Flood Risk and Drainage Site Appraisal

February 2020

EAS

Land at Longstowe

Cambridgeshire

Longstowe Hall Estate

EAS

Document History

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A	Client Draft	ML	SA	SA	15/01/2020
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C					
D					
E					

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Contents

1 Introduction

1.1 EAS has been commissioned by Longstowe Hall Estate to prepare a Site Appraisal for land to the west of High Street, Longstowe, Cambridgeshire. 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 to the west of High Street in Longstowe and is surrounded by arable and agricultural land on the north, south and west.

1.4 The 5.67ha site is currently a mixture of residential, arable and agricultural buildings and a location plan is contained within Appendix A. For the purposes of this report it is proposed that the site will be developed with 30 dwellings with associated landscaping, amenity space and wildlife habitat creation. The developable area of the site is 1.26ha.

1.5 The site falls wholly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps . It is also shown to be predominantly at very low risk of surface water flooding with some small isolated areas at risk of surface water flooding mainly as flowpaths from land to the east of High Street. 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 brief review of surface water drainage requirements
- 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 SCDS 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 C2.1 illustrate that there is low potential for infiltration at this site.

2.7 Appendix C3 confirms that the site is not within a Source Protection Zone.

2.8 Appendix D1.1 shows that the site is not at risk of fluvial flooding.

2.9 Tables 4a and 4b from the SFRA contain historic flood records from sources including rivers, highway drainage and sewers and there are no records of historic flooding within the site and one incident of fluvial flooding on Old North Road from the Dean brook which is approximately 630m east of the site.

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.

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 wholly 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 0.1% annual probability of flooding from fluvial sources.

3.7 **Groundwater:** The site has a bedrock of Gault formation (mudstone) and Oadby Member (diamicton) supercial deposits. The area is shown to have low groundwater vulnerability in DEFRA's Magic Map.

3.8 Appendix C2 and C2.1 of the SFRA show that there is low potential for infiltration whilst appendix B3 confirms that there are no recorded incidents of groundwater flooding at this location. The Flood Incidents Register contained within the 2015 Cambridgeshire County Council Surface Water Management Plan also shows include any records of groundwater flooding. The register held no records of groundwater flooding at this location.

3.9 BGS borehole data shows one record within 1km of the site. The nearest record is to the east of Old North Road approximately 650m from the site and groundwater waswell within the cellar of Newton Hall and groundwater was encountered at 100 feet (30.48m) below ground level in 1960. As such, the risk of groundwater flooding at the site is considered to be low.

3.10 **Sewer Flooding:** Anglian Water sewer records show that a rising main is located within High Street and runs adjacent to the site. Table 4b of the SFRA does not indicate any sewer

flooding incidents close to the site. As there are no other sewers in the vicinity, sewer flooding is not considered to be a significant flood risk to the development site.

3.11 **Surface Water/Overland Flow:** The EA surface water flood map shows the majority of the site to be at very low risk of flooding from surface water. The mapping also shows that there is a overland flowpath from the site which runs across High Street and the land to the east towards the Dean Brook. The surface water is shown to build up against the rear of one of the agricultural buildings and shows ponding to depths between 300-900mm for the low (0.1-1% annual probability) and medium (1-3.33% annual probability) and less than 300mm flood depths in high (greater than 3.33% annual probability) risk events before flowing towards High Street. It is recommended that a topographic survey is carried out on site to determine the site levels however, these small areas of surface water flood risk are unlikely to represent any causes for concern and could be mitigated against as part of any development proposal.

3.12 It is important that an effective surface water drainage system is included in the proposed development to ensure surface water runoff does not pose a significant flood risk to the development or to adjacent land and properties. This has been discussed further in the next section.

3.13 **Artificial Sources:** The EA flood map shows that there is no risk of flooding from reservoirs.

4 Surface Water Drainage

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 site geology is a bedrock Gault Mudstone formation with Oadby Member Diamicton superficial deposits (taken from BGS geology mapping) and therefore typically an attenuation strategy would be preferred however due to the lack of an obvious outfall from the site at this stage, it is recommended that the masterplan allows more room for infiltration drainage due to the expected lower infiltration rates.

