GeoSmart Information

FloodSmart

Flood Risk Assessment

Site Address

Astwood Lane
Feckenham
Redditch
B96 6JQ

Grid Reference

E 401123 N 261725

Report Prepared for

Patricia Dormer
The Paddocks
Astwood Lane
Feckenham
Redditch
Worcestershire
B96 6HG

Date

2021-05-28

Report Status

FINAL

Site Area

1.15 ha

Report Reference

74902R1

RISK - Low

The Site is located within fluvial Flood Zone 1 (Low probability), and within an area defined as being at Very Low risk. The Site has a Very Low risk of surface water flooding and a Negligible risk of groundwater flooding.

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1. Executive summary

A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with The National Planning Policy Framework (NPPF) (2019) and National Planning Practice Guidance (NPPG) (2014). A site-specific flood risk assessment, to assess the flood risk to and from the development Site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) and Sea (coastal/tidal) flooding	Very Low	N/A
Surface water (pluvial) flooding	Very Low	N/A
Groundwater flooding	Negligible	N/A
Other flood risk factors present	Yes[1]	
Is any other further work recommended?	Yes	Yes (see below)

N/A = mitigation not required

[1]A risk maybe present from culverts along the Plack Brook to the north. A risk is also present from sewers to the north along Astwood Lane. The risk of flooding from artificial sources to the Site is considered to be Low. The risks may be higher though on access routes to and from the Site, based on historic records of flooding.

Summary of existing and proposed development

The Site is currently greenfield and is used as a paddock. Development proposals comprise residential development of up to 25 dwellings, including associated parking, access and landscaping.

A SuDS attenuation pond is proposed in the north east of the Site to accommodate surface water runoff from the proposed development and access is from the north of the Site from Astwood Lane.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

- According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located within a fluvial Flood Zone 1 (Low probability).

  According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, the Site has a Very Low risk of flooding from Rivers and the Sea.

  A watercourse called the Bow Brook (main river) is located approximately 200 m north west of the Site, however the extent of the Flood Zones associated with this watercourse do not affect the Site or access.

  Another watercourse called the Plack Brook is located approximately 90 m north of the Site, however no detailed modelling has been undertaken by the EA and there are no Flood Zones available because the catchment area is approximately 2.51 km^2. The EA's Risk of surface water flood mapping is likely to represent the worst-case extent of flooding associated with this catchment though, and would not impact the Site.

- According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a Very Low risk of pluvial flooding.

  The Site is adjacent to south of areas at risk of pluvial flooding during a High, Medium, and Low risk event with anticipated flood depths of up to 0.3 m in a High and Medium event and 0.6 m in a Low risk event. This could potentially affected access to the Site.

- Groundwater Flood Risk screening data indicates there is a Negligible risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event. The Level 2 SFRA (MWH, 2012) has identified the Site to be within an area with greater than 25 % groundwater flooding coverage but less than 50 %, from superficial geology.

- The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:

  - The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
  - Ordnance Survey (OS) data confirms there are no canals near to the Site.
  - A sewer flooding history search was undertaken using the Strategic Flood Risk Assessment (Royal Haskoning, 2009). The SFRA states that the area surrounding the Site and Astwood Lane to the north is at risk from sewer flooding.

    The risk of flooding from artificial sources to the Site is considered to be Low. The risks may be higher though on access routes to and from the Site, based on historic records of flooding within the vicinity of the Site.

The risk to the development has been assessed over its expected 100 year lifetime, including appropriate allowances for the impacts of climate change. More extreme weather

events could increase the risk to the Site from increases in river flooding and increased potential for surface water. Site specific assessment indicates risk to the Site will not increase significantly and appropriate mitigation measures are proposed.

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site:

- As historic flooding has been identified in the vicinity of the Site and as the watercourse to the north of the development has not been modelled in detail, Finished Floor Levels (FFL) of Plots 1 to 11 at the front of the Site should be set at least 0.3 m above adjacent ground elevations. Standard flood resilient design measures could also be considered.
- A Flood Warning and Evacuation Plan (FWEP) is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning.
    - Occupants of the Site should be signed up to receive EA Flood Alerts and Flood Warnings.
- The regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the potential for blockages in drainage systems, which may potentially increase flooding risks.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development. Due to the historical incidences of flooding to the north of the Site along Astwood Lane, attenuation/infiltration ponds and above ground SuDS features should be bunded and non-return flap valves used where possible, to avoid interaction between any flooding within Astwood Lane and surface water drainage from the Site.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction

Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development Site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2019) and the source(s) of any flood risk present. Finally, a preliminary assessment of the steps that can be taken to manage any flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2019) and NPPG (2014).

"*The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied*" (NPPF, 2019).

The NPPF (2019) and NPPG (2014) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"*This general approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim should be to keep development out of medium and high risk flood areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible*" (NPPG, 2014).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2014 (Paragraph: 030 Reference ID: 7-030-20140306), a thorough review of a commercially available flood risk report and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Bromsgrove District and Redditch Borough Strategic Flood Risk Assessment (SFRA) (2009) is used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2019).

The existing and future flood risks to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and

mitigation measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted			
	Commercial Flood Maps	SFRA*	Environment Agency	OS Data
Historical	X	X	X	
Fluvial/tidal	X	X	X	
Surface water (pluvial)	X	X	X	
Groundwater	X	X		
Sewer		X		
Culvert/bridges		X		X
Reservoir		X	X	

*The SFRA and local guidance have been used to inform this report as referenced in Section 6.

