

Appendix D

FLOOD MAP PACK





FLOOD MAP PACK



Limitations & Quality Assurance

Pack Prepared By

SH

Pack Checked By

MQ

Pack Authorised By

LM

Limitations:

This pack is based on flood risk information available and current at the time of preparation based on data provided by third parties.

Conclusions drawn based on this pack are limited in their accuracy in proportion to the validity of the datasets this pack is based on.

WSP cannot be held responsible for the accuracy of the third-party data and the interpretation of this pack may change if the data is amended or updated after the date of production.

WSP UK Ltd makes no warranties or guarantees, actual or implied, in relation to this pack, or the ultimate commercial, technical, economic, or financial effect on the project to which it relates, and bears no responsibility or liability related to its use other than as set out in the contract under which it was supplied.



Overview

Site Information

PROJECT
41258
SITE
London Road, Hitchin
CLIENT
Martin Grant Homes
EASTINGS, NORTHINGS
519074, 227411
WSP CONTACT
SH
DATE CREATED
12/09/2025

Pages

2	Site Location
3	Flood Map for Planning
4	Flood Map for Planning CC
5	Risk of Flooding from Rivers and Sea
6	Risk of Flooding from Rivers and Sea CC
7	Risk of Flooding from Surface Water
8	Risk of Flooding from Surface Water CC
9	Risk of Flooding from Reservoirs
10	Previous Flooding
11	Flood Alert and Warning Areas
12	Source Protection Zones & Borehole Records

Site Location

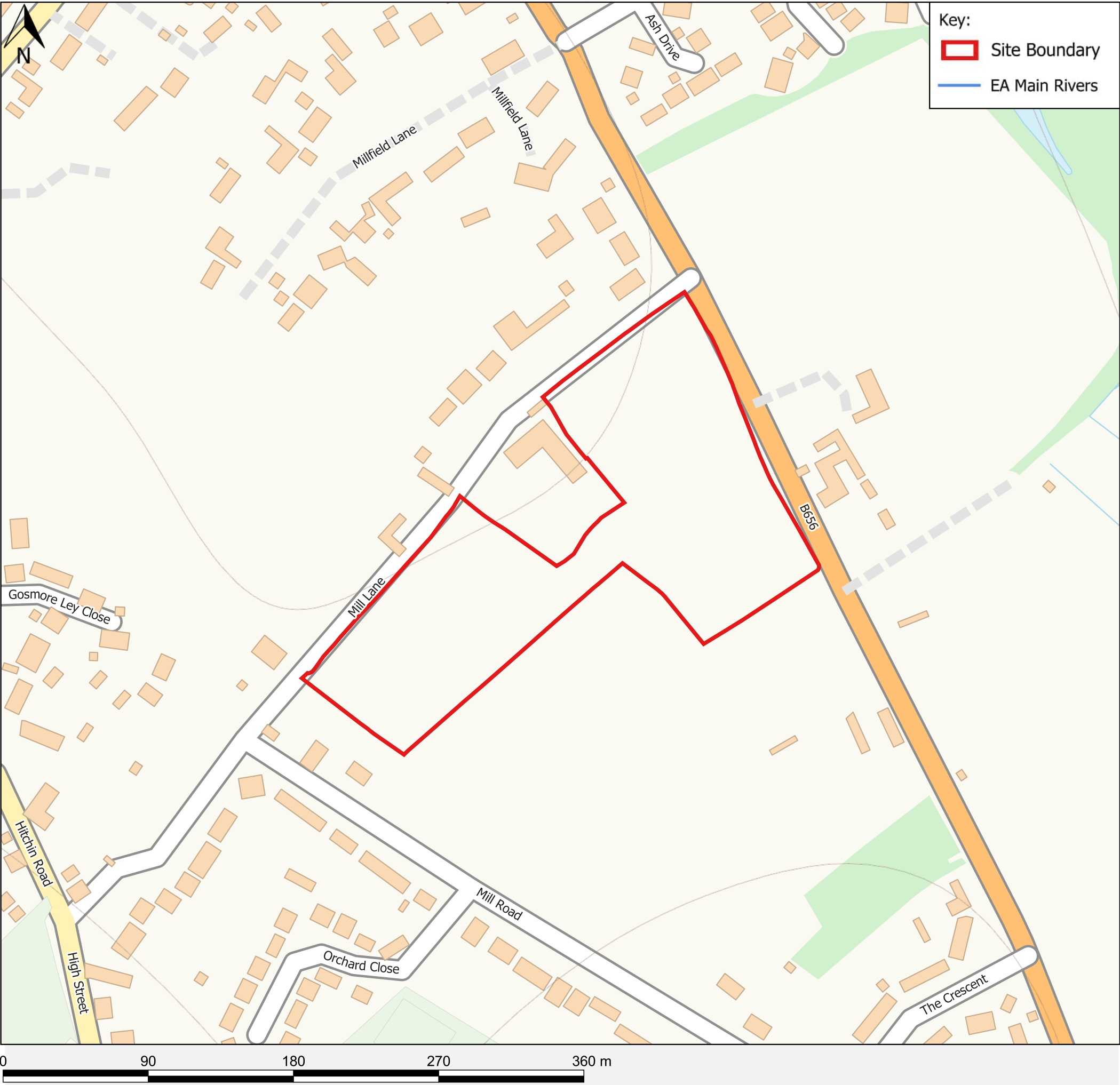
SITE AREA

3.27 hectares

CLOSEST MAIN RIVER

River Ivel / Hiz / Purwell

2470.2m away from site



Flood Map for Planning

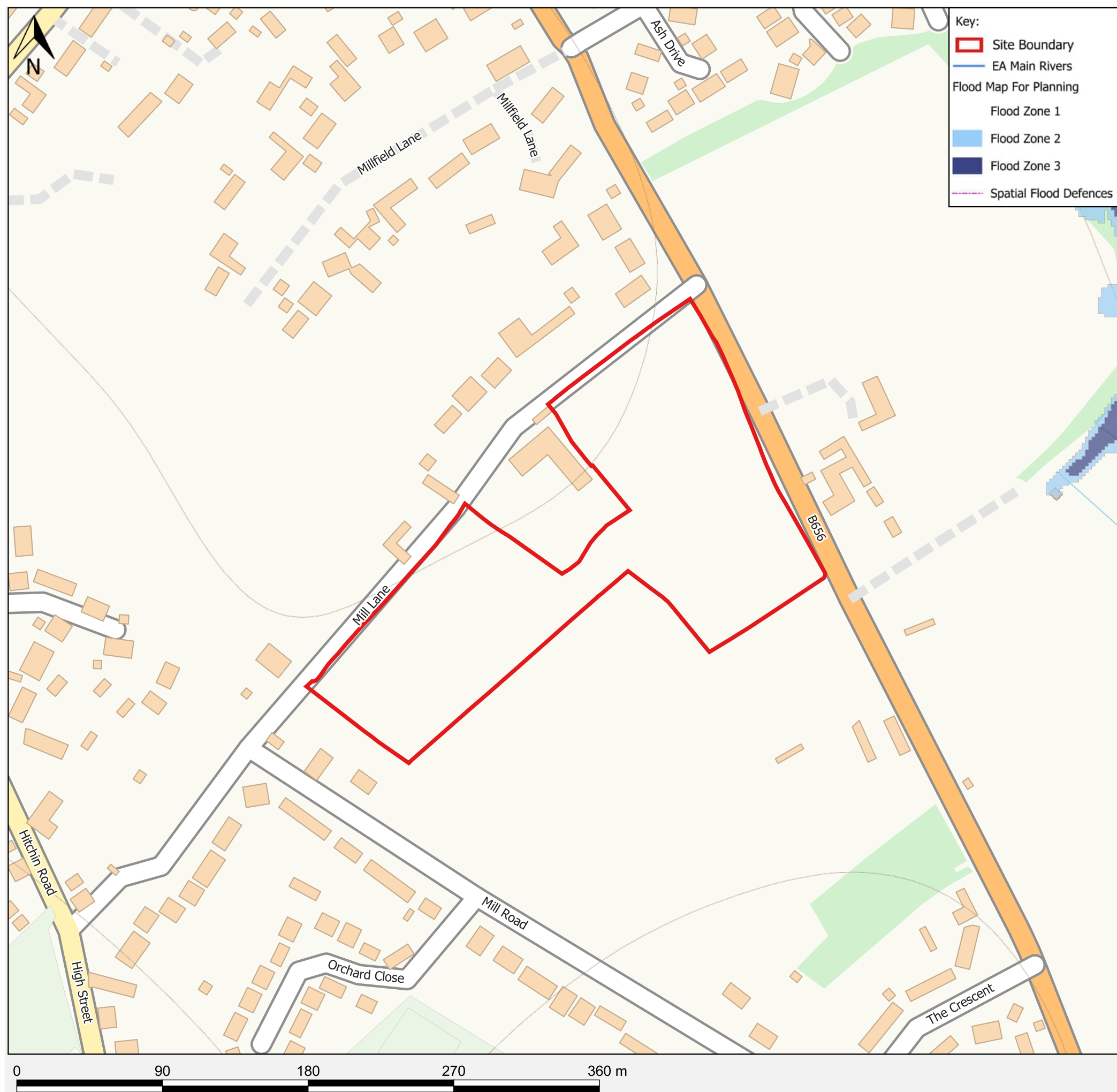
3

The Flood Zones show the extent of land at present day risk of flooding from rivers and the sea, ignoring the benefits of flood defences, for the following annual probabilities:

- **Flood Zone 1** - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of river or sea flooding - all land outside Zones 2 and 3).
- **Flood Zone 2** - Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0% AEP) of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability (0.1% - 0.5% AEP) of sea flooding.
- **Flood Zone 3** - Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability (> 0.5% AEP) of sea flooding.

Spatial Flood Defences – Flood defences can be structures, buildings or parts of buildings. Typically, these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

The assets shown in this dataset are flood defences currently owned, managed or inspected by the Environment Agency.



Flood Map for Planning CC

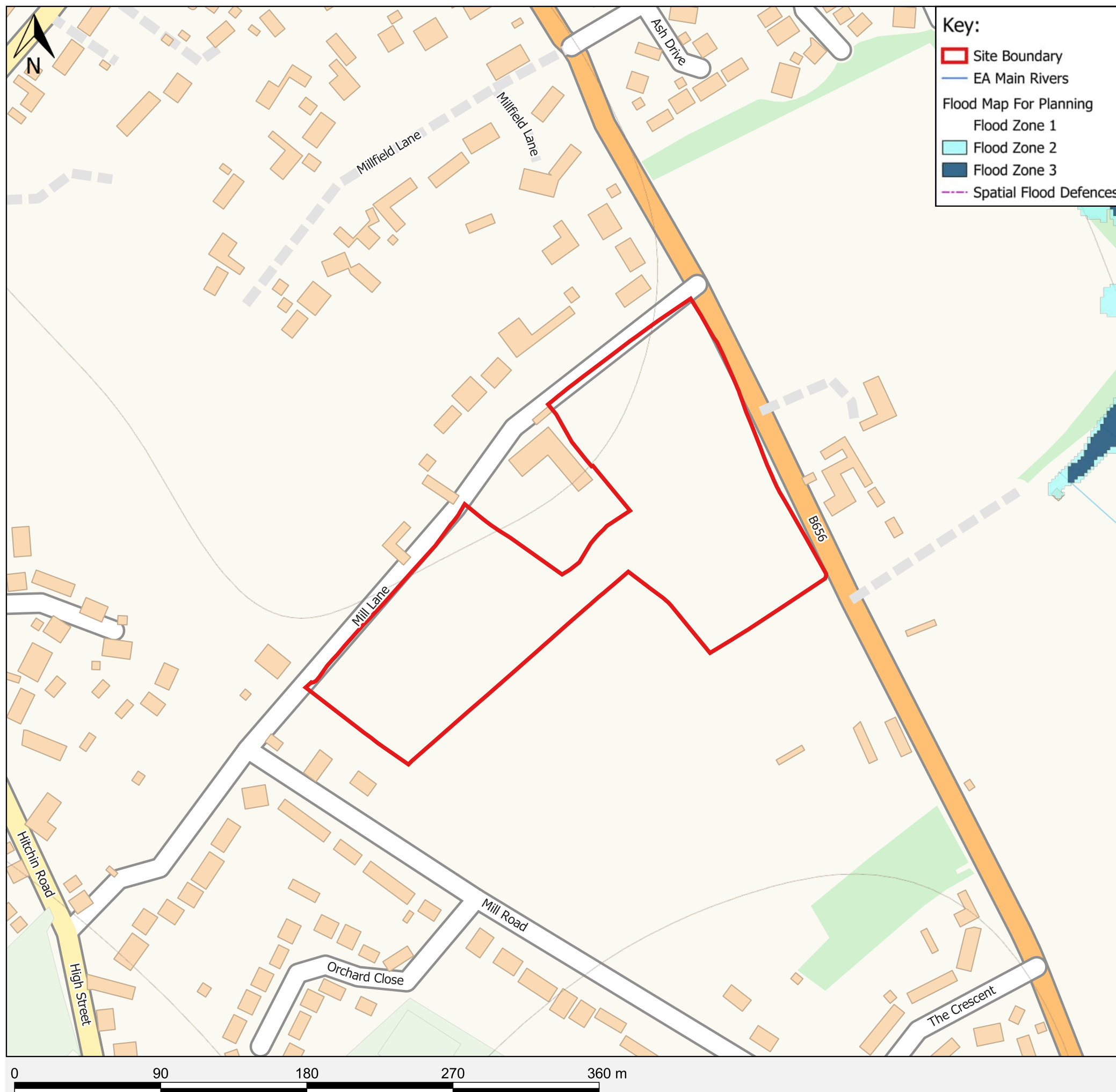
Climate change scenarios have been produced to indicate the predicted impacts of climate change on future risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.

