



Land at Malthouse Lane, Burgess Hill

Flood Risk and Surface Water Drainage Appraisal

DRAFT

On behalf of **Vistry Homes Ltd**

Vistry
Partnerships

Project Ref: 332511294/001 | Rev: 01 | Date: October 2022

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1 Introduction

- 1.1.1 This report considers the baseline conditions of the site, specifically the impact of flooding and the development of surface water drainage. The constraints and the opportunities that this site affords and where necessary the potential suitable mitigation measures which could be required.
- 1.1.2 Whilst planning policy, both at a regional and local level, is often used to shape flood risk and surface water drainage design for sites, this also helps to inform the emerging masterplan and provides the foundations for the vision of a site. The proposal is to deliver a design which goes beyond the standard approach regarding sustainability and incorporating design principles as promoted within the supporting Vision Document for the site.
- 1.1.3 The details within the report are based on data available at the time of this study and is a high-level assessment. The findings are subject to change following receipt of further data, such as a site-wide topographical survey, details of any future ground investigations, and consultations with the statutory authorities, which are all proposed in support of a future planning application.
- 1.1.4 It should also be noted that this document is not a Flood Risk Assessment (FRA) or a supporting Sustainable Drainage Statement, both of which are to be undertaken as part of a suite of technical documents in support of a future Planning Application. All proposals with respect to flood risk and drainage are therefore subject to agreement with stakeholders such as the Environment Agency (EA), Local Planning Authority (LPA) which is Mid Sussex District Council (MSDC), the Lead Local Flood Authority (LLFA), which for this site is West Sussex County Council (WSCC), and Anglian Water (AW).

1.2 Purpose of this Report

- 1.2.1 The purpose of this report is to explore how the strengths of a development in this location can be harnessed and developed to enable local flood risk and surface water drainage policy objectives to be met. A brief overview of the impacts associated with development in this location, both in terms of opportunities for sustainable surface water drainage and in terms of flood risk have also been provided.
- 1.2.2 The document has been prepared as a template for the future sustainable surface water drainage strategy but also to help inform the next stage of the Local Plan process.

Report Structure

- 1.2.3 The remainder of this report is structured as follows:
- **Section 2** summaries the existing flood risk and surface water drainage policies which have been and are to be considered in the future development;
 - **Section 3** sets out the existing site details and hydrological context of the site, from existing data sources and studies;
 - **Section 4** provides details on the existing flood risk conditions effecting the site from both existing data sources and studies;
 - **Section 5** presents an early indication of a flood mitigation considerations;
 - **Section 6** outlines the future surface water drainage strategy based on preliminary calculations and assumptions;
 - **Section 7** summarises conclusions and recommendations.

1.3 Baseline Data

1.3.1 The report has been prepared based on the following sources of information:

- Environment Agency (EA) published 'Open Data' datasets available online, reproduced with OS mapping under licence to Stantec (contains Ordnance Survey data © Crown copyright and database right [2021], contains Environment Agency information © Environment Agency and database right) (**Appendix A**);
- Indicative Layout by Define (**Appendix B**);
- Sewer Asset Records by Southern Water, dated August 2022 (**Appendix C**);
- Consultation with key stakeholders, including the Environment Agency (EA), West Sussex County Council (WSCC), Mid Sussex District Council (MSDC), and Southern Water (SW) (**Appendix D**);
- Mid Sussex District Strategic Flood Risk Assessment Level 1 (June, 2015)
- Mid Sussex District Plan (2014 – 2031)
- Water. People. Place. A guide for master planning sustainable drainage into developments
- West Sussex LLFA Policy for the Management of Surface Water (updated November 2018)
- The West Sussex Plan 2017 – 2022
- West Sussex County Council Local Flood Risk Management Strategy 2013 – 2018
- West Sussex Preliminary Flood Risk Assessment (May 2011)
- River Adur Catchment Flood Management Plan (December 2009)

2 Flood Risk and Surface Water Drainage Policy

- 2.1.1 This report has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance as detailed below.

2.2 Relevant Planning Policy

- 2.2.1 National policy in relation to flood risk is contained within the **National Planning Policy Framework (NPPF)**, updated July 2021, issued by the Ministry of Housing, Communities and Local Government, with reference to Section 14 'Meeting the challenge of climate change, flooding and coastal change'.
- 2.2.2 The associated **Planning Practice Guidance (PPG)** was released in March 2014 (with reference to the 'Flood Risk and Coastal Change' section) and last updated August 2022.
- 2.2.3 The NPPF and PPG demonstrate a flood risk management approach for the lifespan of the proposed development considering the effects of climate change. The document sets the framework to minimise vulnerability, provide resilience to the impacts of climate change, and to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.
- 2.2.4 In May 2022 the guidance within the PPG on the application of climate change allowances in FRAs was significantly updated:
- <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.
- 2.2.5 The guidance provides contingency allowances for the potential increases in peak river flow, peak rainfall intensity and sea level rise which are considered accordingly subject to the site conditions – discussed further in **Section 4**.
- 2.2.6 The NPPF sets out the requirement for the Sequential Test and Exception Test in paragraphs 162 and 163 respectively – see below.

“162. 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. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding).

163. 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”

- 2.2.7 These Tests are to be applied where appropriate, depending on the proposed development flood risk 'vulnerability' and the Flood Zone in which it is located. This is detailed further in **Section 5**.

2.3 Regional Policy and Guidance

Mid Sussex District Strategic Flood Risk Assessment

- 2.3.1 The Mid Sussex District SFRA was released in 2015 to inform future spatial planning and assist in developing planning policies relating to flood risk. The document provides an overall

understanding of the flood risk from all potential sources at the site and within the vicinity of the site.

West Sussex County Council Local Flood Risk Management Strategy

- 2.3.2 The LFRMS outlines how WSCC will work with other authorities to manage all sources of flooding within the region, both now and in the future.

2.4 Local Policy and Guidance

Preliminary Flood Risk Assessment

- 2.4.1 WSCC is defined as the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010. The first element of the Flood Risk Regulations (2009) is for LLFAs to produce a Preliminary Flood Risk Assessment (PFRA) providing a high-level overview of flood risk from all sources within a local area, including consideration of surface water, groundwater and ordinary (minor) watercourses.
- 2.4.2 WSCC's PFRA was released in May 2011 and provides a high-level overview of flood risk from all sources within West Sussex.

Mid Sussex District Plan

- 2.4.3 The District Plan adopted in 2018 and sets out the strategic approach to development within the District of Mid Sussex. This includes specific policy relating to flood risk and drainage, which state:

DP41: Flood Risk and Drainage:

"Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change; and 12) To support sustainable communities which are safe, healthy and inclusive.

Evidence Base: Gatwick Sub Region Water Cycle Study; Strategic Flood Risk Assessment; Water. People. Places SuDS guidance.

Proposals for development will need to follow a sequential risk-based approach, ensure development is safe across its lifetime and not increase the risk of flooding elsewhere. The District Council's Strategic Flood Risk Assessment (SFRA) should be used to identify areas at present and future flood risk from a range of sources including fluvial (rivers and streams), surface water (pluvial), groundwater, infrastructure and reservoirs.

Particular attention will be paid to those areas of the District that have experienced flooding in the past and proposals for development should seek to reduce the risk of flooding by achieving a reduction from existing run-off rates.

Sustainable Drainage Systems (SuDS) should be implemented in all new developments of 10 dwellings or more, or equivalent non-residential or mixed development unless demonstrated to be inappropriate, to avoid any increase in flood risk and protect surface and ground water quality. Arrangements for the long term maintenance and management of SuDS should also be identified.

For the redevelopment of brownfield sites, any surface water draining to the foul sewer must be disconnected and managed through SuDS following the remediation of any previously contaminated land.

SuDS should be sensitively designed and located to promote improved biodiversity, an enhanced landscape and good quality spaces that improve public amenities in the area, where possible.

The preferred hierarchy of managing surface water drainage from any development is:

- 1. Infiltration Measures*
- 2. Attenuation and discharge to watercourses; and if these cannot be met,*
- 3. Discharge to surface water only sewers.*

2.5 Future Flood Risk Assessment and Supporting Drainage Strategy

- 2.5.1 At a future planning stage, the site would be subject to a site-specific Flood Risk Assessment and any associated work, to better understand the flood risk constraints of the site. This work is informed with more detailed baseline data, obtained through further investigatory works such as intrusive geotechnical investigations, topographical and watercourse surveys, the scope of which is agreed with the appropriate approving authorities. At this local plan stage a conservative approach is applied within this report.
- 2.5.2 A sustainable drainage surface water drainage strategy will also be provided in accordance with planning policy and consultation with WSCC as the LLFA and MSDC as the LPA.

3 Site Setting

3.1 Site Location

- 3.1.1 The site is located on land to the west of Burgess Hill, in West Sussex and comprises of an eastern parcel and western parcel, divided by Malthouse Lane. The centre of the eastern parcel has an approximate National Grid Reference (NGR) of 529731E, 117936N and the western parcel NGR is 528971E, 118513N.
- 3.1.2 The eastern parcel is bordered by Malthouse Lane and agricultural land to the west, Herrings Stream to the south, the Burgess Hill Green Circle Route beyond which is the Jane Murray Way (A273) to the north, and agricultural land and Scotches Farm to the east. The western parcel is bordered by Danworth Lane to the west, Herrings Stream to the south, greenfield land to the north, and Malthouse Lane to the east – see **Figure 3.1**.

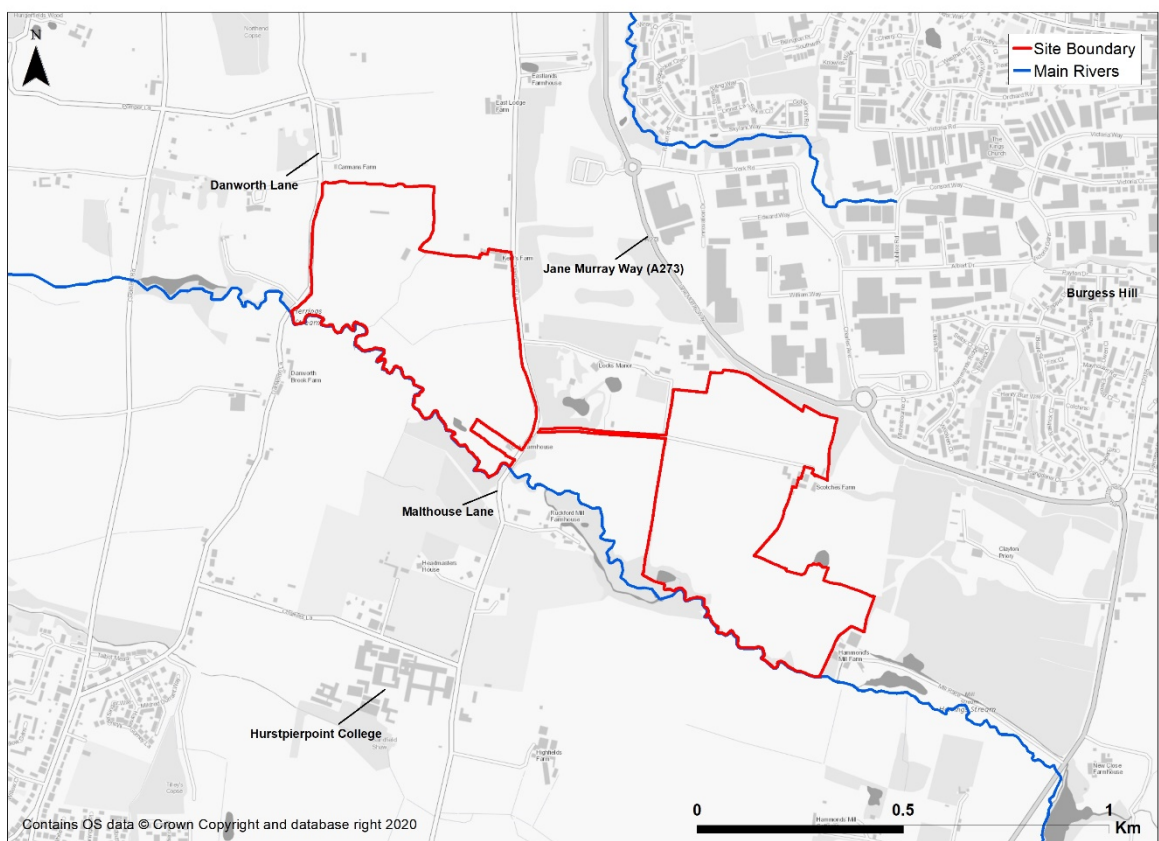


Figure 3.1: Site Location Plan

- 3.1.3 The site currently primarily comprises of greenfield land for agricultural land use, bounded to the south by the Herrings Stream.
- 3.1.4 The site lies within administrative boundary of Mid Sussex District Council (MSDC) and West Sussex County Council (WSCC).

3.2 Site Topography

- 3.2.1 EA Light Detection and Ranging (LiDAR) survey data shows that in the eastern parcel the ground levels are generally highest in the east at approximately 41 m Above Ordnance Datum

(AOD). In the south of the eastern parcel, ground levels fall to the south and southwest towards the watercourse corridor of the Herrings Stream, to the lowest point at approximately 24 m AOD. In the north of the eastern parcel, the ground levels generally fall northwards to approximately 42 m AOD, at the highest point of the site, towards Jane Murray Way (A273) – see **Figure 3.3**.

- 3.2.2 In the north of the western parcel ground levels fall to the south and southwest towards the watercourse corridor of the Herrings Stream, to the lowest point at approximately 20 m AOD in the southeast corner.

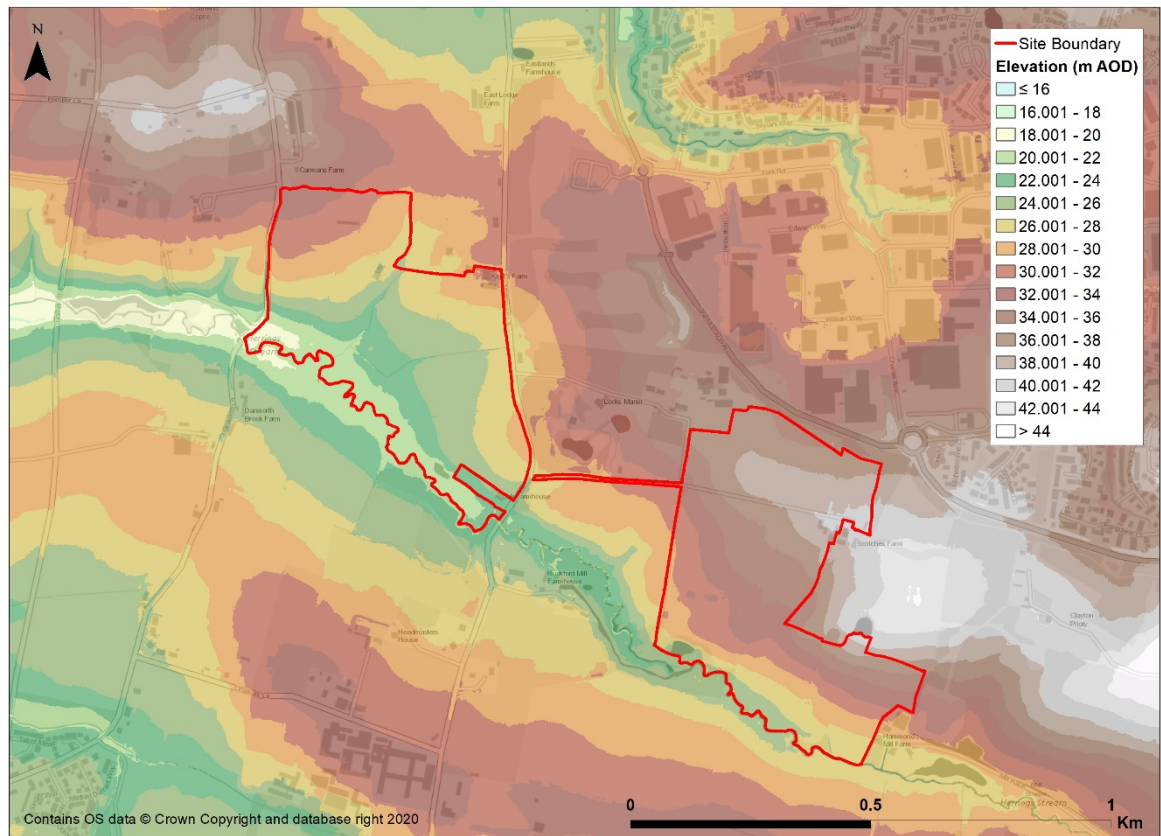


Figure 3.3: Site Topography (EA LiDAR)

3.3 Hydrological Setting

- 3.3.1 The Herrings Stream, an EA main river, is located along the southern boundary extent of the site, flowing generally from southeast to northwest. The Herrings Stream confluences with the River Adur approximately 4.8km west of the site. In addition to the main river, there are sections of ordinary watercourses associated with the Herrings Stream.
- 3.3.2 The Pook Bourne watercourse, an EA main river, is located to the northeast of the western parcel. The Pook Bourne flows generally southeast to northwest through Burgess Hill and confluences with the Herrings Stream approximately 1.8km northwest of the site.
- 3.3.3 A minor watercourse/drain bisects the land in the western parcel, flowing south/southwest to the Herrings Stream, OS mapping identifies this watercourse source is likely a pond located outside the site boundary. In addition there is an ordinary watercourse in the western parcel, originating at the eastern boundary next to Malthouse Lane and flowing generally west before its confluence with the Herrings Stream. The watercourse is likely to be a spring, denoted by 'Issues' on OS Mapping. In addition, OS mapping identifies a land drain to the north of the western parcel boundaries.