4.6 The site falls predominantly from west to east towards High Street and ultimately the Dean Brook. Whilst there are a number of properties currently draining surface water on the site there are no obvious options for surface water disposal within the site boundary. In order to determine if and where a suitable outfall for the site exists, further investigation is required

and where no outfall exists infiltration testing should be undertaken to determine a specific infiltration rate across the site.

4.7 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 rainwater harvesting 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.

4.8 An assessment of the volume of storage has been based on the 1 in 1 year greenfield runoff rate for the site assuming a connection to a watercourse. This would meet the requirements of the LLFA if infiltration drainage is proven to not be suitable.

4.9 To understand the scale of attenuation volume that might be required at the site, Micro Drainage was used to estimate greenfield runoff rates based on an impermeable site area of 0.76 hectares. The estimated runoff rates are:

QBAR = 3.3 l/s/ha (2.51 l/s)

Q1 year = 2.9 l/s/ha (2.2 l/s)

Q30 year = 8.0 l/s/ha (6.1 l/s)

Q100 year = 11.8 l/s/ha (9.0 l/s)

4.10 The MicroDrainage output is included in Appendix D.

4.11 A MicroDrainage Quick Storage Estimate was carried out to determine the likely storage volume required for a 1 in 100 year (+40% climate change) restricted to the 1 in 1 year greenfield runoff rate. It was assumed that 60% of the site was impermeable (roofs and hardstandings) for the purpose of this storage estimate, i.e. an impermeable area of 0.76 hectares. This results in a required attenuation volume of 658m^3. The Quick Storage Estimate parameters and results are included in Appendix E.

5 Foul Water Drainage Assessment

5.1 There is a rising main which runs adjacent to the site within High Street. Anglian Water records show a connection to the rising main north of Middle Farm, it is assumed that foul water from the buildings within the red line boundary all discharge at this location.

5.2 Due to the proposed number of units within the site, it would not be suitable to connect to non-mains drainage given the proximity of the public foul sewer.

5.3 Whilst it is assumed that the existing drainage from the site connects to the public sewer, further investigation should be carried out to confirm this.

5.4 It is recommended that consultation with Anglian Water is carried out to determine if it is feasible to connect to the sewer and the level of upgrades required.

6 Summary and Conclusions

6.1 This report has dealt with a proposed development of 30 dwellings with associated landscaping, amenity space and wildlife habitat creation.

6.2 The site falls wholly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps . It is also shown to be predominantly at very low risk of surface water flooding with a small overland flow path which builds up against one of the agricultural buildings before running east towards High Street. This will be mitigated by installing an effective surface water drainage system on the site.

6.3 There are no obvious outfalls for surface water drainage on the site with the information currently available and further work is required to establish a suitable outfall or undertake site specific infiltration testing to determine a specific infiltration rate.

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 mudstone geology is likely to be suitable for infiltration drainage although features will be larger and therefore the masterplan should accommodate this.

C) Further investigation is recommended to determine if there is a viable outfall for the site surface water.

D) Once a suitable outfall has been established, the drainage strategy will be restricted to the 1 in 1 year greenfield runoff rate and storage will be provided for all events up to and including the 1 in 100 year + 40% climate change event.

E) A rising main runs adjacent to the site within High Street. It is assumed that all existing drainage from the site discharges via a connection to the rising main north of Middle Farm. 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. It is recommended that consultation with Anglian Water is carried out to determine if it is feasible to connect to the sewer and the level of upgrades required.

