FLOOD RISK ASSESSMENT

Site Address

Baker House, The Close, Potters Bar EN6 2HY

1 Abbreviations

Abbreviation	Description
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
HBC	Hensmere Borough Council
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
SuDS	Sustainable Drainage Systems
GWSPZ	Groundwater Source Protection Zone
LLFA	Lead Local Flood Authority
mbgl	metres below ground level
DCLG	Depanment for Communities and Local Government
PPGPS	Planning practice guidance and Planning system

2 Executive Summary

Location	Baker House, The Close, Potters Bar, EN6 2HY
Proposed Development	Conversion of a class E commercial building into class C3 four bedroom dwellinghouse.
EA Flood Zone	Flood Zone 1
Sequential and Exception Tests	Sequential and Exception Tests may be required. LLFA to decide.
Main Sources of Flooding	Potters Bar Brook.
Flood Defences	High Ground - The site does not benefit from flood defences.
Record of Xietoric Flooding	No recorded flooding incidents at the site.
Fluvial (River and Tidal (Bea) Flood Risk	Medium - However, no significant fluvial/tidal flooding incidents identified.
Fluvial (Surface Water) Flood Risk	Low - No significant surface water flooding incidents identified. Only 3 drainage infrastructure flooding in the vicinity ol the site.
Flood Risk from Artificial (Canals and Reservoirs)	Low - No signiticant artificial sources identified.
Sources of Groundwater Flood Risk	Low - Site has no susceptibility to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development will not increase the site impermeable area. As such it will have no adverse impact on local flood risk.
Proposed Flood Risk Mitigation Measures	• Finished floor levels will be no lower than existing ground floor levels; • Construction will utilise flood resistant design, materials and services. • Occupants will sign up for EA Emergency Flood Warning Direct Service:
Surface Water Management (SuDS)	SuDS would reduce current surface water run of rates. Given the small size of the site, there is limited potential for implementation. Consideration should be given to infiltration techniques and rainwater harvesting.
Conclusion	The site is considered to be at low overall risk of flooding. No previous records of fluvial, tidal, groundwater or surface water flooding incidents were found at the site location and the proposed development will not increase local flood risk.

3 Introduction

This report is purposely written to provide a nood Risk Assessment (FRA) for a site located at Baker House, The Close, Potters Bar, EN6 2HY.

4 Development Proposal

The FRA is required to support a planning application for the Conversion of a class E commercial building into class C3 four bedroom dwellinghouse.

Further details including drawings of the development plans are available in Appendix 2.

5 Report Aims and Objectives

The aim of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. Further, it seeks to assess whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) and its supporting guidance.

6 Summary of Data Review Undertaken

The following research has been undertaken as part of the FRA:

- Desktop assessment of topographical, hydrological and hydrogeological settings through review of the information sourced from the Bfitish Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
- Reviaw of publicly available flood risk mapping provided by the EA;
- Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

7 Legislative and Policy Context

7. Legislative Contcxt

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy".

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of tha various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

7.2 Policy Cnatext

7.2.1 National Planning Policy Framework (NPPF)

The NPPF sets out the government's planning policies for England and how these are expected to be applied. It provides also, a set of guidelines and philosophy with

which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

Section 10 entitled “Meeting the challenge of climate change, flooding and coastal change” specifically d e a l s with flood risk. I t states among other things that LPAs should try to ensure that “inappropriate development in areas at ñsk of flooding is avoided by directing development away from areas at highest risk, but whare development is necessary, making it safe without increasing flood risk elsewhere”. It further states that when determining planning applications, LPAs should only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- development is appropriately flood resilient and resistant, induding safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments.

The NPPF also lays out requirements for how LPAs should deal with planning applications in coastal areas. They should ensure that should they “reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast.”

Developments in Coastal Change Management Areas should only be considered

ApprOpfiate where it is demonstrated that:

B it will be safe over its planned lifetime and will not have an unacceptable impact on coastal change;

M the character of the caast including designations is not oomprornised;

B the development provides wider 9ustainability benefits; and

M the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

The Herlsmere Local Plan has an important role to play in the process of balancing development pressures and the environmental impact of new development in Hertsmere. The key policies relating to flood risk in the Local Plan are summarised below:

Policy D1: Watercourses, River Corridors, Floodplains and Water Meadows, states that development, including culverting of watercourses, will not be permitted where it would have an adverse impact on the Borough's watercourses, river corridors, floodplains and water meadows.

