PROPOSED MIXED USE DEVELOPMENT
LAND AT MERCER ROAD, HORSHAM, WEST SUSSEX

Riverdale Developments Ltd

Flood Risk Assessment

December 2024

Proposed Mixed Use Development

Land at Mercer Road, Horsham, West Sussex

Flood Risk Assessment

Document Preparation

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Contents

List of Tables

List of Figures

List of Appendices

1.0 INTRODUCTION

1.1 Background

1.1.1 Connect Consultants Limited have been appointed by Riverdale Developments Ltd to prepare a Flood Risk Assessment (FRA) in support of proposals for a residential-led mixed-use development, comprising residential dwellings and employment space. The benefit of this report is to our instructing client.

1.1.2 The purpose of this Flood Risk Assessment is to demonstrate that the proposed development will not present a risk to flooding.

1.2 Scope

1.2.1 This Flood Risk Assessment identifies that the proposed development satisfies the following criteria;

- Demonstrate that there is a low risk of flooding from all sources, including; fluvial, tidal/coastal, surface water, groundwater, sewers, infrastructure failure, reservoirs, canals and other artificial sources;
- Identify a surface water drainage strategy;
- Assesses the acceptability for Flooding Risks; and
- Consider flooding mitigation measures if required, and conclude with a summary of measures where appropriate.

1.2.2 This report has been prepared to support a full planning application.

2.0 DEVELOPMENT SITE DETAILS

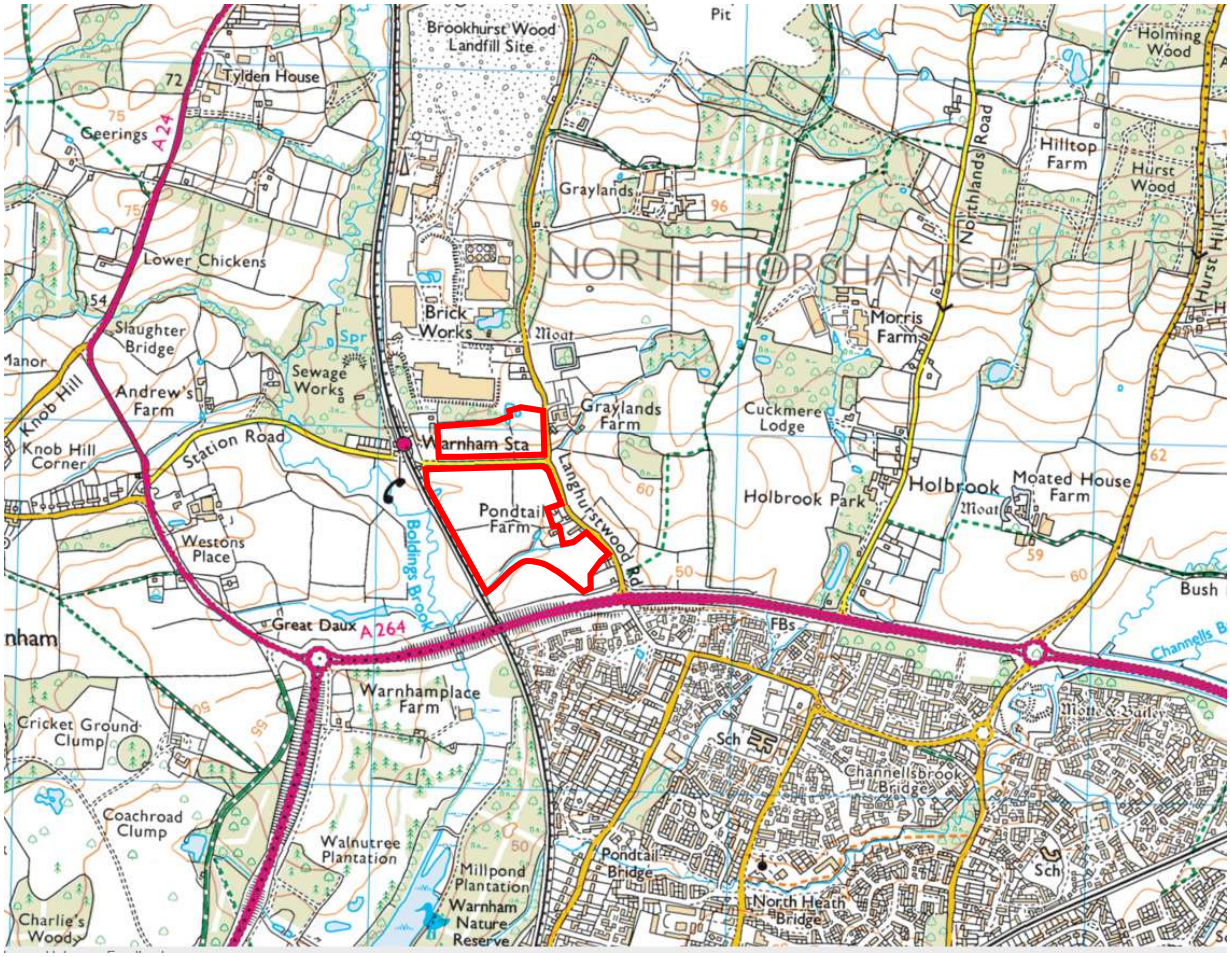
2.1 Site Location

2.1.1 The development site is a parcel of land on the northern side of the town of Horsham. Horsham is located approximately 8.0 miles West of Crawley and 22.0 miles South-East of Guildford. The development site will have a total development area of 142,927m^2 (14.293ha).

2.1.2 The site lies adjacent to the western edge of the recently consented strategic urban extension known as the North of Horsham development (Planning Reference: DC/16/1677).