Figure 3.4: Hydrological Context

- 3.3.4 There are two ponds located within the site boundaries, in the southwest corner of the eastern parcel and in the southeast corner of the western parcel. OS Mapping shows the pond located in the southeast corner of the western parcel is connected to the Herrings Stream. In addition, there are a number of ponds in the immediate vicinity of the site.
- 3.3.5 There is a footbridge which crosses the Herrings Stream along the southern extent of the eastern parcel within the site boundaries.
- 3.3.6 The Herrings Stream along the southern extent of the site does not have flood defences, and the site is not within an EA designated area benefiting from flood defences. However, there is natural high ground along an extent of the Pook Bourne to the northeast of the site, shown in mapping provided in **Appendix A**.

3.4 Existing Sewer Infrastructure

- 3.4.1 Sewer records provided by SW (see **Appendix C**) show there are no existing wastewater sewers within the site boundaries. The SW asset plans show a wastewater network in the vicinity of the site, as follows:
- To the northeast of the site there is a combined gravity sewer flowing northwards, located to the east of the Pook Bourne watercourse.
 - To the northeast of the site there is a surface water sewer and foul sewer network within part of Sparrow Way, Wren Close, Woodpecker Crescent, Robin Road, Skylark Way and York Road. There is a surface water sewer located within Blackbird Close. The surface water sewers flow westwards and outfall to the Pook Bourne watercourse. The foul water sewers flow to the combined gravity sewer.
 - To the west of the site near to Cuckfield Road, there is a rising main sewer.

- To the north of the eastern parcel, there is a surface water sewer and foul sewer network within Charles Avenue and Hammonds Ridge.
- 3.4.2 South East Water potable water network plans have been obtained, showing the presence of a distribution main within the site boundary bisecting the western parcel, and along the road to the existing farm off Malthouse Lane.

3.5 Geology and Hydrogeology

- 3.5.1 The British Geological Survey (BGS) mapping suggests that an area along the southern boundary associated with the Herrings Stream lies on superficial deposits of Alluvium comprising of clay, silt, sand and gravel.
- 3.5.2 The BGS mapping indicates the underlying bedrock geology for the majority of the site is the Weald Clay Formation comprising of mudstone. There are multiple bands of Weald Clay Formation comprising of sandstone mapped across the western and eastern parcels.
- 3.5.3 The site does not lie within an EA Groundwater Source Protection Zone. There are localised areas of the site that lie on a bedrock Secondary A Aquifer which correspond with the sandstone extents of the Weald Clay Formation. In addition, there are localised areas of the site that lies on a superficial Secondary A Aquifer which correspond with alluvium and head deposits.
- 3.5.4 The soil at the site is classified as “Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils” which has “impeded drainage” according to Cranfield University’s Soilscales map.
- 3.5.5 A review of BGS Boreholes shows that there is no available borehole data within the site boundaries. The nearest BGS borehole record (ref: TQ31NW43) is located approximately 510m northeast of the eastern parcel site boundary, the records are for trial pits and indicate soil to 0.30m below ground level (bgl), underlain by mottled clay to 2.20m bgl, there is no groundwater recorded.
- 3.5.6 Stantec’s Phase 1 Ground Condition Assessment (October 2022) report for the site confirms that a ground investigation was undertaken by Peter Brett Associates LLP (PBA now Stantec UK Ltd) in 2007 approximately 250m north of the site. Th report states that “The groundwater encountered in Stantec’s ground investigation located 250m north of the site is likely perched groundwater discharging from the sand band in the Weald Clay Formation. The standing depths of the groundwater are recorded between 0.12 to 1.27mbgl”.
- 3.5.7 The EA Groundwater Vulnerability Map shows variable risk categories based on the likelihood of a pollutant reaching the groundwater across the site area. The mapping shows the majority of the site as being ‘Unproductive’, in addition to areas of ‘Low’ along the watercourse corridor of the Herrings Stream, and bands of ‘High’ and ‘Medium-High’ across the site.

4 Flood Risk Overview

- 4.1.1 The assessment of flood risk has been undertaken based on the sources of information listed in **Section 1.2**.
- 4.1.2 The baseline flood maps have been taken from the Stantec GIS flood maps report in **Appendix A**, utilising the EA Open Data datasets available online and reproduced with OS mapping under licence to Stantec.

4.2 River (Fluvial) Flood Risk

- 4.2.1 The EA Flood Map for Planning illustrates that much of the site is within **Flood Zone 1 'Low Probability'** (defined as land at less than 1 in 1000 (0.1%) annual probability of river flooding) – see **Figure 4.1** below.
- 4.2.2 However, part of the site towards the southern extent lies within **Flood Zone 2 'Medium Probability'**, (land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding) and **Flood Zone 3 'High Probability'** (land with more than a 1 in 100 (1%) annual probability of river flooding). Flood Zones 2 and 3 within the site correspond to the watercourse corridor of the Herrings Stream.
- 4.2.3 It should be noted that the EA Flood Zone map does not consider flood risk from minor (ordinary) watercourses with an upstream catchment area of less than 3 km². Consequently, it is likely that the risk of flooding from the ordinary watercourses has not been represented.

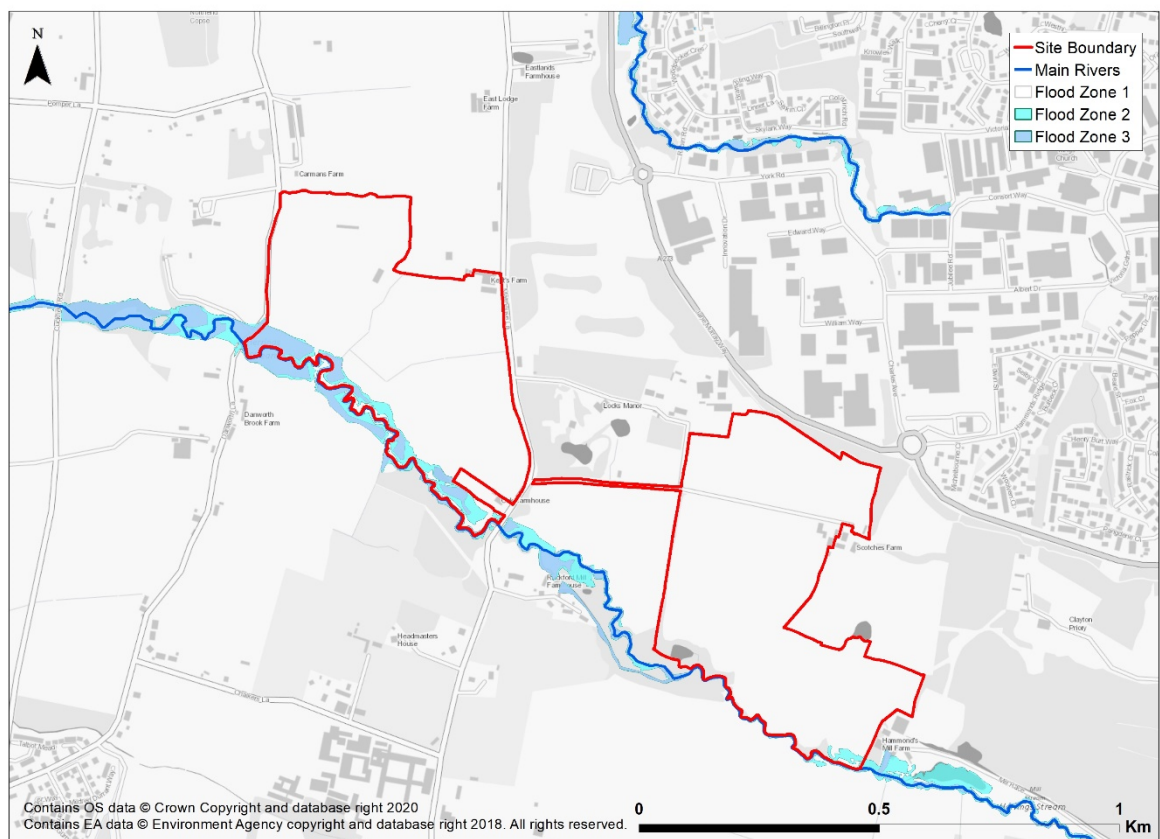


Figure 4.1: EA Flood Zone Mapping

- 4.2.4 Model information regarding fluvial flood risk has been requested from the EA in September 2022, however the EA has confirmed there will be a delay in receiving a response.

- 4.2.5 The SFRA identifies that “all areas covered by Flood Zone 3 are to be treated as areas of Flood Zone 3b unless evidence can be provided to demonstrate otherwise”, in addition the EA advise that the functional floodplain comprises of land having 1 in 30 (3.3%) or greater annual probability of flooding with any existing flood risk management infrastructure operating effectively. Mapping of the functional floodplain provided from the SFRA by MSDC shows the EA Flood Zone 3 extent as Flood Zone 3b – Functional Floodplain.
- 4.2.6 The SFRA mapping provided by MSDC includes an extent of ‘EA – Indicative Floodplain’ across the south of the site. However, the SFRA report identifies that the EA “stated that the indicative floodplain information is out of date and no longer used by the Agency”.

4.3 Tidal Flood Risk

- 1.1. The site not located near to the coast or a tidally dominated watercourse, so tidal flood risk is not of concern to the site.

4.4 Surface Water (Pluvial) Flood Risk

- 4.4.1 The EA ‘Risk of Flooding from Surface Water’ mapping identifies areas that could be susceptible to surface water flooding in various rainfall events. The latest mapping assesses flooding resulting from severe rainfall events based on the following three scenarios:
- ‘High’ Risk: 1 in 30 (3.3%) or greater AP rainfall event;
 - ‘Medium’ Risk: Between a 1 in 100 (1%) and 1 in 30 (3.3%) AP rainfall event;
 - ‘Low’ Risk: Between 1 in 1000 (0.1%) and 1 in 100 (1%) AP rainfall event;
 - ‘Very Low’ Risk: Lower than 1 in 1000 (0.1%) AP rainfall event.
- 4.4.2 The EA mapping shows that much of the site is predicted to be at a ‘Very Low’ risk of surface water flooding; however, there are areas of ‘Low’, ‘Medium’ and ‘High’ risk located predominately adjacent to and along the watercourses across the site and associated with areas of low-lying topography - see **Figure 4.2**.

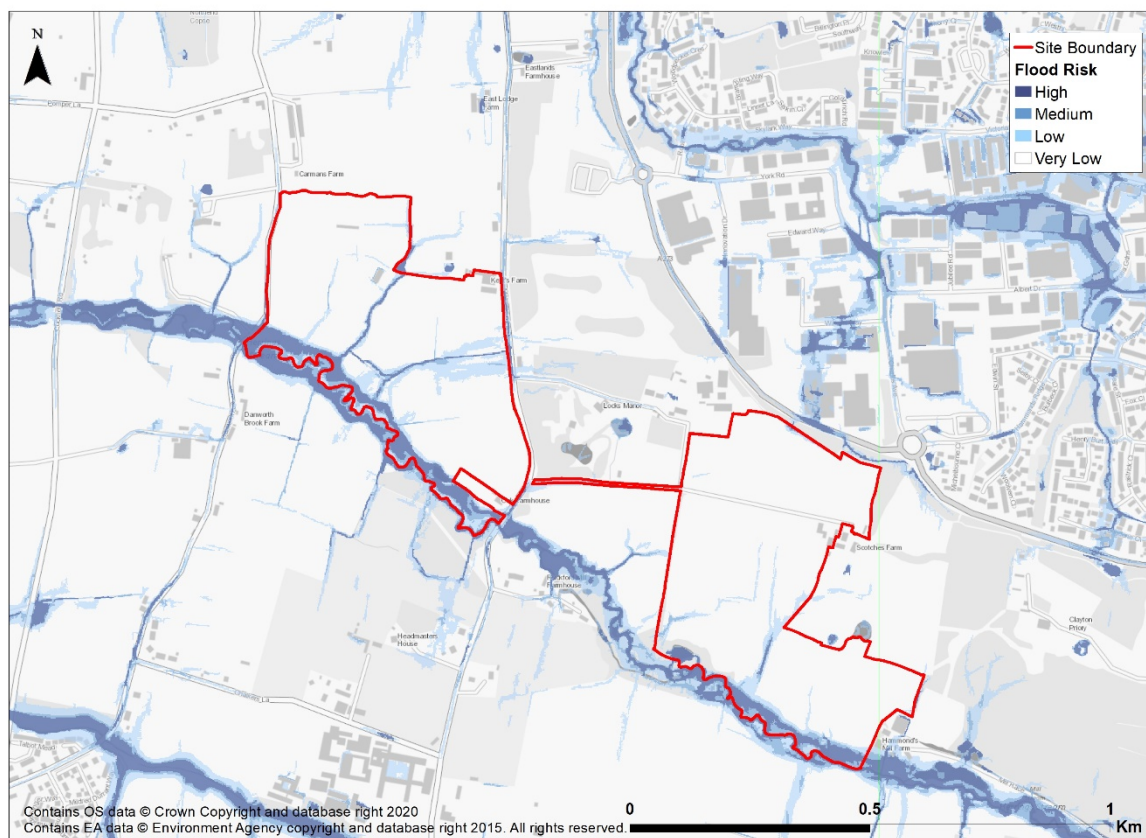


Figure 4.2: EA Risk of Flooding from Surface Water Map

- 4.4.3 There are overland surface water flow paths across the site during a 'Low', 'Medium' and 'High' risk scenario. There are surface water overland flow paths which originate from off-site areas, from Malthouse Lane, north of Kents Farm, and south of Scotches Farm.
- 4.4.4 It is noted that the 'High' risk surface water flood extent generally corresponds with the extent of Flood Zone 2 along the southern area of the western parcel. However, this is not evident for the south of the eastern parcel.
- 4.4.5 Correspondence with MSDC have confirmed that following updates to the PPG in August 2022, the LLFA consider the following:
- High surface water flood risk is equivalent to flood zone 3b
 - Medium surface water flood risk is equivalent to flood zone 3a
 - Low surface water flood risk is equivalent to flood zone 2
 - Very Low surface water flood risk is equivalent to flood zone 1
- 4.4.6 It should be noted that the surface water maps are generated using a generic methodology on a national scale, whereby rainfall is routed over a ground surface model. The analysis does not take account of any specific local information on below-ground drainage infrastructure and infiltration. Consequently, the mapping provides a guide to potentially vulnerable areas based on the general topography of an area.