Policy D3: Control of Developmant and Runoff Considerations, states that planning permission wil not be granted for development within area at risk of flooding unless it incorporates appropriate flood protection measures.

Policy CS15: Environmental Impact of development states, inter alia, that proposals will be required to incorporate sustainability principles, minimising their impact on the environment and ensuring prudent use of natural resources by avoiding development in the floodplain unless flood prevention/mitigation measures are in place as required by the Environmental Agency.

3 EA Standing Advice on Flood Risk

The Environment Agency's standing advice lays out the process that must be

followed when carrying out flood risk assessments for developments

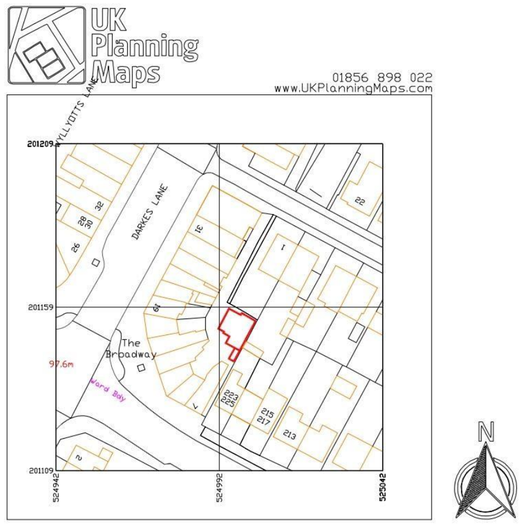
Flood risk assessments are required for developments within one of the flood zones. This includes developments:

- in flood zone 2 or 3 including minor development and change of use more than 1 hectare (ha) in flood zone 1
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)
- in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency

8 Site Description and Environmental Characteristics

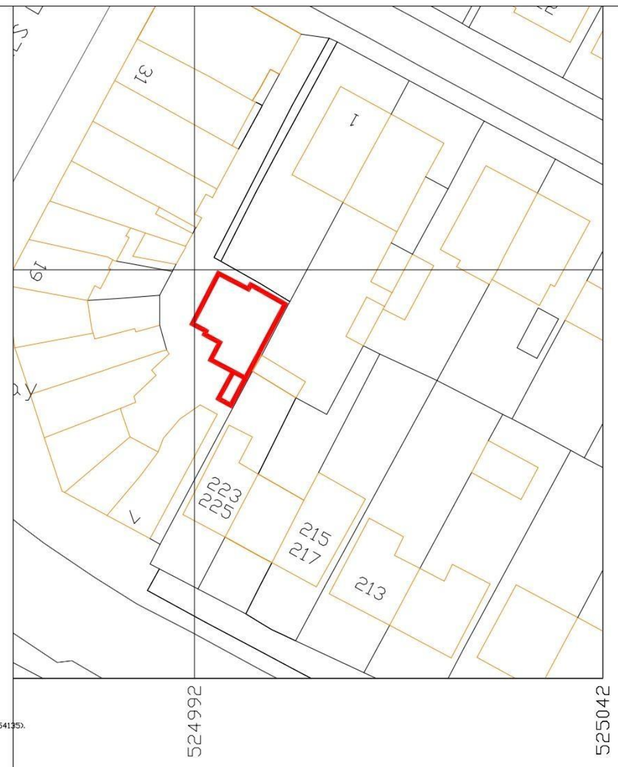
The site is located at Baker House, The Close, Potters Bar, EN6 2HY. It is Centred at national grid . It has an area of approximately 70m^2

A site location map and aerial photo are shown below. Photographs of the site are available in Aopendix 1.



10 0 10 20 30 40 50

Existing Site Location Plan | Scale 1:1250



from the Ordnance Survey National Geographic Database a

Existing Site Plan | Scale 1:500

NOTES

1.Dimensions should not be scaled from the drawings where accuracy is essential.