2.1.3 The location of the proposal site, in the context of the urban area, is presented in Figure 2.1 below.

Figure 2.1 – Site Location



Source: OS Map

2.2 Reference Documents

2.2.1 This Flood Risk Assessment has been undertaken with reference to the following publication:

- National Planning Policy Framework (NPPF) from Ministry of Housing, Communities and Local Government (February 2019)
- Planning Practice Guidance 'Flood Risk and Coastal Change' from Ministry of Housing, Communities and Local Government (July 2018)
- Department for Environment, Food and Rural Affairs (March 2015), Non-statutory technical standards for sustainable drainage systems
- Environment Agency (December 2019), Flood Risk Assessments: Climate Change Allowances
- Environment Agency (October 2013), Delivering benefits through evidence: Rainfall runoff management for developments
- HM Government (2010), The Building Regulations, Drainage and Waste Disposal: Approved Document H, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), Sustainable drainage systems: Hydraulic, structural and water quality advice, C609, CIRIA, London
- Woods-Ballard et al (2015), The SuDS Manual, C753, CIRIA, London
- CIRIA Report C624 Development and flood risk – guidance for construction industry (2004), CIRIA
- National SuDS Working Group (2004), Interim Code of Practice for Sustainable Drainage Systems
- Institute of Hydrology (1999), Flood Estimation Handbook and FEH Web Service (2015)
- BS EN 752:2017 Drain and sewer systems outside buildings. Sewer system management
- BS 8582:2013 – Code of practice for surface water management for development sites
- BS 8533:2017 Assessing and managing flood risk in development – Code of Practice
- Horsham District Council, Horsham Strategic Flood Risk Assessment (report ref. 60613369-rev 02, January 2020)
- West Sussex County Council Preliminary Flood Risk Assessment (PFRA), June 2015
- West Sussex County Council Local Flood Risk Management Strategy (LFRMS), (2013-2018) dated May 2014

3.0 DESCRIPTION, SITE TOPOGRAPHY AND DEVELOPMENT PROPOSALS

3.1 Location and Description of the Site

3.1.1 The site is located at land at Mercer Road, Horsham, West Sussex, as presented in Figure 2.1 above. The site is bounded by the Weinerberger brickworks to the north, Langhurst Wood Road to the east, the A264 to the south and the railway line to the west. Mercer Road, which serves Warnham Station, crosses the site East-West near its northern boundary.

3.2 Current Land Use

3.2.1 The site is currently occupied by a small number of barns and undeveloped agricultural land, as presented on the topographical survey provided in Appendix A. The barns will be demolished as part of the proposed development.

3.2.2 There are several ponds identified at various locations within the site and a brook which runs along the southern portion of the site. The brook flows in a westerly direction and discharges out through the culvert under the railway line. The brook ultimately joins the Boldings Brook off the South-East of the site beneath the A264 dual carriageway.

3.3 Development Proposals

3.3.1 The development proposals are shown on the site layout plan provided in Appendix B.

3.3.2 The proposal is for a mixed-use residential-led development to provide 304 residential dwellings, and small convenience store of 190sqm gross floor area (GFA) and a car park comprising 50 spaces to serve Warnham train station. The 304 residential dwellings comprise 65 flats and 239 houses.

3.3.3 The larger portion of the site, south of Mercer Road, is anticipated to contain solely residential development; the smaller portion, north of Mercer Road, will be both residential and employment.

3.4 Site Topography

3.4.1 The development site is undulating in nature, and generally falls down to the south. The site levels generally vary between circa 56.0m and 42.0m, falling from North-East corner of the site to the South-West corner of the site.

3.5 Existing Drainage

3.5.1 The site is currently open and fully permeable, with the exception of a small number of barns towards the South-East, as shown on the topographical survey enclosed in Appendix A.

3.6 Existing Geology and Hydrology

3.6.1 Geo-Environmental Services Limited (Geo-Environmental) has completed a Phase 1 Desk Study for the site, report reference GE17826-DSR-DEC18 dated December 2018. The report extracts are enclosed in Appendix C.

3.6.2 The above Phase 1 Desk Study states:

- With reference to British Geological Survey (BGS) mapping, the geology of the site was anticipated to comprise the Weald Clay Formation. In addition, the Arun Terrace Deposits (Superficial Deposits) was indicated to be present in the southwest portion of the site. Given the development history of the site, there is the potential for a limited extent of Made Ground to be present within the southeast portion of the site.
- The site is indicated to be outside of any source protection zone (SPZ).
- No groundwater abstraction was identified within 250m of the site boundary.
- The BGS Groundwater Flood Susceptibility (GFS) Data map indicated that the site has the potential for groundwater flooding to occur at surface in the southwest portions of the site. However, the Weald Clay Formation is generally impermeable and the migration of mobile contaminants is therefore considered to be limited.

3.6.3 The Horsham District Council SFRA states:

- Parts of the Wealden Group bedrock that underlies the study area and the Alluvium and River Terrace Deposits superficial deposits are described by the Environment Agency as being Secondary A Aquifers. The Environment Agency describes Secondary A Aquifers as:

  '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.'

3.6.4 Due to underlying clay geology, the discharge of surface water through infiltration (such as soakaways) are not considered practical or appropriate for this development site. However, infiltration testing will be carried out prior to detailed design to confirm this assumption.

3.7 Flood Risk Vulnerability Classification

3.7.1 The development is split into two distinct elements, a residential element and an employment element. Table 3.1 below is a copy of Table 2 from the Planning Practice Guidance (PPG) for 'Flood Risk and Coastal Change' to the National Planning Policy Framework (NPPF), which determines the vulnerability of the development site. The proposed residential element would be classed as More Vulnerable development, whilst the commercial element would be classed as Less Vulnerable development.

