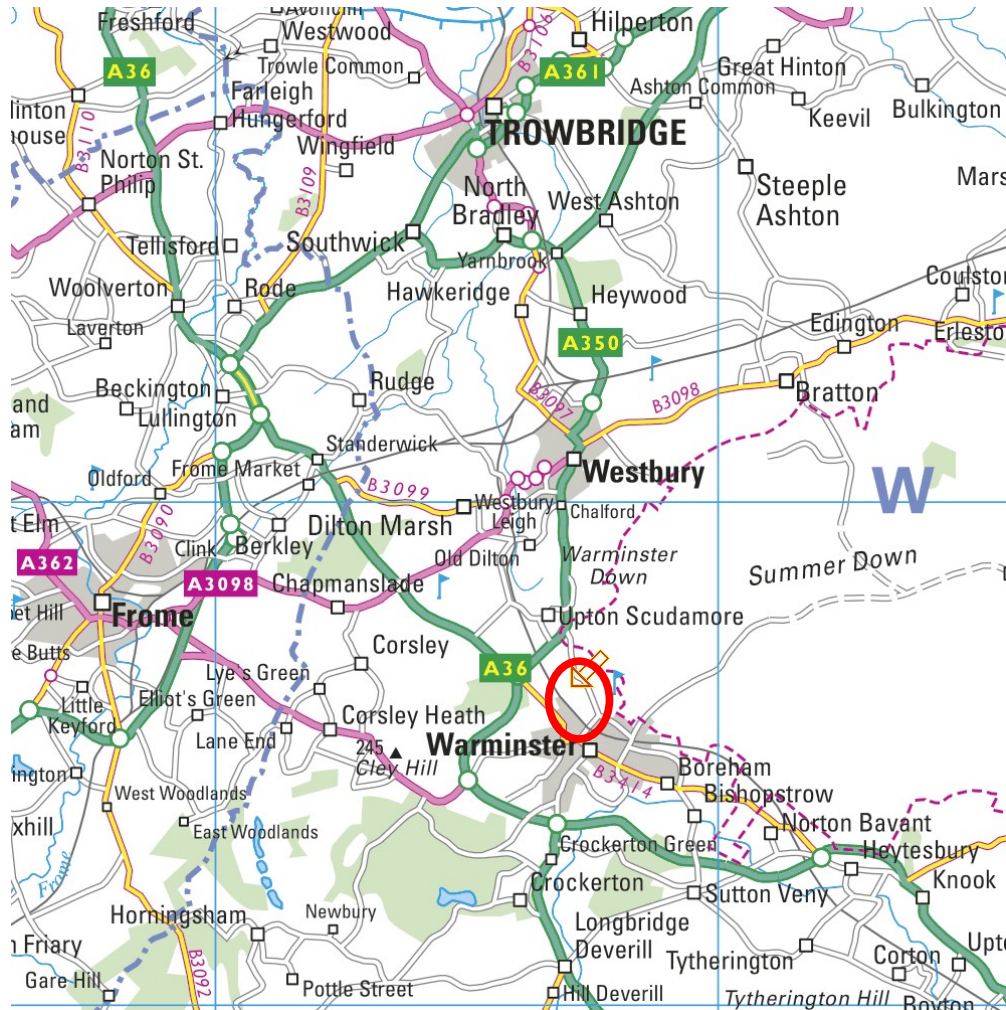
2.14. EA 'Flood risk assessments: climate change allowances' 2016 (Updated May 2022)

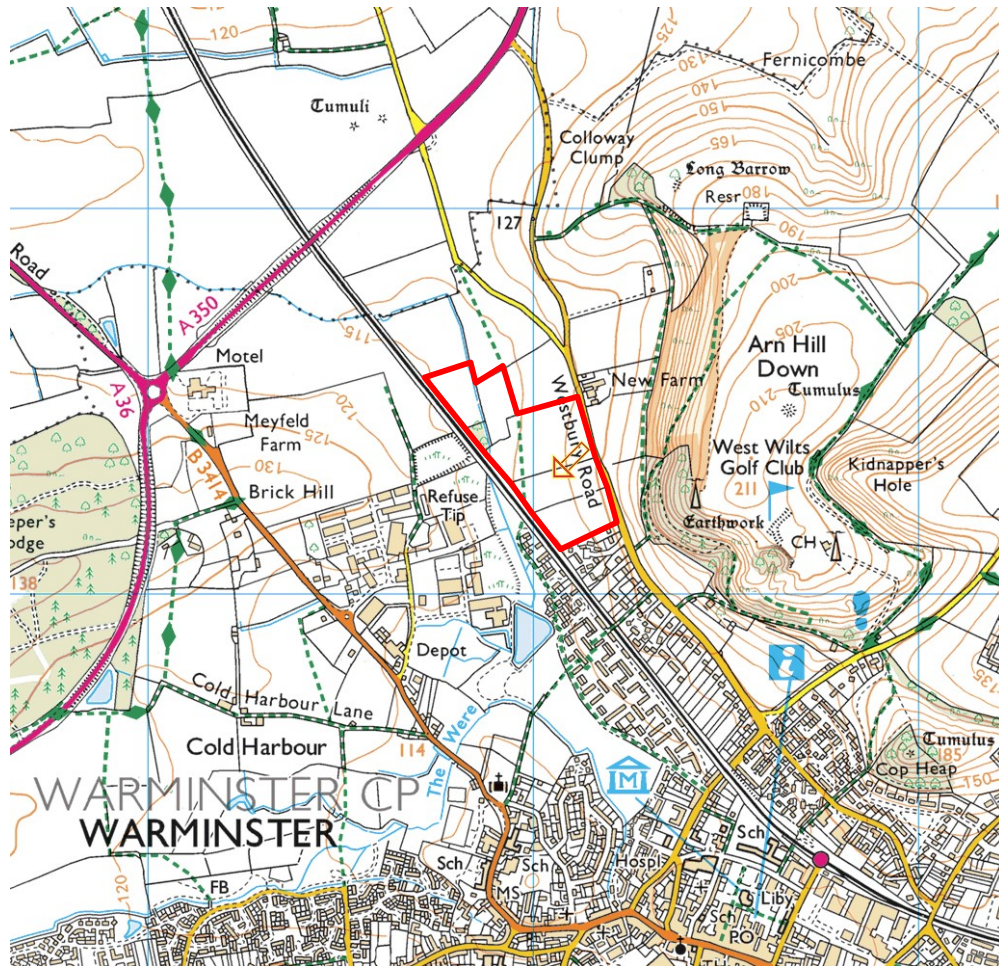
The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and supporting planning practice guidance on Flood Risk and Coastal Change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account. Local planning authorities refer to this when preparing local plans and considering planning applications. This advice updates previous climate change allowances to support NPPF. The Environment Agency (EA) has produced it as the government's expert on flood risk.

3. Existing Site Details

3.1. Site Location and Description

The site is located to the southwest of Westbury Road in the north of Warminster in Wiltshire. The location is indicated on the images below and the site centred OS Grid Co-ordinate is E387050, N146300.





The site is currently a green-field site of approximately 10.4Ha divided into several fields by hedges and a watercourse.

Immediately to the east is the Westbury Road with New Farm, Arn Down Hill, and the West Wiltshire Golf Club to the east; to the south are existing properties The Woodlands, and Lime Kiln Close; to the east is the Wessex Main Line Bristol to Southampton railway with commercial development west of the railway, Crusader Park; and to the north open fields.

A public right of way runs north/south through the site with an uncontrolled pedestrian crossing over the railway in the south to Arn View on the west side of the railway.

An unnamed watercourse flows from north to south through the site, a tributary of The Were. The watercourse runs through a culvert under the railway and south to The Were that then runs southeast through Warminster to the River Wylfe.

Westbury Road: Looking North with The Site on the left.



Westbury Road: Looking South with The Site on the right.



3.2. Topographical Survey

A Topographic Survey was undertaken by Anthony Brookes Surveys dated January 2021 and can be seen in Appendix B.

The site generally falls from the east towards the watercourse and the culvert under the railway. Levels vary from approximately 127mAOD in the east to approximately 113mAOD in the west. Slopes are generally from flat to 8% (1:12.5), with a small area in the southeast slightly steeper.

Details of the elevations and slopes are shown on the drawings shown below and included in Appendix B.

678-FRA-002	Existing Elevations
678-FRA-003	Existing Slopes
678-FRA-004	Existing Slope Arrows

3.3. Existing Hydrology

Details of the existing hydrology are shown on drawing 678-FRA-001 'Existing Hydrology and Flood Risk' included in Appendix C.

An unnamed ordinary watercourse flows through the site from the north and leaves the site through a culvert under the railway; catchment details shown below). The culvert is approximately 1.2m high by 1.0m width. The watercourse continues south from the west side of the railway to The Were which flows southeast to the River Wylfe approximately 2km south of the site. The Were and River Wylfe are both classified as main river and are the Environment Agency's responsibility. The unnamed watercourse is an ordinary watercourse and is the responsibility of Wiltshire Council as LLFA. The watercourse bed width is generally 0.7m – 1.5m, the depth is generally 0.6m – 1.0m, and bank slopes generally 1 in 1.

In addition to the watercourse there are a few shallow hedge/field boundary ditches generally less than 0.6m deep.

FEH Catchment: 7.17km² (717Ha)



3.4. The 'Winter Rain Acceptance Potential' (WRAP) Map

As shown below on the WRAP map extract the site is in Soil Class 1.



Soil class 1 has a general description as follows:

Well drained permeable sandy or loamy soils and shallower analogies over highly permeable limestone, chalk, sandstone or related drifts.

This indicates that ground conditions might support the use of infiltration; refer to Section 3.12 for details of Ground Investigations).

3.5. SAAR (Standard Average Annual Rainfall)

As shown on the map extract below the SAAR map indicates a Rainfall of 850mm



3.6. M5 60 Rainfall Map

The M5-60 Rainfall is estimated to be 19.0 as shown on the map extract below:



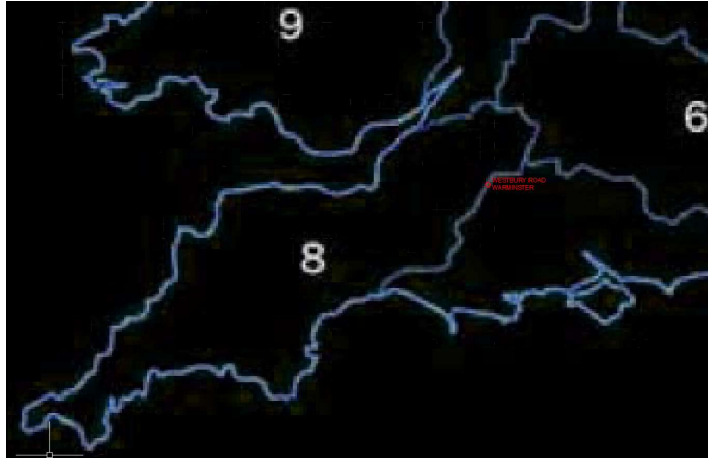
3.7. M5 60 Ration R Map

As shown below on the map extract the M5 60 R estimated to be 36 (0.36):



3.8. FSR region 60 Ration R Map

As shown on the map extract below the FSR map shows the site in Region 8

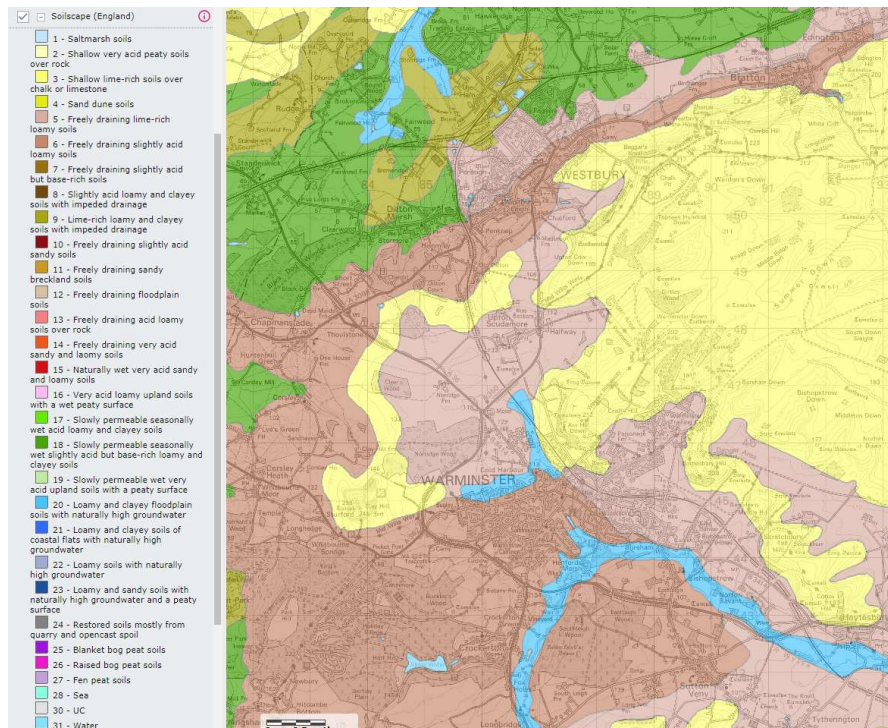


3.9. Soilscape – Soil Classification

The Soilscape Soil Classification map extract below shows the site to be in an area of:

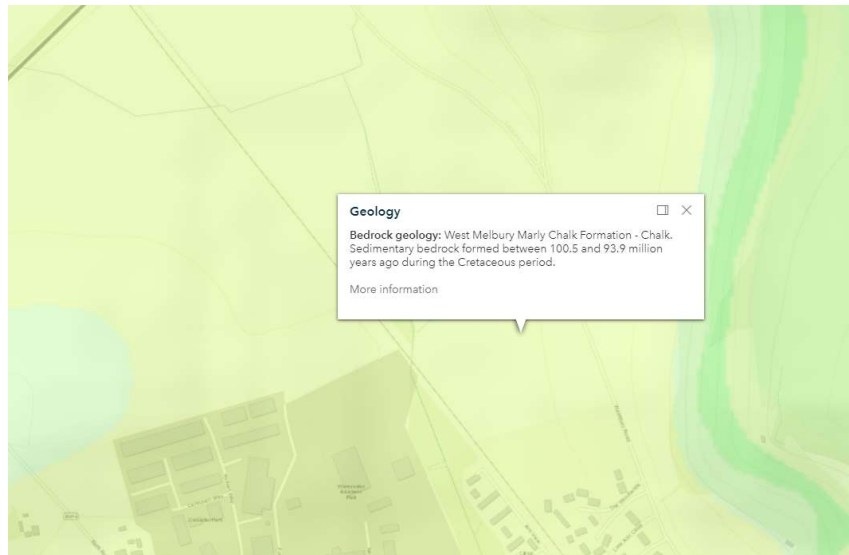
3 – Shallow lime-rich soils over chalk or limestone

20 – Loamy and clayey floodplain soils with naturally high groundwater



3.10. The British Geological Survey (BGS)

Geological Survey of Great Britain mapping indicates that the site lies predominantly within the West Melbury Marly Chalk Formation - Chalk.



The bedrock geology suggests that infiltration in the chalk formation might be possible.

The Superficial deposits mapping below shows the lower part of the site in the west adjacent to the watercourse to be Alluvium – Clay, silt, sand, and gravel.



The mapping for the superficial deposits suggests that the upper soils might be less suitable for infiltration.

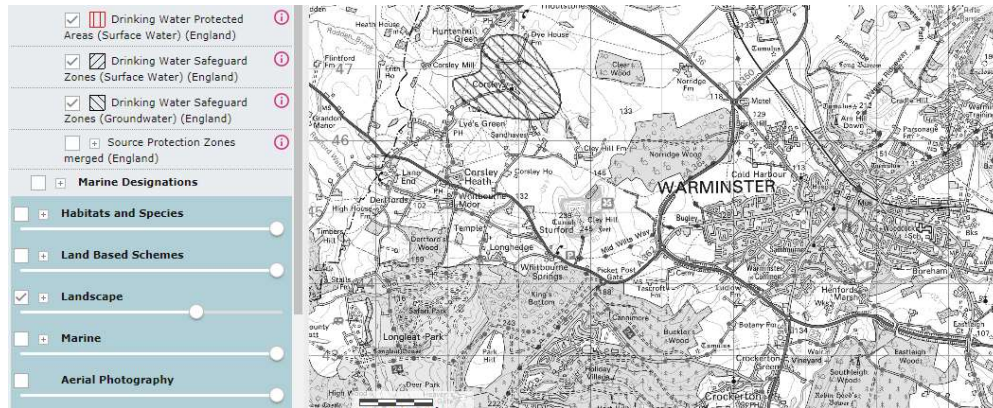
Refer to Section 3.12 below for details of Ground Investigation.

3.11. Environment Agency Hydrogeology Information

Groundwater Source Protection Zone Map

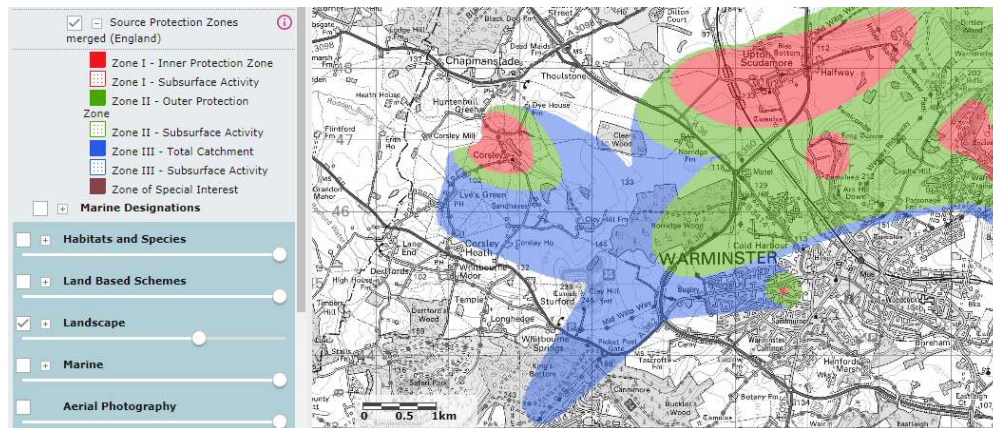
Groundwater provides a third of our drinking water in England, and it also maintains the flow in many of our rivers. In some areas of Southern England, groundwater supplies up to 80% of the drinking water. The site is not located within a Drinking Water Protected or Safeguarded area, or Source Protection Zone.

Drinking Water



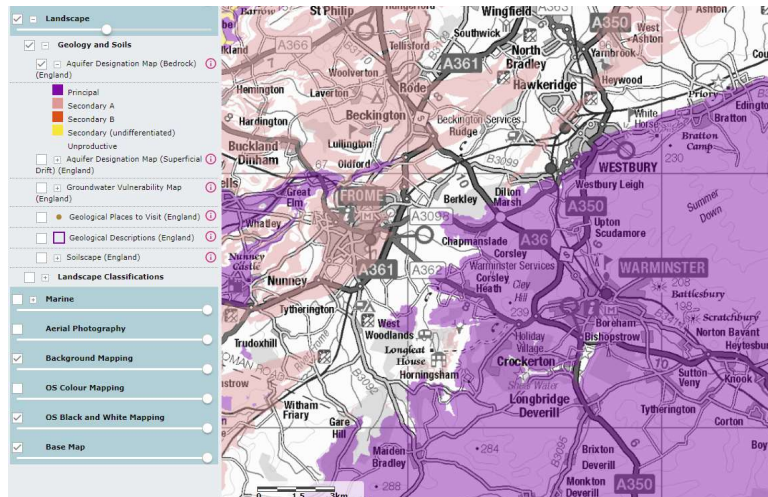
The site is not in a Drinking Water Protected Area or Safeguarded Zone.

Source Protection Zones

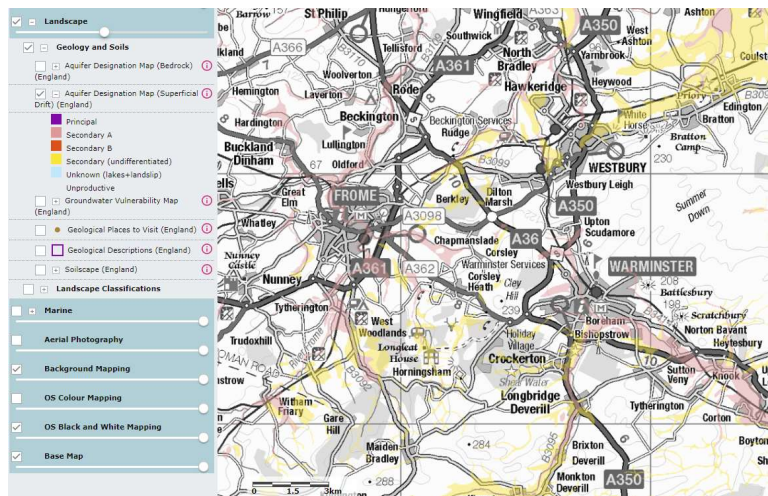


The site is within a Zone II - Outer Protection Zone.

Aquifer Designation Map Bedrock



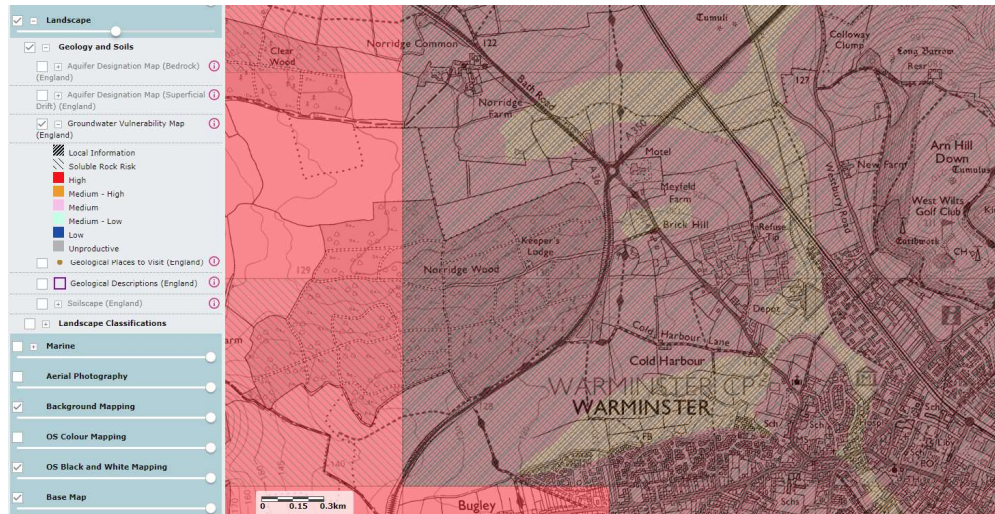
Aquifer Designation Map Superficial Drift



The site is in an area where the bedrock is classified as a Principle Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

The superficial drift (alluvium) is classified as Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

Groundwater Vulnerability Map



The higher part of the site in the east is in an area classified as High Groundwater Vulnerability. The lower part in the west is Medium-High Groundwater Vulnerability.

Overall, the site is in an area of Medium to High Vulnerability in terms of Groundwater sensitivity.

3.12. Ground Investigation

A ground investigation was undertaken by Clarkebond dated 8th March 2021, report No 4E05548. Test hole locations, logs, and infiltration test results are included in Appendix D.

Key extracts from the report are shown below:

A summary of the strata encountered is presented in Table 5.1 and discussed in sections 6.1 to 5.7. For full details of the strata encountered reference should be made to the exploratory hole logs in Appendix E.

Table 5.1 Ground Conditions – depth to base

Hole	Topsoil	Made Ground (TP23 only)	Silty/sandy gravelly clay (Head Deposits)	Clayey silty/sandy gravel (Weathered West Melbury Marly Chalk)	Chalk (bedrock)	Ground water
WS01	0.20		0.80	1.00*	-	Dry
WS02	0.20		1.10	2.00*	-	Dry
WS03	0.20		-	1.50*	-	Dry
WS04	0.30		-	1.30*	-	Dry
WS05	0.20		0.70	1.00*	-	Dry
WS06	0.15		0.90	1.10*	-	Dry
TP01	0.15		1.60*	-	-	1.50
TP02	0.15		0.80	1.80*	-	1.20
TP03	0.20		1.40	1.80*	-	Dry
TP04	0.30		0.60	-	1.50*	Dry
TP05	0.30		0.50	-	1.70*	Dry
TP06	0.25		1.00	-	1.90*	Dry
TP07	0.20		0.80		1.60*	Dry
TP08	0.20		0.80	1.80	2.00*	Dry
TP09	0.20		1.30	-	2.30*	Dry
TP10	0.15		0.70	-	2.00*	Dry
TP11	0.20		-	0.90	1.60*	Dry
TP12	0.10		0.80	2.00*	-	Dry
TP13	0.20		-	0.70	2.00*	Dry
TP14	0.10		1.70	-	1.80*	Dry
TP15	0.10		0.70	-	1.70*	Dry
TP16	0.15		0.80	-	2.00*	Dry
TP17	0.20		1.80	-	1.90	Dry
TP18	0.15		1.10	1.80*	-	1.80
TP19	0.20		0.80	1.60*	-	Dry
TP20	0.15		0.90	-	1.20	Dry
TP21	0.20		1.00	2.10*	-	Dry
TP22	0.15		0.80	1.40*	-	Dry
TP23	-	0.20	1.30	2.50*	-	Dry
TP24	0.15	-	-	2.00*	-	Dry
TP25	0.20	-	0.80	2.00*	-	Dry

* Base of hole

5.2 Topsoil

Topsoil was encountered in all of the exploratory holes to between 0.15 and 0.30m below ground level (bgl). The material generally consisted of a dark brown sandy silt with occasional rootlets.

