Catesby Land and Planning Ltd

Moors Fields, Flitch Green

Flood Risk Assessment

890428-R1(1)-FRA

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RSK GENERAL NOTES

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Title: Flood Risk Assessment

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1 INTRODUCTION

RSK Land and Development Engineering Ltd were commissioned by Catesby Land and Planning Limited (the client) to provide a Flood Risk Assessment (FRA) to support the design and construction of up to 180 new dwellings on land off Station Road known as Moors Fields, Flitch Green (the site).

The description of the development for planning purposes is as follows: -

"Outline planning application (with all matters reserved except for means of access from Station Road) for residential development of up to 180 dwellings, a countryside park, up to 100sqm of office hub floorspace, sustainable urban drainage system and associated infrastructure".

The purpose of the FRA is to establish the risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the flood risk to a more acceptable level. The FRA must demonstrate that the development will be safe for its lifetime (in this case assumed to be 100 years) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

This document has been produced to assess the flood risk from tidal, fluvial, surface water, groundwater, sewer and artificial sources in line with the National Planning Policy Framework (NPPF) (Ref. 1) and its corresponding Planning Practice Guidance (PPG) (Ref.2).

This assessment has been undertaken with reference to data, documents and guidance published by the Environment Agency (EA), the Lead Local Flood Authority (LLFA), Anglian Water (AW) and the Local Planning Authority (LPA) (Uttlesford District Council).

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

2 SITE DESCRIPTION & PROPOSALS

2.1 Existing site

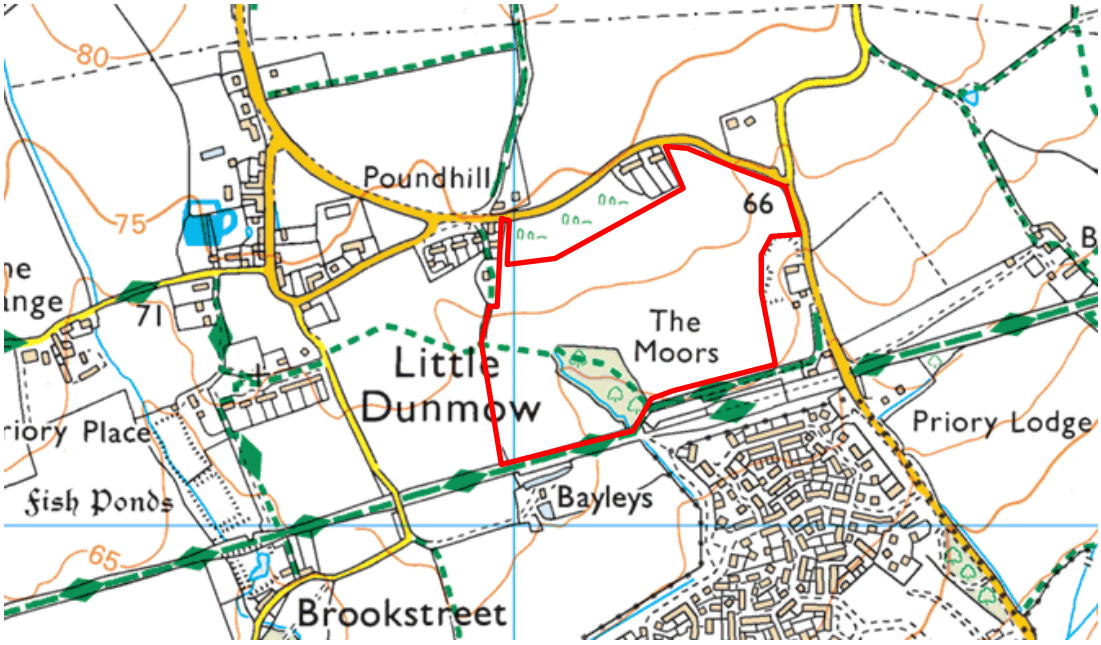
2.1.1 Site Description

The site is located on land known as Moors Fields on land to the south and west of the Station Road, immediately to the north of the Flitch Green residential area. It can be located at National Grid Reference 566273^{E}, 221358^{N}. A site location plan is included as **Figure 2.1**.

The site covers an area of approximately 14ha and currently comprises a large agricultural field with a wooded copse area known as 'The Moors' in the centre of the southern site boundary, with a small watercourse issuing in the north of this area and flowing in a north to south direction through it.

The surrounding area is characterised by a few residential properties fronting Station Road and agricultural land beyond Station Road to the north, additional agricultural land to the west, Flitch Way (Greenway and Wildlife Corridor) and Flitch Green residential area to the south and a recent residential development, Station Road and additional agricultural land to the east.

Figure 2.1: Site location plan



2.1.2 Topography

A site-specific topographic survey has been carried out by NJC Surveys Ltd (drawing no.S2884, December 2020).

The survey shows the site slopes generally from north to south. The northern edge of the site is the topographical high, around 73.9 metres above ordnance datum (AOD) along the north-most corner with a general slope to the south down to 63.4mAOD along the

southern edge. The area of the Moors comprises a small shallow valley sloping from 67.6mAOD down to 61.6mAOD along the stream course.

The topographic survey and existing site layout are included in **Appendix B**.

2.1.3 Existing Drainage

The site consists of a large arable field that currently drains in a north to south direction towards the ordinary watercourse that originates in The Moors area of the site. This watercourse issues towards the northern part of The Moors and on the day of the site walkover in December 2020, water was observed as rising some distance into the field to the north of The Moors and along the western site boundary extending up towards the garden of Willow Cottage, where there is a localised depression on the site boundary that on the day of the visit was waterlogged.

No positive land drainage was observed within the field itself or outfalling into the watercourse, but due to dense vegetation access was not possible to the watercourse channel in certain areas of The Moors. This watercourse then passes out of the site in a south-easterly direction and is culverted under the embankment of the Flitch Way bridleway.

There are two land ditches along the southern boundary of the site either side of The Moors. These do not appear to serve a formal drainage function and appear to have been dug to prevent access to the site being accessed from the land to the south of Flitch Way.

2.2 Development Proposals

The development proposals for the site include the clearing of the site to construct up to 180 dwellings. Development description is included in Section 1.

The relevant proposed site plans are included as **Appendix C**.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

Reference to Ordnance Survey (OS) mapping and the EA's web-based mapping indicates that the nearest Main River is the Stebbing Brook which is located approximately 600m to the south-east of the site on the east side of Station Road and flows northeast to southwest to its confluence with the River Chelmer approximately 900m to the south of the site. The River Chelmer itself flows in a west to east direction approximately 850m to the south of the site.

The Ordinary Watercourse that issues in The Moors area in the south of the site flows through a shallow natural valley and in a north to south direction beyond the southern site boundary towards its confluence with the River Chelmer located 830m from the southern site boundary. Access was not possible to large sections of this watercourse to the south of the site, but some areas appear culverted as the watercourse runs round the perimeter of the Flitch Green residential area to the south.

OS mapping shows an unnamed watercourse flowing south toward the site in the area immediately northwest of the site (to the north of Station Road). This watercourse is marked on OS mapping as 'sinks' to the north of the junction of Moors Lane and Station Road. It is possible that this watercourse is culverted beneath Station Road and close to the alignment of Moors Lane, however, no evidence of this was observed during the walkover.

3.2 Geology

Based on published geological records for the area (British Geological Survey (BGS) online mapping), the site exhibits the following geology:

> Superficial Geology: The majority of the site is overlain by Lowestoft Formation – Diamicton although the south-east corner is underlain by the Kesgrave Catchment Subgroup – Sand and Gravel. These are both superficial deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by rivers.
>
> Bedrock Geology: London Clay Formation – Clay, Sand, Silt. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Paleogene Period. Local environment previously dominated by deep seas.

The closest BGS borehole log is ref.TL62SE136, located further west of the site at Barley Barn, Little Dunmow. This is a 130m deep borehole and shows a strata column of 3m of clays and flints on the surface, overlying 7m of sands and shingles, on top of a bedrock 72.5m layer of London Clays.

3.3 Hydrogeology

Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the sites underlying bedrock is classified as unproductive, while the overlying Diamicton superficial deposits are classified as a Secondary (undifferentiated) aquifer with the Kesgrave Sand and Gravel Deposits in the south-eastern site corner classified as a Secondary A Aquifer. Together these show the underlying geology does

not yield much groundwater. The groundwater vulnerability layer also classifies the region as a Low/Unproductive.

The site is located within a Zone III, Total Catchment Zone of a Source Protection Zone (SPZ).

3.4 Anglian Water Assets

Sewer details have been referenced from sewer record plans obtained from Anglian Water (see **Appendix D**). The plan indicates the following sewer network around the site:

A Ø150mm foul sewer emerges from the adjacent housing to the north of the site. This sewer crosses the entire central area of the site running directly south to cross the unnamed watercourse within The Moors area. Manholes were clearly present during the site visit undertaken in December 2020 and most manholes were noted as being in poor condition.

A second Ø225mm foul sewer runs roughly west to east from Greater Dunmow and crosses through the south-west corner of the site to join the foul sewer described above close to the site's southern boundary where the watercourse flows offsite.

No surface water sewers are present within the site's boundaries.

Offsite foul and surface water sewers are located to the east of the site, in the recent housing development comprising Harrisons Road and Ainsworth Avenue located to the southeast. These sewers then run south along Station Road.

Correspondence with Anglian Water has stated that the onsite 150mm and 225mm sewers will all require a 3m protective easement on either side of the existing sewer for their safety during construction and operation.

4 SOURCES OF FLOOD RISK

4.1 Criteria

In accordance with the NPPF and advice from the EA, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the development (in this case assumed to be 100 years).

Changes to EA climate change guidance in February 2016 and later in July 2021 indicate that increased allowances in peak river flow and rainfall intensity should now be incorporated within any assessment. The appropriate allowance for peak river flow is based on the site's location in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

The flood risk elements that need to be considered for any site are defined in BS 8533 'Assessing and managing flood risk in development Code of practice' (October 2011) as the "Forms of Flooding" and are listed as:

Flooding from rivers (fluvial flood risk);
Flooding from the sea (tidal flood risk);
Flooding from the land;
Flooding from groundwater;
Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject site.

4.2 Flooding from rivers (fluvial flood risk)

The EA Flood Zone mapping study for England and Wales is available on their website at: https://flood-map-for-planning.service.gov.uk.

The latest EA published flood zone map (**Figure 4.1**) shows that the site lies within Flood Zone 1, representing a less than 1 in 1,000 annual probability of flooding from fluvial sources.

A Product 4 data request has been made to the the EA, and their response has confirmed that the site is outside the areas of their flood zone models (**Appendix E**). The model data indicates that the site falls outside of the 1 in 1,000 year flood extent, confirming the sites location within Flood Zone 1. The area does not benefit from any formal fluvial flood defences managed or owned by the EA.

The Ordinary Watercourse that issues in The Moors does not have any modelled fluvial floodplains associated with it due to the limited upstream catchment size. The surface water flood maps (see Section 4.4 below) are often considered a good indication of the likely worse case fluvial flood extents associated with smaller watercourses, and these indicate that the areas that could be affected by out of bank flow from the watercourse are located within The Moors area and in the western area of the site that was observed as waterlogged during the site walkover.

Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks. Climate change guidance for river modelling was updated by the EA in February 2016. No model re-runs have been undertaken as part of this site-specific FRA, and the supplied flood zones are therefore considered to represent the best available and up-to-date data when considering the flood risk to the site.

Figure 4.1: Environment Agency 'Flood map for planning'

The Essex SFRA [Ref. 4] specifies that new development should be directed to sites with lower flood risk, which is generally towards the adjacent zone of lower probability of flooding. Given that the site lies in Flood Zone 1 and the development area is located upslope from the Ordinary Watercourse, the impact upon the site should be negligible and no further analysis of fluvial flood risk is required.

The overall risk of fluvial flooding is considered to be **very low**.

4.3 Flooding from the sea (tidal flood risk)

The site is not considered to be at risk from tidal flooding due to its inland location.

4.4 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised flooding before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water flows from the site are believed to drain naturally to the local water features via overland flow.

The EA's surface water flood map (see **Figure 4.2**) highlights the course of the unnamed watercourse as a moderate to high-risk surface water overland flow path running northwest to southeast through the western site area. There is also a larger area of high

risk at the point where the watercourse is culverted under the Flitch Way. It also appears that some bands of low-risk surface water runoff cross some of the western areas of the site, these are likely to correspond to slight topographic low points within the site and any development in this area can be mitigated by careful drainage design.

Station Road also acts as a flow path that intercepts overland flows from the north-east and diverts these around the northeast and eastern site boundary.

Figure 4.2: Environment Agency 'Flood risk from surface water' map

The Essex Strategic Flood Risk Assessment (SFRA) (2019) [Ref. 4] states that surface water flooding is shown to correlate with small watercourses and urban areas throughout the county. Little Dunmow is not considered a surface water flood risk priority.

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. This could lead to an increased risk of flooding but is unlikely to significantly increase the risk to the subject site, and particularly to the proposed development.

The area of the site for development has an overall risk of surface water flooding typically considered to be **very low**.

4.5 Flooding from groundwater

Groundwater flooding tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels and in some instances to the surface. This can result in flooding, particularly of low-lying areas or basement levels.

Available geological mapping indicates that the majority of the site is underlain by the London Clay Formation, which is of very low permeability. The more permeable overlying superficial Diamicton deposits represent a Secondary (Undifferentiated) aquifer but are still unlikely to yield significant quantities of groundwater. It possible that perched water

tables may form as a result of more permeable superficial deposits overlying the London Clay.