3.7.2 The proposed development type is highlighted in Table 3.1 below based on the vulnerability of flood risk.

Table 3.1

Flood Risk Vulnerability Classification	
Vulnerability	**Type of Development**
More Vulnerable	Hospitals.
	Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
	Buildings used for **dwelling houses**, student halls of residence, drinking establishments, nightclubs and hotels.
	Non–residential uses for health services, nurseries and educational establishments.
	Landfill and sites used for waste management facilities for hazardous waste.
	Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding.
	Buildings used for **shops**; financial, professional and other services; restaurants, cafes and hot food takeaways; **offices**; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
	Land and buildings used for agriculture and forestry.
	Waste treatment (except landfill* and hazardous waste facilities).
	Minerals working and processing (except for sand and gravel working).
	Water treatment works which do not need to remain operational during times of flood.
	Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Source: Planning Practice Guidance - 2018

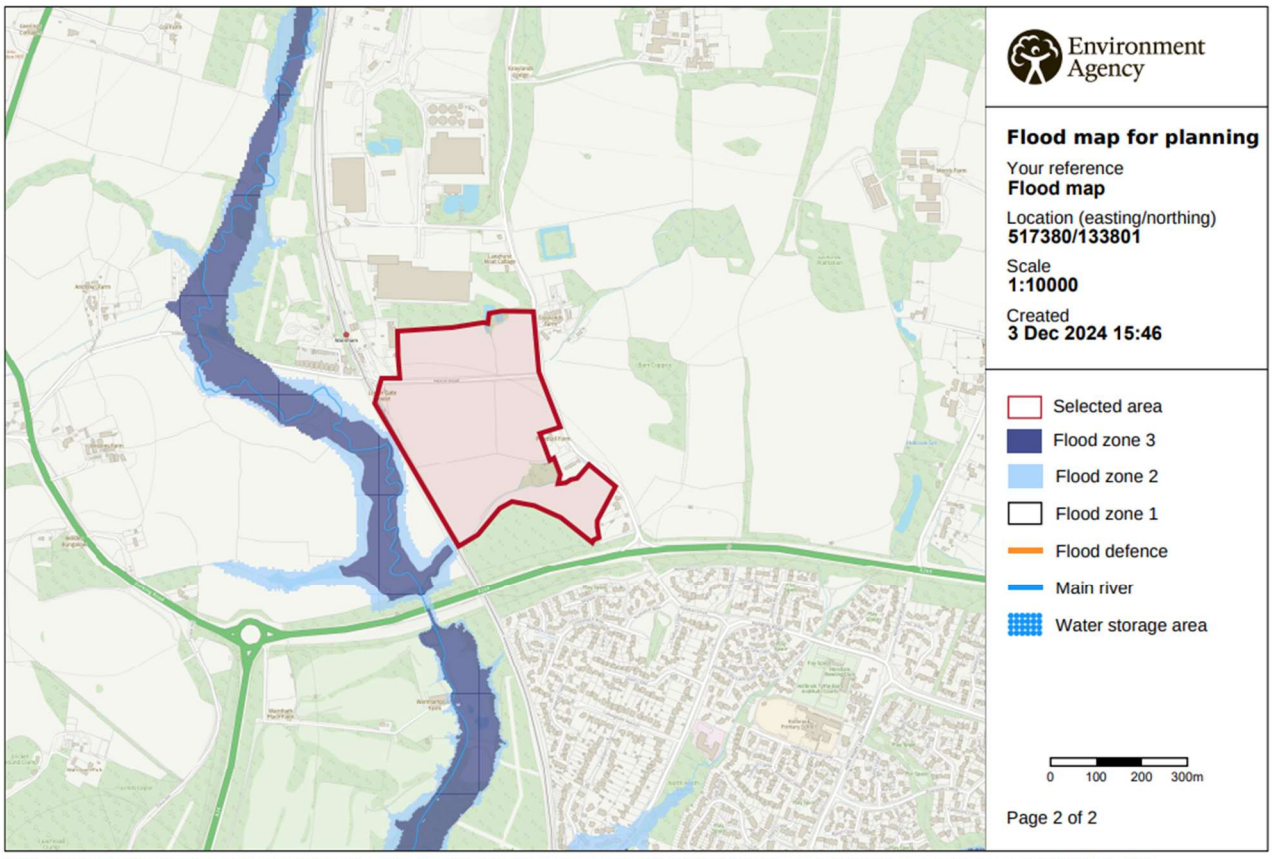
4.0 EXISTING FLOOD RISK TO THE SITE

4.1 Fluvial / Tidal Flooding

4.1.1 The Environment Agency (EA) produces floodplain maps which identifies the possible extent of fluvial flooding for a 1 in 100 year flood event (i.e. having a 1% probability of being exceeded each year) and the possible extent of tidal flooding for a 1 in 200 year event, ignoring the presence of flood defences. Also, the possible extent of flood arising from a in 1,000 year event (0.1% probability) is shown.

4.1.2 The Environment Agency's Flood Map for Planning (Rivers and Sea) has been reviewed and is shown in Figure 4.1 below. The flood map was extracted from the GOV.UK website on 3rd December 2024. The approximate development site boundary is shown in red. The map indicates that the development site is entirely contained within Food Zone 1 (low probability) and is therefore considered to be at low risk of flooding from rivers or the sea.

Figure 4.1 – Flood Map for Planning (Rivers and Sea)



Source: GOV.UK Website

4.1.3 Table 1 from the NPPF Planning Practice Guidance for 'Flood Risk and Coastal Change' defines the flood zones. An extract of Table 1 is shown in Table 4.1 below. The development site which is contained within Flood Zone 1 is defined as 'Land having a less than 1 in 1,000 annual probability of river or sea flooding' in any year.

Table 4.1

Flood Zone Definitions	
Flood Zone	**Definition**
Zone 1 - Low probability	**Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)**
Zone 2 - Medium probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a - High probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b - The Functional Flood Plain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Source: Planning Practice Guidance - 2018

4.2 Surface Water Flooding

4.2.1 The Environment Agency's 'Risk of Flooding from Surface Water' has been reviewed and is shown in Figure 4.2 below. The flood map was extracted from the GOV.UK website on 11th November 2020. The approximate development site boundary is shown in red.