5.3 Made Ground

Made Ground was only encountered in TP23 to a depth of 0.20m below ground level. The material consisted of dark brown sandy silt with brick fragments.

5.4 Head Deposits

The topsoil was underlain by the superficial geology of the Head Deposits. This material generally comprised soft to firm silty gravelly friable clay encountered to depths of 0.50m to 1.80m bgl.

5.5 Weathered West Melbury Marly Chalk Formation

The Topsoil and Head Deposits were underlain by the weathered solid geology of the Weathered West Melbury Marly Chalk Formation. This material was weathered to a dense to very dense silty/sandy clayey gravel (Grade Dc chalk). The base was encountered at depths ranging from 0.70m to 2.50m bgl.

5.6 West Melbury Marly Chalk Formation

The solid geology of the West Melbury Chalk Formation was present as intact chalk bedrock being encountered at depths of 0.90m to 2.50m bgl. This typically comprised moderately to highly weathered closely fissured very weak to weak light grey silty chalk with lenses of friable chalky clay (Grade C4).

5.7 Groundwater

Groundwater was only encountered in TP1, TP2 and TP18 during the intrusive works, at depths of 1.50m, 1.20m and 1.80m bgl respectively. These three pits are located in the lower lying north west of the site.

Monitoring of groundwater levels within the standpipes installed was undertaken on the 25th February 2021. The results are presented in Table 5.2.

Table 5.2 Groundwater Monitoring Results

Hole	WS1	WS2	WS6
Depth to water	0.71m bgl	Dry to 1.40m	Dry to 2.50m

5.8 Field Observations of Contamination

No visual or olfactory evidence of contamination was encountered.

6.9 Soakaway Drainage

Infiltration testing was undertaken in accordance with BRE 365 (2016) in six locations (TP03, TP04, TP05, TP06, TP07, TP16). The stratum tested was the weathered superficial strata and solid West Melbury Marly Chalk Formation. Only TP7 recorded sufficient infiltration to obtain a result. An infiltration rate of 2.8×10^{-5} m/s was calculated.

Within the remaining five location negligible infiltration was recorded and it was not possible to undertake one cycle of testing. However, the very low dissipation of water would suggest infiltration rates are likely to be less than 1×10^{-6} m/s and therefore efficient soakaway drainage is unlikely to be feasible.

Soakaways should be positioned a minimum of 5m from any proposed structure to avoid the risk of inducing ground dissolution and collapse near buildings.

The results of the infiltration testing are presented in Appendix F.

The GI concludes that the underlying soils are not suitable for the proposed development to drain to infiltration.

Further groundwater monitoring was undertaken on the 3rd of October 2023 and is also included within Appendix D. An extract of the key information is shown below:

BH Loc.	BH Ground Level OD (m)	Installed depth (m bgl)	03 Oct 23												Comments
GW01	125.50	14.50	Dry	< 111											
GW02	115.00	8.00	3.60	111.40											
GW03	114.00	8.00	2.76	111.24											
GW04	119.00	14.50	7.56	111.44											
GW05	122.00	18.00	11.85	110.15											

3.13. Flood Estimation Handbook (FEH) Data

FEH point data from fehweb

Point data at 386947,146323 ✕

Point: 386947,146323 📄

Tag: 502



Descriptor	Value
NGR	ST 86947 46323
BFIHOST	0.859
BFIHOST19	0.881
PROPWET	0.35
SAAR6190	850 mm

FEH catchment data from fehweb

NGR	ST 86950 46300	Urbconc1990	0.612
Area	7.19 km²	Urbext1990	0.0217
Altbar	136 m	Urbloc1990	0.873
Aspbar	358 degrees	Urbconc2000	
Aspvar	0.11	Urbext2000	0.0032
BFIHOST	0.978	Urbloc2000	
BFIHOST19	0.942	CatchmentRainC	-0.027
CentroidEasting	386410 m	CatchmentRainD1	0.366
CentroidNorthing	147003 m	CatchmentRainD2	0.388
Dplbar	2.37 km	CatchmentRainD3	0.278
Dpsbar	40.4 m/km	CatchmentRainE	0.29
Farl	1	CatchmentRainF	2.48
Fpext	0.1469	GridRainD1	0.363
Fpdbar	0.674 cm	GridRainD2	0.417
Fploc	0.712	GridRainD3	0.273
Ldp	4.33 km	GridRainC	-0.027
PROPWET	0.35	GridRainE	0.289
Rmed1H	11 mm	GridRainF	2.484
Rmed1D	34.1 mm		
Rmed2D	46.3 mm		
SAAR6190	852 mm		
Saar4170	845 mm		
Sprhost	3.4 %		

3.14. BFI HOST

The FEH mapping shows a high BFI Host (Type 1, 2 or 3) which implies infiltration is likely. However, intrusive ground investigation and soakaway testing show infiltration is not feasible with the upper soils encountered being clays with low permeability.

A review of NATMAP Host data and description for the 29 HOST types advises that HOST Class 6 most reflects the site specific ground investigation, being described as *'Percentage of the polygon in HOST Class 6 Free draining permeable soils in unconsolidated loams or clays with low permeability and storage capacity'*

The FEH table below also demonstrates that class 6 most suits the ground investigation

Substrate hydro-geology	MINERAL SOILS				PEAT SOILS			
	Groundwater or aquifer	No impermeable or gleyed layer within 100cm	Impermeable layer within 100cm or gleyed layer at 40-100cm		Gleyed layer within 40cm		All	
Weakly consolidated, microporous, by-pass flow uncommon (Chalk)	Normally present and at >2m	¹ 1.000 (4.31)	¹³ 1.000 (0.87)		¹⁴ 0.380 (0.66)		¹⁵ 0.380 (9.93)	
Weakly consolidated, microporous, by-pass flow uncommon (Limestone)		² 1.000 (2.12)						
Weakly consolidated, macroporous, by-pass flow uncommon		³ 0.900 (1.58)						
Strongly consolidated, non or slightly porous, by-pass flow common.		⁴ 0.791 (3.33)						
Unconsolidated, macroporous, by-pass flow very uncommon.		⁵ 0.900 (5.07)						
Unconsolidated, microporous, by-pass flow very common.		⁶ 0.645 (2.61)						
Unconsolidated, macroporous, by-pass flow very uncommon.	Normally present and at ≤ 2m	⁷ 0.793 (1.84)		IAC' <12.5	IAC' ≥12.5	Drained	Undrained	
Unconsolidated, microporous, by-pass flow common.		⁸ 0.560 (1.62)		⁹ 0.734 (3.68)	¹⁰ 0.520 (2.21)	¹¹ 0.927 (0.55)	¹² 0.170 (2.94)	
Slowly permeable	No significant groundwater or aquifer	¹⁶ 0.778 (0.43)	IAC' >7.5	IAC' ≤7.5	²⁴ 0.312 (13.85)		²⁶ 0.244 (2.49)	
Impermeable (hard)		¹⁷ 0.609 (9.28)	¹⁸ 0.518 (5.40)	²¹ 0.340 (4.02)				
Impermeable (soft)			¹⁹ 0.469 (2.16)	²² 0.315 (1.10)			²⁷ 0.259 (0.83)	
Eroded Peat			²⁰ 0.524 (0.69)	²³ 0.218 (1.31)				
Raw Peat				²⁵ 0.170 (3.64)			²⁸ 0.581 (0.58)	
							²⁹ 0.226 (5.73)	

A BFIHOST of 0.645 (HOST Class 6) will therefore be used as this will give more accurate results based on the site specific surveys

3.15. Existing Green-field Run-off Rates (FEH)

The green-field run-off rate for the development catchment area has been calculated using UK SuDS (Wallingford) formula and FEH data method assuming:

- SAAR (Standard Average Annual Rainfall) = 850mm (from FEH Data)
- BFIHOST (soil Index) = 0.645 (see Section 3.14)
- Developable area = 6.70Ha

Results are included in Appendix E and summarised below

Greenfield Rate for Developable area

- 1 year = 16.0 l/s
- QBar = 20.5 l/s
- 30 year = 40.1 l/s
- 100 year = 57.0 l/s

Greenfield Rate per Ha

- 1 year = 2.4 l/s
- QBar = 3.1 l/s
- 30 year = 5.91 l/s
- 100 year = 8.5 l/s

3.16. Existing Green-feld Run-off Volume.

Ciria C753 & the EA/DEFRA guide 'Preliminary Rainfall Runoff Management for Developments' recommend that the basis for considering the run-off volume is the difference pre- and post-development for the 1:100 6-hour event.

Ciria C753 (Section 24.10)

Green-field Run-off Volume = $10 \times RD \times A \times SPR$

RD: 1:100 6-hour rainfall (6 hours @ 10.389mm/hr, from Micro Drainage) = 62.334mm

A: Site Development Area (Ha) = 6.70Ha

SPR: Soil Type Standard Percentage Run-off (Soil Type 4)* = 0.45

Existing 1:100 6-hour Green-field Run-off Volume: $10 \times 62.334 \times 6.70 \times 0.45 = 1,879\text{m}^3$

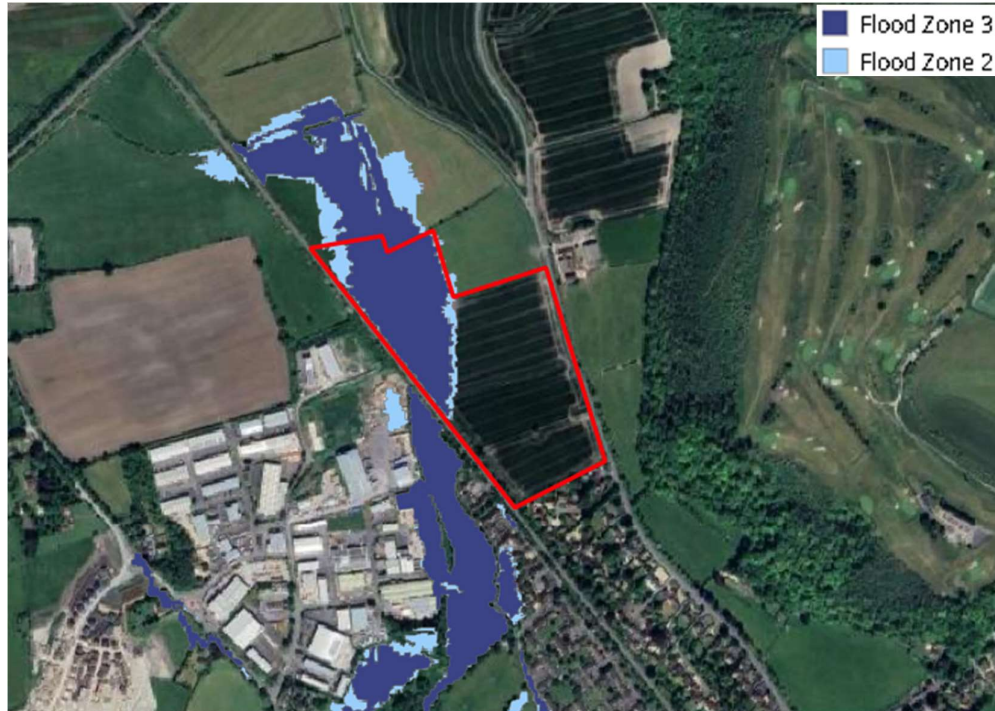
* Soil Type 4 has been used based on the intrusive ground investigation results rather than Soil Type 1 shown on the WRAP map because the upper soils encountered are impermeable

4. Flood Risk Assessment

4.1. Environment Agency Flood Zone Mapping

The site benefits from various flood maps as listed below.