The datasets shown on Flood Map for Planning are aimed at supporting planners and developers to make long-term decisions about the location and design of development and the use of land. Such decisions need to account for the full anticipated lifetime of the development being planned. Therefore, the following allowances have been chosen:

- the 'Central' allowance for the 2080s epoch (2070-2125) for risk of flooding from rivers
- the 'Upper End' allowance for risk of flooding from the sea, accounting for cumulative sea level rise to 2125

The Flood Zones show the extent of land at future risk of flooding from rivers and the sea, ignoring the benefits of flood defences, for the following annual probabilities:

- **Flood Zone 1** - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of river or sea flooding - all land outside Zones 2 and 3).
- **Flood Zone 2** - Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0% AEP) of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability (0.1% - 0.5% AEP) of sea flooding.
- **Flood Zone 3** - Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability (> 0.5% AEP) of sea flooding.



Risk of Flooding from Rivers and Sea

The RoFRS represent risk considering the presence and condition of flood risk management assets and takes account of the chance of them overtopping or failing. They show the overall flood risk from rivers and the sea. The data is presented in flood risk likelihood categories, which indicate the chance of flooding in any given year.

While flood defences reduce the level of risk, they do not completely remove it. For example, water can flow over the top of the defence, or they can fail in extreme weather conditions or if they are in poor condition. As a result, RoFRS may show that there is risk to areas behind some flood defences.

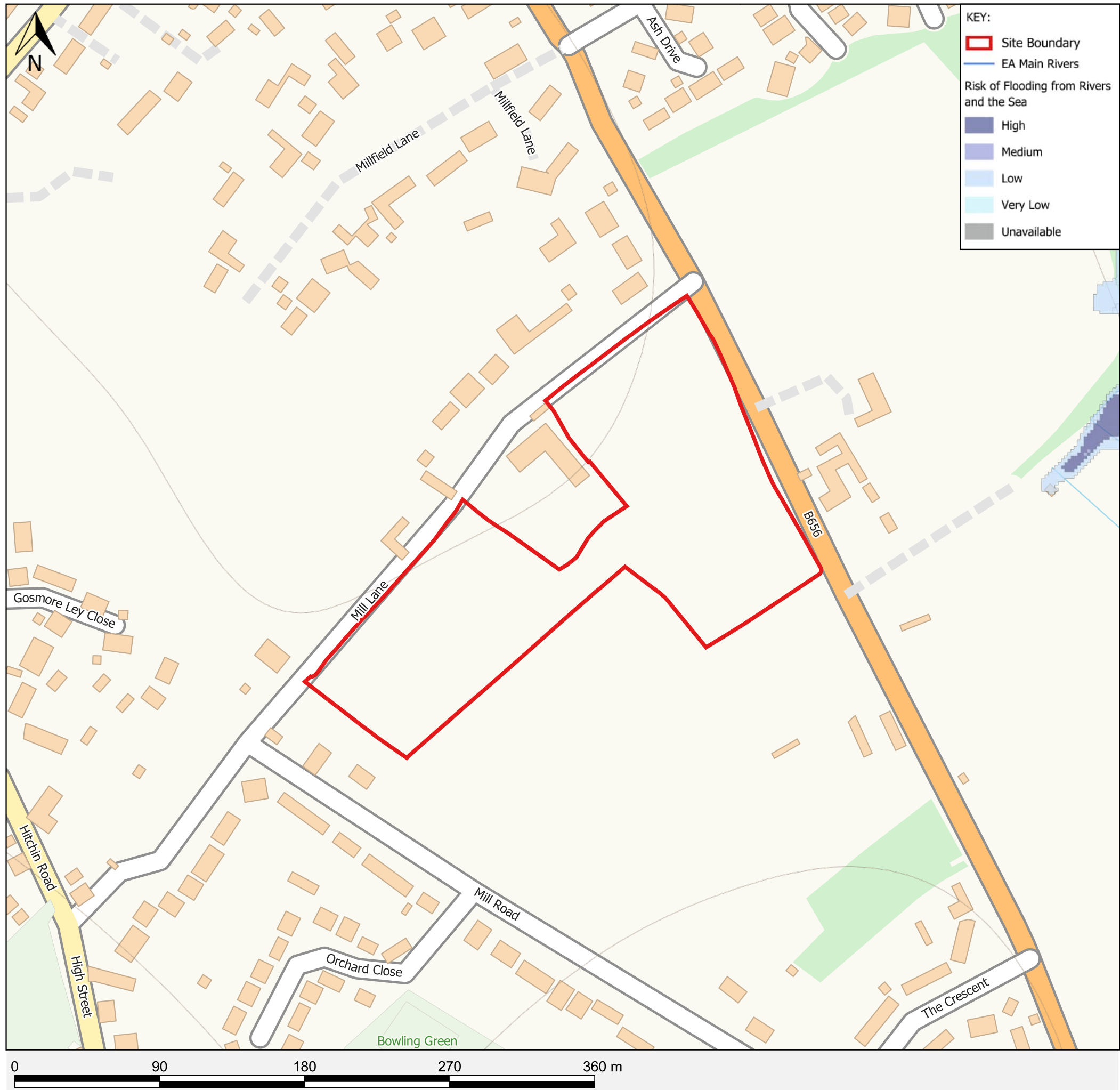
Risk is displayed as one of four likelihood categories:

High Risk – Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from rivers or the sea.

Medium Risk – Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from rivers or the sea.

Low Risk – Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0%) of flooding from rivers or the sea.

Very Low Risk – Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from rivers or the sea.



Risk of Flooding from Rivers and Sea CC

As well as present day risk of flooding from rivers and the sea, climate change scenarios have been produced to indicate the predicted impacts of climate change on future flood risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.

Near-term epochs and central/higher central allowances are being used initially, to support short and medium-term decisions informed by the highest flood likelihood projections:

- Fluvial: central allowance - 2040-2069 ("2050s" epoch)
- Coastal: higher central allowance - 2036-2065

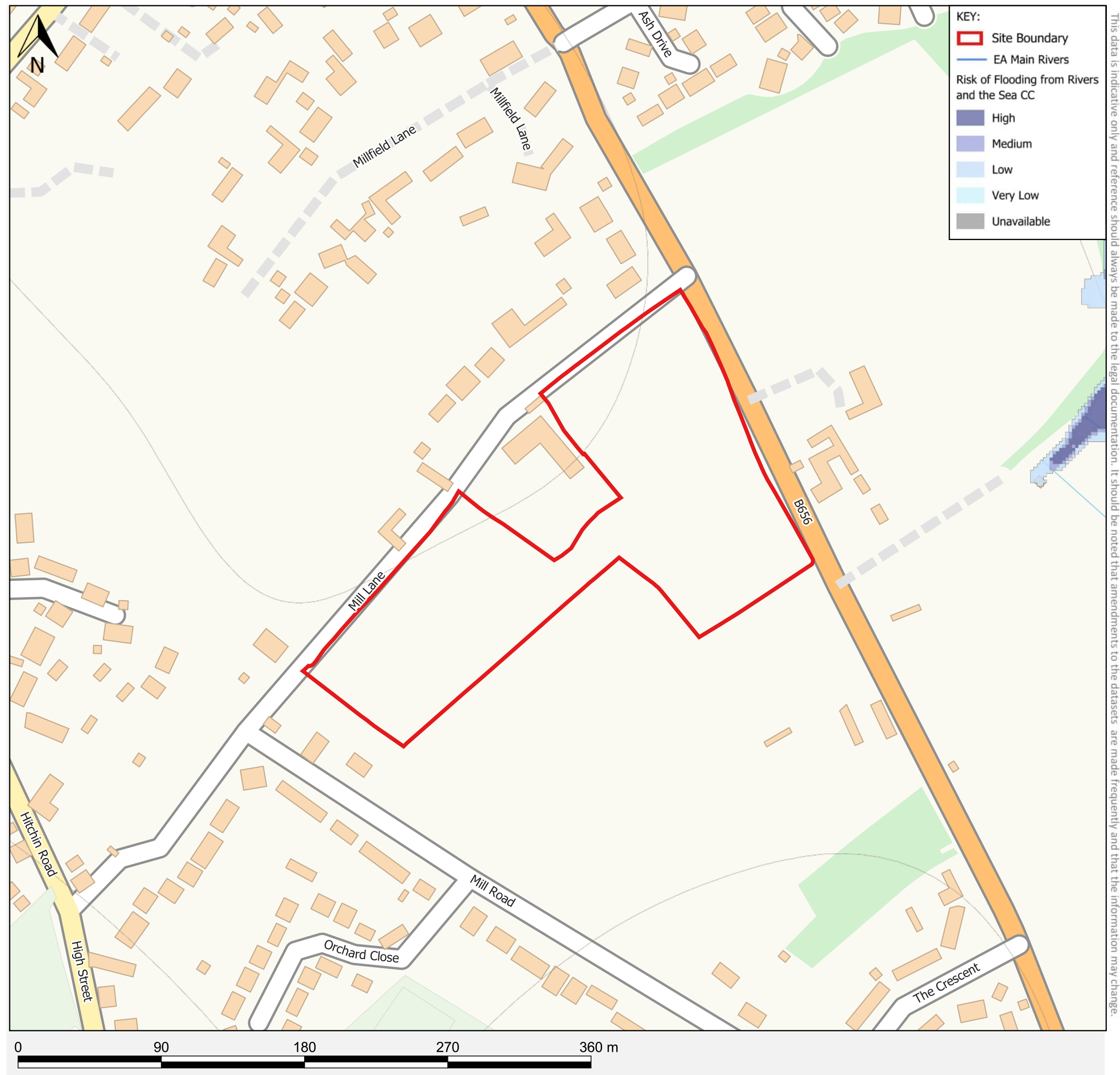
Risk is displayed as one of four likelihood categories:

High Risk – Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from rivers or the sea.

Medium Risk – Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from rivers or the sea.

Low Risk – Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0%) of flooding from rivers or the sea.

Very Low Risk – Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from rivers or the sea.



Risk of Flooding from Surface Water

The RoFSW products are an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. It includes information about flooding extents and depths.

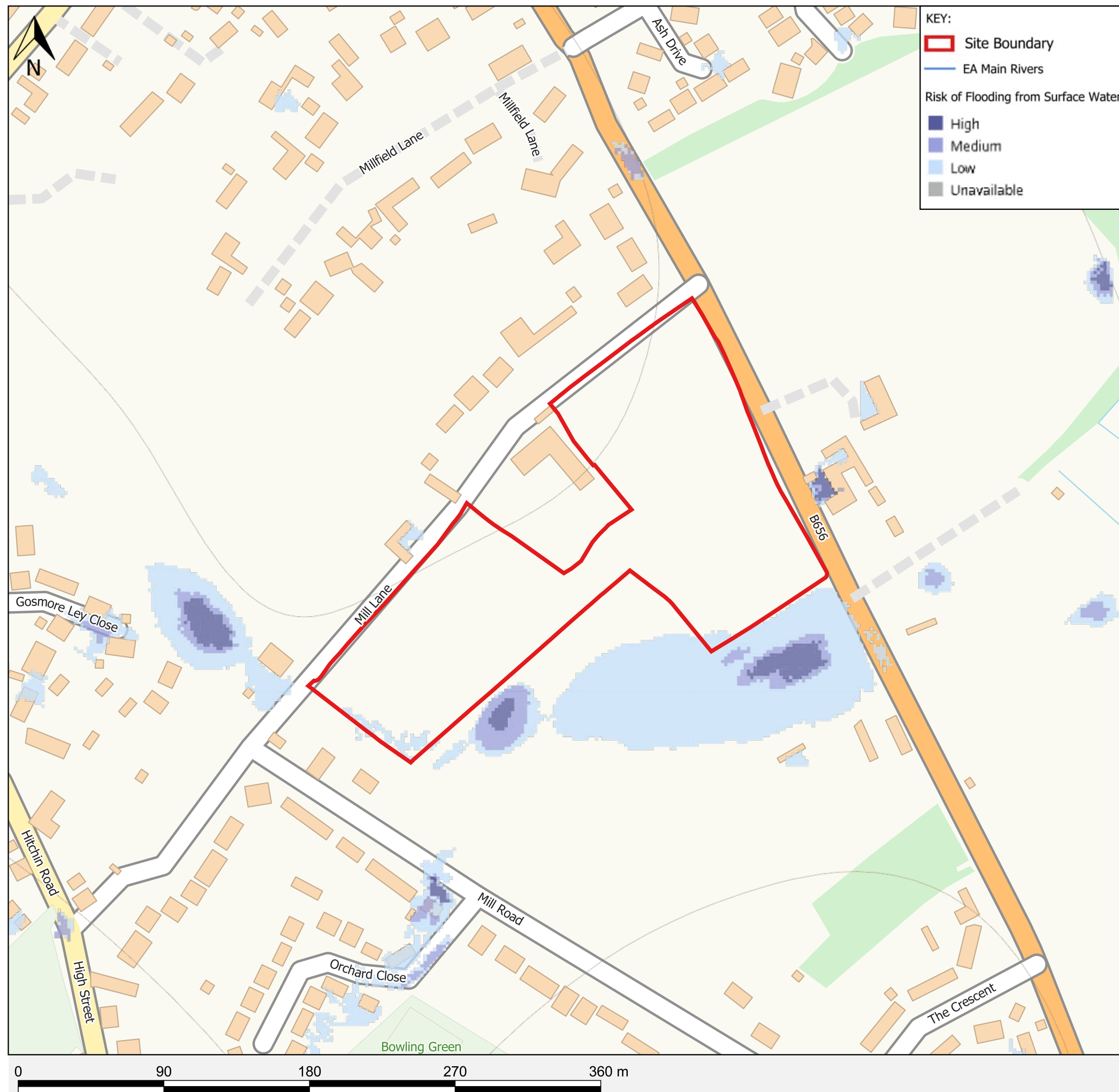
Risk is displayed as one of three likelihood categories:

High Risk - Land having a 1 in 30 or greater annual probability (> 3.3% AEP) of flooding from surface water.