4.5 Groundwater Flood Risk

- 4.5.1 Information regarding groundwater flood risk has been requested from the EA, LLFA and MSDC. MSDC have confirmed that they do not hold any specific records on groundwater flood risk for the site.
- 4.5.2 The SFRA (2015) confirms that the settlement of Burgess Hill is “considered to be in an area of low potential for groundwater flooding”.
- 4.5.3 However, as detailed in **Section 3.4**, Stantec’s Phase 1 Ground Condition Assessment (October 2022) identifies that there is likely to be perched groundwater discharging from the sand bands in the Weald Clay formation. Perched groundwater could result in a potential groundwater flood risk to parts of the site, and will be subject to future groundwater investigations.

4.6 Reservoir Flood Risk

- 4.6.1 The EA provides maps showing the risk of flooding in the event of a reservoir failure. The reservoir breach extents are captured in the baseline flood maps in **Appendix A**.
- 4.6.2 A review of EA mapping shows that the site lies outside of an area at risk of reservoir flooding. Therefore, there is no risk associated with this flood source.

4.7 Sewer Flood Risk

- 4.7.1 The West Sussex LFRMS (2013-2018) identifies that Burgess Hill has previously experienced regular sewer flooding. However, the West Sussex PFRA (2011) does not include specific information on sewer or water main flooding in the vicinity of the site.
- 4.7.2 Southern Water have been contacted to provide information regarding the surface water and foul water system.

4.8 Other Sources of Flood Risk

- 4.8.1 There are no known canals or other artificial watercourses located within the site boundary or immediate vicinity. Some waterbodies such as ponds are noted within the site boundaries and in the vicinity of the site but are unlikely to present a risk.

4.9 Historical Flooding

- 4.9.1 The EA ‘Historic Flood Map’ is a dataset showing the maximum extent of all individual recorded flood outlines from river, the sea and groundwater and shows areas of land that have previously been subject to flooding. This map indicates that the EA contain no record of flooding at the site (see **Appendix A**).
- 4.9.2 The accuracy of such historic mapping is often dependant on the frequency of flooding, and whether the watercourse is in an area with sensitive receptors to flooding (i.e. a watercourse through a highly urbanised area is more likely to have an accurate record of flooding as flooding would have a greater potential impact on the local community than in a sparsely inhabited rural area). As such, the historic data over the site should be treated with caution.
- 4.9.3 The MSDC SFRA (2015) does not identify a historic surface water flood event in the site area. In addition, MSCS confirm that they “do not hold specific records of any historic flooding within the site. This does not mean that flooding has not occurred just that we do not hold any records”.
- 4.9.4 However, MSDC confirms that there have been historic flood events in the vicinity of the site, including details of a surface water flooding event in October 2020 where “Record of heavy rainfall causing surface water flooding in the Jane Murray Way area, particularly in the vicinity of B&Q (Unit A Mid Sussex Retail Park)”.

- 4.9.5 The West Sussex LFRMS (2013-2018) identifies Burgess Hill as a 'wet spot', classified as areas where a significant number of adjacent properties may be susceptible to flooding, with a significant cluster of properties at risk in the urban centre of Burgess Hill.
- 4.9.6 The SFRA mapping provided by MSDC identifies a number of historical data sources in the vicinity of the site, however, did not provide further information.

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4.10 Summary of Flood Risk

4.10.1 **Table 4.1** provides an overview of flood risk to and from the site, based on the information obtained and detailed in this chapter.

Table 4.1: Summary of Sources of Flood Risk

Source of Flooding	Flood Risk Impact to the Site	Comment
River / Fluvial		The majority of the site lies within Flood Zone 1 'Low Probability'. The southern part of the site lies within Flood Zone 2 'Medium Probability' and Flood Zone 3 'High Probability'. SFRA mapping shows areas of the site within Flood Zone 3b, the functional floodplain.
Surface Water / Pluvial		The majority of the site is at a 'Very Low' risk of surface water flooding. There are southern areas of the site associated with the watercourses and areas of low topography are at a 'Low', 'Medium' and 'High' risk of flooding.
Groundwater		Perched groundwater could be present across the site, which can be confirmed through future site investigations.
Reservoirs		The site is not at risk of flooding from a reservoir.
Sewers		It is anticipated that flooding from sewers will not be of concern to the site.
Key:		Low/Negligible Risk – No noticeable impact to or from the Site and not considered to be a constraint to development
		Medium Risk – Issue requires consideration but not a significant constraint to development
		High Risk – Major constraint to development requiring active consideration in mitigation proposals

5 Flood Risk Constraints and Opportunities

Finished floor levels

- 5.1.1 Standard requirements for ground floor levels of new development are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Development – Code of Practice'. This recommends floor levels are set a minimum of 300mm above the modelled 1 in 100 annual probability plus allowance for climate change flood level. This flood level could be required at the planning stages by stakeholders to be defined through hydraulic modelling of the Herrings Stream; subject to consultation with the LLFA and EA to confirm their requirements.
- 5.1.2 It is also recommended that ground floor levels are set a suitable freeboard (minimum 150mm) above surrounding ground to mitigate the residual flood risk associated with excess surface water runoff in an extreme rainfall event. Similarly, exterior ground levels across the site should also be appropriately contoured to direct surface water away from buildings in such a scenario.

Floodplain Storage and Flow Routes

- 5.1.3 Any new development located in the vicinity of a watercourse should be constructed such that it does not detrimentally impact on flow routes or reduce the available floodplain storage over a site; either of which could potentially cause an increase in flood levels on-site or elsewhere. As such, all built development should be located in Flood Zone 1 (**Section 4**).
- 5.1.4 There are overland surface water flow routes, which based on the EA LiDAR information is likely to accept runoff from offsite areas. The overland flows could be engineered via a drainage ditch or SuDS corridor to convey the flow, subject to future modelling works. This would allow flows to be directed to the Herrings Stream to enable areas that are currently at risk of surface water flooding to be developed.

Groundwater Flood Risk

- 5.1.5 As detailed in **Section 3.4** and **Section 4**, the bands of sand of the Weald Clay Formation could contain perched groundwater. Therefore, due to the presence of shallow groundwater as recorded, it is anticipated that groundwater monitoring is likely to be required to investigate groundwater flood risk and appropriate mitigation may be required.

Watercourse Consent

- 5.1.6 As the Herrings Stream is designated as main river, the EA require a minimum buffer of 8m from the Herrings Stream to be provided and must be maintained with no built development. A Flood Risk Activity Permit (FRAP) will be required for any new outfalls to the Herrings Stream or any works within 8m. This offset has been retained within the current
- 5.1.7 In accordance with the Land Drainage Byelaws, no built development will be located within an easement from the top of the ordinary watercourse banks without the prior written approval of the LLFA and LPA.
- 5.1.8 Therefore, it is recommended that all proposed development areas should be located within Flood Zone 1 and maintain a minimum buffer of 8m away from any main river or ordinary watercourse.
- 5.1.9 Should it be necessary to cross the watercourses, it is required that crossings over the watercourses have a soffit level a minimum 300mm above the 1% AP plus climate change design event flood level. It is also required that crossings have a clear span structure, with limited footings in the floodplain.

Safe Access / Egress

- 5.1.10 It is necessary to consider and incorporate safe access arrangements as part of the mitigation measures of any development, to ensure the users of the development are safe in times of flooding.
- 5.1.11 As the majority of the site lies within Flood Zone 1 and is at 'very low' risk of surface water flooding, it is anticipated that continuous safe access/egress routes would be available from the proposed development. Provision for safe access and egress routes would need to be demonstrated in any planning application and associated masterplan.

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6 Surface Water Drainage

- 6.1.1 The NPPF recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development, this being complementary to the control of development within the floodplain. The LLFA also advocates the use of appropriate SuDS in new development.
- 6.1.2 The implementation of SuDS to manage surface water can also add value to a development through biodiversity, water quality and amenity benefits, resulting in multi-functional spaces that enhance the site, rather than simply functional 'drainage' features.
- 6.1.3 As the intention of SuDS is to mimic the natural drainage regime of the undeveloped site, the NPPF PPG states the following (consistent with the Building Regulations H3 hierarchy):

...the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

- *Into the ground (infiltration),*
- *To a surface water body,*
- *To a surface water sewer, highway drain or another drainage system,*
- *To a combined sewer.*

Suitability for Infiltration

- 6.1.4 The site is assumed to have poor infiltration potential based on the identified soil association type and recorded geology. However, consultation will be carried out with the LLFA at planning stage to establish whether bespoke infiltration testing should be undertaken to determine the suitability of sustainable infiltration drainage.
- 6.1.5 The SFRA (2015) confirms that there are areas within the district that are underlain by Weald Clay where infiltration may not be appropriate due to the impermeable nature. The SFRA (2015) also identifies that "Due to the geology of the Burgess Hill area, poor permeability is likely to limit the effectiveness of SuDS that promote infiltration; however some infiltration may still be achieved". It is anticipated that although some infiltration could be possible in some areas of the site, these areas are likely to have connectivity to the watercourses in the vicinity of the site.
- 6.1.6 MSDC have confirmed that "The SuDS infiltration map suggests low infiltration potential at this location, however onsite infiltration testing will be required".

Suitability for Discharge to a Water Body

- 6.1.7 In accordance with the SuDS hierarchy, if infiltration is not feasible, discharge to a watercourse is the next preferred option.
- 6.1.8 The Herrings Stream watercourse is located adjacent to the southern boundary, and existing ordinary watercourses are located within the site. A review of topography indicates that the Herrings Stream currently receives surface water runoff from the majority of the site. The north of the eastern parcel naturally drains to the north, towards the Jane Murray Way (A273).
- 6.1.9 At this stage discharge to the Herrings Stream in the south is considered the most appropriate method to dispose of surface water for the majority of the site.
- 6.1.10 Any works to the form of the existing watercourses will be undertaken in agreement with the approved authorities and ensure there is no detriment to offsite areas.

Suitability for Discharge to a Surface Water/Combined Sewer

- 6.1.11 Should a positive outfall not be achieved for areas of the site that do not naturally drain to the Herrings Stream, options to achieve outfalls to the existing drainage ditches will be assessed. If it is determined at the planning stage that discharge to the local surface water sewers are required for the northeast area, this will be in agreement with Southern Water (SW).
- 6.1.12 In proximity to the north of the site, there is a SW 375mm surface water sewer within the roundabout at the A273, flowing north to Charles Avenue.

6.2 Greenfield Runoff Rates

- 1.2. The greenfield runoff rate was estimated using the FEH Statistical method based on catchment descriptors for the site as recommended in the CIRIA SuDS Manual. This method resulted in the following greenfield runoff rates:
- 1 in 1 year: 7.7 l/s/ha
 - 1 in 2 year: 8.0 l/s/ha
 - Q_{BAR} (approximately 1 in 2.33 annual probability event): 9.1 l/s/ha
 - 1 in 10 year: 14.7 l/s/ha
 - 1 in 30 year: 21.8 l/s/ha
 - 1 in 100 year: 29.0 l/s/ha
- 6.2.1 The West Sussex LLFA Policy for the Management of Surface Water (November 2018) states that “In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change.” Therefore, the LLFA will expect the 1 in 1 year greenfield runoff rates to be applied to the site and will be subject to approval with stakeholders.
- 6.2.2 A review of the topographical survey identifies that six catchments are applicable to the existing site – see **Appendix F**.

6.3 Sustainable Drainage Systems (SuDS)

- 6.3.1 It is a requirement of the NPPF that SuDS are used in all major developments, if feasible. CIRIA report C753 ‘The SuDS Manual’ outlines the various types of SuDS, their benefits and limitations, and design considerations associated with each.
- 6.3.2 Not all SuDS components/methods are feasible or appropriate for all developments, factors such as available space, ground conditions and site gradient will influence the feasibility of different methods for a development.
- 6.3.3 At this stage it is anticipated the SuDS features proposed at the site will be widely dispersed throughout the development with strategic attenuation features. The design and the integration of proposed SuDS features within the wider landscape strategy and proposals will be carefully considered as part of the masterplanning process and shall themselves, provide an element of Public Open Space use.
- 6.3.4 The site already has a number of landscape features including existing watercourse in the south (Herrings Stream) and other watercourses/ land drains. These are proposed to be enhanced through wetland planting and permanent pools in the southern area of the site and through green / blue corridors which will permeate through the site. The SuDS proposals shall be designed to ensure they enhance and support the landscape proposals going forward.

6.3.5 The prevailing surface water strategy to be adopted is a network of sustainable drainage, where feasible consisting of and not limited to:

- a. Open swales / rills, that can be effectively integrated into the development and be wet, dry, or for storage purposes. As shown in [Figure 6.1](#), these can be combined with roads to intercept and treat runoff at source, and both provide ecological and amenity benefits as well as effective water quality treatment.



Figure 6.1: Open Swales and Rills Example

- b. Attenuation Basins, [Figure 6.2](#), are designed to hold back stormwater to prolong the event and reduce peak flows, then slowly release flows into the system. They are multifunctional features that can additionally be used for community spaces and increase amenity and biological value;



Figure 6.2: Attenuation Basin Examples

- c. Wetland planting and Ponds, [Figure 6.3](#), ideally incorporated as part of the green / blue corridors within the development and surrounding areas within proximity to the existing watercourses and within the proposed strategic basins themselves. Opportunities will be explored to locate these features within the existing Herring Stream boundaries. They can provide multiple uses, such as for amenity space, biological enhancement and can be integrated with other SuDS or blue / green infrastructure. Water quality treatment can be effectively managed using these features through appropriate planting and used as part of a wider SuDS Management Train;



Figure 6.3: Wetland Planting and Ponds Examples

- d. Porous Paving, as shown in Figure 6.4, to allow water to infiltrate into the ground (where feasible) to feed into groundwater aquifers or can be lined to aid water quality treatment and reduce runoff intensity into the drainage system. This is likely to be feasible for car parking areas, with a lined tank system beneath for rainwater harvesting purposes. The introduction of porous paving will help 'slow the flow' and can also reduce the attenuation basin storage requirements.



Figure 6.4: Porous Paving Examples

- 6.3.6 Discussions will be undertaken with the approving authorities so that the proposed SuDS are designed in accordance with best practice and maintenance adoption is conserved as part of the design process.
- 6.3.7 Piped networks may still be utilised in areas subject to LLFA, Highways and Sewerage undertaker adoption requirements.
- 6.3.8 The SuDS will also help promote water saving initiatives, such as rain water harvesting to reduce the demand on water resources in the area and will also provide education settings to promote water efficiency.

6.4 Attenuation Storage Requirements

- 6.4.1 In line with NPPF requirements and following DEFRA's 'Non-statutory technical standards for sustainable drainage systems' as advised by the LLFA, surface water runoff from any proposed development should be accommodated on-site for all events up to and including the 1 in 100 annual probability event, with 45% allowance for climate change, and discharge from each site at existing greenfield runoff rates.
- 6.4.2 MicroDrainage Quick Storage Estimates (QSE) have been undertaken using FEH rainfall data to provide an indication of the volume of storage that would likely be required on site to provide the necessary attenuation based upon rainfall events up to the 1% (1 in 100) annual probability event plus, an additional allowance of 25% and 45% on rainfall intensity, which is to account for the potential impacts of climate change. The climate change allowance is based on the latest

- 6.4.3 It is assumed that the proposed residential areas within the site would have an impermeable area of 60% to allow for likely development density and including a 10% allowance for urban creep, the local centre and primary school (not including school fields) would potentially have an impermeable area of 80%, and the access road would have an impermeable area of 100%. This will be reviewed as development proposals progress.