3. Site analysis

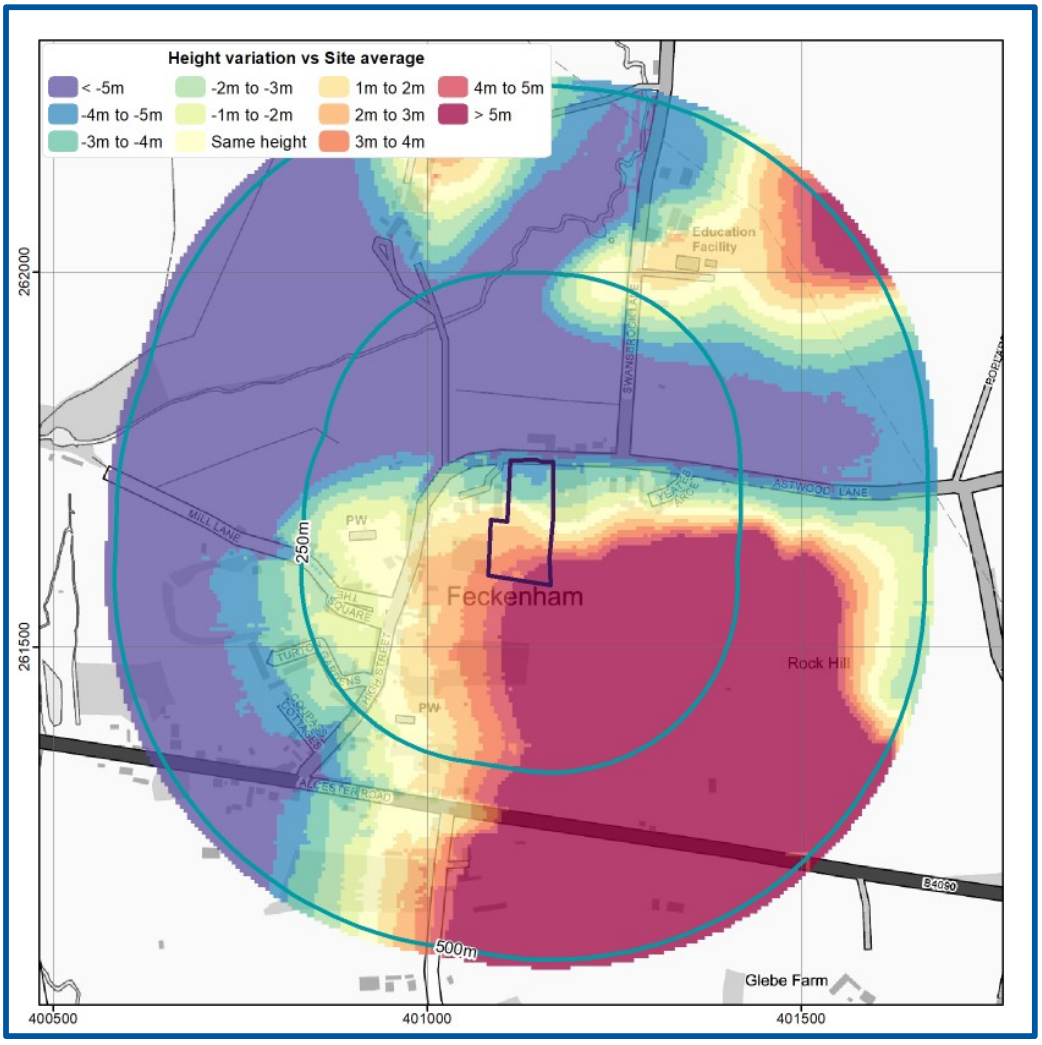
Site information

The Site is located in Feckenham in a setting of agricultural, commercial and residential land use at National Grid Reference SP 01123 61725. Site plans and drawings are provided in Appendix A.

According to OS data, using a 500 m buffer around the Site, the area is on a steep slope (Figure 1). It is noted that to the north land rises to c. 72.35 m above Ordnance Datum (AOD). To the west land falls to c. 66.28 mAOD, to the east land rises to c. 70.19 mAOD and to the south falls to c. 81.65 mAOD.

The general ground levels on the Site are between 68.83 and 78.89 mAOD with the Site falling gradually in a northerly direction. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±0.15 m (Appendix B).

Figure 1. Site Location and Relative Elevations (GeoSmart, 2021).



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Development

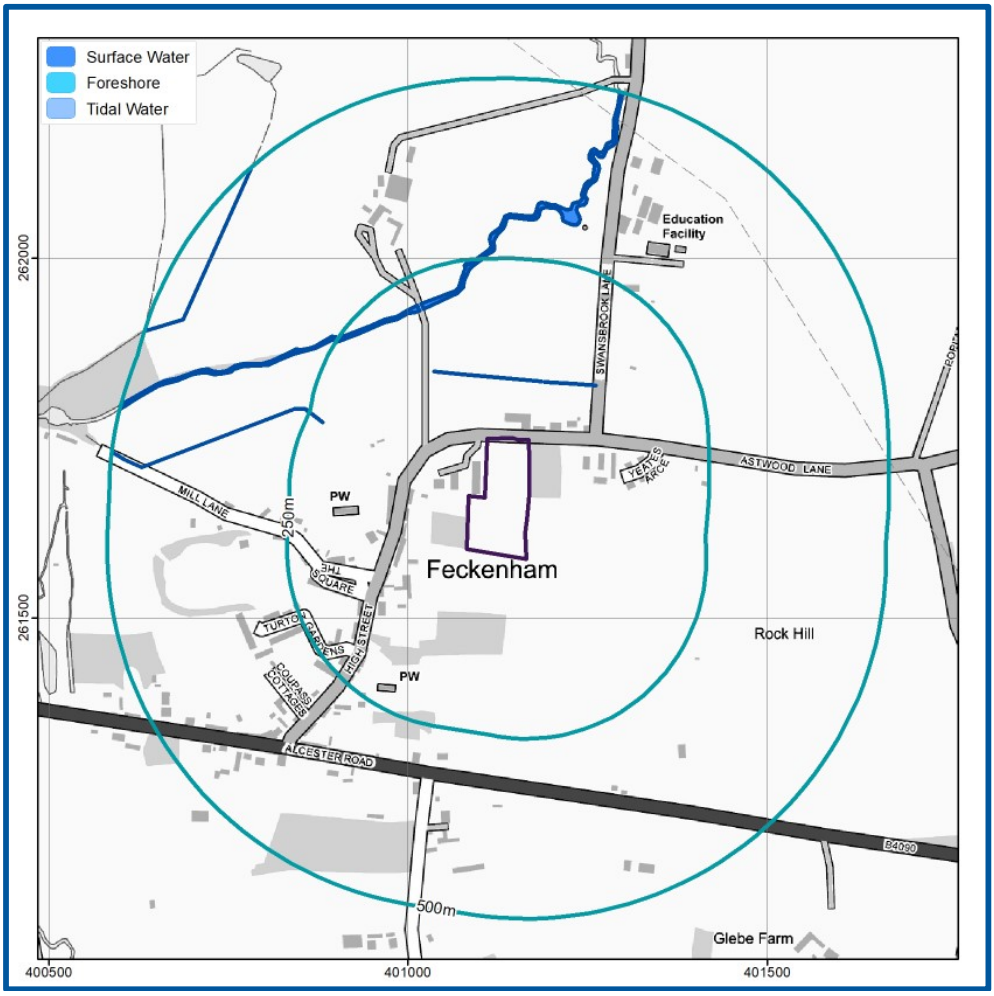
The Site is currently greenfield and is used as a paddock. Development proposals comprise residential development of up to 25 dwellings, including associated parking, access and landscaping. A SuDS attenuation pond is proposed in the north east of the Site to accommodate surface water runoff from the proposed development and access is from the north of the Site from Astwood Lane. Site plans are included within Appendix A.

The effect of the overall development will result in an increase in number of occupants and/or users of the building and will result in the change of use, nature or times of occupation. According to Table 2 of the NPPG (2014), the vulnerability classification of the existing development is Water Compatible and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

The Bow Brook (main river) is approximately 200 m to the north west of the Site with an associated ordinary watercourse 90 m (Plack Brook) to the north.

Figure 2. Surface water features (EA, 2021)



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Proximity to relevant infrastructure

A bridge over the Bow Book is approximately 240 m to the north west and 520 m to the north.

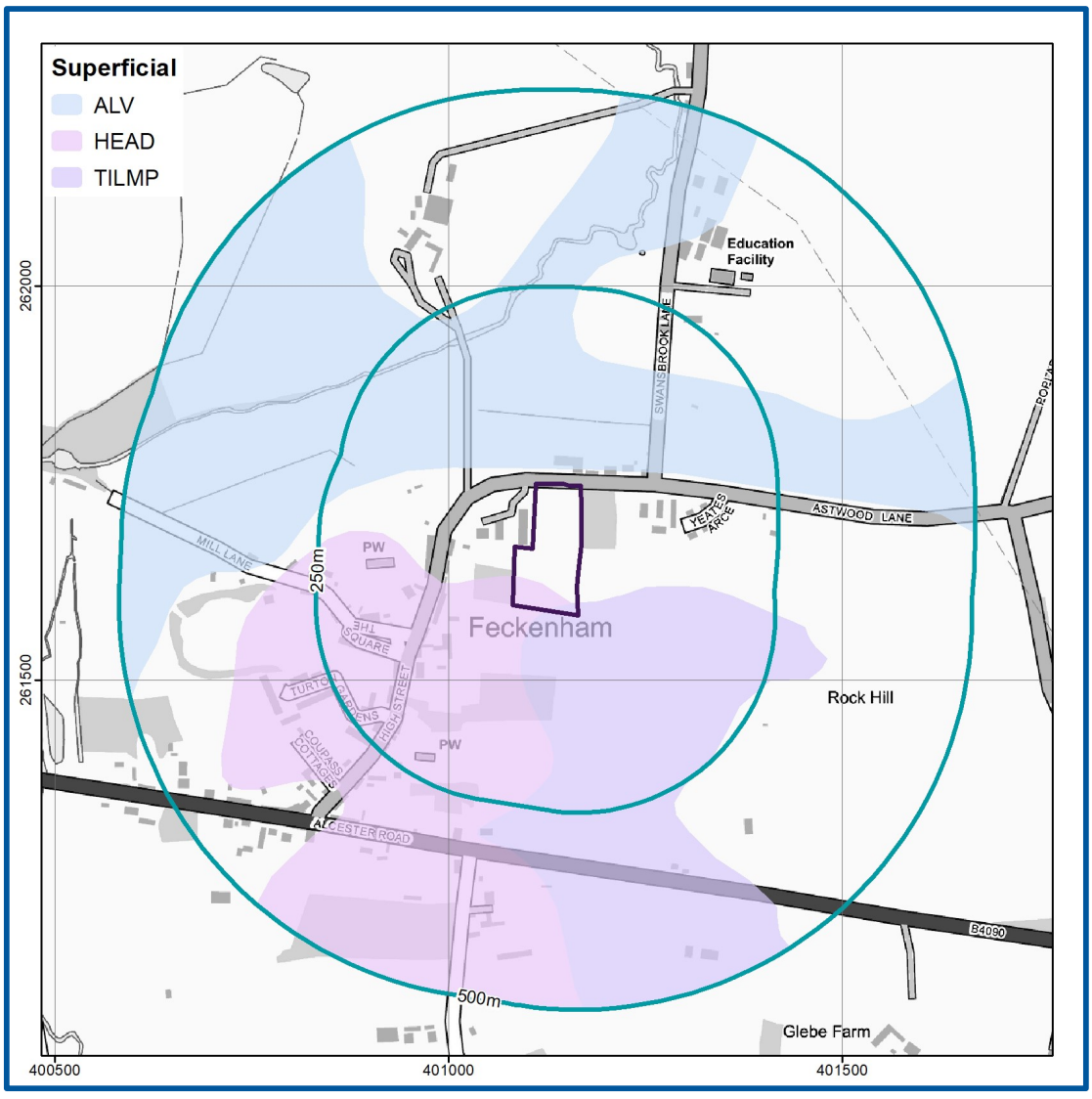
The Plack Brook is culverted 110 m to the north east and 115 m to the north west.