EA Flood Map for Planning



Flood mapping shows that most of the site in the east is Flood Zone 1 (<0.1%, or less than 1:1,000 annual probability of flooding). The area in the west adjacent to the existing watercourse is Flood Zone 2 (0.1% to 1%, or between 1:1,000 and 1:100 annual probability of flooding), and Flood Zone 3 (less than 1%, or 1:100 annual probability of flooding).

EA Product 4 – Flood Risk Information

Flood risk information was obtained from the EA, see Appendix K for details. The flood levels provided are:

1% (1:100) AEP = 114.49mAOD Flood Zone 3 Extent/Level
0.1% (1:1,000) AEP = 114.79mAOD Flood Zone 2 Extent/Level

EA Long Term Flood Risk Mapping

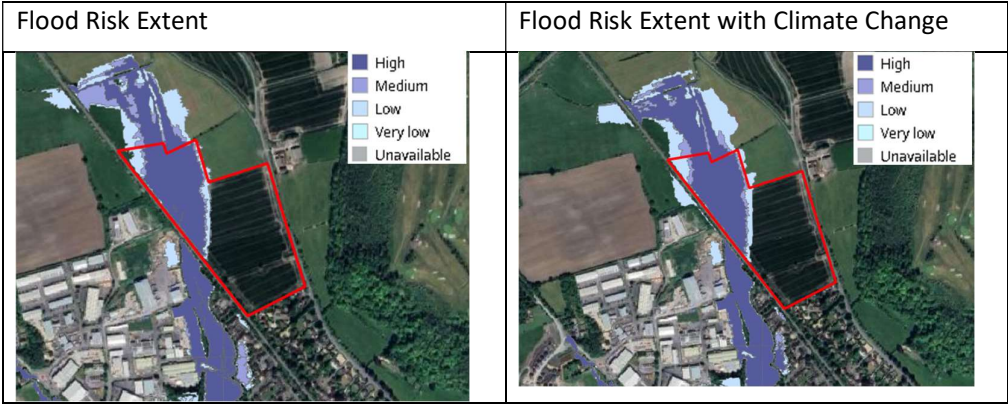
The mapping is created by dropping a volume of rainfall on the land for the three events (0.1%, 1%, & 3.3%) and modelling where it flows, and the depth and velocity of the flow. The modelling does not include smaller bridges, culverts, etc. and is intended to provide guidance on areas where flood risk from surface water needs to be considered in more detail.

The EA states that: 'Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.'

Definition of risk categories:

- **Very low risk** means that each year this area has a chance of flooding of less than 0.1% (<1:1,000). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
- **Low risk** means that each year this area has a chance of flooding of between 0.1% and 1% (1:1,000 – 1:100). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
- **Medium risk** means that each year this area has a chance of flooding of between 1% and 3.3% (1:100 – 1:30). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
- **High risk** means that each year this area has a chance of flooding of greater than 3.3% (>1:30). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

Flood Risk from Rivers or the Sea



The site is at Very Low risk of flooding from Rivers or the Sea.

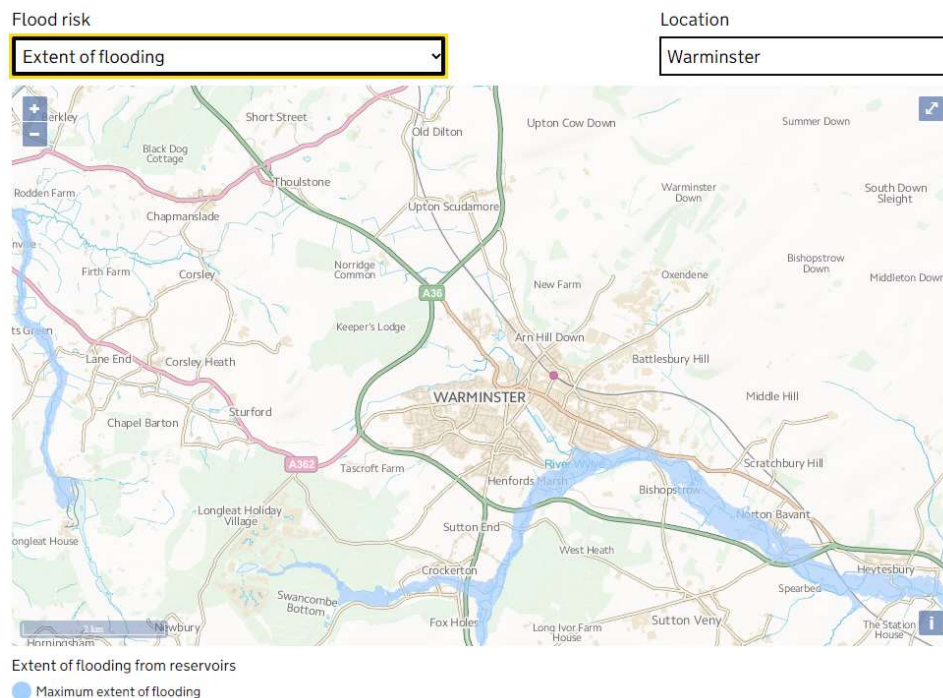
Flood Risk from Surface Water



The maps show that the site is predominately at a Very Low risk of flooding from surface water (<0.1%, or <1:1,000) with some areas of medium and low risk generally associated with the existing ditches and low areas.

There are a few ditches and low points on the site where surface water is shown to pond but there are no significant flows on to the site, other than from the watercourse, that need to be managed, or flows from the site. The drainage proposals for the development will manage surface water falling on the site and ensure that the development is not at risk from surface water flooding.

EA Map Risk of Flooding from Reservoir



The site is not at risk of flooding from Reservoirs.

4.2. Hydraulic Modelling – Chris Whitlow Associates

Chris Whitlow & Associates Ltd are undertaking 2D Hydraulic modelling of the watercourse to confirm flood extents.

Full details of the modelling report are within to Appendix L or as part of a future Reserved Matters application once complete.

The Modelling results are shown below for the 1 in 1000 year event, which demonstrates a reduced extent when compared to EA Extents.

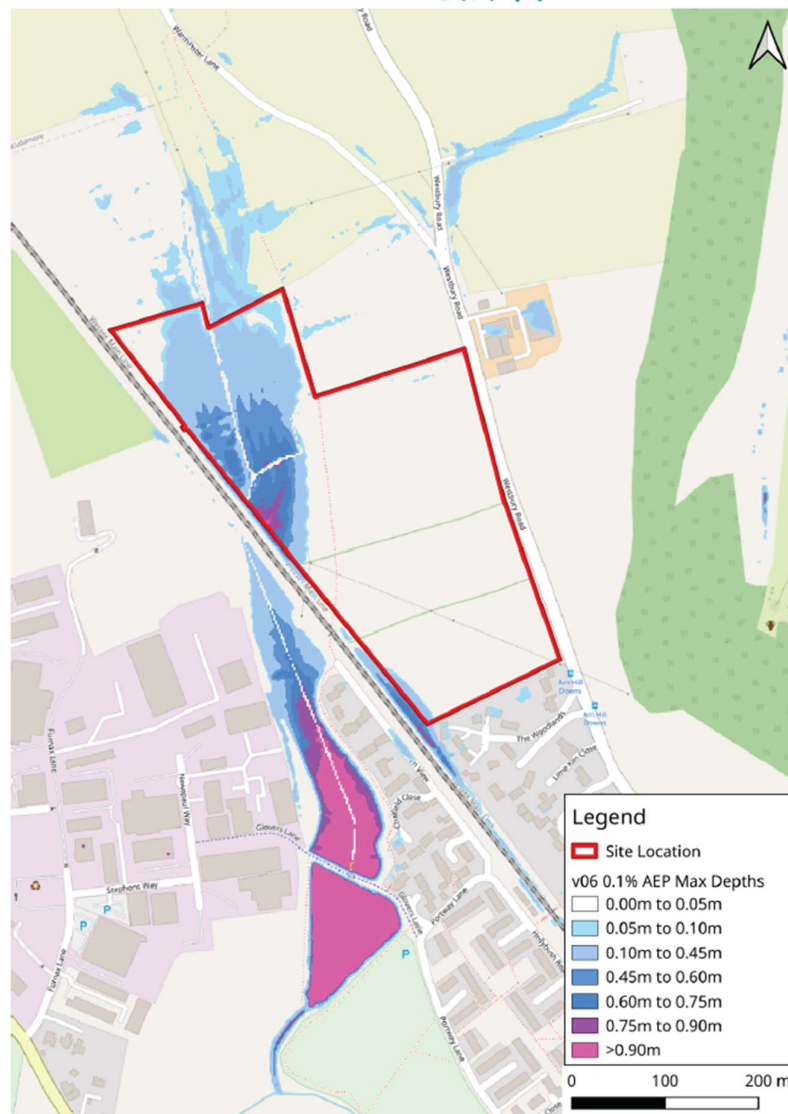


Figure 20: Peak flood depth map for 1 in 1000 year return period (0.1%AEP) flood event

4.3. Strategic Flood Risk Assessment (Level 1 SFRA) Scott Wilson June 2009

A Level 1 SFRA was undertaken by Scott Wilson with the final report data June 2009

4.4. Strategic Flood Risk Assessment (Level 1 SFRA) URS July 2013

The June 2009 Level 1 SFRA was updated to reflect the amalgamation of the former districts into a single unitary authority Wiltshire Council and to reflect current guidance / policy.

4.5. Strategic Flood Risk Assessment (Level 1 SFRA) JBA May 2024

The most recent Level 1 SFRA was undertaken by JBA with the final report dated November 2024.

The Appendices are available via the Council's Strategic Flood Risk Assessment Data Explorer found at:

<https://wiltscouncil.maps.arcgis.com/apps/webappviewer/index.html?id=28c00215d87b468a9a0cd79c63d3d270>

The table below lists the risk of flooding for the relevant appendices.

Appendix	Flood Risk Information
<i>Appendix C – Flood Map For Planning*</i>	Site is mainly Flood Zone 1 with Flood Zones 2 and 3 in the west.
<i>Appendix D - Flood Zone 3b</i>	Site is not within area which has undergone detailed FZ3b modelling
<i>Appendix E – Risk of Flooding from Surface Water*</i>	There are areas of the site in the west and south west of the site that is at RoFSW 1:30 with greater areas at 1:100 and 1:1000
<i>Appendix F – Impact of Climate Change on RoFSW *</i>	Lower areas and areas adjacent to the watercourse are within the 1:100 + CC RoFSW areas.
<i>Appendix G – Groundwater Emergence*</i>	Areas adjacent to the watercourse are at significant risk of groundwater flooding whilst the area of the site is at local risk.
<i>Appendix H – Risk of Flooding from Reservoirs</i>	The site is not at risk of flooding from Reservoirs
<i>Appendix I – Risk of Flooding from Sewers*</i>	The site and the area to the east has one recorded sewer flooding incident, though the area is large and it is not clear where the incident was recorded

<i>Appendix J – Recorded Flood Outlines</i>	The site is not within any recorded groundwater, surface water or flooding outlines.
<i>Appendix K – Flood Alert and Warning Areas*</i>	The site is within the groundwater alert and flood alert area and the area along the watercourse is within a flood warning area.
<i>Appendix L1 – Type of Flood Defences</i>	No Flood Defences are shown on or around the site.
<i>Appendix L2 – Flood Defences Standard of Protection</i>	The area of effect from the flood embankment to the south of the site does not extend to the site.
<i>Appendix L3 – Condition of Flood Defences</i>	Watercourse through site shown as being of unknown condition
<i>Appendix L4 – Reduction in Risk of Flooding from Rivers and Sea*</i>	A small area of the site adjacent to the watercourse is shown as being of reduced risk
<i>Appendix M – Risk of Flooding from Canals and Recorded Incidents</i>	The site is not at risk of Canal Flooding
<i>Appendix O – Cumulative Impact Assessment*</i>	Cumulative Impact Score is Medium
<i>Appendix P – Fluvial plus Central Climate change Flood Risk</i>	Flood Zone 2 Proxy shown along in vicinity of watercourse
<i>Appendix Q – Fluvial plus Higher Central Climate Change Flood Risk</i>	Flood Zone 2 Proxy shown along in vicinity of watercourse
<i>Figure 1-3 – Main Rivers in Wiltshire</i>	The watercourse to the west and an adjoining watercourse to the north of the site are shown as main rivers.

