

**Land off Kidnappers Lane
Leckhampton, Cheltenham**

Robert Hitchins Limited



Flood Risk Assessment

&

Drainage Strategy

January 2019



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Document Control

Project Number: 421

Project: Kidnappers lane, Leckhampton

Client: Robert Hitchins Limited

Document Title: Flood Risk Assessment & Drainage Strategy

Author: Peter Amies

Revision: -

Status: Planning

Control date: 21/01/2019

Record of Issue

Issue	Status	Author	Date	Check	Date	Authorised	Date
-	Planning	P Amies	21/01/19			P Amies	21/01/19

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1. EXECUTIVE SUMMARY

- 1.1.** The site at Kidnappers Lane is considered within the level 2 Strategic Flood Risk Assessment (L2SFRA) as part of its evidence base for Gloucester, Cheltenham and Tewkesbury Joint Core Strategy. The site forms part of “Site C17” at Leckhampton and Shurdington.
- 1.2.** The L2SFRA and EA mapping identifies the site as being entirely within Flood Zone 1 (low risk, less than 1:1,000 annual probability of flooding).
- 1.3.** This site specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance, 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.
- 1.4.** Flood risk from all sources (sea, fluvial, pluvial, surface water, sewers, groundwater, artificial) has been assessed and it has been demonstrated that the proposed development will not be at risk from flooding from these sources. Refer to Section 5 for further details.
- 1.5.** A surface water drainage strategy has been developed that incorporates a Sustainable Drainage System (SuDS) and is shown on drawing No. 421-200 Drainage Strategy contained within Appendix F. The proposed 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. Surface water flows from the proposed development will discharge to the existing ditch along the site boundary and mimic the existing drainage patterns for the site.
- 1.6.** To mitigate for the additional surface water run-off volume resulting from the proposed development the EA/Defra and Ciria guidance together with BS8582 recommend that Extended Attenuation Storage is provided and that run-off is restricted to 5 l/s for all events up to the 1:100 with allowance for climate change. This approach ensures that sufficient run-off is retained on site for extreme events to protect the receiving water course in times of flooding.
- 1.7.** A 40% allowance for climate change has been included in the SuDS attenuation assessment to take in to account the predicted increase in rainfall intensity over the lifetime of the development.
- 1.8.** Micro-drainage has been used to calculate the proposed attenuation pond volumes for the 1 in 1:1, 1:30, and the 1:100+40% climate change events. The results of the simulation are contained within Appendix H and summarised in Section 6.3.
- 1.9.** The proposed SuDS will provide treatment to the surface water run-off from the development and will follow the SuDS treatment train approach to remove pollutants.
- 1.10.** Flood routes will be provided for exceedance events, or for local failure of the drainage system, and will ensure that flood flows are directed safely through the development to the downstream drainage system.

- 1.11.** The proposed Sustainable Drainage System for the development will be managed and maintained to ensure that it will operate effectively for its lifetime.
- 1.12.** This Flood Risk Assessment and Drainage Strategy demonstrates that the proposed development meets with all the national and regional policy requirements and satisfies all the criteria of the Environment Agency.
- 1.13.** 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 Sustainable Drainage System.

2. INTRODUCTION

2.1. This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Phoenix Design Partnership Limited on behalf of Robert Hitchins Limited and its successors in title to the land to support an outline planning application.

2.2. The outline planning application is for a residential development comprising of up to 25 dwellings, associated infrastructure, open space, and landscaping, with creation of new vehicular access from Kidnappers Lane.

See Indicative Masterplan contained within Appendix A.
See Section 5.1 for Site Location Plan.

2.3. The site at Kidnappers Lane is considered within the level 2 Strategic Flood Risk Assessment (L2SFRA) as part of its evidence base for Gloucester, Cheltenham and Tewkesbury Joint Core Strategy, “**Site C17**”. Refer to Section 3.7 for further details.

2.4. This site specific Flood Risk Assessment (FRA) has been produced in accordance with the National Planning Policy Framework document, Section 10 ‘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.

2.5. 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.

3. POLICY & GUIDANCE

3.1. National Planning Policy Framework (NPPF): 2012

The NPPF was published in March 2012 replacing PPS25 ‘Development and Flood Risk’. The purpose of the NPPF is to help achieve sustainable development; it sets out the Government’s planning policies for England and how they expected to be applied. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Section 10 of the NPPF ‘Meeting the challenge of climate change, flooding and coastal change’ sets out the government policies on development and flood risk.

