Flood Risk and Drainage Site Appraisal

January 2020

EAS

49 Cambridge Road

Impington, Cambridgeshire

Chivers Farms Ltd.

EAS

Document History

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A	Client Draft	ML	SA	SA	05/02/2020
B					
C					
D					
E					

EAS

Contents

1 Introduction

1.1 EAS has been commissioned by Chivers Farms Ltd to prepare a Site Appraisal for land at 49 Cambridge Road. 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 south of Impington and is situated between Cambridge Road and Bridge Road (B1049) with residential areas to the north and west.

1.4 The 0.23ha site is currently greenfield adjacent to the residential plot of 49 Cambridge Road, a location plan is contained within Appendix A. For the purposes of this report it is proposed that the site will be developed with 5 dwellings with associated landscaping and amenity space, an illustrative masterplan has been included within Appendix G.

1.5 The site falls wholly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. It is also shown to be mostly at very low risk of surface water flooding in the western portion with areas of high risk low depth flooding along the south eastern boundary. There is an open watercourse which bounds the site on the eastern boundary. 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 (2014)

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 C2.2 illustrate that there is uncertain potential for infiltration at this site.

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

2.8 Appendix D1.2 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 flooding within 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 in an area at risk of flooding or which are 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 The fluvial modelling does not consider the risk of the ordinary watercourse along the eastern boundary of the site and whilst it has been discussed in terms of surface water flood risk below it is recommended that at the next stage a site visit is undertaken along with a review of site levels to give an indication of the likely risks associated with the ordinary watercourse from the risk of blockage and exceedance.

3.8 **Groundwater:** The site has a bedrock of Gault formation (mudstone) and River Terrace Deposits (sand and gravel) superficial deposits in the southern section of the site and no recorded superficial deposits in the north of the site. The area is shown to have unproductive groundwater vulnerability in the north and the medium-low risk of groundwater vulnerability in the south in DEFRA's Magic Map.

3.9 Appendix C2 and C2.2 of the SFRA show that there is uncertain 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.

3.10 BGS borehole data shows two records within very close proximity to the site. The nearest record is immediately to the east of site adjacent to Cambridge Road and ground water was struck at 1.5m below ground level, whilst the other was only undertaken to a depth of 1m which did not strike ground water. Therefore it is strongly recommended that on site testing is carried out to determine the risk of seasonal variations in groundwater. As such, the risk of groundwater flooding at the site is considered to be medium as groundwater is relatively high in the area and seasonal fluctuations are unknown however, there are no recorded incidents of groundwater flooding within the SFRA.

3.11 **Sewer Flooding:** Anglian Water sewer records show that a 150mm foul sewer runs on the western side of Cambridge Road, whilst the site is on the eastern side. Table 4b of the SFRA does not indicate any sewer flooding incidents close to the site. As there are no recorded incidents of sewer flooding and the sewer is located on the opposite side of the road with the road falling in southerly direction it is considered that the risk of sewer to the development site is low.

3.12 **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 some high risk (greater than 3.3% annual probability) with low depths below 300mm as seen in Appendix C. It is likely that these areas are just topographic low points on the site as the watercourse along the southern boundary only shows water in the low risk event. 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.

3.13 The illustrative masterplan included in Appendix G shows that the properties would be located in an area at very low risk of flooding.

3.14 The Cambridgeshire County Council SWMP shows that there are three reported incidents of surface water flooding approximately 200m north of the site, all occurring at the same location however, the confidence in source is listed as low within the SWMP. There are no records of flooding within the site itself or immediately adjacent to the site.

3.15 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.

3.16 **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 River Terrace superficial deposits in the south of the site and no recorded superficial deposits in the north (taken from BGS geology mapping) and with groundwater previously recorded at 1.5m below ground level it is proposed that an attenuation strategy which restricts runoff before discharging to the adjacent watercourse should be utilised as the preferred surface water drainage solution.

4.6 The site is relatively flat with site levels falling in a southerly direction. The site is bound by an ordinary watercourse on the eastern side which runs in a southerly direction before flowing west towards the Public Drain.