There are High Ground flood defences 200 m to the north east along the Bow Brook.

Hydrogeological features

British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 3) in the south west consists of Head (HEAD) (clay, silt, sand and gravel) covering 30 % of the Site (BGS, 2021) and is classified as a Secondary Undifferentiated Aquifer (EA, 2021). No superficial geolgoy is recorded for the remainder of the Site.

Figure 3. Superficial Geology (BGS, 2021)



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BGS mapping indicates the underlying bedrock geology (Figure 4) consists of the Branscombe Mudstone Formation (BGS, 2021) with siltstone and diamicton covering 15 % of the Site thought the centre classified as a Secondary (A) Aquifer (EA, 2021), and mudstone in the north and south classified as a Secondary (B) Aquifer (EA, 2021).

Figure 4. Bedrock Geology (BGS, 2021)

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The Site does not lie within a groundwater Source Protection Zone (SPZ) (EA, 2021).

A review of the BGS borehole database (BGS, 2021) indicates there are no relevant boreholes within the vicinity of the Site (500 m) from which the mapped geology can be confirmed.

The hydrogeological characteristics suggest there is unlikely to be a shallow groundwater table beneath the Site.

4. Flood risk to the development

Historical flood events

According to the EA's Historical Flood Map (Figure 5), no historical flood events have been recorded at the Site (EA, 2021). The SFRA (Royal Haskoning, 2009) has identified 2 historic flooding points along Astwood Lane to the north (Points 23) associated with Plack Brook. The flooding occurred in 2007, where 2 houses suffered external flooding and 5 houses suffered internal flooding, and twice in 2008 where Astwood Lane was closed to traffic, with one property flooding in January. The cause of flooding for these events is confirmed to be overflow of watercourses, a mechanical, structural, and operational failure (blockage/collapsed culver) and localised surface water flooding.

It is noted that works carried out by Worcestershire County Council have been proven to partially reduce the flooding in the Astwood Lane vicinity (Royal Haskoning, 2009).

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 5. EA Historical Flood Map (EA, 2021)

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Rivers (fluvial) / Sea (coastal/tidal) flooding

According to the EA's Flood Map for Planning Purposes (Figure 6), the Site is located within fluvial Flood Zone 1 and is therefore classified as having a Low probability of fluvial flooding. The Site lies approximately 35 m south of the nearest land within Flood Zones 2 and 3 where ground elevations are ~ 67 mAOD. Ground elevations at the Site are between 68.83 and 78.89 mAOD.

Figure 6. EA Flood Map for Planning Purposes (EA, 2021)

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Guidance

As defined in the NPPF (2019):

Ignoring the presence of any defences, land located in a Flood Zone 1 is considered to have a Low probability of flooding, with less than a 1 in 1000 annual probability of fluvial or coastal flooding in any one year.

Development of all uses of land is appropriate in this zone (see glossary for terminology).

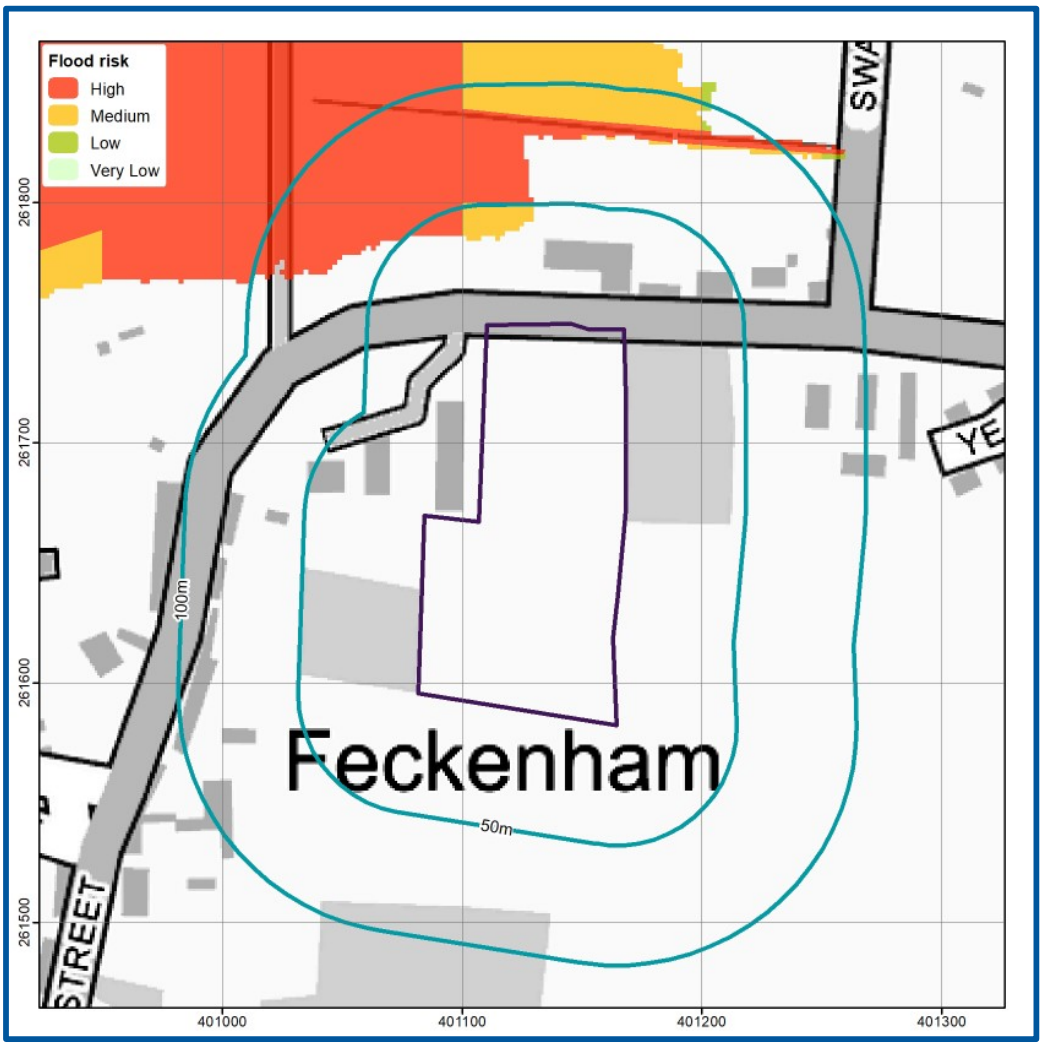
Flood risk including the benefit of defences

The type and condition of existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) mapping (Figure 7), which considers the crest height, standard of protection and condition of defences, the flood risks from Rivers and the Sea at the Site are Very Low. An area of Medium to High risk is present in areas designated Flood Zone 2 and 3 approximately 35 m to the north, however, the flooding does not impact the Site or the access along Astwood Road.