Appendices

Appendix: A - Location Plan

N
W
E
S

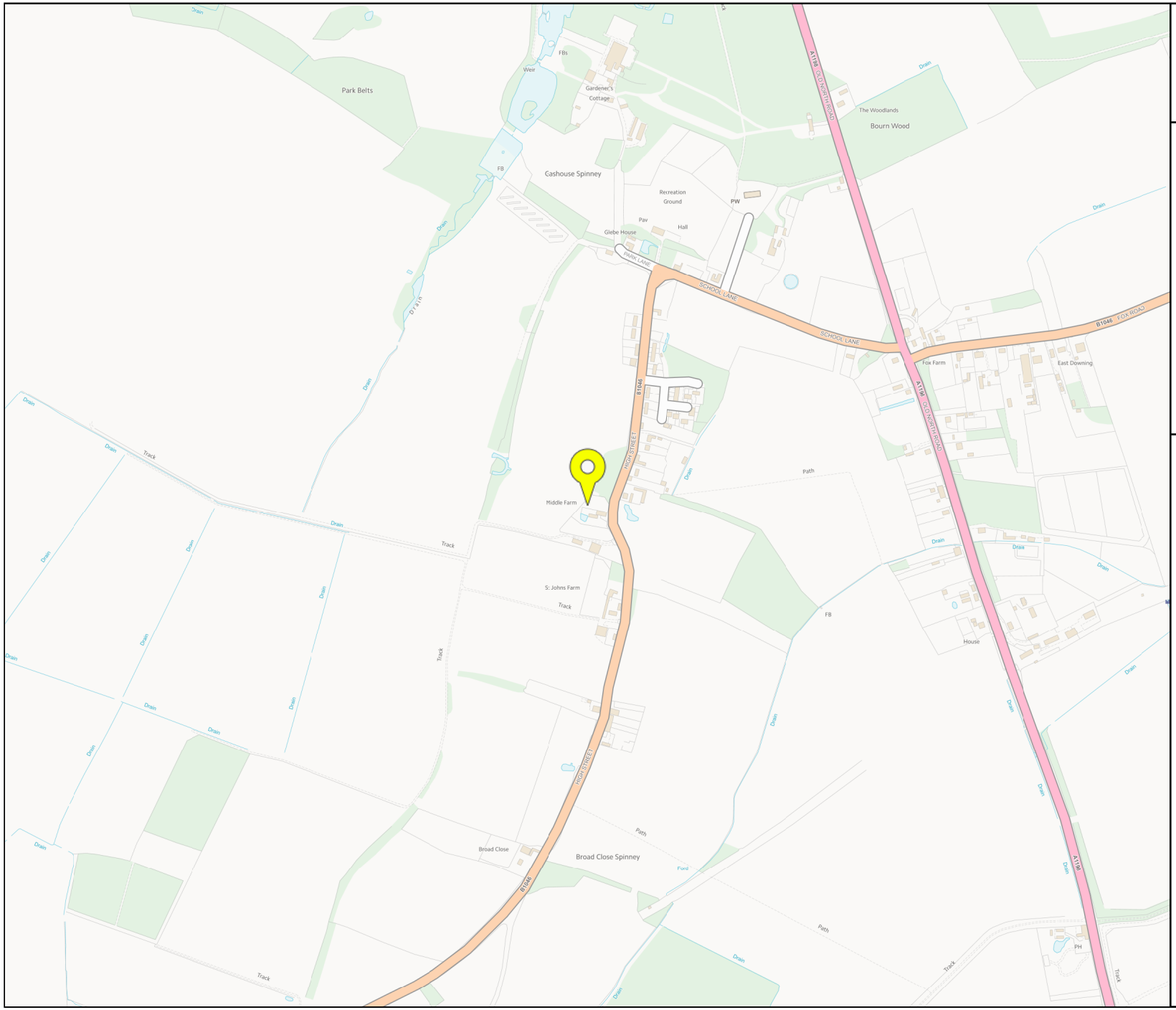
Pond
Wood
Weir
Track
63m
66m
The
Drain
Golders Farm
Rookery
56m
Arts
Tk
Path
Playing Field
Pav
Hall
PW
Gashouse
Rectory
Samsons Cottage
Farm
PARK L
69m
B1046
CHOOL LANE
A1198
Farm
67m
71m
STREET
HIGH
Moat
BROOK
A119
Ppg Sta
66m
Mayford
Path
Middle Farm
72m
St Johns Farm
OLD NORTH ROAD
63m
Coal
Wks
Beaconsfield
Oliver Cromwell's Hole
NewDitch(Drain)
Broad Close
Spinney
Close
72m
Edgehill Farm
Kingston Wood
Moat
PH
68m
Bellams Farm
79m
Lower Farm
Copy Yard
B1046
0 50 100 200 300 400 500 Metres