Table 6.1: Proposed Post-Development Surface Water Attenuation Requirements

Catchment ID	Catchment Area (ha)	Impermeable Area (ha)	Discharge Rate (l/s)*	Storage Requirement for 1% plus 45% climate change event (m ³)
1A	9.64	1.62	12.5	1555
1B		0.58	4.5	546
1C		0.62	4.8	583
1D		0.34	2.6	322
2A	8.07	1.30	10.0	1241
2B		1.12	8.6	1067
3	4.43	1.39	10.7	1328
4	4.23	0.98	7.5	934
5A	12.36	2.37	18.2	2290
5B		1.95	15.0	1879
6A	6.59	0.55	4.2	521
6B		0.65	5.0	614

* Based on the site applicable greenfield Q1 runoff rate of 7.7l/s/ha

- 6.4.4 The indicative locations of strategic attenuation basins and strategic SuDS corridors for conveyance are provided in **Appendix F**. It should be noted that these estimates are indicative and do not take into account any potential storage within the wider drainage network.
- 6.4.5 At this initial stage, the attenuation basins have been designed to accommodate the 1 in 100 plus 25% allowance for climate change event including a 300mm freeboard. The basins are 1.2m in depth, with 1 in 4 side slopes. The basins have been located outside the fluvial flood zones and 'High' risk surface water flood extents.
- 6.4.6 Guidance included in the West Sussex LLFA Policy for the Management of Surface Water (November 2018) recommends that the "attenuation storage volume provided by any drainage area should half empty within 24 hours so that it can receive runoff from subsequent storms". The half drain down times within 24 hours have been initially assessed and are able to fulfil this requirement.
- 6.4.7 The final storage type, location and volume, and the potential for use of further SuDS components, will be confirmed as part of the detailed masterplanning and outline drainage design.
- 6.4.8 Consideration should be given to the land take requirements for SuDS features, which may change depending on side slopes, water depth, review of detailed topography in the area and the final form/shape which may be more accommodating of existing topography.

Exceedance

- 6.4.9 To demonstrate that in an exceedance event any flooding does not negatively affect the development or offsite areas, flows up to the 1% AP plus climate change rainfall event will be managed and contained onsite. Furthermore, the attenuation will be designed to accommodate

surface water runoff with no flooding for all events up to and including the 1% AP plus 40% climate change event.

Water Quality and Pollution Control

- 6.4.10 Appropriate pollution control measures must be included in the surface water drainage system to minimise the risk of contamination or pollution entering the receiving watercourse and aquifer from surface water runoff from the development.
- 6.4.11 The drainage system will be designed to comply with the requirements of the SuDS treatment train as laid out in CIRIA C753 'The SuDS Manual', described as the 'Simple Index' Approach.
- 6.4.12 A SuDS treatment train will be applied for each catchment whereby runoff passes through a variety of SuDS techniques to control volumes of runoff and reduce pollution before discharge to a watercourse.
- 6.4.13 The treatment of surface water runoff will be designed to ensure it meets the requirements of the Water Framework Directive (WFD) with not detriment to the receiving watercourses.

Adoption and Maintenance

- 6.4.14 It is assumed that the surface water infrastructure will be designed to adoptable standards and adopted either by Southern Water, ICOSA or a private management company. Sewerage companies such as Southern Water will adopt SuDS features provided, they meet expected design standards.
- 6.4.15 The LPA (MSDC) and the LLFA (WSCC) will be consulted on how SuDS features should be designed.

7 Summary and Recommendations

7.1.1 Land at Malthouse Lane, Burgess Hill presents an opportunity to deliver strategic growth without causing a detriment to flood risk. The site provides the opportunity to deliver sustainable growth considering the following:

- A Flood Risk Assessment (FRA) would be required as part of any future planning application. The FRA should be carried out in line with the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance, regional and local planning policy and guidelines. Throughout the FRA process, consultation should be carried out with the following where applicable, the Local Planning Authority (LPA), Lead Local Flood Authority (LLFA), Environment Agency (EA) and Southern Water (SW).
- Most of the site is in Flood Zone 1. The southern part of the site lies within Flood Zone 2 'Medium Probability' and Flood Zone 3 'High Probability', as such all built development is to be in the Flood Zone 1 'Low Probability' extent.
- The sequential approach is to be adopted at the site whereby development is in areas with the lowest risk of flooding and conveyance routes provided within the masterplan for overland flow. Appropriate easements will also be applied to the watercourse to ensure they remain free from development and future maintenance access can be retained.
- Infiltration drainage is unlikely to be feasible and this will be confirmed as part of the future works in consultation with the LLFA. The watercourses at the site are considered the most appropriate receptors for the development generated surface water runoff as this mimics the existing situation.
- The site has the potential to support a range of sustainable measures to manage and control surface water run-off, with the view to deliver an integrated Sustainable Drainage System (SuDS). These features will be fully joined up with ecology/habitat areas, green infrastructure, and public open space. Rather than creating simple functional 'drainage features', this integrated approach will contribute to habitat creation and enhance biodiversity, provide multi-functional amenity space, and preserve water quality. This is in line with national and local guidance. Wetland planting and pond areas are to be located within areas that have connectivity to the existing Herrings Stream in the south. These will not only provide attenuation storage but will also allow for habitat enhancement.
- The volume of surface water being discharged from the development will be carefully controlled to replicate the drainage regime of the existing site in accordance with the LLFA surface water drainage design requirements and local planning authority, so as not to cause any increase on- or off-site with regard to flood risk.
- The SuDS will ensure there is no increase in discharge rates from the site but will also improve water quality discharge, using the principles from the SuDS Manual.
- It is estimated attenuation storage is listed in section 6 of this report. To be attenuated in basins, ponds, and wetlands. Conveyed through a SuDS train which will incorporate features such as swales, rills, bio-retention areas, and rain gardens. Additional SuDS such as porous paving and rainwater harvesting are also promoted at the site to help with additional water quality treatment and reduce the demand on water resources in the area. The attenuation features are designed to accommodate development generated runoff up to the 1 in 100 annual probability plus 40% climate change event prior to discharge (Q_{1 year} discharge rate).

6.1.2 The site generated surface water flows are attenuated and managed on site and can provide betterment to existing flood risk in the receiving watercourse. SuDS will be designed so they are integrated within the wider landscape proposals and will provide opportunities, where possible, to enhance biodiversity and recreation facilities. Opportunities will be explored at the

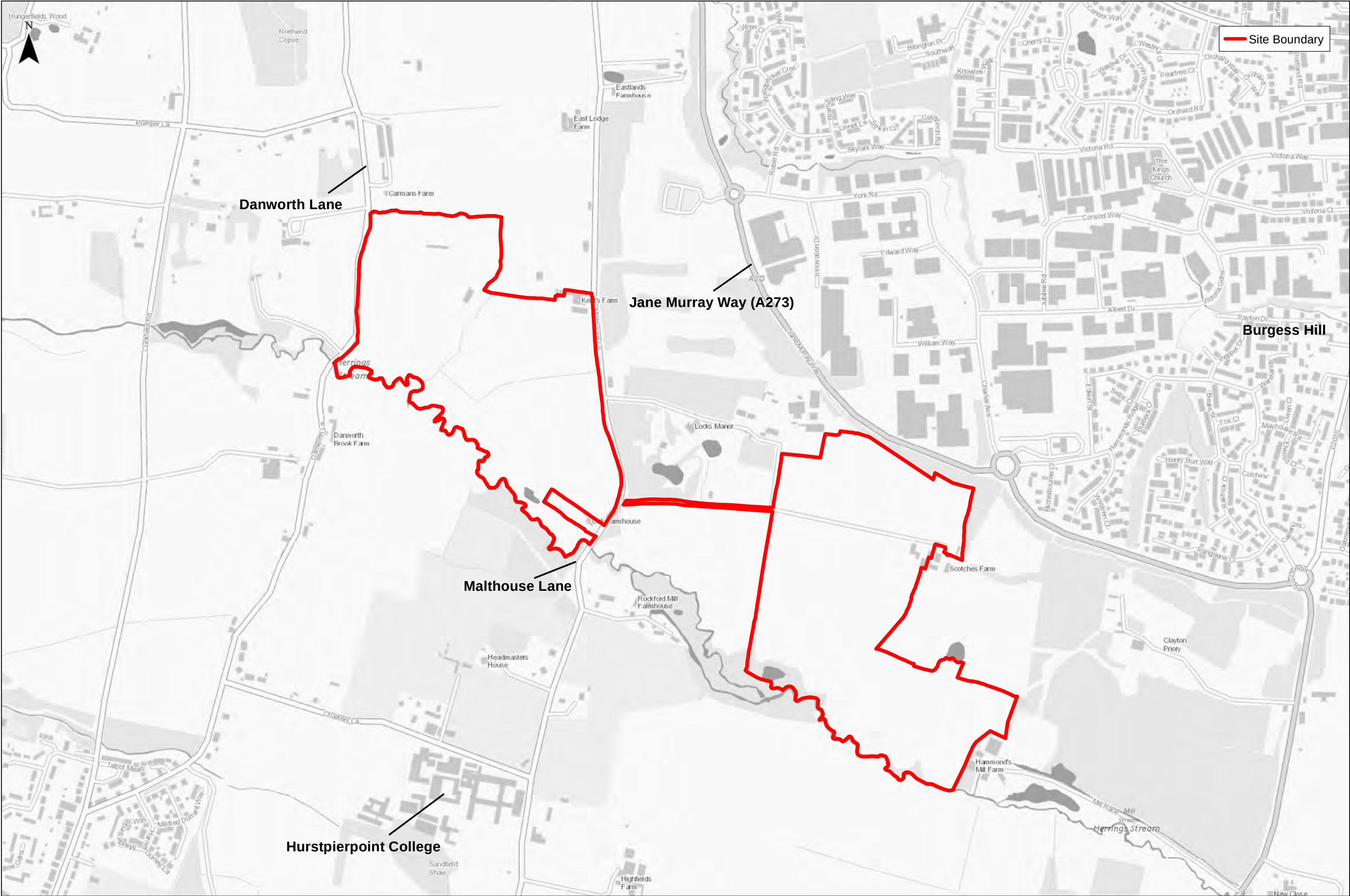
planning stage for rainwater harvesting and grey water reuse to reduce the demand on water supplies.

- 6.1.3 Overall, the site is well positioned to deliver housing needs and the development will meet the requirements of both national and regional planning policy.

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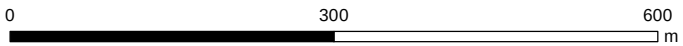
Appendix A OpenData Flood Maps

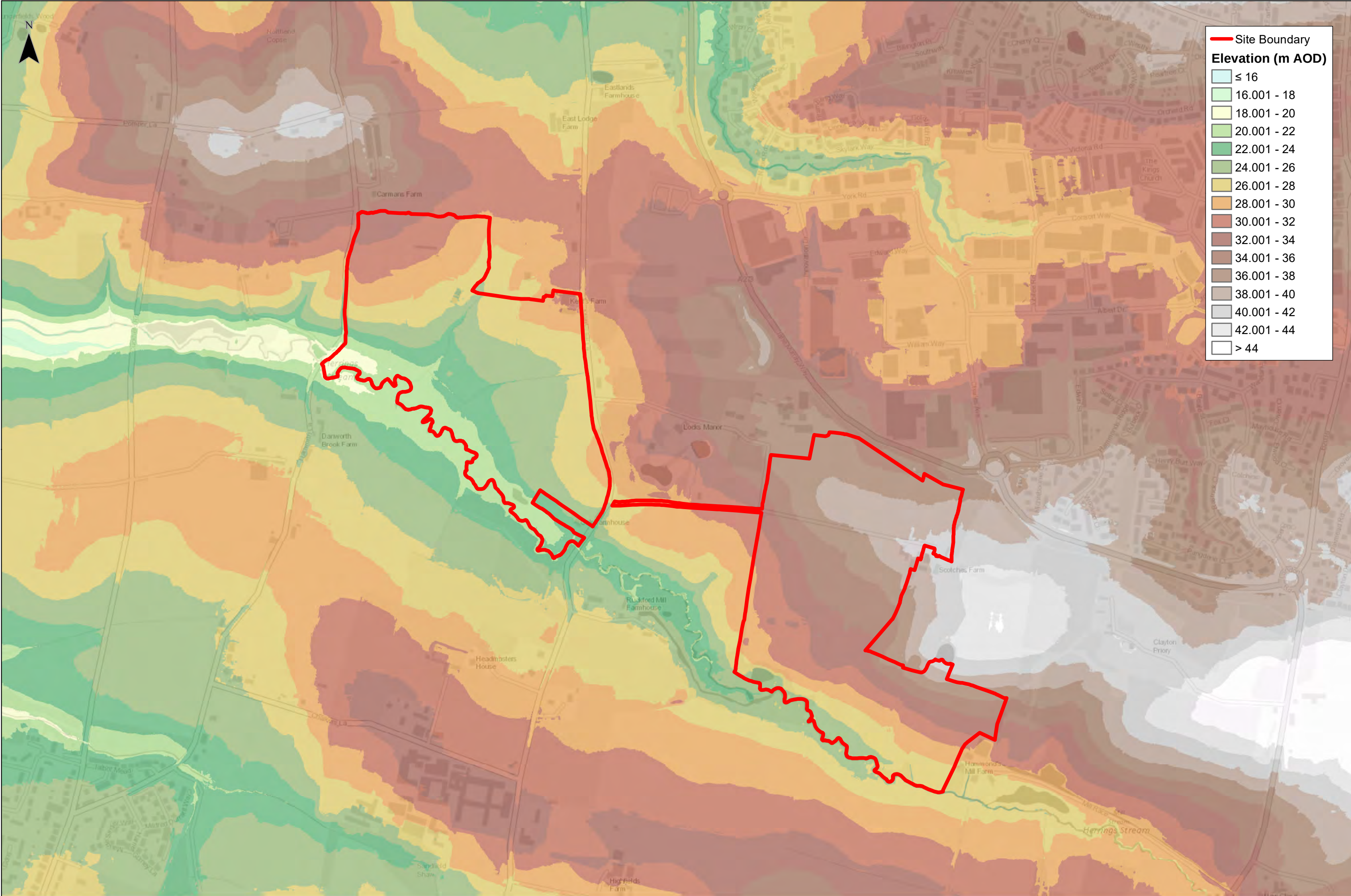
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				Figure 332511294/GIS001a	Rev A



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	Vistry Group			Drawn: MD	Checked: SK
				Figure 332511294/GIS001b	Rev A

