Flood Risk and Drainage
Site Appraisal
February 2020

EAS

Land north of Horseheath Road,

Linton, Cambridgeshire

Pembroke College Cambridge

Document History

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B					
C					
D					
E					

EAS

Contents

1 Introduction

1.1 EAS has been commissioned by Pembroke College Cambridge to prepare a Site Appraisal for Land north of Horseheath Road, Linton, Cambridgeshire CB21 4XQ. This document has been prepared to inform site representations to the Greater Cambridge Local Plan Regulation 18 Issues and Options consultation.

1.2 The contents of this report form a preliminary assessment of the site in terms of flood risk and drainage.

1.3 The site is located between Balsham Road and Horseheath Road, to the immediate east of Linton. The site is surrounded by agricultural land to the north, east and south, while the town of Linton lies to the west.

1.4 The 7.29 hectare site is currently agricultural land, and is shown on the location plan in Appendix A. For the purposes of this report it is proposed that the site be developed as a residential scheme of approximately 130 dwellings, with associated infrastructure and public open space. There is potential to provide additional community facilities or provide contributions to enhance the existing facilities.

1.5 The site falls entirely within Flood Zone 1 of the Environment Agency (EA) Flood Map for Planning. It is also shown to be predominantly at very low risk of surface water flooding, with only a small section of the site at medium to high risk of surface water flooding. This document will review the above risks further and provide advice to support the site representation and future masterplanning of the site.

1.6 This report is based on EA Flood Maps, South Cambs Strategic Flood Risk Assessment (SFRA), Cambridgeshire County Council Surface Water Management Plan (SWMP), BGS geological information and Anglian Water sewer records.

1.7 The report is set out as follows:

- Section 2 – sets out the relevant flood risk and drainage policy background.
- Section 3 – reviews and discusses the flood risk to the development and the future development drainage.
- Section 4 – provides a review of surface water drainage solutions
- Section 5 – provides a brief review of foul drainage solutions.
- Section 6 – summarises the findings of the report.

2 Policy Background

Introduction

2.1 This section sets out the current local policy and examines the local strategic documents for flood risk and drainage matters.

Adopted South Cambridgeshire Local Plan (2018)

Policy CC/9: Managing Flood Risk

2.2 The policy states that:

1. "In order to minimise flood risk, development will only be permitted where:
    a. The sequential test and exception tests established by the National Planning Policy Framework demonstrate the development is acceptable (where required).
    b. Floor levels are 300mm above the 1 in 100 year flood level plus an allowance for climate change where appropriate and practicable also 300mm above adjacent highway levels.
    c. Suitable flood protection/mitigation measures are incorporated as appropriate to the level and nature of flood risk, which can be satisfactorily implemented to ensure safe occupation, access and egress. Management and maintenance plans will be required, including arrangements for adoption by any public authority of statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime;
    d. There would be no increase to flood risk elsewhere, and opportunities to reduce flood risk elsewhere have been explored and taken (where appropriate), including limiting discharge of surface water (post development volume and peak rate) to natural greenfield rates or low, and
    e. The destination of the discharge obeys the following priority order:
        I. Firstly, to the ground via infiltration;
        II. Then, to a water body;
        III. Then, to a surface water sewer
        IV. Discharge to a foul water or combined sewer is unacceptable.
2. Site specific Flood Risk Assessments (FRAs) appropriate to the scale and nature of the development and the risks involved, and which takes account of future climate change, will be required for the following:
    f. Development proposals over 1ha in size;
    g. Any other development proposals in flood zones 2 and 3;
    h. Any other development proposals in flood zone 1 where evidence, in particular the Strategic Flood Risk Assessment or Surface Water Management Plans, indicates there

are records of historic flooding or other sources of flooding, and/or a need for more detailed analysis.

3. FRAs will need to meet national standards and local guidance (including recommendations of the South Cambridgeshire and Cambridge City Strategic Flood Risk Assessment (2010) and the Phase 1 and 2 Water Cycle Strategy or successor documents)."

Policy CC/8: Sustainable Drainage Systems

2.3 The policy is as follows:

"Development proposals must incorporate appropriate sustainable surface water drainage systems (SuDS) appropriate to the nature of the site. Development proposals will be required to demonstrate that:

a. Surface water drainage schemes comply with the Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems and the Cambridgeshire Flood and Water Supplementary Planning Document or successor documents;

b. Opportunities have been taken to integrate sustainable drainage with the development, create amenity, enhance biodiversity, and contribute to a network of green (and blue) open space;

c. Surface water is managed close to its source and on the surface where it practicable to do so;

d. Maximum use has been made of low land take drainage measures, such as rain water recycling, green roofs, permeable surfaces and water butts;

e. Appropriate pollution control measures have been incorporated, including multiple component treatment trains; and

f. Arrangements have been established for the whole life management and maintenance of surface water drainage systems."