Paragraphs 100 to 104 of the NPPF set out the requirements for Sequential Tests and Exception Tests to direct development to areas of lowest flood risk and ensure that development will be safe from flooding and that it does not increase flood risk elsewhere, taking in to account climate change.

3.2. Planning Practice Guidance: 2014

The guidance on flood risk and coastal change published in March 2014 effectively revives the technical guidance within the former PPS25 but within the context of the NPPF; it also replaces the Technical Guidance to the NPPF.

The guidance does not introduce any substantive changes to the approach established in PPS25 and in the Technical Guide to the NPPF. The guidance reinforces key areas of policy with additional detail and procedural requirements.

The main steps to be followed are set out in the guidance:

- Assess Flood Risk: SFRAs, Local Plan, Site Specific FRAs.
- Avoid Flood Risk: Sequential Approach, Sequential Test, Exception Test.
- Manage and Mitigate Flood Risk: Flood Resistance/Resilience, Safe for Lifetime (including Climate Change & Maintenance), SuDS, Flood Risk Management Opportunities.

The guidance addresses the need to reduce the cause and impact of flooding through the design of developments and the use of sustainable drainage systems. It also offers guidance on how to ensure that development will be safe from flooding, and the management of flood risk including flood resilient and resistant development.

3.3. Flood & Water Management Act 2010 (FWMA)

The FMWA provides legislation for better, more comprehensive management of flood risk. National SuDS Standards will be introduced as a result of the legislation.

Changes to planning came in force in April 2015 requiring details and SuDS now to be included in planning applications.

3.4. Cheltenham Borough Council Saved Local Plan Policies

POLICY UI 1

DEVELOPMENT IN FLOOD ZONES

Objective O30

Within developed areas of zones subject to high risk of flooding (note 1), the change of use of basements to flats will not be permitted until the town is protected against a 1 in 100 year event. Other residential, commercial and industrial development will be permitted only where:

- (a) it would not adversely affect flood flow regimes or reduce the storage capacity of the flood plain ; and
- (b) an appropriate minimum standard of flood defence can be maintained for the lifetime of the development (see note 2); and
- (c) it would not place life at risk directly or as a result of placing further demands on the emergency services during times of flooding.

Within zones subject to low to medium risk of flooding, essential civil infrastructure will not be permitted, except where:

- (a) the facility has to be or is already located in the zone; and
 - (b) access is guaranteed and the facility is capable of remaining operational in times of extreme flooding.
-

Note 1

An indication of zones subject to high flood risk is provided by flood plain maps published by the Environment Agency. Because of local variability and uncertainties, the definition of flood risk zones cannot be prescriptive and at any given moment must be determined by completion of a flood risk assessment.

Note 2

The minimum standard of flood defence will include a differential of at least 600mm between 1 in 100 years flood levels and the lowest floor level of a building.

This advice is provided by the Environment Agency and will be treated as a material consideration in any application.

**POLICY UI 2
DEVELOPMENT AND FLOODING**

Objective O30

Development will only be permitted where it would:

(a) in the case of new development, not increase the quantity or rate of surface water run-off (see notes 1 and 2); or

in the case of redevelopment, reduce the quantity or rate of surface water run-off (see note 1);
and

(b) not have a direct and adverse effect on a watercourse or its flood defences; and

(d) not impede access to flood defence and management facilities.

Note 1

The minimum standard of attenuation required will be the difference in run-off between that for a 1 in 100 year storm prior to development and a 1 in 100 year storm post development.

Note 2

The restriction and reduction of surface water run-off is likely to require the use of sustainable drainage systems (see paragraphs 13.25 - 13.26).

**POLICY UI 3
SUSTAINABLE DRAINAGE SYSTEMS**

Objective O30

In new developments the incorporation of Sustainable Drainage Systems will be required. Where this is not practicable developers will be required to demonstrate fully why the development cannot incorporate sustainable drainage systems and how the development manages surface water drainage.

3.5. Gloucester, Cheltenham & Tewkesbury Joint Core Strategy

The GCT JCS was adopted in December 2017.