The SFRA (Royal Haskoning, 2009) states that the Plack Brook, approximately 90 m north of the Site, at Rock Hill Farm (potential development Site for housing) has no Flood Zone definition. This is likely as the catchment is 2.51 km^2 (under 3 km^2). The EA's Risk of surface water flood mapping is likely to represent the worst-case extent of flooding associated with this catchment though and would not impact the Site.

Figure 7. Risk of Flooding from Rivers and Sea map (EA, 2021)



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Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a Very Low risk of pluvial flooding. Figure 8 (overleaf) confirms the extent and depth of flooding during a 1 % AEP (1 in 100 year - Medium risk) event.

Areas at risk of pluvial flooding during a High, Medium, and Low risk event are adjacent to the north and west, potentially affecting access routes to the Site.

Flood depths of up to 0.3 m are anticipated in a High and Medium event and flood depths of up to 0.6 m are anticipated in a Low risk event. Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000 year event confirms the Site is not located on a potential overland flow route during a Low risk scenario.

Guidance

According to EA's surface water flood risk map a:

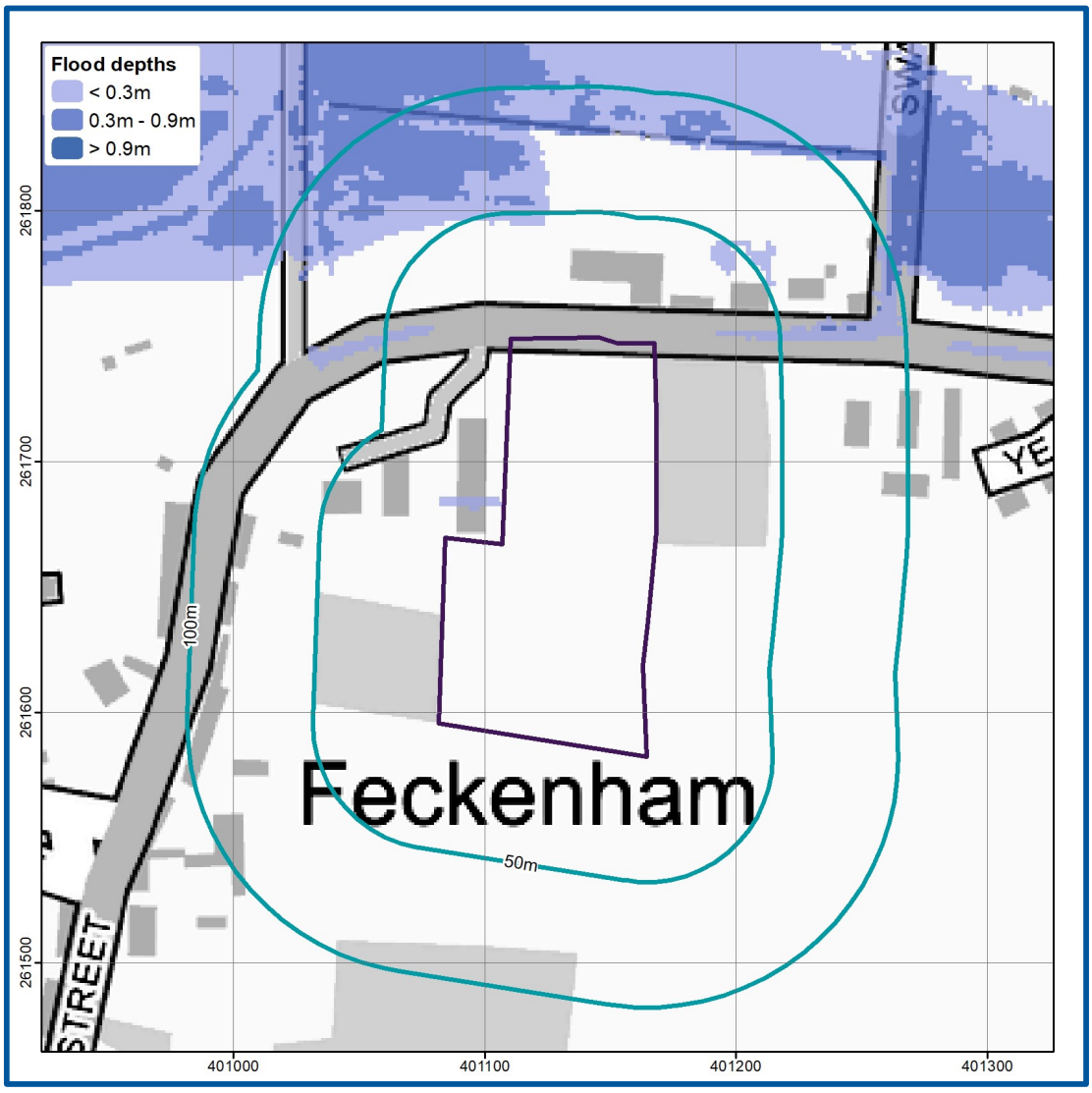
- Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).
- Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).
- Medium risk - chance of flooding of between a 1 in 100 and 1 in 30 (1% and 3.3%).
- High risk - chance of flooding of greater than 1 in 30 (3.3%).

The SFRA does indicate reported incidents of historical surface water flooding within 100 m of the Site (See Section 4) (Royal Haskoning, 2009). The SFRA confirms the Site is not located within a Critical Drainage Area (CDA)[1] (Royal Haskoning, 2009).

Climate change may lead to an increase in rainfall intensity which affects river levels, land and urban drainage systems. Rainfall intensity for small and urban catchments may increase from 5 to 20 % (central estimate) or 10 % to 40 % (Upper estimate) over the period to 2115 (EA, 2021). The increase in surface water flood risk is best represented by the 1 in 1000 year pluvial flood extent but according to the mapping this is unlikely to impact the Site. On-Site surface water drainage systems should be designed appropriately to manage the run-off.

[1] A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2019). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

Figure 8. EA Medium surface water flood risk map (EA, 2021)



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Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 9) indicates there is a Negligible risk of groundwater flooding at surface during a 1 in 100 year event.

Figure 9. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2021)

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Mapped classes combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

Based on a review of (limited) site specific data there is unlikely to be a mechanism for groundwater flooding at the Site and the risk is Negligible. Site specific assessment suggests that groundwater levels are unlikely to reach the surface at the Site.

The SFRA does not indicates reported incidents of historical ground water flooding within 20 m of the Site (Royal Haskoning, 2009). The Level 2 SFRA (MWH, 2012) has identified the Site to be within an area with greater than 25 % groundwater flooding coverage but less than 50 %, from superficial geology.

The groundwater system is considered unlikely to be in continuity with the Site surface due to the presence of low permeability material overlying the Site, as indicated by aquifer designations and the BGS maps.

On the basis of the site-specific assessment the groundwater flood risk is considered to be Negligible. The risks are higher for buried infrastructure and soak-away systems which may be affected by high groundwater levels.

	Guidance
Negligible Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.	

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment.

The impact of climate change on groundwater levels beneath the Site is linked to the predicted risk in both peak river levels and also the variation in rainfall recharge which is uncertain. Based on the available evidence the resulting increase to groundwater flood risk is not considered significant.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Sewer flooding

The SFRA state that the area surrounding the Site and Astwood Lane to the north is at risk from sewer flooding (Royal Haskoning, 2009).