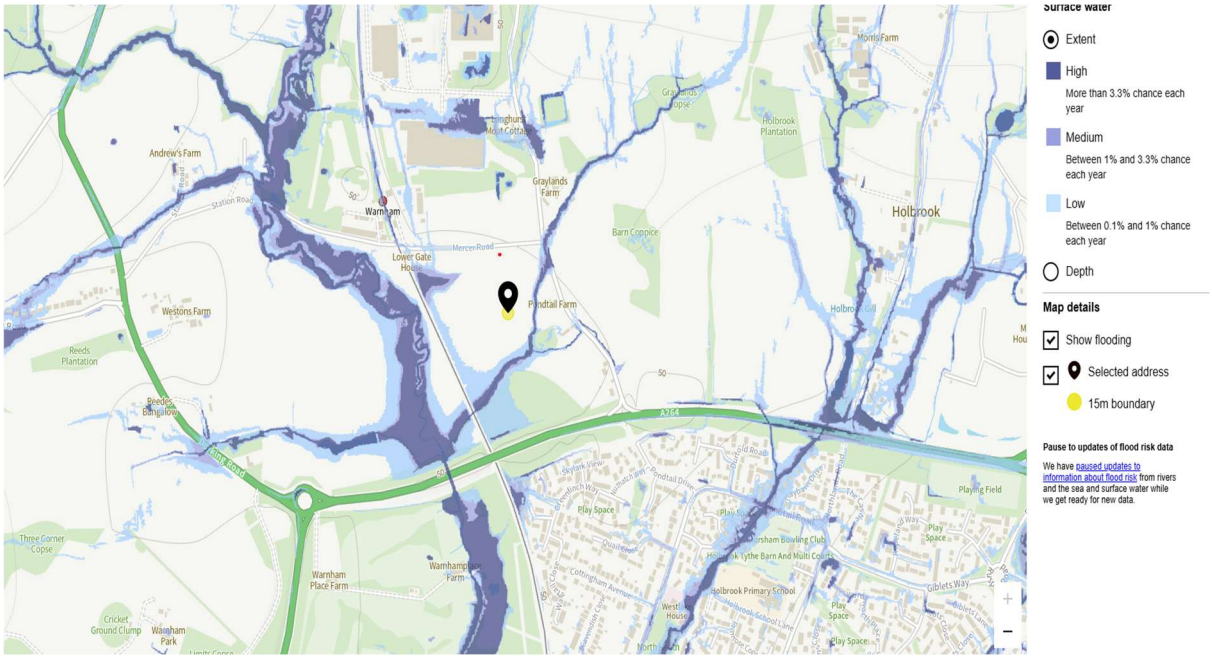
4.2.2 The northern portion of the site is located in an area of very low (less than 1 in 1,000) risk from surface water flooding in a given year, with low (1 in 100 to 1 in 1,000), medium (1in 30 to 1 in 100) and high (greater than 1 in 30) risk due to the presence of ponds located towards the northern boundary.

4.2.3 The majority of the southern portion of the site is located in an area of very low (less than 1 in 1000) risk from surface water flooding in a given year. The low, medium and high surface water flood risk towards the North-West and South-East are associated with ponds which are isolated within the site boundary.

4.2.4 There is a surface water flood risk route that crosses the development site from the North-East to South-East which is associated with the Brook. The flood risk route moves in a westerly direction and ultimately joins to the Boldings Brook off the South-East corner of the site, beneath the A264 dual carriageway.

Figure 4.2 – Risk of Flooding from Surface Water

Source: GOV.UK Website



4.2.5 Post-development, the site will be positively drained, thereby reducing the risk of surface water flooding.

4.2.6 In order to mitigate the impact of storm exceedance or infrastructure failure and to safeguard properties, consideration shall be given to minimising the number of low-lying properties.

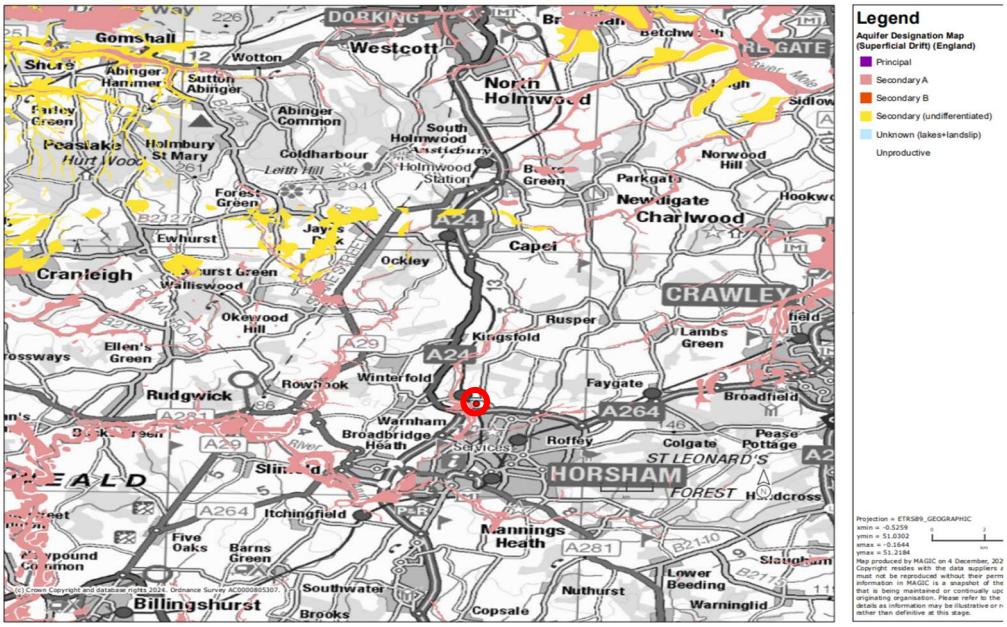
4.2.7 The external levels and drainage network of the site will be designed to direct the overland flow through the development and away from the proposed buildings and towards garden areas and shared spaces, thereby reducing the risk of flooding. From a flood risk perspective, the proposed development is considered to be appropriate.

4.2.8 It is important to note that this map is generated using a wider methodology applied at the national scale. The model utilises generalised information on infiltration, sewerage infrastructure, rainfall events and catchment topography to route rainfall over a ground surface model. As such, the analysis does not take account of site-scale factors/characteristics that may exert an influence upon surface water flood depths and extents. The map therefore only provides a guide regarding the areas that may be vulnerable to this source of flooding.