Policy INF2: Flood Risk Management

- 1. Development proposals must avoid areas at risk of flooding, in accordance with a risk-based sequential approach. Proposals must not increase the level of risk to the safety of occupiers of a site, the local community or the wider environment either on the site or elsewhere. For sites of strategic scale, the cumulative impact of the proposed development on flood risk in relation to existing settlements, communities or allocated sites must be assessed and effectively mitigated**
- 2. Minimising the risk of flooding and providing resilience to flooding, taking into account climate change, will be achieved by:**
 - i. Requiring new development to, where possible, contribute to a reduction in existing flood risk;**
 - ii. Applying a sequential test for assessment of applications for development giving priority to land in Flood Zone 1, and, if no suitable land can be found in Flood Zone 1, applying the exception test;**
 - iii. Requiring new development that could cause or exacerbate flooding to be subject to a flood risk assessment which conforms to national policy and incorporates the latest available updates to modelling and climate change data and historic data and information and guidance contained in the authorities' Strategic Flood Risk Assessments and Supplementary Planning Documents, in order to demonstrate it will be safe, without increasing flood risk elsewhere;**
 - iv. Requiring new development to incorporate suitable Sustainable Drainage Systems (SuDS) where appropriate in the view of the local authority to manage surface water drainage: to avoid any increase in discharge into the public sewer system; to ensure that flood risk is not increased on-site or elsewhere; and to protect the quality of the receiving watercourse and groundwater. Where possible, the authorities will promote the retrofitting of SuDS and encourage development proposals to reduce the overall flood risk through the design and layout of schemes which enhance natural forms of drainage. Developers will be required to fully fund such mitigation measures for the expected lifetime of the development including adequate provision for ongoing maintenance;**
 - v. Working with key partners, including the Environment Agency and Gloucestershire County Council, to ensure that any risk of flooding from development proposals is appropriately mitigated and the natural environment is protected in all new development.**

This policy contributes towards achieving Objective 6.

3.6. Cheltenham Borough Council Strategic Flood Risk Assessment, Level 1

In December 2007 Gloucester County Council, in partnership with its Local Authorities, commissioned Halcrow to produce a Level 1 Strategic Flood Risk Assessment (SFRA). The SFRA for Cheltenham Borough Council final report is dated September 2008. The purpose of this SFRA is to assess and map all forms of flood risk from Fluvial (rivers), Tidal (sea), groundwater, surface water, sewers and impounded water bodies (reservoirs and canals), both now and in the future taking into account future climate change predictions, to allow the councils to use this as an evidence base to locate future development primarily in low flood risk areas.

The SFRA will also be used for the preparation of the Local development Framework (LDF), in particular the core strategy. Furthermore the SFRA provides useful information for Sustainability Appraisal (SA) and will assist in the development of flood risk policies.

3.7. Gloucestershire, Cheltenham & Tewkesbury Joint Core Strategy Strategic Flood Risk Assessment, Level 2 (L2SFRA)

In April 2010 Halcrow Group Ltd was commissioned by the Joint Core Strategy (JCS) comprising Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council, to undertake a Level 2 SFRA. This SFRA was published in October 2011. The aim of the study is to improve existing Flood Zone information for a number of watercourses within the JCS area and assess the flood hazard posed by these watercourses. The level 2 SFRA refines and builds upon the work undertaken in the level 1 SFRA.

The site forms part of the L2SFRA “Site C17” ‘Leckhampton & Shurdington’. As part of the Level 2 assessment, a 1D-2D model has been developed for key watercourses in the JCS area, this included the Hatherley Brook and Ham Brook as shown below:-

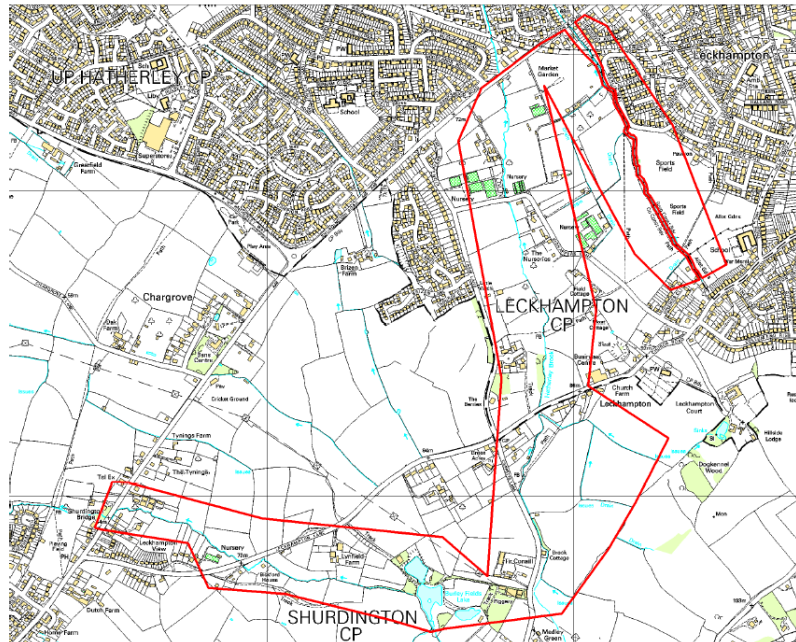


Figure 3.1: Leckhampton & Shurdington model extents

Additional L2SFRA Flood Maps for Site C17 are contained in Appendix B for reference. Further information relating to the L2SFRA is included within the body of this FRA.