Policy CC/7: Water Quality

2.4 The policy states:

1. "In order to protect and enhance water quality, all development proposals must demonstrate that:

a. There are adequate water supply sewerage and land drainage systems (including water sources, water and waste water infrastructure) to serve the whole development, or an agreement with the relevant service provide to ensure the proivision of the necessary infrastructure prior to the occupation of the development. Where development is being phased, each phase must demonstrate sufficient water supply and waste water conveyance, treatment and discharge capacity;

b. The quality of ground, surface or water bodies will not be harmed and opportunities have been explored and taken for improvements to water quality, including renaturalisation of river morphology, and ecology;

c. Appropriate consideration is given to sources of pollution, and appropriate Sustainable Drainage Systems (SuDS) measures incorporated to protect water quality from polluted surface water runoff.

2. Foul drainage to a public sewer should be provided wherever possible, but where it is demonstrated that it is not feasible, alternative facilities must not pose unacceptable risk to water quality or quantity."

South Cambridgeshire and Cambridge City Level 1 Strategic Flood Risk Assessment (SFRA) September 2010

2.5 The SFRA objectives are to:

- Assess the risks from all forms of flooding affecting the SCDC and CCC area;
- Provide a reference and policy document to inform the preparation of future LDF documents;
- Ensure that SCDC and CCC meet their obligations under the current PPS25 and Local Development Framework Policy guidelines and standards;
- Inform the Sustainability Appraisal so that flood risk is taken into account when considering options and in the preparation of land use policies;
- Provide a sufficient level of detail to allow SCDC and CCC to undertake the Sequential Test;
- Advise and inform private and commercial developers of their obligations under PPS25 in relation to sustainable development and flood risk.

2.6 Appendix C2 and C2.4 illustrates that there is high potential for infiltration at this site.

2.7 Appendix C3 and C3.4 confirms that the site is within a Source Protection Zone.

2.8 Appendix D1 shows the site to be in Flood Zone 1.

2.9 Appendix B3.4 and Tables 4a and 4b indicates a number of historic fluvial, surface water and sewer flooding incidents in Linton. There are no records of historic flooding within the site boundary.

2.10 In summary no evidence is presented within the SFRA which indicates that the development site is at a risk of flooding from any source. The local geology has been identified to have high potential for infiltration.

Cambridgeshire County Council Surface Water Management Plan (SWMP) August 2011 and County Wide Update (2014)

2.11 The SWMP was originally published in 2011 and was updated in 2014.

2.12 The objectives of the SWMP are to:

- Engage with partners and stakeholders
- Map historical flood incident data

- Map surface water influenced flooding locations
- Identify areas at risk of surface water flooding referred to as “wetspots”
- Identify measures, assess options and confirm preferred options to mitigate against surface water flooding in the prioritised “wetspots”
- Make recommendations for next steps

2.13 The update was to ensure that flooding incidents between 2011 and 2014 were taken in to consideration due to instances of surface water flooding across the County.

3 Flood Risk Assessment

3.1 A copy of the Environment Agency's current Flood Map included in Appendix B shows the development site to be located entirely in Flood Zone 1, and therefore deemed to be at a low risk of fluvial flooding.

3.2 The NPPF requires that for a development site located within Flood Zone 1 which is larger than one hectare, an FRA must accompany the planning application which demonstrates that the proposals would not be exposed to an unsatisfactory level of flood risk, and would not result in an increase in the existing level of flood risk to the surrounding area.

3.3 In addition to the requirements of the NPPF and as a result of changes to the roles of Lead Flood Authorities, from 15 April 2015 all major applications (over 10 dwellings) submitted to the Lead Local Flood Authority (LLFA) which for this site is Cambridgeshire County Council and must include a 'Surface Water Drainage Strategy' which will set out the appropriateness of SuDS to manage surface water run-off, including the provision of the maintenance for the lifetime of the development which they serve. Major applications which do not meet this requirement will not be made valid.

3.4 The site is not within an area managed by an Internal Drainage Board (IDB).

Local Policy

3.5 From a review of the South Cambridgeshire and Cambridge City Council SFRA undertaken in Section 2 of this report, there were no sources of flooding identified which would impact on the development site nor historic flooding incidents associated with the site.

Sources of Flooding

3.6 **Fluvial Watercourses:** A copy of the Environment Agency's Flood Map for the area is included in Appendix B. The mapping shows that the site is located within Flood Zone 1 and therefore deemed to be at a low risk of fluvial flooding; less than a 1 in 1000 or 0.1% annual probability of flooding from fluvial sources.

3.7 The River Granta, an EA 'Main River', lies around 1km to the south west. No other watercourses are in the local area, so the site is not considered to be at risk of flooding from fluvial sources.

3.8 **Groundwater:** The site has a bedrock of Lewes Nodular Chalk Formation and Seaford Chalk Formation and no superficial deposits. The area is shown to be in a Zone 2 Outer Source Protection Zone on DEFRA's Magic Map. The site is also shown to be an area with 'Soluble Rock Risk' and in a high groundwater vulnerability area. This means that the underlying Principal Aquifer is highly vulnerable to pollutants, and solution features that enable rapid movement of a pollutant may be present.

3.9 Appendix C2 and C2.4 of the SFRA show that there is high potential for infiltration whilst Appendix B3 confirms that there are no recorded incidents of groundwater flooding at this location.

3.10 BGS borehole data shows historic records approximately 700m south west of the site, at Rosemary Cottage, Barham Road. Groundwater was encountered at around 26 feet (7.92m) below ground level in 1937. The second record is for Bell's Cottage, Barham Road which is

approximately 600m to the south west in 1949. Groundwater was recorded at 26 feet 6 inches (around 8.10m) below ground.