4.3 Groundwater Flooding

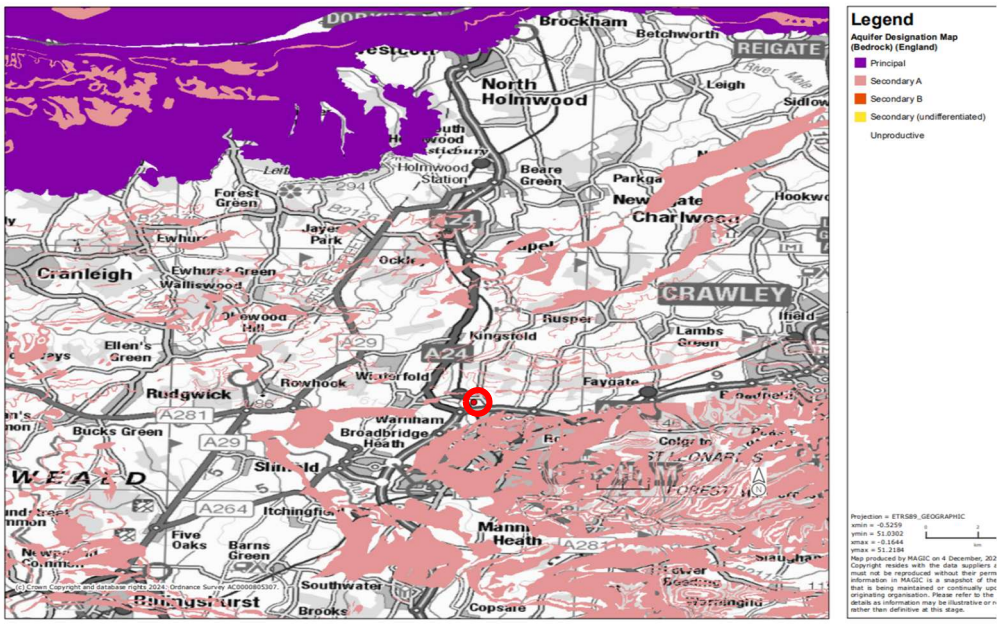
4.3.1 From information provided on the DEFRA website via the Magic Map, see Figure 4.3 and Figure 4.4 below, the development site appears to be partially underlain by a Secondary A aquifer in the superficial deposits. The site does not appear to be underlain by an aquifer in the bedrock layer.

Figure 4.3 – Groundwater – Aquifer Designation Map (Superficial)



Source: DEFRA's Magic Map Website

Figure 4.4 - Groundwater – Aquifer Designation Map (Bedrock)



Source: DEFRA's Magic Map Website

4.3.2 As described in Section 3.6 above, the Phase 1 Desk Study report notes that 'The southwestern portion of the site overlies Secondary 'A' aquifer, shallow groundwater (<5m bgl) is likely to be present on site beneath the site. The site is outside any Source Protection Zones. However, the Weald Clay Formation is generally impermeable and the migration of mobile contaminants is therefore considered to be limited'.

4.3.3 The Environment Agency's dataset, Areas Susceptible to Groundwater Flooding (AStGWF), is shown in (Appendix A, Figure 3A) of the Horsham District Council SFRA (report ref. 60613369-rev 02, January 2020). The map indicates where in Horsham District groundwater may emerge due to certain geological and hydrogeological conditions. The susceptible areas are represented by one of four categories showing the proportion of each 1km square where there is potential for groundwater emergence.

4.3.4 The groundwater flooding map is enclosed in Appendix D. The map indicates the site to be in area less than 25% susceptible to groundwater flooding.

4.3.5 The GeoSmart (GW5) dataset, Areas at risk of Groundwater Flooding is shown in (Appendix A, Figure 3B) of the Horsham District Council SFRA. The map indicates the site to be at a Negligible Risk of flooding from groundwater and any groundwater flooding incidence has a chance of less than 1% annual probability of occurrence, see Appendix E.

4.3.6 Based upon a review of the mapping outlined above, and taking into consideration the clay geology, groundwater flooding at the surface of the development site is considered unlikely.

4.4 Sewer Flooding

4.4.1 The proposed development will benefit from new storm water and foul water drainage. Southern Water will adopt the foul water system and the storm water system.

4.4.2 As this is a new development, the storm water system will be designed and built to accommodate the 1 in 100 year + 40% for Climate Change storm event without escape from the site.

4.4.3 In the event that a storm event occurs in excess of the system design criteria, the likelihood is that surface water may escape the designed system.

4.4.4 In the event described in 4.4.3 above, any exceedance would be channelised along the proposed highway, and this exceedance would likely be returned to the drainage system, overflow to shared spaces and/or gardens, or further off site.

4.4.5 The Horsham District Council SFRA sets out the sewer flooding data provided by Severn Trent Water as part of the DB5 Register. The data has been provided for the number of properties within a 4 or 5 digit postcode area that have experienced flooding either internally or externally within the last 10 years, see map enclosed in Appendix F. The map indicates the site to be in a postcode area where 12 to 24 properties have been affected by sewer flooding.