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 a 1 l/s discharge rate assuming a connection to a watercourse as the 1 in 1 year greenfield runoff rate would result in an unneccessary risk of blockage given the size of the required orifice to control flows this low. This would meet the requirements of the LLFA.

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 0.14 hectares. The estimated runoff rates are:

QBAR = 3.3 l/s/ha (0.5 l/s)

Q1 year = 2.9 l/s/ha (0.4 l/s)

Q30 year = 8.0 l/s/ha (1.12 l/s)

Q100 year = 11.8 l/s/ha (1.7 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 1 l/s. The impermeable area has been determined by indicative figures provided within the illustrative masterplan included within Appendix G, i.e. an impermeable area of 0.13 hectares. This results in a required attenuation volume of 92m^3. The Quick Storage Estimate parameters and results are included in Appendix E.

5 Foul Water Drainage Assessment

5.1 Anglian Water records show that there are no sewers within the site however there is a 150mm turned 225mm diameter foul sewer which runs to the west of the adjacent Cambridge Road which is less than 10 metres from the site.

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

5.3 It is recommended that consultation with Anglian Water is carried out to determine if there is sufficient capacity within their sewer or the level of upgrades required, where necessary.

6 Summary and Conclusions

6.1 This report has dealt with a proposed development of 5 residential dwellings with associated landscaping and amenity space.

6.2 The site falls wholly within Flood Zone 1 of the Environment Agency (EA) Flood Zone maps. It is also shown to be mostly at very low risk of surface water flooding in the western portion with areas of high risk low depth flooding along the south eastern boundary. There is an open watercourse which bounds the site on the eastern boundary which could also put the site at risk in the event of blockage or exceedance.

6.3 Due to the presence of groundwater at 1.5m below ground level in the nearest borehole and the uncertain infiltration potential of the ground set out by the SFRA it is recommended that an attenuation strategy is the most suitable drainage strategy.

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) Built development should remain outside of the areas at risk of surface water flooding as indicated within the illustrative masterplan in Appendix G.

C) Further ground investigation is required to determine seasonal variations in ground water levels as one historic borehole doesn't provide enough information to determine the risk of groundwater flooding fully.

D) The mudstone geology and presence of groundwater means that an attenuation strategy is proposed for the site.

E) The drainage strategy will be restricted to the closest rate feasible to the 1 in 1 greenfield runoff rate as it is unlikely that 1 in 1 greenfield runoff rates could be achieved without causing unnecessary risk of blockage due to the associated low flow rates.

F) Storage will be provided for all events up to and including the 1 in 100 year + 40% climate change event with at least one source control feature included within the design.

G) There is a foul sewer within 10 metres of the site which will be utilised for the disposal of foul drainage. It is recommended that consultation with Anglian Water is carried out to determine if there is sufficient capacity within their sewer or the level of upgrades required, where necessary.

6.5 In conclusion, provided that built development remains outside the small area at high risk of surface water flooding the site and further ground investigation is carried out to determine seasonal variations in ground water levels the overall risk of flooding to the site is low with practical and sustainable solutions for both foul and surface water drainage.

Appendices

Appendix: A - Location Plan

KEY

- Site Boundary (0.23ha)
- Impington Development Framework
- Protected Village Amenity Area
- Existing Drain
- Surface Water Flood Risk
  - High
  - Medium
  - Low
- Local Green Space
- Existing Vegetation
- Existing Highway
- Access Points

Rev.	Date.	Details.
-	-	-

Do not scale from this drawing. All dimensions to be checked on site. This plan is to be read with all accompanying documentation.© Bidwells 2020