*Denotes an extract of drawing that can be seen below, the remainder can be seen at the following link:

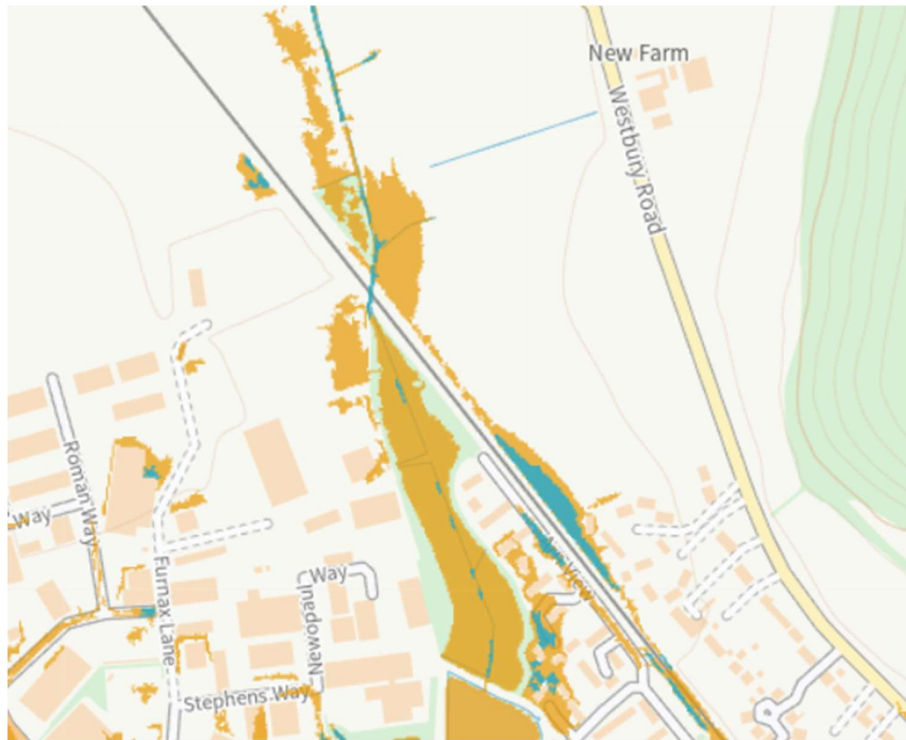
Appendix C – Flood Map for Planning



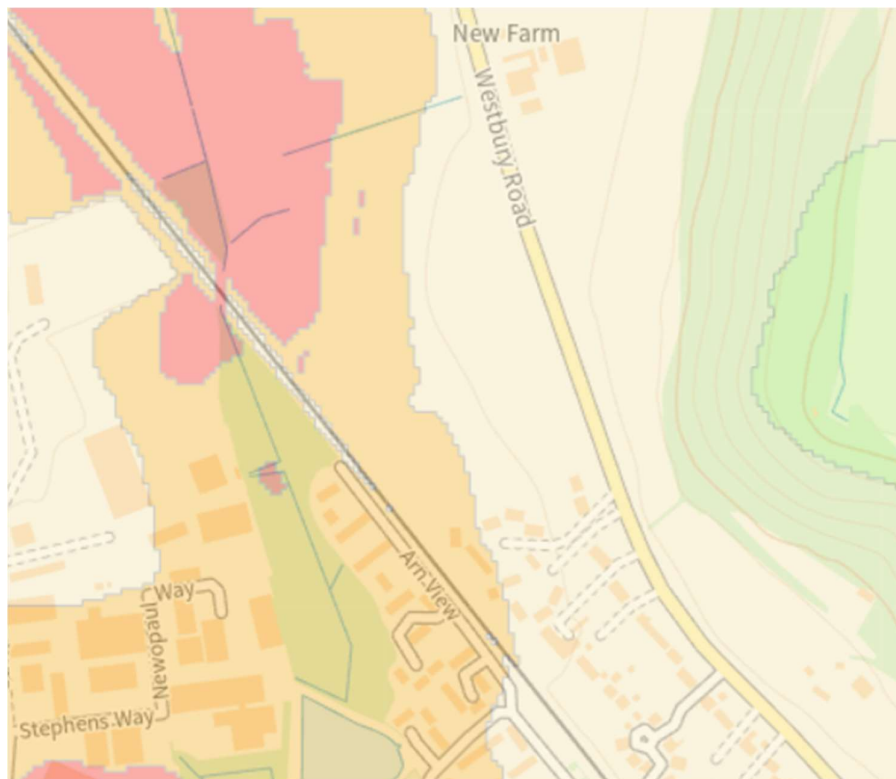
Appendix E – Risk of Flooding from Surface Water



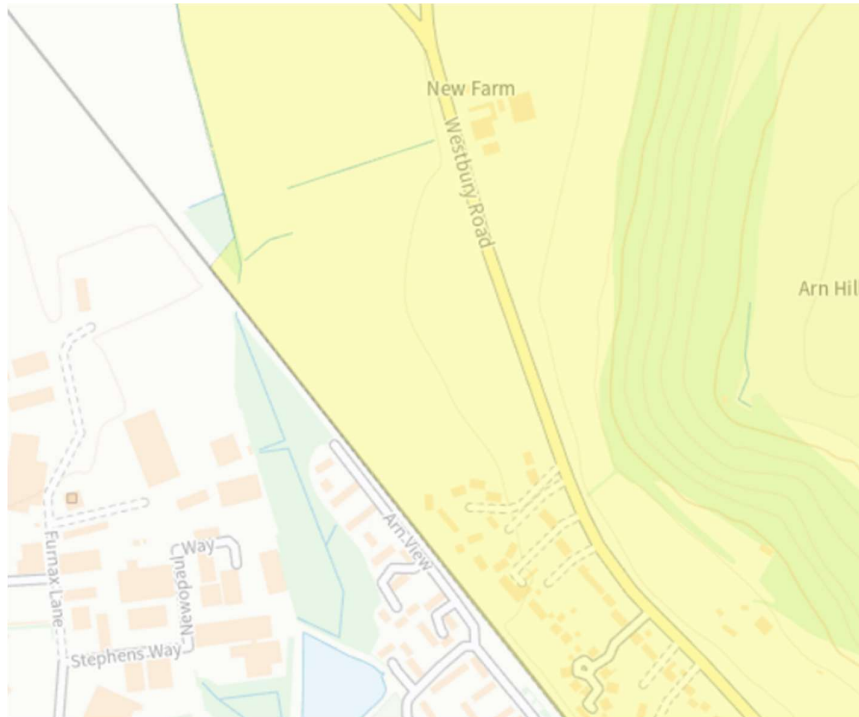
Appendix F – Impact of Climate Change on RoFSW



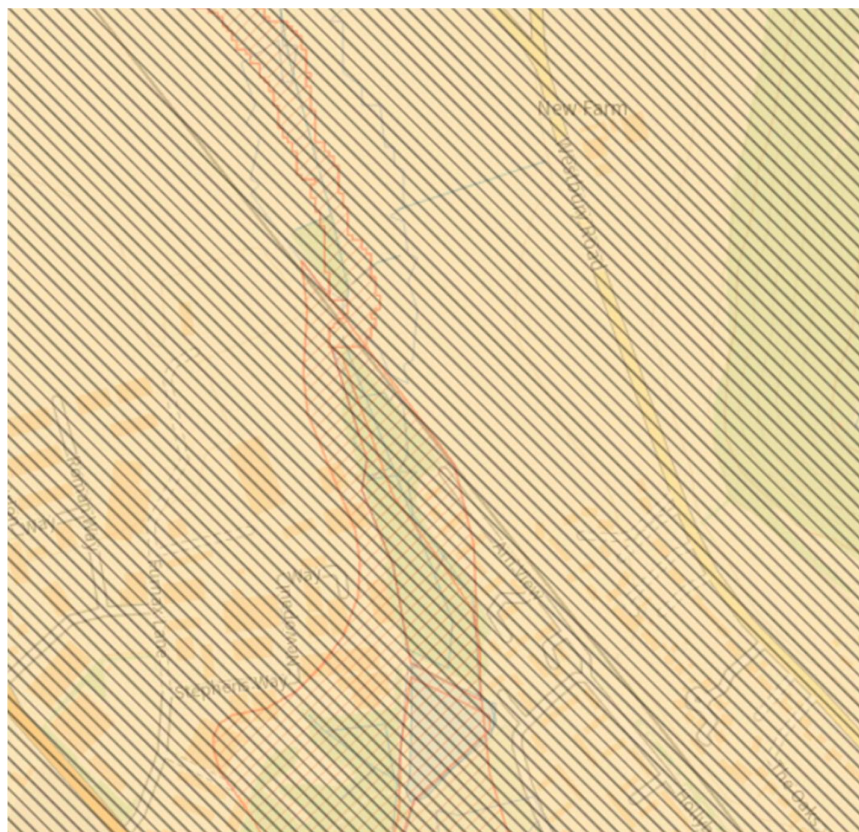
Appendix G – Risk of Flooding from Groundwater



Appendix I – Risk of Flooding from Sewers



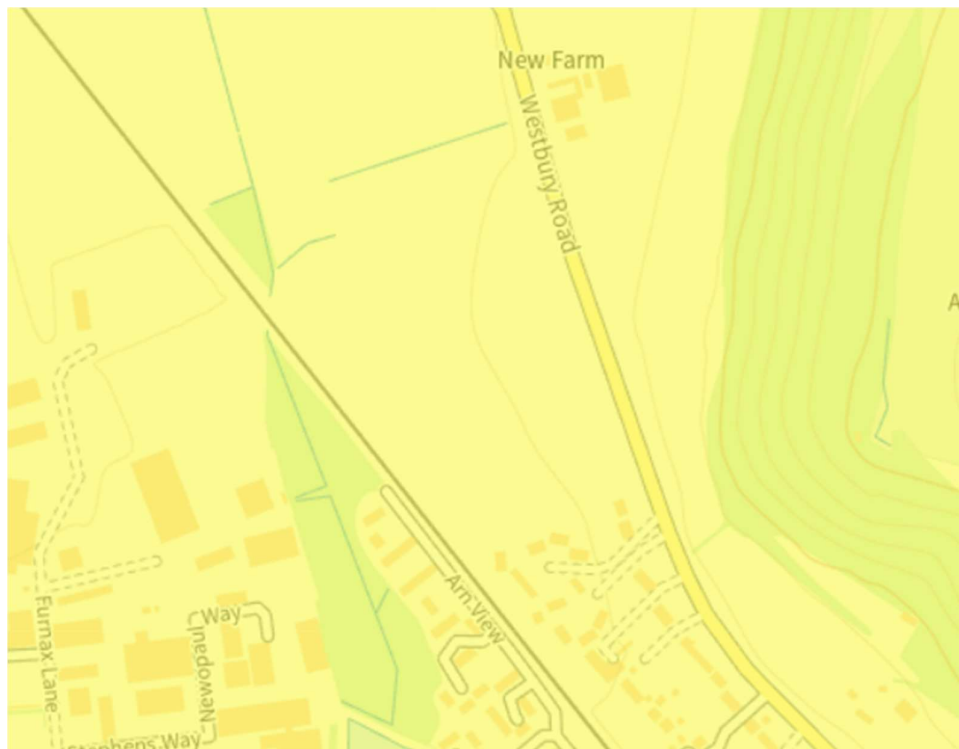
Appendix K – Flood Alert and Warning Areas



Appendix L4 – Reduction in Risk of Flooding from Rivers and Seas



Appendix O – Cumulative Impact Assessment



Catchment Flood Management Plan Policy:

Warminster is within the Wiltshire Towns Sub Areas of the Hampshire Avon CFMP Policy Areas where Policy 6 applies, see extracts below:

Table 2-4 Hampshire Avon CFMP policy areas covering Wiltshire

Sub Area	Settlements	Policy
1 - River Bourne	Tidworth	Policy 4 - "Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change."
2 - Upper Avon and Wylfe	Devizes, Pewsey, Warminster	Policy 6 - "Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits."
3 - Warminster	Warminster	Policy 4 - "Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change."

Policy 4 – "This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options."

Policy 6 – "This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists) but would only be implemented in specific locations within the area, after more detailed appraisal and consultation."

The SFRA shows the site to be at Low Risk of flooding.

4.6. Fluvial Flood Risk

The Hydraulic Modelling as well as EA and SFRA mapping show the west part of the site adjacent to the watercourse to be in Flood Zones 2 and 3, and the east part of the site in Flood Zone 1.

In accordance with the NPPF sequential risk-based approach the proposed 'more vulnerable' dwellings will be in Flood Zone 1, the area of lowest flood risk. Built development (houses, roads, driveways, Suds), pumping station, site access and level raising will be located in areas that are not at risk of flooding, now and in the future.

Other uses such as open space, landscaping, sports pitches etc. will be in flood zones 2 and 3 in accordance with the PPG compatibility guidance.