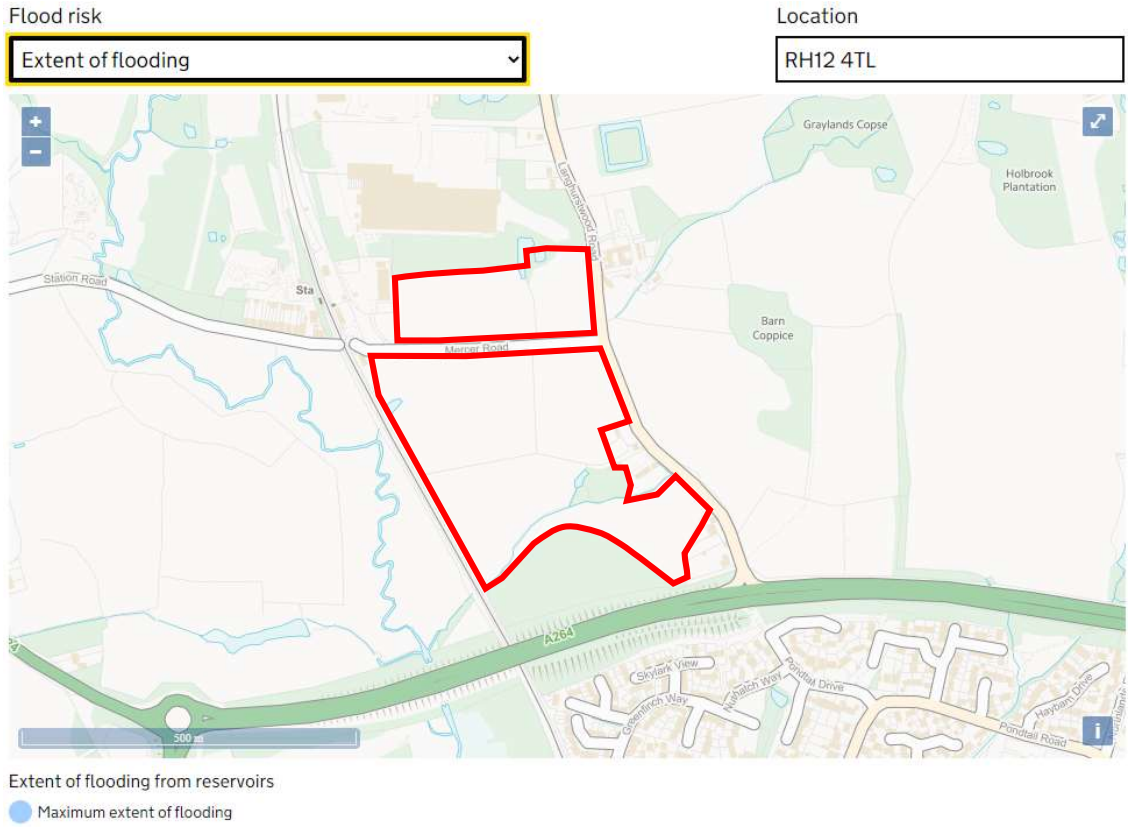
4.4.6 Thames Water have confirmed that there are no sewer flooding incidents reported with the area of Horsham District Council that they cover.

4.5 Flooding from reservoir, canals and other artificial sources

4.5.1 An extract Environmental Agency's map 'Risk of Flooding from Reservoirs' has been reviewed as shown in Figure 4.5 below. The approximate site boundary is marked in red and indicates that there are several ponds located to the North-East, North-West and South-East of the site.

4.5.2 The nearest reservoir (Warnham Mill Pond) is located at Warnham Local Nature Reserve, Horsham, approximately 5km to the south-west of the site. In this instance, the 'Flood Risk from Reservoirs' map indicates that the site would not be affected by flooding associated with the breaching of a reservoir, as shown in the extract provided in Figure 4.5 below.

Figure 4.5 – Risk of Flooding from Reservoirs



Source: GOV.UK Website

4.5.3 The above maps show the area that may be affected by flooding as a result of a breach of a large, raised reservoir which is capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land.

4.5.4 Based on the information available at the time of preparing this report, it can be concluded that the risk of flooding from reservoirs and other artificial sources is low.

4.6 Historic Flooding

4.6.1 The Historic Flooding Map (Appendix A, Figure 5) enclosed within the Horsham District Council SFRA, indicates no historic flooding incidents within the vicinity of the site, see Appendix G.

4.7 Flood Risk Vulnerability and Flood Zone Compatibility

4.7.1 Based on the above analysis, the proposed development is located within Flood Zone 1 with the residential element classed as More Vulnerable development and the commercial element classed as Less Vulnerable development. With reference to Table 4.2 below (copy of Table 3 from the NPPF Planning Practice Guidance for 'Flood Risk and Coastal Change'), the proposed development would be considered "appropriate" from a flood risk perspective. Neither a Sequential Test nor an Exception Test would be required.

Table 4.2

Flood Risk Vulnerability and Flood Zone Compatibility					
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	✗	✗	✗	✓
✓: Development is appropriate			✗: Development should not be permitted		

Source: Planning Practice Guidance - 2018

4.8 Flood Compensation

4.8.1 As the development site is located in Flood Zone 1, flood compensation measures will not be required.

4.9 Access and Egress

4.9.1 Access and egress to and from the site in the event of flooding will be via the proposed development's access road which lies within Flood Zone 1. This will allow the residents of the development to move to higher ground, thereby providing safe, flood-free access.

5.0 MANAGEMENT OF SURFACE WATER

5.1 Current Conditions

5.1.1 The site is currently open and fully permeable, with the exception of a small number of barns towards the South-East. The barns will be demolished as part of the development. Therefore greenfield run-off calculations shall be used to establish the allowable run-off rate from the development site.

5.2 Surface Water Drainage Hierarchy

5.2.1 The development should consider the location of discharge as a hierarchy. It is the requirement of Planning Practice Guidance, The Building Regulations (2010), Approved Document H (Drainage and waste disposal) to dispose of surface water collected by a development in accordance with the following, the Planning Practice Guidance states:

"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. *into the ground (infiltration);*
2. *to a surface water body;*
3. *to a surface water sewer, highway drain, or another drainage system;*
4. *to a combined sewer."*

5.2.2 Each of the above options are considered individually below:

5.3 Infiltration

5.3.1 As discussed in Section 3.6 above, due to underlying clay geology, the discharge of surface water through infiltration (such as soakaways) are not considered practical or appropriate for this development site. However, infiltration testing will be carried out prior to detailed design to confirm this assumption.

5.4 Watercourse / Main River

5.4.1 There is a brook which runs along the southern portions of the site. The brook flows in a westerly direction and discharges out through the culvert under the railway line. The brook ultimately joins the Boldings Brook off the South-East of the site beneath the A264 dual carriageway. Surface water from the development site will drain to this watercourse.

5.5 Sewers

5.5.1 Draining the site to an existing watercourse is a viable option, therefore the use of surface water sewers will not be considered further.