3.8. Ciria C753 ‘The SuDS Manual’

Ciria C753 ‘The SuDS Manual’ published in 2015 provides comprehensive guidance on the planning, design, construction and maintenance of Sustainable Drainage Systems (SuDS) in the UK. C753 guidance should be used to help develop the strategy and design of the SuDS.

3.9. 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.

3.10. Sewers for Adoption

‘Sewers for Adoption’ 7th Edition published by Water UK in August 2012 provides guidance on the design and construction of surface water drainage systems for adoption by Water Companies.

3.11. 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.

3.12. Building Regulations Part H 2010 ‘Drainage & Waste Disposal’

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

3.13. 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.

3.14. Non Statutory Technical Standards For Sustainable Drainage Systems 2015

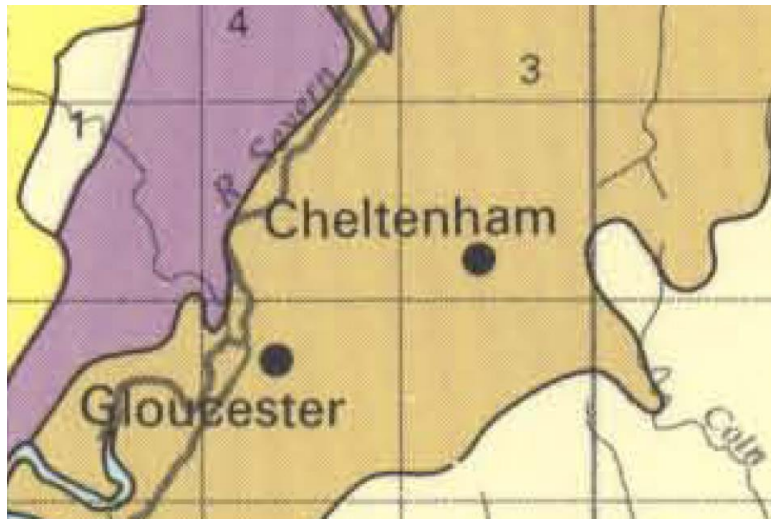
This document sets out the Non-Statutory Technical Standards For Sustainable Drainage Systems and should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance.

4. EXISTING SITE DETAILS

4.1. Hydrogeology

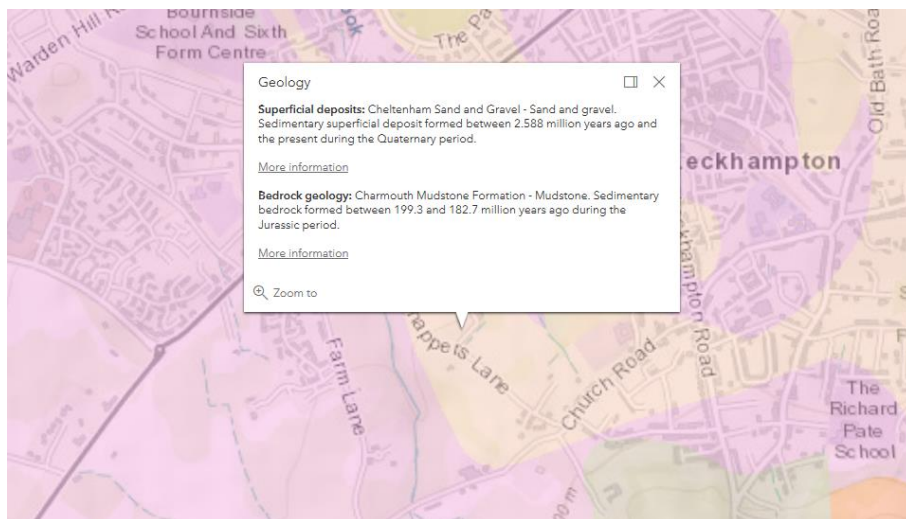
4.1.1. The 'Winter Rain Acceptance Potential' (WRAP) map

This map shows the site to be Soil Class 3 which generally comprises relatively impermeable soils in boulder and sedimentary clay and permeable soils with shallow ground water or mixed areas of permeable and impermeable soils in approximately equal proportions.