BIDWELLS

Scale: 1:7,500 @ A3 OS Ref: TL 3154 Drawing No: B.16,221a Date: 22/01/2020

Produced by Bidwells GIS Mapping -

Appendix: B – EA Flood Map for Planning



Environment Agency

Flood map for planning

Your reference
Longstowe

Location (easting/northing)
530759/254856

Scale
1:10000

Created
24 Feb 2020 14:45

- 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

0 100 200 300m

Appendix: C – EA Surface Water Flood Map

Source: Long Term Flood Risk Map (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

Appendix: D – Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

Input

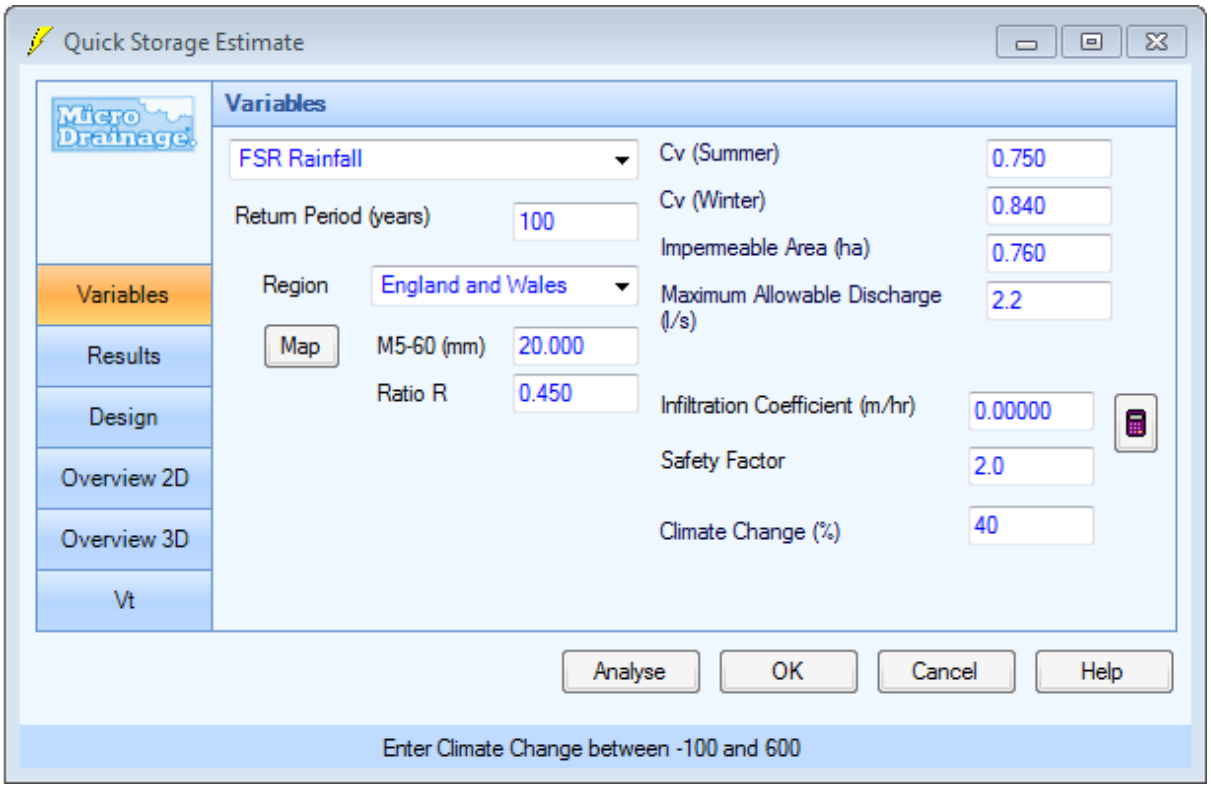
Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	550	Region Number	Region 5