Medium Risk - Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from surface water.

Low Risk - Land having between a 1 in 100 and a 1 in 1,000 annual probability (0.1% - 1.0%) of flooding from surface water.

Very Low Risk - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from surface water.



Risk of Flooding from Surface Water CC

As well as present day risk of flooding from surface water, climate change scenarios have been produced to indicate the predicted impacts of climate change on future flood risk. The climate change allowances are based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5.

A near-term epoch (2040 – 2060 “2050s” epoch) and central allowances are being used initially, to support short and medium-term decisions informed by the highest flood likelihood projections.

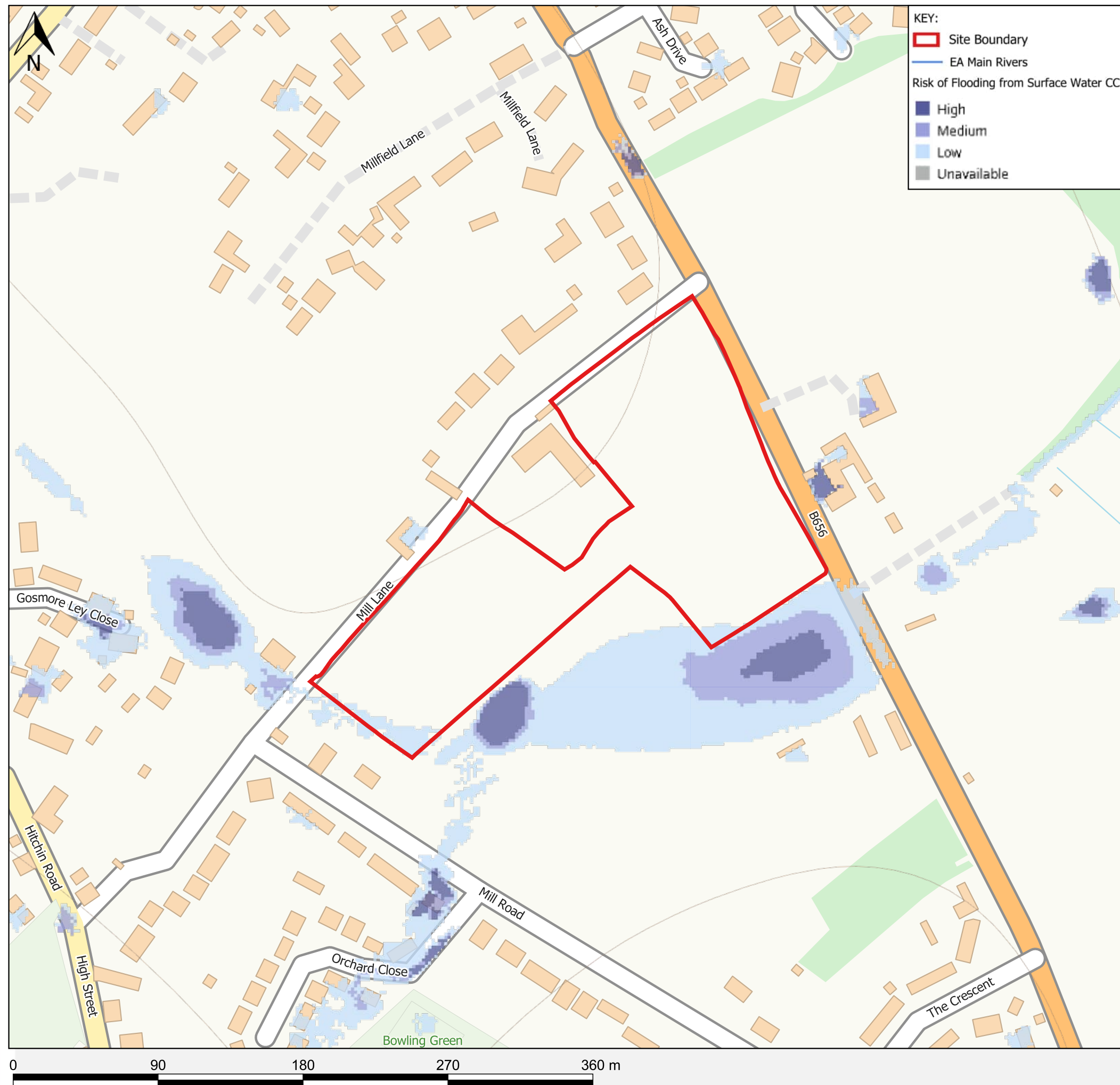
Risk is displayed as one of three likelihood categories:

High Risk - Land having a 1 in 30 or greater annual probability (> 3.3% AEP) of flooding from surface water.

Medium Risk – Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from surface water.

Low Risk – Land having between a 1 in 100 and a 1 in 1,000 annual probability (0.1% - 1.0%) of flooding from surface water.

Very Low Risk – Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from surface water.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

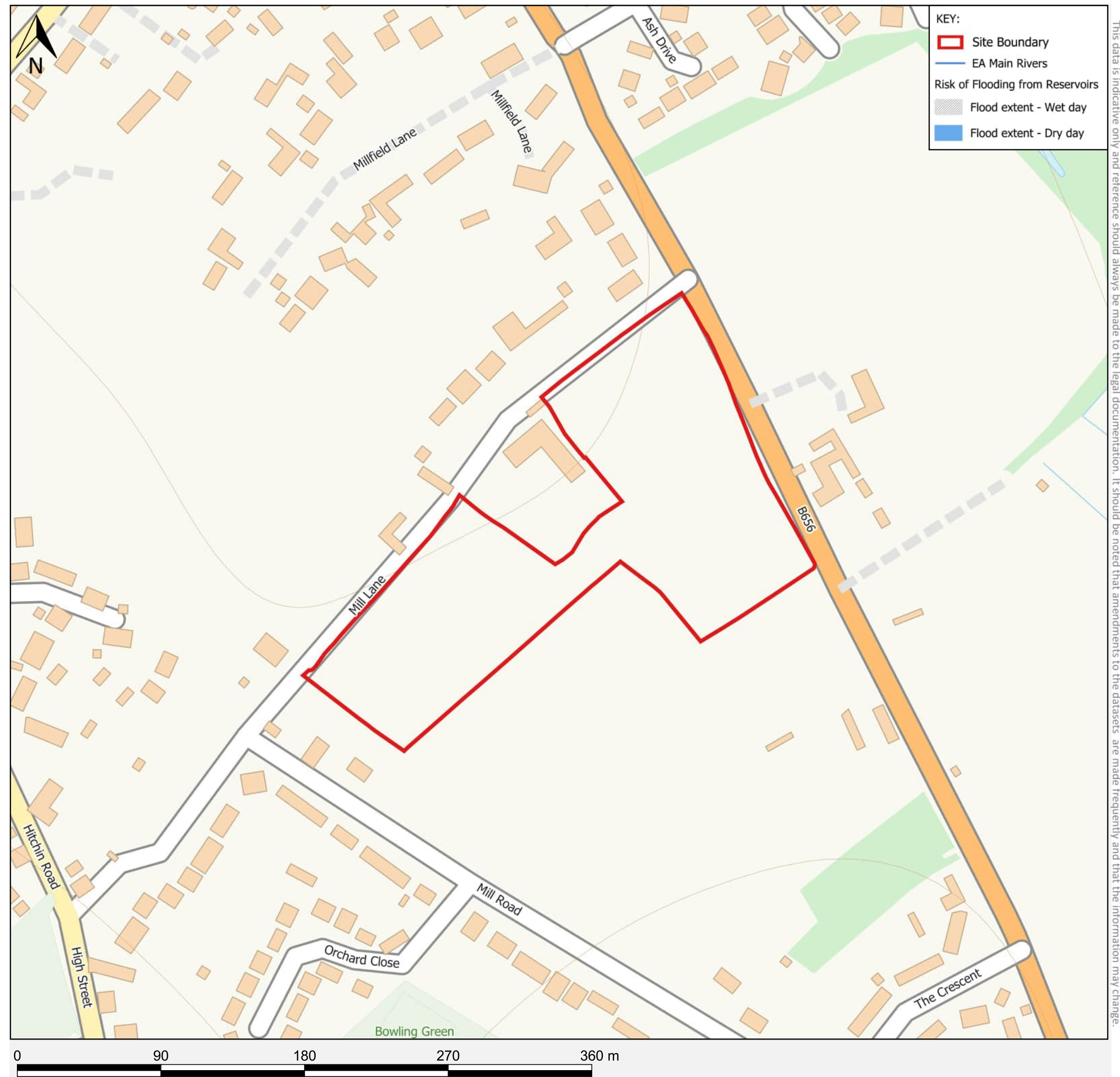
Risk of Flooding from Reservoirs

The Risk of Flooding from Reservoirs (wet day) layer shows the individual flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a “wet day” when local rivers had already overflowed their banks.

It represents a prediction of a credible worst-case scenario, however it's unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding.

The Risk of Flooding from Reservoirs (dry day) shows flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a “dry day” when local rivers are at normal levels.

These national datasets are “indicative” not “definitive”. Definitive information can only be provided by individual local authorities, and you should refer directly to their information for all purposes that require the most up to date and complete dataset.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

Previous Flooding

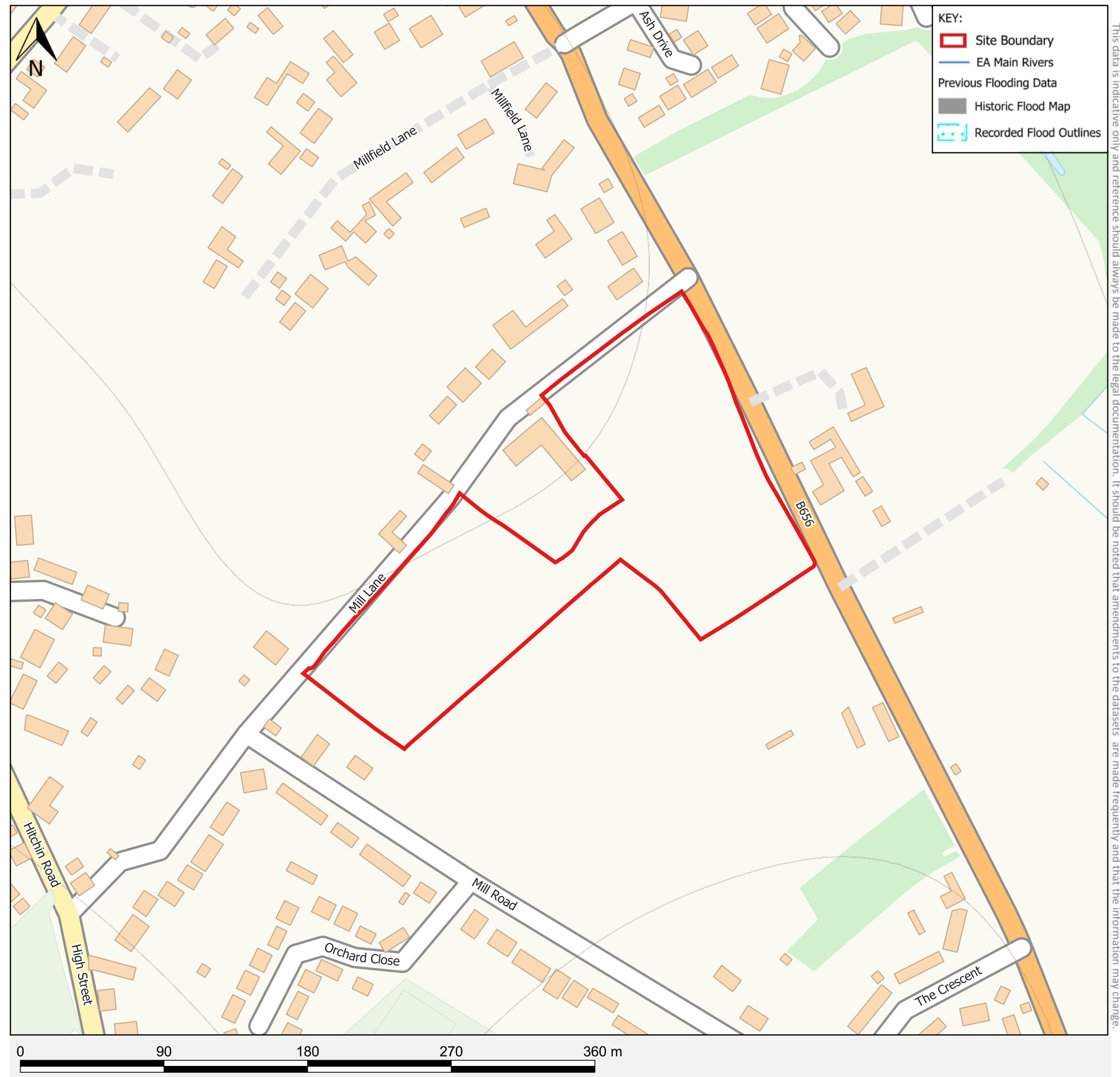
RECORDED FLOOD OUTLINES

Recorded Flood Outlines shows all records of historic flooding from rivers, the sea, groundwater and surface water. The absence of coverage by Recorded Flood Outlines for an area does not mean that the area has never flooded, only that there are currently no records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. The Recorded Flood Outlines take into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. Any flood extents shown do not necessarily indicate that properties were flooded internally.