Scale Bar: 0 10 20 30 40

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OPPORTUNITIES & CONSTRAINTS

Job Code: 57490

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Drawing Scale: 1:1,250@A3

Date: 23.01.20

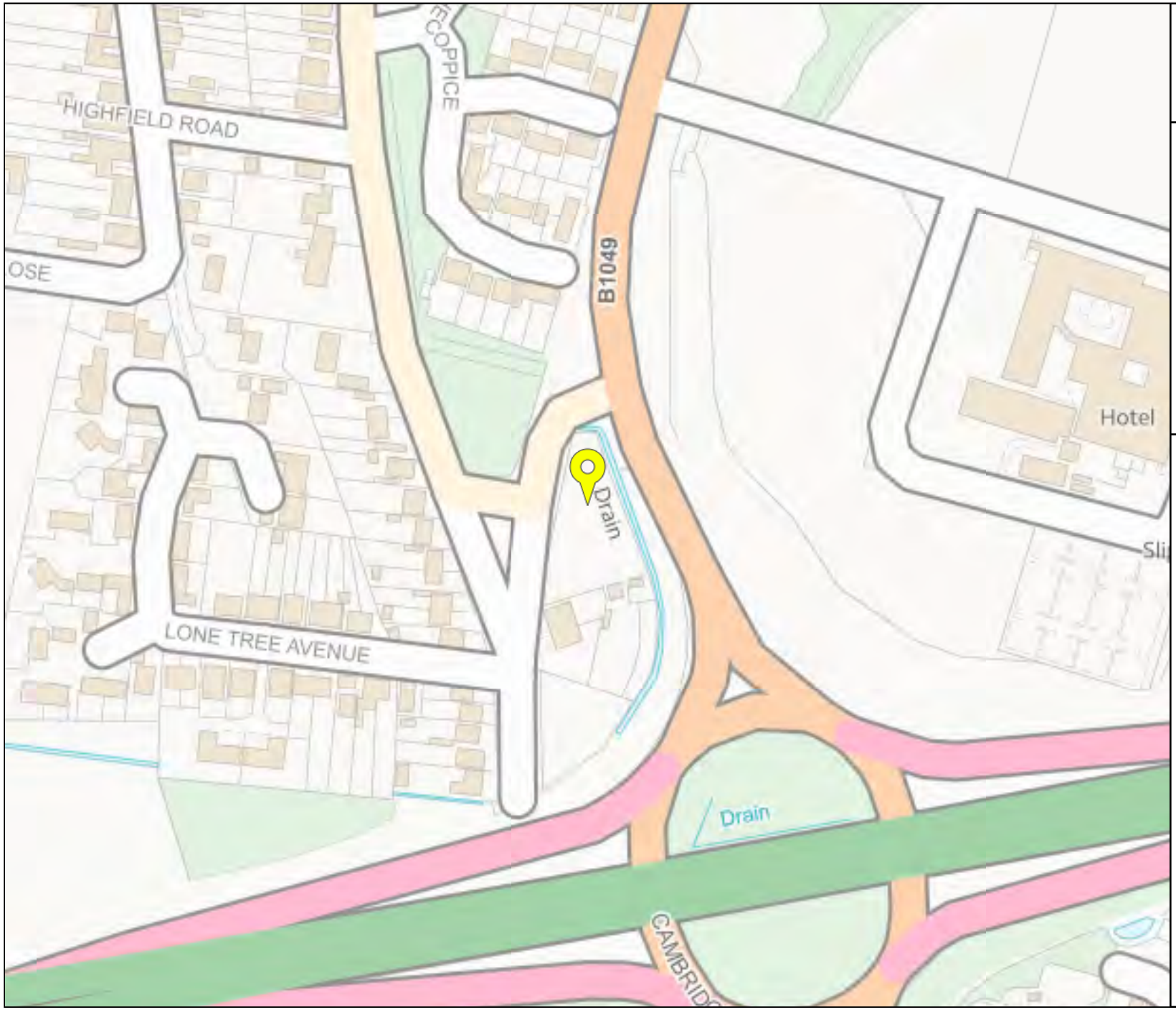
Drawn By: JS

Checked By: -

Drawing Number: UDS57490-A3-0100

Revision: -

Appendix: B – EA Flood Map for Planning



Environment Agency

Flood map for planning

Your reference
Triangle Site

Location (easting/northing)
544285/261928

Scale
1:2500

Created
30 Jan 2020 15:06

- Selected point
- Flood zone 3
- Flood zone 3: areas bene tting from ood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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