4.1.2. The British Geological Survey (BGS)

Superficial deposits are shown to comprise of Cheltenham Sand & Gravel. Bedrock is Charmouth Mudstone Formation.

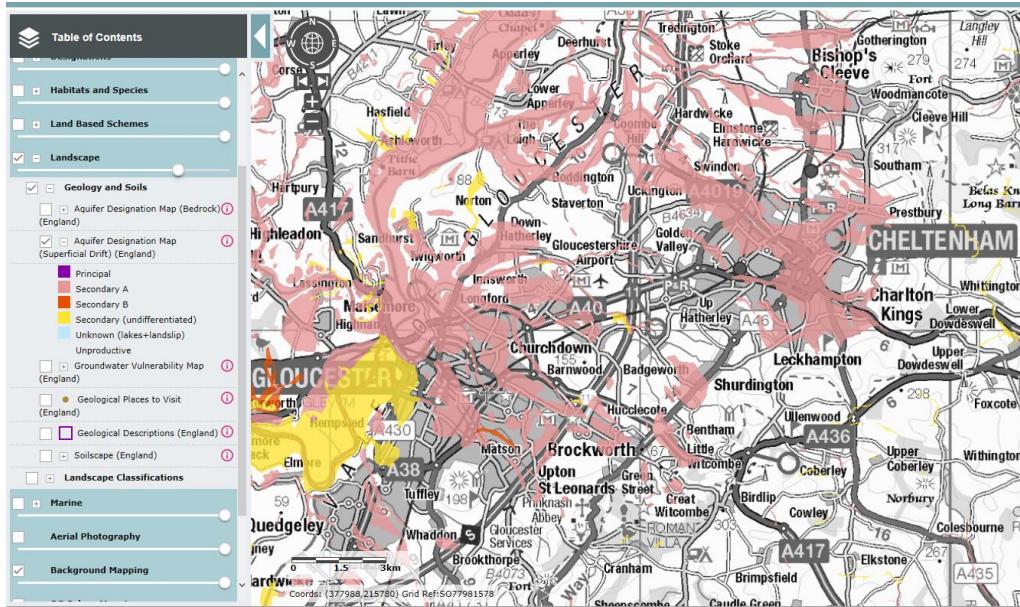


Refer also to findings of ground investigation within section 4.3

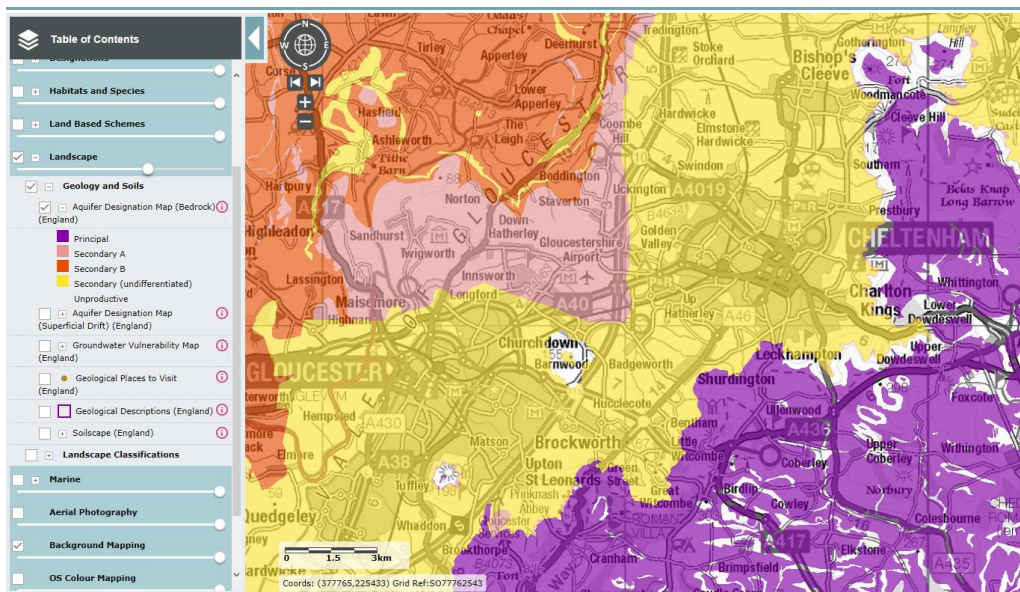
4.1.3. Environment Agency Information

Aquifer Designation

EA mapping indicates that the Alluvium and Cheltenham Sand and Gravel superficial deposits classify as a Secondary A Aquifer, 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.