3.11 Given the above, the risk of groundwater flooding at the site is considered to be low.

3.12 **Sewer Flooding:** Anglian Water sewer records in Appendix C do not show any sewers in the immediate vicinity of the site, although there are some foul sewers located in Brinkman Road and Hollybush Way. Table 4 of the SFRA indicates a historic sewer flooding incident in the roads to the west of the site, but none on the site. As there are no other sewers in the immediate vicinity, sewer flooding is not considered to be a significant flood risk to the development site.

3.13 **Surface Water/Overland Flow:** The surface water flood map included in Appendix D shows the site to be mainly at very low risk of flooding from surface water. This indicates a probability of flooding from surface water of less than 1 in 1000 each year. There is a medium to high risk area along a small section at the northern boundary, which runs parallel with Balsham Road. The surface water flood map shows there to be an overland flowpath from the north following Balsham Road and ultimately flowing into the River Granta. There is likely to be a ditch or low lying topography along the route of the road which results in this surface water flowpath. It is recommended that a topographic survey is carried out to determine the site levels to more accurately assess the surface water depths in this area. It is also recommended to locate all buildings away from the northern site boundary and outside of this surface water risk area.

3.14 There also appears to be a small overland flowpath during the most extreme scenario at the southern end of the site which appears to be flowing from a small road or track crossing the field. This should also be considered during the masterplanning stage, to ensure it does not become blocked or be directed towards any of the new development.

3.15 It is important that an effective surface water drainage system is included in the proposed development to ensure surface water runoff from the new impermeable area does not pose a significant flood risk to the development. This has been discussed further in the next section.

4 Surface Water Drainage Assessment

4.1 The NPPF states within Flood Zone 1, “developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques (SuDS)”.

4.2 SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.

4.3 The SuDS management train incorporates a hierarchy of techniques and considers all three SUDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:

- Discharge to ground.
- Discharge to a surface water body.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

4.4 The philosophy of SUDS is to replicate as closely as possible the natural drainage from a site pre-development and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:

- Reducing runoff rates, thus reducing the flood risk downstream.
- Reducing pollutant concentrations, thus protecting the quality of the receiving water body.
- Groundwater recharge.
- Contributing to the enhanced amenity and aesthetic value of development areas.
- Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site-Specific SuDS

4.5 The various SuDS methods need to be considered in relation to site-specific constraints. Several SuDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 1 outlines the constraints and opportunities to each of the SuDS devices in accordance with the hierarchical approach outlined in The SuDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	May be suitable depending on design of buildings	Potentially
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Geology at site is likely to be suitable – infiltration tests will be required to confirm this. Given the groundwater vulnerability is high, the potential to create pollution pathways must be considered when designing soakaways and the like.	Potentially, depending on infiltration test results
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Permeable paving should be viable across the site for parking and road surfaces, depending on infiltration test results.	Yes
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the site by reusing water for non-potable uses e.g. toilet flushing, recycling processes.	There is potential for use within the site. If community or domestic rain water harvesting is not suitable, simple systems such as water butts can be included to reduce mains water consumption for irrigation.	Yes
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Swales can be utilised within the site for conveyance and infiltration, assuming the masterplan allows space for this.	Yes
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Geology at site is likely to be suitable however this will be subject to infiltration tests.	Potentially depending on infiltration test results.
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	Geology at site is likely to be suitable however this will be subject to infiltration tests. Groundwater vulnerability should be considered when designing infiltration basins.	Potentially depending on infiltration tests.
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	These features could be utilised within the site for surface water storage in major events.	Yes
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Attenuation should be provided by above ground features that provide multiple benefits.	Yes, as last resort if infiltration test results are poor.

Table 1: Sustainable Drainage Methods

4.6 Priority must be given to features that provide multiple benefits such as multi-functional spaces, biodiversity, amenity, water quality and reducing water consumption.

4.7 Features such as infiltration basins can provide areas that are dry for most of the year and can be used for recreational activities.

4.8 The site geology is a bedrock of chalk with no superficial deposits (taken from BGS geology mapping) and it is therefore likely to be viable to use infiltration methods. This will need to be confirmed by having infiltration tests carried out across the site. The underlying aquifer is highlighted as being in a high groundwater vulnerability area which means the aquifer can be susceptible to pollutants. Therefore, measures should be taken to ensure the infiltration SuDS devices are designed to minimise the creation of pollution pathways to the aquifer.

4.9 An assessment of the volume of storage has been based on the lowest acceptable rate of infiltration for chalk which is 1 x 10^{-6} m/s, to provide a worst case scenario for the volume required. The specific infiltration rate from testing in accordance with BRE Digest 365 should be used to design the infiltration devices.

4.10 A MicroDrainage Quick Storage Estimate was carried out to determine the likely storage volume required for a 1 in 100 year (+40% climate change) storm event based on the above infiltration rate. It was assumed that 60% of the site would be impermeable (roofs, roads and hardstandings) for the purpose of this storage estimate, i.e. an impermeable area of 4.37 hectares. This results in a required attenuation volume of 4916m^3. The Quick Storage Estimate parameters and results are included in Appendix E.