HISTORIC FLOOD MAP

The Historic Flooding shows the maximum extent of individual Recorded Flood Outlines from river, the sea and groundwater springs that meet a set criteria. It shows areas of land that has previously been subject to flooding. This excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial. If an area is not covered by the Historic Flood Map it does not mean that the area has never flooded, only that we do not currently have records of flooding in this area that meet the criteria for inclusion. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. Outlines that don't meet these criteria are stored in the Recorded Flood Outlines dataset. The Historic Flood Map takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It will include flood extents that may have been affected by overtopping, breaches or blockages. Flooding is shown to the land and does not necessarily indicate that properties were flooded internally.

If an area is not covered by these layers, it does not mean that the area has never flooded, only that there are not currently records of flooding in the area.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

Flood Alert and Warning Areas

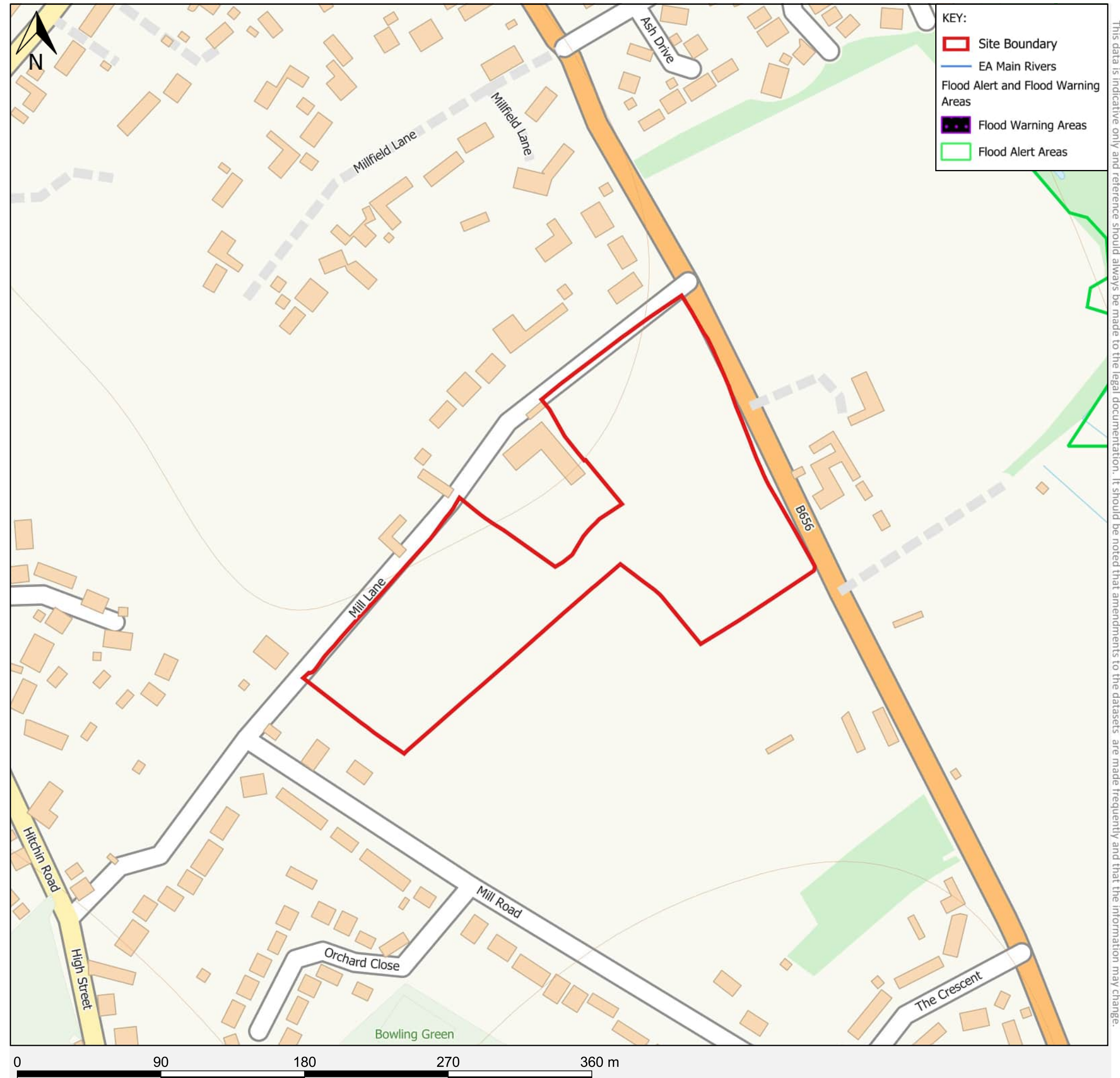
FLOOD ALERT AREAS

Flood Alert Areas are areas where it is possible for flooding to occur from rivers, sea and in some location's groundwater. A single Flood Alert Area may cover the floodplain within the Flood Warning Service Limit of multiple catchments of similar characteristics containing a number of Flood Warning Areas. A Flood Alert Area may also match that of a corresponding Flood Warning Area and warn for the possibility of flooding in that area. In some coastal locations a Flood Alert may be issued for spray or overtopping and be defined by a stretch of coastline. Practical and administrative factors may also influence the exact extent of a Flood Alert Area. A Flood Alert is issued to warn people of the possibility of flooding and encourage them to be alert stay vigilant and make early / low impact preparations for flooding. Flood Alerts are issued earlier than Flood Warnings to provide advance notice of the possibility of flooding and may be issued when there is less confidence that flooding will occur in a Flood Warning Area.

FLOOD WARNING AREAS

Flood Warning Areas are areas where flooding is expected to occur and where a Flood Warning Service is provided. Areas generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater. Specifically, Flood Warning Areas define locations within the Flood Warning Service Limit that represent a discrete community at risk of flooding. The purpose of Flood Warnings is to alert people that flooding is expected, and they should take action to protect themselves and their property. Flood Warnings are issued when flooding is expected to occur, Severe Flood Warnings are issued to similar areas when there is a danger to life or widespread disruption is expected.

If an area is not covered by these layers, it does not mean that the area has never flooded, only that there are not currently records of flooding in the area.



Source Protection Zones & Borehole Records

Source Protection Zones

Source Protection Zones (SPZs) are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.

The following subdivisions are defined within SPZs:

Zone 1: (Inner Protection Zone) - This zone is defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50-metre radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease.

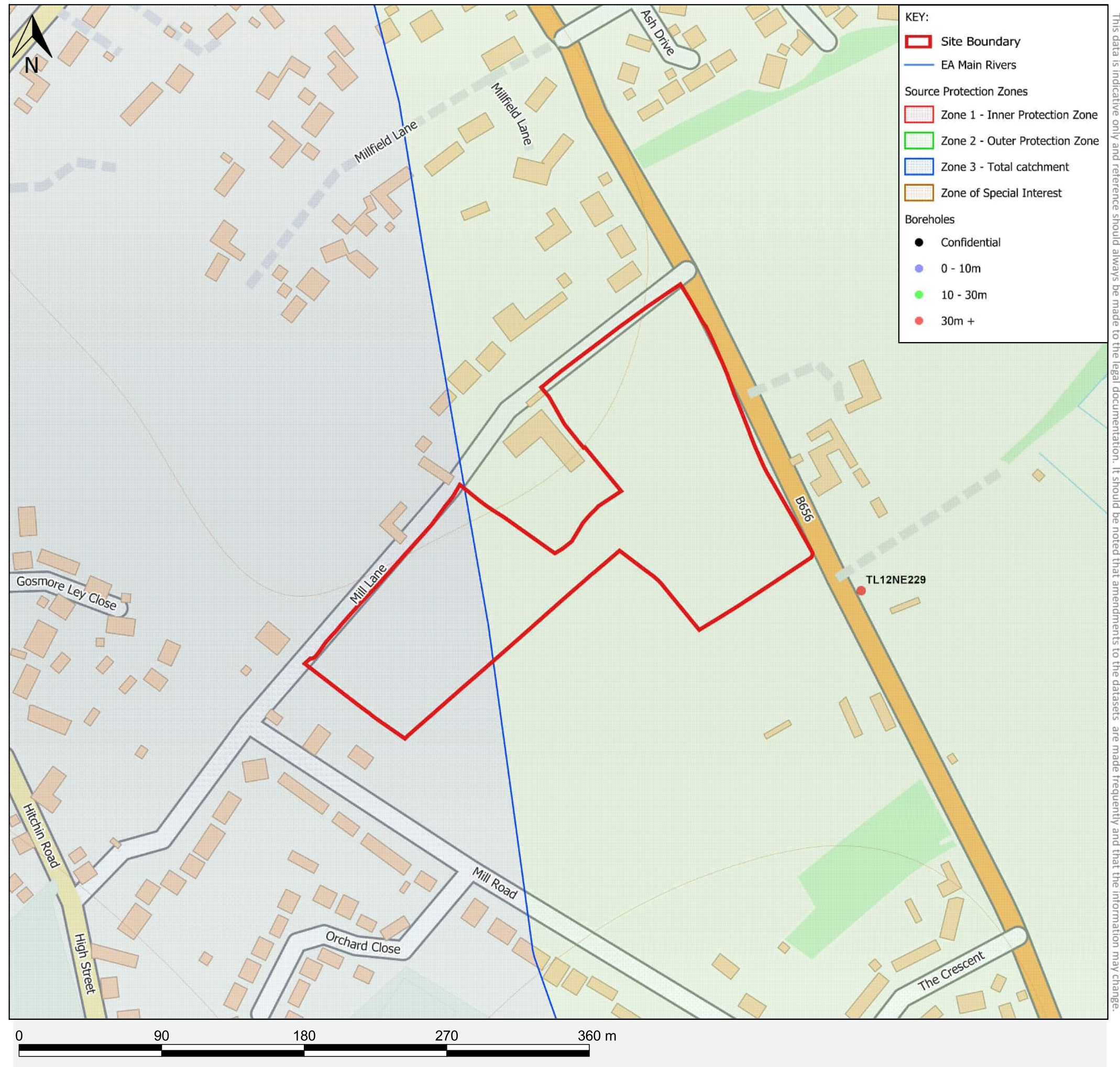
Zone 2: (Outer Protection Zone) - This zone is defined by the 400-day travel time from a point below the water table. Additionally, this zone has a minimum radius of 250 or 500 metres, depending on the size of the abstraction. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.

Zone 3: (Total catchment) - This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

Zone 4, or 'Zone of Special Interest': is occasionally defined for some groundwater sources. These zones highlight areas (mainly on non-aquifers) where known local conditions mean that potentially polluting activities could impact on a groundwater source, even though the area is outside the normal catchment of that source

Borehole Records

Borehole records are made available from the British Geological Survey. Boreholes range from one to several thousands' metres deep. Borehole records are produced from a geologist's or surveyor's observations of the rock core extracted from the ground and typically include locality and lithological descriptions with depths and thickness. Geophysical logs may also be noted from on-site measurements.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.