Guidance

Properties classified as "at risk" are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Severn Trent).

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

Culverts and bridges have been identified within 500 m of the Site:

- A bridge over the Bow Book is approximately 240 m to the north west and 520 m to the north.
- The Plack Brook is culverted 110 m to the north east and 115 m to the north west.

A culvert has been identified over 50 m of the Site comprising a covered channel or pipe that is used to continue a watercourse or drainage path under an artificial obstruction. Culverts range in size and capacity and require appropriate maintenance to function. Screens may be installed across openings to prevent entry and reduce the risk of blockage inside the culvert. However, they can cause of flooding when they are poorly maintained or trap large amounts of debris in times of high flow.

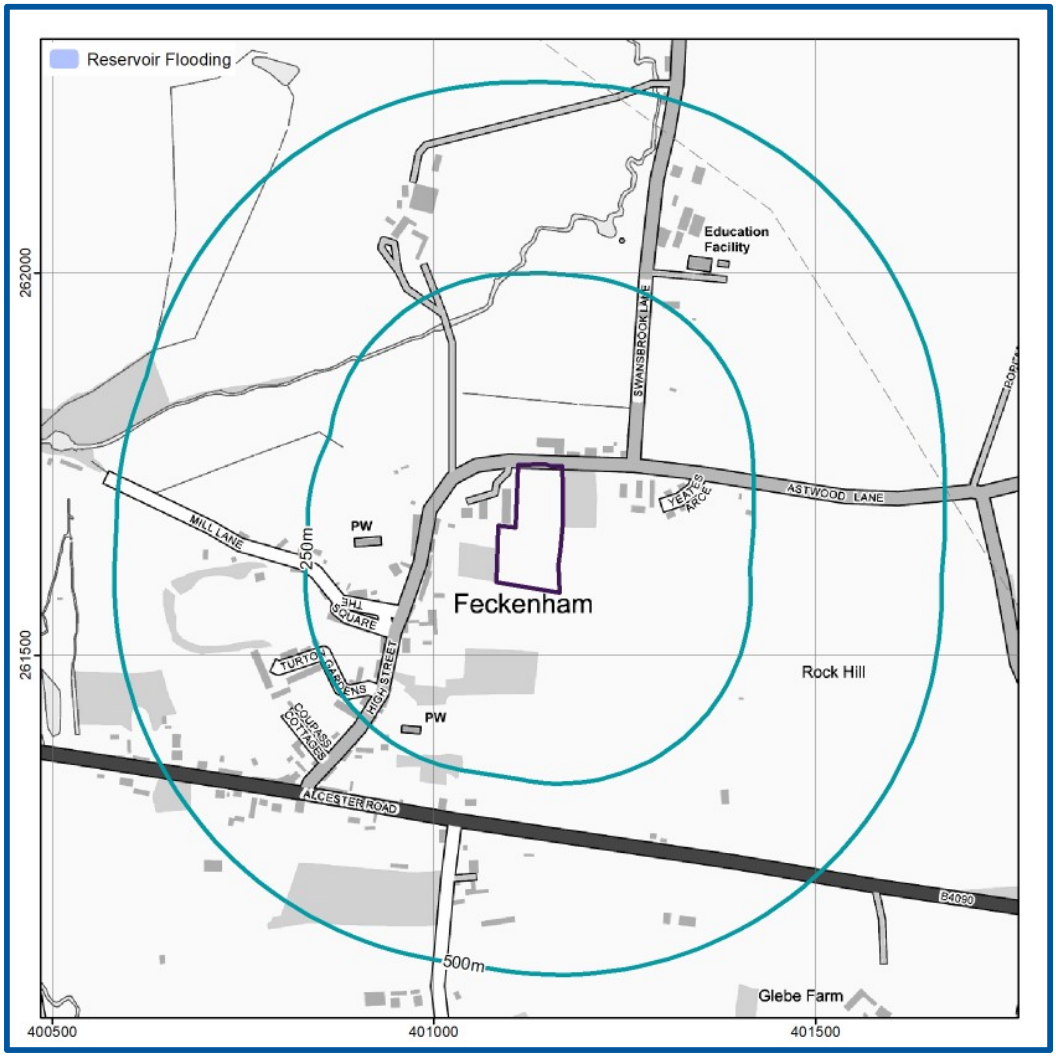
The Site lies upstream and downstream of the infrastructure and could potentially be affected by flooding as a result of blockage. Further assessment of local elevation data indicates the Site lies above adjacent land and is therefore unlikely to be at risk. An additional assessment is therefore not required.

The SFRA has identified historic drainage issues within the Site area, with a mechanical, structural and operational failure (blockage) contributing to flood events along Astwood Lane to the north in 2007 and 2008 due to the collapse of a culvert (Royal Haskoning, 2009).

Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 10) (EA, 2021).

Figure 10. EA Risk of Reservoir Flooding (EA, 2021)



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Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m^3 of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2021).

5. Flood risk from the development

Floodplain storage

As the development is located within Flood Zone 1, there would be no losses in floodplain storage as a result of the development.

Drainage and run-off

The proposed development involves an increase in the coverage of impermeable surfaces at the Site. As a result the rate and volume of runoff from the development is likely to increase over its lifetime. Therefore, an estimation of run-off is required to permit effective Site water management and prevent any increase in flood risk to off-Site receptors from the Site, over the lifetime of the proposed development.

The potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated, using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016).

The NPPF (2019) recommends the effects of climate change are incorporated into FRA's and the recently updated climate change guidance (published in 2016 and updated in 2019) confirms the requirements for inclusion within FRA's.

As the proposed development is being changed to residential, the lifespan of the development and requirements for climate change should allow up to the 2115 scenario.

Table 2. Climate change rainfall allowances

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Sustainable Drainage System (SuDS)

It is recommended attenuation of run-off is undertaken on-Site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision of storage within a Sustainable Drainage System (SuDS). SuDS can deliver benefits from improving the management of water quantity, water quality, biodiversity and amenity. Potential SuDS options are presented in the table below, subject to further investigation:

Table 3. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rainwater harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.
Swales	Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.
Soakaways	An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.
Attenuation basins/pond	Dry basin or a permanent pond that is designed to hold excess water during a rainfall event.

It is assumed that any changes to the existing drainage system will be undertaken in accordance with best practice and that care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

6. Suitability of the proposed development

The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance
Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2019). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered. **Exception test:** In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within Table 4 overleaf (Table 3 of the NPPG (2014)).

As the Site is located within Flood Zone 1, all types of development listed within the Table overleaf are acceptable according to National Policy.

Table 4. Flood risk vulnerability and flood zone 'compatibility (taken from NPPG, 2014)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a - high probability	Exception test required	✓	X	Exception test required	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Bromsgrove District and Redditch Borough Strategic Flood Risk Assessment (Royal Haskoning, 2009):

According to Figure 3 of the SFRA, the Site is adjacent to a proposed development Site for housing. This has been identified as Rock Hill Farm (0.4 Ha).

Figure 12 identified the Site in an area with a potential danger of becoming marooned. This is due to the shallow gradient of the watercourse and the lack of channel capacity. A solution has been suggested where a new channel could be cut to the north, upstream, to reduce the risk of properties becoming marooned.

"The southern, more rural, half of Redditch Borough is drained by two Main Rivers, which flow from north to south. The western branch is referred to as Swans, or Elcocks, Brook. The eastern branch is referred to as The Wharrage at its upstream end before becoming the Wixon Brook south of Windmill Drive. Downstream of their confluence, the watercourse is referred to as Swans Brook and, to the south of 'The Dingle', located to the west of Feckenham village, as Bow Brook. This Brook continues flowing south until Beanhall Mill Farm on the Borough boundary at which

point it turns west and flows parallel to the edge of the Borough as far as Priest Bridge where it crosses over the boundary. These Main Rivers are also fed by numerous ordinary watercourses, which primarily flow from the north and east."