2.Details dimensions and levels to be checked on site by builder prior to commencement of works.Any works commenced prior to all necessary local authority approvals are entirely at the risk of the owner& builder.

3.Structural details are subject to exposure of existing construction and verification by L.A surveyor prior to carrying out the affected work.

4.All materials are to be used in accordance with the manufacturers' guidelines and all relevant British Standards Codes of Practice & Regulation 7 of Building Regs.

5.All works are to be carried out in accordance with Local Authority requirements .

6.The intended works fall within the Party Wall Act 1996 and any adjoining owners affected must be notified prior to commencement of any works.

7.Thames Water Authority permission to be obtained if building over or adjacent to sewers within 3 metres.(tel:08459 200 800)

8.No part of the extension to project into adjoining boundary lines.

Rev no.	Date	Description
Status	Planning	

project

Conversion of Class E commercial into Class C3 residential dwelling.

client

Mr Oluwaseun Morakinyo

drawing title

Site plan

Rocktower Solutions

Address : Rocktower Solutions
90 Station Road
Rochester Kent ME24BT

Tel: 07834231569

Gmail: rocktowersolutions7@gmail.com

designed AA	date
drawn OA	scale 1:500@A3
checked AA	
sheet no	

The retail parts has access points from The Broadway and the rear of the building.

The site falls within the jurisdiction of Hertsmere Borough Council in terms of the planning process.

The Lead Local Flood Authority (LLFA) for the district is Hertfordshire County Council.

The site is located within Flood Zone 1 for planning purposes. There are other Flood Zones in the area 2 and 3; defined by the EA. EA Flood Zone Maps are available in Appendix 5.

The site is currently used as commercial workshop.

A description of current land uses surrounding the boundaries of the site is given below in Table 1 below.

Table 1: Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (within 0 - 25m)	General Local Area (i.e. within 25 - 250m)
Eastern	Residential	Residential/Railway
Southern	Residential/Commercial	Residential
Western	Road	Road/Residential/Commercial

The nearest main watercourse is the Potters Bar Brook which flows in a culvert 100m East ol the site.

The British Geological Survey (BGS) mapping was analysed for data on the site underlying superficial and bedrock geology but none was available.

BGS mapping (Appendix 3\ indicates that the site lies upon an unproductive bedrock aquifer.

According to Elevation Finder the site levels are approximately 1OOmAOD.

9 The Sequential and Exception Tests

?.1 The .Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process. The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Minor development means:

- minor non-residential extensions:industrial/commercial/leisure etc extensions with a footprint less than 250 square metres.
- alterations: development that does not increase the size of buildings e.g. alterations to external appearance.

  householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed devalepment that would create a separate dwelling within the curtilage of the existing dwelling

  e.g. subdivision of houses into flats.

If alternative sites of lower flood risk are not available then the proposed development may require an Exception Test to be granted planning permission. Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications othef than for minor developments.All three elements of the exception test have to be passed before development is allocated or permitted. For the exception test to be passed:

- It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SFRA, where one has been prepared:

Tha development shouldbe on developed land or onpreviously developed land;

A flood risk assessment must demonstrate that the development wit be safe without increasing flood rid‹ elsewhere, and where possible wil reduoe the overal flood risk.

The requirements for an Exception Test are given in Table 2 and are defined in terms of Flood Zone and development vulnerability classification.

Table 2: HPPF flood zone vulnerability compatibility (source: NPPF}.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infiastiqcture				
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
	Exception Test required	✗	Exception Test required		
	Exception Test re uired	✗	✗	✗	✓

7 Development is appropriate

A Development should not be permitted.

10 Site Specific Flood Risk Analysis

The PFRA and Leval 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

1(.1 FIUVÏ2! (River) are TidaI (S=a) Floud Risk

10.1.1 Mechanisms for Fluviat Floodinq

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downmream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

- Overbank flooding - this occurs when water rises steadily and overflows over the edges of a river or stream.
- Flash flooding —this is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with I'mle to no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

10.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps al ow a site to be defined in terms of its flood zone (e.g. 1, 2, 3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that existing flood defences are not taken into account within the models or the maps. The EA fluvial flood zones are defined as follows:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- **Flood zone 2: Between 1 in 100 (1%) and 1 in 1000 annual probability af flooding;**

Flood zone 3 - Greater than 1 in 100 annual probability of fluvial flooding.