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London
WC2A 1AF

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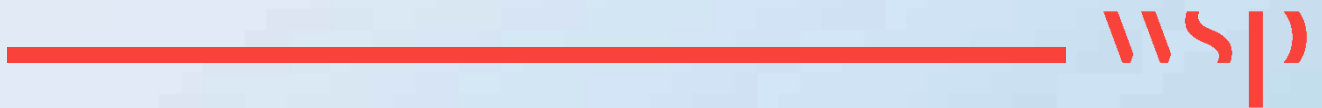
WATER ADVISORY

 +44 (0)20 7314 5000

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Appendix E

GREENFIELD RUNOFF RATES & VOLUMETRIC ASSESSMENT CALCULATIONS



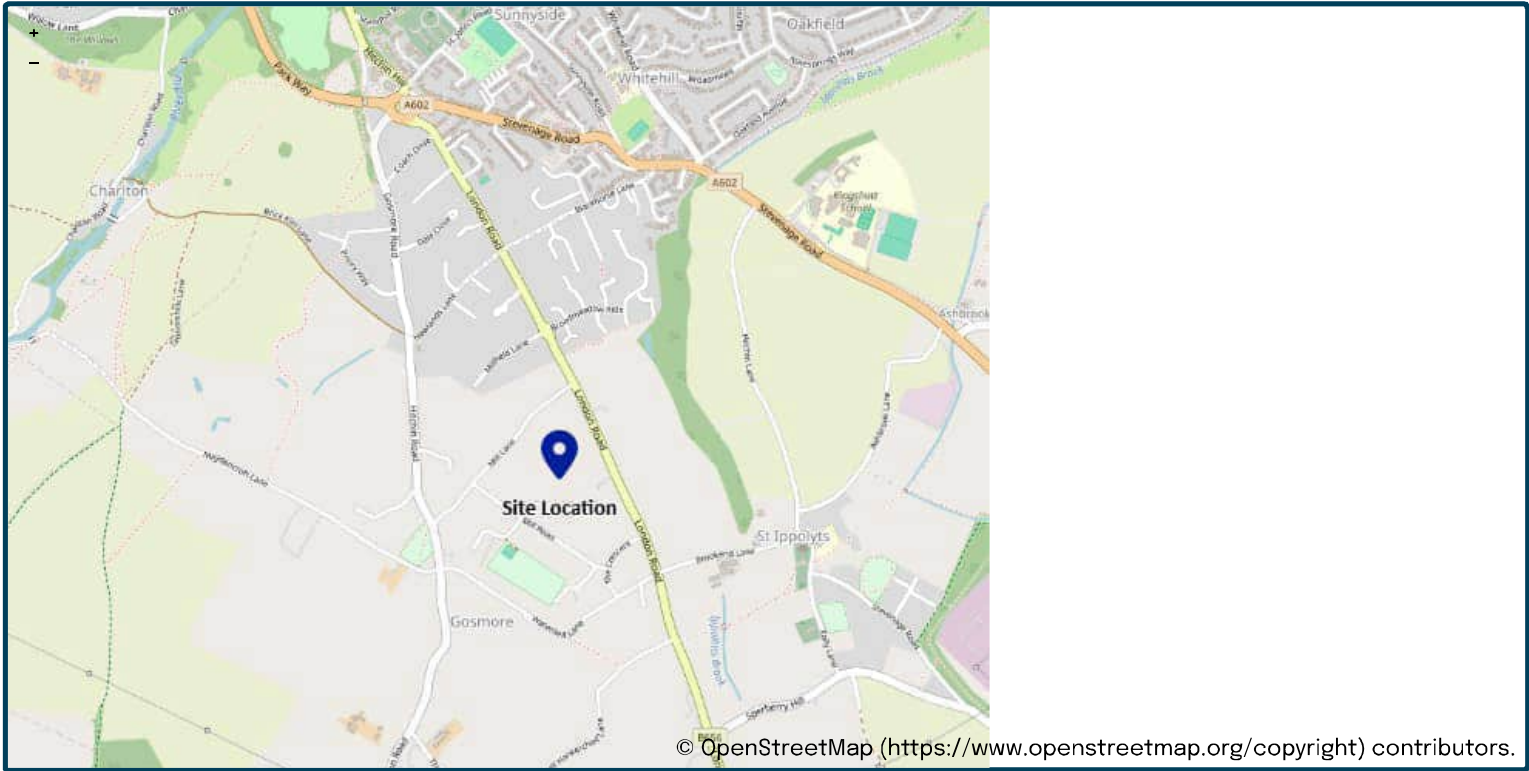
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	11/09/2025
Calculated by	Julia Stypik
Reference	
Model version	2.1.2

Location

Site name	Location 1 East
Site location	London Road, Hitchin



Site easting (British National Grid)	519108
Site northing (British National Grid)	227244

Site details

Total site area (ha)	1.1044	ha
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Greenfield runoff

Method

Method	FEH statistical
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FEH statistical

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	601	mm	612
BFIHOST	0.837		
QMed-QBar conversion	1.124	☐	1.124
QMed (l/s)	0.52	l/s	
QBar (FEH statistical) (l/s)	0.59	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	5	☐	5
1 year growth factor	0.87		
2 year growth factor	0.89		
10 year growth factor	1.65		
30 year growth factor	2.45		
100 year growth factor	3.56		
200 year growth factor	4.21		

Results

Method	FEH statistical	
Flow rate 1 year (l/s)	0.5	l/s
Flow rate 2 year (l/s)	0.5	l/s
Flow rate 10 years (l/s)	1.0	l/s
Flow rate 30 years (l/s)	1.4	l/s
Flow rate 100 years (l/s)	2.1	l/s
Flow rate 200 years (l/s)	2.5	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.1.2) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

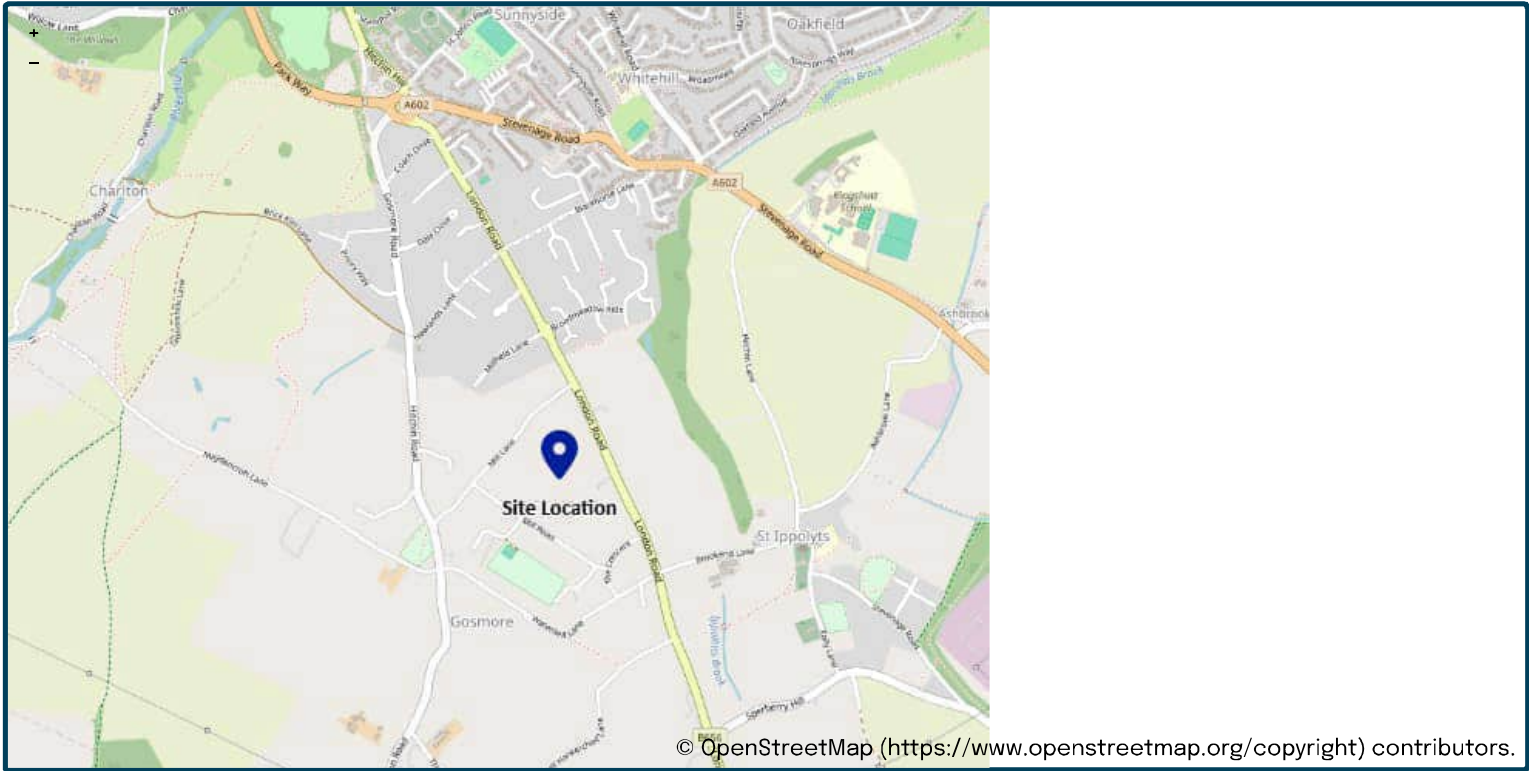
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	11/09/2025
Calculated by	Julia Stypik
Reference	
Model version	2.1.2

Location

Site name	Location 2 West
Site location	London Road, Hitchin



Site easting (British National Grid)	519108
Site northing (British National Grid)	227244

Site details

Total site area (ha)	0.341	ha
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Greenfield runoff

Method

Method	FEH statistical
--------	-----------------

FEH statistical

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	601	mm	612
BFIHOST	0.837		
QMed-QBar conversion	1.124	☐	1.124
QMed (l/s)	0.16	l/s	
QBar (FEH statistical) (l/s)	0.18	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	5	☐	5
1 year growth factor	0.87		
2 year growth factor	0.89		
10 year growth factor	1.65		
30 year growth factor	2.45		
100 year growth factor	3.56		
200 year growth factor	4.21		

Results

Method	FEH statistical	
Flow rate 1 year (l/s)	0.2	l/s
Flow rate 2 year (l/s)	0.2	l/s
Flow rate 10 years (l/s)	0.3	l/s
Flow rate 30 years (l/s)	0.4	l/s
Flow rate 100 years (l/s)	0.6	l/s
Flow rate 200 years (l/s)	0.8	l/s

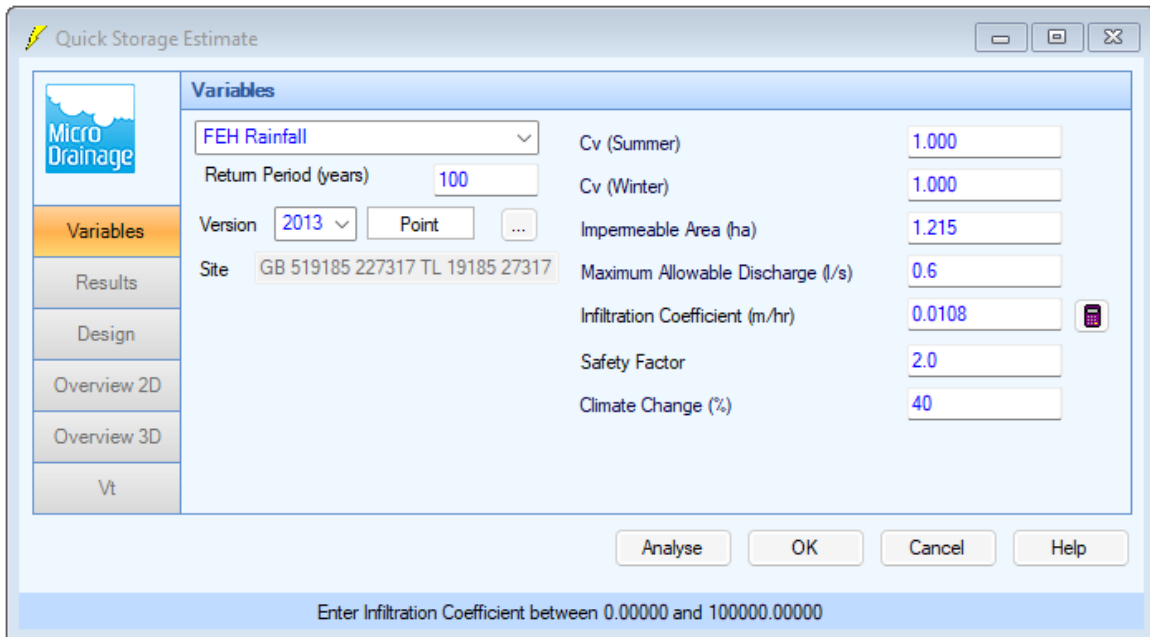
Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

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MicroDrainage Quick Storage Estimate Results.