4.11 The storage should not be provided in a single feature at the edge of the site boundary but should instead be integrated across the site using a variety of features.

4.12 Permeable paving can be used for private driveways, car parking areas and private access roads. This will provide water quality benefits in addition to allowing water to infiltrate to the ground, similar to the existing situation.

4.13 Cambridgeshire County Council will also consider the adoption of permeable surfaces therefore the main access road could also be permeable if required subject to agreement with the Highway Authority. This should be considered during masterplanning.

4.14 Private or communal crate soakaways could also be effective at the site assuming infiltration rates are suitable. Soakaways should be located a minimum of 5m from any building or site boundary. Communal soakaways could be located below amenity areas or car parks, and private soakaways could be located in back gardens. The site is likely to fall from east to west given the overland flowpaths, therefore any communal soakaways should be located at the lowest areas, which would be to the west of the site.

4.15 The responsibility for the maintenance of private or communal soakaways should also be considered to ensure they do not become ineffective in the future.

4.16 Previous experience working with Cambridgeshire County Council (CCC) has identified the requirement for source control measures to be included across the site. The use of permeable paving, bioretention areas, green roofs and water butts are all considered to be source control measures and therefore would need to be included in any drainage strategy to satisfy CCC when submitting a planning application.

4.17 If infiltration tests demonstrate poor rates, an attenuation strategy could be considered. However, as there are no surface water sewers or watercourses nearby to discharge to, it will be necessary to investigate further options for surface water disposal. This may involve consultation with Anglian Water to discharge to their foul sewer, requisitioning a new surface water sewer or identification of a nearby ditch that connects to a watercourse.

4.18 If an attenuation strategy is required, CCC will require the discharge rate to be restricted to the 1 in 1 year greenfield runoff rate. Methods such as providing balancing ponds, wetlands, detention basins and lined permeable paving could be considered across the site to provide the required attenuation volume.

5 Foul Water Drainage Assessment

5.1 There are some 150mm diameter Anglian Water foul water sewers located within some of the roads to the west of the site, approximately 100m to 200m from the site boundary (Appendix C).

5.2 Due to the proposed number of units within the site, it would not be suitable to connect to non-mains drainage, therefore a connection to the public foul sewer should be considered. It may be difficult to connect to some of the foul sewers to the immediate west, as this would require crossing third party land. However, there are foul sewers in Balsham Road (to the north west) and Lonsdale (to the south west) to which new foul sewers could be requisitioned along the highway. These options should be considered further, and a pre-development enquiry should be made to Anglian Water to determine whether there is capacity in the local foul sewer network to take the proposed foul flows from the development. If there is insufficient capacity, Anglian Water may request that a section of their network is upgraded as part of the development works.

6 Summary and Conclusions

6.1 This report has considered a proposed residential scheme of approximately 130 dwellings, with associated infrastructure and public open space. The existing site is an undeveloped agricultural field.

6.2 The site falls entirely within Flood Zone 1 of the Environment Agency (EA) Flood Map for Planning. It is also shown to be mainly at very low risk of surface water flooding with only a small portion of the site at risk of surface water flooding.

6.3 For the purpose of masterplanning, the built development should be kept wholly outside of the surface water flood extent which is along the northern boundary and a small overland flowpath towards the southern boundary.

6.4 The following recommendations are made as a result of this assessment in order to demonstrate the feasibility of the proposals at a planning application stage:

A) All sources of flooding have been considered by means of a desktop assessment and no significant risks have been identified.

B) The chalk geology and the Strategic Flood Risk Assessment show that there is high potential for infiltration drainage. The chalk aquifer is considered to be highly vulnerable so this will need to be considered when designing an infiltration drainage strategy to ensure pollution pathways are not created.

C) More detailed investigation in the form of infiltration tests should be carried out across the site to demonstrate that infiltration methods are viable.

D) If infiltration tests show poor rates, it may be necessary to consider an attenuation and discharge strategy. Further investigation will be necessary to identify a suitable discharge location to either a sewer or ditch nearby.

E) The surface water drainage strategy should utilise drainage features that provide multiple benefits and functions including above ground features such as infiltration or detention basins that can be used as recreation space when dry.

F) The surface water drainage strategy should also include features that improve water quality, biodiversity, amenity and habitat creation.

G) The closest public foul sewers are approximately 100 -200 metres to the west of the site. Due to the likely number of properties proposed as part of any development non-mains drainage would not be acceptable due to the proximity of the public sewer.