Flood zane 3 is split into two sub-œtegories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional hood plain (i.e. an important storage area for flood waters in extreme events).

W Flood zone 3a: Greater than 1 in 100 annual probability of fluvial flooding and/or greater than 1 in 200 (0.5•A) annual probability of tidal flooding;

B Flood zone 3b: functional flood plain (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding;

10.1.3 Main Potential Sources of Local Fluvial Flooding

The nearest potential source of fluvial flooding is considered to be the Potters Bar Brook which flows in a culvert approximataly 100m East of the site.

12.1.4 Records of Historic Fluvial Flooding Incidents

The EA informed that they do not hold any information on recorded flood incidents in the vicin”ity of the site.

The Historic Flood Map (Appendix 4) from the Strategic Flood Risk Assessment undertaken by the by the LLFA in 2008 indicates that the last time the borough suffered a significant fluvial flooding event was in 2000. The ftood did not impact the site.

10.1.5 Designated Fluviat Flood Risk Zone for the Site

As described above, the site is partly located within Flood Zones 1, 2 and 3 as defined by the Environment Agency. The front part of the site, which is in Flood Zone 3 has a 1% annual probability of fluvial flooding and is proposed for retail use. The central part is located within Flood Zone 2 and has between 1% and 0.1•/» annual probability of fluvial flooding. The rear part of the site which contains the rear residential access (East) is in Flood Zone 1 and has a less than 0.1•4 annual probability of fluvial flooding.

10,1 6 Mechanisms for Tidal Flooding

Tidal flooding may be described simply as the inundation of low lying coastal areas by the sea, or the overtopping or breaching of sea defences, Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

10.1.7 Definition of EA Tidal Flood Risk Zones

As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal flood zones are defined as:

	Flood zone 1: Less than 1 in 1000 annual probability of flooding;
M	Flood zone 2: Between 1 in 200 and 1 in 1000 annual probability of tidal flooding;
	Flood zone 3 - Greater 1 in 200 annual probability of tidal flooding;

8. Potential Sources of Tidal Flooding

The area in which the site is located is considered very unlikely to be affected by tidal flooding.

9. Flood Defences

The EA provided a detailed information on assets in the surrounding area which is presented in Appendix 7.. These consist of High ground and simple culverts.

10.Climate Change - EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extents

No detailed flood model ing has been conducted in the area by the EA. When contacted the EA stated as follows: "Unfortunately, we have not carried out any

detailed hood modelling in the area you have requested. Our Flood Map in this area is formed of national generalised modelling which was used in 2004 to create fluvial floodplain maps on a national scale. This data was later improved using a more detailed terrain model for the area. This modelling is not a detailed locel assessment; it is used to give an indication of areas at risk from flooding. In the future we may carry out detailed modelling in this area, but we do not currently have any plans to do so.“

10.1.11 Long Term Fluvial Flood Risk Considering Flood Defences

The EA's long term flood risk maps give an indication of the actual risk associated with flooding aher taking into account the effect of any flood defences in the area. The maps (Appendix 8\ indicate that the EA considers the long term risk from fluvial flooding to the site to be medium.

10 2 P!uvie! (Surface Water) Flood Risk

A pluvial, or surface water hood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water Hooding occurs when high intensity rainfall leads to run-off which flows over the ground surfacœ, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greatar than the rate of infiltration, or return into watercourses. Surface water flooding œn be exacerbated when the undertying soil and geology is saturated (as a result of prolonged precipitation or a high water table) or when the drainage network has insufficient capacity.