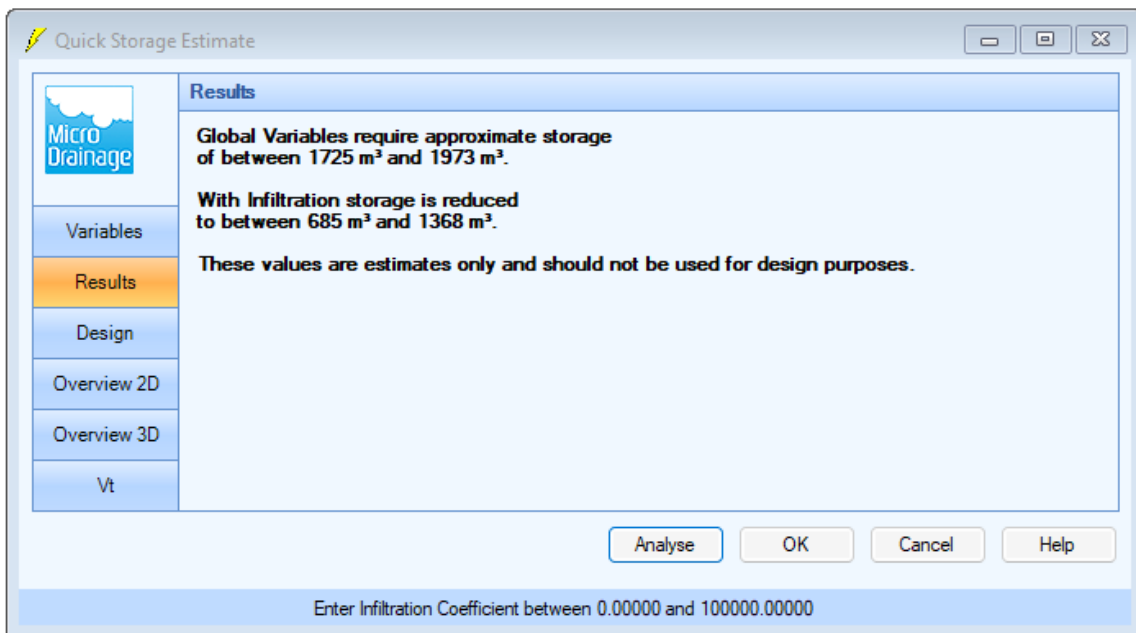
1. Catchment Site 1 Analysis, Eastern Infiltration Basin.



The screenshot shows the 'Variables' tab of the 'Quick Storage Estimate' window. The left sidebar contains a vertical menu with 'Variables' selected, and other options: 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area is titled 'Variables' and contains the following fields:

Field	Value
FEH Rainfall (dropdown)	FEH Rainfall
Return Period (years)	100
Version	2013
Point	...
Site	GB 519185 227317 TL 19185 27317
Cv (Summer)	1.000
Cv (Winter)	1.000
Impervious Area (ha)	1.215
Maximum Allowable Discharge (l/s)	0.6
Infiltration Coefficient (m/hr)	0.0108
Safety Factor	2.0
Climate Change (%)	40

At the bottom of the window, there are four buttons: 'Analyse', 'OK', 'Cancel', and 'Help'. A status bar at the very bottom reads: 'Enter Infiltration Coefficient between 0.00000 and 100000.00000'.



The screenshot shows the 'Results' tab of the 'Quick Storage Estimate' window. The left sidebar is the same as the previous image, but 'Results' is now selected. The main area is titled 'Results' and contains the following text:

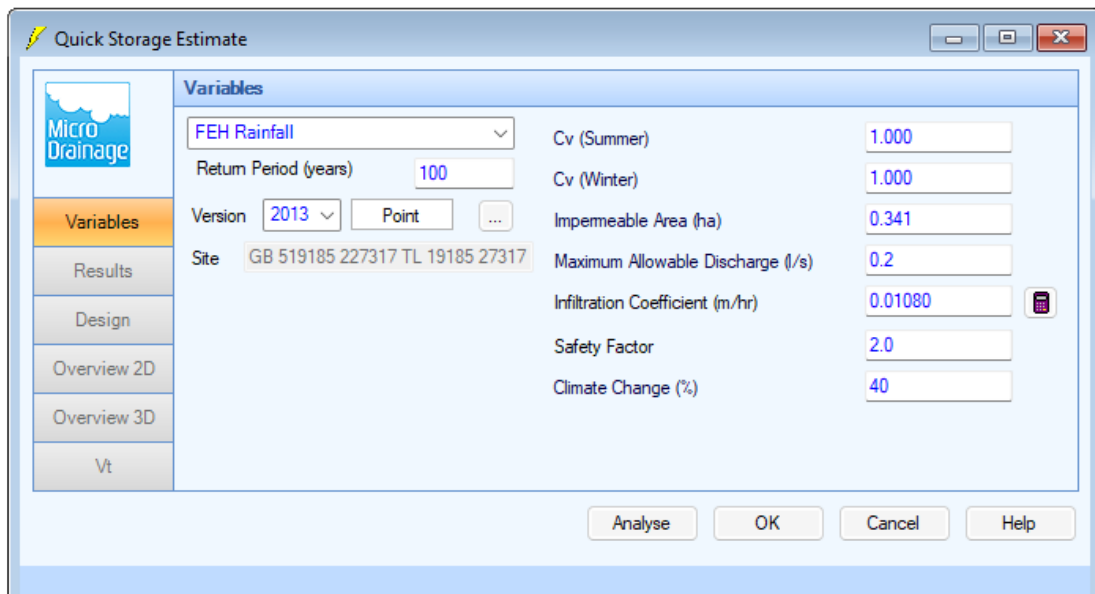
Global Variables require approximate storage of between 1725 m³ and 1973 m³.

With Infiltration storage is reduced to between 685 m³ and 1368 m³.

These values are estimates only and should not be used for design purposes.

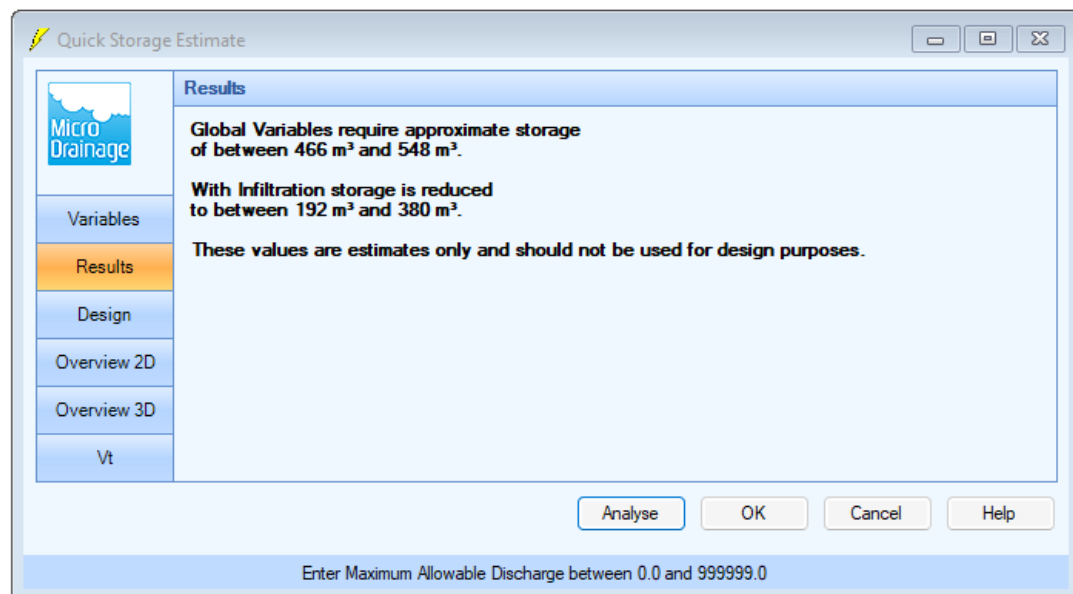
At the bottom of the window, there are four buttons: 'Analyse', 'OK', 'Cancel', and 'Help'. A status bar at the very bottom reads: 'Enter Infiltration Coefficient between 0.00000 and 100000.00000'.

2. Catchment Site 2 Analysis, Western Infiltration Basin.



The screenshot shows the 'Variables' tab of the 'Quick Storage Estimate' window. The left sidebar contains a vertical menu with 'Variables' selected, and other options: 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area is titled 'Variables' and contains input fields for various parameters. The 'FEH Rainfall' dropdown is set to 'FEH Rainfall'. The 'Return Period (years)' is set to '100'. The 'Version' is set to '2013' and the 'Point' is set to 'Point'. The 'Site' is set to 'GB 519185 227317 TL 19185 27317'. The 'Cv (Summer)' and 'Cv (Winter)' are both set to '1.000'. The 'Impermeable Area (ha)' is set to '0.341'. The 'Maximum Allowable Discharge (l/s)' is set to '0.2'. The 'Infiltration Coefficient (m/hr)' is set to '0.01080'. The 'Safety Factor' is set to '2.0'. The 'Climate Change (%)' is set to '40'. At the bottom right, there are four buttons: 'Analyse', 'OK', 'Cancel', and 'Help'.

Variable	Value
FEH Rainfall	FEH Rainfall
Return Period (years)	100
Version	2013
Point	Point
Site	GB 519185 227317 TL 19185 27317
Cv (Summer)	1.000
Cv (Winter)	1.000
Impermeable Area (ha)	0.341
Maximum Allowable Discharge (l/s)	0.2
Infiltration Coefficient (m/hr)	0.01080
Safety Factor	2.0
Climate Change (%)	40



The screenshot shows the 'Results' tab of the 'Quick Storage Estimate' window. The left sidebar contains a vertical menu with 'Results' selected, and other options: 'Variables', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area is titled 'Results' and contains the following text:

Global Variables require approximate storage of between 466 m³ and 548 m³.

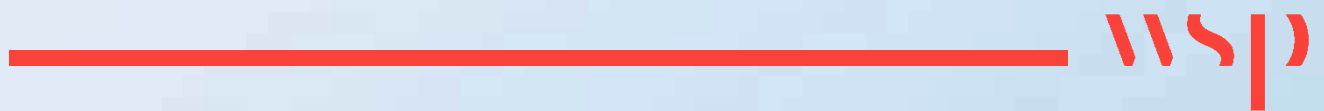
With Infiltration storage is reduced to between 192 m³ and 380 m³.

These values are estimates only and should not be used for design purposes.

At the bottom right, there are four buttons: 'Analyse', 'OK', 'Cancel', and 'Help'. At the bottom of the window, there is a status bar that reads: 'Enter Maximum Allowable Discharge between 0.0 and 999999.0'.

Appendix F

RSK SITE INVESTIGATION



Our ref: 1920378-L01 (00)

10th January 2019

Martin Grant Homes
Grant House
Felday Road
Abinger Hammer
Dorking, Surrey
RH5 6QP

Dear Isabella,

**RE: LAND AT MILL LANE / LONDON ROAD, ST IPPOLYTS, HITCHIN, HERTFORDSHIRE
SITE INVESTIGATION**

1. INTRODUCTION

On the instruction of Martin Grant Homes (Client), RSK Environment Ltd (RSK) has carried out a site assessment for the above-mentioned site. It is understood that the site is being considered for acquisition and an initial assessment will identify possible environmental concerns pertaining to the previous and current use of the site in order to ascertain any potential contamination liabilities.

This report is subject to the service constraints given in **Appendix A**.

1.1 Site location and description

The site is located at National Grid reference 519070, 227410 and is bounded to the north by Mill Lane and to the east by London Road, as shown on **Figure 1**.

The site is understood to be agricultural land and currently consists of rough grassland bordered by hedges and mature/semi mature trees on the perimeter of the site. The area around the site is predominantly residential and agricultural land as detailed in **Table 1**.

Table 1: Site setting

To the north:	Immediately to the north the site is bounded by Mill Lane beyond which lies residential housing.
To the east:	Adjacent to the east of site lies London Road and beyond this agricultural land is present.
To the south:	The south of the site is adjacent to agricultural land and beyond this lies residential properties.
To the west:	Adjacent to the west the site is bounded by Mill Road with residential properties beyond

The site covers approximately 2.84 hectares at an elevation of approximately 80 m above Ordnance Datum (mAOD). The site is generally level with a slight slope upwards towards the north.

2. SITE DEVELOPMENT HISTORY

- The earliest available map records from 1881 as detailed in the Landmark report **Appendix B** show the site to be operating as a farm with a sand pit located in the southwest of the site. The Hopground cottages are shown to border the site at the western end;
- The 1884 map shows a well is also present on the parcel of land to the south east of the site;
- By 1898 the sand pit is now inactive and buildings have been constructed adjacent to Mill Lane; The Hopground cottages are no longer present and the site has been developed with a different configuration of five small buildings;
- The 1924 historical map shows another small building to have been constructed on site and the addition of a pump;
- The site remained relatively unchanged until 1981 where it appears the inactive sand pit has now been infilled and Mill Farm is no longer operating on the land parcel of the western section of the site. A sewage works is now visible to the east of site beyond London Road;
- Aerial photography from 2000 shows the site to be characterised by grassland and bordered by mature trees and hedges with a small number of mature trees located on site;
- By 2006 the sewage works are no longer identifiable to the east of the site;
- The latest map available from 2018 indicates the south western land parcel of the site to have a surface layer now characterised by rough grassland.

3. GEOLOGY

The BGS website indicates the geology of the site to be characterised by the succession shown in **Table 2** below.

Table 2: Conjectural geological succession beneath the site

Geological unit	Brief description	Thickness
Superficial soils		
Glaciofluvial deposits	Sands and gravels	Unknown
Solid geology deposits		
Zig Zag Chalk Formation	Chalk – mostly firm, pale grey to off-white blocky chalk	Up to 75 m

Some made ground is likely to be present due to the existing history of development on site dating back to before the 1900's and the infilling of a former sand pit.

4. HYDROGEOLOGY

4.1.1 Aquifer characteristics

Based on the findings of the Landmark report dated 23rd November 2018 **Appendix B**, the hydrogeology of the site is likely to be characterised by the presence of a Secondary A aquifer within the superficial glaciofluvial deposits and a Principal aquifer within the chalk bedrock.

It is also possible that localised perched water may be present in any made ground.