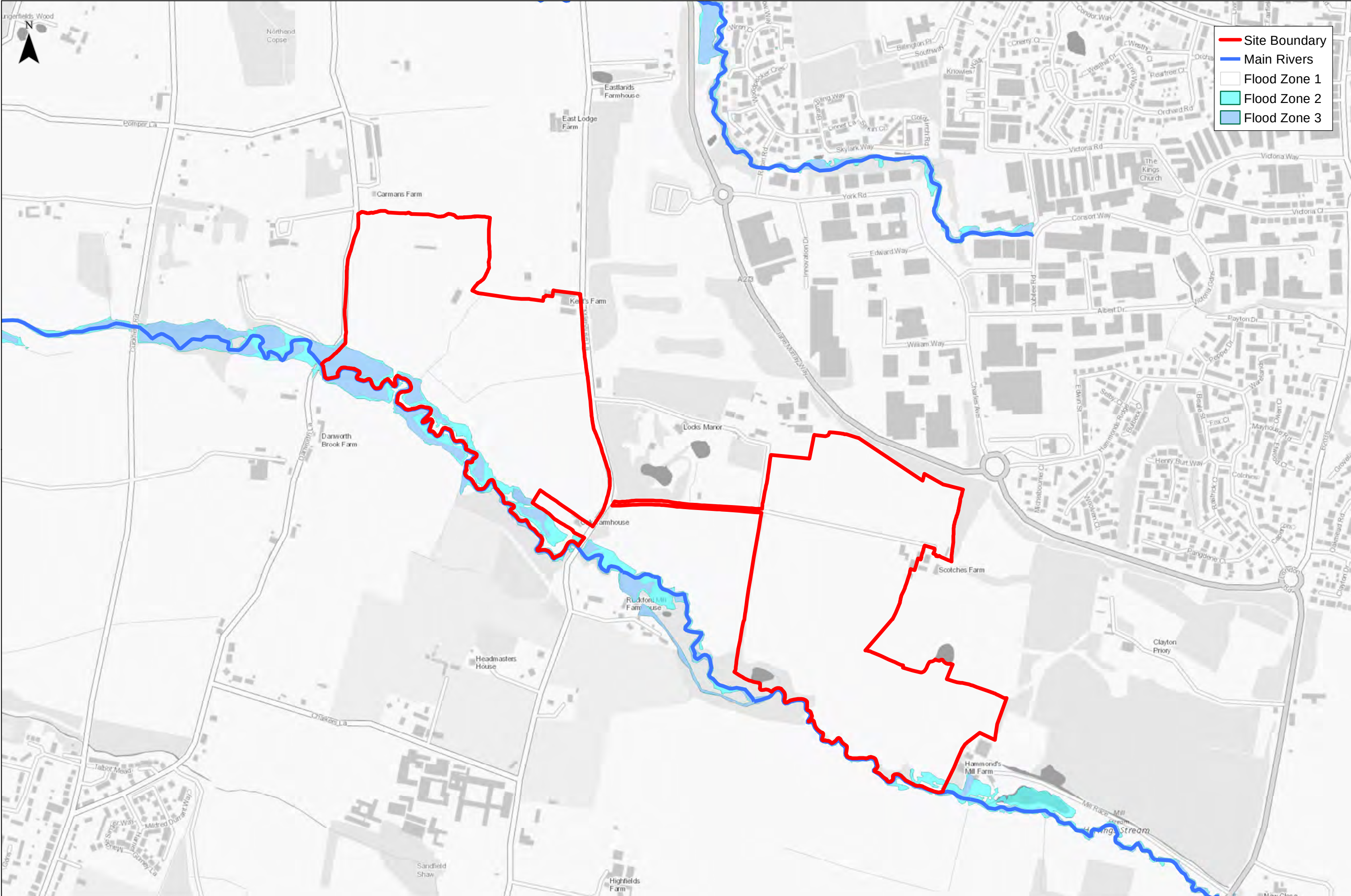


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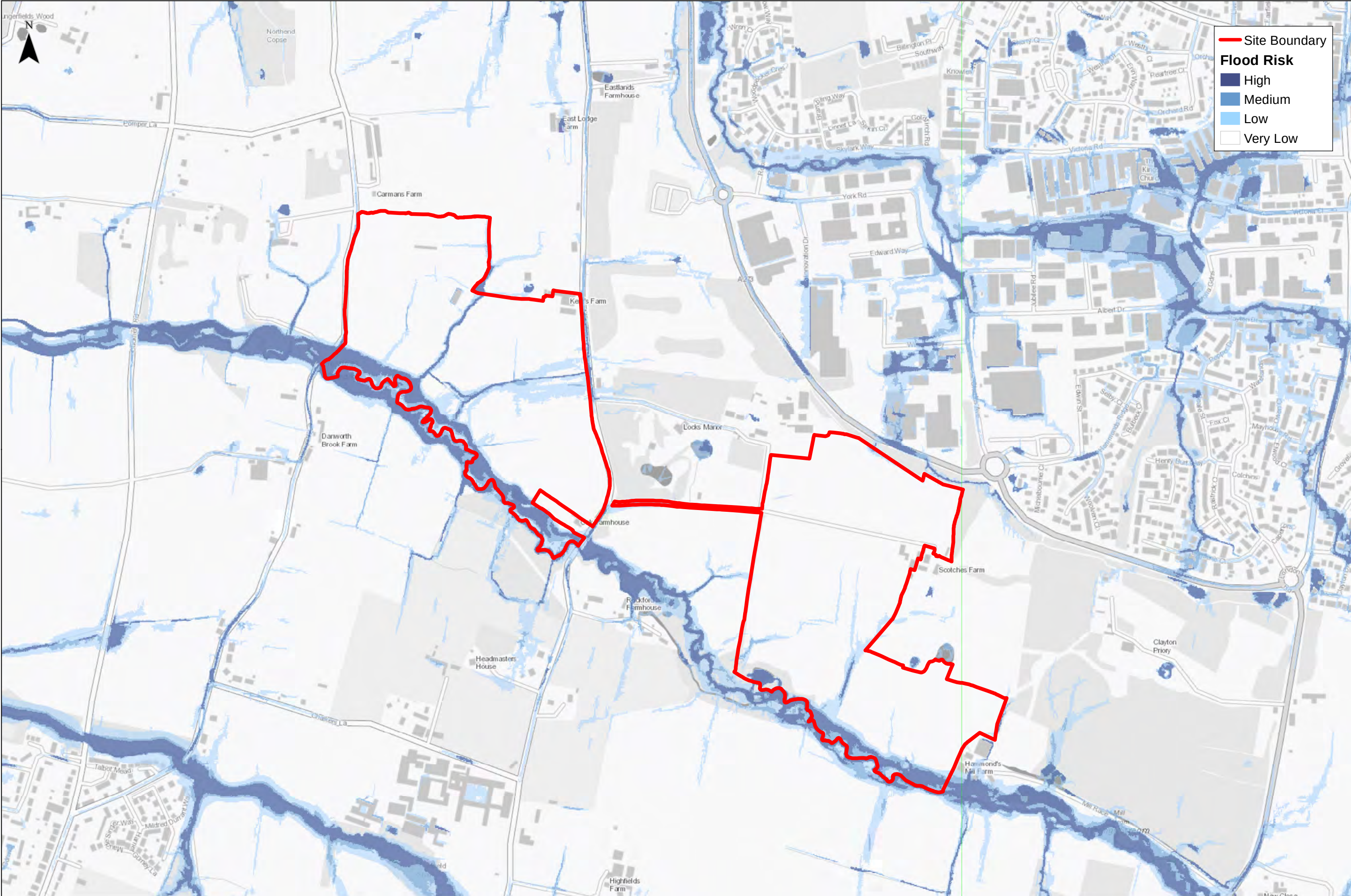
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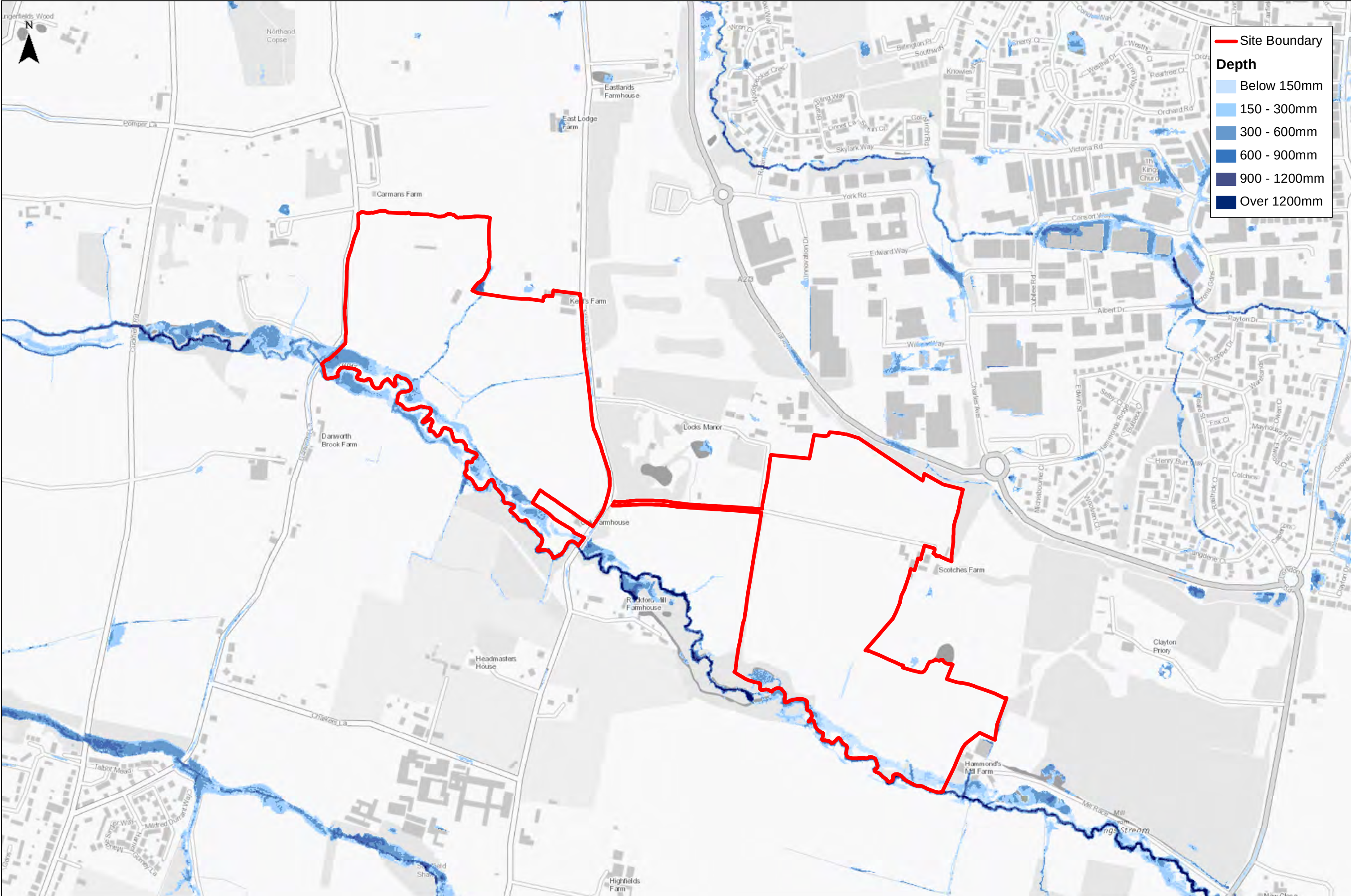
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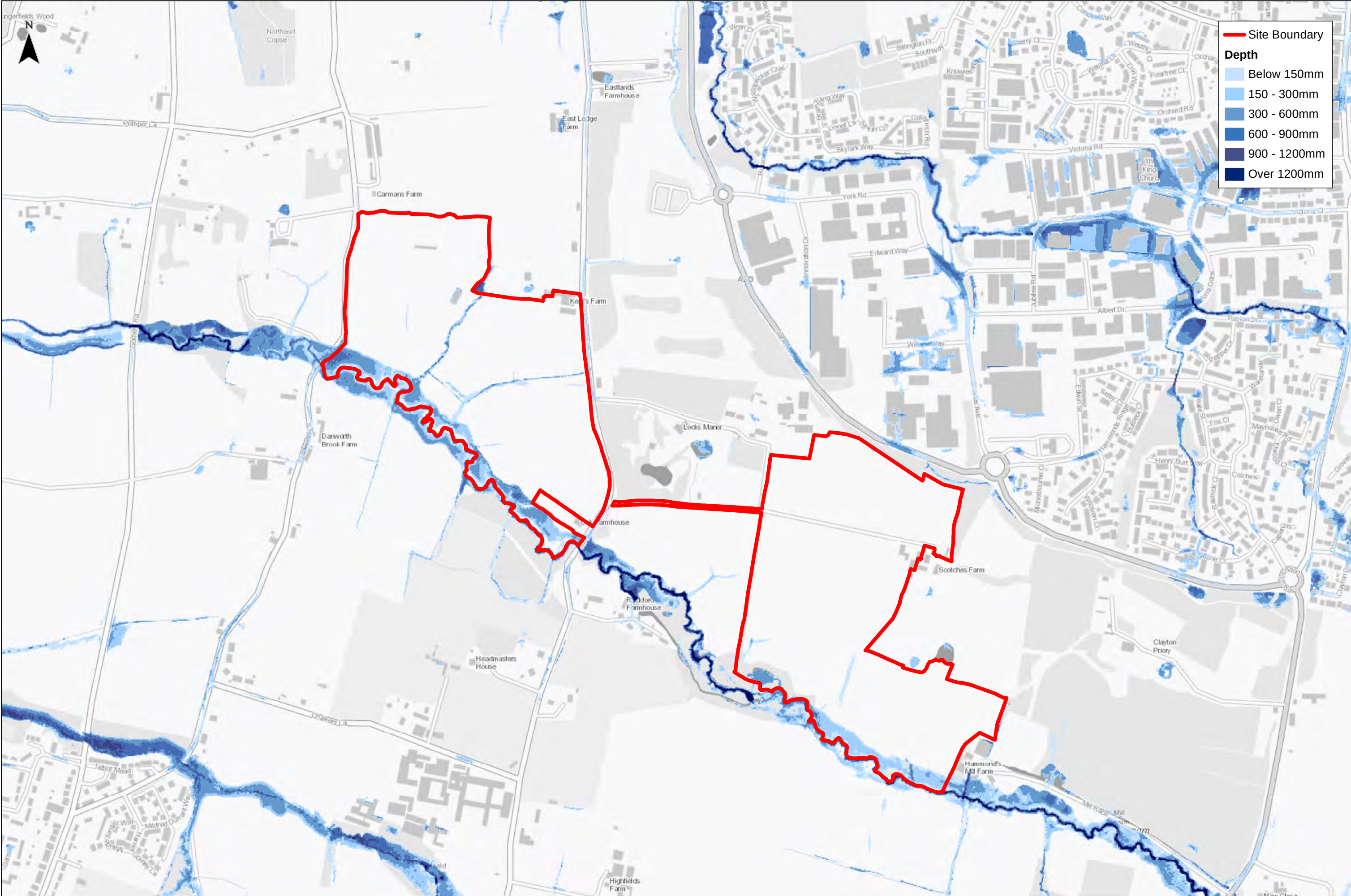
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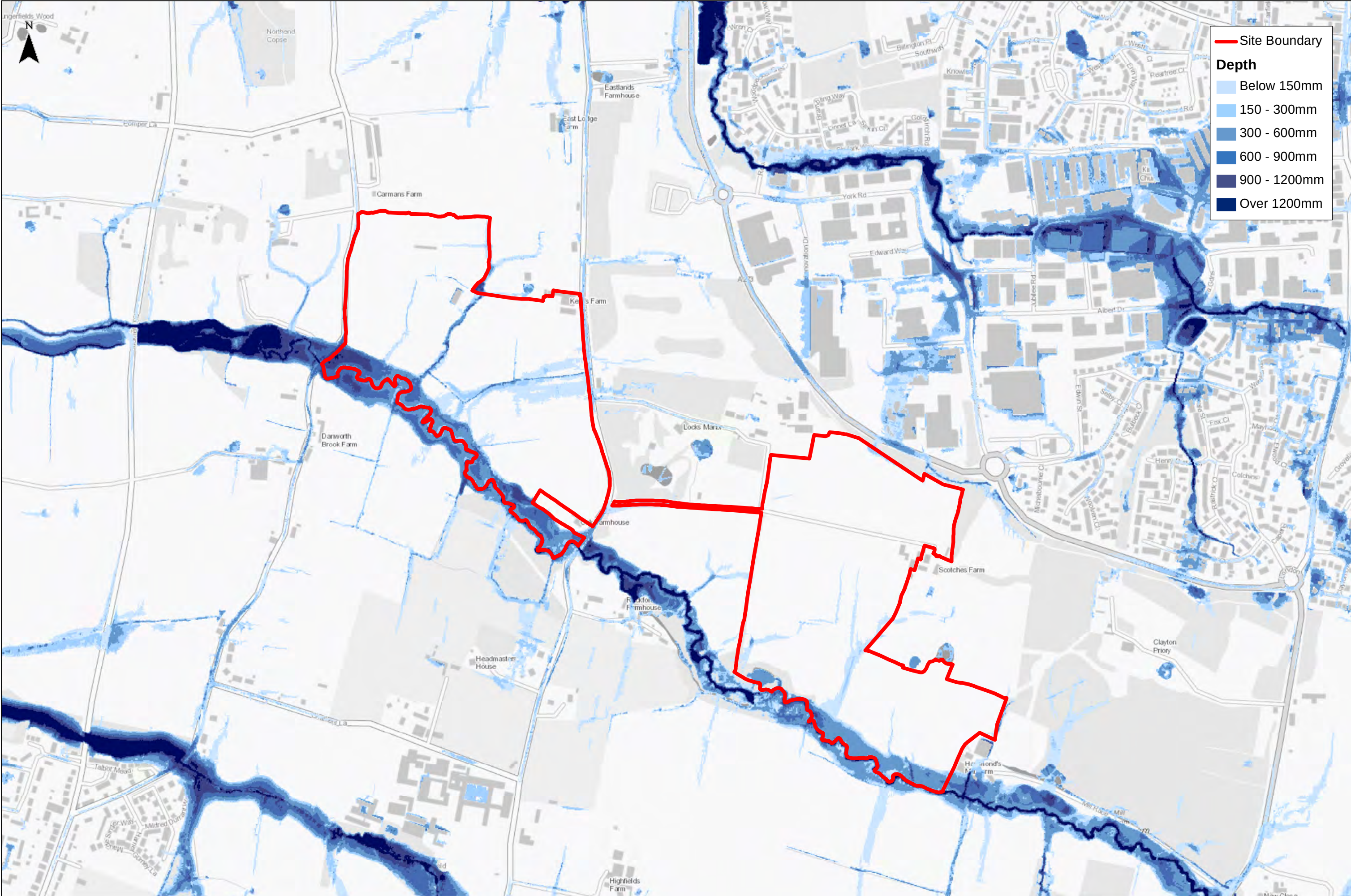