The Essex SFRA [Ref. 4] states that the risk of groundwater flooding is dependent on local geological/soil conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when effective rainfall is low, and extractions are higher. In very wet winters, rising groundwater levels may lead to the flooding of normally dry land, as well as reactivating flow in streams that only flow for part of the year.

The development does not currently include proposals to lower ground levels, but some perched/shallow groundwater may be encountered during construction and excavation.

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. However, the change in flood risk is likely to be low, and no significant resulting risk is anticipated for the proposed development.

The overall groundwater flood risk is considered to be **low**.

4.6 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption [Ref. 5]. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition, a 1 in 100 year event could exceed the capacity of the surrounding sewer network as well as any proposed drainage system. When exceeded, the surcharged pipe work could lead to flooding from backed up manholes and gully connections.

Given the presence of two small diameter foul public sewers crossing the site this could lead to immediate foul water flooding within highways and parking areas within the site. Flows would most likely follow the existing ground levels and flow through the site towards the Moors watercourse. The development will be designed to ensure that any surcharging of the onsite foul sewer that runs through the development will be diverted away from the properties.

Climate change is likely to result in increased rainfall and therefore more frequent flooding from sewers. However, this would not be significant in terms of the proposed development.

The overall sewer flood risk is considered to be **low**.

4.7 Other sources of flooding

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures. These flooding sources are considered below.

4.7.1 Reservoirs

The EA reservoir flood map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

According to the EA Reservoir flood maps the site is not at risk of flooding from reservoirs.

Reservoir flooding is also extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then, reservoir safety legislation has been introduced to ensure reservoirs are maintained.

Figure 4.3: Environment Agency 'Flood risk from reservoirs map

The overall risk of reservoir flooding is considered to be **very low**.

4.7.2 Canals

No canals are in sufficient proximity to influence the site.

4.7.3 Other artificial features

No other artificial features with the potential to result in a flood risk to the site have been identified. The onsite ordinary watercourse has been assessed as part of fluvial/pluvial flood risk. The downstream culvert conveying the watercourse underneath the Flitch Way has not been accessed for a detailed inspection (of both size and condition), however, observations during the walkover indicate that the invert level of this culvert is some distance below the Flitch Way and therefore any blockage of this culvert would create localised back up of flows, but would be unlikely to extend beyond The Moors area and not affect the developable site area.

5 MITIGATION MEASURES AND RESIDUAL RISK

5.1 Overview

As all proposed development is to be located in Flood Zone 1, no additional mitigation is required for protection against fluvial flooding. However, controls on surface water runoff to ensure that offsite flood risk is not increased will be implemented as described in Section 7.

5.2 Overland flood flow

No further overland flow control measures are proposed as all surface water runoff up to the 1 in 100 year (plus 40% climate change) storm event will be stored on site and discharged via infiltration into the ground/ or to the nearby watercourses. Surface flows may be generated due to drainage capacity exceedance, which can be conveyed into the SuDS features via surface flows along the new roads.

5.3 Finished floor levels

Given the residual potential for some localised surface water overland flow passing through the site, it is recommended that proposed finished floor levels (FFLs) are 150mm above the site access roads which will act as exceedance flow routes.

5.4 Environmental Permit/Ordinary watercourse easement and consents

Under the Water Resources Act 1991 (Ref. 6) and associated byelaws, works in, over, under or adjacent to main rivers require the consent of the EA and works in, over, under or adjacent to ordinary watercourses will require IDB, Local Authority or LLFA consent. This is to ensure that they neither interfere with the IDB/EA/LPA/LLFA's work nor adversely affect the environment, fisheries, wildlife and flood defence in the locality.

Due to the presence of an Ordinary Watercourse within the site boundary, it is likely that the LLFA will require consent for any works within the proximity of this watercourse and may also require specific easements for these watercourses. Usually an 8m easement is required that is kept free from development. The illustrative masterplan ensures that there is no development proposed within this zone. The only structure that will require LLFA consent would be the proposed surface water outfall from the site that connects into the Ordinary Watercourse.

5.5 Flood compensation

The site is shown to be outside the 1 in 100 year climate change floodplain so floodplain compensatory measures are not deemed necessary.

5.6 Safe access/egress

As the development area of the site lies outside of the 1 in 100 year plus climate change flood extent, safe access and egress will be available up to this storm event.

5.7 Flood resistance and resilience measures

As the development area of the site is lies outside of the 1 in 100 year plus climate change flood extent, flood resistant and resilience measures are not considered necessary.

5.8 Flood Management Plan

As the development area of the site is lies outside of the 1 in 100 year plus climate change flood extent, a Flood Management Plan is not considered necessary.

6 PLANNING POLICY CONTEXT

6.1 Land use vulnerability

Table 3 of the PPG indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. Table 6.1 below is reproduced from Table 3 of PPG.

Table 6.1: Flood risk vulnerability and flood zone 'compatibility' (extracted from PPG)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to Table 2 of the PPG, the proposed development, based on its residential use, is classed as 'More Vulnerable'. These classifications of development are appropriate for areas within Flood Zone 1 and therefore appropriate for the subject site.

6.2 Sequential Test

The Sequential Test is required to assess flood risk and the PPG recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

The site is located within Flood Zone 1 and passes the Sequential Test; therefore there is no requirement for the Exception Test to be satisfied.

6.3 Exception Test

In accordance with Table 6.1, there is no requirement to apply the Exception Test for a 'more vulnerable' development within Flood Zone 1.

7 SURFACE WATER DRAINAGE

7.1 Scope

As the site is greater than 1ha in size, the LLFA requires such development to focus on the management of surface water run-off. This section discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere within the catchment, as well as the type of potential SuDS features that could be incorporated as part of the masterplan.

The use of SuDS is also encouraged by local policy, as indicated within the SFRA (Ref. 4), LFRMP (Ref. 7) and supporting Sustainable Design and Construction Supplementary Planning Guidance (Ref. 8). Additionally, and in accordance with the Defra Non-Statutory Technical Standards (Ref. 9), the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to greenfield rates. Where a reduction to the greenfield rate is not practicable, the proposed surface water drainage strategy should not exceed the existing runoff rate. The strategy should also account for a 10% allowance for urban creep increasing the proposed impermeable areas over time.

In addition, Building Regulations Part H (Ref. 10) requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined). Infiltration techniques should therefore be applied wherever they are appropriate.

7.2 Pre-development situation

The existing site area is 13.8ha in size and 100% permeable. Both the current site area and the proposed development area (approximately 6.16ha) have been used to calculate the existing greenfield runoff rate, using the pro-rata IoH 124 method (Ref. 11). Calculations are contained in **Appendix F**.

Table 7.1: IOH 124 surface water runoff (greenfield)

Return period	Total Site Area (13.8ha)	Development Area (6.16ha)
	Peak flow (l/s)	Peak flow (l/s)
Q_{BAR}	31.94	14.26
1 in 1 year	27.15	**12.12**
1 in 30 year	73.47	32.79
1 in 100 year	101.90	45.48

7.3 Discharge options and limits

Building Regulations Part H[Ref. 10] requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined).

7.3.1 Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed site. The effectiveness of infiltration is completely dependent on the physical conditions at the site.

Infiltration is not considered a viable option for this site. Potential obstacles include:

Local variations in permeability preventing infiltration – Although some of the overlying superficial geology in the south-eastern site area would potentially be considered suitable for infiltration, the underlying London Clay bedrock restricts this potential and could lead to a perched water table.

Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H2 states that these “should not be built in ground where the water table reaches the bottom of the device at any time of the year”; and;

Source Protection Zones - The site is located within an Outer Zone III Groundwater Source Protection Zone.

7.3.2 Discharge to watercourse

Since the site naturally drains downslope to the south towards the Ordinary Watercourse within The Moors it is proposed to attenuate the majority of the sites drainage via an on-site system before discharging directly to the watercourse.

7.3.3 Discharge to surface water sewer

Discharge to surface water sewer is not considered feasible due to the lack of surface water sewers near the site.

7.3.4 Outfall Rate Restrictions

The Essex SuDS Design Guide [Ref. 12] states that for greenfield sites the LLFA require runoff to be restricted to the 1 in 1-year greenfield rate for all events up to and including the 1 in 100yr rainfall event with climate change. With this regulation the sites outfall rate will be restricted to 12.12 l/s.

7.4 Storage Estimates

The proposed development will increase the sites impermeable area and therefore will increase surface water runoff directly. Therefore, it will be necessary to manage surface water on-site in order to limit the discharge of surface water to the agreed rate (as above). In order to provide this betterment, sufficient on-site attenuation up to the 1 in 100 year climate change rainfall event will be required.

To determine the approximate volume of attenuation storage that would be required, the WinDes 'Quick Storage' calculation has been used. These volumes can be later revised at detail design stage by the introduction of specific flow control methods.

Calculations have been run using a discharge rate of 12.1 l/s and an assumed impermeable area of 4.06ha. No allowance is included in the calculations for infiltration. Calculations can be found in **Appendix G**.

Table 7.2: Quick storage estimates

Return period	Quick Storage volume (m^3)	
	Minimum	Maximum
1 in 30 year	1324	1843
1 in 100 year	1833	2466
1 in 100 year + 40% CC	2796	3733

The maximum storage required on-site to accommodate the 1 in 100 year plus 40% climate change rainfall event is approximately **3773m^3**.

7.5 Proposed drainage strategy

7.5.1 Surface Water and Attenuation

The proposed attenuation for the site will be provided by an on-site attenuation basin supported by a network of conveyance swales. Although not shown at this illustrative layout stage, it is also recommended that permeable paving be incorporated to non-adopted a roads and parking areas in accordance with the recommendations of the LLFA. The proposed features are designed to provide approximately 3900m^3 of storage. This is in excess of the 3773m^3 required storage volume to retain the 1 in 100 plus 40% climate change event. Design calculations are included in **Appendix H**. The SuDS measures are outlined in the Indicative Surface Water Strategy, attached in **Appendix I**.

The dimensions, volumes and location of the SuDS features will need to be revised as the masterplan develops and during the detailed planning stage. Detailed design of individual features is not part of the scope of this report. Preliminary design criteria have been based upon guidance given in the CIRIA publication 'The SUDS Manual' (Ref. 12).

Temporary drainage should be established for the construction phase of development to prevent silt mobilisation, potentially impacting on flow regimes and silt pollution downstream. The construction of SuDS should be considered in the early stages of site design.

7.5.2 Foul Water Outfall

The proposed foul drainage can make a direct connection to the existing public foul sewers that runs through the site. An enquiry has been received from Anglian Water (see **Appendix D**) in order to determine the capacity of the existing system and any necessary upgrades to the system.

According to the received report the nearest practicable foul connection is to the 150mm diameter sewer at manhole ref. 1301. Anglian Water has assessed the impact of gravity flows from the planned development to the public foul sewerage network and has confirmed that the foul sewerage system currently has capacity. A detailed description of

the Foul Water Strategy is contained in the Preliminary Foul Water and Utilities Assessment (RSK Ref: 890428-R2(00)) dated October 2021.

7.5.3 Adoption and Maintenance

The long term maintenance of the various SuDS features within the site boundary will most likely be undertaken by a management company. Maintenance of SuDS features should be undertaken in line with maintenance schedules outlined in the SuDS Manual (Ref. 13) and if adopted, any maintenance guidance prescribed by the adopting authority.

Full maintenance schedules should be confirmed at the detailed design stage in consultation with the appropriate product suppliers. A preliminary maintenance regime and appropriate techniques is included in **Appendix K**.

7.6 Water Quality

The SUDS Manual (Ref. 13) contains guidance on how to assess water quality, stating *"Determining the hazard posed by the land use activities at a site and the extent to which underlying soil layers and/or proposed treatment components reduce the associated risk can be done using a variety of methods that vary in complexity and data requirements."*

In accordance with Table 4.3 of the SuDS Manual, the proposed development for the site can be summarised with the following pollution hazard levels and management requirements for discharge to the receiving surface water:

Residential roofs – **Very Low** Pollution Hazard – Simple Index Approach; and

Individual property driveways, roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (schools, offices) – **Low** Pollution Hazard – Simple Index Approach.

It is therefore considered appropriate to use the Simple Index Approach for the purpose of this assessment.

Table 26.1 of the SUDS Manual indicates that for the Simple Index Approach:

Simple pollution hazard indices should be based on land use (e.g., Table 26.2); and

Risk reduction for Surface Water should be done using Simple SuDS hazard mitigation indices (e.g., Table 26.3)

Extracts of Tables 26.2 and 26.3 are replicated below, highlighting the relevant features applicable to this site:

Table 7.3: Extract of SuDS Manual Table 26.2: Pollution hazard indices for different land use classifications

Land use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	**Very Low**	0.2	0.2	0.05
Individual property driveways, roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (schools, offices)	**Low**	0.5	0.4	0.4

Table 7.4: Extract of Table 26.3: Indicative SuDS mitigation indices for discharges to surface waters

Land use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Swale	0.6	0.5	0.5
Detention basin	0.5	0.5	0.6

The SuDS Manual States:

Total SuDS mitigation index ≥ pollution hazard index

(for each contaminant type) (for each contaminant type)

These features in isolation provide water quality treatment prior to discharge, however the outline drainage strategy seeks to utilise a number of these treatment trains, thus further reducing the likelihood of any pollutants leaving the site. Subject to condition, a detailed drainage design will form part of a full planning application with the details requiring confirmation from the Local Authority prior to commencement on site.

In conclusion, any one SuDS feature (Table 7.4) is shown to be in excess of the requirement for residential roofs, individual property driveways, roofs, residential car parks, low traffic roads and non-residential car parking with infrequent change (Table 7.3). It should be noted that all surface water runoff will pass through a treatment train of at least two features and therefore the water quality requirements are considered to be met.

8 CONCLUSIONS AND RECOMMENDATIONS

This FRA complies with the NPPF and PPG and demonstrates that flood risk from all sources has been considered in relation to the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

The proposed development site lies in an area designated by the EA as Flood Zone 1, with the annual probability of fluvial flooding classified as less than 1 in 1,000 (<0.1%).

This flood risk assessment has considered multiple sources of flooding and concluded the following:

Table 8.1: Flood risk summary

Source	Level of risk	Description/Mitigation
Fluvial	Very Low	No fluvial floodplains encroach onto the site area.
Tidal	Negligible	Located inland.
Surface water	Typically, very low	Areas of higher risk are mostly located within watercourse channels and site periphery. Development area is classified as very low risk with isolated areas of low risk that can be mitigated by design.
Groundwater	Low	Underlain by Clay and relatively clay rich superficial deposits.
Sewers	Low	Sewer records indicated there are no surface water sewers located within the site boundary and two foul sewers crossing the site.
Reservoirs	Very Low	None required
Artificial sources	Low	None required

The proposals will follow best practice regarding site drainage to ensure that any surface water runoff from the development is managed, ensuring flood risk is not increased elsewhere.

In order to prevent flooding, both on and off the site attenuation and controlled discharge will be utilised to control surface water flows. These features will be designed to store the volume of water associated with a 1 in 100-year rainfall event, plus an additional allowance to account for increased rainfall due to climate change. Offsite flows will be restricted to the 1 in 1 year rate in accordance with LLFA recommendations.

Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds.

9 REFERENCES

1. Communities and Local Government, 'National Planning Policy Framework', 2021.
2. Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', March 2014.

   http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/
3. Environment Agency, 'Guidance: Flood Risk Assessments: Climate Change Allowances'. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, February 2016.
4. AECOM, 'South Essex Level 1 Strategic Flood Risk Assessment', April 2018.
5. WRC, 'Sewers for Adoption' 7th Edition, August 2012.
6. Water Resources Act 1991 - https://www.legislation.gov.uk/ukpga/1991/57/contents
7. CISS, "Local Flood Risk Management Plan", June 2018
8. Sustainable Design and Construction Supplementary Planning Guidance.
9. DEFRA, 'Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems', March 2015.
10. HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'.
11. Institute of Hydrology (IoH), 'Flood Estimation for small catchments - Report 124', 1994
12. Essex Planning Officers Association, 'Essex Design Guide', July 2018.
13. CIRIA, 'The SUDS Manual – C753', 2015.

APPENDIX A
RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Catesby Land and Planning Ltd (the "client") in accordance with the terms of a contract between RSK and the "client" dated December 2020. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer 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.

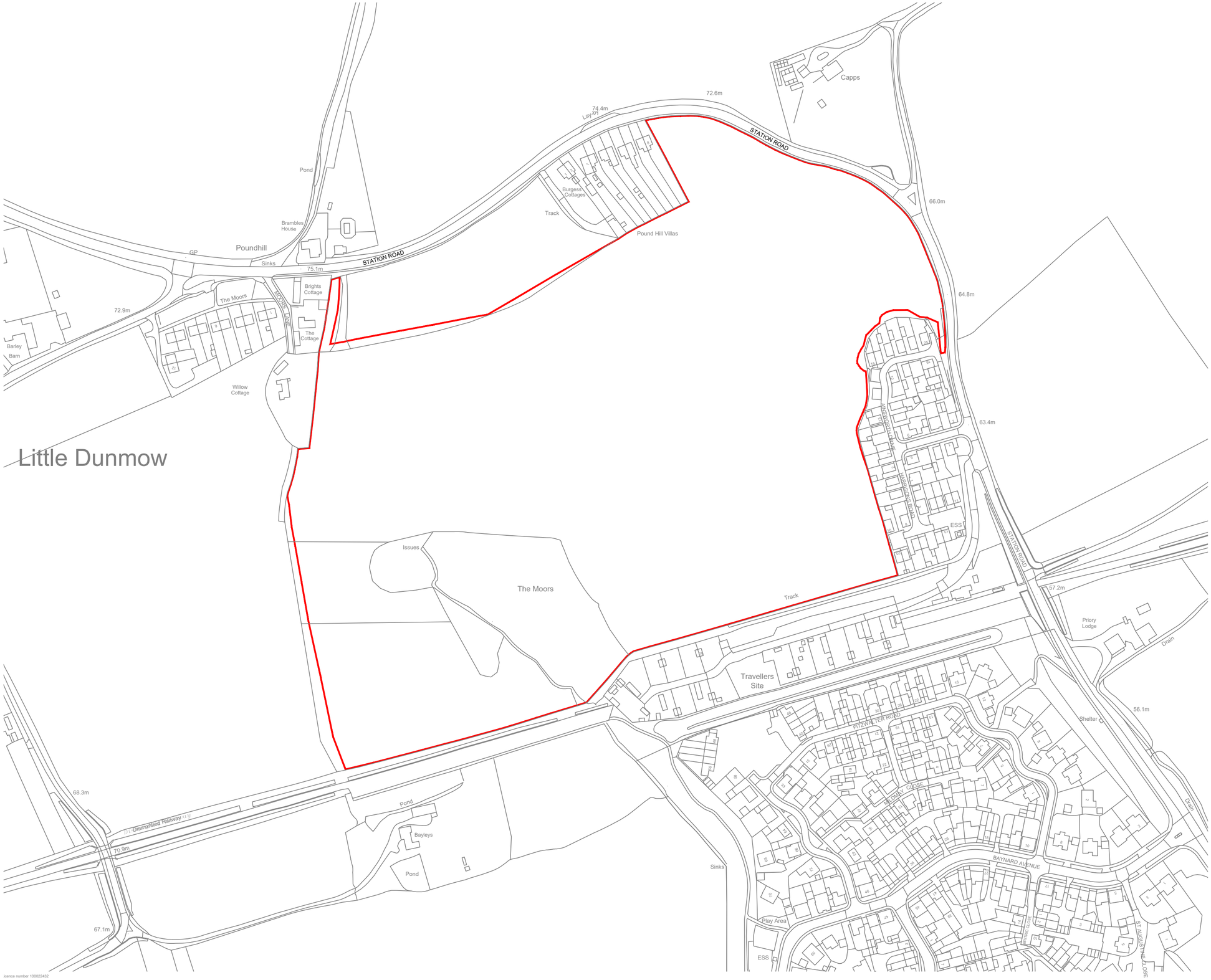
6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between 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, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey 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. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and 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 phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the 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 soil and groundwater conditions, together with the position of any current structures and underground 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 (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
TOPOGRAPHIC SURVEY



Rev:	Date:	Description:	Initial:
-	--/--/----	-	-

Project:

Land off Station Road
Flitch Green, Essex

Drawing:

07 Site Location Plan

Scale:	Drawn:
1:2000 @ A2	LA
Date:	**Checked:**
07/06/21	--

Catesby Estates plc
part of Urban&Civic

Survey Notes

1: This Survey is related OS Grid Base (OSGB36 15).

2: All Levels are related to OS Datum (OSGB36 15).

3: The information Shown on this drawing is surveyed to the accuracy of the base scale shown.

4: Man entry to sewers has not been undertaken. Depths and pipe sizes are measured / estimated from the ground. This should be checked with Local Authority records or on site prior to the commencement of any works.

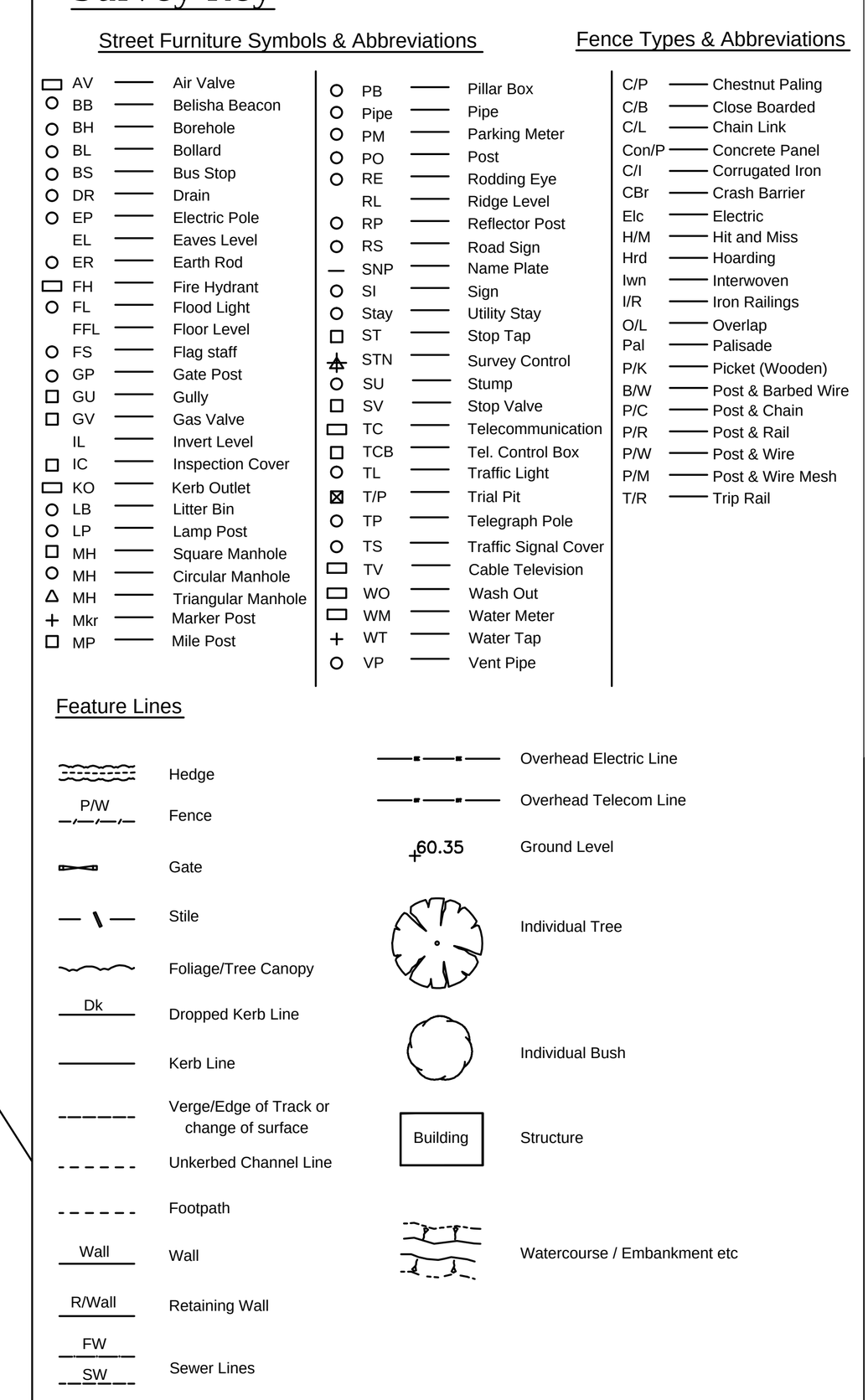
5: Boundaries shown are physical features and may not represent legally conveyed ownership.

6: Some services or features on the ground may be missing due to parked vehicles and other obstructions.

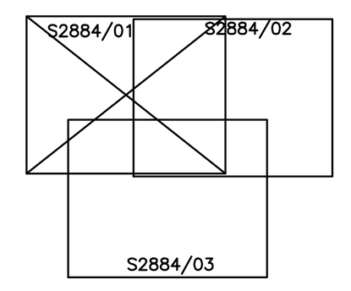
7: Where adjacent buildings have been surveyed remotely all walls may not be shown due to obstructions along lines of sight.

8: This plan should only be used for its original purpose. NJC Surveys LTD accepts no responsibility for this plan if it is supplied to any party other than the original client.

Survey Key



SHEET LAYOUT



SURVEY CONTROL

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FUT2	66118.558	21441.129	3.339
FUT3	66164.062	21270.307	8.096
NJC1	66462.102	1345.853	3.286
NJC2	66442.562	21439.886	6.692
NJC3	66388.537	21531.119	9.379
NJC4	66222.423	21589.782	4.277
NJC5	66173.571	21560.529	4.910
NJC9	66002.592	21468.375	4.920
NJC10	66075.749	21501.320	4.840
NJC21	66016.534	21136.793	7.755
NJC22	66128.995	21155.253	4.683
TB1	66271.118	21583.481	2.623
TB2	66358.053	21548.012	8.818
TB3	66424.386	21526.132	6.697
TB4	66445.666	21453.210	4.965

REV	DATE	DESCRIPTION	BY	APP.

NJC SURVEYS LTD
The Old Police Station,
South Street,
Ashby de la Zouch,
Leicestershire
LE65 1BQ
Telephone ● 01530 414251
Mail ● [redacted]
[redacted] ● [redacted]
[redacted] Surveys ● Building Surveys ● GPS Surveys ● Setting Out
Dimensional Control ● Monitoring Surveys ● Ground Modelling ● Volumetric Calculations

Client

Catesby Estates plc

Project Title

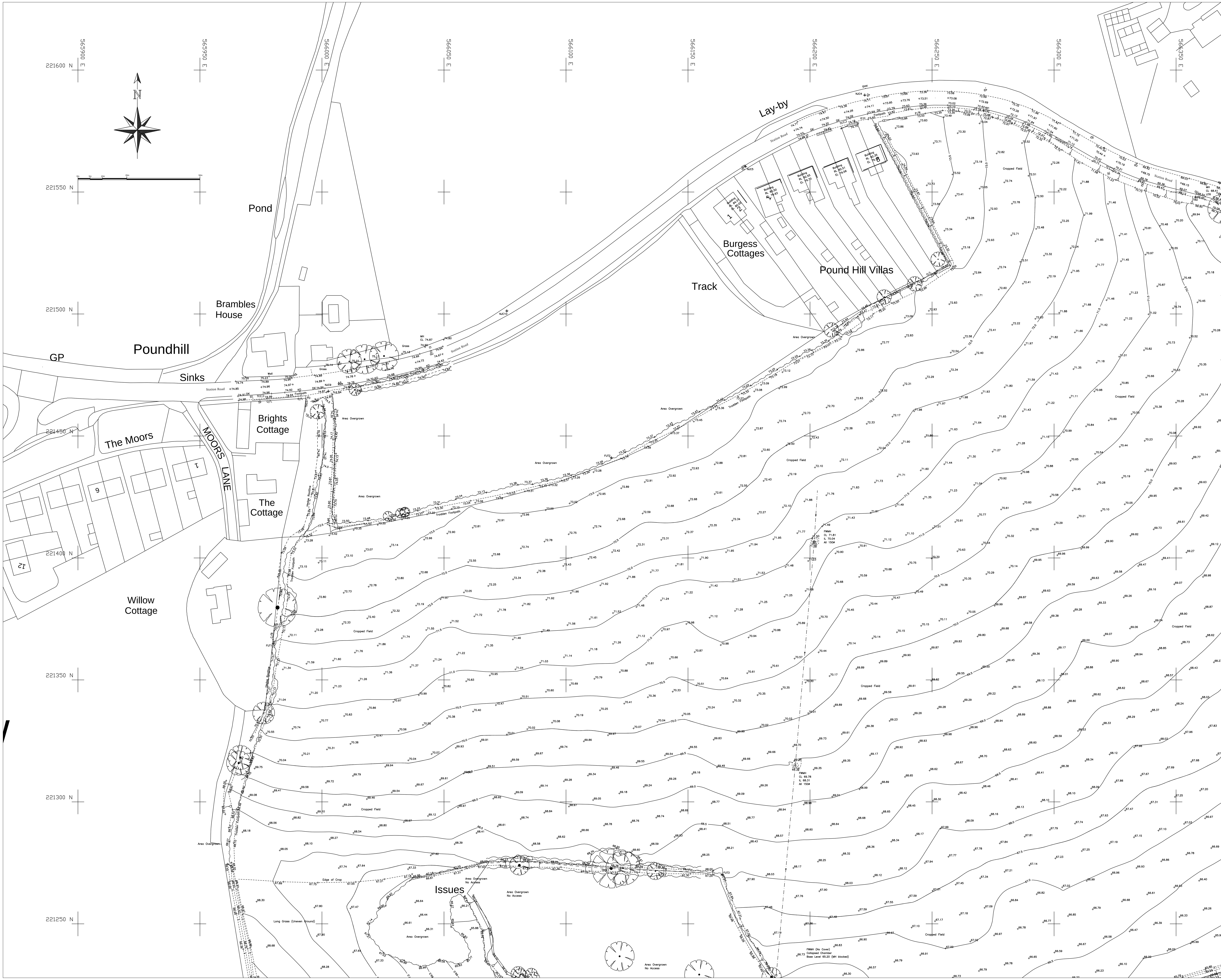
Station Road,
Flitch Green

Drawing Title

Topographical Survey

Drawn	Checked	Authorised
TMB	LD	NJC
Date	**Scale**	**Sheet size**
08/12/2020	1/500	A0

Drg. No.	Revision
S2884/01	



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Survey Key

Street Furniture Symbols & Abbreviations

Fence Types & Abbreviations

Feature Lines

SHEET LAYOUT

S2884/01 S2884/02 S2884/03

SURVEY CONTROL

STN	EASTINGS	NORTHINGS	LEVEL
FUT1	65980.084	21364.914	2.105
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TB4	66445.666	21453.210	4.965

REV	DATE	DESCRIPTION	BY	APP.

njc SURVEYS LTD

The Old Police Station,
South Street,
Ashby de la Zouch,
Leicestershire
LE65 1BQ

Telephone ● 01530 414251

[redacted] Out
Dimensional Control ● Monitoring Surveys ● Ground Modelling ● Volumetric Calculations

Client

Catesby Estates plc

Project Title

Station Road,
Flitch Green

Drawing Title

Topographical Survey

Drawn	Checked	Authorised
TMB	LD	NJC
Date: 08/12/2020	Scale: 1/500	Sheet size: A0

Drg. No. S2884/02

Revision

Survey Notes

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Survey Key

Street Furniture Symbols & Abbreviations

- AV Air Valve
- BB Bolloho Beacon
- BH Borehole
- BL Bollard
- BS Bus Stop
- DR Drain
- EP Electric Pole
- ER Electric Point
- EB Earth Rod
- FH Fire Hydrant
- FL Flood Light
- FFL Floor Level
- FS Flag staff
- GP Gate Post
- GU Gully
- GV Gas Valve
- IL Invert Level
- IC Inspection Cover
- KO Kerb Outlet
- LB Lamp Box
- LP Lamp Post
- MH Square Manhole
- MH Circular Manhole
- MH Triangular Manhole
- MM Marker Post
- MP Mile Post
- PB Pillar Box
- PP Pipe
- PM Parking Meter
- PO Post
- RE Holding Eye
- RL Ridge Level
- RP Reflector Post
- RS Road Sign
- SNP Name Plate
- SP Drain
- SW Safety Way
- ST Stop Tap
- STN Survey Control
- SU Stump
- SV Stop Valve
- TC Telecommunication
- TCB Tel. Control Box
- TL Traffic Light
- TP Tel Pit
- TP Telegraph Pole
- TS Traffic Signal Cover
- TV Cable Television
- WO Wash Out
- WM Water Meter
- WT Water Tap
- VP Vent Pipe

Fence Types & Abbreviations

- CIP Chestnut Paling
- CB Close Boarded
- CL Chain Link
- CONP Concrete Panel
- CR Corrugated Iron
- HED Hedge Planter
- EL Electric
- HM Hit and Miss
- HG Hoarding
- Iwn Interwoven
- IR Iron Railings
- OL Overlap
- Pal Palisade
- PIK Picket (Wooden)
- PWM Post & Barbed Wire
- PWC Post & Chain
- PIR Post & Rail
- PIW Post & Wire
- PIM Post & Wire Mesh
- TIR Trip Rail

Feature Lines

- Hedge
- FNW Fence
- Gate
- Stile
- Foliage/Tree Canopy
- Dk Dropped Kerb Line
- Kerb Line
- Verge/Edge of Track or change of surface
- Unkerbed Channel Line
- Footpath
- Wall
- RWall Retaining Wall
- FW Sewer Lines
- SW
- Overhead Electric Line
- Overhead Telecom Line
- 60.35 Ground Level
- Individual Tree
- Individual Bush
- Building Structure
- Watercourse / Embankment etc

SHEET LAYOUT

SURVEY CONTROL

STN	EASTINGS	NORTHINGS	LEVEL
FUT1	65980.084	21364.914	2.105
FUT2	66118.558	21441.129	3.339
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Dimensional Control • Monitoring Surveys • Ground Modelling • Volumetric Calculations

Client

Catesby Estates plc

Project Title

Station Road,
Flitch Green

Drawing Title

Topographical
Survey

Drawn	Checked	Authorised
TMB	LD	NJC
Date	Scale	Sheet size
08/12/2020	1/500	A0
Drg. No.		Revision
S2884/03		

APPENDIX C
PROPOSED ILLUSTRATIVE SITE LAYOUT

- Site boundary
- Proposed all modes access
- Existing access to Public Right of Way - footpath
- Proposed pedestrian and cycle access
- The Flitch Way / Saffron Trail (offsite)
- Existing Public Right of Way retained
- Existing pedestrian / cycle link to Flitch Green / Little Dunmow
- Proposed on-site footpath / cycle path
- Proposed managed / semi natural open space
- Proposed strategic planting areas
- Existing trees retained
- Proposed trees
- Existing scrub / woodland retained
- Proposed hedges
- Proposed play area with 20m offset to homes
- Proposed surface water attenuation area and swales
- Existing stream retained
- Potential landscape buffer between Flitch Green and Little Dunmow, and between the site and existing homes along Harrisons Road / Ainsworth Drive
- Potential countryside park with new walking routes
- Potential natural play area
- Potential pocket park
- Potential trim trail
- Potential micro allotments
- Potential community orchard
- Potential drainage and ecological area
- Potential new family homes
- Potential office hub

n

1:2500

0 100m

client:
Catesby Land and Planning Ltd

project:
Land at Station Road, Flitch Green

drawing title:
Illustrative Masterplan

job number: **CAT115**
drawing number: **3202A**
scale **1:2500 @ A3**
drawn **JVS / AJ**
date: **November 2021**
status: **Preliminary**

[redacted]

Urban Design Box
UDB

- Site boundary
- Proposed all modes access
- Existing access to Public Right of Way - footpath
- Proposed pedestrian and cycle access
- The Flitch Way / Saffron Trail (offsite)
- Existing Public Right of Way retained
- Existing pedestrian / cycle link to Flitch Green / Little Dunmow
- Existing trees retained
- Existing scrub / woodland retained
- Existing stream retained
- Proposed development area (to include streets, residential development, an office hub and green corridors)
- Proposed public open space (to include drainage attenuation, landscape buffers, countryside park, allotments, community orchard and children's play)
- Proposed landscape buffer (min. 8m along boundaries with adjacent properties, min. 16m along site frontage)
- Proposed green corridors within the development area (exact location and size to be determined at Reserved Matters stage)
- Proposed swale corridors within the development area (exact location and size to be determined at Reserved Matters stage)
- Proposed surface water attenuation area (exact location and size to be determined at Reserved Matters stage)

Total Development Area	**6.16ha**
Total Open Space	**7.80ha**

NB:
The development area illustrated allows for a limited deviation of 5m eitherside of the line, except for when immediately adjoining existing properties, the site frontage and root protection areas for retained trees.

n

1:2500

0 100m

client:
Catesby Land and Planning Ltd

project:
Land at Station Road, Flitch Green

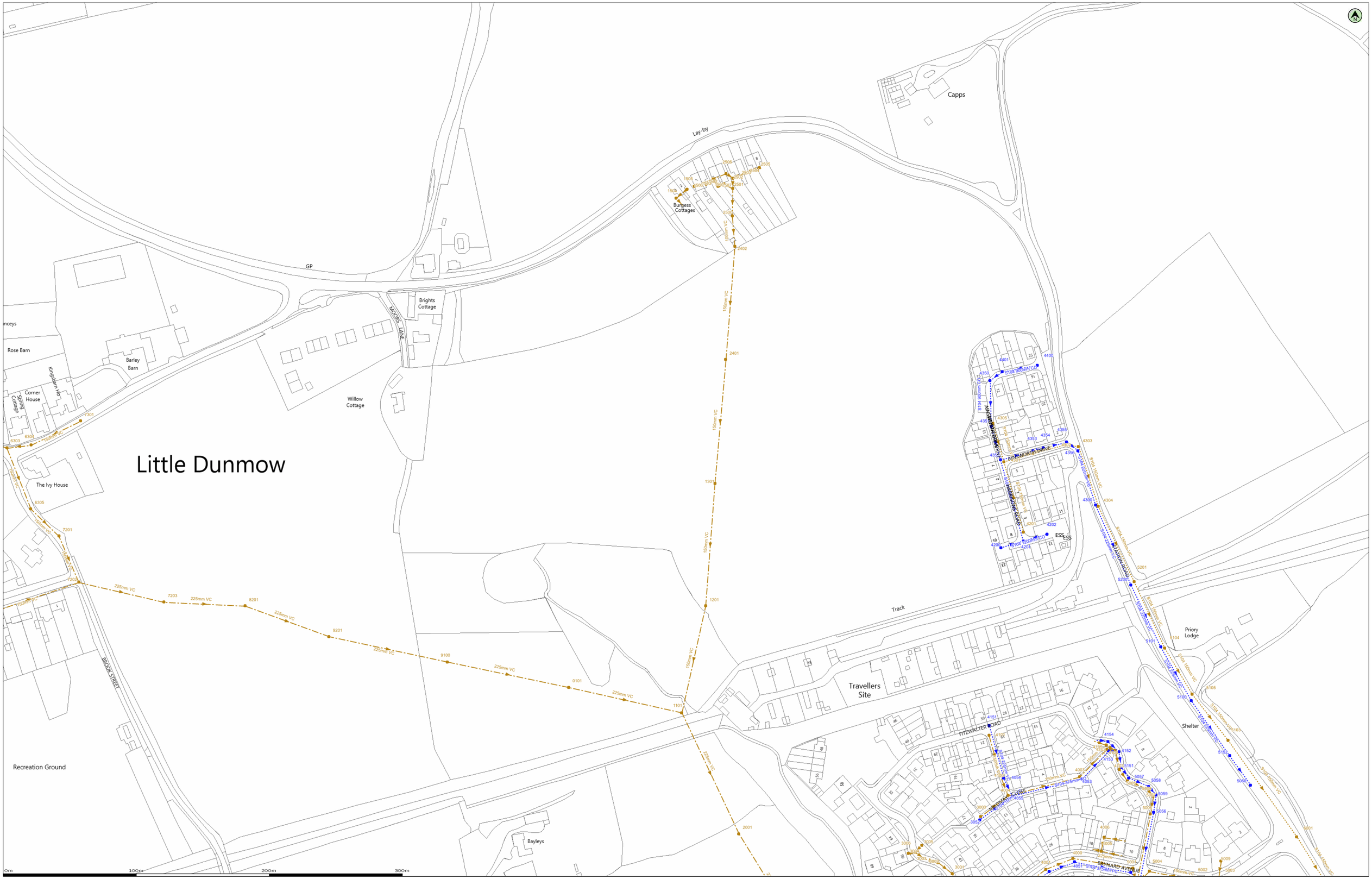
drawing title:
Development Framework Plan

[redacted]

job number:	drawing number:
CAT115	**3501F**
scale	drawn
1:2500 @ A3	**AJ**
date:	status:
November 2021	**Preliminary**

Urban Design Box
UDB

APPENDIX D
ANGLIAN WATER ASSET PLANS AND CORRESPONDENCE



Date: 26/01/21 | Scale: 1:1250 | Map Centre: 566174,221353 | Data updated: 31/12/20 | Our Ref: 487752 - 1 | Wastewater Plan A1

- 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)

cnewlands@rsk.co.uk
Stat Rd, Uttlesford

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
0101	566086	221167	F	66.44	65.12	1.32
1101	566171	221148	F	64.04	61.37	2.67
1201	566189	221228	F	66.82	64.82	2
1301	566196	221320	F	69.74	68.28	1.46
1500	566181	221543	F	-	-	-
1501	566198	221543	F	-	-	-
1502	566196	221547	F	-	-	-
1503	566190	221545	F	-	-	-
1504	566167	221534	F	-	-	-
1505	566175	221541	F	-	-	-
2001	566214	221057	F	61.83	60.18	1.65
2401	566204	221413	F	71.64	69.99	1.65
2402	566211	221498	F	73.73	72.95	0.78
2500	566209	221521	F	-	-	-
2501	566209	221542	F	-	-	-
2502	566209	221549	F	-	-	-
2503	566213	221551	F	-	-	-
2504	566223	221554	F	-	-	-
2505	566230	221557	F	-	-	-
2506	566204	221553	F	-	-	-
2507	566203	221545	F	-	-	-
3000	566396	221070	F	-	-	-
3001	566374	221027	F	-	-	-
3002	566364	221035	F	-	-	-
3003	566353	221038	F	-	-	-
3004	566347	221043	F	-	-	-
3005	566352	221048	F	-	-	-
3006	566341	221042	F	-	-	-
4000	566465	221038	F	-	-	-
4001	566445	221030	F	-	-	-
4003	566470	221100	F	-	-	-
4004	566416	221086	F	-	-	-
4005	566486	221044	F	-	-	-
4006	566488	221054	F	-	-	-
4100	566410	221101	F	-	-	-
4101	566402	221131	F	-	-	-
4102	566490	221120	F	-	-	-
4103	566500	221105	F	-	-	-
4104	566497	221120	F	-	-	-
4105	566490	221123	F	-	-	-
4201	566428	221283	F	-	-	-
4301	566413	221336	F	-	-	-
4302	566459	221349	F	-	-	-
4303	566469	221348	F	-	-	-
4304	566484	221303	F	-	-	-
4305	566405	221365	F	-	-	-
5001	566510	221031	F	-	-	-
5004	566522	221029	F	-	-	-
5005	566506	221097	F	-	-	-
5006	566523	221072	F	-	-	-
5007	566525	221085	F	-	-	-
5008	566520	221091	F	-	-	-
5009	566576	221037	F	-	-	-
5103	566582	221127	F	-	-	-
5104	566534	221196	F	-	-	-
5105	566555	221162	F	-	-	-
5201	566511	221246	F	-	-	-
6001	566633	221055	F	-	-	-
6303	565664	221347	F	73.7	71.96	1.74
6304	565682	221349	F	73.78	72.14	1.64
6305	565682	221301	F	72.21	70.9	1.31
7201	565703	221280	F	71.64	70.18	1.46
7202	565718	221246	F	70.76	68.36	2.4
7203	565782	221231	F	71.86	67.92	3.94
7301	565719	221367	F	74.02	72.6	1.42
8201	565843	221228	F	71.74	67.53	4.21
9100	565995	221186	F	-	-	-
9201	565906	221205	F	70.11	67.07	3.04
3052	566395	221067	S	-	-	-
4051	566466	221036	S	-	-	-
4052	566447	221029	S	-	-	-
4053	566472	221098	S	-	-	-
4054	566413	221099	S	-	-	-
4055	566419	221085	S	-	-	-
4151	566402	221138	S	-	-	-
4152	566499	221119	S	-	-	-
4153	566492	221119	S	-	-	-
4154	566491	221126	S	-	-	-
4200	566411	221272	S	-	-	-
4201	566428	221277	S	-	-	-
4202	566445	221282	S	-	-	-
4300	566482	221304	S	-	-	-
4350	566403	221397	S	-	-	-
4351	566404	221363	S	-	-	-
4352	566411	221338	S	-	-	-
4353	566435	221344	S	-	-	-
4354	566443	221347	S	-	-	-
4355	566460	221351	S	-	-	-
4356	566469	221345	S	-	-	-
4400	566438	221409	S	-	-	-
4401	566412	221404	S	-	-	-
5055	566509	221028	S	-	-	-
5056	566526	221073	S	-	-	-
5057	566507	221099	S	-	-	-
5058	566522	221093	S	-	-	-
5059	566527	221086	S	-	-	-
5060	566598	221094	S	-	-	-
5100	566554	221157	S	-	-	-
5101	566531	221197	S	-	-	-
5151	566501	221107	S	-	-	-
5152	566583	221116	S	-	-	-
5200	566509	221244	S	-	-	-

Pre-Planning Assessment Report

Land off Station Road, Dunmow, Uttlesford

InFlow Reference: PPE-0113780

Assessment Type: Used Water

Report published: 23/02/2021

Thank you for submitting a pre-planning enquiry.

This has been produced for RSK.

Your reference number is **PPE-0113780**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

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Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Dwellings	200

The anticipated residential build rate is:

Year	Y1	Y2	Y3	Y4
Build rate	50	50	50	50

Development type: Greenfield

Planning application status: Unknown

Site grid reference number: TL6620221324

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	225	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	225	3.00 m either side of the centre line
Sewer mains	225	3.00 m either side of the centre line
Sewer mains	225	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from this development is in the catchment of Felsted Water Recycling Centre, which currently does not have capacity to treat the flows from your development site. Anglian Water are obligated to accept the foul flows from your development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer at manhole 1301 on site at National Grid Reference NGR TL 66200 21326. The cover level is 69.74m and the invert level is 68.28m. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

You indicated on the Pre-Planning Application form that a connection to the public surface water sewer network is not required. Therefore a capacity assessment has not been made on the public surface water network.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

As the proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an infrastructure charge for each new property connecting to the public sewer that benefits from Full planning permission.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the public sewer.

Infrastructure charge for water recycling:	**£ 570.00**

The Water Recyling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 570.00	200	£ 114000

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non- household premises, the fixed element is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge.

Details of the relevant multiplier for each fitting can be found at our website.

It has been assumed that the onsite used water network will be provided under Section 104 of the Water Industry Act

It is recommended that you also budget for connection costs.

Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 4 - Map of Proposed Connection Points

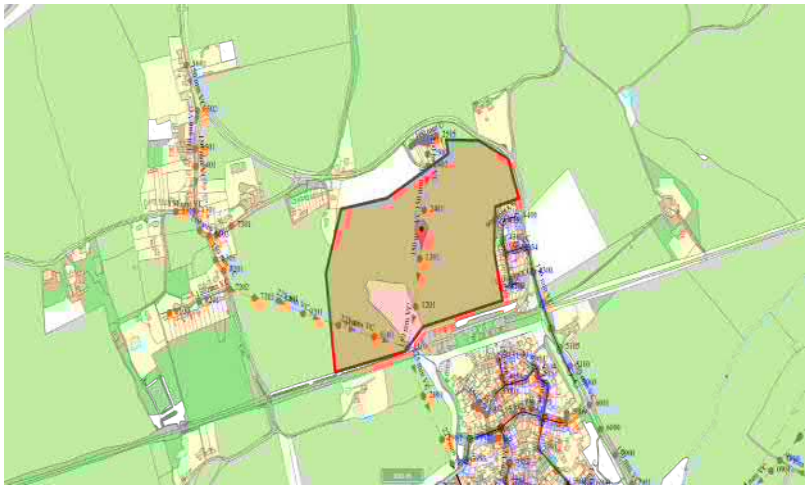


Figure 1:Showing your used water point of connection

Section 5 - Useful information

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

Inflow reference: PPE-0113780 **Used Water Connection Point: to the 150mm diameter sewer at manhole 1301 on Site**

Potable Water
Raw Water
Decommissioned Water
Fitting
Hydrant
Please note: Not all fittings are shown on the map

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

APPENDIX E
ENVIRONMENT AGENCY CORRESPONDENCE

Flood Zone 3 Factsheet

East Anglia (East)

Oct 2017 - v.6

This factsheet provides information to assist with the preparation of a Flood Risk Assessment (FRA) in support of development proposals reviewed by the East Anglia (East) teams, based at Ipswich. It should be read alongside the Environment Agency's general FRA advice (FRA Guidance note 3). For information relating to proposals managed by East Anglia (West) teams based at Brampton, please contact: planning.brampton@environment-agency.gov.uk.

This factsheet covers issues relating to FRAs only and does not address other matters we may take into account when considering development proposals (e.g. proximity to a watercourse, contaminated land, Water Framework Directive and biodiversity requirements). For further information on those issues, please contact: planning.ipswich@environment-agency.gov.uk

Sequential Test and Exception Test

The Local Planning Authority (LPA) will need to be satisfied that the proposed development passes the flood risk Sequential Test, and if applicable, the first part of the Exception Test, in line with requirements of the National Planning Policy Framework (NPPF). We therefore strongly suggest you speak to them prior to commencing work on an FRA. Information regarding the aim of the Sequential Test, applying the Sequential Test and the Exception Test can all be found in the Practice Guide supporting the NPPF.

Inappropriate development

Table 2 of the Practice Guide categorizes developments according to their vulnerability and table 3 sets out which vulnerabilities are inappropriate in Flood Zone 3. You should be aware that we are likely to object in principle where it is indicated that a development is not compatible in Flood Zone 3. Please note that Flood Zone 3b is defined by the Local Planning Authority's Strategic Flood Risk Assessment, or by the 5% (1 in 20 year) modelled flood outlines and levels held by the Environment Agency.

More detail on what should be in the FRA (additional to that highlighted in Guidance Note 3):

The FRA should assess all sources of flooding and provide sufficient information on the characteristics of flooding at the site, such as frequency, depth, velocity, speed of onset, and duration. As a minimum the FRA needs to assess the flood risk on site by comparing our modelled flood levels with a GPS verified topographical survey of the site to determine the anticipated flood depths during the 5% (1 in 20), 1% / 0.5% (1 in 100 / 200) (design) and 0.1% (1 in 1000) (extreme) events including allowances for climate change. Climate change allowances can be found on our website. If the area is protected by defences then the FRA should consider both the actual flood risk to the site through overtopping of the defences, and the residual risk posed by the defences being breached.

- **Sequential approach on site**

If the site contains a range of Flood Zones, the sequential approach should be applied within the site to direct development to the areas of lowest flood risk. If it isn't possible to locate all development in Flood Zone 1, then the most vulnerable elements should be located in the lowest risk parts of the site.

- **Finished Floor Levels**

Proposals for 'more vulnerable' development should include floor levels set no lower than 300 mm above the level of any flooding that would occur if defences were overtopped in a 1% / 0.5% flood event (including allowances for climate change). Safe refuge should also be provided above the 0.1% undefended/breach flood level (including allowances for climate change). We are likely to raise an objection where these requirements are not achieved.

We recommend 'less vulnerable' development also meets this requirement to minimize disruption and costs in a flood event. If this is not achievable then it is recommended that a place of refuge is provided above the 0.1% flood level (including allowances for climate change). Where safety is reliant on refuge it is important that the building is structurally resilient to withstand the pressures and forces (hydrostatic & hydrodynamic) associated with flood water. The LPA may need to receive supporting information and calculations to provide certainty that the buildings will be constructed to withstand these water pressures.

- **Safe Access**

During a flood, the journey to safe, dry areas completely outside the extent of a 1% / 0.5% flood event (including allowances for climate change), should not involve crossing areas of potentially fast flowing water. Those venturing out on foot in areas where flooding exceeds 100 millimetres or so would be at risk from a wide range of hazards, including, for example unmarked drops, or access chambers where the cover has been swept away. Safe access and egress routes should be assessed in accordance with the guidance document 'FD2320 (Flood Risk Assessment Guidance for New Developments)'.

- **Emergency Flood Plan**

Where safe access cannot be achieved, or if the development would be at actual flood risk or residual risk of flooding in a breach, an emergency flood plan must be provided. The plan should deal with matters of evacuation and refuge, and should demonstrate that people will not be exposed to flood hazards. The emergency flood plan should be submitted as part of the FRA and will need to be agreed with the Local Planning Authority.

- **Flood Resilience / Resistance Measures**

To minimize the disruption and cost implications of a flood event we encourage development to incorporate flood resilience/resistance measures up to the extreme 0.1% climate change flood level.
Information on preparing property for flooding can be found in the documents 'Improving the Flood performance of new buildings' and 'Prepare your property for flooding'.

- **Betterment**

Every effort should be made by the applicant to improve the flood risk to the local area, especially if there are known flooding issues. Opportunities should also be taken to provide environmental enhancements as part of the design, for example naturalizing any rivers on the site with a buffer zone on both sides.

- **Increases in Built Footprint (excluding open coast situations)**

It will need to be shown that any increase in built footprint within the extent of a 1% flood event (including allowances for climate change), can be directly compensated for on a volume-for-volume and level-for-level basis to prevent a loss of floodplain storage. If there are no available areas for compensation above the design flood level and compensation will not be possible, then a calculation of the offsite flood risk impacts will need to be undertaken. If this shows significant offsite impacts then no increases in built footprint will be allowed. Further guidance on the provision of compensatory flood storage is provided in section A3.3.10 of the CIRIA document C624.

Flood Defence Consent

Flood Defence Consents now fall under the Environmental Permitting (England and Wales) Regulations 2010 system (EPR). You may need an environmental permit for flood risk activities if you want to do work in, under, over or within 8 metres of a fluvial river or any flood defence structure or culvert / 16m from a tidal river or any flood defence structure or culvert. New forms and further information can be found at: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits .

Local policies and recommendations

You will need to demonstrate to the Local Planning Authority that the requirements of any local flood risk planning policies have been met and the recommendations of the relevant Strategic Flood Risk Assessment, Shoreline Management Plans and Catchment Flood Management Plans have been considered.

Further Information:

If you require the flooding information we hold for this site then please email our local Customers and Engagement Team: enquiries_eastanglia@environment-agency.gov.uk. For further details on our flood map products please visit our website at: www.environment-agency.gov.uk/research/planning/93498.aspx.

creating a better place

Environment Agency

Our ref: EAn/2021/203001
Date: 02 February 2021

Dear Ben,

Enquiry regarding Product 4 for Land at Little Dunmow.

Thank you for your enquiry which was received on 21 January 2021.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please note that we have recently changed our process for responding to modelled data requests, please read the information within this letter for further details.

Your request for a Product 4 falls under the exemption in provision 6(1)(a) and (b) of the Environmental Information Regulations 2004 (EIR) which states that

'……6.—(1) Where an applicant requests that the information be made available in a particular form or format, a public authority shall make it so available, unless—

(a) it is reasonable for it to make the information available in another form or format; or

(b) the information is already publicly available and easily accessible to the applicant in another form or format……'

On this occasion we are not providing the information in the Product 4 format for the following reasons:

- Complying with the preference would incur a significant cost, which the public authority [The Environment Agency] cannot pass on to the requester;
- Providing shapefiles used to create a Product 4 allows us to make the information available at a lower cost; and
- The impact on the available resources of the public authority [The Environment Agency], of supplying shapefiles used to create a Product 4, is therefore much less.

About the Model used
Model: Chelmer
Date: 2010
Consultant: Halcrow Group Limited

[redacted]

East Anglia Area
Ipswich Office, Iceni House, Cobham Road, Ipswich, Suffolk, IP3 9JD
General Enquiries: 03708 506506
Email: enquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

The shape files we have provided have all the data required used to create a product 4. Therefore site specific data is included, as all levels and flood extent outlines have been provided for the flood risk model nearest to your site. Please use the free software 'QGIS' to open and view the shapefiles and the Quick Map services for base maps. By navigating to your site (e.g. using the site grid reference) you will be able to extract flood risk levels from the model that are relevant to your site.

We are licensing the supplied data to you under the Environment Agency Conditional Licence. You must first check this supporting information, to determine if the conditions of use are suitable for your purposes. If the conditions for use are not suitable for your purposes, this information is not provided with a licence for use, and the data is provided for the right to read only.

Product 4 data is derived from the shapefiles supplied above and the following open data sources;

Flood Zone 3 https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-3
Flood Zone 2 https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-2
Historic Flood Map https://data.gov.uk/dataset/historic-flood-map1

Please note, that the Flood Map for Planning is available to view and export maps for your site at: https://flood-map-for-planning.service.gov.uk/

Please note that our historic flood event maps may not be comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at your location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system)
- overflowing or backing up of sewer or drainage systems which have been overwhelmed
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea.

Areas Benefiting from Flood Defences

Areas benefiting from flood defences are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

Flood Risk Assessment Checklist

If you are planning on using this data within a Flood Risk Assessment, we recommend that you take the time to fill in the attached FRA checklist, and to read the attachments which contain information relevant to the area that interests you.

We would like to stress the importance of filling in the Flood Risk Assessment check list, and providing up-to-date and correct data. The data will be checked against our records when we review the Flood Risk Assessment in our role as statutory consultee.

It is important that you provide a map in section 2 of the FRA checklist (See Appendix A), including the highest and most representative flood levels for your site. We recommend using a number of nodes that provide a fair representation of the modelled data across your site. For example, if it is a small extension (< 250 square metres) then approximately 5-10 nodes would be sufficient. For larger sites, approximately 10 to 20 nodes would be appropriate.

Please contact our Sustainable Places team at planning.ipswich@environment-agency.gov.uk if you have any further enquiries regarding the planning process and Flood Risk Assessments.

If you have any further queries regarding how to use the above data please contact the Partnership and Strategic Overview (PSO) team directly at: PSOENS@environment-agency.gov.uk.

If you have a new enquiry or would like us to review the information we have provided under the Freedom of Information Act 2000 and Environmental Information Regulations 2004 please contact us within two months by email at Enquiries_EastAnglia@environment-agency.gov.uk

Kind Regards

Phoebe Atkins

Flood & Coastal Risk Management Officer

PSO Essex, Norfolk and Suffolk
East Anglia Area

East Anglia Area
Ipswich Office, Iceni House, Cobham Road, Ipswich, Suffolk, IP3 9JD
General Enquiries: 03708 506506
Email: enquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

APPENDIX F
GREENFIELD RUNOFF RATES & RAINFALL DATA

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Benjamin Donoghue
Site name:	Station Road, Finch Green
Site location:	Uttleford

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.

Site Details

Latitude:	51.86595° N
Longitude:	0.41231° E
Reference:	3829749964
Date:	Jan 26 2021 10:12

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 13.8

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	582	582
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	31.94	31.94
1 in 1 year (l/s):	27.15	27.15
1 in 30 years (l/s):	73.47	73.47
1 in 100 year (l/s):	101.9	101.9
1 in 200 years (l/s):	119.47	119.47

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Benjamin Donoghue
Site name:	Flitch Green
Site location:	Little Dunmow

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.

Site Details

Latitude:	51.86588° N
Longitude:	0.41279° E
Reference:	761072623
Date:	Oct 14 2021 16:32

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 6.16

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	582	582
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

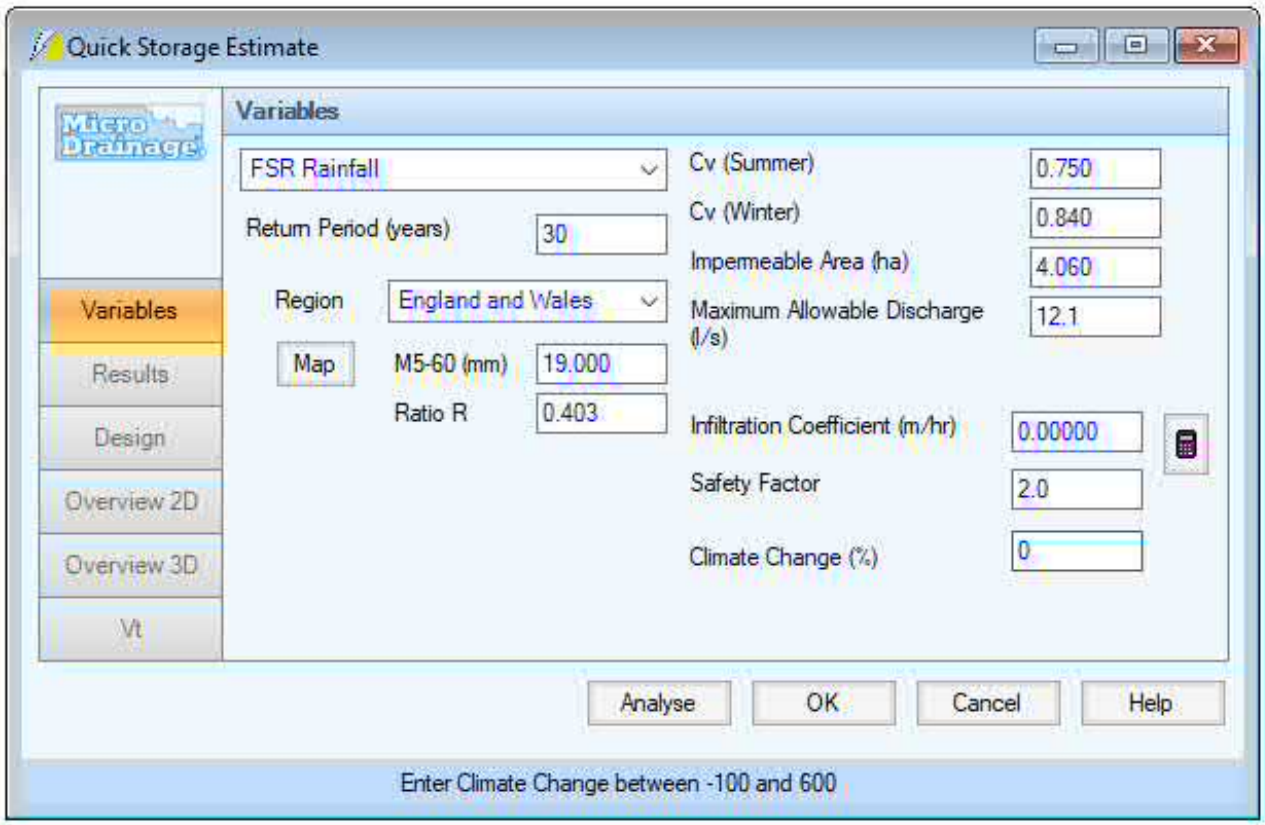
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

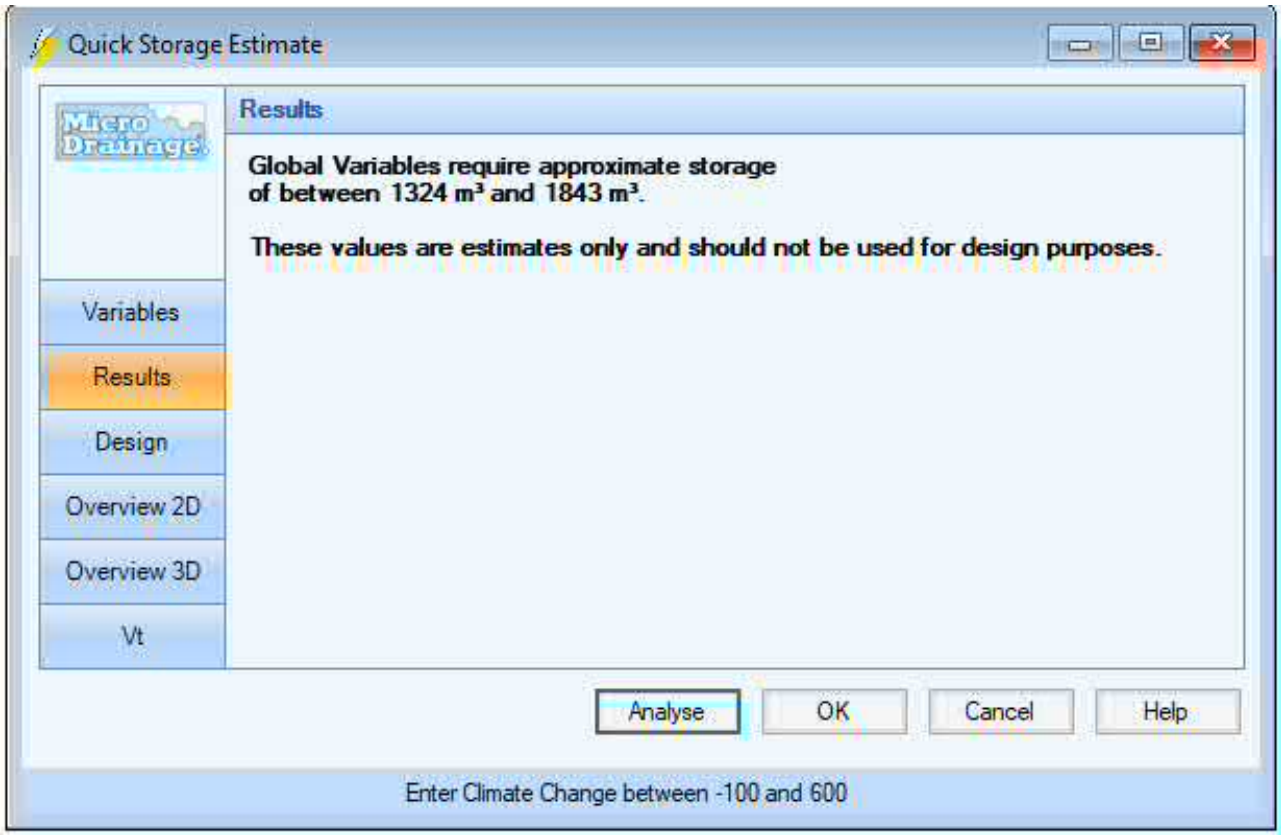
Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	14.26	14.26
1 in 1 year (l/s):	12.12	12.12
1 in 30 years (l/s):	32.79	32.79
1 in 100 year (l/s):	45.48	45.48
1 in 200 years (l/s):	53.33	53.33

APPENDIX G
QUICK STORAGE ESTIMATES

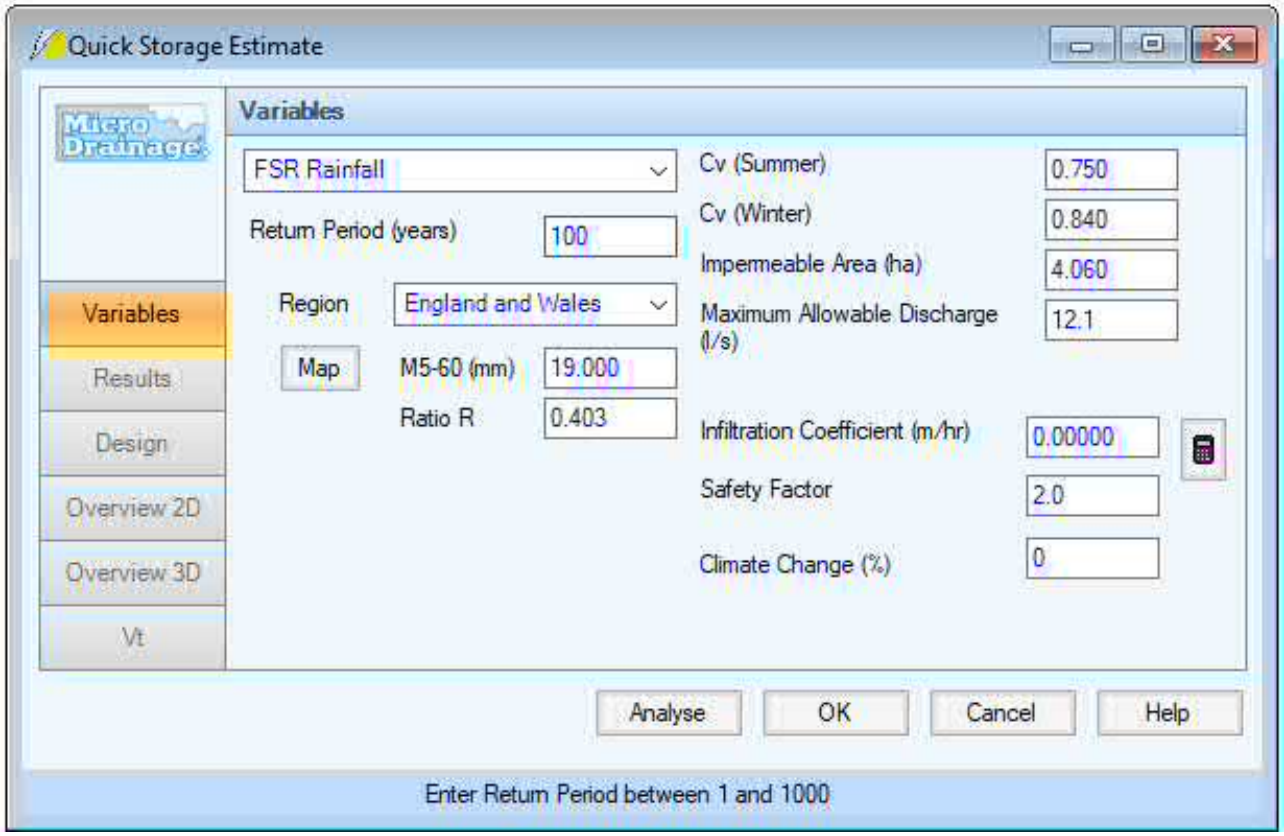
Quick Storage Estimate

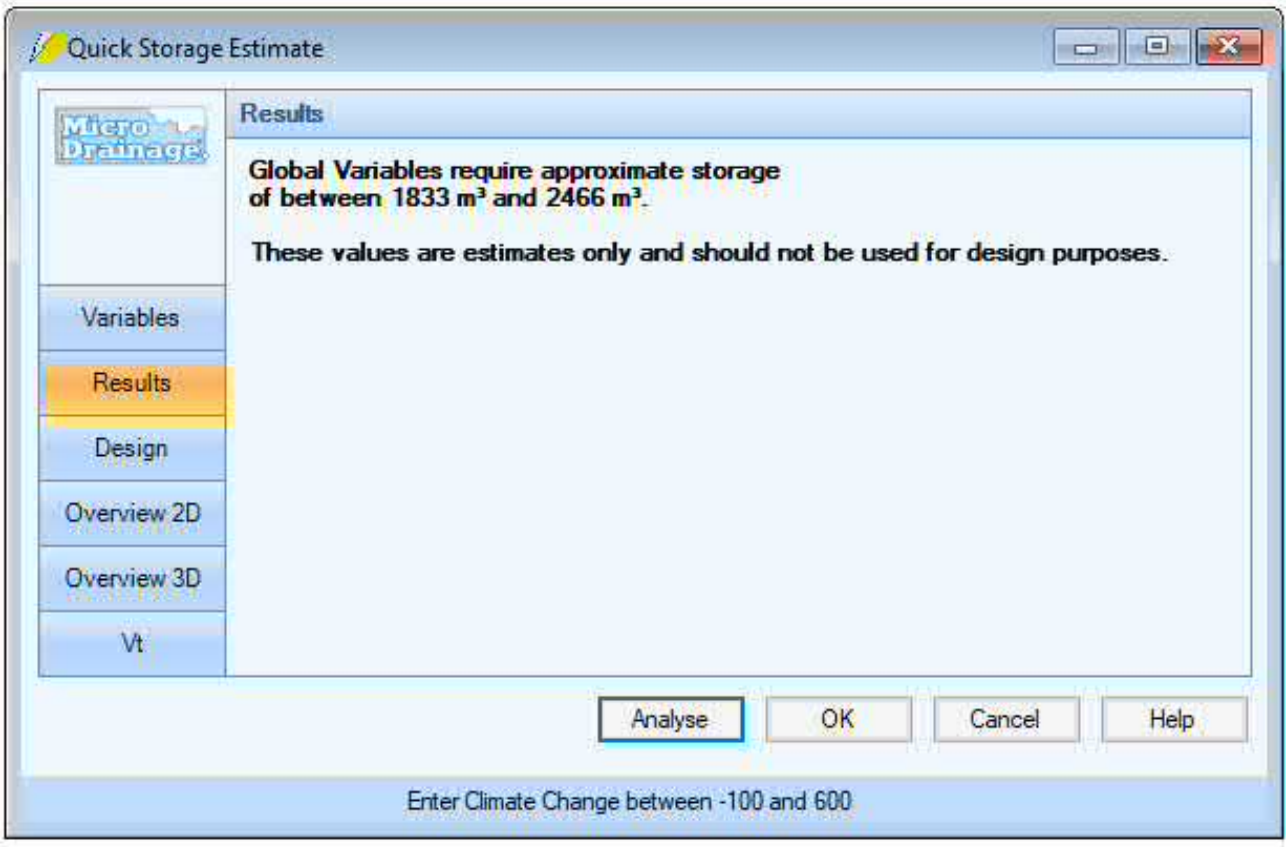
1 in 30yr



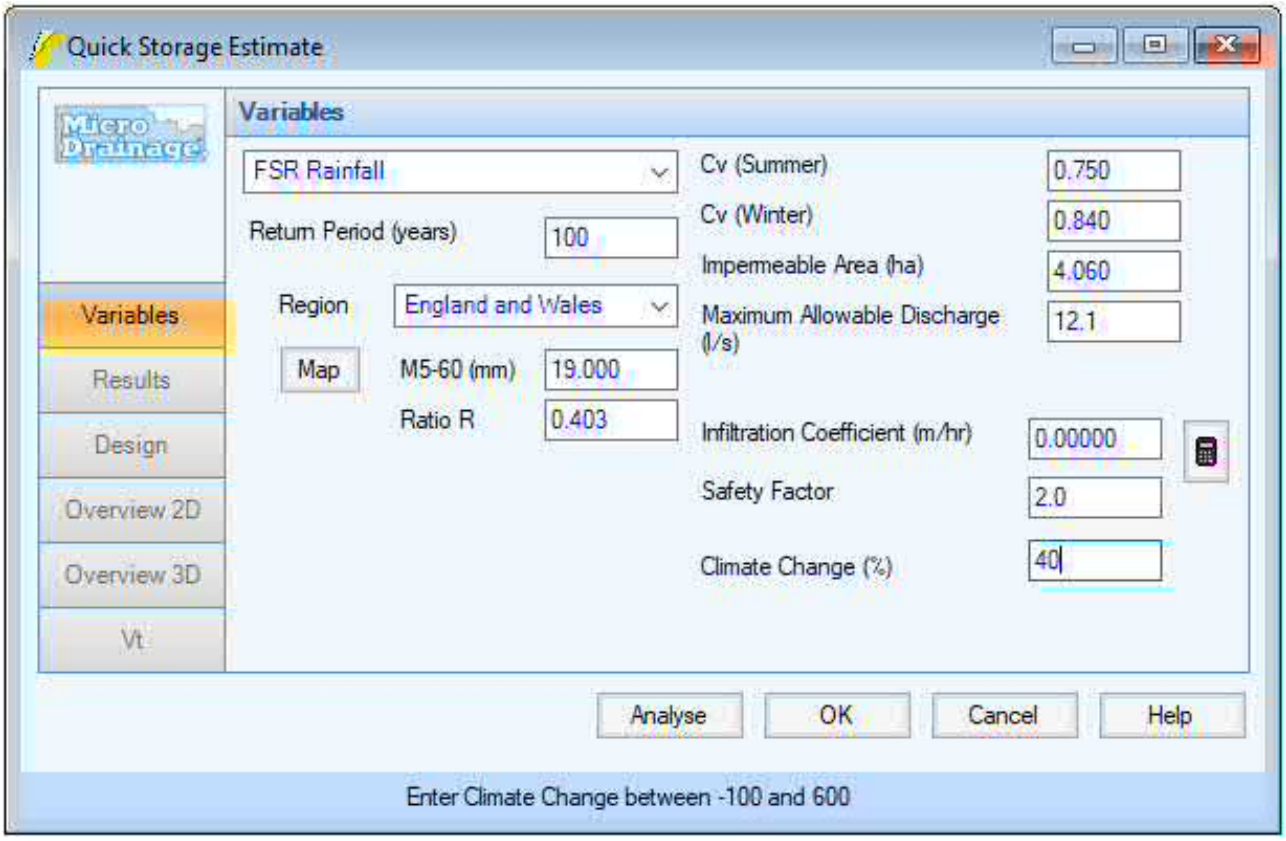


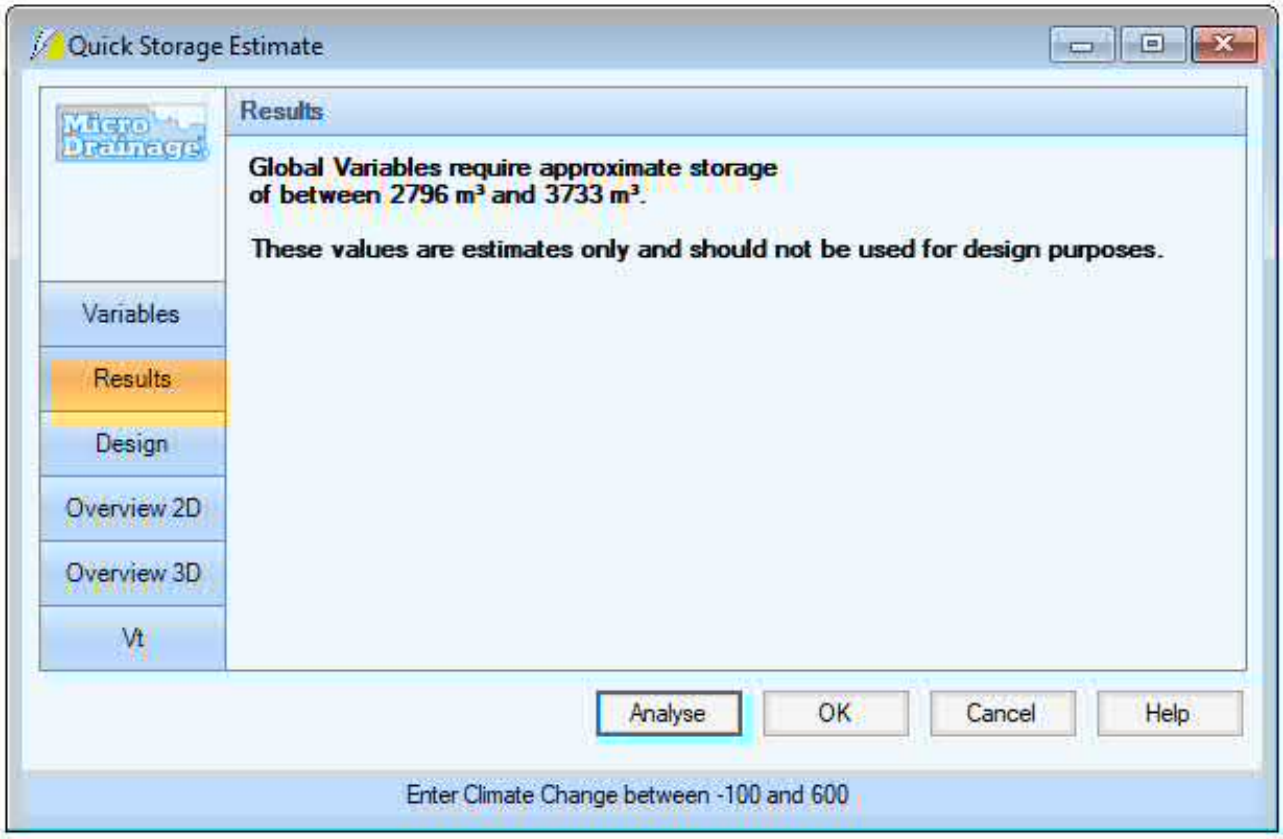
1 in 100yr


Quick Storage Estimate
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.403
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
4.060
Maximum Allowable Discharge (l/s)
12.1
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
0
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Return Period between 1 and 1000


Quick Storage Estimate
Results
Global Variables require approximate storage of between 1833 m³ and 2466 m³.
These values are estimates only and should not be used for design purposes.
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

1 in 100yr (+40% climate change)





APPENDIX H
DESIGN CALCULATIONS

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.421	0.421	29.3	970.9	O K
30 min Summer	0.541	0.541	29.5	1265.4	O K
60 min Summer	0.659	0.659	29.5	1560.7	O K
120 min Summer	0.766	0.766	29.5	1835.0	O K
180 min Summer	0.817	0.817	29.5	1968.7	O K
240 min Summer	0.844	0.844	29.7	2041.4	O K
360 min Summer	0.866	0.866	29.8	2098.0	O K
480 min Summer	0.869	0.869	29.8	2106.9	O K
600 min Summer	0.864	0.864	29.8	2093.5	O K
720 min Summer	0.858	0.858	29.8	2077.5	O K
960 min Summer	0.842	0.842	29.6	2036.1	O K
1440 min Summer	0.803	0.803	29.5	1932.5	O K
2160 min Summer	0.735	0.735	29.5	1755.7	O K
2880 min Summer	0.666	0.666	29.5	1579.1	O K
4320 min Summer	0.540	0.540	29.5	1263.2	O K
5760 min Summer	0.441	0.441	29.4	1019.9	O K
7200 min Summer	0.370	0.370	28.6	849.7	O K
8640 min Summer	0.320	0.320	27.2	730.1	O K
10080 min Summer	0.284	0.284	25.7	644.9	O K
15 min Winter	0.470	0.470	29.5	1089.6	O K
30 min Winter	0.604	0.604	29.5	1421.9	O K
60 min Winter	0.735	0.735	29.5	1755.4	O K
120 min Winter	0.855	0.855	29.7	2068.9	O K
180 min Winter	0.913	0.913	30.2	2224.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	130.939	26
30 min Summer	85.941	41
60 min Summer	53.779	70
120 min Summer	32.554	128
180 min Summer	23.966	186
240 min Summer	19.180	246
360 min Summer	13.913	362
480 min Summer	11.087	480
600 min Summer	9.290	534
720 min Summer	8.036	594
960 min Summer	6.389	718
1440 min Summer	4.617	984
2160 min Summer	3.331	1388
2880 min Summer	2.640	1792
4320 min Summer	1.899	2552
5760 min Summer	1.502	3240
7200 min Summer	1.252	3960
8640 min Summer	1.078	4664
10080 min Summer	0.950	5344
15 min Winter	130.939	26
30 min Winter	85.941	40
60 min Winter	53.779	68
120 min Winter	32.554	126
180 min Winter	23.966	184

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
240 min Winter	0.946	0.946	30.5	2312.4	O K
360 min Winter	0.974	0.974	30.7	2388.5	O K
480 min Winter	0.983	0.983	30.8	2412.4	O K
600 min Winter	0.980	0.980	30.8	2404.0	O K
720 min Winter	0.970	0.970	30.7	2376.7	O K
960 min Winter	0.946	0.946	30.5	2312.9	O K
1440 min Winter	0.892	0.892	30.0	2167.7	O K
2160 min Winter	0.794	0.794	29.5	1908.8	O K
2880 min Winter	0.692	0.692	29.5	1644.9	O K
4320 min Winter	0.506	0.506	29.5	1177.5	O K
5760 min Winter	0.377	0.377	28.7	866.3	O K
7200 min Winter	0.301	0.301	26.5	685.6	O K
8640 min Winter	0.256	0.256	24.0	578.6	O K
10080 min Winter	0.226	0.226	21.6	509.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	19.180	240
360 min Winter	13.913	356
480 min Winter	11.087	466
600 min Winter	9.290	574
720 min Winter	8.036	676
960 min Winter	6.389	762
1440 min Winter	4.617	1068
2160 min Winter	3.331	1516
2880 min Winter	2.640	1936
4320 min Winter	1.899	2684
5760 min Winter	1.502	3352
7200 min Winter	1.252	4032
8640 min Winter	1.078	4672
10080 min Winter	0.950	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.403	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time / Area Diagram

Total Area (ha) 4.060

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.353	4-8	1.353	8-12	1.353

Model Details

Storage is Online Cover Level (m) 1.300

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2200.0	1.200	2839.3	2.400	0.0	3.600	0.0	4.800	0.0
0.200	2300.9	1.300	2896.2	2.600	0.0	3.800	0.0	5.000	0.0
0.400	2404.0	1.301	0.0	2.800	0.0	4.000	0.0		
0.600	2509.5	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	2617.1	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	2727.1	2.200	0.0	3.400	0.0	4.600	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.000 Hydro-Brake® Type Md5 SW Only Invert Level (m) 0.000
Design Flow (l/s) 12.1 Diameter (mm) 223

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.0	1.200	33.2	3.000	51.8	7.000	79.2
0.200	19.2	1.400	35.6	3.500	56.0	7.500	82.0
0.300	26.4	1.600	37.9	4.000	59.9	8.000	84.7
0.400	29.1	1.800	40.2	4.500	63.5	8.500	87.3
0.500	29.5	2.000	42.3	5.000	66.9	9.000	89.8
0.600	29.2	2.200	44.4	5.500	70.2	9.500	92.2
0.800	29.4	2.400	46.4	6.000	73.3		
1.000	31.0	2.600	48.3	6.500	76.3		

APPENDIX I
INDICATIVE SURFACE WATER DRAINAGE STRATEGY

CIVIL / STRUCTURAL DESIGN RISK MANAGEMENT

Abnormal or unusual residual risks associated with the design outcomes shown on this drawing are:-

RSK LDE LTD has followed its Design Risk Management process for Hazard Elimination and Risk reduction in developing the designs shown on this drawing.
Abnormal or unusual residual risks may be shown above where it is considered that such risk may not normally be expected by competent persons engaged on work of this nature or type.

KEY

- Site Red Line Boundary
- Existing Watercourse
- Existing Land Drainage
- Existing Surface Water Sewer
- Existing Foul Water Sewer
- Proposed Surface Water Drainage Sewer
- Proposed Foul Water Drainage Sewer
- Proposed Sewer Easement
- Proposed Attenuation Basin
- Proposed Swale
- Headwall
- Development Parcel Area
- Watercourse Culvert
- Overland Flow Direction

Notes:

1. This drawing has been produced to planning/viability purposes only.
2. This drawing is to be read in conjunction with all other relevant drawings.
3. All dimensions are in metres U.N.O
4. All levels in metres.

Rev.	Date	Amendment	Drawn	Chkd.	Appd.
P02	18.11.21	Updated Illustrative Layout (CAT115_3202A)	BD	MC	MC
P01	01.11.21	Preliminary Issue	BD	MC	MC

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Fax: +44 (0) 24 7650 1417
Email: info@rsk.co.uk

Client
Catesby Land and Planning Ltd

Project Title
Moors Fields
Station Road
Land to the north of Flitch Green

Status
FINAL

Drawing Title
ILLUSTRATIVE
SURFACE & FOUL WATER STRATEGY
(REV A)

Drawn	Date	Checked	Date	Approved	Date
BD	18.11.21	MEC	18.11.21	MEC	18.11.21

Scale	Orig Size	Dimensions	Revision
1:1000	A1	M	P02

Drawing File
890428-RSK-A-ALL-18-11-21-DRAINAGE STRATEGY - REV A.DWG

Project No.	Originator	Unit	Site Area	Series	Number	Sheet
890428	RSK		ALL	05	01	01

Scale 1:250
0 2.5 5 7.5 10 12.5m

APPENDIX K
SUDS MAINTENANCE RECOMMENDATIONS

Catesby Land and Planning Ltd

Moors Fields, Flitch Green, Uttesford

Sustainable Drainage System (SuDS) Management Strategy

Project No. 890428-R2(0)

OCTOBER 2021

RSK GENERAL NOTES

Project No.: 890428-R2(0)

Title: Moors Fields, Flitch Green, Uttesford

Client: Catesby Land and Planning Ltd

Date: October 2021

Office: RSK LDE, Abbey Park, Humber Road, Coventry

Status: Final

Author	Ben Donoghue	**Technical reviewer**	Matt Cheeseman
	[redacted]		[redacted]
Date:	October 2021	Date:	October 2021

Project manager	Colin Whittingham
	[redacted]
Date:	October 2021

CONTENTS

1 INTRODUCTION

This management strategy has been prepared by RSK Land and Development Engineering Ltd on behalf of Catesby Land and Planning Ltd, to satisfy planning conditions related to Moors Fields, Flitch Green, Uttesford (The Development).

The SuDS considered for the purposes of this statement, include drainage features that will be employed to reduce and manage surface water runoff from the development to a design return period of one hundred years plus climate change. This is required so that the development will not increase the risk of flooding to the site and its environs. All drainage on site is taken to the underlying strata via infiltration features. Such features include the following:

Permeable paving;
Attenuation Basin;
Swales;

The following detailed design drawings issued for construction should be referred to when reading this document for details of the SuDS features utilised on this site:

890428-RSK-20-10-21 Drainage Strategy

This document outlines the long term maintenance of the proposed surface water system and will make reference to the following documents, some of which provide further detail on the maintenance operations required:

CIRIA Report C753, *'The SuDS Manual'*, 2015

CIRIA Report C625, *'Model Agreements for Sustainable Water Management Systems'*, 2004

CIRIA Report C768, *'Guidance on the Construction of SuDS'*, 2017; and

Interpave, *'Permeable pavements: Guide to the Design, Construction and Maintenance of Concrete Block Permeable Pavements'*, ed. 4, 2006.

2 MAINTENANCE RESPONSIBILITIES

Responsibility for drainage within England and Wales rests with various bodies. For The Development, the drainage responsibilities will be divided between the following:

Private Landowner – each Householder will be responsible for the maintenance of drainage features within individual property curtilages; and

Communal Areas - A Management company will be set up for the Development to maintain all permeable paving, stormwater attenuation tanks, detention basins, outfalls and any associated flow controls within communal areas. However, it should be noted that if, the Flood and Water Management Act 2010 is ever fully implemented this allows a surface water drainage system to be vested to the SuDS approving body (SAB). This would be reviewed at the time of any implementation of the act.

3 MAINTENANCE REGIME

As the maintenance of the communal SuDS features will be carried out via a Management Company, the form of agreement should include the required maintenance listed below. Should the maintenance be transferred at a later date to a public body, then the model agreement SUDS MA1 should be used, details of which can be found in the CIRIA guidance C625.

The following section describes the required maintenance for each feature in turn. The SuDS maintenance requirements listed below should be reviewed after the first 5 years, with a view to agreeing a new regime for the ongoing maintenance.

Notwithstanding the routine inspections and maintenance requirements, after severe storm events all features shall be inspected to clear debris and repair damaged structures or features. Records of the maintenance carried out shall be prepared by the Management Company.

3.1 Permeable Paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

3.2 Detention Basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), as or required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), the annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

3.3 Swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspection inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design level	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of soil surface	As required
	Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

3.4 Operation and Maintenance Requirements for Trees

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly or as required
	Manage other vegetation and remove nuisance plants	Monthly
	Inspect inlets and outlets	Monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually
	Water	As required
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

3.5 Operation and maintenance requirements for ponds and wetlands

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May-October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once build-up has occurred to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25-50 years
Remedial actions	Repair erosion or other damage	As required
	Replant where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate inlets, outlets and overflows	As required

APPENDIX A
INSPECTION CHECKLIST

General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (e.g. biodiversity, wildlife and visual aspects)	

Inspection Date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Silt/Sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible potentially problematic where water has to soak into the underlying construction or ground (e.g., underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								

Inspection Date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (check against approved planting regime)								
Does any part of the system require weeding, pruning or mowing? (check against maintenance frequency state in approved design).								
Is there any evidence of invasive species becoming established? If yes, state action required								
Are any check dams or weirs in good condition?								
Is there any evidence of any accidental damage to the system (e.g., wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow control?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects?								

Inspection Date	Details	Y/ N	Action required	Date completed	Details	Y/ N	Action required	Date completed
Other observations								
Information appended (eg photos)								
Continue as current Increase maintenance Decrease maintenance								
Proposed date for next inspection								