Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith

LAND EAST OF STATION ROAD, ELSENHAM

Outline Flood Risk Assessment & Drainage Strategy

4697-WSP-00-XX-RP-DR-0001
SEPTEMBER 2022

PUBLIC

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OUTLINE FLOOD RISK ASSESSMENT (REV 2.0) PUBLIC

PROJECT NO. 70084697

OUR REF. NO. 4697-WSP-00-XX-RP-DR-0001

DATE: SEPTEMBER 2022

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EXECUTIVE SUMMARY

	ITEM	COMMENT
1	Development Description	The proposed allocation for the site includes up to 200 dwellings.
2	Location	Land East of Station Road, Elsenham Easting – 553658 Northing – 227032
3	Scale of Development	9.8 hectares
4	Current Land Use	Greenfield (agriculture)
5	Type of Application	Outline Planning Application
6	Flood Zone Classification	Falls within Flood Zone 1
7	Site Levels	High point of approximately 102.75mAOD located at the south-east corner of the site boundary. Low point of approximately 89.50mAOD located along west side the site boundary. Gradients across the site vary between approximately 1:15 and 1:130, overall gradient is approximately 1:30 falling north-west.
8	Allowance for Climate Change	40% Climate Change
9	Safe Access and Egress	Via Phase 1 road network going south-east, ultimately connecting to B1051 Henham Road
10	Surface Water Drainage	The proposed surface water drainage will comprise of a traditional piped gravity system which will be offered for adoption, along with one attenuation basin. The attenuation basin has been sized to accommodate: • 1 in 100-year event plus 40% climate change • 1 in 30 + 40% plus 1 in 10-year event The surface water shall then be discharged into a nearby ditch located north-west of the attenuation basin and flowing north. Discharge flow will be limited to the 1 in 1-year greenfield runoff rate (i.e. 11.2 L/s).
11	Foul Water Drainage	The proposed foul drainage strategy will comprise of a traditional piped gravity system which will be offered for adoption. This will convey the flows towards the low point of the site (located towards the north-western corner). A pumped system will convey the flow to the gravity FW network proposed as part of Phase 1, ultimately connecting to the Thames Water sewer network located under the B1051 Henham Road. The pumping station will be designed to adoptable standards (Code for Adoption 2021) and the design flow rate is 5.0 L/s. Liaison with Thames Water is ongoing to confirm adequate capacity is available. Coordination with Phase 1 design team is ongoing to confirm adequate capacity for Phase 2 is available.

1

INTRODUCTION

1 INTRODUCTION

1.1 APPOINTMENT AND BRIEF

1.1.1. WSP have been appointed by Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith to undertake an outline Flood Risk Assessment and Drainage Strategy to support the Outline Planning Application for a proposed residential development in Elsenham, Essex.

1.1.2. The proposed allocation for the site includes up to 200 dwellings, including two apartment blocks.

1.1.3. Refer to **Appendix A** for the site location plan.

1.2 REPORT SCOPE

1.2.1. The National Planning Policy Framework (NPPF) Section 10 '*Meeting the Challenge of climate change, flooding and coastal change*' requires a planning application to be accompanied by a site-specific FRA. This report sets out the proposed drainage strategy for the scheme including design considerations and constraints that have been applied in order for key consultee's such as the Environment Agency (EA) and the Essex County Council (ECC), acting as Lead Local Flood Authority, to comment/approve in principle prior to planning submission.

1.2.2. This report is a holistic risk-based assessment of potential flooding from possible sources, including fluvial, tidal, groundwater and surface water run-off. It also identifies and examines the residual flood risk to the proposed development and third-party land.

1.2.3. Whilst completing the assessment, consideration has been given to the National Planning Policy Framework (NPPF), Planning Practice Guidance, British Standard 8533:2017, Assessing and Managing Flood Risk in Development, and British Standard 8582:2013 Code of Practice for Surface Water Management for Development Sites.

1.3 LIMITATIONS

1.3.1. This report is based on the interpretation and assessment of data provided by third parties. WSP cannot be held responsible for the accuracy of the third-party data and the conclusions and findings of this report may change if the data is amended or updated after the date of consultation.

1.4 CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS

1.4.1. The revised Construction (Design and Management) Regulations 2015 (CDM Regulations) came into force in April 2015 to update certain duties on all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities under clause 9 (1) is to ensure that the client organisations, in this instance Bloor Homes, are made aware of their duties under the CDM Regulations.

2

POLICY CONTEXT

2 POLICY CONTEXT

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1.1. The National Planning Policy Framework (NPPF) was published in February 2019 (updated in July 2021) with the aim of protecting the environment and to promote sustainable growth. There is an overarching presumption in favour of sustainable development that should be the basis of every plan and every decision.

2.1.2. The following paragraphs/policies within the NPPF are considered relevant to this assessment:

- Paragraph 159: Requires that "Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.".
- Paragraph 162: Explains that "The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source"; and
- Paragraph 167: Explains that "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere […];
- Paragraph 169: Recommends that "major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

    a) take account of advice from the lead local flood authority;
    b) have appropriate proposed minimum operational standards;
    c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
    d) where possible, provide multifunctional benefits".

- Annex 3: Provides information on flood risk vulnerability classification.

2.1.3. The guidance further states that local planning authorities should "Where appropriate, applications should be supported by a site-specific flood-risk assessment."

2.1.4. Allocation and planning of development must therefore be considered against a risk based search sequence as provided by the guidance.

2.1.5. This FRA serves as the site-specific flood-risk assessment and demonstrates that the Proposed Development is safe for its lifetime without increasing flood risk elsewhere.

2.2 TECHNICAL GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

2.2.1. The NPPF Technical Guidance includes Flood Zone definitions and flood risk vulnerability classifications for different land uses.

2.2.2. The assessment of flood risk is based on the definitions in Table 1 of the Technical Guidance of the NPPF. Table 1 include the following:

Table 2-1 - Flood Zone Definitions

Flood Zone 1	▪ As that which has a "Low Probability" of flooding. The definition provided in Table 1 is: *"This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)."*
Flood Zone 2	▪ As that which has a "Medium Probability" of flooding. The definition provided in Table 1 is: *"This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year."*
Flood Zone 3a	▪ As that which has a "High Probability" of flooding. The definition provided in Table 1 is: *"This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year."*
Flood Zone 3b	▪ As "the functional floodplain". The definition provided in Table 1 is: *"This zone comprises land where water has to flow or be stored in times of flood."*

2.2.3. Included within the "Policy aims" of Table 1 for Flood Zone 3a is reference to flood storage. This is not required in Flood Zone 2 but for Flood Zone 3a it is stated as follows:

> *"In this zone, developers and local authorities should seek opportunities to:*
>
> *...*
>
> ▪ *Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage."*

2.2.4. The Environment Agency will often refer to this as "*flood compensation storage*" and require that the existing flood storage in the development area is maintained on a "*level-for-level"* basis. Typically, they will ask for evidence that the volume available for flooding is the same at every 200mm vertical slice post-development as it was pre-development up to the level of the 1 in 100 year flood, i.e. the extent of Flood Zone 3a.

2.2.5. The NPPF classifies the Flood Risk Vulnerability of various land uses in Table 2 (reproduced below). The More Vulnerable Classification encompasses usages such as hospitals and buildings used for dwellings. Less Vulnerable applies to buildings used for general industry, storage and distribution.

Table 2-2 - Flood Risk Vulnerability Classification

Essential Infrastructure	▪ Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. ▪ Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. ▪ Wind turbines.

Highly Vulnerable	▪ Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. ▪ Emergency dispersal points. ▪ Basement dwellings. ▪ Caravans, mobile homes and park homes intended for permanent residential use. ▪ Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”)
More Vulnerable	▪ Hospitals. ▪ Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. ▪ Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. ▪ Non–residential uses for health services, nurseries and educational establishments. ▪ Landfill and sites used for waste management facilities for hazardous waste. ▪ Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	▪ Police, ambulance and fire stations which are not required to be operational during flooding. ▪ Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in “more vulnerable”, and assembly and leisure. ▪ Land and buildings used for agriculture and forestry. ▪ Waste treatment (except landfill and hazardous waste facilities). ▪ Minerals working and processing (except for sand and gravel working). ▪ Water treatment works which do not need to remain operational during times of flood. ▪ Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development	▪ Flood control infrastructure. ▪ Water transmission infrastructure and pumping stations. ▪ Sewage transmission infrastructure and pumping stations. ▪ Sand and gravel working. ▪ Docks, marinas and wharves. ▪ Navigation facilities. ▪ Ministry of Defence installations. ▪ Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. ▪ Water-based recreation (excluding sleeping accommodation). ▪ Lifeguard and coastguard stations. ▪ Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.

	▪ Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

2.2.6. The overall aim is to steer new development to Flood Zone 1. Where there are no reasonably available sites within Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (see table below). Following review of Table 2.2: Flood Risk Vulnerability Classification the proposed development would be classified as Less Vulnerable.

Table 2-3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

FLOOD RISK VULNERABILITY CLASSIFICATION		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✘	Exception Test Required	✓
	Zone 3b	Exception Test Required	✓	✘	✘	✘

✓ Development is appropriate

✘ Development should not be permitted

2.3 ESSEX COUNTY COUNCIL – PRELIMINARY FLOOD RISK ASSESSMENT (PFRA) 2011, AND 2017 ADDENDUM

2.3.1. ECC are required to produce and submit a PFRA to the EA under the Flood Risk Regulations (2009). PFRAs are aimed at providing a high-level overview of flood risk from surface water, groundwater and ordinary watercourses across the LLFA study area. In this case, the administrative area of Essex includes twelve lower tier district and borough councils and is served by two different water companies.

2.3.2. The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010. The Environment Agency has used a national methodology, specified by Defra to identify indicative Flood Risk Areas in England.

2.3.3. Flood risk data and records of historic flooding were collected from a number of local and national sources to develop a clear understanding of the flood risk across Essex. Information relating to 1342 flood events, caused by flooding from surface water, groundwater, ordinary watercourse, canals and small impounded reservoirs, was collected and analysed, although comprehensive details on flood extents and consequences during these events was largely unavailable.

2.3.4. The PFRA is a high-level screening exercise to locate areas in which the risk of surface water and groundwater flooding is significant and warrants further examination through the production of maps and management plans.

2.3.5. The aim of the PFRA is to provide an assessment of potential flood risk across the study area, including information on past floods and the potential consequences of future floods.

2.3.6. The preliminary flood risk assessment (PFRA) and flood risk areas (FRAs) for Essex County Council were reviewed during 2017, using all relevant current flood risk data and information. The review has identified that there are no changes to the assessment of risk since the preliminary assessment report was published in 2011. The annexes to the preliminary assessment report have been reviewed and updated to show that there has been no new information since 2011.

2.4 UTTLESFORD STRATEGIC FLOOD RISK ASSESSMENT (SFRA) 2018

2.4.1. The Uttlesford District is situated in the west of Essex. Its main towns are Great Dunmow and Saffron Walden. It is at the watershed of three major river catchments: Great Ouse (River Cam, The Slade, River Bourn); Thames (River Roding, Pincey Brook, River Stort, Bourne Brook, Stansted Brook, Ugley Brook), and North Essex (River Pant, River Chelmer, Stebbing Brook, River Ter, River Can). As a consequence, the SFRA will need to consider downstream impacts of development and land use change.

2.4.2. The National Planning Policy Framework (NPPF) emphasises the responsibilities for LPAs to ensure that flood risk is understood and managed effectively through all stages of the planning process. This Level 1 SFRA facilitates this by identifying the spatial variation in flood risk across the South Essex study area, providing guidance to the LPAs for each Authority on using the SFRA within the

plan making process and providing guidance to developers in the preparation of site-specific Flood Risk Assessments (FRAs).

2.4.3. Specifically, the SFRA:

- Refines information on flood risk taking into account all sources of flooding and the impacts of climate change;
- Informs the Sustainability Appraisal process, so that flood risk is fully taken into account;
- Informs the application of the Sequential and, if necessary, Exception Tests in the allocation of future development sites, as required by the NPPF, and planning application process;
- Identifies the requirements for site specific FRAs;
- Informs the preparation of flood risk policy and guidance;
- Determines the acceptability of flood risk in relation to emergency planning capability; and,
- Considers opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and storage for flood water.

2.4.4. In the preparation of the Level 1 SFRA, the most up-to-date flood risk information from all flooding sources (tidal, fluvial, surface water, groundwater, sewer and artificial sources) has been collated, reviewed and presented for use by the Essex Authorities to inform the preparation of Local Plans and prudent decision-making by Development Management officers on a day-to-day basis. This has included collation of existing hydraulic modelling outputs combined with updated hydraulic modelling (including flood defence breach analysis) to inform the SFRA mapping.

3

EXISTING SITE

3 EXISTING SITE

3.1 SITE LOCATION

3.1.1. The site is located in Elsenham, north-west Essex in East Anglia, adjacent to both Old Mead Road and Station Road. An approximate address for the site is Land East of Station Road, Elsenham and approximate OS coordinates are 553658, 227032.

3.1.2. The existing site is predominantly greenfield with agriculture usage. A site location plan can be found in **Appendix A**.

3.2 SITE DESCRIPTION

3.2.1. Table 3-1 describes the general site characteristics.

Table 3-1 - Characteristics of the Site

Characteristic		Description
Area		The catchment area for Phase 2 is approximately 9.8ha. The actual Outline Planning Application redline area is 11.12ha, as this also includes areas within Phase 1 of the development.
General Topography		High point of approximately 102.75mAOD located at the south-east corner of the site boundary. Low point of approximately 89.50mAOD located along west side of the site boundary. Gradients across the site vary between approximately 1 in 15 and 1 in 130.
Boundaries	**North**	Elsenham Station Car Park
	South	Elsenham Phase 1 development
	East	Bound by existing farmland
	West	Old Mead Road and Station Road
Access		Vehicular access through Phase 1 development. Non-Motorised Users access via Phase 1 development and proposed footpath/cycle path to Railway Station

3.3 EXISTING TOPOGRAPHY

3.3.1. The site has a high point of approximately 102.75mAOD located at the south-east corner of the site boundary, and a low point of approximately 89.50mAOD located along west side of the site boundary. Along the whole site, the ground falls from north-east (highest levels) to south-west (lowest levels).

3.3.2. The gradients vary between 1:130 and 1:15, with the average fall being approximately 1:30.

3.3.3. Based on the topographical survey in **Appendix A**, there are no existing structures present within the site.

3.4 EXISTING WATERBODIES

3.4.1. The nearest EA main river to the site is the Stansted Brook which is located approximately 1km south of the site. Stansted Brook is a tributary of the river Stort downstream of Stansted Mountfitchet. It flows through Elsenham and Stansted Mountfitchet.

3.4.2. There are no records of flooding within the site or nearby proximity.

3.4.3. No waterbodies are known to be present within the site boundary. However, a ditch is located in the proximity of the site, within the Phase 1 boundary. This will be used as a discharge point for Phase 1 surface water flows.

3.5 EXISTING SEWERS

3.5.1. According to the records shown in **Appendix C**, there are no existing public sewers shown within the site.

SURFACE WATER SEWERS

3.5.2. There is no record of existing surface water sewers east of the railway. The closest surface water sewer to the site runs within the housing development west of the railway.

FOUL WATER SEWERS

3.5.3. The closest foul water sewer is a 6-inch rising main running south bound on the eastern side of the railway. This is located more than 20m away from the site redline boundary.

PHASE 1 SEWER NETWORK

3.5.4. Phase 1 of the housing development is located south of the site. This will comprise of a traditional gravity surface water network with 2 infiltration basins and one attenuation basin. The outfall of the attenuation basin will be a ditch located north-west of the Phase 2 redline.

3.5.5. The Phase 1 foul water network comprises of a mix of gravity and pumped systems, which will convey flows towards the Thames Water network southeast of the site, towards the B1051 Henham Road.

3.6 GEOLOGY AND HYDROGEOLOGY

3.6.1. The British Geological Survey (BGS) online Geology of Britain Viewer indicates the west of the site is partly underlain by Kesgrave Catchment Subgroup and Head (Clay, Silt and Sand). No superficial deposits recorded in the eastern half of the site, refer **Figure 3-1**.

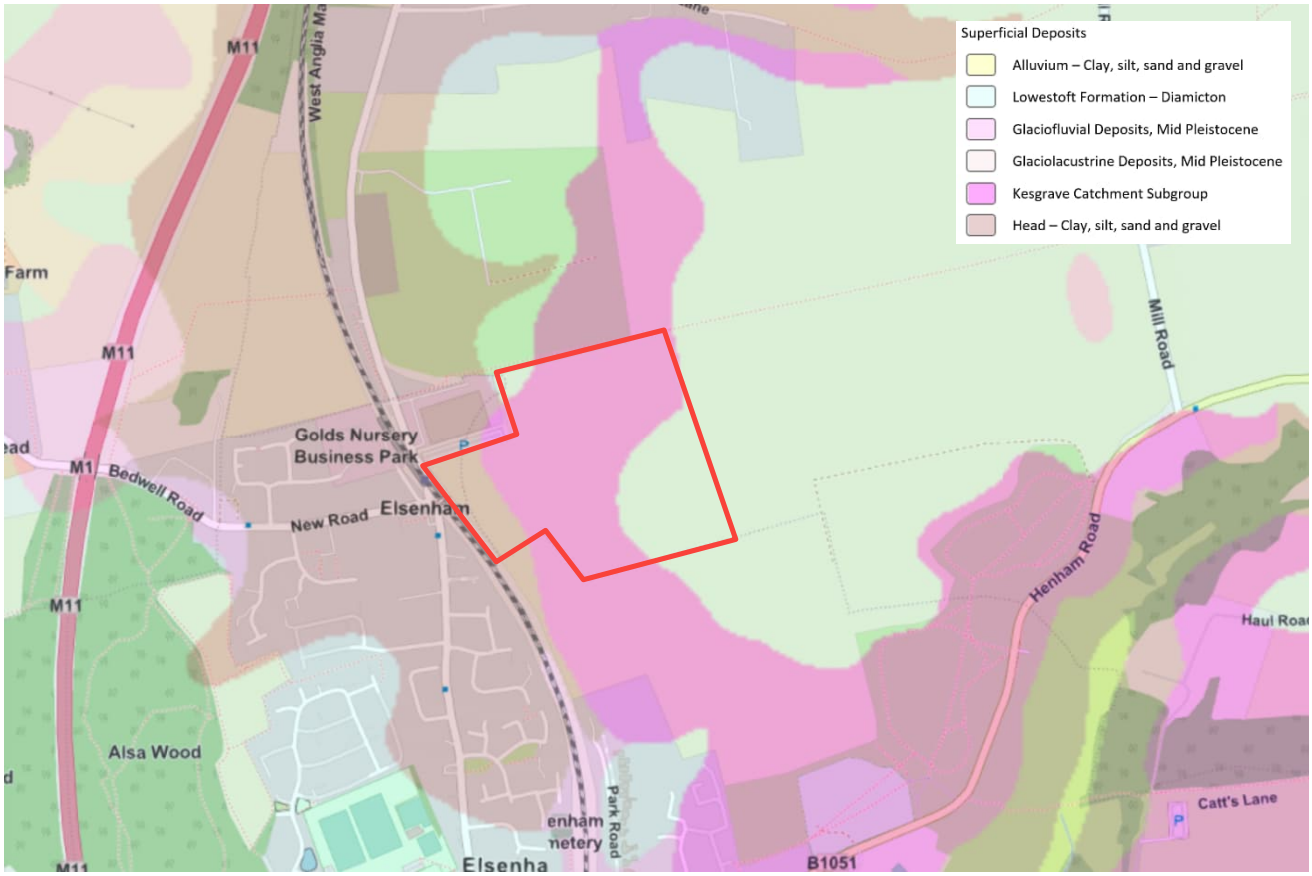

Figure 3-1 - BGS Superficial Deposits Map

3.6.2. The site does not fall within a Groundwater Source Protection Zone or drinking water protected area.

3.6.3. A geo-environmental and geotechnical site investigation was carried out in December 2021, results can be found in **Appendix B**. Based on soakage tests performed as part of the investigation above, infiltration is not considered viable for the site.

3.6.4. No groundwater was recorded within any of the exploratory points during the ground investigation.

4

SOURCES OF FLOOD RISK

4 SOURCES OF FLOOD RISK

4.1.1. This chapter assesses the risk of flooding to the site from all current and future potential sources of flooding.

4.1.2. **Table 4-1** summarises the findings of the assessment. A more detailed explanation of the flood risk issues on the site and determination of flood risk ratings are presented in sections 4.2 to 4.6 below.

Table 4-1 - Degree of risk from each source of Flooding Source Risk

Source	Risk Negligible / Low / Moderate / High
Fluvial	Low
Ground Water	Low
Surface Water	Low
Sewer	Low
Other – Canals	N/A
Other – Reservoirs	N/A
Other – Culverts	N/A

4.2 FLUVIAL FLOOD RISK

4.2.1. The Environment Agency's (EA) Flood Map for Planning indicates that the site is located entirely within Flood Zone 1; see **Figure 4-1** overleaf. This means the site is assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). EA Correspondence can be found in **Appendix D**.

4.2.2. Based on the available information the risk of fluvial flooding is considered to be low.

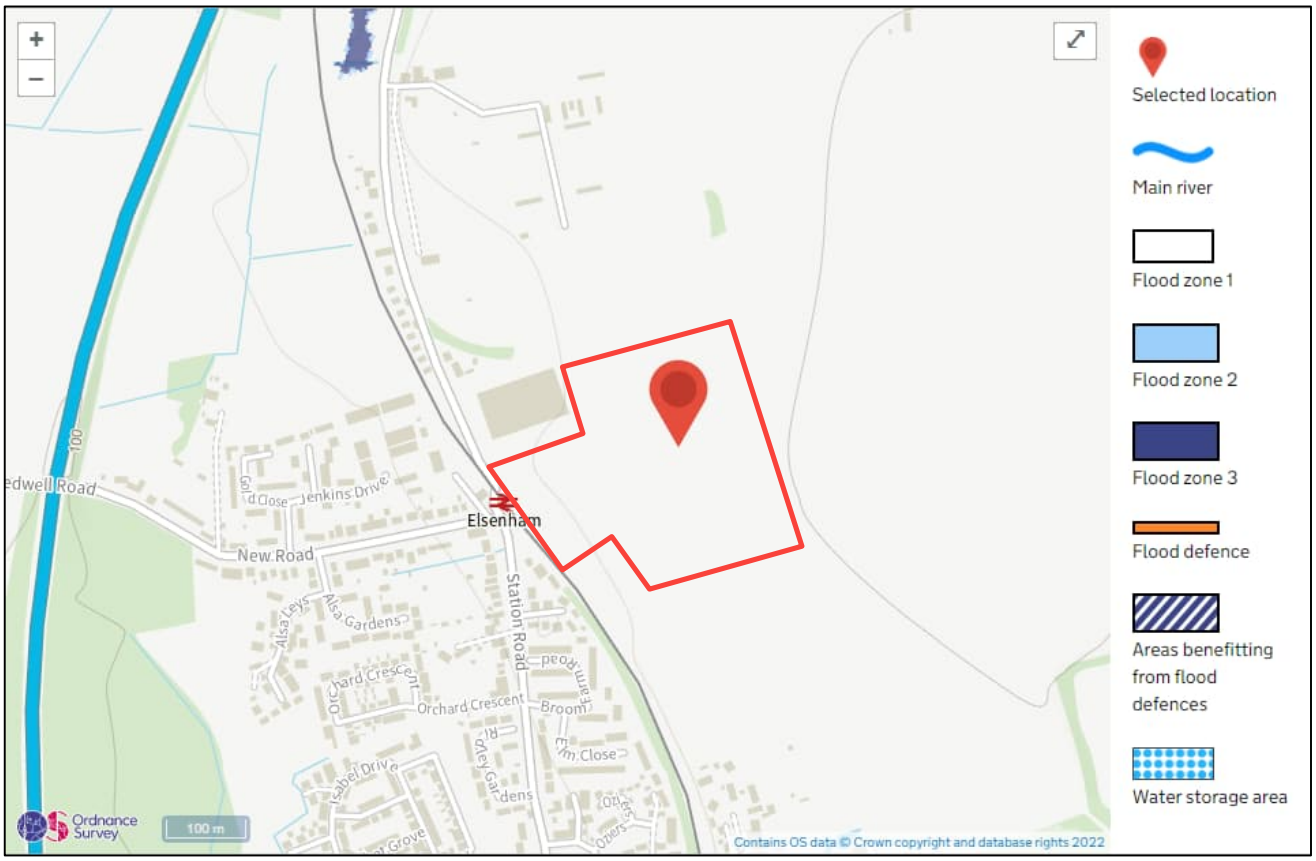

Figure 4-1 - Environment Agency Flood Map - Flood Zones

4.3 GROUND WATER FLOODING

4.3.1. Ground investigation carried out in 2021 by RSK Geosciences (refer to **Appendix B**) did not find evidence of ground water within the site.

4.3.2. The Uttlesford SFRA (2016) groundwater flooding susceptibility indicates that site falls within an area considered low risk (<25%) of groundwater flooding to occur at the surface.

4.3.3. As part of the groundwater investigation mentioned above, no groundwater was recorded within any of the exploratory points of the site.

4.3.4. Based on the Environment Agency Ground Water Monitoring Report dated July 2022, nearest monitoring location to the site is Ashley Green and it shows that the area is below normal groundwater level. It also indicates that the Aquifer Geology of the site is Chalk. Refer to **Appendix D** for the EA Correspondence.

4.3.5. Based on the available information the risk of groundwater flooding is considered to be low for the proposed site.

4.4 SURFACE WATER FLOODING

4.4.1. Surface water flood risk was modelled by the EA, identifying areas that may experience ponding during each of a 1 in 30 year, 1 in 100 year and 1 in 1,000 year return period event.

4.4.2. As shown in **Figure 4-2** below, the site is considered to be at a very low risk of surface water flooding.

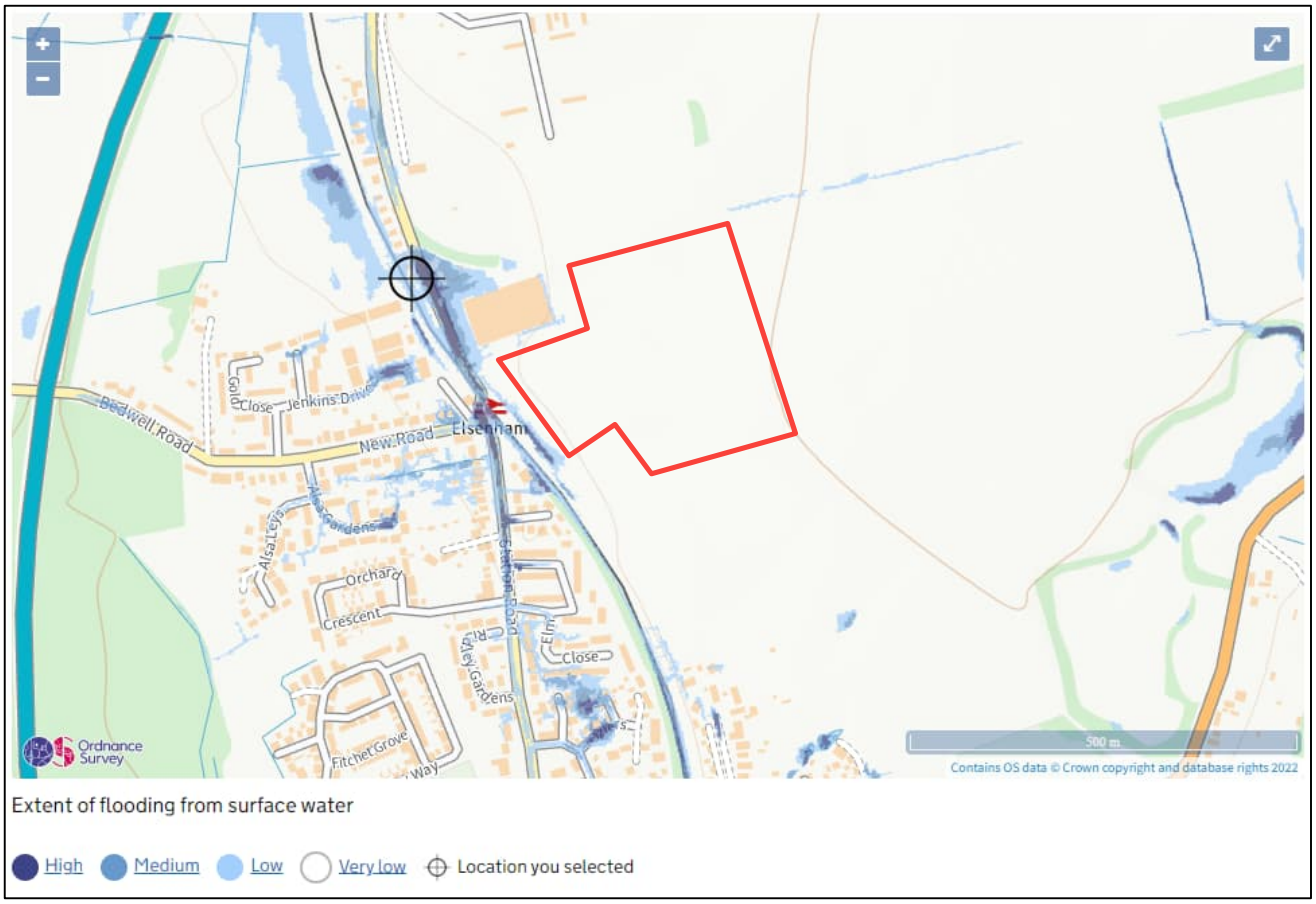

Figure 4-2 - Environment Agency Flood Map - Risk of Flooding from Surface Water

4.4.3. Essex County Council as the LLFA have indicated that the site does not fall within a Critical Drainage Area (CDA), which highlights areas most at risk of surface water flooding based on more detailed modelling.

4.4.4. According to the Uttlesford Strategic Flood Risk Assessment (2016), no critical drainage areas have been identified yet within Uttlesford by the LLFA.

4.4.5. Based on the available information the risk of surface water flooding is currently considered to be low for the proposed site.

4.5 SURCHARGED SEWER FLOODING

4.5.1. Based on existing sewer records, no sewers are currently located within the site boundary. As part of the Phase 1 development, a gravity piped surface water network and a part gravity / part pumped foul water network will be implemented. Based on existing topography of the Phase 1 and Phase 2

sites, it is anticipated that any flooding incurring within Phase 1 due to surcharge of the sewer mains will not flow towards the Phase 2 development.

4.5.2. Based on the available information, the risk of flooding from surcharged sewers is considered to be low. No records of historical flooding from sewers were available to the EA or the LLFA.

4.6 FLOODING FROM OTHER SOURCES

4.6.1. Non-natural or artificial sources of flooding can include reservoirs, lakes, canals, culverts etc. The potential effects of flood risk management infrastructure and other structures also needs to be considered.

4.6.2. There are no canals within the vicinity of the site, therefore the risk of flooding from canals is considered to be negligible.

4.6.3. The EA Flood Risk from Reservoirs map shows that the site does not fall within the maximum extent of potential reservoir flooding, therefore the risk of flooding as a result of a reservoir breach is considered to be negligible.

4.6.4. Based on topographical survey information, no culverts have been identified within the vicinity of the site, therefore the risk of flooding from culverts is considered to be negligible.

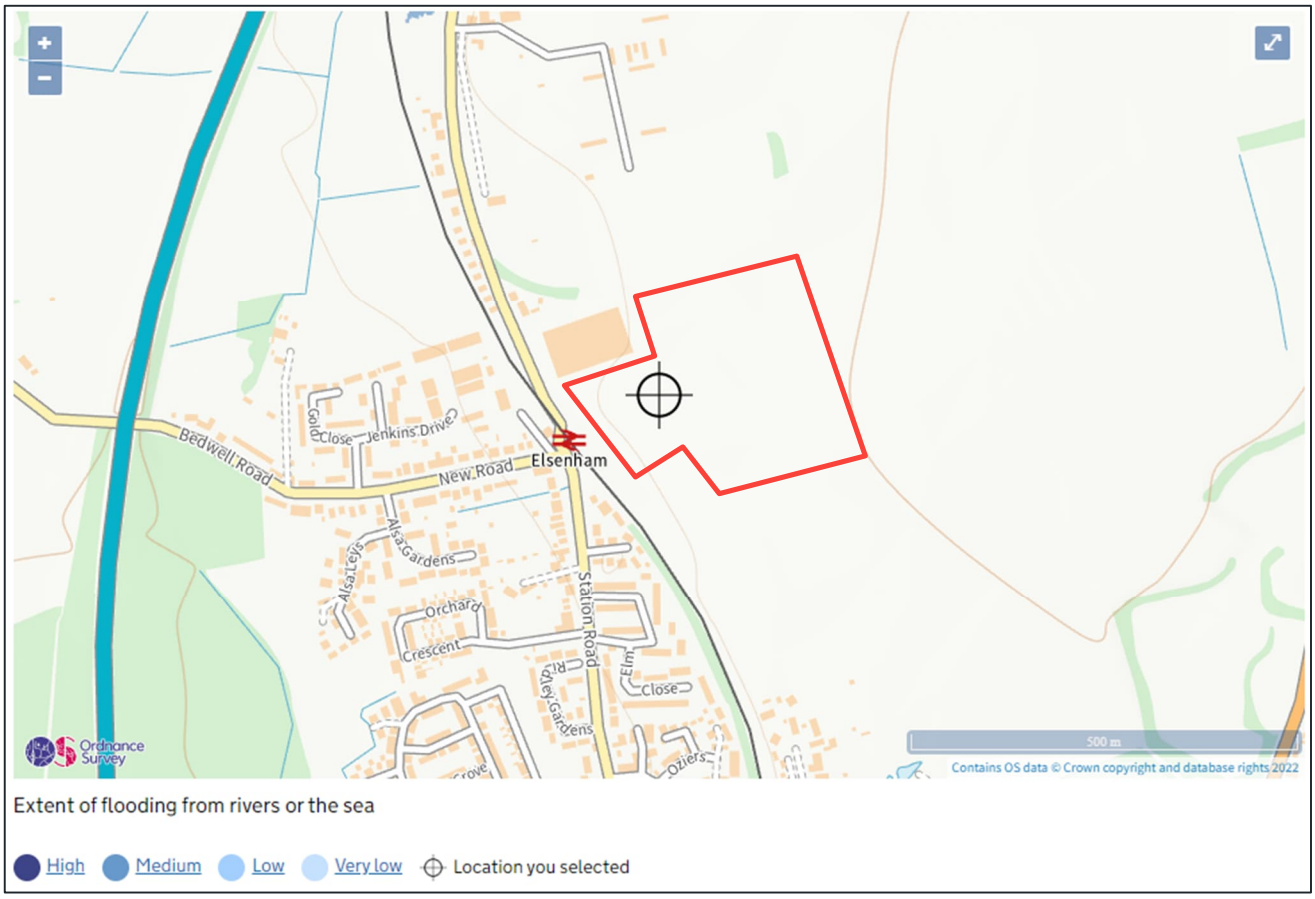

Figure 4-3 - Environment Agency Flood Map - Risk of flooding from rivers or the sea

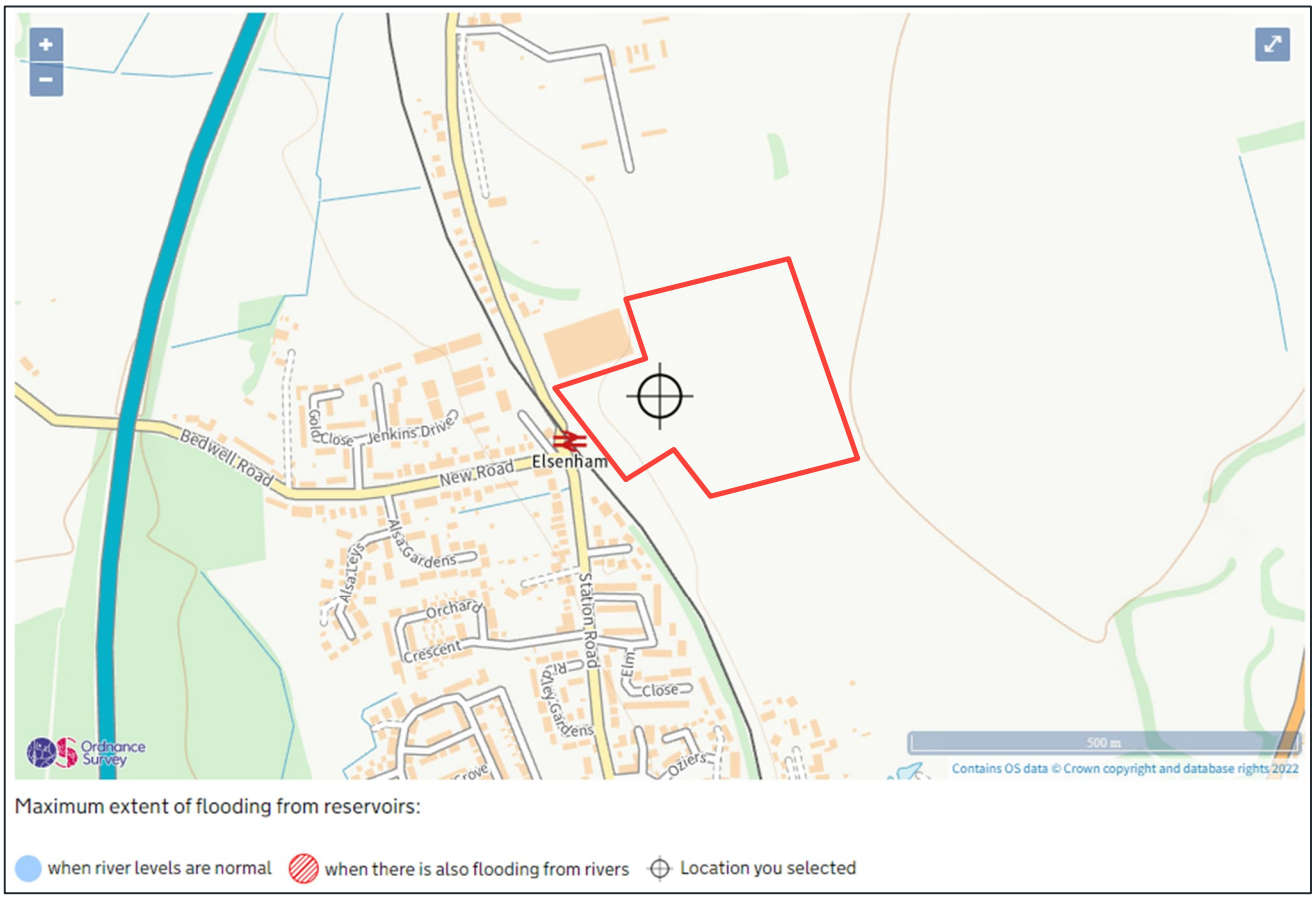

Figure 4-4 - Environment Agency Flood Map - Risk of flooding from reservoirs

4.7 HISTORICAL FLOOD RECORDS

4.7.1. The EA does not hold any record of historic flooding for the Site.

4.7.2. The LLFA and Uttlesford SFRA (2016) also show no records of flood incidents within the site.

5

NPPF SEQUENTIAL AND EXCEPTION TEST

5 NPPF SEQUENTIAL AND EXCEPTION TEST

5.1.1. Residential developments are classed as ‘more vulnerable’ as stated in Table 2 of the Flood Risk and Coastal Change Chapter of the Planning Practise Guidance (2015).

5.2 THE SEQUENTIAL TEST

5.2.1. The Sequential Test, within the National Planning Policy Framework, aims to steer all new developments to areas at the lowest risk of flooding and to ensure that the development type proposed is appropriate by reference to the flood risk.

5.2.2. The proposed site is solely located within Flood Zone 1 (based on Environment Agency modelled flood levels) which therefore satisfies the requirement of the sequential test.

5.3 THE EXCEPTION TEST

5.3.1. Table 2 of the Flood Risk and Coastal Change Chapter of the Planning Practice Guidance (2015) classes different types of development depending upon their vulnerability. Residential development is classed as ‘more vulnerable’.

5.3.2. Table 3 of the Flood Risk and Coastal Change Chapter of the Planning Practice Guidance (2015) shows that ‘more vulnerable’ land uses are acceptable in Flood Zone 1.

6

SURFACE WATER MANAGEMENT – POLICY CONTEXT

6 SURFACE WATER MANAGEMENT - POLICY CONTEXT

6.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) – FEBRUARY 2019

6.1.1. The Updated National Planning Policy Framework (NPPF) was published in February 2019 (updated in July 2021) and sets out the Government's national policies for flood risk management in a land use planning context within England.

6.1.2. Paragraph 155 of the NPPF states “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.”

6.1.3. The guidance further states that local planning authorities should “ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment.”

6.1.4. Allocation and planning of development must therefore be considered against a risk-based search sequence as provided by the guidance.

6.1.5. This FRA serves as the site-specific flood-risk assessment and demonstrates that the proposed development is safe for its lifetime without increasing flood risk elsewhere.

6.2 SUSTAINABLE DRAINAGE SYSTEMS WRITTEN STATEMENT HCWS161 (DECEMBER 2014)

6.2.1. The Secretary of State for Communities and Local Government laid a Written Ministerial Statement in the House of Commons on 18 December 2014 setting out changes to planning that will apply for major development from 6 April 2015. This confirms that in considering planning applications, local planning authorities should consult the relevant Lead Local Flood Authority (LLFA) on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

6.2.2. Therefore, from 6 April 2015 local planning policies and decisions on planning applications relating to major development are required to ensure that sustainable drainage systems (SuDS) are used for the management of surface water.

6.2.3. Major development is development involving any one or more of the following:

- The winning and working of minerals or the use of land for mineral-working deposits;
- Waste development;
- The provision of 10 dwellings or more;
- The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
- Development carried out on a site having an area of 1 hectare or more.

6.3 DEFRA SUSTAINABLE DRAINAGE SYSTEMS NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS (MARCH 2015)

6.3.1. This document sets out non-statutory technical standards for sustainable drainage systems. It should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance.

6.3.2. For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

6.3.3. Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

6.3.4. Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with the above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

6.3.5. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

6.3.6. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

6.3.7. The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

6.4 BRITISH STANDARD 8582:2013 CODE OF PRACTISE FOR SURFACE WATER MANAGEMENT FOR DEVELOPMENT SITES (NOVEMBER 2013)

6.4.1. In the absence of specific local guidance on the management of surface water run-off, BS 8582 should be considered as best practice guidance for the development of surface water drainage strategies for new development sites.

6.5 FLOOD AND WATER MANAGEMENT ACT (FWMA) 2010

6.5.1. The FWMA (2010) was first proposed as the legislative vehicle to implement the European Floods Directive, however due to delays in the bill, it was not implemented within the timeframe set out by the Floods Directive, and hence the implementation of the Floods Directive and the FWMA was delayed until 2010.

6.5.2. The FWMA provided the legislative basis for a number of recommendations in the Pitt Review. In October 2010, Section 9 of the FWMA came into force requiring all LLFAs in England to develop, maintain, review, update as well as apply and monitor the application of a strategy for local flood risk in their area. This is known as a Local Flood Risk Management Strategy (LFRMS).

6.6 SUSTAINABLE DRAINAGE SYSTEMS DESIGN GUIDE – ESSEX COUNTY COUNCIL (LLFA) – 2020

6.6.1. This Supplementary Planning Document provides technical guidance on the application of SuDS within Essex. It has been created to be a comprehensive resource for SuDS reference and policy development for decision makers and designers, developers and partner organisations to support the application of SuDS in a range of contexts across Essex.

6.6.2. SuDS must be designed to ensure that development and occupants are protected from flooding, and that off-site flood risk is not increased. Where possible SuDS should aim to reduce the overall risk of flooding off-site and drain via infiltration as a preference in accordance with the drainage hierarchy contained in Approved Document H of the Building Regulations.

6.7 CLIMATE CHANGE

6.7.1. The Climate Change Adaptation Sub-Committee Progress Report 2014, increased flood risk is the greatest threat to the UK from climate change. Models of the climate system suggest floods of the type experienced in England and Wales in autumn 2000, and between December 2013 and February 2014, have become more likely as a consequence of increased concentrations of greenhouse gases in the atmosphere.

6.7.2. More frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall could be expected. Sea levels are also expected to continue to rise.

6.7.3. New EA guidance “Flood risk assessments: climate change allowances” issued on the 19th February 2016 (updated on 27th May 2022) and forming part of the NPPF technical guidance provides up to date information on expected changes in rainfall, river flows and sea level rise as a consequence of climate change.

6.7.4. A key change from the previous guidance is that the climate change allowances for peak river flows now are shown as variable on a regional basis; allowance are also now based on percentiles, whereby a percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level (e.g. a 50% percentile means that the allowance has 50% chances of not being exceeded).

6.7.5. On this basis key allowances for peak river flows based on percentiles are:

- central allowance, - based on the 50th percentile
- higher central - based on the 70th percentile
- upper end - based on the 90th percentile

These allowances are detailed in Table 1 (Peak river flow allowances by river basin district) of the EA guidance.

6.7.6. As discussed in the EA Guidance, the choice of the appropriate allowance for peak river flow (e.g. central or higher central) should reflect the risk for the proposed development and therefore is linked to the expected hazard, vulnerability and resilience of the scheme; recommendations on the appropriate allowances to be considered are provided in the EA Guidance.

6.7.7. For peak rainfall the EA Guidance provides an upper end and central allowance depending on epoch; the guidance recommends assessing both the central and upper end allowances to understand the range of impact. These allowances are detailed in Table 2 (Peak rainfall intensity allowance in small and urban catchments) of the EA guidance.

6.7.8. For this proposed site, based on the new guidance residential development (considered "More Vulnerable" in flood risk terms) should be reviewed against the following new climate change allowances:

Table 6-1 – Summary of Climate Change Factors

Flood Criteria	Climate Change Factor
Peak Runoff	40% for the 1 in 100-year return period event 35% for the 1 in 30-year return period event

HOW IS FLOOD RISK LIKELY TO BE AFFECTED BY CLIMATE CHANGE?

6.7.9. The projections for the UK in relation to climate change are that the UK will experience more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall of the type that has been responsible for the large flood events recently experienced in the UK.

6.7.10. Flood risk is likely to increase with climate change. However, the flood risk management measures described in the following sections will make an allowance for this.

7

FLOOD RISK MANAGEMENT AND DRAINAGE STRATEGY

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7.1 FLOOD RISK MANAGEMENT MEASURES

SITE LOCATION AND LAYOUT

7.1.1. The Environment Agency's Flood Map for Planning indicates that the site is located entirely within Flood Zone 1. 'More vulnerable' land uses (residential developments) are acceptable in Flood Zone 1 as stated in Table 3 of the Flood Risk and Coastal Change Chapter of the Planning Practice Guidance (2015).

SITE LEVELS

7.1.2. Finished site levels should be engineered to provide positive drainage, prevent ponding and channel flows away from premises during exceedance events. The accumulation of standing water would therefore not occur and thus not pose a risk to the development.

FLOOD WARNINGS/ EVACUATION PLAN/ FLOOD PROOFING

7.1.3. The site is not located within a Flood Warning or Flood Alert Area.

ACCESS AND EGRESS

7.1.4. As the proposed development is located within Flood Zone 1, access and egress is unlikely to be affected during extreme fluvial flooding events. Vehicular access and egress will be via the Phase 1 network which leads to the B1051 Henham Road. Non-Motorised Users can also access via the proposed footway/cycleway connection towards Station Road.

COMPENSATORY STORAGE

7.1.5. The site is located within Flood Zone 1; therefore, compensatory flood storage is not required.

7.2 EXISTING SITE

7.2.1. Greenfield runoff rates have been calculated using the HR Wallingford tool. Surface water will follow existing topography, naturally flowing towards the low point of the site located in the north-west corner.

7.2.2. Table 7-1 below sets out the existing greenfield runoff rates for the Site. Greenfield runoff rate calculations can be found in **Appendix F**.

Table 7-1 – Greenfield Runoff Rates

Return Period	Greenfield Runoff Rate (l/s) considering 5.46ha site
Qbar	13.2
1yr	11.2
30yr	30.3
100yr	42.1

7.3 PROPOSED DEVELOPMENT DRAINAGE

SUSTAINABLE DRAINAGE SYSTEMS (SUDS)

7.3.1. A Sustainable Drainage Systems (SuDS) hierarchy has been followed in applying the use of sustainable drainage techniques to the proposed development. This has been set out in **Table 7-2** below with justifications provided where particular techniques are deemed feasible.

Table 7-2 – SuDS Feasibility

SuDS Technique	Can they be feasibly incorporated into the site?	Reason
Green Roofs	X / ✓	Due to the nature of typical residential roofs, green roofs are unlikely to be feasibly incorporated into the housing. Subject to the final building designs, green roofs may be incorporated into the apartment buildings.
Basins and Ponds	✓	Basins are proposed to be used as the primary means of surface water attenuation within the site.
Filter Strips and Swales	X	These features are most efficient over flatter gradients, considering the average gradients of the site, use of these features has been discarded.
Infiltration techniques	X	Site investigation (**Appendix B**) confirmed infiltration is not viable for this site.
Permeable Surfaces and Filter Drains	✓	Permeable surfacing will be proposed for non-adopted highways, as a method of collecting water from hard-standing areas, this to provide source control as well as an element of upstream storage and pre-treatment. These devices will be lined and discharge to the site-wide drainage network.
Rainwater Harvesting	X / ✓	Rainwater harvesting may be utilised on site but has not been allowed for within the attenuation calculations as it may be full during the critical event.
Tanked Systems	X	Attenuation tanks may be used on-site to provide attenuation; however, their use should ideally be limited to where other means of attenuation are not considered viable. This is due to tanks not contributing towards the site-wide surface water treatment requirements, as well as them creating additional complexities with regards to maintenance and long-term storage.

7.3.2. Planning guidance requires drainage to discharge surface water in line with the following hierarchy:

1. Infiltration
2. Existing Watercourse
3. Existing Surface Water Sewer
4. Existing Combined Sewer

7.3.3. Infiltration was confirmed to not be a viable means of surface water discharge by the ground investigation (refer to **Appendix B**). Thus, the chosen outfall will be an existing watercourse (i.e. nearby ditch located north-west of the site).

SURFACE WATER DRAINAGE STRATEGY

7.3.4. The surface water strategy below sets out the principles of how the site will be drained. Refer to The Outline Drainage Strategy in **Appendix I** for more details.

7.3.5. The SuDS strategy for the proposed development has been derived using the principles outlined within the CIRIA C753 SuDS Design Manual along with BS 8582:2013 – Code of Practise for Surface Water management for Development Sites.

7.3.6. The scheme will utilise the existing topography and drainage catchments. No significant re-profiling of the site is proposed and hence the resultant flood flow paths will replicate the existing and direct flows to the proposed attenuation basins within the site.

7.3.7. The proposed development drainage arrangement for the site will look to hold water at the surface where viable and comprise of the following:

- A strategic pipe network will convey all surface water to an attenuation basin located at the low points of the catchment. The attenuation basins are to discharge at the 1 in 1yr greenfield runoff rate for all storm events and the storage volume required has been modelled to capture 1 in 100yr +40% climate change. However, as the basin was not able to achieve a half-drain time of 24 hours, it was subsequentially upsized to accommodate the volume of the 1 in 30 +40% climate change event and a 1 in 10-year back-to-back event.
- The pipework will be designed to adoptable stands with no surcharging in the 1 in 2-year return period and no flooding during the 1 in 30-year return period.
- The discharge location will be the existing ditch located north-west of the site.

7.3.8. The attenuation basin has been designed in MicroDrainage, the result of the modelling are summarised in **Table 7-**3 below. MicroDrainage modelling report can be found within **Appendix H**.

Table 7-3 – Attenuation Basin Details

Rainfall event (years)	Contributing Impermeable Area (ha)	Attenuation Volume Required (m^3)	Attenuation Volume Available (m^3)	Bed Level (m AOD)	Max Water Depth (m)	Top of Basin (m AOD)	Discharge Rate (l/s)	Discharge Location
1 in 10	5.05	1612	4690	88.15	0.60	89.95	11.2	Nearby existing ditch
1 in 30 +40% CC		3038			1.07			
Combined 1:30+40% and 1:10 year		4650			1.49			
1 in 100 + 40% CC		4052			1.38			

7.3.9. The basin has been designed to allow for back-to-back rainfall event of 1 in 30-year return period plus 40 % climate change and a 1 in 10-year return period, in accordance with the Essex LLFA requirements.

7.3.10. The surface water flow will reach the basin via the piped gravity system, with the attenuation basin representing the only surface treatment feature. A portion of the flows will be also treated via the permeable paving proposed within the shared driveways, before reaching the piped network.

7.3.11. The simple index approach (reference CIRIA C753 paragraph 26.7.1) was used to ensure adequate treatment was delivered by the proposed SuDS components to the surface water flows.
For each contaminant type, the following relation shall be verified

$$Total\ SuDS\ mitigation\ index\ \geq pollution\ hazard\ index$$

Table 7-3 – Pollution hazard indices

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

CIRIA C753 TABLE 26.2

Since the majority of the surface water flow will not pass through the proposed permeable paving, this feature has not been accounted for. However, it will provide an element of source control, sediment removal and long-term storage.

Table 7-4 – SuDS mitigation indices

Type of SuDS component	TSS	Metals	Hydrocarbons
Detention basin	0.5	0.5	0.6

CIRIA C753 TABLE 26.3

As per table above, for each contaminant type the mitigation indices are equal to or greater than relevant pollution hazard index.

7.3.12. To ensure the effectiveness of the proposed drainage network, a robust maintenance regime in accordance with CIRIA 753 will be implemented to ensure future performance of all SuDS and drainage components. This will include regular cleaning of SuDS devices located on communal areas by a private management company. The SuDS Maintenance and Management Plan can be found in **Appendix I**. Adoptable Sewer network will be offered to local water authority via a Section 104 agreement. Strategic SUDS will be managed by a Private Management Company to be arranged by Client.

7.3.13. The proposed drainage network is designed not to exacerbate any existing flood risk associated with properties situated upstream, or downstream, of the site in accordance with principles set out within the NPPF.

7.3.14. The drainage strategy drawing in **Appendix G** shows the following details for surface water:

- Attenuation basins – sizes (area and volume), levels and discharge rates and locations for the proposed attenuation basins. The basin shown in the plan includes an allowance for access and maintenance tracks and shows earthworks extents based on existing levels;
- Indicative locations of upstream SuDS features, e.g. permeable paving;
- Indicative locations of main pipework connecting to basin.

FOUL WATER DRAINAGE STRATEGY

7.3.15. The proposed foul water drainage strategy consists of a traditional piped gravity network that will convey all the flows towards the low point of the site. From there, a pumped system will discharge the flows on the Phase 1 network. Flows will then reach via gravity the existing Thames Water network to the southeast of the site. For the Outline Drainage Strategy, refer to **Appendix G**. Thames Water have been contacted regarding existing capacity in their network and water recycling centre. Once the Predevelopment enquiry is received, this will be appended to the report.

7.3.16. As per Code for Adoption ("the Code") Clause D5.6.1, the design flow rate of the pump units in foul pumping stations serving less than 500 dwellings should be at least the maximum of:

a) half the incoming peak design flow rate (see Clause B3.1.1 of "the Code"); and

b) the flow rate required to achieve a minimum flow velocity in the rising main in accordance with

Clause D6.3.1 of "the Code".

Awaiting further input from the pumping station design specialist, the design flow rate was estimated as per point a) above, resulting in 0.5 L/s.

7.3.17. Sewer records can be found in **Appendix C**. A predevelopment enquiry has been made to Thames Water to confirm there is adequate capacity within the existing sewer. Liaison with the sewer company is still undergoing.

7.3.18. A copy of the pre-development correspondence to date can be found in **Appendix C**.

8

CONCLUSIONS

8 CONCLUSIONS

8.1.1. This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared to accompany an outline planning application for the site submitted on behalf of Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith. The site is located in Elsenham, north-west Essex in East Anglia, adjacent to both Old Mead Road and Station Road. An approximate address for the site is Land East of Station Road, Elsenham and approximate OS coordinates are 553658, 227032.

8.1.2. Based on the information provided within this report, it is concluded that:

- The development site is located entirely within Flood Zone 1.
- The development site is not located within a groundwater source protection zone or protected drinking water area.
- The British Geological Survey (BGS) online Geology of Britain Viewer indicates the west of the site is partly underlain by Kesgrave Catchment Subgroup and Head (Clay, Silt and Sand). No superficial deposits recorded in the eastern half of the site.
- Following site-specific ground investigation, infiltration is not expected to be a viable means of surface water discharge due to the abundance of clays throughout the site.
- The site is at low or negligible risk from all sources of flooding.
- Any offsite flooding will not be exacerbated as all surface water flows will be captured and attenuated to the 1 in 1-year greenfield rate (i.e. 11.2 L/s).
- Safe access and egress will be via Phase 1 development road network, ultimately connected to the B1051 Henham Road.
- The proposed development drainage arrangement will comprise of a SuDS treatment train consisting of permeable pavement, piped network and attenuation basin to provide source control, water quality treatment and biodiversity enhancement, prior to discharging surface water via attenuation basins to existing nearby ditch located north-west of the site.
- Surface water runoff will be attenuated via on-site basins for all events up to and including the critical 1 in 100-year storm rainfall event plus a 40% allowance for climate change.
- The attenuation basin was designed to accommodate the back-to-back rainfall scenario for the 1 in 30 + 40% Climate Change combined with a 1 in 10-year event, in accordance with the Essex County Council LLFA requirements.
- To ensure the effectiveness of the proposals, a maintenance regime will be in place to ensure the future performance of all the SuDS and drainage devices. Adoptable Sewer network will be offered to local water authority via a Section 104 agreement. Strategic SUDS will be managed by a Private Management Company to be arranged by Client.
- The proposed foul water drainage strategy will include an adoptable gravity network and pumping station that will discharge all foul flows via the proposed Phase 1 gravity network into the Thames Water foul sewer network south-east of the site. The design flow rate for the pump is 5.0 L/s.

- A pre-development enquiry has been made to Thames Water to confirm available capacity within their foul water system. The predevelopment report will be appended to this document once received.

8.1.3. Based upon information provided within this report, it is concluded that the site is presented as sustainable in terms of flood risk and compliant with the criteria set out in the NPPF.