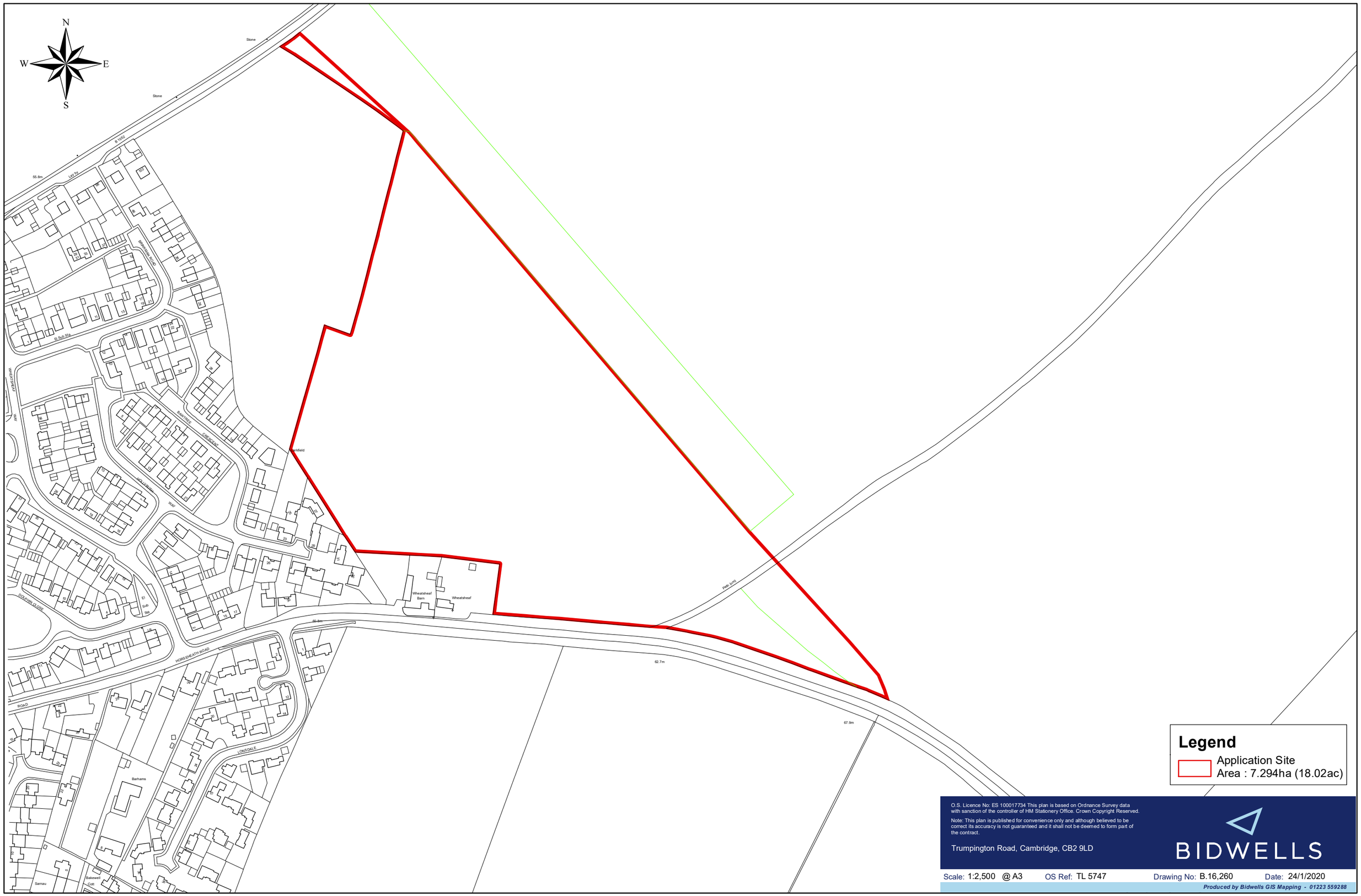
6.5 In conclusion, the overall risk of flooding to the site is low with likely practical and sustainable solutions for both surface and foul water drainage; and the site is therefore suitable from a flood risk and drainage perspective for residential development.

Appendices

Appendix: A - Location Plan
Appendix: B – EA Flood Map for Planning
Appendix: C – Anglian Water Sewer Records
Appendix: D – Surface Water Flood Maps
Appendix: E – WINDES MicroDrainage Quick Storage Estimate

Appendix: A - Location Plan

Land north of Horseheath Road, Linton



Trumpington Road, Cambridge, CB2 9LD

BIDWELLS

Scale: 1:2,500 @ A3 OS Ref: TL 5747 Drawing No: B.16,260 Date: 24/1/2020

Produced by Bidwells GIS Mapping - 01223 559288

Appendix: B – EA Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
Linton	**557123/247125**	**13 Feb 2020 17:20**

Your selected location is in flood zone 1, an area with a low probability of flooding.