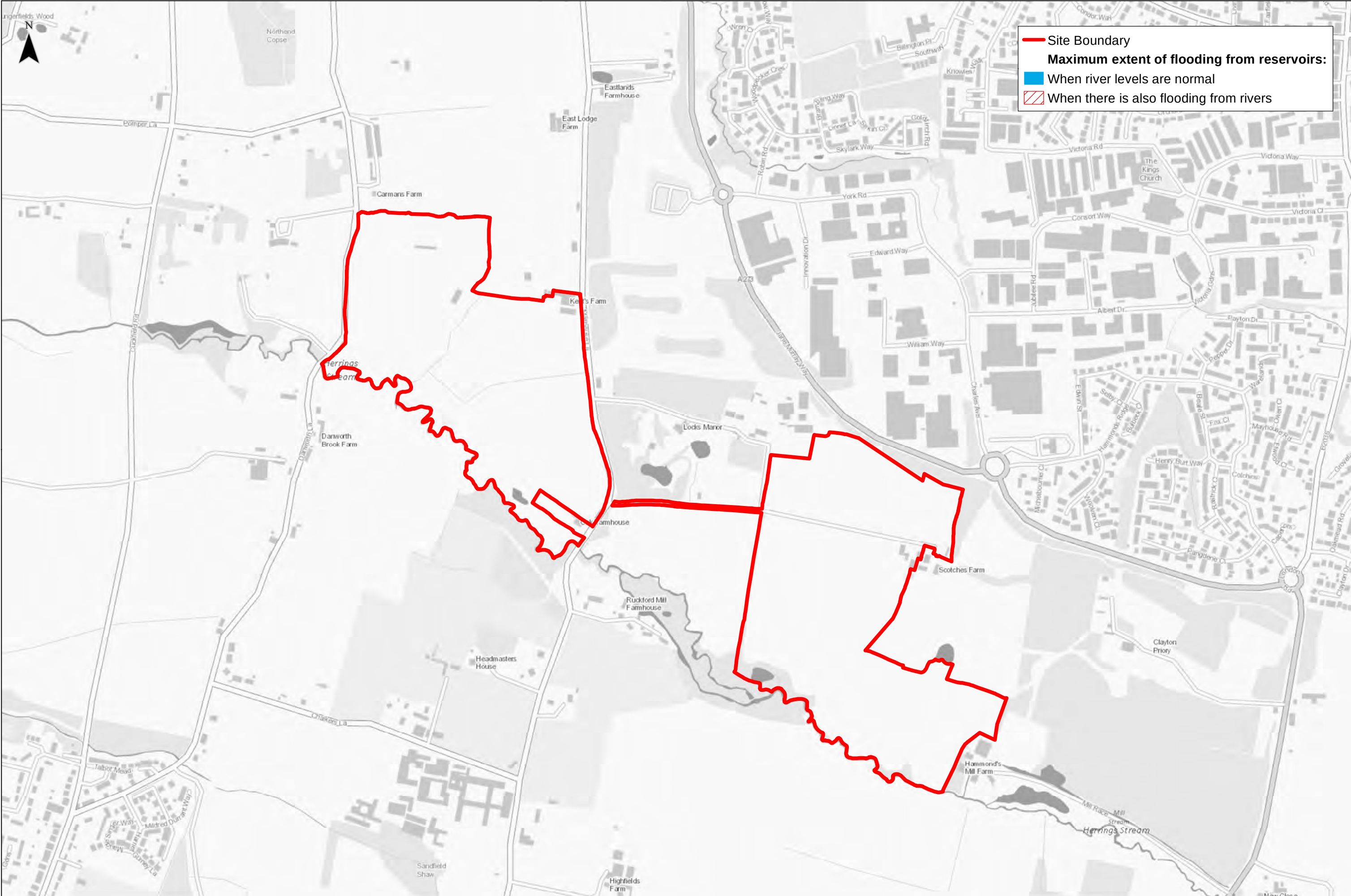
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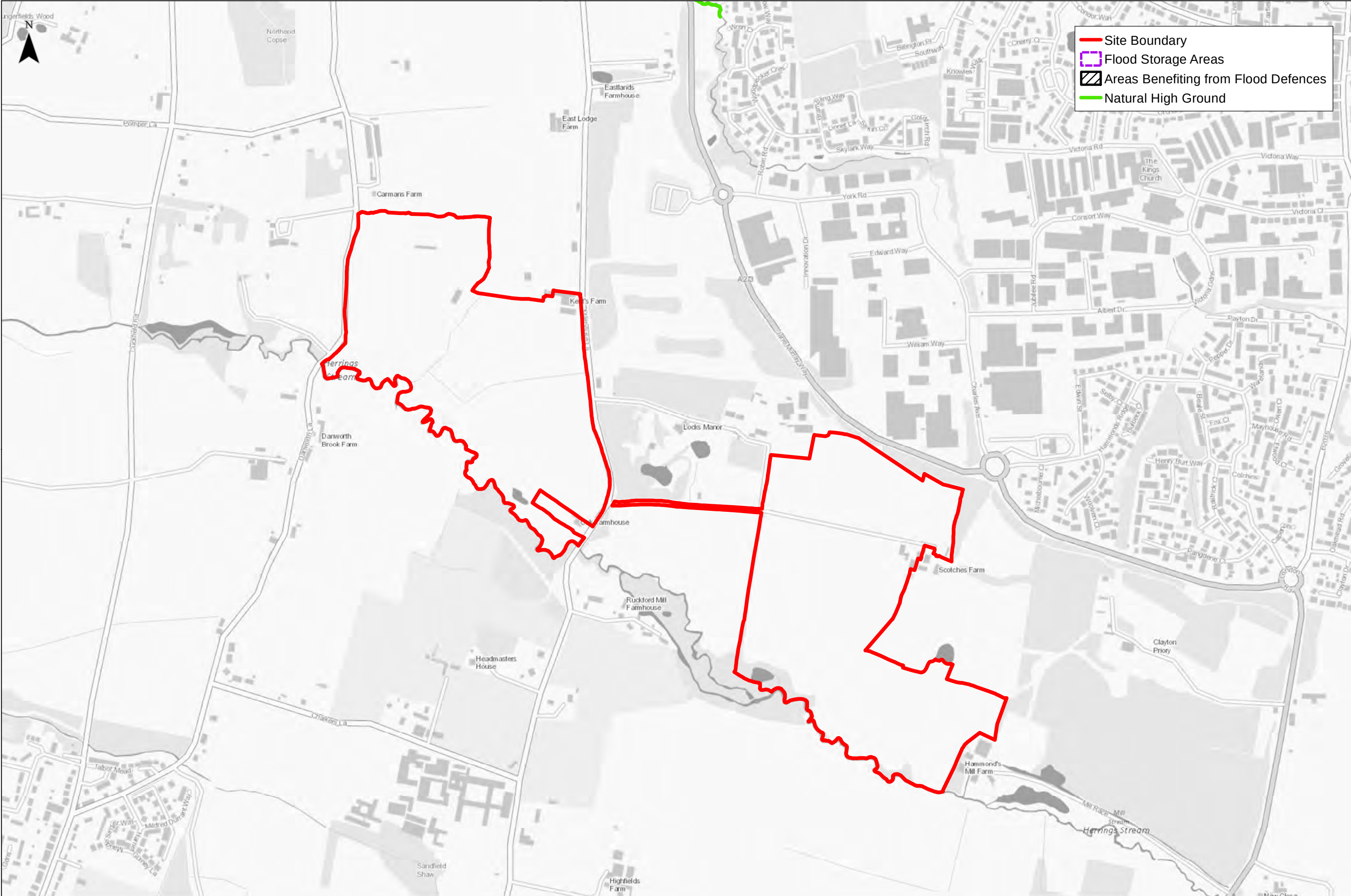




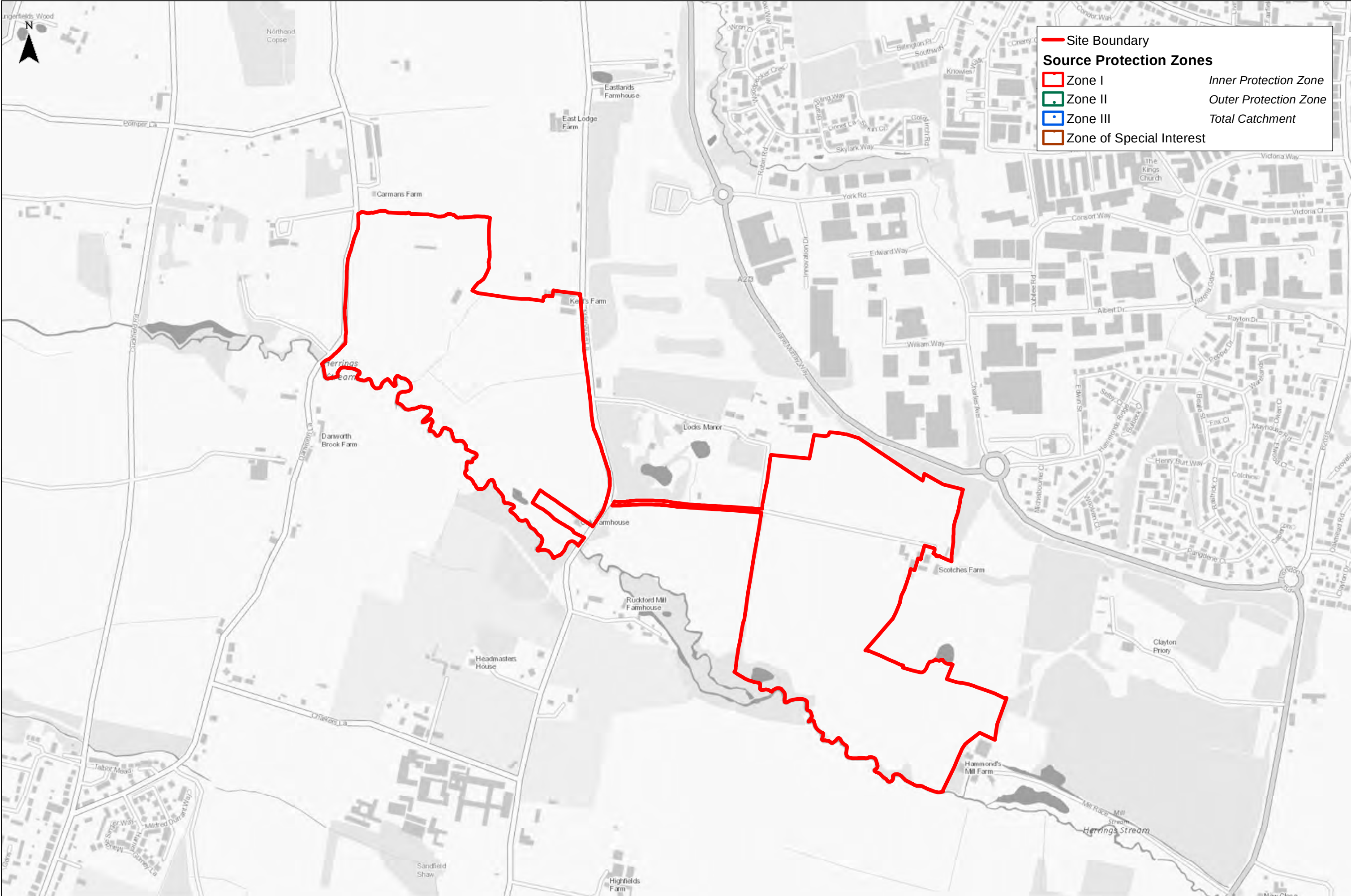




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	Client Vistry Group	LAND WEST OF BURGESS HILL Flood Defences, Areas Benefiting from Flood Defences, and Flood Storage Areas	0300600 m Contains OS data © Crown Copyright and database right 2020 Contains EA data © Environment Agency copyright and database right 2020. All rights reserved.	1:7,000 @ A3 Date: 28/09/2022 Drawn: MD Checked: SK Figure 332511294/GIS009 Rev A
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— Site Boundary