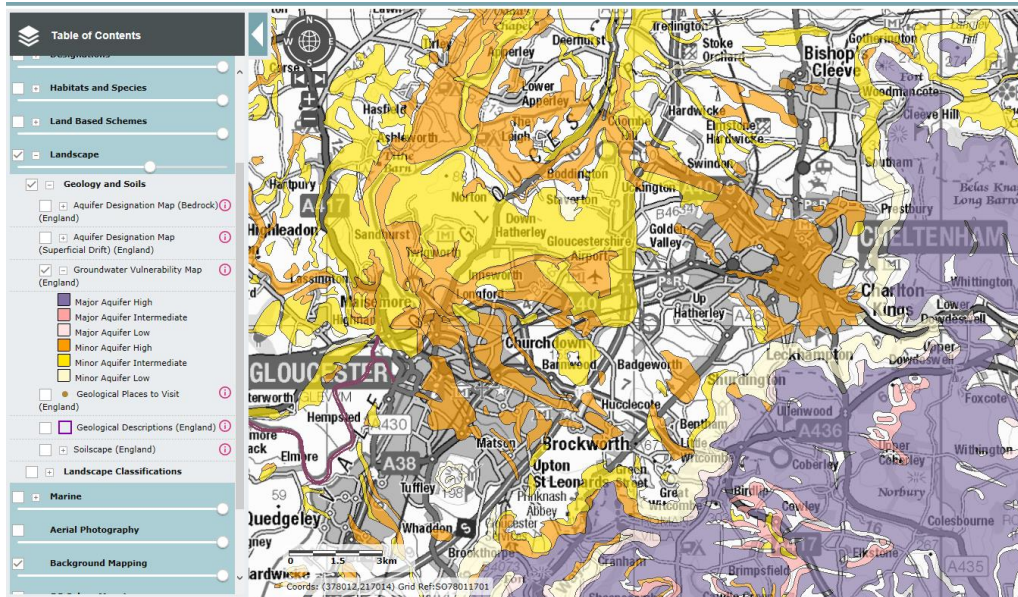


EA mapping for the Blue Lias Formation and Charmouth Mudstone Formation bedrock is classified as a Secondary (undifferentiated) Unproductive Aquifer.



Ground Vulnerability Zone Map

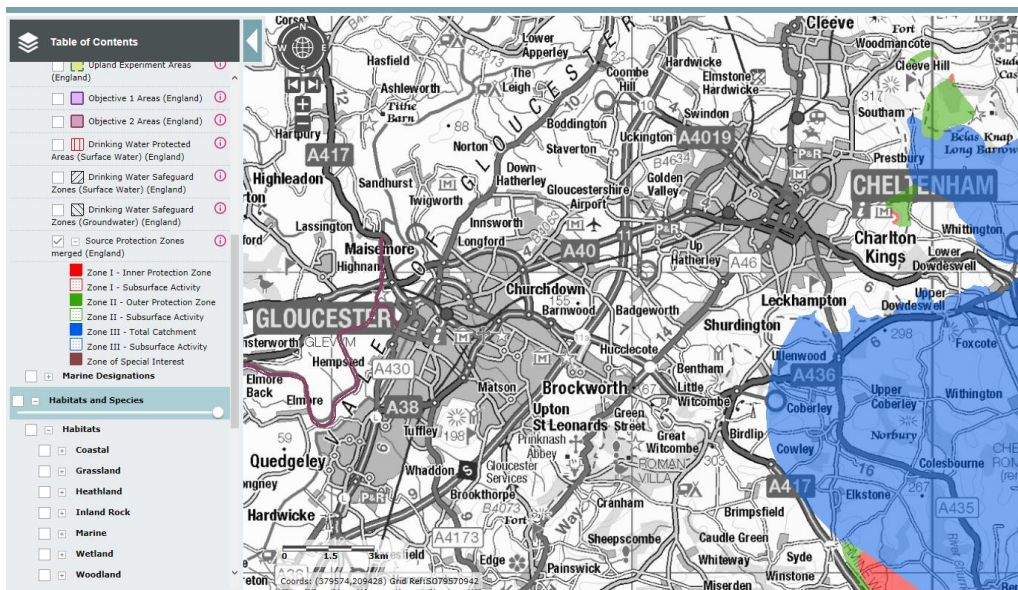
EA mapping for groundwater vulnerability shows the site to be in an area classified as a minor aquifer intermediate