10.2.1 Mechanisms of Pluvial Flooding

The chief mechanisms for surface water flooding can be divided into the following categories:

- Runoff from higher topography;
- Localised surface water runoff —as a result of localised ponding of surface water;
- Sewer Flooding - areas where extensive and deep surface water flooding is likely to be inHuenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
  Low Lying Araas —areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
- Railway Cuttings —railway infrastructure cut into the natural geological formations can cause extra surface run off and pooling disrupting service and potentially affecting adjacent structures;
- Railway Embankments —discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur.
- Failure of artificial sources (i.e. man-made structures) such as such as canals and reservoirs.

2. Main Potential Sources of Local Pluvial Flooding

The main potential source of fluvial flooding to the site is considered to be surface water ponding and blockage of drainage infrastructure.

3. Records of Historic Pluvial Flooding Incidents

Examination of the LLFAs Level 1 SFRA revealed evidence of records of pluvial flooding in the vicinity of the site, however the flood extents did not impact the site.

A map showing the locetion of surface water flooding incidents is available in Appendix 4 .

4.Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals) An examination of OS mapping and the EA's mapping revealed no indications of significant reservoirs or canals in the area of the site

The EA's reservoir flood risk map indicates that the site does not lia within an area that is at risk of reservoir flooding.

5. Sewer Flooding

A map showing recorded incidents of sewer flooding is available in Appendix 4. This and a further map from Thames Water indicate that the area is at low risk of sewer flooding.

6.Climate Change - Modelled Predictions of Surface Water Run-off Flooding

Mapping showing the predicted extent and depth of surfaœ water flooding for the 1 in 1D0 year and 1 in 1000 rainfall return periods events provided by the EA for the site are available in Appendix 6.

These maps indicate that the site would be unaffected during both precipitation events. The areas immediately to the west and south of the site would be impacted by flooding during the 1 in 1000 year event with depths of up to 300mm.

7. Long Term Surface Water Flood Risk

The EA's long term flood risk maps which are available in Appendix 8 indicate that the long term risk of flooding from surface water is considered to be Very Low.

0.3 Risk of Flooding From Multiple Sources (ROFL*S)

The Environment Agency provides a map which gives an indication of the overall flood risk from fluvial, tidal and surface water sources considering the presence of river defences. This map indicates that there is between 1º/ and :2.3°/‹ chance of flooding at the site in any year, with the rear part of the site being at less than 0.1ᴰ/« yearly chanœ of flooding. A copy of the map is presented in Appendix 8.

Groundwater flooding occurs when water rises from the underlying aquifer at the location of a spring —where the underlying impermeablegeology meets the ground surface. This tends to occur after much longer periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth.

Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions

10 4.1 Historic Records of Groundwater Flooding

A map showing the locations of historic groundwater flooding incidents is available in Appendix 4. The map indicates that there has been one recorded incident of groundwater flooding within 500m of the site. The incident, however, did not impact the site.

10.4.2 Susceptibility to Groundwater Flooding

The Groundwater Depth map also provided by BGS indicates that the groundwater level is le9s than 3mbgl. A copy of the map is available in Appendix 9.

A Critical Drainage Area may be defined as a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure". A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2000 as "an area **within** Flood Zone 1 which has critical drainage problems and which has been notified... [to]...the local planning authority by the Environment Agency".

No information was found in the SFRA to suggest that the site is located within a Critical Drainage Araa.

11 Potential Impacts of the Development On Local Flood Risk

The development will result in an insignificant change in the impermeable area of the site (i.e. <$^{2)}$ and as such, is unlikely to impact upon local flood storage.

As the development does not involve the significant redesign of buildings at the site, it is considered unlikely to alter flood flow paths.

12 Flood Risk Mitigation Measures

The Department for Communities and Local Government ‘s (DCLG) Planning practice guidance and Planning system (PPGPS) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

As such, the developer has the option to implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 3 below to reduce surface water discharges from the site.

Table 3: SuDs Options

. Store rainwater for later use;
w Use infiltration techniques, such as porous surfaces in non-clay areas; Attenuate rainwater in ponds or open water features for gradual release; Attenuate
w rainwater by storing in tanks or sealed water features for gradual release; Discharge directly to a water course;
Discharge rainwater directly to a surface water
sewer/drain; Discharge to a combined sewer.