5.6 SuDS Assessment

5.6.1 A review of SuDS has been undertaken for the proposed development. The review is set out in Table 5.1 below.

Table 5.1

SuDS Assessment		
SuDS Group	**Suitability**	**Justification/Comments**
Rain Water Harvesting	Maybe	Use maybe considered in dwellings but would only mitigate a small portion of the increase in volume of run-off created by the site. Rain water butts can be used. To be considered at detailed design stage.
Green Roofs	No	Green Roofs are generally only applicable on flat roofs. The proposed houses are to have pitched roofs.
Infiltration	No	Underlying clay geology not suitable.
Filter Strips/Filter Drains	No	Underlying clay geology not suitable.
Swales	Yes	Where levels allow swales will be used for attenuation and to convey surface water through the site.
Trees	Yes	Majority of trees across the development site will be retained.
Bioretention Systems	No	Attenuation will be provided in the form of detention basins.
Detention Basin	Yes	A number of detention basins will be utilised for attenuation within the development site.
Attenuation Tanks	No	Attenuation will be provided in in the form of detention basins.
Pervious Pavements	Yes	Tanked pervious pavements will be provided for all private drives to provide a level of surface water attenuation and treatment.
Ponds and Wetlands	Yes	Existing ponds located within the site will be enhanced. A number of detention basins will have a permanent wetland/pond.
Trapped Drainage	No	Treatment of surface water will be provided using tanked pervious pavements and detention basins. Where levels allow swales will be utilised which will provide a level of water treatment.

5.7 Surface Water Drainage Strategy

5.7.1 In order to ensure that the rate of surface water run-off from the site does not increase as a result of the proposed development, the surface water discharge rates will be restricted to greenfield equivalent run-off rates.

5.7.2 The proposed drainage strategy for the development site will comprise a piped network with storage provided in a number of detention basins. Due to the topography of the site, the drainage strategy will be split into four catchments. There is a brook which runs along the southern portions of the site. The brook flows in a westerly direction and discharges out through the culvert under the railway line. Surface water from the development site will drain to this watercourse.

5.7.3 As infiltration is not considered practical or appropriate for this development site, tanked permeable paving will be used for all private drives to provide a level of water treatment.

5.7.4 An indicative drainage layout plan is enclosed in Appendix P. The drawing shows that surface water attenuation can be accommodated on the site.

5.8 Surface Water Drainage Design and Management

5.8.1 Proposals are to design the storm water system to accommodate the 1 in 100 year + 40% for Climate Change storm event without escape from the site. Table 2 from the Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, defines the climate change allowances to be adopted when preparing flood risk assessments. An extract of Table 2 is shown in Table 5.2 below.

Table 5.2

Peak Rainfall Intensity Allowance in Small Catchments (less than 5km^2) or Urban Drainage Catchments (based on a 1961 to 1990 Baseline)			
Allowance	**'2020s' (2015 to 2039)**	**'2050s' (2040 to 2069)**	**'2080s' (2070 to 2115)**
Upper End	10%	20%	40%
Central	5%	10%	20%

Source: Environment Agency - 2016

5.9 Existing Run-off Rates

5.9.1 Calculations have been undertaken to identify the Greenfield run-off rates for the development site in accordance with ICP SUDS. The greenfield run-off rates have been calculated using the following parameters:

- Soil Type = 0.450
- SAAR = 800mm
- Urban = 0.000
- Region Number = 6

5.9.2 The catchment areas and the proposed impermeable areas are presented in the drawing enclosed in Appendix H and Appendix I respectively.

5.9.3 The greenfield run-off rate calculations for each catchments are enclosed in Appendix J, K, L,M,N and O.

5.9.4 The total Qbar greenfield run-off rate from the site is 66.5l/s. Therefore, surface water from the development site will outfall to the existing brook, located to the south of the site at a greenfield rate of 66.5l/s.

5.10 Attenuation Requirements

5.10.1 Surface water will discharge into the existing brook, located to the south of the development site and will be attenuated to a total Q_{bar} greenfield run-off rate of 66.5l/s. To achieve this, surface water will be stored in a number of detention basins to accommodate a 1 in 100 year event + 40% for climate change.

5.10.2 The storage requirement for the 1 in 100 year + climate change event has been calculated utilising the following parameters.

- Rainfall Profile = Flood Estimation Handbook
- Return Period = 100 year
- Durations = 15 to 10080 minutes
- Climate Change = 40%
- Control = Hydrobrake

5.10.3 The indicative drainage layout comprising the attenuation is shown on the plan enclosed in Appendix R.

5.11 Basin 1

5.11.1 A quick storage estimate has been calculated for Catchment 1 using the above parameters. The approximate storage required for Basin 1 is between 561 m^3 and 984 m^3, see Appendix P. For a worst-case assessment, a total storage of 984 m^3 will be provided by means of a combination of a retention Basin (approximately 84%) and storage within the piped network will be provided for Basin 1.

5.12 Attenuation Tank

5.12.1 The attenuation requirement for the Attenuation tank has been calculated using the above parameters. The approximate storage required for the Attenuation Tank is between 1,370m^3 and 1,925m^3, see Appendix P. For a worst-case assessment, a total storage of 1,950m^3 will be provided for within the Attenuation Tank.

5.13 Basin 2

5.13.1 The attenuation requirement for Basin 2 has been calculated using the above parameters. The approximate storage required for Basin 2 is between 1,015m^3 and 1,464m^3, see Appendix P. For a worst-case assessment, a total storage of 1,464 m^3 will be provided by means of a combination of a retention Basin (approximately 88%) and storage within the piped network will be provided for Basin 2.

5.14 Overland Flows

5.14.1 Proposals are to design the surface water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate change.

5.14.2 Notwithstanding the points identified above with regards to flood exceedance and in the event of a storm event in excess of the designed system, the most likely cause of flooding will be down to poor maintenance, blockage or collapse.