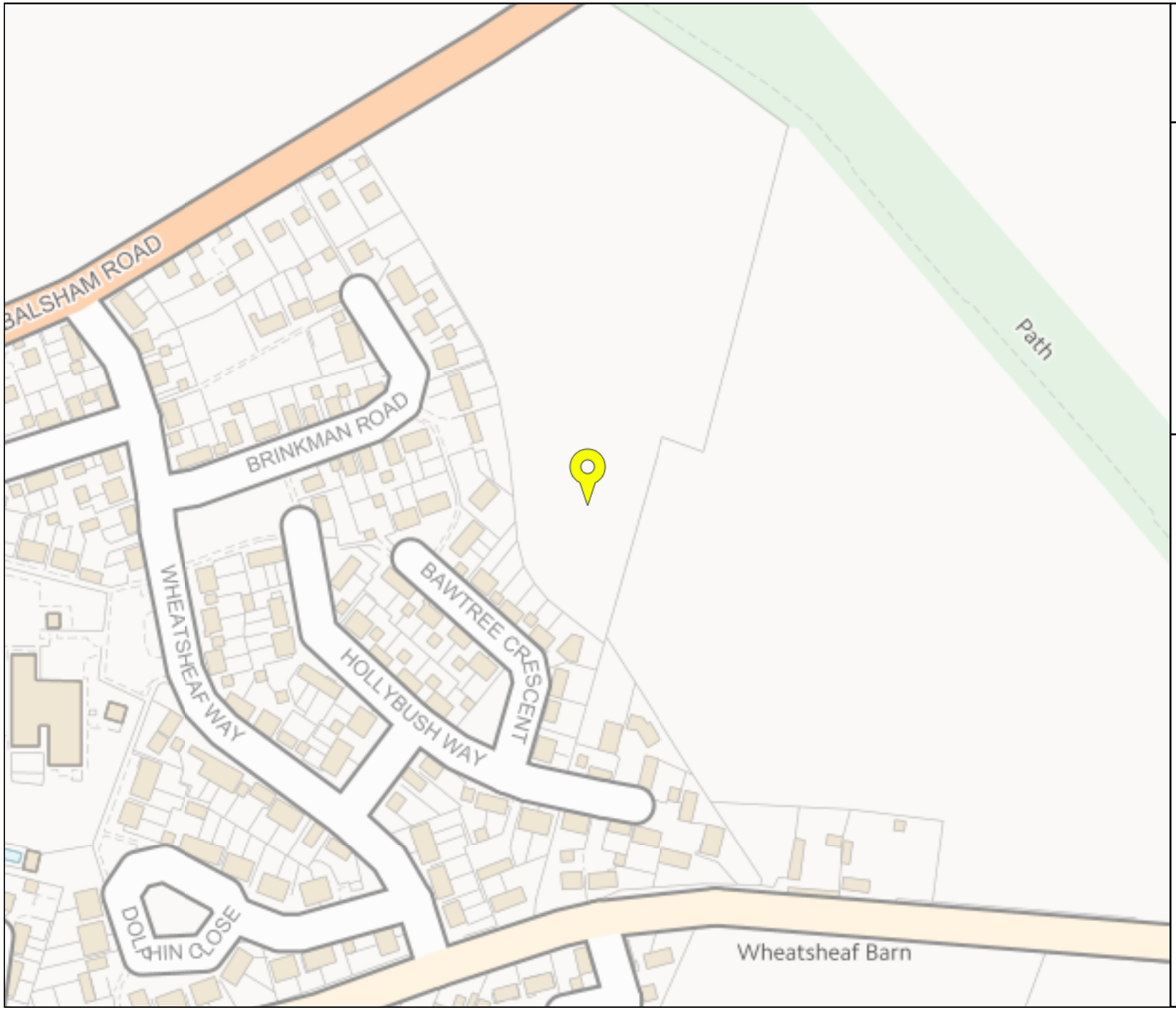
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
Linton

Location (easting/northing)
557123/247125

Scale
1:2500

Created
13 Feb 2020 17:20

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

Appendix: C – Anglian Water Sewer Records

B 1052

9202

9203

Lay-by

150mm VC

150mm VC

0201

0202

BRINKMAN ROAD

9104

BAWTREE CRESCENT

0002

1002

1001

HOLLYBUSH WAY

0001

150mm VC

0003

0004

1901

9001

0903

0902

0901

HORSEHEATH ROAD

Larkfield

Path (um)

Wheatsheaf Barn

Wheatsheaf

1902

1951

1853

1852

1802

1801

9804

0m 50m 100m 150m

Data updated: 03/01/20

Scale: 1:1250

Map Centre: 557224,247163

Date: 14/02/20

Our Ref: 369982 - 1

Wastewater Plan A2

Powered by digdat

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent Sewer
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