Zone I

Zone II

Zone III

Zone of Special Interest

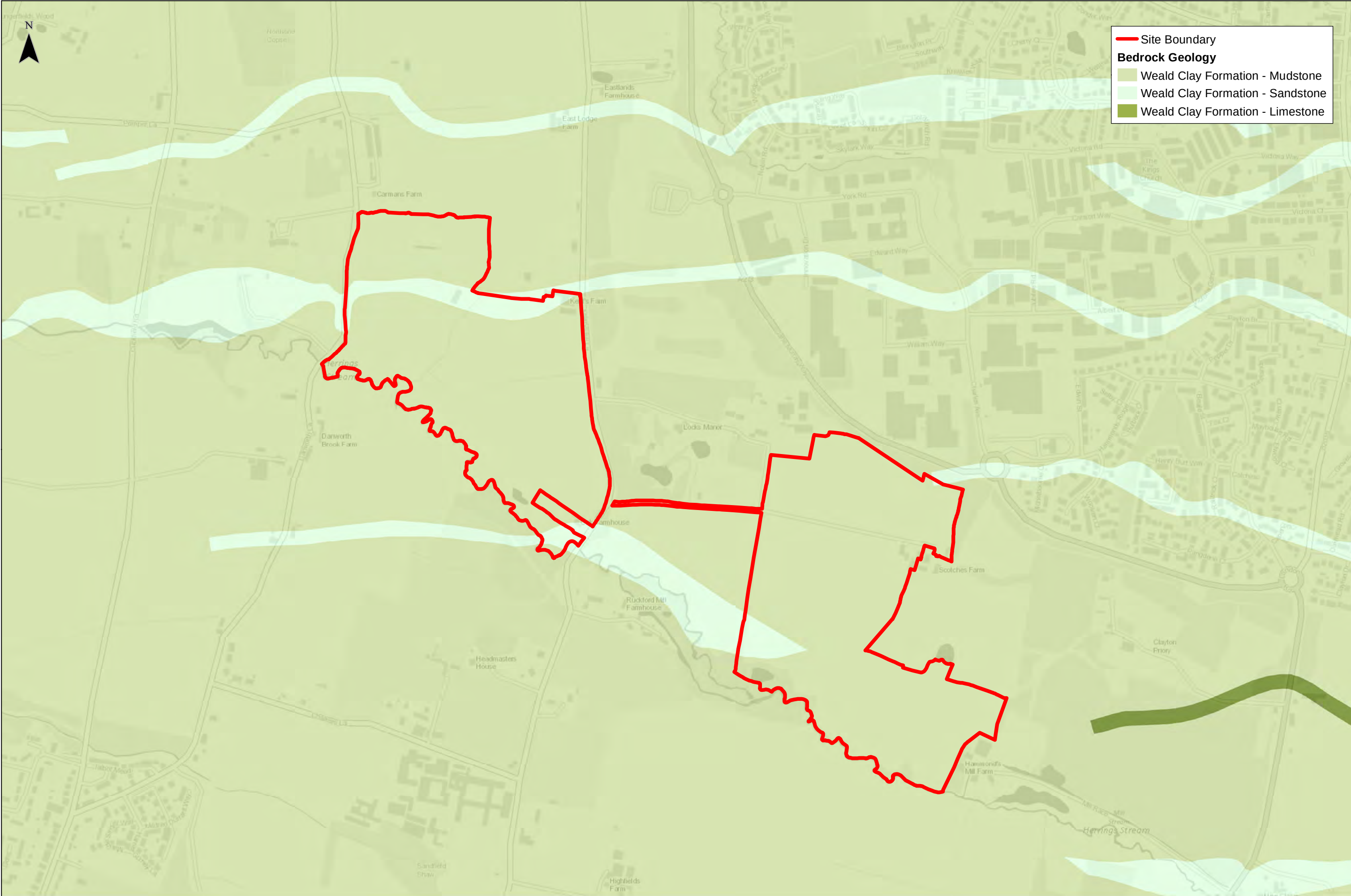
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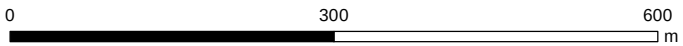
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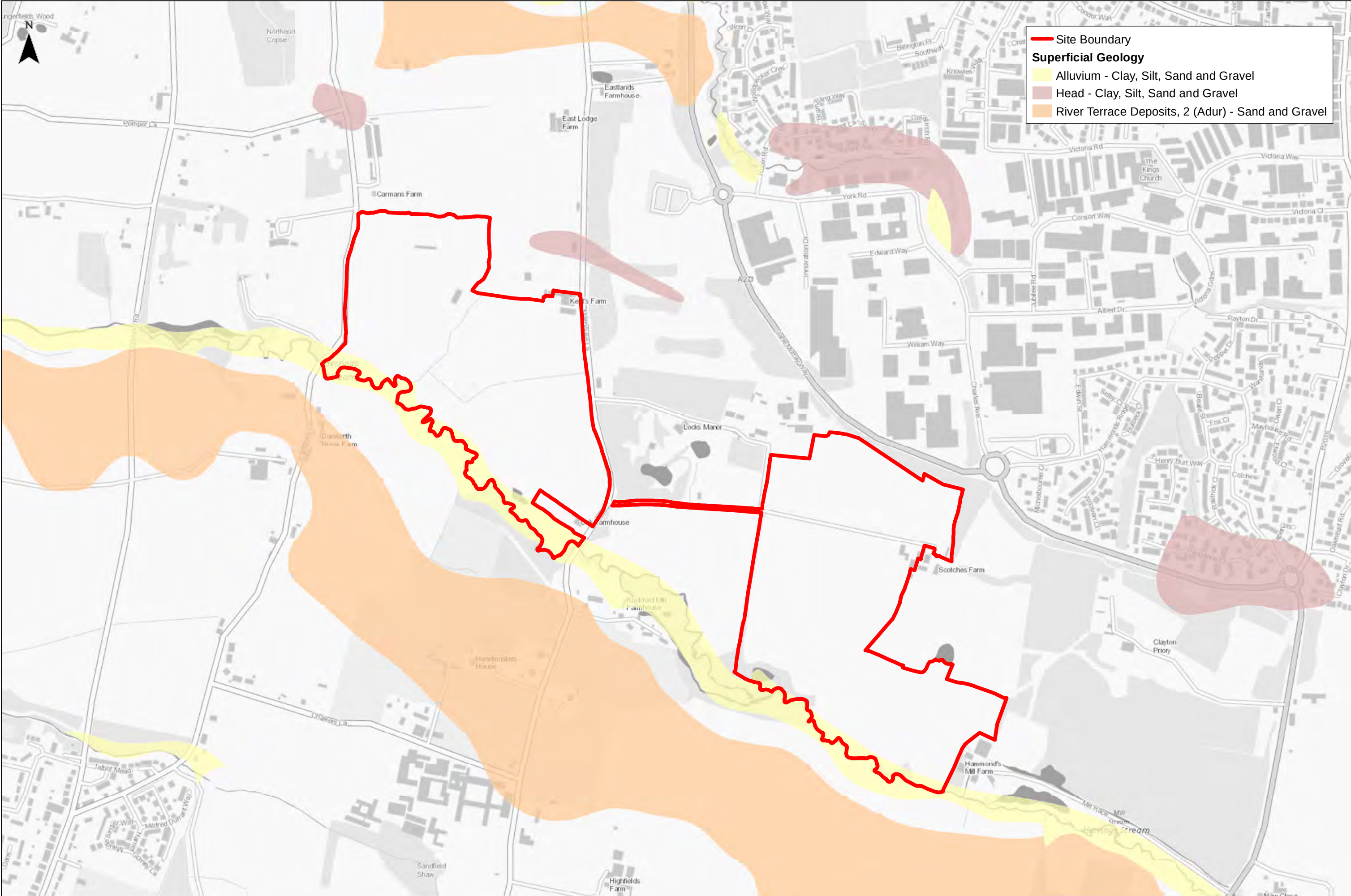
Total Catchment

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					Figure 332511294/GIS011	Rev A

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	Vistry Group			Drawn: YR	Checked: SK
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				Rev A	



Site Boundary

Superficial Geology

Alluvium - Clay, Silt, Sand and Gravel

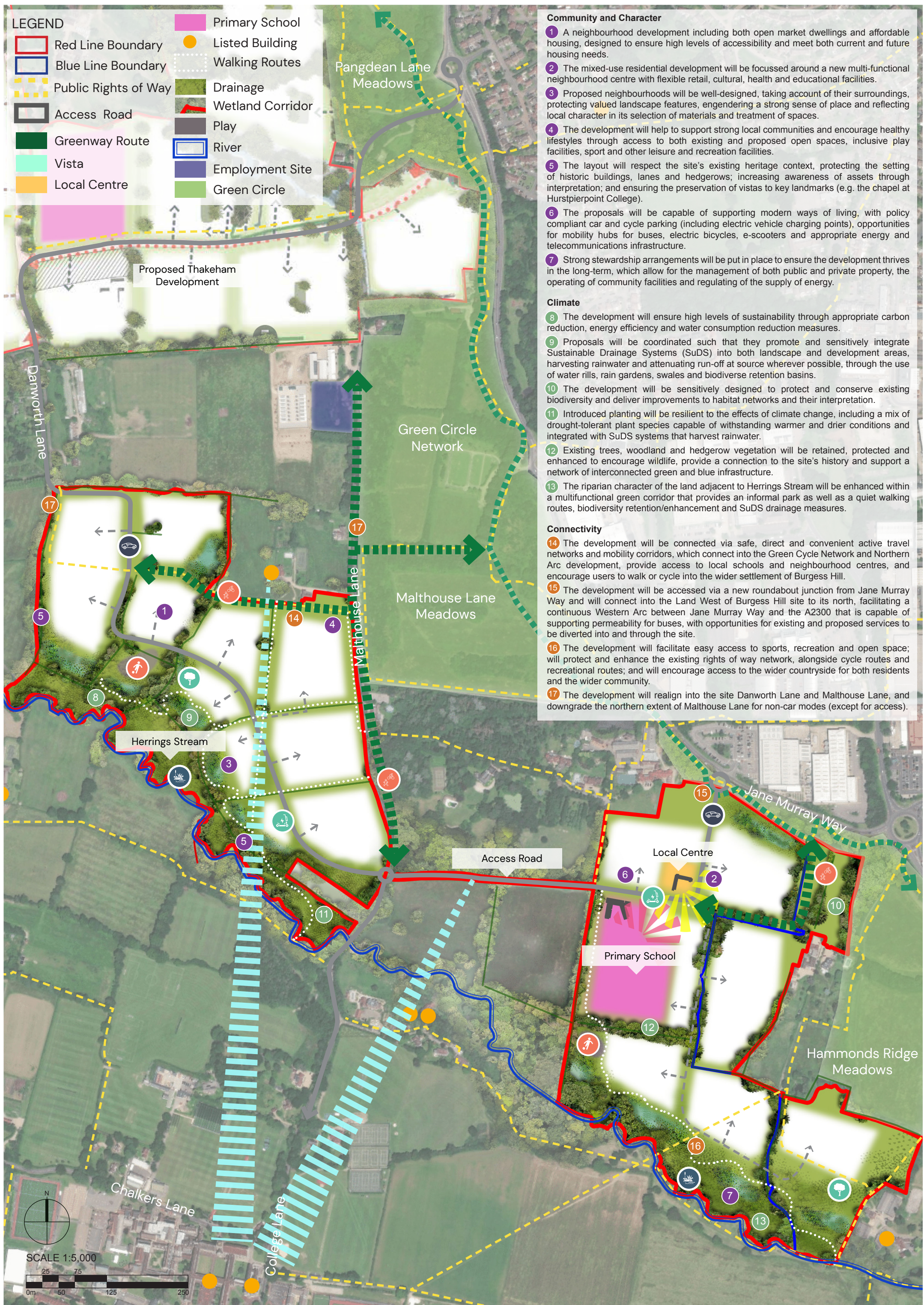
Head - Clay, Silt, Sand and Gravel

River Terrace Deposits, 2 (Adur) - Sand and Gravel

Stantec	Client	LAND WEST OF BURGESS HILL Superficial Geology	0300600m		1:7,000 @ A3	Date: 28/09/2022
	Vistry Group		Contains OS data © Crown Copyright and database right 2020 Contains British Geological Survey materials © UKRI 2020.		Drawn: YR	Checked: SK
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Appendix B Development Proposals

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Appendix C SW Sewer Asset Plan

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0m 250m 500m 750m

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Date: 15/09/22

Scale: 1:1250

Map Centre: 52869.118745

Data updated: 16/08/22

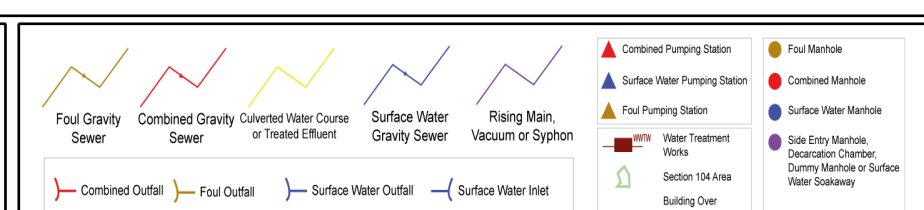
Our Ref: 952306 - 2

Wastewater Plan A0

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (C) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water pipes only. Any other use of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

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



Yvonne.Riley@santec.com

Burgess Hill - West



Appendix D Stakeholder Correspondence

DRAFT

From: [drainage](#)
To: [Riley, Yvonne](#); [drainage](#)
Cc: [Knowles, Stephanie](#)
Subject: RE: Land West of Burgess Hill - Request for Information - MSDC
Date: 23 September 2022 11:25:46
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.jpg](#)
[image006.png](#)
[332511294 GIS001a Site Location.pdf](#)

Dear Yvonne,

Please find below our responses, as requested. I have also forwarded your email to the planning team responsible for issuing the mapping that accompanies the Strategic Flood Risk Assessment, they should contact you directly in due course.

- Any records of flooding in the vicinity of the site. – *Mid Sussex District Council is aware of flooding events in this vicinity: October 2020 – Record of heavy rainfall causing surface water flooding in the Jane Murray Way area, particularly in the vicinity of B&Q (Unit A Mid Sussex Retail Park). MSDC do not hold any specific records of any historic flooding within the site. This does not mean that flooding has not occurred just that we do not hold any records.*
- Any maps or information on surface water flood risk other than those held by the EA.- *Please see above*
- As above for groundwater flood risk.- *Mid Sussex District Council do not hold any specific records for this location*
- Maps or information regarding local land drainage systems. - *Mid Sussex District Council do not hold any specific records for this location*
- As above for highway drainage systems – *WSCC Highways to assist*
- Information on the local strategy for dealing with surface water. – *Please refer this enquiry to the Lead Local Flood Authority (LLFA) which is West Sussex County Council*
- Any information on infiltration drainage potential at the site. – *The SuDS infiltration map suggests low infiltration potential at this location, however onsite infiltration testing will be required.*
- Types of SuDS likely to be acceptable for adoption – *Inclusion of land considered to be adopted by MSDC should be discussed with MSDC at the earliest opportunity via the S.106 process.*
- Any runoff restrictions that may apply at this location (over and above requirements set out in NPPF) e.g. Critical Drainage Areas. - *Please refer to the West Sussex Lead Local Flood Authority policy for the management of surface water, which can be found here: [Flood reports, projects and policies - West Sussex County Council](#)*
- Anything else you feel is relevant that an FRA would need to consider.- *Please consult the updated Planning Practice Guidance for flood risk: [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](#) West Sussex LLFA consider the below in light of the updated guidance:*
 - High surface water flood risk is equivalent to flood zone 3b
 - Medium surface water flood risk is equivalent to flood zone 3a
 - Low surface water flood risk is equivalent to flood zone 2
 - Very Low surface water flood risk is equivalent to flood zone 1

Any current and new planning applications are expected to follow the latest EA climate change guidance. The Flood Risk and Drainage Team will be happy to provide site specific guidance as part of any planning pre-application.

I hope this is of assistance, if you have any further queries do please get in touch.

Kind Regards,

Natalie – on behalf of the Flood Risk and Drainage Team

Flood and Drainage Support Officer
Corporate Estates & Facilities Business Unit
Mid Sussex District Council, Oaklands Road, Haywards Heath, West Sussex, RH16 1SS
Telephone: (01444) 477577 (option 3)
Switchboard: (01444) 458166
Mon-Fri - (10:00 – 16:00)
drainage@midsussex.gov.uk
www.midsussex.gov.uk

-

From: Riley, Yvonne <Yvonne.Riley@stantec.com>
Sent: 20 September 2022 14:25
To: drainage <drainage@midsussex.gov.uk>
Cc: Knowles, Stephanie <stephanie.knowles@stantec.com>
Subject: Land West of Burgess Hill - Request for Information - MSDC

You don't often get email from yvonne.riley@stantec.com. [Learn why this is important](#)

Good afternoon,

I have been provided with your contact details, hopefully you can be of assistance. Stantec has been commissioned to undertake a review of Flood Risk and Surface Water Drainage for the site of Land West of Burgess Hill, shown in the attached location plan. The site will comprise of a residential development and has an approximate grid reference of 529227E, 118251N.

We have also requested information from the Environment Agency (EA), West Sussex County Council and Southern Water but we would be very grateful for the following information where available:

- Any records of flooding in the vicinity of the site.
- Any maps or information on surface water flood risk other than those held by the EA.
- As above for groundwater flood risk.
- Maps or information regarding local land drainage systems.
- As above for highway drainage systems.
- Information on the local strategy for dealing with surface water.
- Any information on infiltration drainage potential at the site.
- Types of SuDS likely to be acceptable for adoption
- Any runoff restrictions that may apply at this location (over and above requirements set out in NPPF) e.g. Critical Drainage Areas.
- Anything else you feel is relevant that an FRA would need to consider.

We would also like to request a copy of the mapping produced to accompany the Mid Sussex District Council Strategic Flood Risk Assessment (Level 1, June 2015), as highlighted within the document held on the Mid Sussex District Council website.

In addition, we would be interested in your current policy with regards to the new EA climate change guidance.

We look forward to your reply at your earliest convenience. Meanwhile, if you have any queries, please do not hesitate to get in touch using the contact details below.