4.1.2 Vulnerability of groundwater resources

The site has been classified by the EA website to overlie a:

- Secondary A aquifer: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers, and;
- Principal aquifer: Principal Aquifers (previously called Major): geology that exhibit high permeability and/or provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The soils beneath the site are classified as having HIGH URBAN (HU) leaching potential.

HU - soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere, so a worst-case vulnerability classification is assumed until proven otherwise.

Information available on the DEFRA Magic website indicates that the site lies within a currently designated zone 3 (total Catchment) groundwater Source Protection Zone. This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

4.1.3 Licensed groundwater abstractions

The environmental database report (Landmark report, dated 23rd November 2018) indicates the presence of one licensed groundwater abstraction within a 1 km radius of the site. The licence is for domestic and agricultural purposes located 819 m south west of site which operates under licence number 6/33/13/*g/063.

5. SITE INVESTIGATION STRATEGY & METHODOLOGY

5.1 Introduction

RSK carried out intrusive investigation works on 3 December 2018.

Prior to conducting intrusive works, utility service plans were obtained and buried service clearance undertaken in line with RSK's health and safety procedures. Copies of statutory service records obtained by RSK as part of the agreed scope of works are contained in **Appendix C**.

5.2 Objectives

The specific objectives of the investigation were as follows:

- to establish the location and extent of an infilled former sand pit, identified on historic maps in the south-western corner of the site, including the thickness of the fill
- to determine the composition of the infill material and assess its contamination status; and
- to obtain samples for chemical testing.

5.3 Selection of investigation methods

The techniques adopted for the investigation were chosen with consideration of the objectives and site constraints.

Mechanically excavated trial pitting was chosen to obtain a sufficient number of investigation locations, to achieve greater visibility of the made ground and consequently enable delineation of the former sand pit.

5.4 Investigation strategy

The ground investigation was carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930: 2015 Code of practice for ground investigations, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. Whilst every attempt was made to record full details of the strata encountered in the boreholes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

The investigation strategy involved targeted trial pits, focussing on the area of the possible location of the former sand pit, identified on historic maps in the south-western corner of the site.

Twelve machine excavated trial pits were dug to a maximum depth of 4 m bgl before being backfilled with arisings.

5.5 Implementation of investigation works

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS 5930:2015 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1).

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite required. They were dispatched to the laboratory in cool boxes under chain of custody documentation. Samples were stored in accordance with the RSK quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination.

Selected samples were placed in polythene bags for headspace screening with a photo-ionisation detector (PID) fitted with a 10.2 eV bulb PID screening results are presented on the exploratory hole records (**Appendix D**).

5.6 Laboratory testing

Laboratory testing was undertaken at a UKAS accredited laboratory with ISO17025 and MCERTS accredited test methods were specified where applicable for contamination testing and as shown in the laboratory test certificates appended.

The soil sampling strategy was designed to characterise made ground that has been used to infill the former sand pit.

The programme of chemical tests undertaken on soil samples obtained from the intrusive investigation is presented in **Table 3** with the laboratory testing results contained in **Appendix E**.

Table 3: Summary of chemical testing of soil samples

Stratum	Tests undertaken	No. of tests
Made ground	Asbestos screening, Speciated PAH - 16MS, TPHCWG (spec. TPH), pH, As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn, Total Sulphate, w/s Sulphate	6
Glaciofluvial deposits	Speciated PAH - 16MS, TPHCWG (spec. TPH), pH, As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn, Total Sulphate, w/s Sulphate	1

6. GROUND CONDITIONS ENCOUNTERED

The results of the intrusive investigation and subsequent geo-environmental analysis undertaken are detailed below.

6.1 Ground conditions encountered

The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater and in-situ testing are included on the exploratory hole records presented in **Appendix D**.

The exploratory holes appear to confirm the presence of the infilled sand pit, recorded on historic maps in the south-western corner of the site. A cross-section of the possible sand pit is presented in **Figure 3**.

It should be noted that the area to the west-north of the former sand pit was not accessible due to very dense vegetation, including shrubs and bushes, therefore the north-western boundary of the sand pit could not be established.

The ground conditions encountered during the fieldworks are summarised in **Table 4** and discussed below.

Table 4: General succession of strata encountered

Stratum	Exploratory holes encountered	Depth to top of stratum m bgl	Proven thickness (m)
Topsoil	All	0	0.2 - 0.40
Made ground	TP3, TP5, TP6, TP9 and TP12	0.20 - 0.40	1.20 - 3.60
Glaciofluvial deposits	Majority of locations except for TP3 and TP5	0.30 – 3.90	Not proven

6.1.1 Topsoil

Topsoil generally comprised soft dark brown very sandy clay, with rootlets.

6.1.2 Made ground

Made ground was encountered in the south-western corner of the site, within the area of the former sand pit recorded on historic maps.

Suspected infilled material was identified in 5 trial pits below topsoil (see attached Exploratory hole location plan): TP3 (to full depth of 3.2 m bgl), TP5 (to full depth of 3.4 m bgl), TP6 (between 0.3 m and 1.5 m bgl), TP9 (between 0.2 m and 2.4 m bgl) and TP12 (between 0.3 m and 3.9 m bgl).

The made ground was generally described as orangish brown very sandy very gravelly CLAY and occasional partings of clayey very sandy gravel in places. Gravel was flints with a significant proportion of anthropogenic material including fragments of bricks, concrete, bituminous material, charcoal, ceramic, structured chalk, rare glass, slate and fragmented wood.

6.1.3 Variable cohesive and granular soils of the Glaciofluvial Deposits

This stratum was encountered at a depth of between 0.30 m and 3.90 m below ground level, the thickness of which was not proven. The soils generally comprised a granular soil described as medium dense yellowish/reddish brown silty fine to medium sand with variable gravel of angular to rounded fine to coarse flint, in places. Soft near ground level and firm to stiff at depth orangish brown clay was also encountered within these deposits.

6.1.4 Visual/olfactory evidence of soil contamination

No asbestos containing material was visually identified and no visual or olfactory contamination of concern was noted within the fill. PID results obtained from samples of suspected fill material were generally <0.1 ppm indicating an absence of significant concentrations of volatile petroleum hydrocarbons and other volatile organic compounds.

6.1.5 Groundwater encountered during intrusive works

Groundwater was not encountered during the investigation works to a maximum depth of 4 m bgl.

7. LABORATORY TEST RESULTS

The chemical soil testing results are presented in **Appendix E**.

7.1.1 Oral, dermal and inhalation exposure with impacted soil by future occupants/site users

As an initial assessment, the soil test results have been compared against the GAC for residential with home-grown produce end use, assuming the worst-case scenario, since the exact nature of the proposed development is unknown. The assessment is presented in **Appendix G**.

A soil organic matter (SOM) of 1% has been selected, assuming the worst-case scenario, as the soil organic matter has not been tested.

One sample obtained from the natural stratum (TP10) marginally exceeded the arsenic screening value of 37 mg/kg. The result was 43 mg/kg. However, none of the samples obtained from the made ground exceeded the arsenic screening value. Furthermore, the BGS Estimated Soil Chemistry Data (Landmark, November 2018) indicates that the site is underlain by a natural stratum with estimated arsenic concentrations between 15 and 25 mg/kg with some areas in the vicinity of the site with arsenic concentrations of between 35 and 45 mg/kg. Therefore, the slightly elevated arsenic concentration is considered to be naturally occurring within the underlying stratum.

The assessment also indicates that all samples obtained from the made ground exceeded the chromium VI screening value of 21 mg/kg. The results varied between 21 and 33 mg/kg. However, this is only a slight exceedance and considered not to be of concern. Also, total chromium (undifferentiated) has been tested. For chromium III (Cr III), the screening value of 9100 mg/kg could be adopted and therefore results are significantly below the adopted GAC.

7.1.2 Inhalation exposure of future occupants/site users to asbestos fibres

The visual inspection at the laboratory identified no materials suspected of potentially containing asbestos and the scheduled laboratory screening for asbestos found no detectable asbestos fibres within the samples of made ground.

7.1.3 Uptake of contaminants by vegetation potentially inhibiting plant growth (phytotoxicity)

The results have been compared with the GAC presented in **Appendix G** for this linkage. The results indicate that a relevant contaminant linkage is unlikely to exist associated with phytotoxic effects for future plant growth.

8. PRELIMINARY WASTE ASSESSMENT

Technical Guidance WM3 sets out requirements for waste sampling. It is a legal requirement to correctly assess and classify waste. The level of sampling should be proportionate to the volume of waste and its heterogeneity.

The classification of waste soil is a two-stage process, the first being an assessment of whether the soil is considered hazardous or not following the guidance within Technical Guidance WM3. For off-site disposal to landfill the results of Waste Acceptance Criteria (WAC) testing must then be reviewed to

establish if the soil is acceptable at the relevant class of landfill or requires pre-treatment to reduce specific hazardous properties.

The samples collected from shallow pits were tested for metals, asbestos, Polycyclic Aromatic Hydrocarbon (PAH), Total Petroleum Hydrocarbons (TPH) and BTEX. Envirolab, an RSK company, has developed a waste soils characterisation assessment tool (HASWASTE), which follows the guidance within Technical Guidance WM3. The analytical results have been assessed using this tool for off-site disposal of materials in the future. The results are presented in **Appendix H**.

The initial hazardous waste risk assessment indicates that none of the samples contain hazardous properties. Therefore, to determine whether waste might be classified as inert or non-hazardous, WAC testing will need to be undertaken.

9. GAPS AND UNCERTAINTIES

The area to the west-north of the suspected former sand pit was not accessible due to very dense vegetation, including shrubs and bushes, therefore the north-western boundary of the pit could not be established. In addition, the thickness of the made ground has not been proven in TP3 and TP5.

Although asbestos was not encountered during the site works and not found in made ground samples tested, asbestos containing material (ACM) could still be present in discrete locations.

10. CONCLUSIONS

The main feature of potential contamination on site identified from the findings of the desk study relate to the potential for made ground associated with the fill material used to infill the historical sand pit on site. It was recommended that an intrusive investigation was conducted to further investigate the nature and magnitude of the fill material.

The ground conditions encountered during the site investigation carried out on 3 December 2018 were generally in line with the initial conceptual site model. The former sand pit, recorded on historic maps appears to have been located in the western corner of the site. Suspected infilled material was identified in 5 trial pits below the topsoil. The proven depths of the former sand pit varied between 1.5 m bgl (TP6) and 3.9 m bgl (TP12). The fill material was generally described as orangish brown very sandy very gravelly clay and occasional partings of clayey very sandy gravel in places. Gravel was flints with a significant proportion of anthropogenic material including fragments of bricks, concrete, bituminous material, charcoal, ceramic, structured chalk, rare glass, slate and fragmented wood.

Variable cohesive and granular soils of the Glaciofluvial Deposits were encountered below the topsoil at a depth of between 0.3 m to 0.4 m bgl or below the made ground in the area of the suspected former sand pit at a depth of between 1.4 m and 3.9 m bgl.

Groundwater was not encountered to a depth of 4mbgl.

No asbestos containing material was visually identified and no visual or olfactory contamination of concern was noted within the fill. No asbestos has been found in made ground samples tested.

Generally, the results of the GQRA indicate that relevant pollutant linkages are not present.

The marginally elevated arsenic concentration in the sample obtained from the superficial deposits is considered to be naturally occurring within the underlying stratum. No exceedances of arsenic were indicated in made ground samples. Marginal exceedances in chromium indicated in made ground samples were considered not to be of concern.

The initial hazardous waste risk assessment indicates that none of the samples contain hazardous properties therefore waste might be classified as inert or non-hazardous (subject to WAC testing).

In terms of any future development, it is likely that any proposed buildings in the location of the former sand pit may need to give consideration to a piled foundation solution.

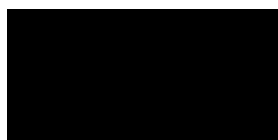
Should a redevelopment option be pursued, then further site investigation will be required across the rest of the site, and possibly to greater depths depending on the exact scheme proposed.