5.14.3 In the event of one of the scenarios occurring in 5.15.2 above, surface water would likely escape the designed system and escape either from chambers and/or gullies and overspill as described above. Overland flows will be directed to follow the path that overland flows currently follow.

5.14.4 As noted above, plot levels and garden levels will be designed to shed water away from properties.

5.15 Foul Water Drainage

5.15.1 There is an existing Foul Water Rising Main located in Langhurst Wood Road to the east of the site, see sewer map enclosed in Appendix Q. Proposals are to be build a new Foul Water Rising Main crossing the site and connect into the existing Foul Water Rising Main in Langhurst Wood Road, subject to agreement with Southern Water.

5.15.2 Foul water from the development site will discharge into the newly built Rising Main which will ultimately discharge foul water into the Foul Water Rising Main located in Langhurst Wood Road.

5.15.3 Southern Water pre-development enquiry has been undertaken to confirm the proposed foul water discharge into their sewer network.

6.0 MAINTENANCE OF DRAINAGE SYSTEMS

6.1 Surface Water Drainage Maintenance

6.1.1 The proposed surface water drainage system will be designed to reduce maintenance requirements, in accordance with Sewer for Adoption standards and offered to Southern Water for future adoption and maintenance. However, a full maintenance strategy will be established for those elements not being offered for adoption.

6.1.2 The various areas that will be maintained are set out in Table 6.1 below.

Table 6.1

Maintenance Areas - Surface Water	
Aspect	**Maintainer**
Private Drains	Occupier
SuDS Private	Occupier
SuDS Communal	SuDS Adoption Authority/Management Company

6.2 Foul Water Drainage Maintenance

6.2.1 The proposed foul water drainage system will be designed to reduce maintenance requirements, in accordance with Sewer for Adoption standards and offered to Southern Water for future adoption and maintenance. However, a full maintenance strategy will be established for those elements not being offered for adoption.

6.2.2 The various areas that will be maintained are set out in Table 6.2 below.

Table 6.2

Maintenance Areas - Foul Water	
Aspect	**Maintainer**
Private Drains	Occupier
Adopted Sewers	Southern Water

7.0 SUMMARY AND CONCLUSIONS

7.1.1 The site is located at land at Mercer Road, Horsham, West Sussex. The site is bounded by the Weinerberger brickworks to the north, Langhurst Wood Road to the east, the A264 to the south and the railway line to the west. Mercer Road, which serves Warnham Station, crosses the site East-West near its northern boundary.

7.1.2 The site is currently occupied by a small number of barns and undeveloped agricultural land. The barns will be demolished as part of the proposed development.

7.1.3 The proposal is for a mixed-use residential-led development to provide 304 residential dwellings, and small convenience store of 190sqm gross floor area (GFA) and a car park comprising 50 spaces to serve Warnham train station. The 304 residential dwellings comprise 65 flats and 239 houses.

7.1.4 The development site is entirely contained within Food Zone 1 (low probability) and is therefore considered to be at low risk of flooding from rivers or the sea.

7.1.5 The majority of the site is located in an area of very low risk from surface water flooding in a given year, with low, medium and high risk due to the presence of ponds located at various locations within the site and the Brook. Post-development, the site will be positively drained, thereby reducing the risk of surface water flooding. The external levels and drainage network of the site will be designed to direct the overland flow through the development and away from the proposed buildings and towards garden areas and shared spaces, thereby reducing the risk of flooding. From a flood risk perspective, the proposed development is considered to be appropriate.

7.1.6 The development site is at a low risk of flooding from groundwater, sewers and other artificial sources such as reservoirs, canals.

7.1.7 The surface drainage strategy for the development site will comprise a piped network with storage provided in a number of detention basins. Surface water will discharge into the existing brook, located to the south of the development site and will be attenuated to a total Q_{bar} greenfield run-off rate of 73.4l/s.

7.1.8 There is an existing Foul Water Rising Main located in Langhurst Wood Road to the east of the site. Proposals are to be build a new Foul Water Rising Main crossing the site and connect into the existing Foul Water Rising Main in Langhurst Wood Road, subject to agreement with Southern Water. Foul water from the development site will discharge into the newly built Rising Main which will ultimately discharge foul water into the Foul Water Rising Main located in Langhurst Wood Road.

7.1.9 National, Regional and Local planning policy requires that:

- Development is directed to sites at the lowest probability of flooding;
- Development accommodates the potential impacts of climate change;
- Development should not be permitted if it would be at an unacceptable risk of flooding or create an unacceptable risk elsewhere; and
- New development should facilitate safe access and exit during flood conditions.

7.1.10 The proposals for residential and employment element are therefore fully compliant with policy in respect of development and flood risk, such that flood risk considerations do not constitute a barrier to the granting of planning consent.

Appendices

APPENDIX A – TOPOGRAPHICAL SURVEY

APPENDIX B – SITE LAYOUT

APPENDIX C – EXTRACTS OF PHASE 1 DESK STUDY REPORT

APPENDIX D – AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING MAP

APPENDIX E – AREAS AT RISK OF GROUNDWATER FLOODING MAP

APPENDIX F – SEWER FLOODING MAP

APPENDIX G – HISTORIC FLOODING MAP

APPENDIX H – CATCHMENT AREA PLAN

APPENDIX I – CATCHMENT AREAS HARDSCAPED / IMPERMEABLE AREA

APPENDIX J – GREENFIELD RUN-OFF RATE CATCHMENT AREA 1

APPENDIX K – GREENFIELD RUN-OFF RATE CATCHMENT AREA 2

APPENDIX L – GREENFIELD RUN-OFF RATE CATCHMENT AREA 3

APPENDIX M – GREENFIELD RUN-OFF RATE CATCHMENT AREA 4

APPENDIX N – GREENFIELD RUN-OFF RATE CATCHMENT AREA 5

APPENDIX O – GREENFIELD RUN-OFF RATE CATCHMENT AREA 6

APPENDIX P – QUICK STORAGE ESTIMATE

APPENDIX Q – SOUTHERN WATER SEWER PLAN

APPENDIX R – INDICATIVE DRAINAGE LAYOUT