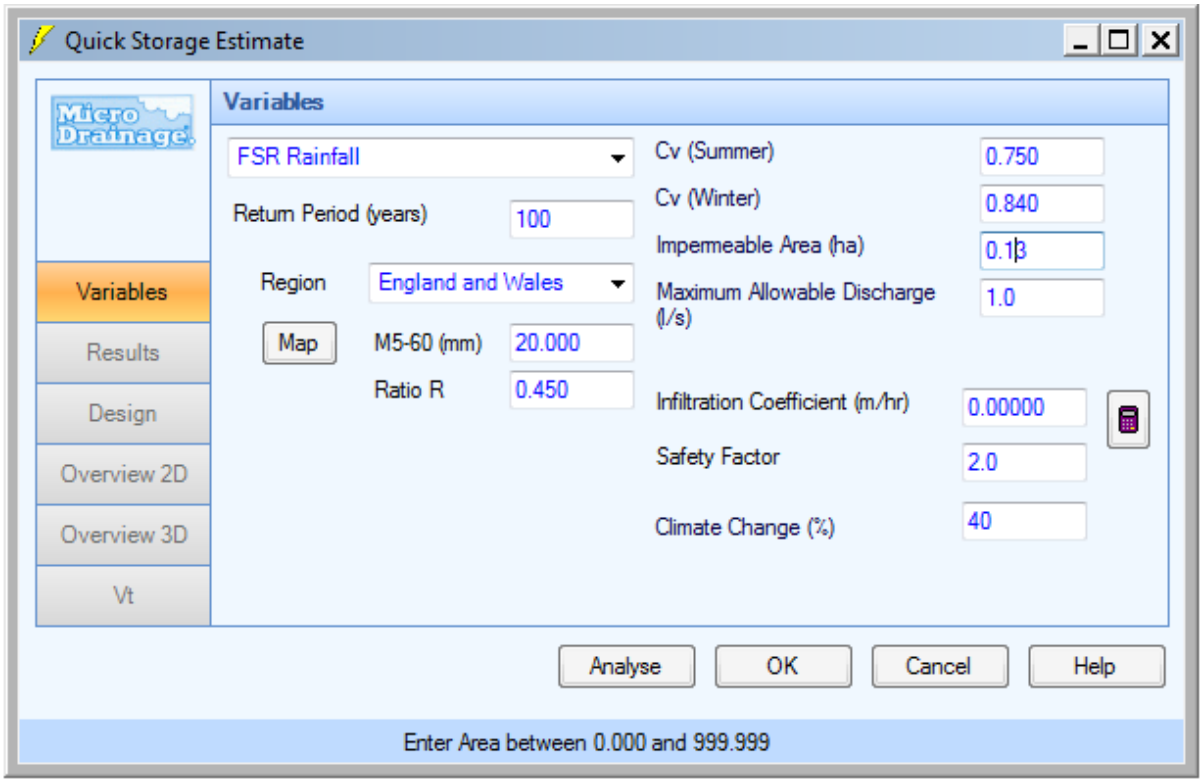
Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	550	Region Number	Region 5