As requested by the EA, so that the proposed dwellings are safe from flooding, floor levels will be set a minimum of 600mm above the Flood Zone 2

The Risk of Fluvial Flooding is therefore Low.

4.7. Risk of Flooding Surface Water (RoFSW)

The EA and SFRA mapping shows RoFSW associated with the ditches/watercourses and the low areas on the site. The risk is generally low, between 1:100 and 1:1,000 and coincides with Flood Zones 2 & 3.

There is a small area of higher risk in the southwest corner of the site in a low area adjacent to the railway boundary (see below)



A review of Lidar, Hydraulic modelling and topographic surveys concluded that this is the result of overland flow from the site itself falling to a depression. The levels and drainage for the proposed development will manage surface water run-off and therefore this risk will be mitigated once the site is developed. Houses will also be located outside this area.

Surface run-off from the higher land to the east of Westbury Road, Arn Hill and the golf course, will generally be intercepted by Westbury Road and directed north along the road to existing ditches north of the site. The levels and drainage/SuDS for the proposed development will manage any overland flows from the Westbury Road and Arn Hill and will channel them safely through the development to the pond and watercourse to ensure that they do not cause flooding.

The RoFSW is therefore Low.

4.8. Flood Risk from Groundwater

The SFRA mapping shows the lower west part of the site to have a high risk of flooding from groundwater with groundwater levels at or near the ground surface. The central section is shown to have groundwater levels between 0.025m and 0.5m below the ground surface. The higher eastern area is shown to have groundwater levels between 0.5m and 5.0m below the ground surface. The map is designed to identify areas for further investigation, and not to be used as sole evidence as per the Wiltshire Level 1 SFRA 2024 Section 4.5 and the disclaimer on the Web Viewer.

The Ground Investigation encountered groundwater at between 1.2 and 1.8m below the ground surface in the west part of the site; groundwater was not encountered in the central and east part of the site. The second round of groundwater monitoring recorded ground water at levels >2.75mbgl. These levels are substantially lower than indicated within the SFRA.

The underlying geology also reduces the likelihood of high groundwater levels as the Head Deposits form a low permeability confining layer over the underlying Chalk Bedrock though this arrangement can create pockets of perched groundwater.

The development levels and drainage can be designed to manage any groundwater flooding to ensure that the development is not at risk of flooding.

The risk of flooding from groundwater is low.

4.9. Flood Risk from Sewers

Details of the existing drains and sewers are shown on drawing 678-FRA-001 included in Appendix C and on Wessex Water sewer records in Appendix F:

- There are no surface water sewers in the vicinity of the site.
- A Highway Drain runs along the eastern side of Westbury Road flowing north and discharging to an existing ditch adjacent to the road. Road gullies in Westbury Road connect to the highway drain.
- There is a 150mm Wessex Water foul sewer and a rising main approximately 300m to 400m to the south of the site in Westbury Road. There are no foul sewers within or adjacent to the site.

Flood risk from the highway drain is low; flood flows would run north along Westbury Road and not on to the site. The risk of flooding from foul sewers to the south is low.

The SFRA mapping does not show any areas of sewer flooding in or adjacent to the site.

The risk of flooding from Sewers is Low.

4.10. Flood Risk from Existing Ditches

There are shallow ditches along some of the hedgerows within the site as shown on drawing 678-FRA-001 included in Appendix C. The ditches will be cleaned out and links maintained to ensure that they flow freely.

The site levels and drainage can be designed to manage flows from the ditches to ensure that the development is not at risk of flooding.

The risk of flooding from the ditches is low.

4.11. Flood Risk from Artificial and Other Sources

There are existing water mains within and adjacent to the site that will either be maintained or diverted through the proposed development. There is a risk of flooding if a water main fails however site levels and drainage can be designed to channel flood water away from dwellings to prevent flooding. There are no other flood risks from artificial or other sources.

The risk of flooding from Artificial and Other Sources is low.

4.12. Flood Risk Vulnerability Classification

The proposed development, classified in accordance with Table 3 of the Planning Practice Guidance 'Flood Risk and Coastal Change', is 'More Vulnerable' (residential).

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Paragraph: 067 Reference ID: 7-067-20140306

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.

4.13. Sequential Test

Paragraph 174 of the NPPF states that:

'Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test

Paragraph 175 of the NPPF states that:

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

PPG Section 027

a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development

A site specific flood risk assessment has been undertaken. The 'More Vulnerable Development' and 'built development within the site boundary' areas that include the dwellings, the attenuation pond, pumping station, highways and driveways as well as the site access and level raising are not located in areas that would be at risk of flooding from any source, now and in the future and ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development.

Drawing 678-FRA-075 (Appendix G) shows the built development areas located outside of the flood risk areas.

Water compatible uses will be provided in the areas at higher risk of flooding.

The proposals are therefore considered to be in accordance with the NPPF sequential approach to locate development in areas of lowest flood risk and a sequential test is therefore not required

4.14. Exception Test

Paragraph 177 of the NPPF states that:

'Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3'

Paragraph 178 of the NPPF states that:

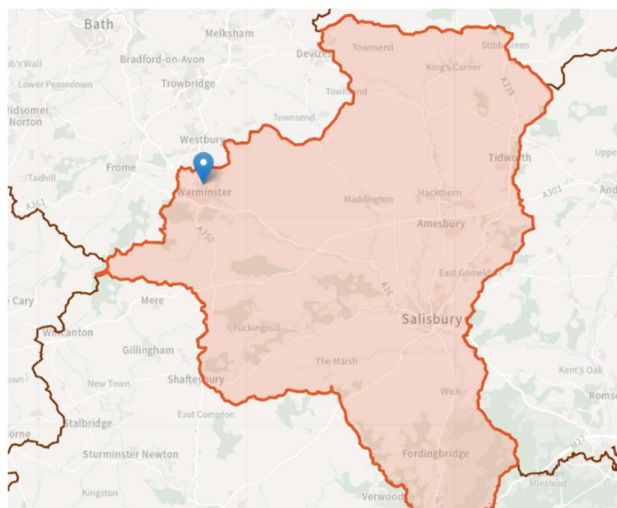
The application of the exception test should be informed by a strategic or site specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

- a) *the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
- b) *b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

The Flood Risk Vulnerability and Flood Zone 'Compatibility' Table 3 within Section 5.3 shows that the proposed development is appropriate and compatible and therefore an exception test is not required. The development levels and drainage will be designed to manage surface water and ensure that the proposed development is not at risk of flooding.

4.15. Climate Change

In accordance with the 2016 EA guidance (updated 2022) 'Flood risk assessments: climate change allowances' the SuDS design will include a 45% (upper end) allowance for the predicted increase in rainfall intensity over the lifetime of the residential development (100 year design life to 2070 to 2115). Extract from guidance below:



Avon Hampshire Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	25%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	25%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

4.16. Urban Creep

To allow for additional run-off resulting from the extending of properties, conservatories, additional parking and larger patios an additional allowance of 10% for Urban Creep will be included in the SuDS design for all events

Drawing 678-FRA-505 (appendix L) shows the assumed urban creep areas within the impermeable area plan

4.17. Exceedance

To manage any residual flood risk, the Proposed Development will include flood exceedance routes to direct any flows from extreme events or localised failures away from existing or proposed properties safely to the downstream surface water drainage system. Any existing routes will either be maintained, managed, or diverted.

4.18. Probability of Flood Risk

The risk of flooding from all sources has been assessed and the FRA demonstrates how flood risk and surface water run-off will be managed to ensure that the development will be safe from flood risk and that it will not increase flood risk elsewhere, including allowance for climate change.

IT IS CONCLUDED THAT THE PROPOSED DEVELOPMENT WILL BE AT LOW RISK FROM FLOODING.

5. Surface Water Run-off

5.1. Sustainable Drainage System (SuDS)

SuDS will be used to manage surface water run-off from the proposed development with surface water discharging to the watercourse running through the site. The SuDS will be designed to ensure that the existing run-off regime is maintained as closely as possible and that there is no increase in flood risk as a result of the development of the site. The SuDS will also prevent pollution of the receiving watercourses.

5.2. Run-off Volumes

Guidance recommends that the run-off volume for the 1:100 6-hour event is used to compare existing and proposed volumes. Existing run-off from the development area has been calculated at 1,879m³. The developed run-off has been calculated using formulae from Ciria C753 as shown below.

Developed Run-off Volume:

$$10.RD.A[((PIMP/100)\alpha 0.8) + ((1-(PIMP/100))\beta SPR)] \text{ (C753 Section 24.10)}$$

RD = Rainfall Depth (mm)

A = Catchment Area

SPR = Standard Percentage Run-off (0.45 for SOIL Type 4)

α = Proportion of impermeable draining to system at 80% (0.8) run-off (roofs, parking, roads, etc). Can be increased to 100 % (1.0) for more conservative assessment (will depend on materials, drainage...).

β = Proportion of pervious areas draining to system, 0-1.0 (gardens, open space, etc).

RD: 1:100 6-hour rainfall (6 hours @ 10.389mm/hr, from Micro Drainage) = 62.334mm

A: Site Area (Ha) = 6.70Ha, Imp Area (Ha) = 3.44Ha

PIMP: 51%

SPR: Soil Type Standard Percentage Run-off (Soil Type 4 from WRAP Map) = 0.45

α : 1.0 (100%) assumed

β : 1.0 (100%) assumed

Developed 1:100 Year + 45% 6-hour Volume = **2624m³**

The calculations show that there is an increase in the volume of run-off from the development. As the underlying soils are impermeable and are not suitable for infiltration it will be necessary to follow alternative guidance to mitigate for the increase in run-off volume resulting from the development.

To mitigate for the additional run-off volume EA/Defra and Ciria guidance together with BS8582 recommend that Extended Attenuation Storage is provided and that run-off is restricted to the Mean Annual Flood Flow (Qbar) green-field rate for all events above the 1:1 up to the 1:100 with an allowance for climate change and urban creep.

6. Surface Water Drainage Strategy

6.1. Surface Water Parameters

A preliminary surface water drainage strategy has been developed that incorporates a Sustainable Drainage System. The SuDS will ensure that flood risk resulting from pluvial events (rainfall) will be managed on-site and that flood risk will not be increased elsewhere as a result of the development.

The surface water drainage and SuDS will be designed in accordance with the following:

- Building Regulations Part H: Drainage & Waste Disposal
- Design and Construction Guidance (formerly Sewers for Adoption)
- The requirements of Wessex Water or other approved Water/Sewerage Undertaker
- Ciria C753: The SuDS Manual.
- National standards for sustainable drainage systems
- Lead Local Flood Authority requirements
 - 10% Urban Creep allowance
 - 30% betterment on greenfield runoff rates
 - MADD factor 0
 - Cv of 1
 - Use Suds features / source control where practicable
 - Modelling for surcharged watercourse / outfall scenario

The hierarchy for the disposal of surface water is that rainwater shall discharge to one of the following, listed in order of priority:

- a) an adequate soakaway, or some other adequate infiltration system; or, where that is not reasonably practicable,
- b) a watercourse; or, where that is not reasonably practicable,
- c) a sewer.

6.2. Surface Water Outfall

The ground investigation (section 3.13) shows that the site is not suitable for the use of soakaways or infiltration

Surface water run-off from the development will therefore be discharged to the watercourse as shown on drawing 678-FRA-075 'Drainage Strategy' included in Appendix G.

As the outfall maybe surcharged during flood events, this scenario will be modelled during the reserved matters stage

The outfall is within the site boundary and an ordinary watercourse consent application will be made to the LLFA once planning permission has been granted

6.3. Flood Risk, Development Levels, and Flood Routes

All dwellings will have floor levels set a minimum of 600mm above the adjacent Flood Zone 2 (0.1%, 1:100 annual probability event) flood level. Safe dry access/egress will be provided to all dwellings.

The external levels of dwellings will generally be a minimum of 150mm below the floor levels; levels and flood routes will be designed to direct surface water flows away from the dwellings. Flood exceedance routes will be designed to direct flows safely through or around the development to ensure that all properties are safe from flooding.

6.4. Proposed Strategy

Details of the outline surface water drainage strategy are shown on drawing 678-FRA-075 'Drainage Strategy' included in Appendix G.

Discharge will be limited to Qbar Mean Annual Flood Flow of 20.5l/s (approx. 1:2.3 annual probability event) for events up to 1:100 event with a 45% allowance for climate change. Flow will be restricted using a Vortex Control device (Hydrobrake or similar) located downstream of the attenuation. An additional orifice will also be used to allow discharge to be reduced to 30% less than the greenfield rates (see section 6.5).