"2.1.5 Bow Brook Catchment

Bow Brook: Spring Brook and Swans Brook

The Bow Brook is located within the Borough of Redditch and will be discussed below. However, the sources of two of its tributaries – Spring Brook and Swans Brook – are located within Bromsgrove District. Their sources are located on the edge of the Birmingham Plateau in the Holyoakes and Bank's Green areas. These two tributaries flow in a southeasterly direction, and merge just upstream of the District boundary. Both tributaries flow through very rural areas and there are no formal defences or reports of flooding along their length, although land drainage does cause minor surface water flooding problems."

"*2.1.9 Bow Brook Catchment*

Bow Brook

The Bow Brook is enmained for all of its length through Redditch District. However, the Main River channel is only referred to as Bow Brook downstream of 'The Dingle' west of the village of Feckenham. Upstream of this point the River is referred to as Swans Brook as far as the Bunker's Hole at Old Yarr, which marks the confluence of two separate Main River channels. Upstream of here, the western channel is referred to as Swans Brook or Elcocks Brook and the eastern channel is referred to as The Wharrage, upstream of Windmill Drive, and the Wixon Brook, downstream of Windmill Drive. The source of The Wharrage is the initiation of the Main River and is in the Recreation Ground north of Swinburne Road. The Swans Brook is an Ordinary Watercourse at its upstream end and becomes enmained at Elcocks Brook, downstream of Sillins Lane.

The Bow Brook itself flows due south from The Dingle until Beanhall Mill Farm on the Borough boundary, at which points it meanders and flows westwards to Priest Bridge where it leaves the Borough. At Priest Bridge, the Bow Brook has a 1 in 100 year return period event flow of 24.8m³/s (CEH dataset).

This Brook flooded in 2007 and caused some property damage along Droitwich Road in Feckenham.

There are no formal defences on any of the watercourses within this catchment. However to the west of Feckenham village, where the Swans Brook becomes renamed as Bow Brook, is an area referred to as 'the Whirly Hole', which is a historical flooding area dating back to Medieval times. The Swans Brook and the Bow Brook are artificial Level 1 SFRA -18-9T1791/R00003/303671/Birm Final Report January 2009 channels along a distance of 1.4km (between OS grid coordinates SP016026 1950 and SP00493 61054). Two weirs are present on the upstream and downstream extents of the Whirley Hole – one at location SP00528 61773 and one at SP00483 61390. The Plack Brook, a tributary of the Bow Brook, discharges through an outlet culvert downstream of the upstream weir. The height of the upstream weir results in elevated water levels in the vicinity of Swansbrook Lane in times of spate. The downstream weir poses potential flood risks to adjacent properties, including those immediately downstream of the Whirly Hole, although these properties were not flooded in the July 2007 event."

"Plack Brook

The Plack Brook rises just north of the village of Astwood Bank and flows in a southwesterly direction towards the village of Feckenham. It then flows through the northern end of the village before outfalling into the Whirly Hole. Flooding has occurred along this Brook due to its shallow gradient (typically 1/300 on average), the collapse of a culvert and a lack of channel capacity and has resulted in the marooning of properties in the past. One solution suggested by the Council Drainage Engineer is to cut a new channel, slightly north of the original, slightly upstream of Feckenham.

Works subsequently carried out by Worcestershire County Council have proved partially effective in reducing flooding in the Poplars Lane, Astwood Lane vicinity. However, minor obstructions (natural and man-made) and the lack of general maintenance west of Swansbrook Lane remain the primary causes of flooding associated with the Plack Brook, as observed during the recent September 2008 event."

"REDDITCH BOROUGH

Similarly to Bromsgrove District, there have been numerous occurrences of sewer flooding within Redditch Borough, mainly within Redditch town. As explained within the accompanying Bromsgrove District and Redditch Borough Water Cycle Strategy report 1, the sewers within Redditch are operating at capacity and are suffering from problems of storm water infiltration into the foul sewers, even though there is also an extensive network of storm water sewers within the town. In July 2007 there were numerous occurrences of sewer flooding which affected dozens of properties, both internally and externally.

Many of the areas outside Redditch town are served by combined sewer systems, which are also overwhelmed during heavy rainfall events. Figures 3 and 5 indicate the general locations of these events, which are clustered within Astwood Bank and Feckenham village."

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2019).

7. Resilience and mitigation

Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

The Site is not identified as being at risk of flooding from fluvial sources according to the EA'S Flood Map for Planning and RoFRaS map. The Site is located within Flood Zone 1 and is therefore acceptable, in line with Table 3 of the NPPG (2014) all types of development are acceptable according to National Policy.

However, the SFRA (Royal Haskoning, 2009) confirms there are historical incidents of flooding during 2007 and 2008 along Astwood Lane to the north of the Site associated with the Plack Brook. It is not clear if the Site was affected in these events.

Therefore, in order to reduce the potential risk of flooding from fluvial sources, Finished Floor Levels (FFL) of Plots 1 to 11 at the front of the Site should be set 0.3 m above ground elevations. Standard flood resilient design measures could also be considered such as:

- Air brick covers (manual or automatic closing); and
- Non-return flap valves on sewer outfalls.
- Use of low permeability building materials up to 0.3 m such as engineering bricks (Classes A and B) or facing bricks;
- Hard flooring on ground floors;
- The use of internal lime plaster/render or where plasterboards are used these should be fitted horizontally instead of vertically and/or using moisture resistant plasterboard at lower levels;
- Water, electricity and gas meters and electrical sockets should be located 0.3 m above ground floor FFLs; and
- Communications wiring: wiring for telephone, TV, Internet and other services should be protected by suitable insulation in the distribution ducts to prevent damage.

A Flood Warning and Evacuation Plan (FWEP) is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning. Occupants of the Site should be signed up to receive EA Flood Alerts and Flood Warnings.

Surface water (pluvial) flood mitigation measures

As the Site is not identified as being at risk of pluvial flooding, mitigation measures are not required.

The regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the potential for blockages in drainage systems, which may potentially increase flooding risks.

A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development. Due to the historical incidence of flooding to the north of the Site along Astwood Lane, attenuation/infiltration ponds and above ground SuDS features should be bunded where possible.

Groundwater flood mitigation measures

As the Site is not identified as being at risk of groundwater flooding, mitigation measures are not required.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

A sewer flooding history search was undertaken using the Strategic Flood Risk Assessment (Royal Haskoning, 2009). The SFRA states that the area surrounding the Site and Astwood Lane to the north is at risk from sewer flooding.

The risk of flooding from artificial sources to the Site is considered to be Low. The risks may be higher though on access routes to and from the Site, based on historic records of flooding within the vicinity of the Site.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

Emergency evacuation - safe access / egress and safe refuge

The Site is located within Flood Zone 1; however, it is located adjacent to an area where historical flood events have occurred. In the event the Site is affected by flooding, emergency evacuation is recommended. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The EA operates a flood warning service in all areas at risk of flooding; this is available on their website: https://www.gov.uk/check-flood-risk. The Site is located within an EA Flood Alerts coverage area (ref: 031WAF208) so is able to receive alerts (Figure 11). All warnings are also available through the EA's 24 hour Floodline Service 0345 988 1188.

The EA aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Figure 11. EA Flood Warning Coverage for the local area (EA, 2021).

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Other relevant information

A Flood Warning and Evacuation Plan (FWEP) is recommended, and occupants should be signed up to receive EAs Flood Alerts.

Registration to the Environment Agency's flood warning scheme can be done by following this link: https://www.gov.uk/sign-up-for-flood-warnings.

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters. Where possible these should all be raised above the extreme flood level.