Groundwater Source Protection Zone Map

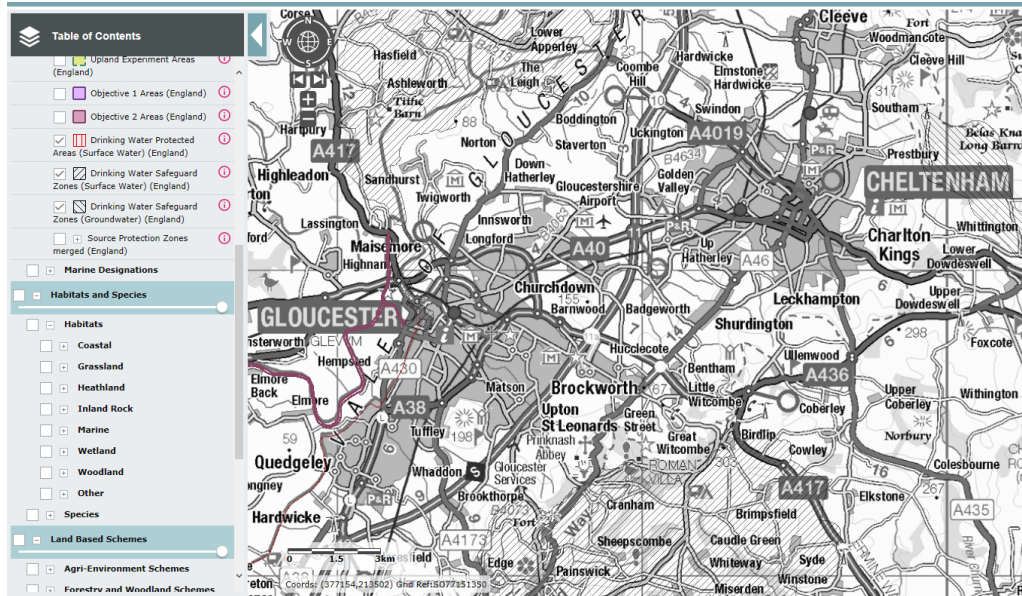
The EA website groundwater mapping shows that the site is not located in a Groundwater Source Protection Zone.

The nearest groundwater abstraction (agricultural use) is on the Hatherley Brook upstream of the Application Site, approximately 1km to the east. There are no groundwater abstractions on the Hatherley Brook downstream of the Application Site.



Drinking Water Protected Areas & Safeguarded Zones

The site is not within a protected area or safeguarded zone.



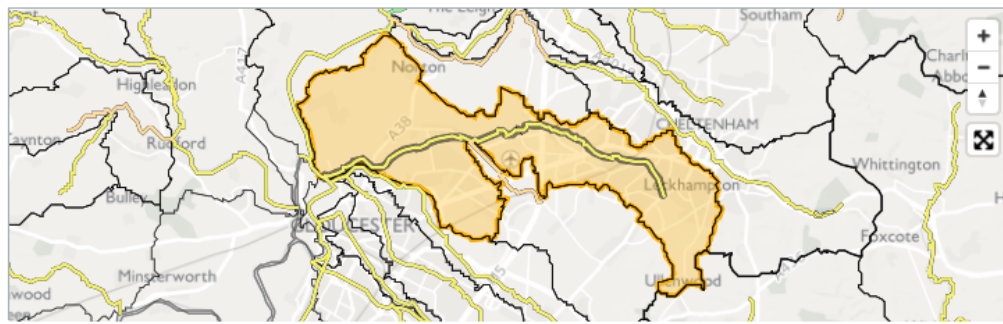
Based upon the above information the site is considered to be within an area of low to moderate sensitivity in terms of Hydrogeology and groundwater resources.

4.2. Hydrology

The Hatherley Brook is located approximately 150m to the west of the site and is classified as an ordinary watercourse turning to Main River to the north of Shurdington Road. There is an unnamed watercourse approximately 150m to the east of the site classified as an ordinary watercourse. There are existing shallow ditches along the northern and eastern boundaries. The existing hydrological features are shown on the topographical survey included in Appendix C.

Water Framework Directive River Basin Management Plans (WFD)

The EA online mapping shows the Hatherley Brook currently has a moderate status; the Severn River Basin Management Plan aims to achieve good status by 2027.