Kind regards,

Yvonne Riley

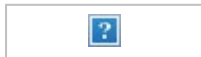
Yvonne Riley

BSc(Hons) MSc
Graduate Engineer
(she/her)

Waterloo House, Victoria Square, Birmingham, B2 5TB

Direct: 01217968244

yvonne.riley@stantec.com

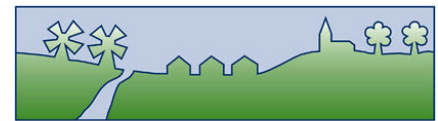
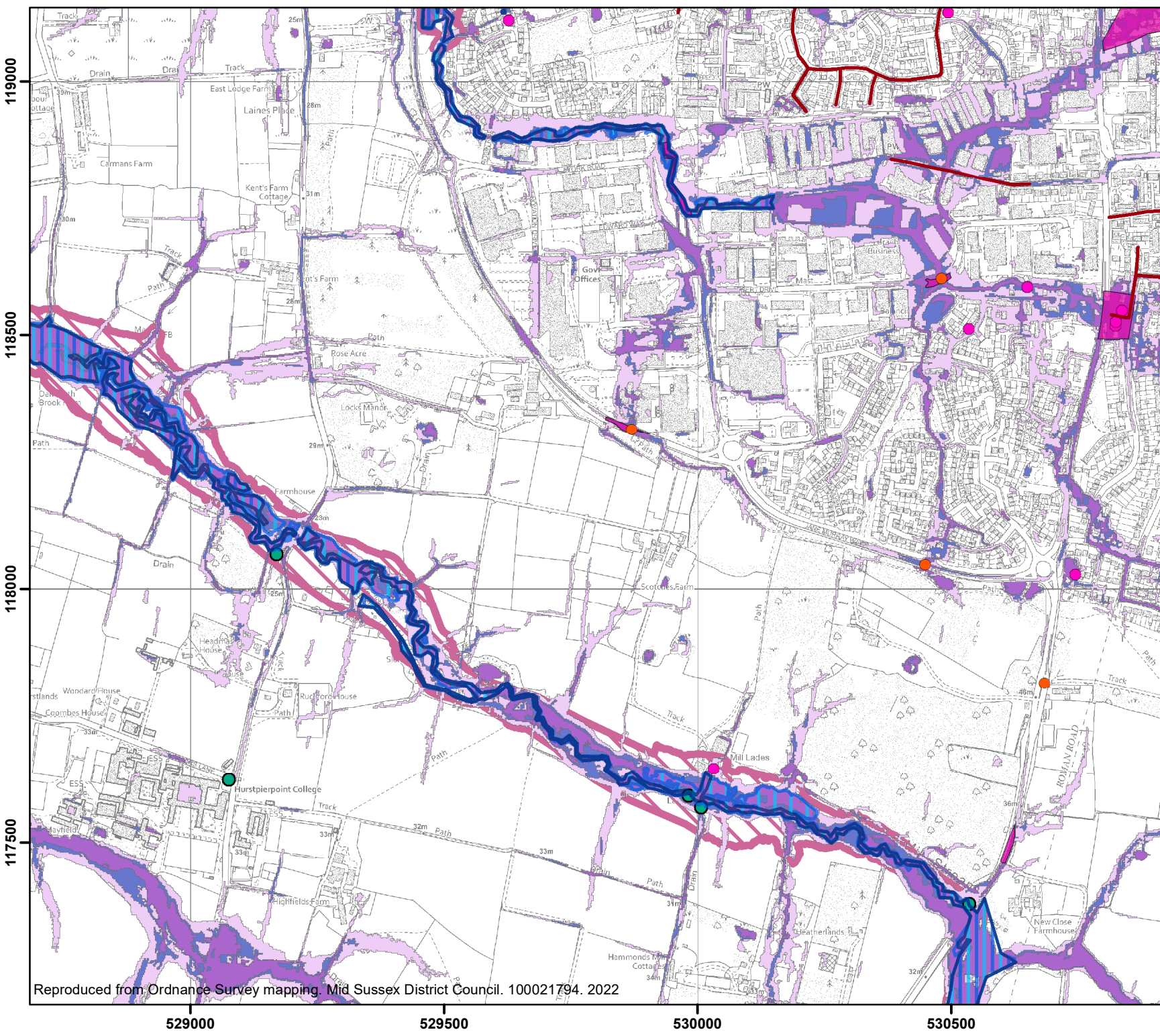


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MID SUSSEX
DISTRICT COUNCIL

Strategic Flood Risk Assessment



- Legend**
- OSMMAAnno
 - Flood Zone 3b - Functional Floodplain
 - Flood Zone 2
 - Upper Mole Flood Zone 3a
 - Upper Mole Flood Zone 3b
 - FloodMap - Areas that Benefit from Flood Defences
 - SFRA - Southern Water Data
 - SFRA - External Data Source (L)
 - Historical - External Data Source (P)
 - Historical - Internal Data Source (P)
 - Historical - EA Data Source (P)
 - SFRA - EA Data Source (A)
 - SFRA - External Data Source (A)
 - SFRA - Internal Data Source (A)
 - Flood Map - Historic Flood Map
 - Flood Map for Surface Water - 1 in 30yr
 - Flood Map for Surface Water - 1 in 100yr
 - Flood Map for Surface Water - 1 in 1000yr
 - EA - Indicative Flood Plains

Reproduced from Ordnance Survey mapping. Mid Sussex District Council. 100021794. 2022

28/09/2022

Appendix E Greenfield Runoff Rates and Surface Water Storage Calculations

DRAFT

332511294 - Land West of Burgess Hill

Proposed Catchments & Impermeable Areas

Catchment	Proposed Catchment Area		Residential Area		Approximate Impermeable Area (0.65 Factor*)		Local Centre / Primary School		Approximate Impermeable Area (0.80 Factor**)		Approximate Spine Road Area		Approximate Impermeable Area (1.00 Factor***)		Total Impermeable Area	
	sq.m	ha	sq.m	ha	sq.m	ha	sq.m	ha	sq.m	ha	sq.m	ha	sq.m	ha	sq.m	ha
1A	96391.25	9.64	21429.62	2.14	12858	1.29					3384.10	0.34	3384.10	0.34	16241.87	1.62
1B			9596.78	0.96	5758	0.58									5758.07	0.58
1C			8574.95	0.86	5145	0.51					1032.00	0.10	1032.00	0.10	6176.97	0.62
1D			4849.37	0.48	2910	0.29					481.80	0.05	481.80	0.05	3391.42	0.34
2A	80718.98	8.07	19767.17	1.98	11860	1.19					1145.30	0.11	1145.30	0.11	13005.60	1.30
2B			16470.40	1.65	9882	0.99					1272.70	0.13	1272.70	0.13	11154.94	1.12
3	44323.92	4.43	14049.72	1.40	8430	0.84					5518.50	0.55	5518.50	0.55	13948.33	1.39
4	42278.09	4.23	14907.38	1.49	8944	0.89					869.50	0.09	869.50	0.09	9813.93	0.98
5A	123584.65	12.36	18316.03	1.83	10990	1.10	13250.49	1.33	10600.39	1.06	2151.50	0.22	2151.50	0.22	23741.51	2.37
5B			32545.49	3.25	19527	1.95									19527.29	1.95
6A	65866.30	6.59	9219.19	0.92	5532	0.55									5531.51	0.55
6B			10825.06	1.08	6495	0.65									6495.04	0.65
Sum=		45.32		18.06		10.83		1.33		1.06		1.59		1.59		13.48

*60% Impermeable area (10% urban creep included)

**80% Impermeable area

*** 100% impermeable area, assumed road width 10m

Greenfield Rates

1 in 1 year = **7.7** l/s/ha

Quick Storage Estimates - Storage Required

Q1 = 1351 m³ of storage volume required per hectare of impermeable development to contain the 1-100+40%cc event (Upper value)

Proposed Outfall Discharge Rates (Total)

Catchment	Total Impermeable Area (ha)	Q1 Discharge Rate (l/s)
1A	1.62	12.5
1B	0.58	4.5
1C	0.62	4.8
1D	0.34	2.6
2A	1.30	10.0
2B	1.12	8.6
3	1.39	10.7
4	0.98	7.5
5A	2.37	18.2
5B	1.95	15.0
6A	0.55	4.2
6B	0.65	5.0

Storage Estimates Using Source Control - Basin Storage Requirement

Catchment	Total Impermeable Area	Q1 Basin Discharge Rate	1:100 + 25%	1:100 + 45%
1A	1.62	12.5	1299	1555
1B	0.58	4.5	456	546
1C	0.62	4.8	487	583
1D	0.34	2.6	269	322
2A	1.30	10.0	1037	1241
2B	1.12	8.6	892	1067
3	1.39	10.7	1110	1328
4	0.98	7.5	780	934
5A	2.37	18.2	1913	2290
5B	1.95	15.0	1569	1879
6A	0.55	4.2	435	521
6B	0.65	5.0	513	614

Half Drain Down Times - West

		1A	1B	1C	1D	2A	2B	3
Storage for 1:100+45cc event (m ³)		1555.0	546	583	322	1241	1067	1328
Rate of Drain Down (l/s)		12.5	4.5	4.8	2.6	10.0	8.6	10.7
Half Drain Down Volume (m3)		777.5	273	291.5	161	620.5	533.5	664
Drain down per hour		44.9	16.1	17.2	9.4	36.0	31.0	38.5
Half drain down time (hours)		17.31	16.98	16.96	17.08	17.22	17.18	17.23
Half drain down time exceeds 24 hours		NO	NO	NO	NO	NO	NO	NO

Half Drain Down Times - East

		4	5A	5B	6A	6B
Storage for 1:100+45cc event (m ³)		934.0	2290	1879	521	614
Rate of Drain Down (l/s)		7.5	18.2	15.0	4.2	5.0
Half Drain Down Volume (m3)		467	1145	939.5	260.5	307
Drain down per hour		27.2	65.7	54.1	15.2	18.0
Half drain down time (hours)		17.19	17.43	17.38	17.09	17.04
Half drain down time exceeds 24 hours		NO	NO	NO	NO	NO

FEH Greenfield Runoff

Using the 2008 Statistical Method QMED Equation



Project Title	Land West of Burgess Hill	
Project No	3325	11294

Methodology as set out in SuDS Manual 24.3.2

[SU​DS Manual Chapter 24](#)

1 Retrieve FEH Catchment Information

Define BFIHOST definition source	FEH	see note 1
Catchment Descriptors	BFIHOST	0.236
	SAAR	825.0
	FARL	1.0

2 Derive QBAR (mean annual flood)

Define area	Site Area	1.0	ha
	Applied Area	50.0	ha
FEH Index Flood (SuDS Manual Equation 24.2)	QMED (Q2)	8.0	l/s
Calculate QBAR by dividing QMED by 2yr growth factor	QBAR	9.1	l/s

3 Select appropriate growth factors

FSR Hydrological Region		7
100yr Growth Curve Factor	GQ100	3.19
30yr Growth Curve Factor	GQ30	2.40
10yr Growth Curve Factor	GQ10	1.62
2yr Growth Curve Factor	GQ2	0.88
1yr Growth Curve Factor	GQ1	0.85

(refer to FSR Hydrological Region tab)



Figure 24.1 Hydrological areas

4 Derive Flood Frequency

Greenfield Runoff per 1ha

100yr Peak Runoff Rate	Q100	29.0	l/s
30yr Peak Runoff Rate	Q30	21.8	l/s
10yr Growth Curve Rate	Q10	14.7	l/s
QBAR Peak Runoff Rate	QBAR	9.1	l/s
2yr Peak Runoff Rate	Q2	8.0	l/s
1yr Peak Runoff Rate	Q1	7.7	l/s

DOCUMENT ISSUE RECORD

Rev	Comments	Prepared	Date	Checked	Date
-	Original calculation	YR	15/09/2022		

- Notes This spreadsheet has been created to allow derivation of greenfield runoff rates using the FEH statistical method applied in a manner consistent with the recommendations of the SuDS Manual. If you have recommendations to improve this spreadsheet please contact Alex Bearne.
- Note 1 FEH Web version 3 allows extraction of BFIHOST and SAAR values for each square kilometre grid Export point data from FEH Webs Service as .XML file and save in project folder and import in the FEH Point Data Import tab. If you do not think the BFIHOST value is representative of your site then it is possible to derive it manually. This should not normally be necessary. BFI can be derived manually using the methodology set out in the Flood Estimation Handbook (see Manual Derivation of BFIHOST tab) or can be defined from ground investigation information.
As default the sheet references the imported FEH data
- Note 2 FARL value is a measure of attenuation from reservoirs and lakes for the majority of studies this should be set to 1 (representing no attenuation). If your site includes a large water body with an attenuating affect on runoff please consult a hydrologist.
FARL is a measurement of studies water bodies in the catchment so that their attenuation effects so this term becomes 1.0 and therefore drops out. (see page 23 of the Preliminary rainfall runoff management for developments EA/Defra 2013)
[Rainfall runoff management for developments.pdf](#)
- Note 3 If the site area is less than 50 hectare the spreadsheet will calculate QMED for 50ha and scale the results automatically to the defined Site Area
- Note 4 QMED is calculated using the statistical equation as revised by Kjeldsen in 2008

$$Q_{MED} = 8.3062AREA^{0.8510} \cdot 0.1536^{(1000/SAAR)} \cdot FARL^{3.4451} \cdot 0.0460^{BFIHOST^2}$$

[Rainfall runoff management for developments.pdf](#)

It is reproduced as Equation 24.2 in the SUDS Manual (pg 512)

- Note 5 QBAR is calculated by dividing QMED by the growth factor for the 2 year event, as per the methodology set out in paragraph 6.2.2 of 'Rainfall runoff management for developments' . QBAR is then used as the index flood for the basis of applying the growth factors.

Appendix F Drawing

Indicative Surface Water Drainage

DRAFT

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.
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1. DISCHARGE RATE FOR DEVELOPABLE AREAS (GREENFIELD 1 IN 1 YEAR): 7.71/s/ha
2. ASSUMED DEVELOPMENT IMPERMEABLE AREAS USED TO INFORM ATTENUATION SIZES ARE AS FOLLOWS:

RESIDENTIAL AREAS = 60% IMPERMEABLE (INCLUDING 10% ALLOWANCE FOR URBAN CREEP)

LOCAL CENTRE AND PRIMARY SCHOOL (EXCLUDING PLAYING FIELDS) = 80% IMPERMEABLE

ACCESS ROADS = 100% IMPERMEABLE

Figure 1: Indicative layout of the proposed flood protection scheme. The diagram illustrates the spatial arrangement of various flood protection and land use features. At the top, a red line indicates the 'SITE BOUNDARY'. Below this, horizontal lines represent 'MAIN RIVERS' and 'CONTOURS'. A brown dashed line marks the 'ACCESS ROAD'. A blue oval structure represents 'INDICATIVE ATTENUATION BASINS'. A hatched area below the basins is the 'ATTENUATION BASIN BUFFER ZONE (4m)'. A blue arrow points to the 'INDICATIVE SuDS CORRIDOR'. A blue dashed line indicates the 'INDICATIVE BASIN CONVEYANCE ROUTE'. A pink dashed line with an arrow shows the 'INDICATIVE OUTFALL LOCATION'. A pink arrow points to the 'OUTFALL INTO EXISTING SOUTHERN WATER SURFACE WATER SEWER'. Another pink arrow indicates the 'INDICATIVE OVERLAND CONVEYANCE ROUTE'. Below these are six colored blocks representing 'CATCHMENT 1' through 'CATCHMENT 6 DEVELOPABLE AREA'. At the bottom, a blue gradient bar indicates 'SURFACE WATER FLOOD RISK' with levels 'HIGH', 'MEDIUM', and 'LOW'.

	KB	YR	SK	2022.10.20
	Dwn.	Dsgn.	Chkd.	YYYY.MM.D

DRAFT

This document is suitable only for the purpose noted above.
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Vistry Group

LAND AT MALTHOUSE LANE, BURGESS
HILL

Project No.	Scale
332511294	1:3000
Revision	Drawing No.
PO	332511294/4001/001