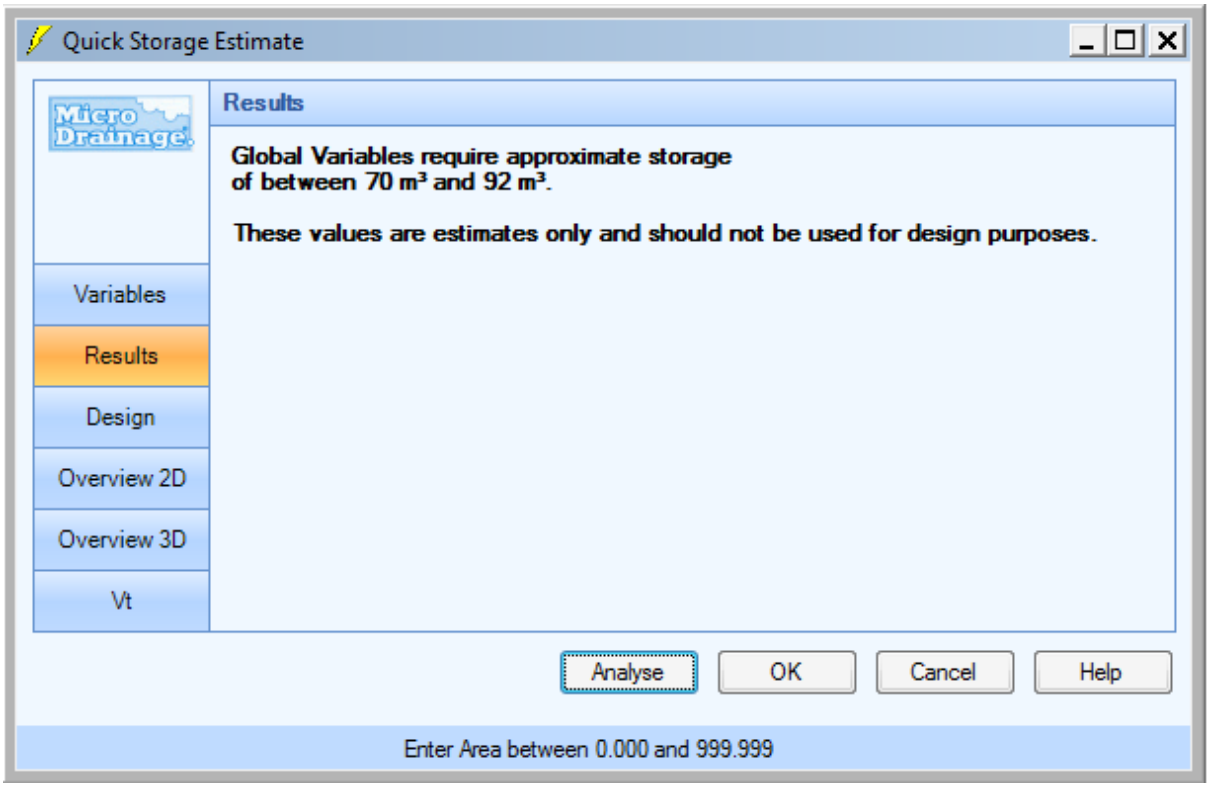
Results l/s

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

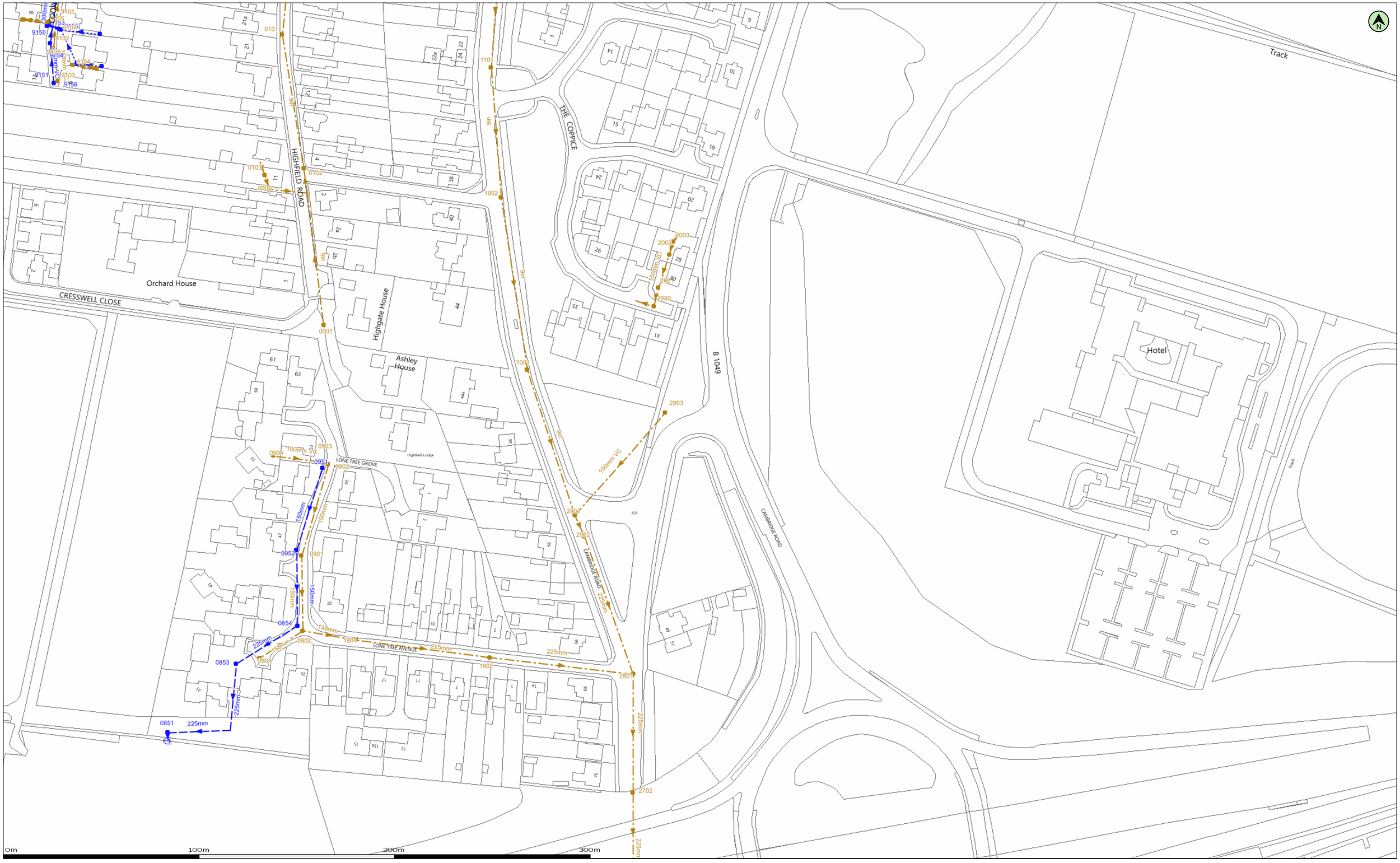
Appendix: E – MicroDrainage Quick Storage Estimate

Storage for the 1 in 100yr + 40% climate change event





Appendix: F – Anglian Water Sewer Records



Date: 30/01/20

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Map Centre: 544287,261975

Data updated: 02/12/19

Our Ref: 366009 - 1

Wastewater Plan A2

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station
- *(Colour denotes effluent type)

49 Cambridge Rd

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	-	-	-
0002	F	-	-	-
0101	F	14.64	12.741	1.899
0102	F	-	-	-
0103	F	-	-	-
0801	F	-	-	-
0802	F	-	-	-
0901	F	-	-	-
0902	F	-	-	-
0903	F	-	-	-
0904	F	-	-	-
1001	F	14.81	13.106	1.704