louisa.wade@eastp.co.uk

Linton

love every drop anglianwater

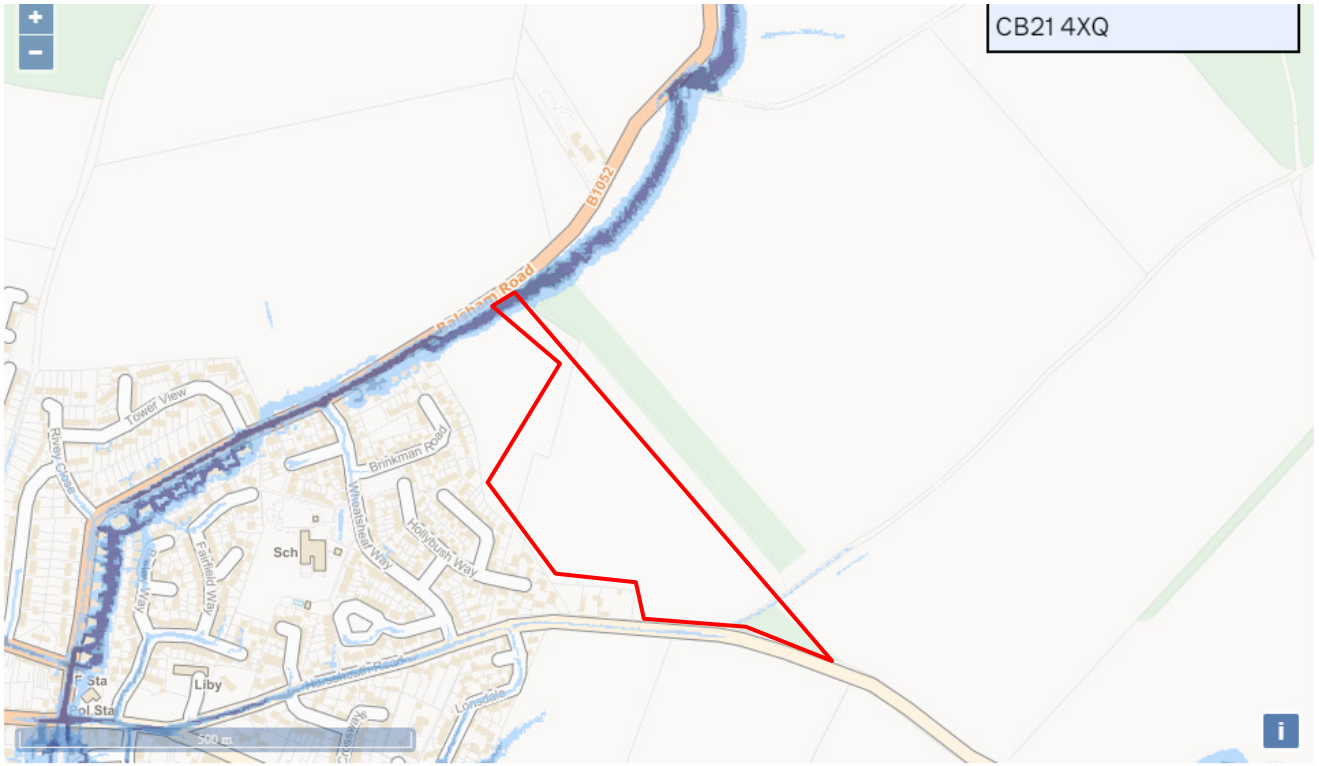
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	63.391	61.291	2.1
0002	F	63.157	61.917	1.24
0003	F	63.925	62.145	1.78
0004	F	63.707	62.167	1.54
0201	F	59.742	56.942	2.8
0202	F	60.019	57.389	2.63
0901	F	60.49	59.16	1.33
0902	F	60.47	59.36	1.11
0903	F	61.66	59.85	1.81
1001	F	65.997	63.967	2.03
1002	F	-	-	-
1801	F	-	56.1	-
1802	F	-	56.7	-
1901	F	63.86	62.59	1.27
1902	F	-	57.6	-
9001	F	61.816	60.126	1.69
9104	F	62.234	60.404	1.83
9202	F	56.3	54.68	1.62
9203	F	56.24	54.89	1.35
9804	F	58.281	56.881	1.4
1852	S	-	56.1	-
1853	S	-	56.7	-
1951	S	-	57.6	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix: D – Surface Water Flood Maps