Attenuation will be provided primarily in a basin or pond as detailed in Section 7 below. Surface water will discharge into the basin or pond via precast concrete headwalls that will be to adoptable standards. Guardrails will be provided on the headwalls to reduce the risk of falls as will safety gratings to prevent unauthorised access.

It is proposed that the surface water sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker under a Section 104 Agreement.

The estimated total volume of attenuation required for events up to the 1:100 + 45% allowance for climate change/urban creep is listed below. Impermeable areas are shown on drawing 678-FRA-505 along with assumed urban creep locations.

Site 3D calculations included in Appendix I and provide the following results:

Event	Discharge (l/s)	Water Level (m)	Attenuation Depth (m)	Attenuation Volume (m3)	Freeboard (m)
1:1	11.1	114.49	0.19	485	1.31
1:30 + 40%	19.7	115.08	0.78	2163	0.72
1:100+45%	20.2	115.36	1.06	3052	0.44

The above proposed discharge rates are all below the QBar (20.5l/s)

6.5. Betterment

In accordance with Wiltshire Council's policy discharge rates for 1:1, 1:30 and 1:100 year events should provide at least a 30% betterment when compared to the equivalent existing greenfield rates.

The Betterment between existing rates and proposed rates are shown below

Event	Existing Greenfield Rate (l/s)	Proposed Discharge Rate (l/s)	Betterment
1:1	16.0	11.1	30%
1:30	40.1	19.7	51%
1:100	57.0	20.2	65%

The above discharge proposed rates all provided 30% betterment when compared to the existing greenfield runoff rates

6.6. Additional SuDS features

The use of additional SuDS features could be used to improve water quality, to decelerate the surface water and meet the requirements of the National SuDS standards

It is proposed that where practicable driveways and Rain Water Pipes could connect into either a swale or rain gardens, although this would be limited by site gradients which are relatively steep in places.

Permeable pavements are not currently proposed but could be used in private areas if required. The impermeable nature of the existing ground means that any permeable paving would not infiltrate but instead connect into the proposed drainage network.

Water Butts could also be used for garden irrigation.

The anticipated features would be confirmed during reserved matters.

7. SuDS Details

7.1. Detention Basin

The Basin is used to attenuate surface water during rainfall events and has no permanent water level, i.e. is dry outside of rainfall events. An internal swale could be used as a low flow channel.

The basin will be designed as a feature to store surface water and allow it to discharge to a 300mm diameter surface water sewer discharging to a new open channel connecting to the existing watercourse, as shown on drawing 678-FRA-075.

The basin will have up to 1.2m depth of storage available for surface water attenuation for events up to and including the 1:100 event with a 45% climate change/urban creep allowance and have a minimum freeboard of 0.3m.

The basin has been designed with bank slopes of 1 in 3 in accordance with The SuDS Manual Ciria C753.

7.2. Attenuation Pond Design

The alternative to a detention basin is an attenuation pond

To provide treatment to the surface water run-off from the development and remove pollutants prior to discharge to the downstream receiving waters a pond has a permanent pool with a between 0.8 and 1m depth of water.

The pond will have a shallow zone (aquatic bench) along the edge of the permanent pool to support wetland planting which will act as a biological filter and safety margin (3m width with a slope of 1:20). The pond will provide ecology, amenity and biodiversity benefits and will add to the aesthetics of the open space.

7.3. Landscaping

The landscaping and aquatic planting for the pond will be designed by the Landscape Architect to provide a diversity of plant species to enhance visual interest and provide a variety of wildlife habitats. Details of the planting will be agreed with the Local Planning Authority and adopting body at the detailed engineering stage.

7.4. Pond or Basin Access

Access to the pond will be via the new development roads. A grassed maintenance strip will be provided around the perimeter of the pond to allow routine maintenance activities and inspections to be carried out.

7.5. Water Butts

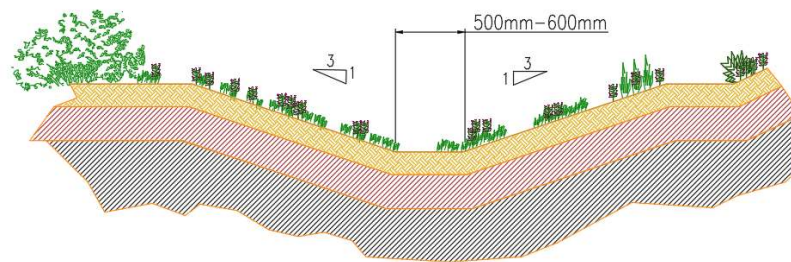
Water butts collect surface water from House and Garage roofs to be used in gardens. Once they reach capacity excess runoff will connect in the drainage network. Water butts could be used where appropriate in gardens but not where a Rain Water pipes connection is not possible.

7.6. Swales

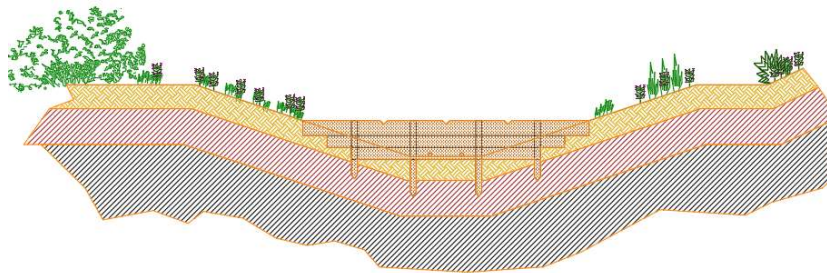
These are shallow, flat bottomed, vegetated open channels designed to convey, treat and sometimes attenuate surface water run-off. When incorporated into the site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits. They are often used to drain roads, paths or car parks and can replace conventional pipework as a means of conveying run-off and the use of adjacent filter strips can also remove the need for kerbs and gullies.

Swales will typically be 500-600mm wide at the base, 300-600mm deep with side slopes of 1:3. The minimum gradient is typically 1:200 with check dams provided where gradients exceed 1:30.

Some examples of swales are shown below including a check dam. Filter medium could also be placed underneath to allow rain water pipe connections.



TYPICAL UNLINED
SWALE



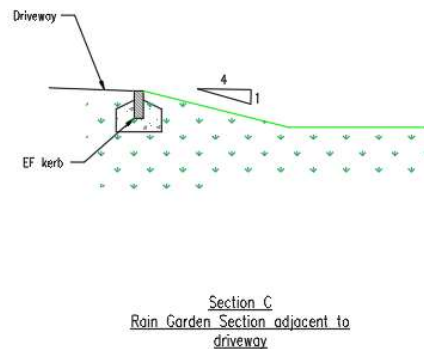
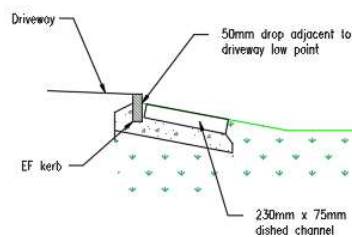
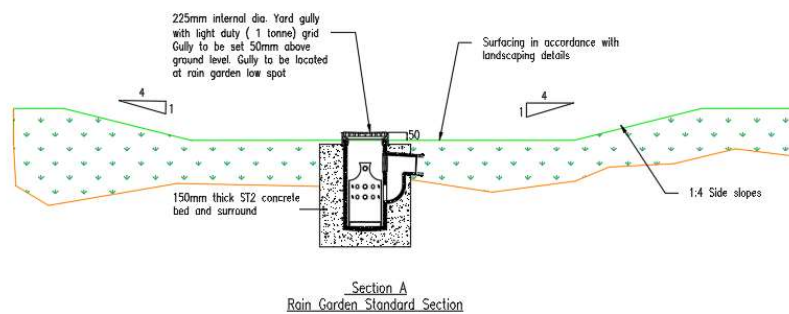
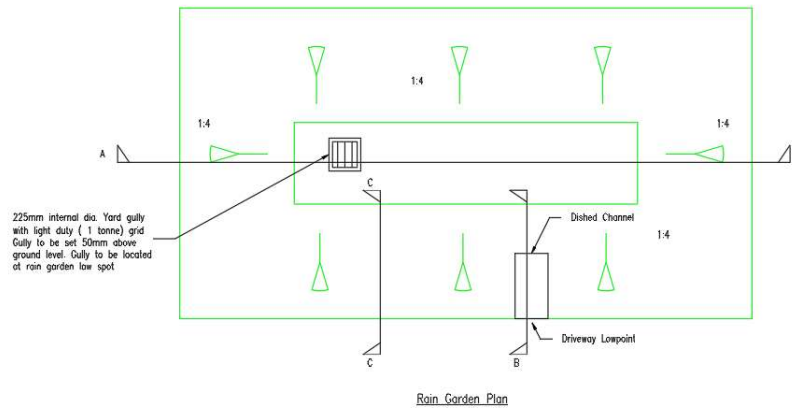
TYPICAL CHECK DAM
ELEVATION

7.7. Rain Gardens

Rain Gardens are shallow landscaped depressions that use soil and vegetation to treat pollutants and can reduce surface water runoff. They are also an attractive landscape feature providing habitat and biodiversity. They are more informal than other forms of bioretention.

Rain gardens will be fed by a small number of driveways, have an above ground overflow and connect into the sewer network.

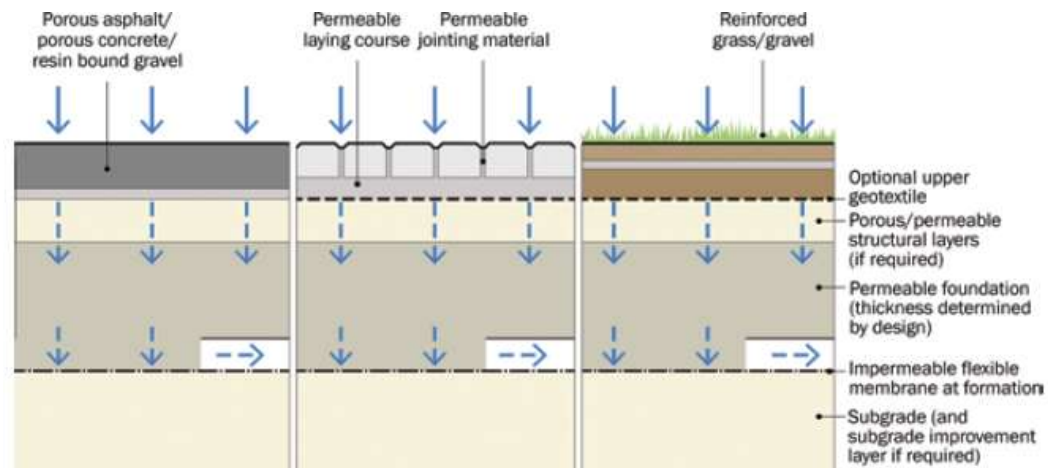
An example of a rain garden arrangement is shown below.



7.8. Permeable Pavement

Permeable pavements allow surface water to infiltrate through the surface providing treatment to surface water. As infiltration is not possible due to ground conditions then surface water would need to be collected and connect into the sewer network via a fin drainage / diffuser .

The pavement can be either block paved or a Porous asphalt. C753 shows the potential types of permeable pavement.



7.9. Health and Safety

Fencing would isolate the pond and reduce its amenity benefit. Barrier planting and landscaping will therefore be used to discourage public access to the open areas of water.

Safety signage and information boards can be provided around the perimeter to improve awareness, discourage unauthorised access and to inform the public of the potential danger, and the purpose and benefits of the pond.

Fencing or guarding will be provided around any structures such as headwalls where there is a vertical drop of 600mm or more.

Full safety details will be considered prior to construction and will be agreed with the Local Planning Authority and adopting body at the detailed design stage.

8. Water Quality

The proposed development will include roads, hard standings, roofs and landscaped areas. Run-off from roofs is unlikely to contain significant pollution. Run-off from roads and hard standings will pick up fuel, oil, heavy metals, rubbish and other pollutants. Run-off from landscaped areas could include pesticides and fertilisers.

Ciria C753, Chapter 26 provides guidance on Water Quality Management: Design Methods. The SuDS pollution mitigation index should equal or exceed the pollution hazard index. Tables 26.2 and 26.3 below provide details of the indices.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
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
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ²	0.7	0.5
Wetland	0.8 ²	0.8	0.8
Proprietary treatment systems ^{3,5}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

The table below summarizes the Indices for the proposed development. The mitigation index for the pond can be seen to exceed the pollution index for all hazards.