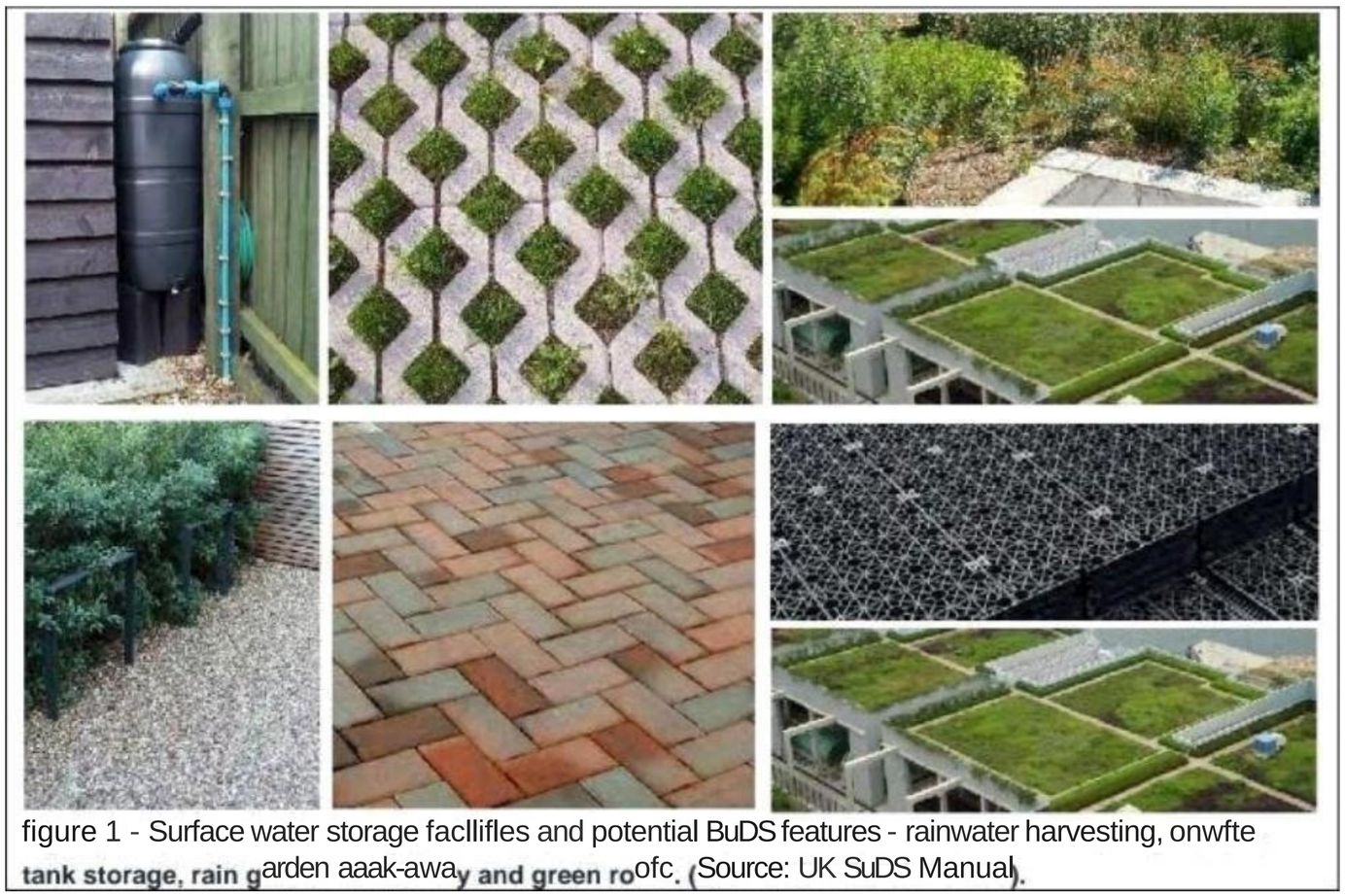


figure 1 - Surface water storage facIlifles and potential BuDS features - rainwater harvesting, onwfte tank storage, rain garden aaak-away and green roofc. (Source: UK SuDS Manual).