Yours faithfully

For RSK Environment Ltd



Louisa Willmott
Graduate Geo-Environmental Engineer



Sylwia Mianowska
Graduate Geo-Environmental Engineer



David Anchor
Director

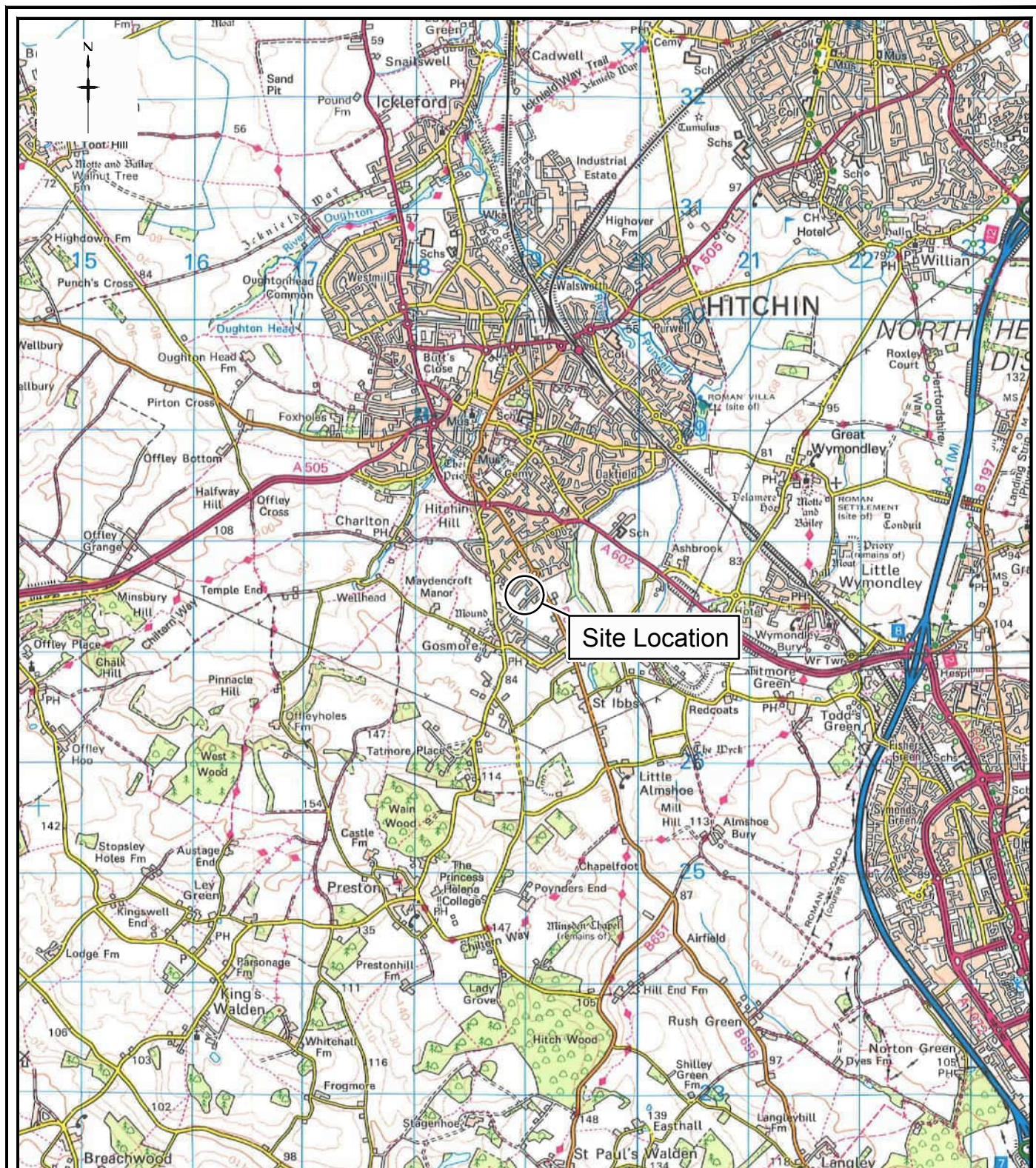
Figures

- | | |
|----------|--------------------------------|
| Figure 1 | Site location plan |
| Figure 2 | Exploratory hole location plan |
| Figure 3 | Cross-section SW-NE/S-N |

Appendices

- | | |
|------------|--|
| Appendix A | RSK Service Constraints |
| Appendix B | Landmark report |
| Appendix C | Utility service plans |
| Appendix D | Exploratory hole records |
| Appendix E | Laboratory certificates for soil analysis |
| Appendix F | Generic assessment criteria for human health |
| Appendix G | GQRA data screening tables |
| Appendix H | WM3 assessment |
| Appendix I | Photographic Log |

FIGURES



Reproduced from the 2012 Ordnance Survey 1:50,000 Scale Landranger Map 166, OSGR - TL190275
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Client

MARTIN GRANT HOMES

Project Title

LONDON ROAD,
HITCHIN

Drawing Title

SITE LOCATION PLAN

Rev	Drawn	Date	Checked	Date	Approved	Date
01	ASC	03.01.19	SM	03.01.19	SM	03.01.19

Dimensions

m

Scale

1:50,000

Original Size

A4

Project Number

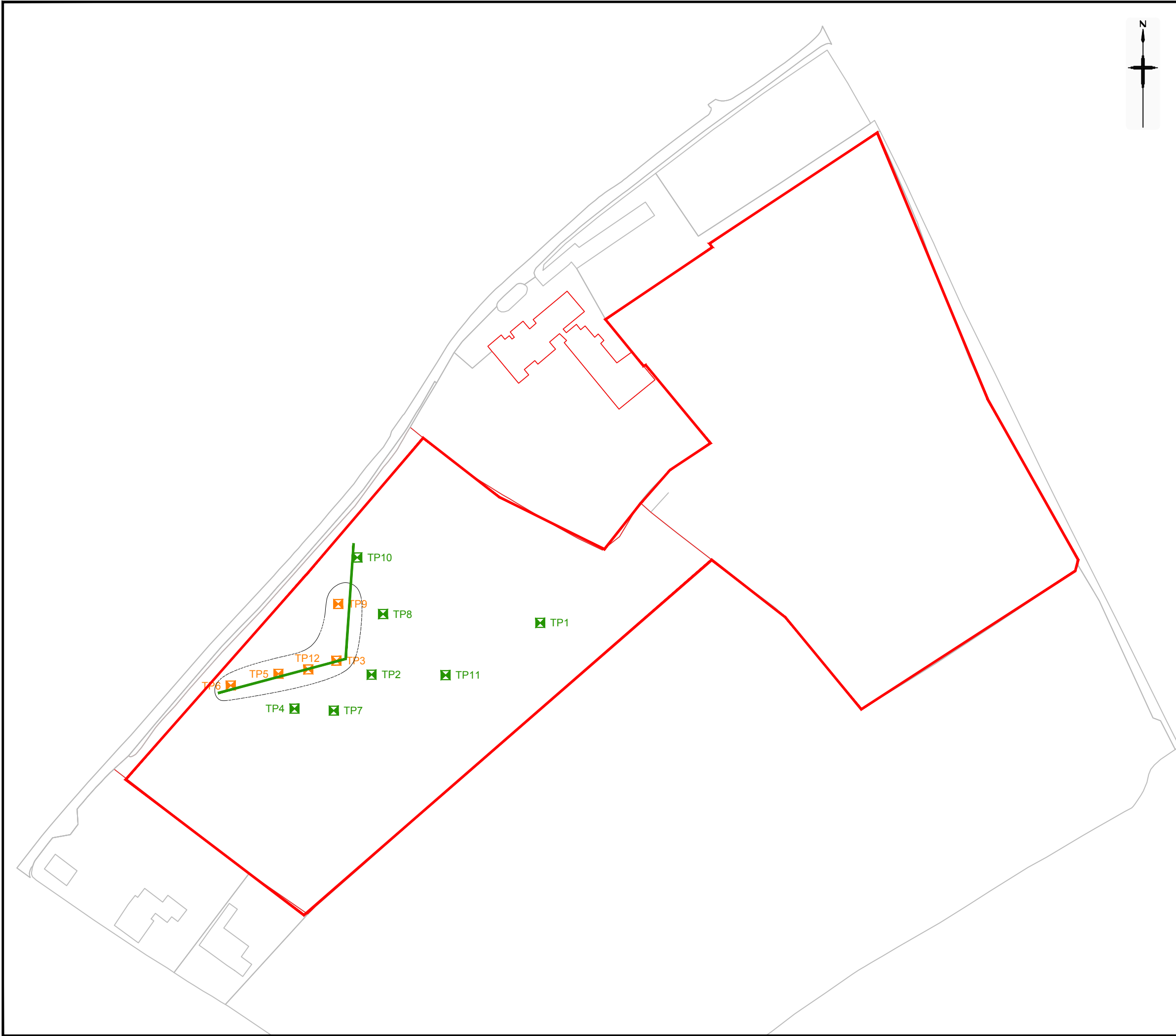
1920378 - L01

Drawing File

1920378 - SLP.dwg

Drawing Number

FIGURE 1



LEGEND

- Site Boundary
- Section Line (See Figure 3)
- Area of Infilled Material Encountered
- Trial Pit Location
- Trial Pit Location with Suspected Infilled Material Encountered

Rev.	Date	Amendment	Drawn	Chkd.	Appd.



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Drawing Title

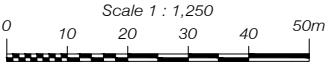
EXPLORATORY HOLE
LOCATION PLAN

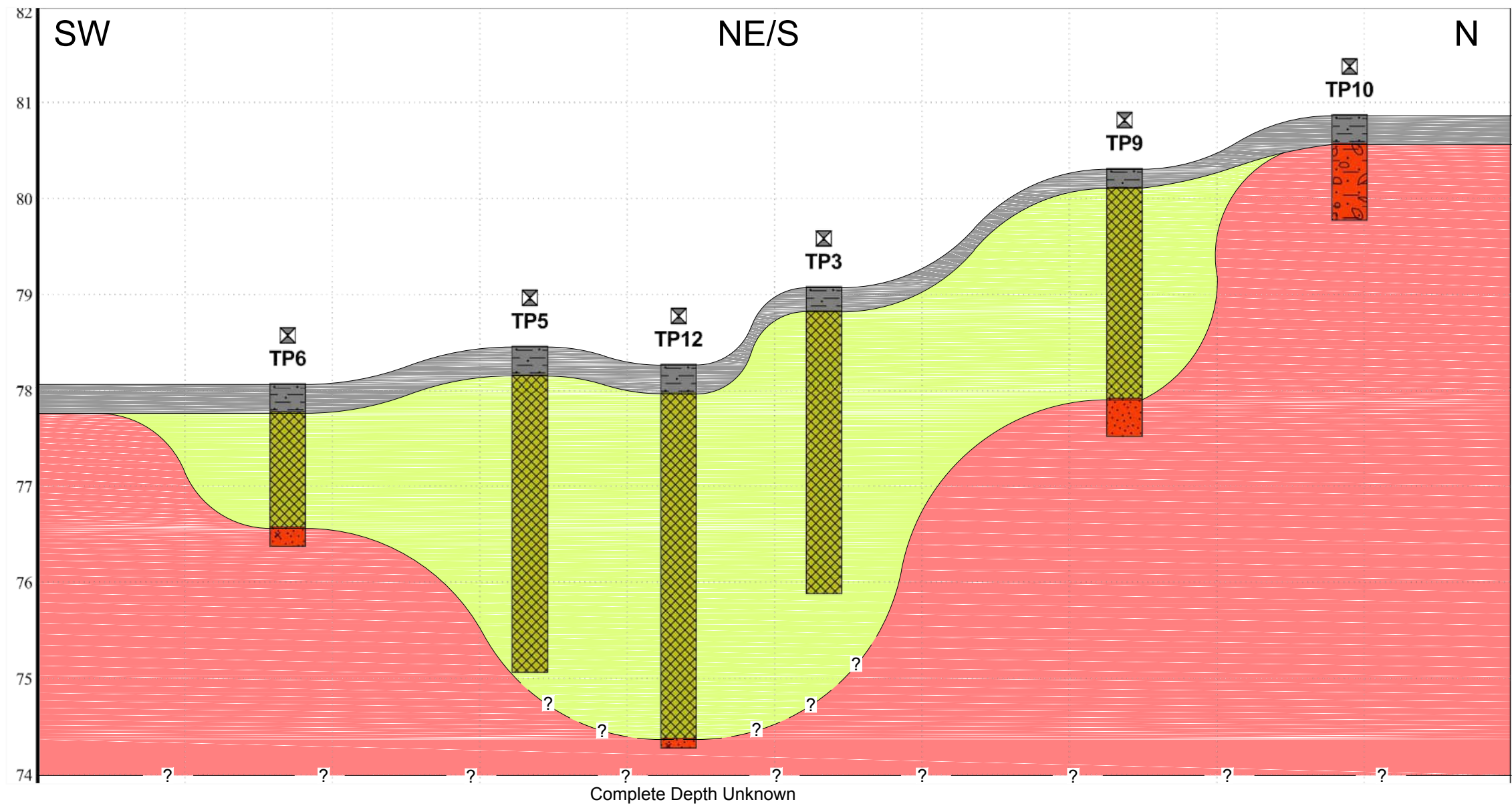
Drawn	Date	Checked	Date	Approved	Date
ASC	03.01.19	SM	03.01.19	SM	03.01.19

Scale	Orig Size	Dimensions
1:1250	A3	m

Project No.	Drawing File
1920378 - L01	1920378 (L01) Fig 2.dwg

Drawing No.	Rev.
FIGURE 2	P1





LEGEND

- Topsoil
- Made Ground (Suspected Infilled Sand Pit)
- Glaciofluvial Deposits

Rev.	Date	Amendment	Drawn	Chkd.	Appd.



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Project Title
HITCHIN, LONDON ROAD

Drawing Title
GEOLOGICAL CROSS SECTION PLAN

Drawn	Date	Checked	Date	Approved	Date
ASC	03.01.19	SM	03.01.19	SM	03.01.19
Scale	Orig Size		Dimensions		
NTS	A3		m		

Project No.	Drawing File
1920378 - L01	1920378 (L01) Fig 3.dwg

Drawing No.	Rev.
FIGURE 3	P1

APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Martin Grant Homes Ltd (the "client") in accordance with the terms of a contract [RSK Group Standard Terms and Conditions] RSK and the "client", dated 21 November 2018. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. the Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely
 - b. the Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection
 - c. the Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the

doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on-site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on-site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.