1002	F	15.752	13.609	2.143
1101	F	16.033	13.963	2.07
1801	F	-	-	-
1802	F	-	-	-
2000	F	-	-	-
2001	F	-	-	-
2002	F	-	-	-
2003	F	-	-	-
2702	F	-	-	-
2801	F	-	-	-
2901	F	-	-	-
2902	F	-	-	-
2903	F	-	-	-
9101	F	-	-	-
9102	F	-	-	-
9103	F	-	-	-
9104	F	-	-	-
9105	F	-	-	-
0851	S	-	-	-
0853	S	-	-	-
0854	S	-	-	-
0951	S	-	-	-
0952	S	-	-	-
9150	S	-	-	-
9151	S	-	-	-
9153	S	-	-	-
9155	S	-	-	-

Appendix: G – Illustrative Masterplan

KEY

Site Boundary (0.23ha)

INDICATIVE SCHEDULE OF ACCOMMODATION:

no. 2 Bed Dwellings:	*3*
no. 3 Bed Dwellings:	*2*
TOTAL DWELLINGS:	***5***

INDICATIVE SITE DENSITY:

Total Site Area:	*0.23ha*
Net Developable Area:	*0.13ha*
PROPOSED DENISTY:	***38dph***

Rev.	Date.	Details.
-	-	-

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Scale Bar: 0 4 8 12 16

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