Pollution & Mitigation Indices

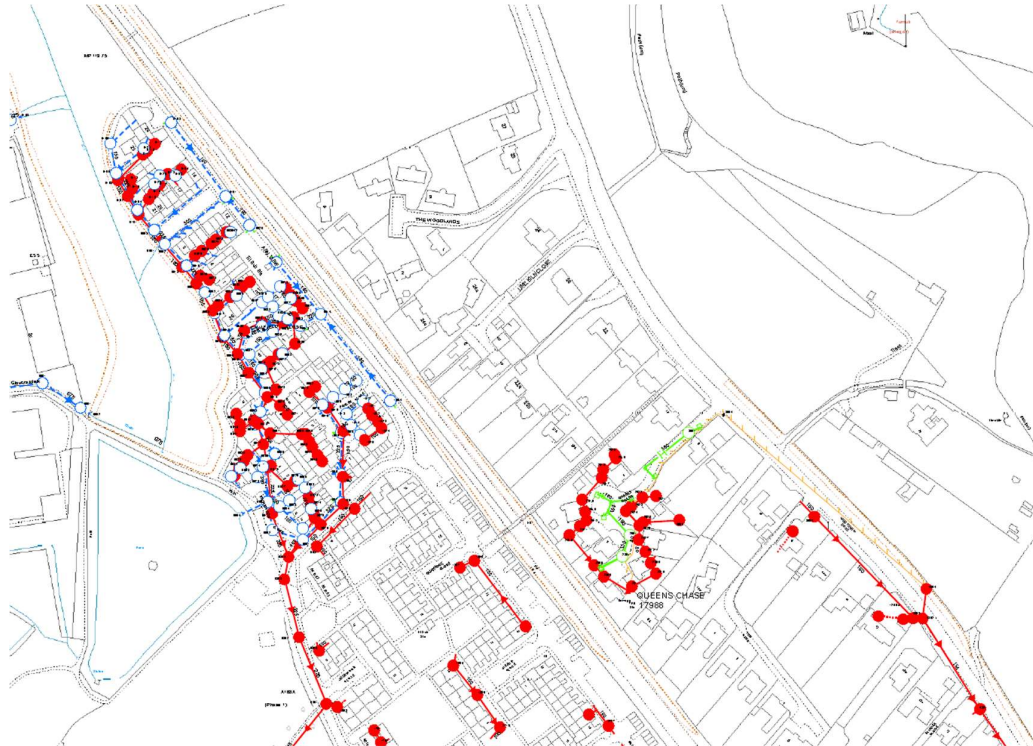
	Total Suspended Solids	Metals	Hydrocarbons
Pollution Index (Residential Roofs)	0.2	0.2	0.05
Pollution Index (Driveways, Residential Roads)	0.5	0.4	0.4
Mitigation Index (Attenuation Pond)	0.7	0.7	0.5
Mitigation Index (Swale)	0.5	0.6	0.6
Mitigation Index (Rain Gardens / Bioretention system)	0.8	0.8	0.8

Trapped gullies will also be used for Access Roads, Drives and Parking Areas which will remove sediments and debris.

9. Foul Drainage Strategy

9.1. Existing Sewers

There is an existing 150mm diameter Wessex Water Sewer in Westbury Road approx. 400m to the south of the site, refer to Drawing 678-FRA-075 'Drainage Strategy' included in Appendix G, Wessex Water correspondence included in Appendix F and screen shot below.



9.2. Proposed Strategy

Site levels mean that a gravity connection to the existing Wessex Water sewer is not possible. It is therefore proposed that foul sewage be pumped and connect to the existing Wessex Water sewer via a rising main. The proposed foul strategy is shown on drawing 678-FRA-075 in Appendix G

The proposed development of 205 dwellings will have a peak foul discharge of approx. 9.5l/s and pumped flow of 4.75 l/s, although this would be confirmed by the pump manufacturer at the detailed design stage.

The pumping station would require 32.8m³ of emergency storage within the adopted system and pumping station compound

The foul sewers for the proposed development will be adopted by Wessex Water or other approved Water/Sewerage Undertaker under a Section 104 Agreement; private foul drainage will be in accordance with Part H of the Building regulations approved documents and will remain in private or management company ownership.

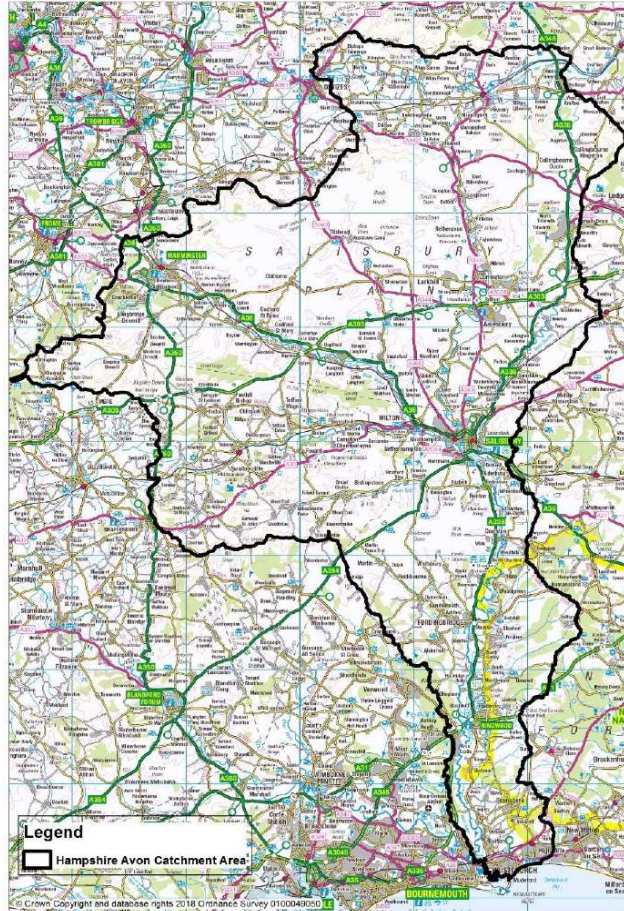
9.3. Phosphates

The existing Wessex Water sewers flow south and discharge to the Warminster Water Recycling Centre (WRC/Sewage Treatment Works) where wastewater and sewage is treated prior to it being discharged to the River Wylfe, see location plan below:

Warminster Water Recycling Centre Location:



The River Wylfe is a tributary of the Hampshire Avon, see river catchment plan below.



Wiltshire Council require all development within the Hampshire Avon Special Area of Conservation (SAC) to be 'phosphate neutral'; in accordance with the Memorandum of Understanding River Avon Special Area of Conservation Phosphate Neutral Development - Interim Mitigation.

A separate report has been produced by Marian Cameron Consultants Ltd to identify existing phosphate levels from the undeveloped site and phosphate levels from the developed site, and to identify mitigation measures required to ensure that the proposed development is phosphate neutral.

A Vortex Grit Separator can be used to capture / remove Phosphorus.

10. Management & Maintenance

10.1. General

The table below lists the proposed drainage and anticipated Maintenance / Management responsibilities.

Drainage Feature	Management and Maintenance Responsibility
Sewers (Foul & Surface Water).	Wessex Water or other approved Water/Sewerage Undertaker.
Rising Main	Wessex Water or other approved Water/Sewerage Undertaker.
Pumping Station	Wessex Water or other approved Water/Sewerage Undertaker.
Precast Concrete Headwalls	Regulated Adopting Body (for example Wessex Water)
Attenuation Pond or Basin	Regulated Adopting Body (for example Wessex Water) or a Private Management Company with appropriate experience
Flow Control	Regulated Adopting Body (for example South West Water) or a Private Management Company with appropriate experience
Highway Drains and Gullies	Wiltshire Council Highways.
Drainage for buildings, drives, parking areas, landscaping, etc. in private ownership	The owners where in sole ownership, and either shared responsibility or a Private Management Company for shared features.
Swales	Regulated Adopting Body or a Private Management Company with appropriate experience or the home owners where in sole ownership
Rain Gardens	The homeowners where in sole ownership or Management Company with appropriate experience
Permeable Pavement	The home owners where in sole ownership or Management Company with appropriate experience
Water Butts	The home owners where in sole ownership

The exact maintenance regime will be confirmed although it is likely it will be similar to that recommended by the SUDS manual.

TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)													
Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management ¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

■ will be required

□ may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

10.2. Pond

TABLE 23.1 Operation and maintenance requirements for ponds and wetlands		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1–5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required

10.3. Basins

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

10.3. Swales

TABLE 17.1 Operation and maintenance requirements for swales		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

10.4. Rain Gardens

TABLE 18.3 Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

10.5. Water Butts

TABLE 11.6 Operation and maintenance requirements for RWH systems

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

10.6. Permeable Pavement

TABLE 20.15	Operation and maintenance requirements for pervious pavements		
	Maintenance schedule	Required action	Typical frequency
	Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
		Occasional maintenance	Stabilise and mow contributing and adjacent areas
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying		As required – once per year on less frequently used pavements
	Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
		Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Monitoring	Initial inspection	Monthly for three months after installation
		Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
Inspect silt accumulation rates and establish appropriate brushing frequencies		Annually	
Monitor inspection chambers		Annually	

10.7. Management & Maintenance Plan

A management and Maintenance Plan will be produced for agreement with the LPA identifying ownership and maintenance responsibilities for the drainage system to ensure that it will be maintained and will operate effectively for the lifetime of the development.

11. Conclusions

11.1. Flood Risk

This site-specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance (PPG), and EA advice notes, and demonstrates that the proposed development will be safe from flood risk and that it will not increase flood risk elsewhere.

The site is located mostly within Flood Zone 1 with a low flood risk (less than 1:1,000 or 0.1% annual probability of flooding from rivers). The low parts of the site adjacent to the watercourse are Flood Zones 2 and 3 having a high risk of flooding. The proposed built development, access and level raising will only be in Flood Zone 1.

The proposed residential development is classified as 'More Vulnerable' and is in Flood Zone 1; the proposed residential development is suitable in this zone and the NPPF Sequential and Exception Tests are not required. Other less vulnerable uses will be in Flood Zones 2 and 3 in accordance with the NPPF/PPG compatibility.

The floor levels of all dwelling will be set a minimum of 600mm above the Flood Zone 2 flood level (0.1% or 1:1,000 annual probability flood event) and safe dry access/egress provided to all dwellings. Development levels will be designed to route surface water flows away from dwellings to protect them from flooding.

Flood risk from fluvial, pluvial, sewers, surface water, groundwater and artificial sources has been assessed and it has been demonstrated that the proposed development will not be at risk from flooding from all sources.

11.2. Surface Water Drainage

Surface water from the proposed development will discharge into the watercourse running through the site with the discharge limited to Qbar for events up to and including the 1:100 + 45% climate change/urban creep allowance event with 30% betterment provided for greenfield rates. This will ensure that flood risk is not increased in the receiving watercourses downstream of the development for the lifetime of the development.

Attenuation will be provided in a basin or pond with sewers discharging directly into it via precast concrete headwalls. The pond will have a permanent pool to provide treatment to the surface water run-off from the development. Bank slopes will be 1 in 3 in accordance with The SuDS Manual Ciria C753.

Flood routes will be provided for exceedance events, or for local failure of the drainage system (blockage, damage, etc.), and will ensure that flood flows are directed safely through or around the development to the downstream drainage system and watercourse.

The use of SuDS will remove pollution from surface water run-off and improve water quality with additional SuDS features provided with practical.

11.3. Foul Drainage

The foul flows from the site will be pumped to the existing sewage network to the south in Westbury Road as confirmed by Wessex Water; full details of the connection will be agreed with Wessex Water.

The foul sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker to ensure that they will be maintained for the lifetime of the development.

11.4. Summary

The Flood Risk Assessment and Drainage Strategy demonstrate that the proposed development meets with all the national and local policy requirements and satisfies all the criteria of the Planning Authority, Lead Local Flood Authority, and Environment Agency.

The Flood Risk Assessment concludes that the site can be safely developed without flood risk and without increasing flood risk elsewhere through the use of an appropriately designed and maintained Sustainable Drainage System.

Appendix A

Indicative Masterplan

Appendix B

Topographical Survey, Elevations, & Slopes

Appendix C

Existing Hydrology & Flood Risk

Appendix D

Ground Investigation Extracts

Appendix E

Green-field Run-off Calculations

Appendix F

Wessex Water Correspondence & Information

Appendix G

Drainage Strategy

Appendix H

Impermeable Area

Appendix I

Site 3D Pond Calculations

Appendix J

LLFA Pre-application Consultation Response

Appendix K

EA Product 4 Flood Risk Information

Appendix L

Hydraulic Modelling

Appendix M

EA & LLFA Consultation Responses