8. Conclusions and recommendations

Table 5. Risk ratings following implementation and subsequent maintenance of mitigation measures

Table 6. Source of Flood Risk	Baseline	After Mitigation
River (fluvial) and Sea (coastal/tidal) flooding	Very Low	N/A
Surface water (pluvial) flooding	Very Low	N/A
Groundwater flooding	Negligible	N/A
Other flood risk factors present	Yes[1]	
Is any other further work recommended?	Yes	Yes (see below)

N/A = mitigation not required

[1]A risk maybe present from culverts along the Plack Brook to the north. A risk is also present from sewers to the north along Astwood Lane. The risk of flooding from artificial sources to the Site is considered to be Low. The risks may be higher though on access routes to and from the Site, based on historic records of flooding.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 7. Summary of responses to key questions in the report

Key sources of flood risks identified	None (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	N/A (see Section 7).
Is any further work recommended?	Yes
Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site: • As historic flooding has been identified in the vicinity of the Site and as the	

watercourse to the north of the development has not been modelled in detail, Finished Floor Levels (FFL) of Plots 1 to 11 at the front of the Site should be set at least 0.3 m above adjacent ground elevations. Standard flood resilient design measures could also be considered.

- A Flood Warning and Evacuation Plan (FWEP) is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning.
    - Occupants of the Site should be signed up to receive EA Flood Alerts and Flood Warnings.
- The regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the potential for blockages in drainage systems, which may potentially increase flooding risks.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development. Due to the historical incidences of flooding to the north of the Site along Astwood Lane, attenuation/infiltration ponds and above ground SuDS features should be bunded and non-return flap valves used where possible, to avoid interaction between any flooding within Astwood Lane and surface water drainage from the Site.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

9. Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
✓	Additional assessment: SuDSmart Report		The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs. Please contact info@geosmartinfo.co.uk for further information.
✓	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

10. References and glossary

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Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 200 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is ±0.25m for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council

SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

NPPF (2019) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
Sequential test	Aims to steer new development to areas with the lowest probability of flooding.
Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.

Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

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Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2021 Ordnance Survey data © Crown copyright and database right 2021
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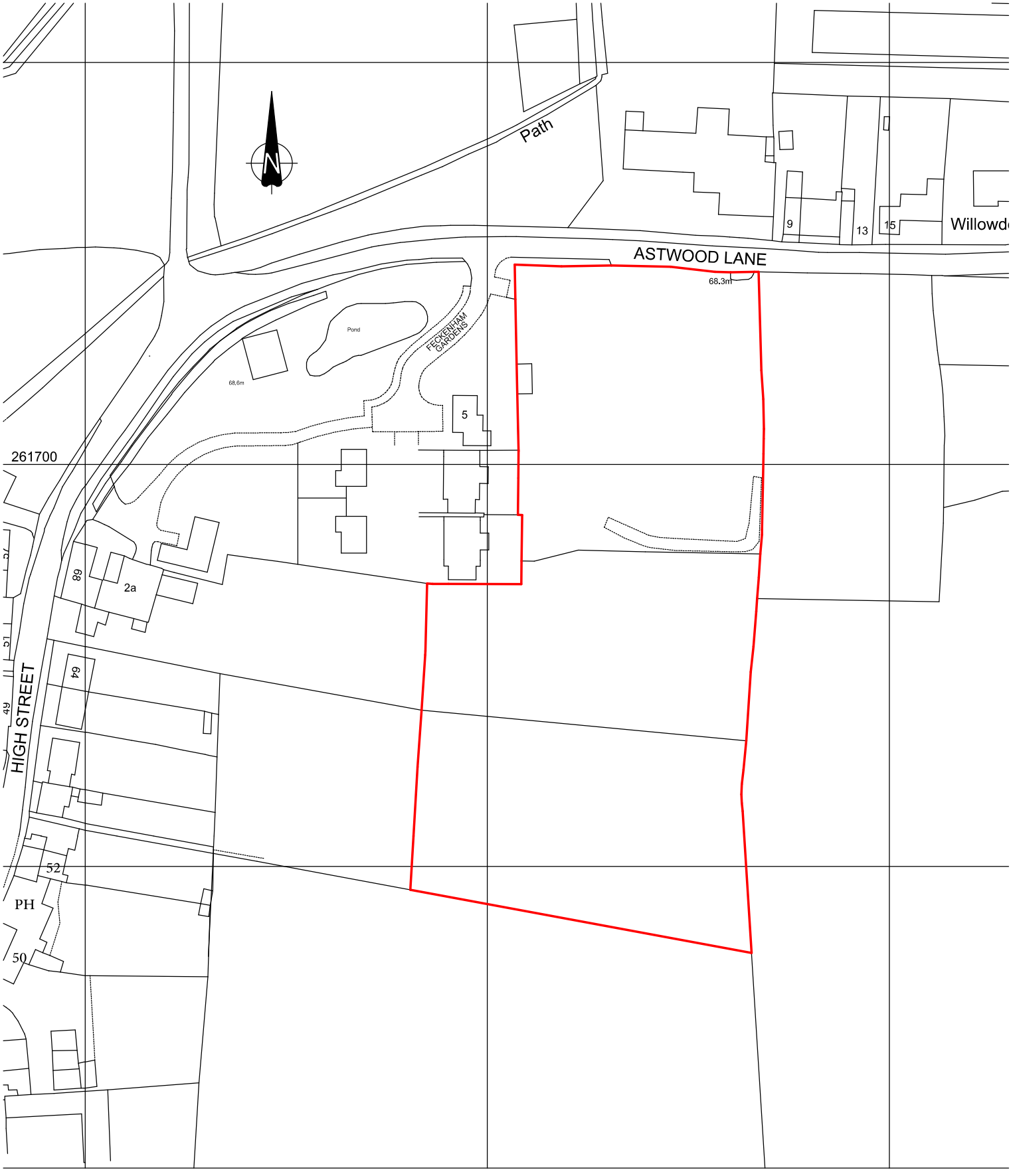
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2021) Contains British Geological Survey materials © NERC 2021 Ordnance Survey data © Crown copyright and database right 2021
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2021
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2021 Environment Agency copyright and database rights 2021

11. Appendices

Appendix A

Site plans



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PROJECT:
Astwood Lane, Feckenham