Hatherley Bk - source to conf R Severn
Overview

Download Water Body as CSV / GeoJSON

Overall classification for 2016
Moderate

Id	G8109054032801
Type	River
Hydromorphological designation ⓘ	heavily modified
NGR ⓘ	SO8853822422
Catchment area	4333.16 ha
Length	14.459 km
Surveillance Water Body ⓘ	No
Catchment area	43.332 km ²

Classifications ⓘ

Cycle 2 classifications ⓘ

Download as CSV

Classification Item	2013	2014	2015	2016
Overall Water Body	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate
Chemical	Good	Good	Good	Good

Cycle 1 classifications

WaterBody has no cycle 1 classifications

Reasons for not achieving good status and reasons for deterioration ⁱ

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Reason Type	SWMI	Activity	Category	More	Classification Element
RNAG	Diffuse source	Urbanisation - urban development	Urban and transport	Details	Phosphate
RNAG	Diffuse source	Poor nutrient management	Agriculture and rural land management	Details	Phosphate
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Phosphate
RNAG	Diffuse source	Livestock	Agriculture and rural land management	Details	Phosphate

Objectives ⁱ

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Classification Item	Status	Year	Reasons
Overall Water Body	Good	2027	Disproportionate burdens
Ecological	Good	2027	Disproportionate burdens
Supporting elements (Surface Water)	Good	2027	Disproportionate burdens
Mitigation Measures Assessment	Good	2027	Disproportionate burdens
Biological quality elements	Good	2015	
Macrophytes and Phytobenthos Combined	Not assessed	2015	Disproportionate burdens
Fish	Good	2015	
Invertebrates	Good	2015	
Hydromorphological Supporting Elements	Supports Good	2015	
Hydrological Regime	Supports Good	2015	
Physico-chemical quality elements	Good	2027	Disproportionate burdens
Ammonia (Phys-Chem)	Good	2015	
Dissolved oxygen	Good	2015	
pH	Good	2015	
Phosphate	Good	2027	Disproportionate burdens
Temperature	Good	2015	
Specific pollutants	High	2015	
Triclosan	High	2015	
Copper	High	2015	
Zinc	High	2015	
Chemical	Good	2015	
Priority substances	Good	2015	
Lead and Its Compounds	Good	2015	
Nickel and Its Compounds	Good	2015	
Other Pollutants	Does not require assessment	2015	
Priority hazardous substances	Good	2015	
Cadmium and Its Compounds	Good	2015	

Based upon the above information the site is considered to be within an area of low to moderate sensitivity in terms Hydrology.

4.3. Ground Investigation

A preliminary geotechnical design report was prepared by Wilson Associates Consulting Engineering Geologists & Geo-Environmental Engineers in September 2015. Phase 2 intrusive investigation had not been carried out at the time this report was written. Whilst soakaway testing has not been carried out the underlying clay soils are unlikely to support the use of infiltration, therefore the use of SuDS in the form of infiltration drainage for this site has been ruled out.

4.4. Existing Greenfield Run-off Rates

From the topographical survey, the natural drainage regime (surface water run-off) from the site drains to existing ditches along the west and north boundaries.

The green-field run-off rate for the site has been calculated using Micro-Drainage ICP SuDS method assuming:

SAAR (Standard Average Annual Rainfall) = 700mm (from Wallingford Map)

SOIL (Soil Index) = 0.40 (Class 3, relatively impermeable soils)

Region = 4 (FSR Region)

The Micro Drainage calculations are included within Appendix D for the **1.4 hectare site**, with results summarised below:

Qbar	=	4.8 l/s	(3.4 l/s/ha)
Q1	=	4.0 l/s	(2.8l/s/ha)
Q30	=	9.3 l/s	(6.7 l/s/ha)
Q100	=	12.2 l/s	(8.7 l/s/ha)

4.5. Existing Greenfield Run-off Volume

The existing green-field run-off volume has been calculated using the following formula:

Volume = RD x A x 10 x SPR (from Ciria C753 Section 24.4)

RD = Rainfall Depth (mm)

A = Catchment Area

SPR = Standard Percentage Run-off (0.4 for relatively impermeable Soils)

Guidance recommends that the run-off volume for the 100 year 6 hour event is used to compare existing and proposed volumes. Run-off from the 1.4 ha development area has been calculated as shown below:

Rainfall has been calculated using Micro Drainage with M5-60 = 18mm and Ratio r = 0.37. The 1:100 6 hour rainfall has been calculated to be 9.808 mm/hr (58.85 mm for 6 hours), refer to Appendix H for rainfall calculations.

Volume = 58.85 x 1.4 x 10 x 0.40 = **330 m³**