EA Risk of Surface Water Flooding - Extent

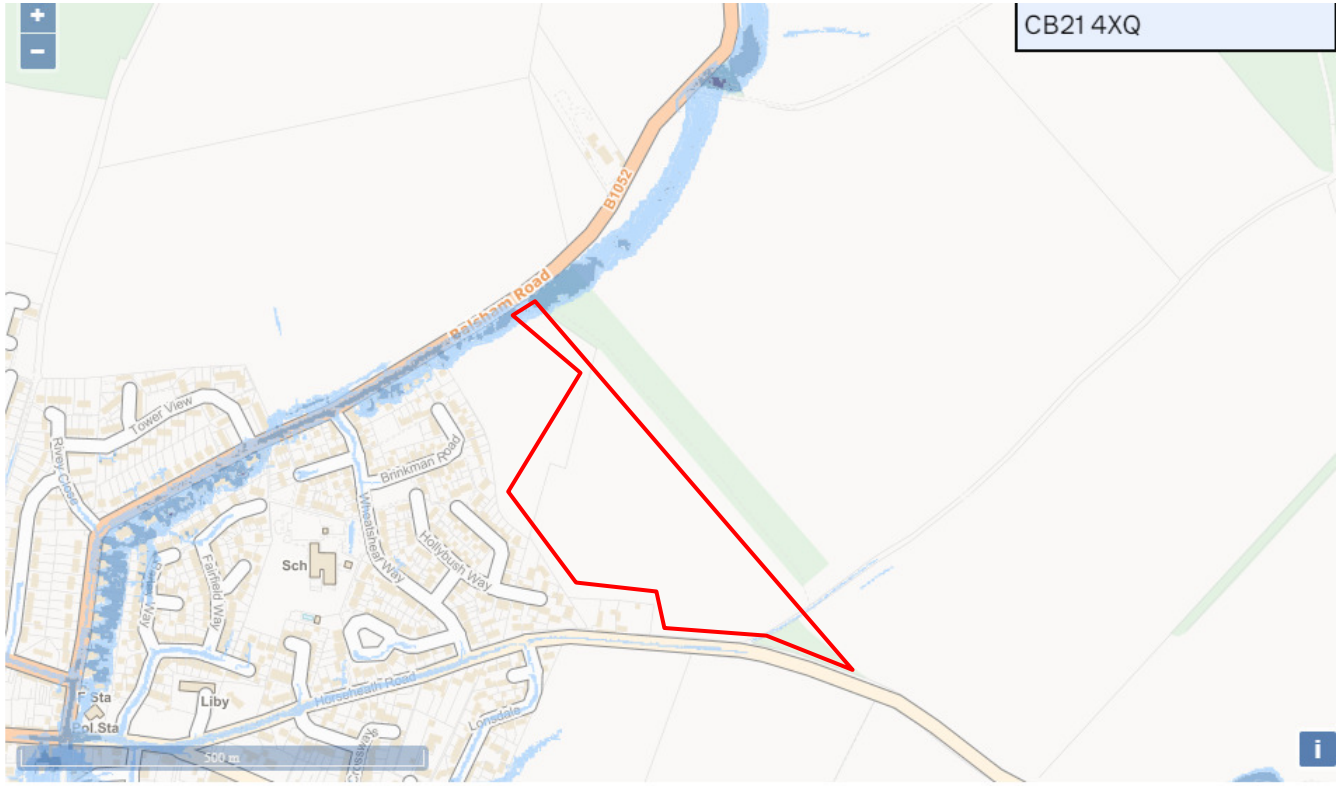


Extent of flooding from surface water

High Medium Low Very low

Site Boundary

EA Risk of Surface Water Flooding – Low Risk Depth



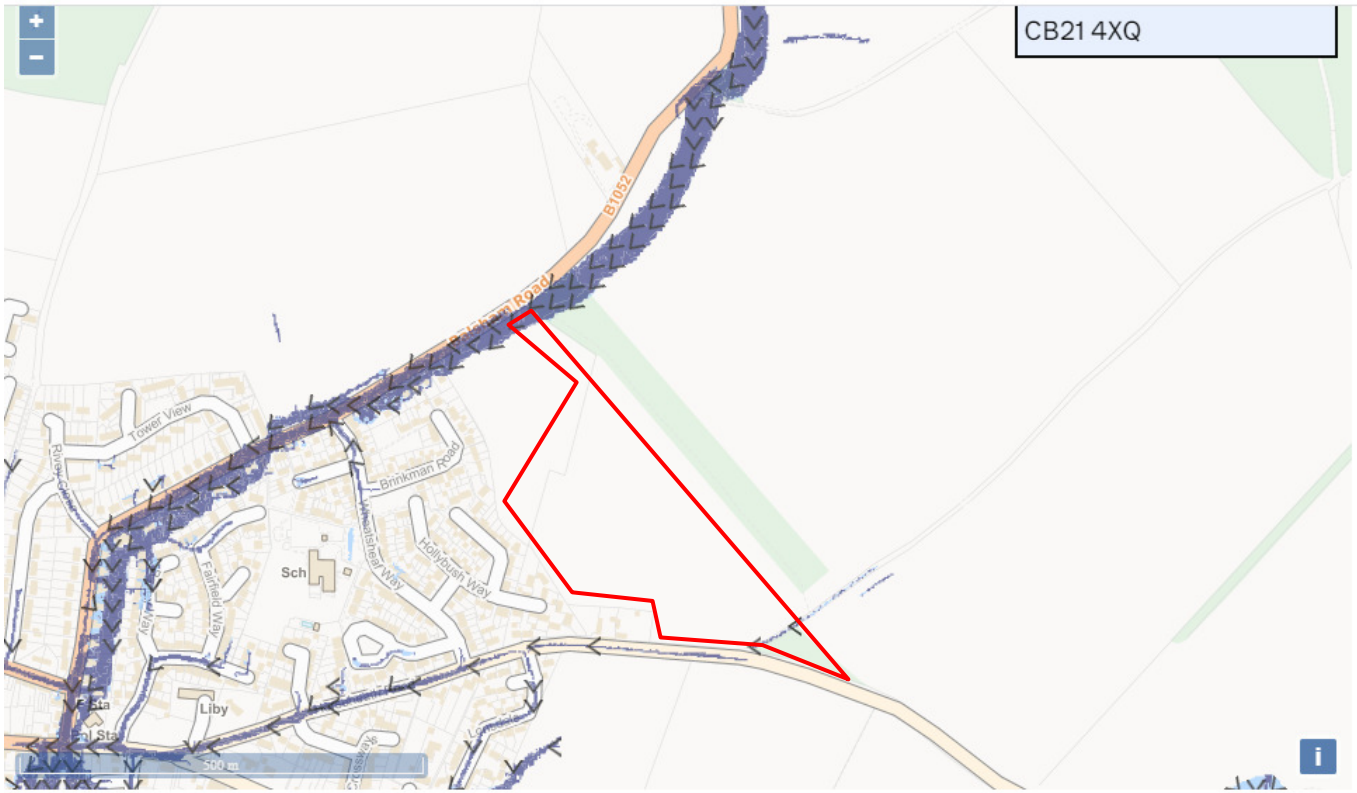
Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Site Boundary

EA Risk of Surface Water Flooding – Low Risk Velocity



Site Boundary

Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

Over 0.25 m/s Less than 0.25 m/s Direction of water flow

Appendix: E – WINDES MicroDrainage Quick Storage Estimate

Storage requirements for the 1 in 100 year (+40% climate change) event based on the lowest acceptable infiltration rate