CLIENT:
Mrs P. Dormer

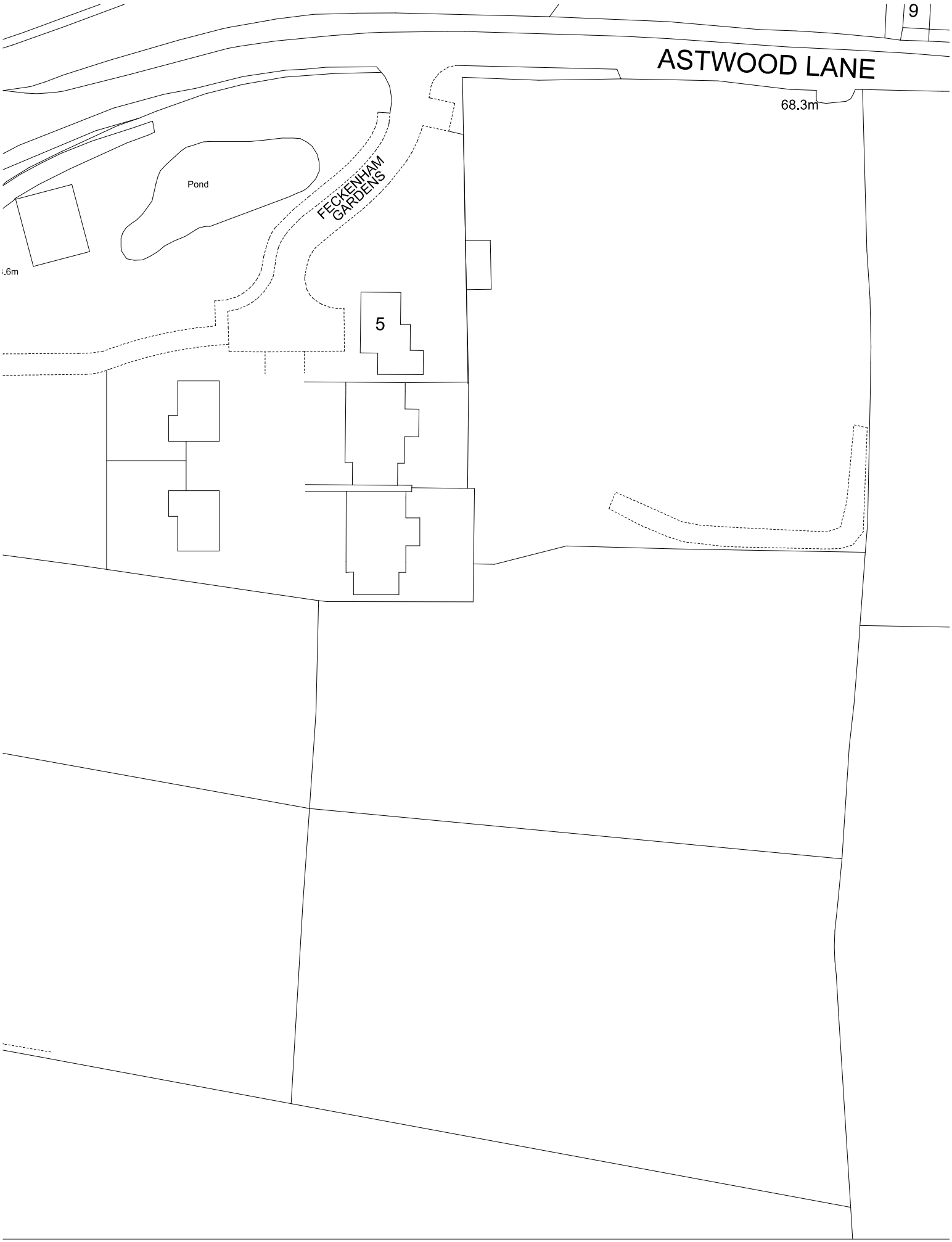
TITLE:
Location Plan

DRAWING No:
.01

SCALE:
1:1250 @ A4

DATE:
Apr 2021

Alan Smith Consultancy
ASC
ARCHITECTURE : PLANNING : DESIGN
with
MASEFIELDS ARCHITECTS and SURVEYORS
2 MILL LANE, FECKENHAM, REDDITCH , WORCESTERSHIRE , B96 6HY
TEL: 01527 893967 FAX: 01527 892568
EMAIL: alan@alansmithconsultancy.co.uk



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ALL RELEVANT HEALTH AND SAFETY LEGISLATION

REVISION:

PROJECT:
Astwood Lane, Feckenham

CLIENT:

TITLE:
Block Plan

DRAWING No:

SCALE:
1:500 @ A3

DATE:
Apr 2021

Alan Smith Consultancy
ASC
ARCHITECTURE : PLANNING : DESIGN
with
MASEFIELDS ARCHITECTS and SURVEYORS

2 MILL LANE, FECKENHAM, REDDITCH , WORCESTERSHIRE , B96 6HY
TEL: 01527 893967 FAX: 01527 892568
EMAIL: alan@alansmithconsultancy.co.uk

SITE AREA: 1.15 ha / 2.85 acres

KEY:

Plots

- 1 to 7 - 2 Bed Affordable to Rent
- 8 to 11 - 3 Bed Affordable to Rent
- 12 to 14 - 4 Bed Low Cost in Perpetuity
- 15 to 17 - 3 Bed Low Cost in Perpetuity
- 18 to 21 - 3 Bed Market Bungalow
- 22 to 25 - 2 Bed Market Bungalow

Proposed Tree Planting

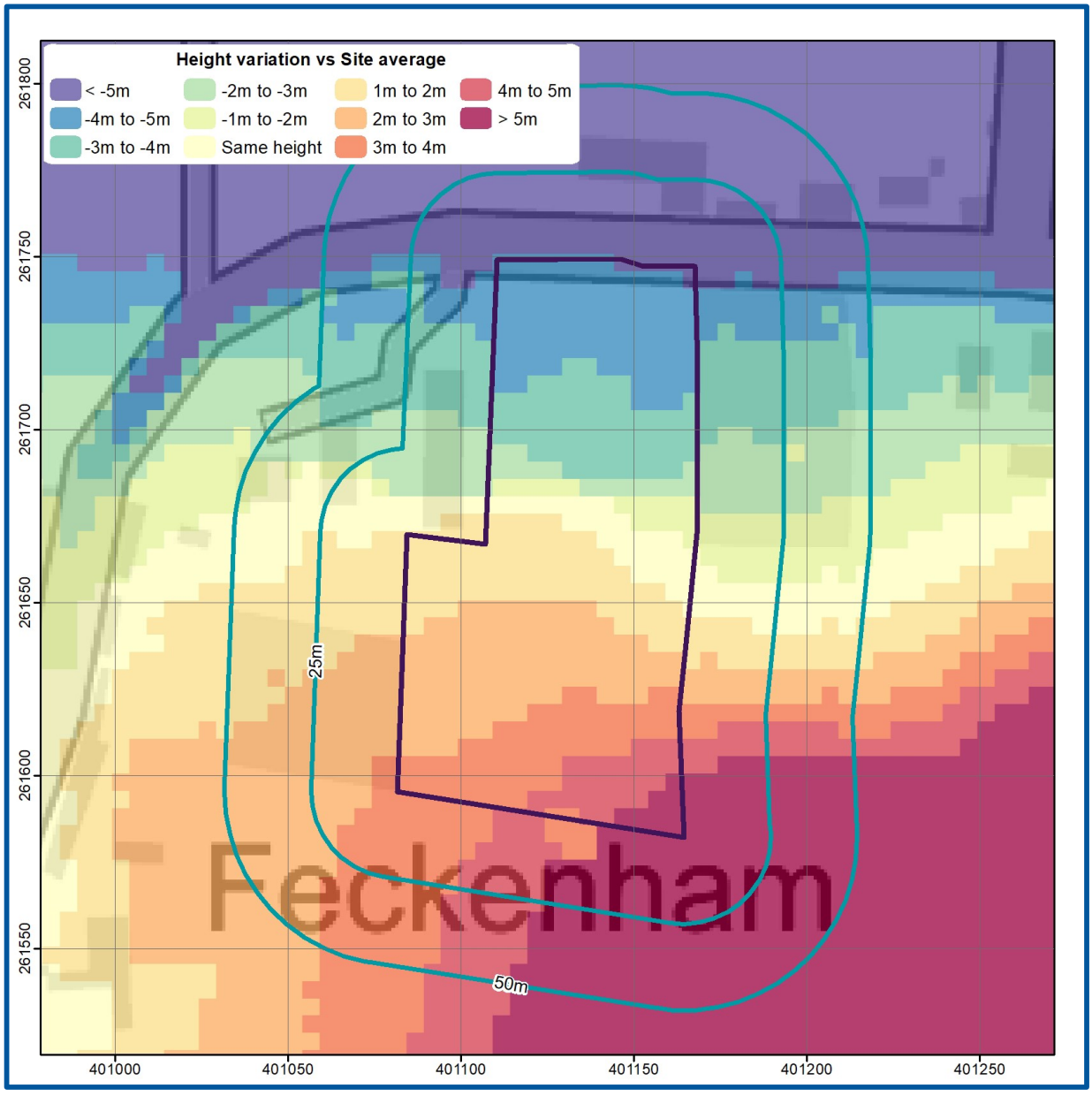
Proposed Indigenous Hedge

Astwood Lane, Feckenham
Site Plan
1:500 @ A3 Apr 2021

GeoSmart Information

Appendix B

Environment Agency LiDAR ground elevation data



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This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

For full T&Cs see http://geosmartinfo.co.uk/terms-conditions

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Alan White

Operations Manager

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

alanwhite@geosmartinfo.co.uk

12. Terms and conditions, CDM regulations and data limitations

Terms and conditions can be found on our website:

http://geosmartinfo.co.uk/terms-conditions/

CDM regulations can be found on our website:

http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/

Data use and limitations can be found on our website:

http://geosmartinfo.co.uk/data-limitations/