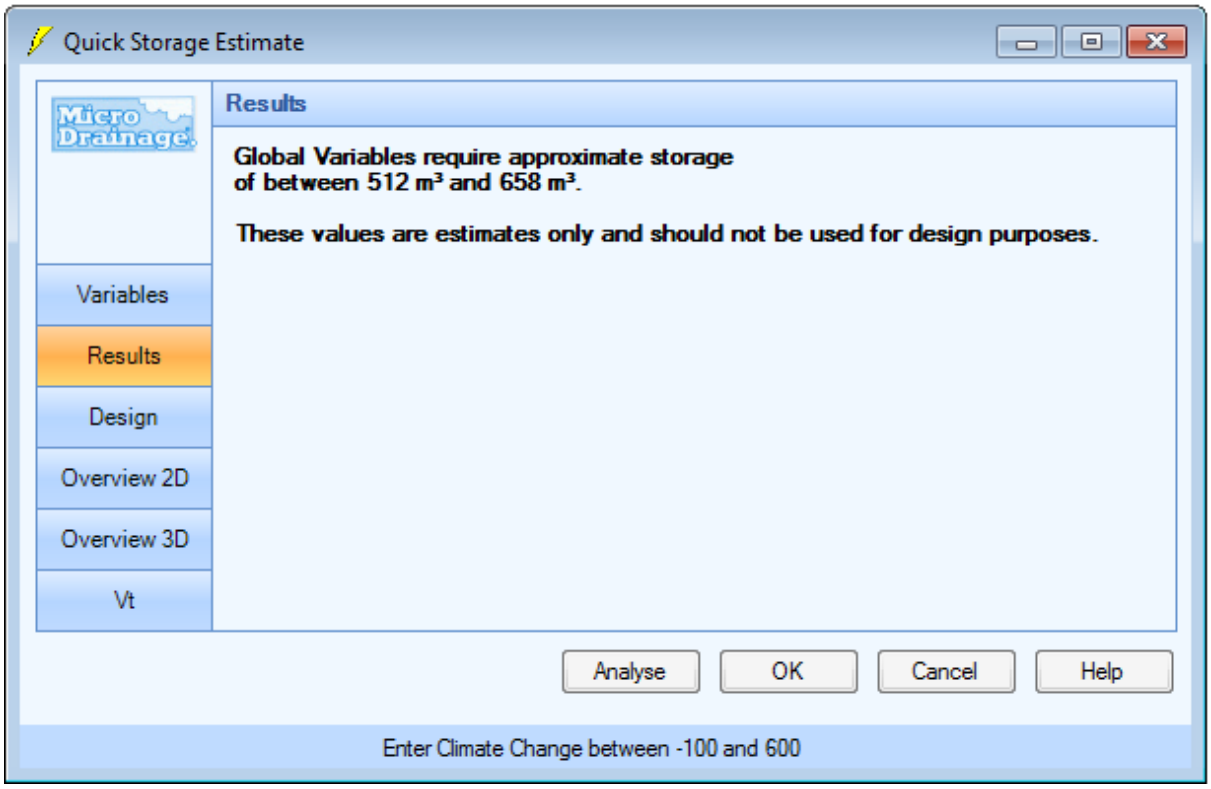
Results l/s

QBAR Rural	3.3
QBAR Urban	3.3
Q100 years	11.8
Q1 year	2.9
Q30 years	8.0
Q100 years	11.8

Appendix: E – MicroDrainage Quick Storage Estimate

Storage required for a 1 in 100 year + 40% climate change event





Appendix: F – Anglian Water Sewer Records

(c) Crown copyright and database rights 2020 Ordnance Survey 100019209 | Scale: 1:1250 | Date: 16/01/20 | Wastewater Plan A2

Data updated: 02/12/19 | Map Centre: 530917,254897 | Our Ref: 362824 - 1 | 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)

High St, Longstowe

love every drop
anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9000	F	-	-	-
9001	F	-	-	-
9002	F	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert