FLOOD RISK ASSESSMENT

3 Chapel Lane
Great Blakenham
Ipswich
Suffolk
IP6 0JJ

orwell
ENVIRONMENTAL

FLOOD RISK ASSESSMENT

Site address
3 Chapel Lane, Great Blakenham, Ipswich,
Suffolk IP6 0JJ

Site coordinates
E 612642 N 250068

Client
Ashley Bagley, 3 Chapel Lane, Great
Blakenham, Ipswich, Suffolk IP6 0JJ

Point of contact
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Report reference
OELFRA-ABDS-0001

Report issue
V1

Date
25/10/2021

1. Executive Summary

This report has been prepared in line with the National Planning Policy Framework (NPPF) as an assessment of the risk of flooding for all sources to the proposed development at 3 Chapel Lane, Great Blakenham, Ipswich, Suffolk, IP6 0JJ. A review of available environmental data has been carried out and is summarized below.

Risk source	Current risk	Risk after development
River and coastal	Low to Moderate	Low to Moderate
Surface water	Low	Low
Groundwater	Low to Moderate	Low to Moderate
Sewer	Low	Low
Structures (culverts, bridges, etc.)	Low to Moderate	Low to Moderate
Reservoir	Low	Low

Orwell Environmental have provided the above assessment based on professional judgement. The risk shows after development is subject to all recommendations being carried out. Explanations of the risk categories we have assigned to the proposed development are enclosed within the report. Orwell Environmental can confirm that no significant flood risk has been identified at the site.

Recommendations for next steps and further work regarding the proposed development are found in Section 8 of this report.

2. Introduction and Scope

This report has been prepared in line with the NPPF which promotes a sequential risk-based approach to the location of developments with the aim of ensuring areas of little or no flood risk are developed as a preference. This report aims to provide a clarification of the nature and significance of sources of flooding which may a risk to the site.

This report includes an in-depth review of Environment Agency data, as well as commercially available data, that indicate sources of flood risk to the site from rivers (fluvial), the coast, surface water (pluvial), groundwater, sewers, structures, and reservoirs. Recommendations are made on how to mitigate or manage any risk identified to make the proposed development fit for purpose, whilst considering climate change.

In addition to data, information in the local Strategic Flood Risk Assessment is also considered to gain a greater understanding of flood risk at a local level, as well as to support Sequential and Exception Tests if required under the NPPF.

This report assesses the current and future flood risk at the site using current best practice methods and it should be noted that the findings presented are based on information supplied by third parties. Whilst Orwell Environmental Limited assume that all information is representative of past, current and future flood conditions at the site and in the surrounding area, we are unable to offer any guarantee as to its validity. This assessment considers only the intended use of the site as provided to us by the client and cannot be used to assess any other activity which may have an impact on the risk of flooding at the site.

3. Site Analysis

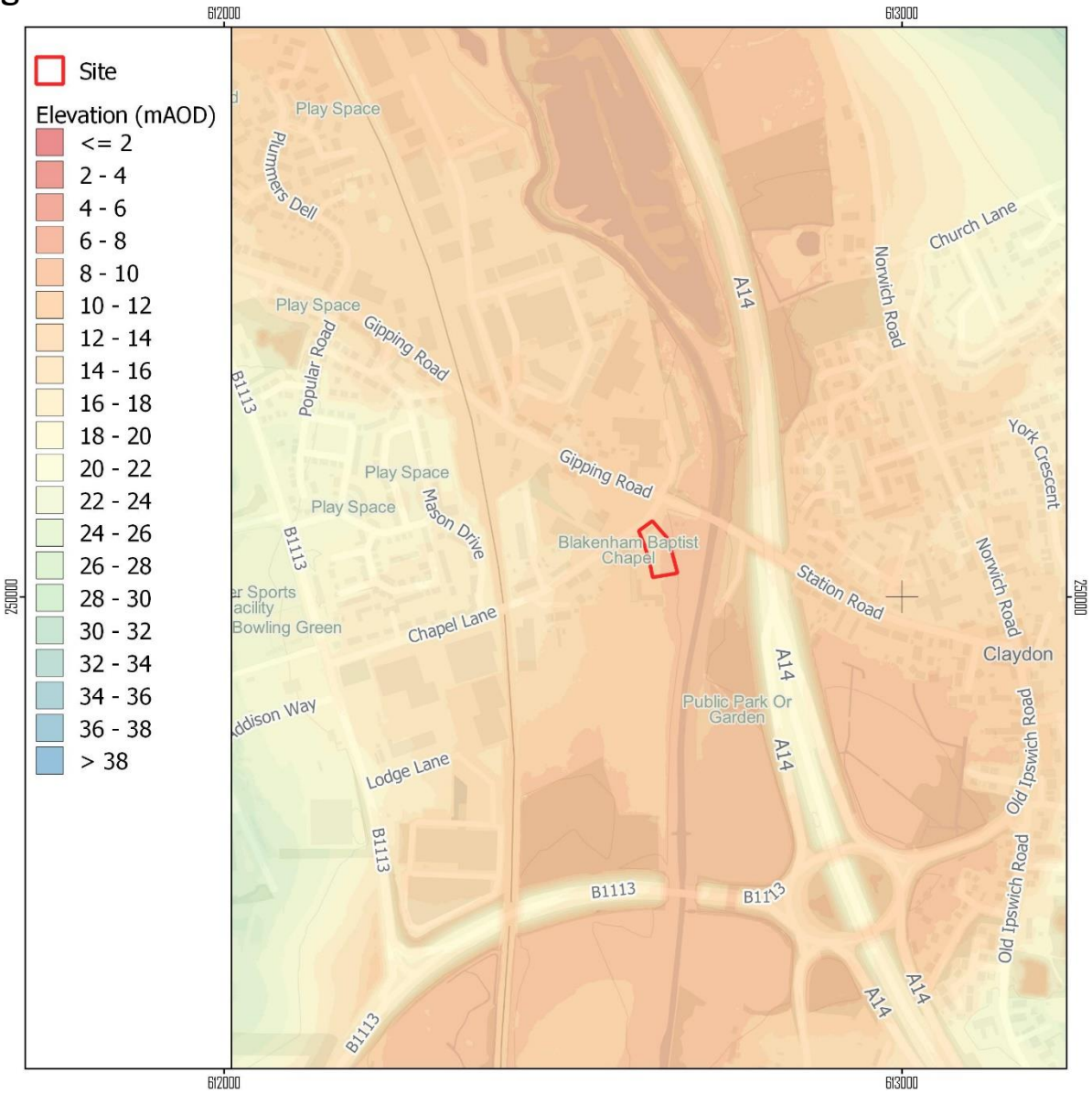
Site and Setting

The site is in Great Blakenham (E 612642 N 250068), near to the River Gipping. The general area is largely a mix of residential, commercial and industrial. Land adjacent to the river is largely in agricultural use.

According to a 1m resolution, LiDAR-derived Digital Terrain Model (DTM) provided by the Environment Agency, elevation on site ranges from 11.28mAOD in the north west and 9.18mAOD in the south east. Terrain on site generally slopes downward in a south easterly direction towards the River Gipping, with a fall of 2.10m.

The topology surrounding the site generally slopes downwards from the west towards the River Gipping. Land to the east of the river slopes in the opposite direction, also towards the River Gipping (See Figure 1).

Figure 1. – Site Location and Elevation



Proposed development

The site is currently in residential use. The client intends to erect a two story side extension, a single story rear extension, and to convert the existing garage to additional living accommodation (See Appendix B). The proposed lifespan of the development is 100 years.

Hydrological features

No surface water features are located on site however, the River Gipping and its associated tributaries are located 36m east. A number of former pits are located from 285m north which are also inundated as ponds. A number of additional ponds are located within 1km (See Figure 2).

Infrastructure

A number of bridges have been identified which span the River Gipping. The closest of these is the Gipping Road Bridge located 66m east. An additional road bridge has also been identified downstream, 463m south of the site where the B1113 crosses the River Gipping. A railway bridge has also been identified c.895m north west, again spanning the River Gipping (See Figure 2).

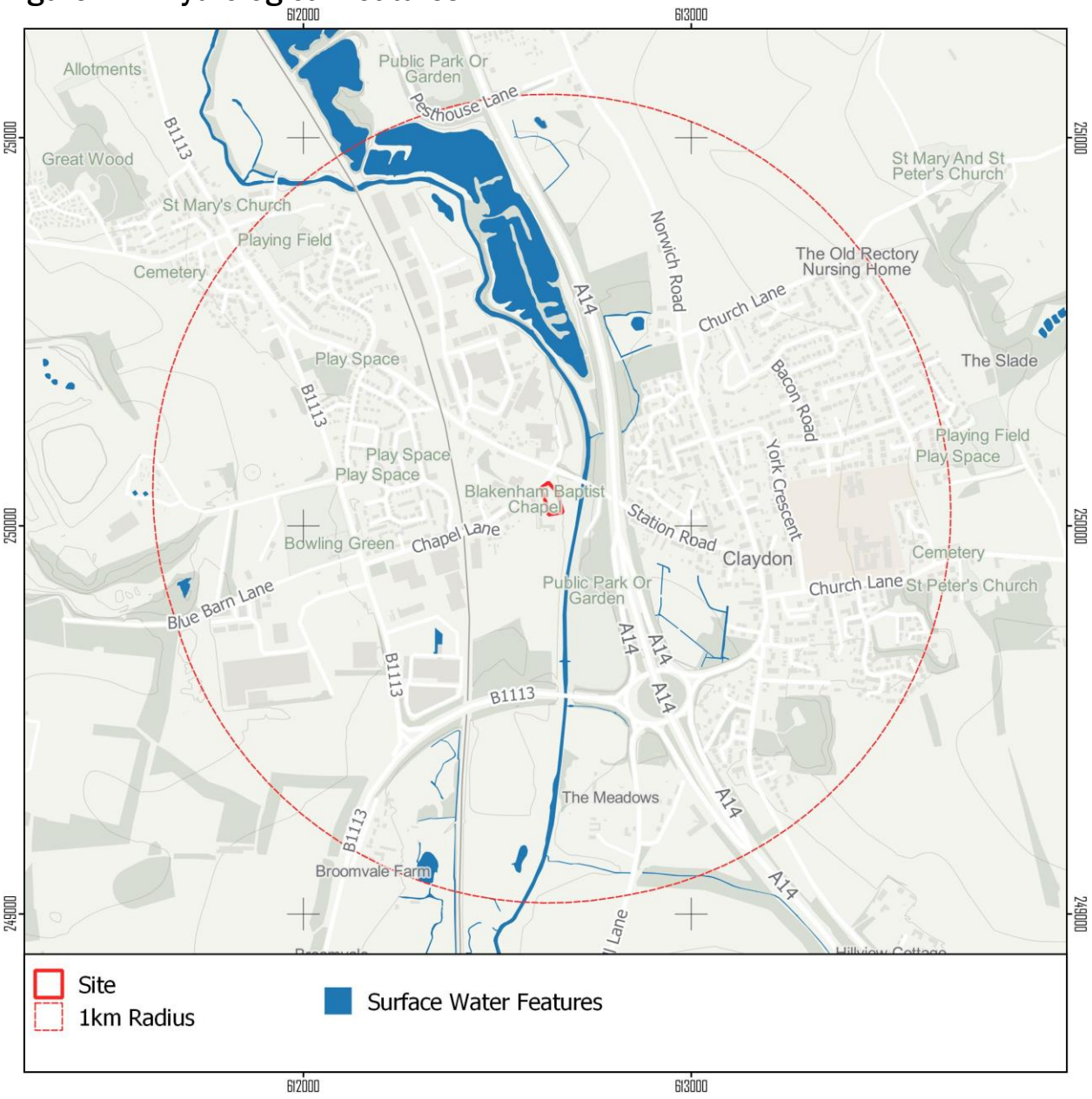
Hydrogeology

Mapping provided by the British Geological Survey (BGS) indicates that the superficial geology underlying the site is undifferentiated river terrace deposits made up of sand and gravel formed up to 3 million years ago in the Quaternary Period and is indicative of land previously dominated by rivers. This is classified by the BGS as a Secondary Aquifer (subset A).

The bedrock geology at the site is the Newhaven Chalk Formation. This is a sedimentary bedrock formed approximately 72 to 86 million years ago in the Cretaceous Period. It indicates that the local environment was previously dominated by warm chalk seas. This is classified by the BGS as a Principal Aquifer.

According the BGS borehole records, the closest record of significant depth to the site is TM15SW122 (27m north east) which found groundwater at 5.20mbgl. This was a percussive window sampler borehole to a depth of 25m, set on land at 12.06mAOD.

Figure 2. – Hydrological Features



4. Flood risk to the site

Historic Flood Events

According to data provided by the Environment Agency, no historic flood events have been recorded within 1km of the site at the time of this report (See Figure 3).

River (fluvial) and coastal flood risk

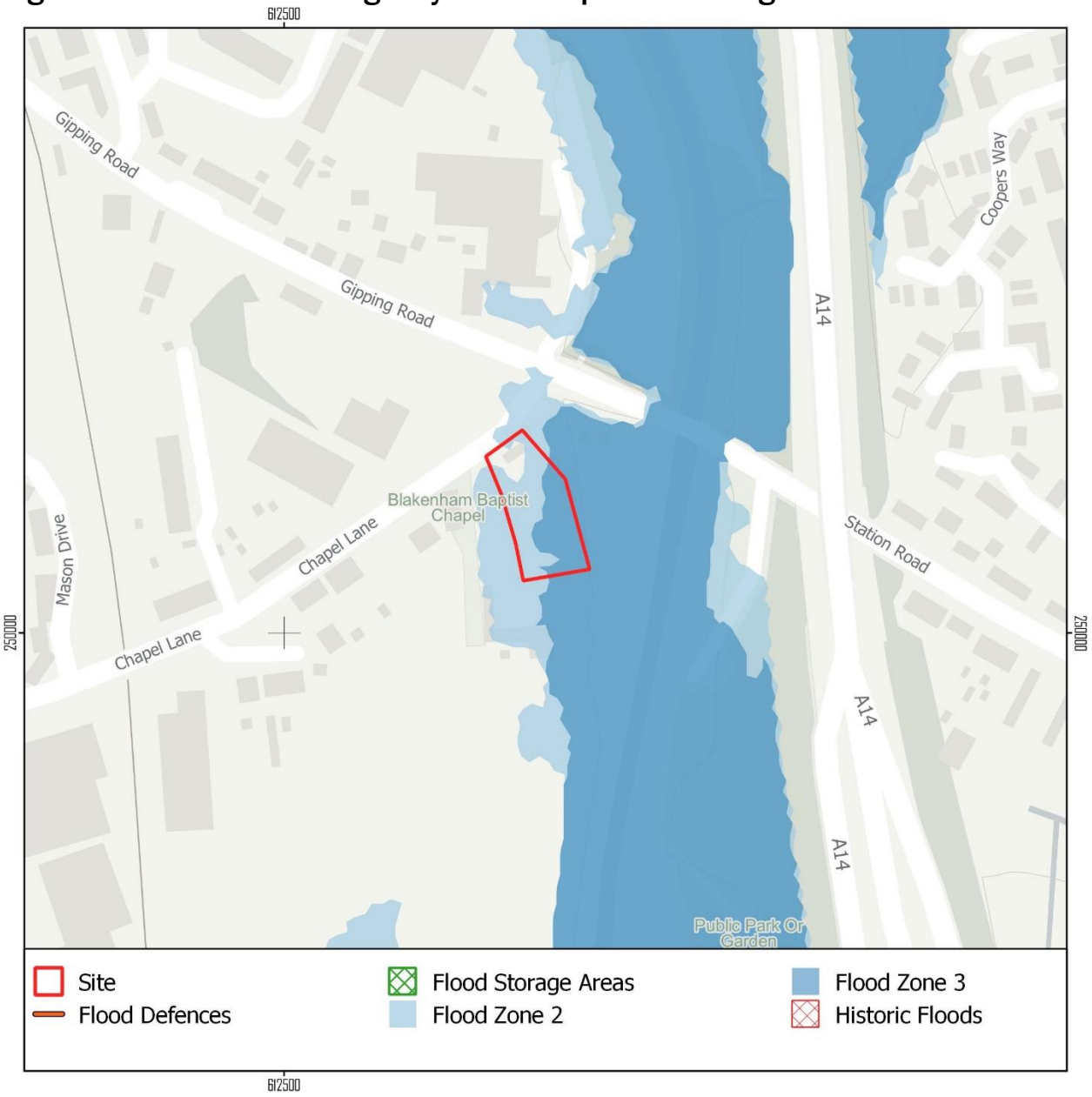
The majority of the site lies within a Flood Zone 2 as defined by the Environment Agency. This area is therefore classified as being at a moderate risk of fluvial flooding. It should be noted that buildings on site are identified as being impacted by this risk banding. The south east of the site lies within a Flood Zone 3 as defined by the Environment Agency and as such, is classified as being at a high risk of fluvial flooding with an Annual Exceedance Probability (AEP) of greater than 1%.

It should be noted that only the area of Flood Zone 2 extends onto the site of the existing and proposed buidlings, and not the Flood Zone 3.

No formal flood defences have been identified to offer the site protection.

See Figure 3.

Figure 3. – Environment Agency Flood Map for Planning



Surface water (pluvial) flooding

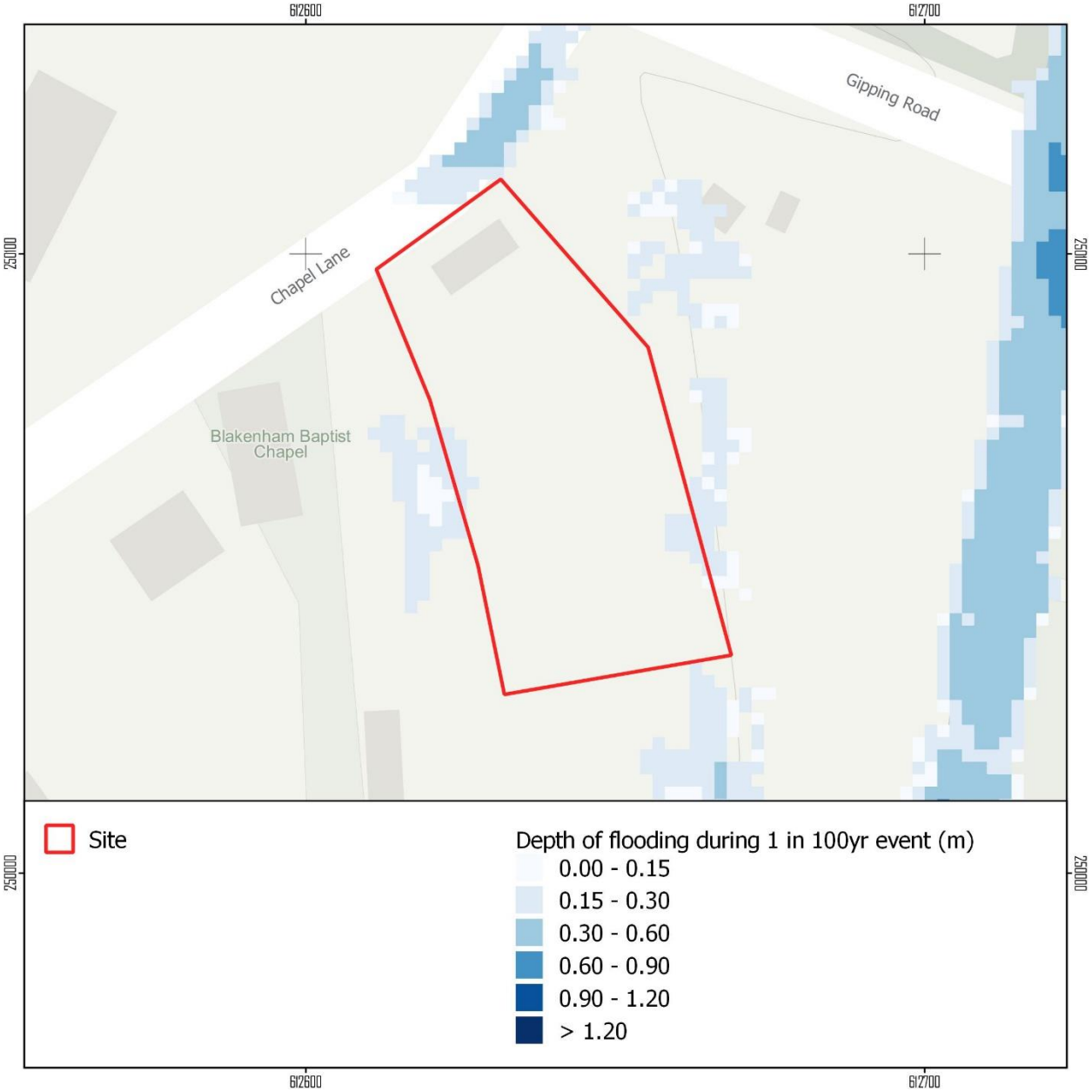
Data provided by the Environment Agency indicates that the site is not at risk of surface water flooding during the 1 in 30 year event. However, isolated areas on the east and western edges of the site have been identified to be at risk during the 1 in 100 year event. Anticipated depths at both of these locations during this event are expected to be up to 0.3m.

In addition, based on site topography and terrain in the surrounding area, the site does not appear to be located within an area of low topography (compared with surroundings) and is not located along an overland flow route.

Mid Suffolk District Council's SFRA also shows that there have been no surface water flood incidents within 100m of the site and confirms that it is not located within a Critical Drainage Area (CDA).

It should be noted that these areas of surface water flood risk do not extend onto the area of the site where the proposed development will be sited. This has been taken into account as part of this assessment.

Figure 4. – Environment Agency Risk of Flooding from Surface Water



Groundwater flooding

According to online mapping provided on the Department for Environment, Food and Rural Affairs, the site sits on top of a principal chalk aquifer in terms of bedrock geology, and permeable sands and gravels . Although groundwater levels were identified 5mbgl at a borehole 27m north east, this borehole was taken at a higher elevation than that of the site. Therefore, we would anticipate that when this sample was taken in April 1971, groundwater levels were sat somewhere around 1.7mbgl, in the sand and gravel superficial geology. During winter we would generally expect groundwater levels to be slightly closer to ground level.

Given the proximity to the River Gipping and the geology underlying the site, it is likely that any groundwater flooding is likely to occur in connectivity with any fluvial flooding and subside with river levels. This has been considered as part of this assessment.

Sewer flooding

The SFRA shows no records of sewer flooding in the proximity to the site.

Structures

The Gipping Road Bridge is located 66m east and theoretically, could cause flooding if a blockage were to occur. However, having considered the size and design of this structure, we do not consider a blockage likely to occur.*

*However, it should be noted that we have considered this structure as part of our fluvial mitigation as detailed in Section 7 of this report.

Reservoir flooding

Data provided by the Environment Agency Web Mapping Services indicates that the site is not at risk of flooding during the event of a reservoir failing.

5. Flood risk as a result of the proposed development

The proposed development includes an increase in building footprint from 90.13m^2 to 143.46m^2 and in turn an increase in impermeable area of 53.33m^2.

An estimation of the storage volume requirements that are needed to meet normal best practice criteria has been carried out 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). See Appendix C.

The total storage volume required for the proposed development for a 1 in 100 year event is 1m^3 with a discharge rate of 2l/s. Therefore, we believe that this can be achieved through the use of the existing soakaway providing it is located within an area of the site not at a significant risk of flooding. It is important to consider the elevation of the site of the soakaway and this should be sited in the higher elevation areas of the site in the north west.

We have assumed that best practice will be followed when carrying out any changes to the existing drainage system, and that care will be taken to ensure that the proposed development does not block or overload any existing drainage or flow pathways to or from the site.

Based on the site topography and the low to moderate risk of surface water flooding at the site it is considered unlikely that any works will interfere with existing overland flow paths.

6. Suitability of the development

National and local planning policies have been considered as part of this report.

Sequential Test

In line with the NPPF, the suitability of the development is assessed against its location with regard to Environment Agency Flood Zones and the vulnerability of the proposed development. In cases where the development is mixed use, the most vulnerable category of vulnerability must be used unless the development is considered in its component parts.

The matrix below shows suitability based on Flood Zones compared with vulnerability. Suitable developments are marked in green, those requiring an Exception Test are marked in amber, and unsuitable development are marked in red.

Flood Zone	Vulnerability Classification				
	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
1					
2					
3a					
3b					

Given the current and proposed use of the site are both residential, this is considered a More Vulnerable development. Given its location within a Flood Zone 2, it is also considered suitable in terms of national planning policy.

With regard to local policy, we have consulted Babergh and Mid Suffolk Level 1 Strategic Flood Risk Assessment (August 2020) which references the NPPF and states that:

> *Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), to inform development zoning within the site and prove, if required, whether the Sequential and Exception Tests are satisfied.*

Based on the data provided and that the majority of the development area is outside of Flood Zone 2, and that all of it is outside of Flood Zone 3, we consider that in terms of local planning policy the development is also considered suitable.

7. Resilience and mitigation

Emergency evacuation/safe access and egress routes

Wherever possible a safe access and egress route should be demonstrated which has a flood hazard rating of 'very low' from areas within the floodplain to an area that is completely outside the boundary of the 1 in 100yr fluvial flood event (with allowance for climate change).

Given that the front entrance of the residential building on site is located outside of the boundary of Flood Zone 2, and are therefore outside of the 1 in 1000 year fluvial flood event, the demonstration of safe access and egress routes is unlikely to be required. However, if this is a requirement proposed by the Local Authority, we recommend following the building's fire exit route.

It may be prudent to register for the Environment Agency's Flood Warning Scheme to receive phone, email or test message alerts if the property is at a risk of flooding. You can do so by following this link:
https://www.gov.uk/sign-up-for-flood-warnings

Mitigation measures

River (fluvial) and coastal

Given the sites location within a Flood Zone 3, and that the existing and proposed building footprints are located within a Flood Zone 2, we have carried out an assessment of Environment Agency hydraulic modelling.

A 'Product 4' was requested from the Environment Agency on 1 October 2021 and a response including hydraulic modelling outputs was received on 22 October 2021. Details of the model are as follows:

Model: *Gipping 2020*
Date: *2020*
Consultant: *Mott Macdonald*

The Environment Agency provided us 1D model nodes for the undefended scenario (in the absence of defences) with figures for flood height, water velocity, and discharge; for the 1 in 1000, 1 in 100, and 1 in 20 year events. Figures for climate change events were also provided for 20 year, 35 year and 65 year for the 1 in 100 year event.

In order to take into account the impact of the Gipping Road Bridge 66m to the north east of the site, it was decided that model node GIPP_10360u should be used to gain a representative calculation for the anticipated depth of flooding during the 1 in 100 year event (with an allowance for climate change).

DEFRA's online Hydrology Data Explorer was used to gain peak river flow climate change allowances for the East Suffolk Management Catchment. Given that the lifespan of the development is 100 years, and that it is considered a More Vulnerable development, the Central Allowance was taken for the 2080 event. This has been identified at 19%.

Since we cannot assume that peak flow is directly proportional to flood height, we have taken the water velocity for the 1 in 100 year event (0.75m/s) and applied the climate change allowance of 19% which gives an anticipated flow for the year 2080 as 0.89m/s.

The closest matching flow to this from the model for node GIPP_10360u is that of the 1 in 100 year, 35 year Climate Change event at 0.91m/s. Therefore, we have used the flood height from this modelled scenario which is 10.62mAOD. See Appendix D.

Analysis has been carried out to identify land lying at or below 10.62mAOD and the results can be seen in Figure 6. It should be noted that neither the existing nor proposed building footprints are expected to be impacted during this event. Further analysis also found that according to the Environment Agency's LiDAR-derived Digital Terrain Model, proposed buildings on site will be set no lower than 11.27mAOD (providing that they match existing floor levels) and therefore will have more than the minimum required 0.3m free board above the anticipated flood height.

Therefore, providing that the development follows the proposed plans in Appendix B of this report, we consider it suitable for use in terms of fluvial flood risk.

Figure 5. – Gipping 2020 Model Node Map

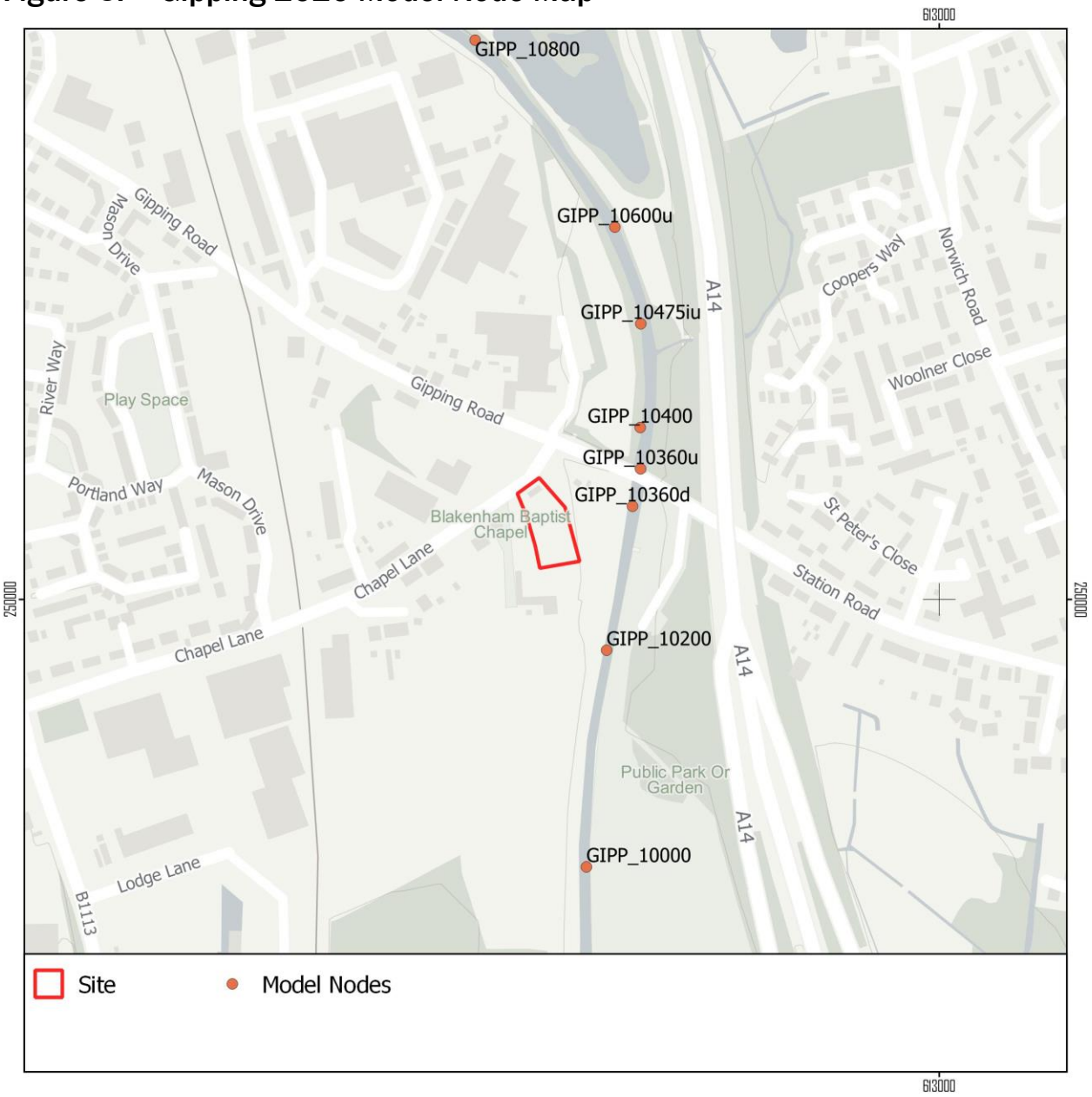
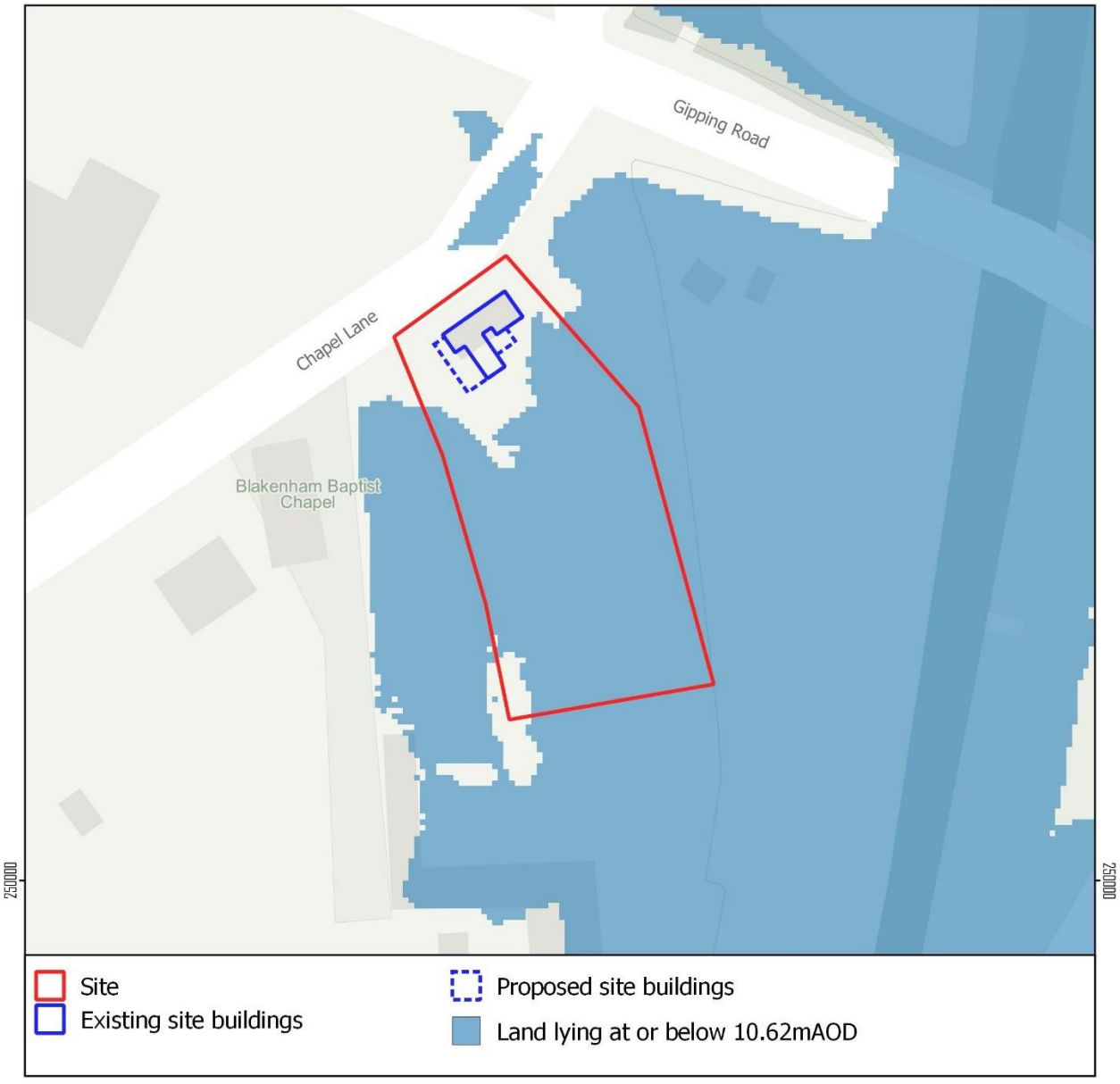


Figure 6. – Land lying below modelled flood event



Surface water

The area to the north of the site where development is proposed has not been identified as being at significant risk of surface water flooding, and therefore mitigation measures are not required. In addition, the increase in runoff due to the proposed development is expected to

be managed through the existing soakaway providing that it is located in an area of the site that isn't at significant risk of flooding.

Groundwater

The site sits above a Principal and a Secondary (A) aquifer, and as a result there is a risk that water may permeate through the geology at the site. However, it is expected that any abnormally high groundwater levels will be driven by river levels. Therefore, we consider the risk of surface water flooding to the development area of the site to be low to moderate, in line with the fluvial risk at the site.

Sewers

Given that the site has not been identified as being at risk of sewer flooding, mitigation measures are not required.

Structures (culverts, bridges, etc.)

Although the Gipping Road Bridge is located 66m north east, given the span of the bridge it is unlikely to become blocked, and considering the fluvial risk in the area, we do not consider the development areas of the site to be at significant risk of flooding as a result of nearby structures and have aligned this risk with the fluvial risk.

Reservoirs

Given that the site has not been identified as being at risk of flooding from reservoir failure, mitigation measures are not required.

8. Conclusions and recommendations

Risk summary for the current site and for the proposed development:

Risk source	Current risk	Risk after development
River and coastal	Low to Moderate	Low to Moderate
Surface water	Low	Low
Groundwater	Low to Moderate	Low to Moderate
Sewer	Low	Low
Structures (culverts, bridges, etc.)	Low to Moderate	Low to Moderate
Reservoir	Low	Low

Key sources of flooding	Fluvial
Are standard mitigation measures required?	No
Are standard mitigation measures likely to provide protection to the development and protection from the development to the surrounding area?	N/A
Does the proposed development likely satisfy the requirements of the Sequential Test?	Yes
Further work and recommendations	Ensure soakaway is located in area of the site that is not identified to be at risk of flooding from Figures 4 and 6, and preferably towards the higher elevation areas of the site in the north west.

9. Glossary of terms and key references

Annual Exceedance Probability (AEP)	The probability of a particular flood event occurring in any year.
Aquifer	An underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials.
- Principal	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
- Secondary A	These are permeable layers of rock or drift deposits capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
- Secondary B	These are predominantly lower permeability layers of rock or drift deposits which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- Secondary undifferentiated	This term has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Exception Test	Follows on from the Sequential Test. The purpose of the test is to explore whether the proposed development brings sufficient sustainability benefits to the community that outweigh the flood risk at the site after development.
Flood Zone 1	An area defined by Environment Agency hydraulic modelling that is **not** expected to flood during a 1 in 1000 year flood event (also termed as 0.01% Annual Exceedance Probability).
Flood Zone 2	An area defined by Environment Agency hydraulic modelling that **is** expected to flood during a 1 in 1000 year flood event (also termed as 0.01% Annual Exceedance Probability).
Flood Zone 3	An area defined by Environment Agency hydraulic modelling that is expected to flood during a 1 in 100 year fluvial flood event (also termed as 1% Annual Exceedance Probability) or a 1 in 200 year tidal flood event (also termed as 2% Annual Exceedance Probability).
- Flood Zone 3a	The area of Flood Zone 3 that is **not** classified as the Functional Floodplain.

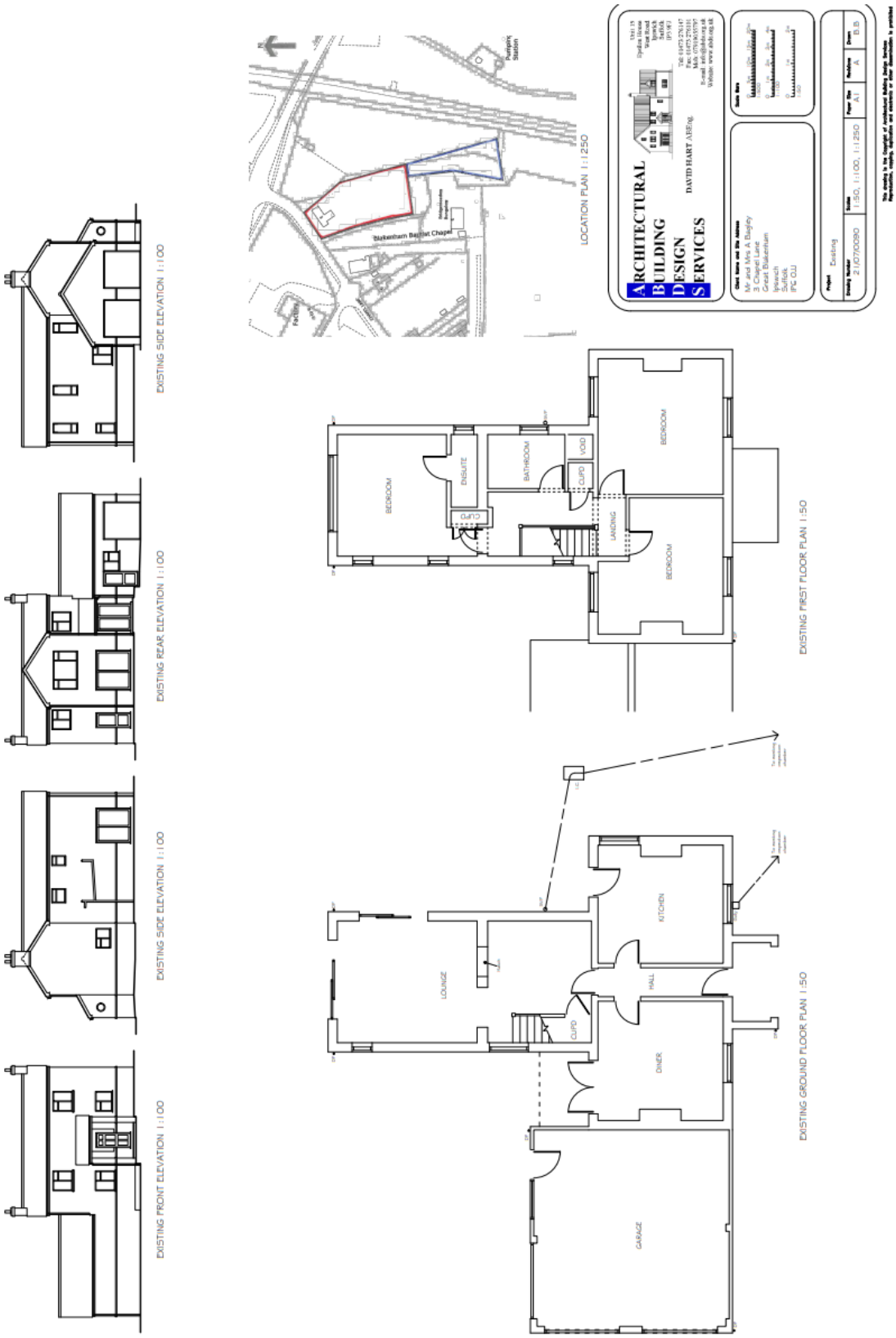
- Flood Zone 3b	The area of Flood Zone 3 that **is** classified as the Functional Floodplain (i.e. the area with greater than 5% Annual Exceedance Probability).
Fluvial	Relating to rivers
Functional Floodplain	An area of land which serves as a storage area for flood waters.
Hydraulic modelling	The practice of estimating water levels and flood extents based on a series on input parameters.
Pluvial	Relating to rain
Sequential Test	A test aimed to steer new developments into taking place in areas of low river flood risk.
Strategic Flood Risk Assessment (SFRA)	A high-level flood risk assessment prepared by Local Authorities to assess flood risk and influence policy within their boundary.
Sustainable Drainage Systems (SuDS)	A collection of water management practices that aim to align modern drainage systems with natural water processes.

The National Planning Policy Framework (February 2019) – Ministry of Housing, Communities and Local Government
https://www.gov.uk/government/publications/national-planning-policy-framework--2

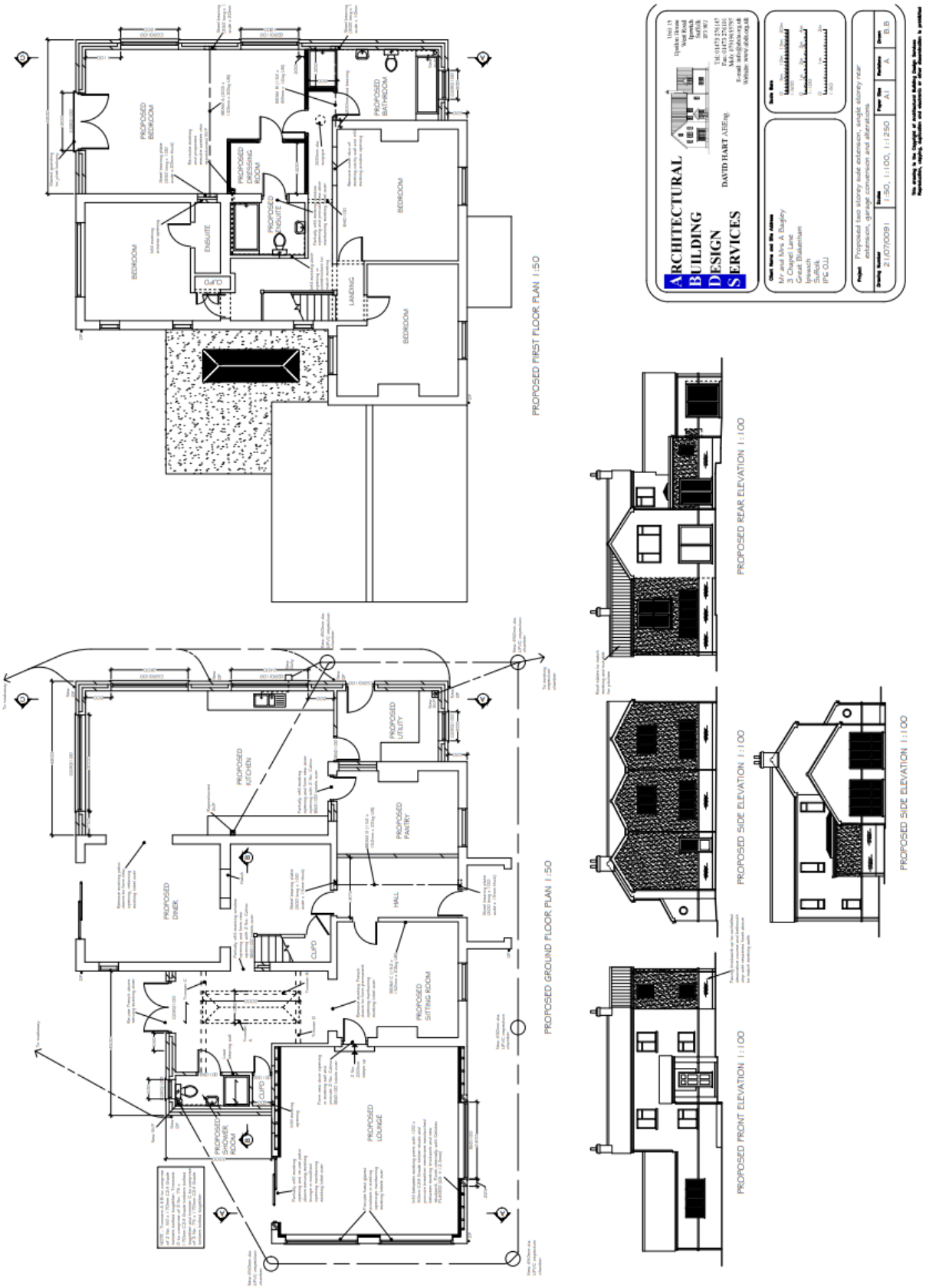
Level 1 Strategic Flood Risk Assessment (August 2020) – JBA Consulting C/O Babergh & Mid Suffolk District Councils
https://www.midsuffolk.gov.uk/assets/Strategic-Planning/Current-Evidence-Base/SFRA2020/Part01-BMSDC-SFRA-Level-1-Report-and-Appendices-Aug2020.pdf

10. Appendices

Appendix A – Existing Site Plan



Appendix B – Proposed Site Plan



Appendix C – Surface Water Storage Requirements

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Charles Krolik-Root
Site name:	3 Chapel Lane
Site location:	Great Blakenham

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	52.10825° N
Longitude:	1.10364° E
Reference:	2032020854
Date:	Oct 25 2021 10:34

Site characteristics

Total site area (ha):	0.27
Significant public open space (ha):	0.256
Area positively drained (ha):	0.014000000000000012
Impermeable area (ha):	0.014
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.02
Net impermable area for storage volume design (ha):	0.01
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	85.47
FEH / FSR conversion factor:	1.11	1.11
SAAR (mm):	580	580
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.65	1.65
Growth curve factor 30 year:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Q_{BAR} for total site area (l/s):	0.39	0.39
Q_{BAR} for net site area (l/s):	0.03	0.03

Site discharge rates	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes	Default	Edited
Attenuation storage 1/100 years (m^3):	1	1
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	1	1

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix D – Gipping 2020 Model Node Table for Node GIPP_10360u

Working grouop

Node	GIPP_10360u	
Description	Fluvial Undefended	
	Flood Height	Flow Velocity
1 in 1000 year	10.72	0.95
1 in 100 year	10.33	0.76
1 in 20 year	10.08	0.62
1 in 100 year plus 25 CC	10.54	0.88
1 in 100 year plus 35 CC	10.62	0.91
1 in 100 year plus 65 CC	10.92	1.01