Additionally, the relevant schedules from Policy CC4 - Minimizing Surface Water Run-off with Sustainable Drainage Systems are:

Developmer›la muat maximize attenuation levels, achieving greenfield

M Al new car parlcs and hardstanding areas should be rainwater permeable with no run-off directed in to the sswer netwodq

All flat ro‹›fs should be green or brown roofs to contribute to reducing surface watar run<›ff.

Given the nature of the development and the size of the site(64m^2), there are limited opportunities for implementing SuDS. Measures such as green roofs, rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks should be considered. If required, the SuDS strategy will be detailed in a separate report.

Flood resilient construction uses methods and materials that reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

12 2.1 Finished Floor Levels

Theproposed conversion is considered to be less vulnerable, For less vulnerable development, EA Standing Advice states that finished floor levels should be either no lower than existing floor levels or 300 millimetres (mm) above the estimated flood level.

As model ed fluvial flood level data was not available for this location it is proposed that finished floor levels will be set no lower than existing floor levels.

12.2.2 Flood Resil ence Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

- M Water exclusion strategy - wheæ erriphasis is ptaced on minimising water entry whilst meintaining structuæl integrity, and on using materials and œnstruction techniques to facilitate drying and clearing. This straBgy is favoured when low fiood water depths aæinvolved (not more than 0.Sm).
- M Water antry etrategy - buildings ara at eignificant risk of etructural damage i there is a water level differenœ between outsicle Snd inside of about 0.6m or more. This stætegy is theæfoæ favoured when high hood water depths are involved (greater than 0.6m).

Given that predicted surface water flood depths less than 0.3m are predicted in extreme scenarios, the water exclusion strategy is considered most applicable for this site,

However, the proposed conversion is limited to the first and second floor levels, as such, the expected measures of constructing a resilient ground floor , wall and door in addition to ensuring adequate underground drainage is not expedient.

2.J Emergency Plan

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa.

The risk to life is largely a function of the depth and velocity ol the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in flaodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA. Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) \text{ -r } DF$$

where, HR = (flood) hazard rating; d - depth of flooding (m); v - velocity of floodwaters (m/sec); and DF = debris factor calculated using Tables below. The scoring methodology and calculation matrix for this is summarised in

Appendix 12.

As no detailed modelling giving predicted flood depths and velocities has been carried out, it is not possible to perform the assessment using the FDR2321 methodology.

As the rear (East) residential access to the building lies within Flood Zone 1, the use of a simple flood emergency plan is considered sufficient for the proposed development. The key elements of the emergency plan are described below.

1. EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone, mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

The agency operates a 24 hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at https://fwd.environment-agency.gov.uk/apn/olr/home along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued, and how best to cope with the aftermath of floods.

2. Access and Safe Egress

Access is available to the front of the building as a Safe egress to Flood Zone 1 via the front door.

3. Safe Refuge

The proposed residential development is situated on the ground, first and second floors of the building thus providing sufficient safe refuge in the event of an extreme flood event.

13 Conclusions and Recommendations

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

The whole site is classified as a less vulnerable, non-minor development in Flood Zone 1.

Less chance of potential flood risk to the site;

The EA defines the site as being within Flood Zone 1, 2 and 3. EA mapping indicates that the site does not benefit from flood defences;

No records of fluvial incidents were identified at the site;

- Records of surface water flooding were identified in the vicinity, but none impacted the site;
- One groundwater flooding incident record was identified in the vicinity but did not impact the site;
- The EA considers the sites overall flood risk to be low;
- The development will not result in a significant change in the impermeable area of the s‘ite or building footprint and therefore is unlikely to increase local flood risk;
- Opportunities for implementing SuDS mitigation measures are limited due to the small size of the site. Consideration should be given to options such as green rook, rainwater harvesting and infiltration methods;
- Occupants will subscribe to the EA Flood Warnings Direct Service;
- Safe egress routes to Flood Zone 1 are easily accessible;

Safe egress routes to Flood Zone 1 are easily accessible;

Based on the information reviewed the overall flood risk to the proposed development is considered to be Low

14 References

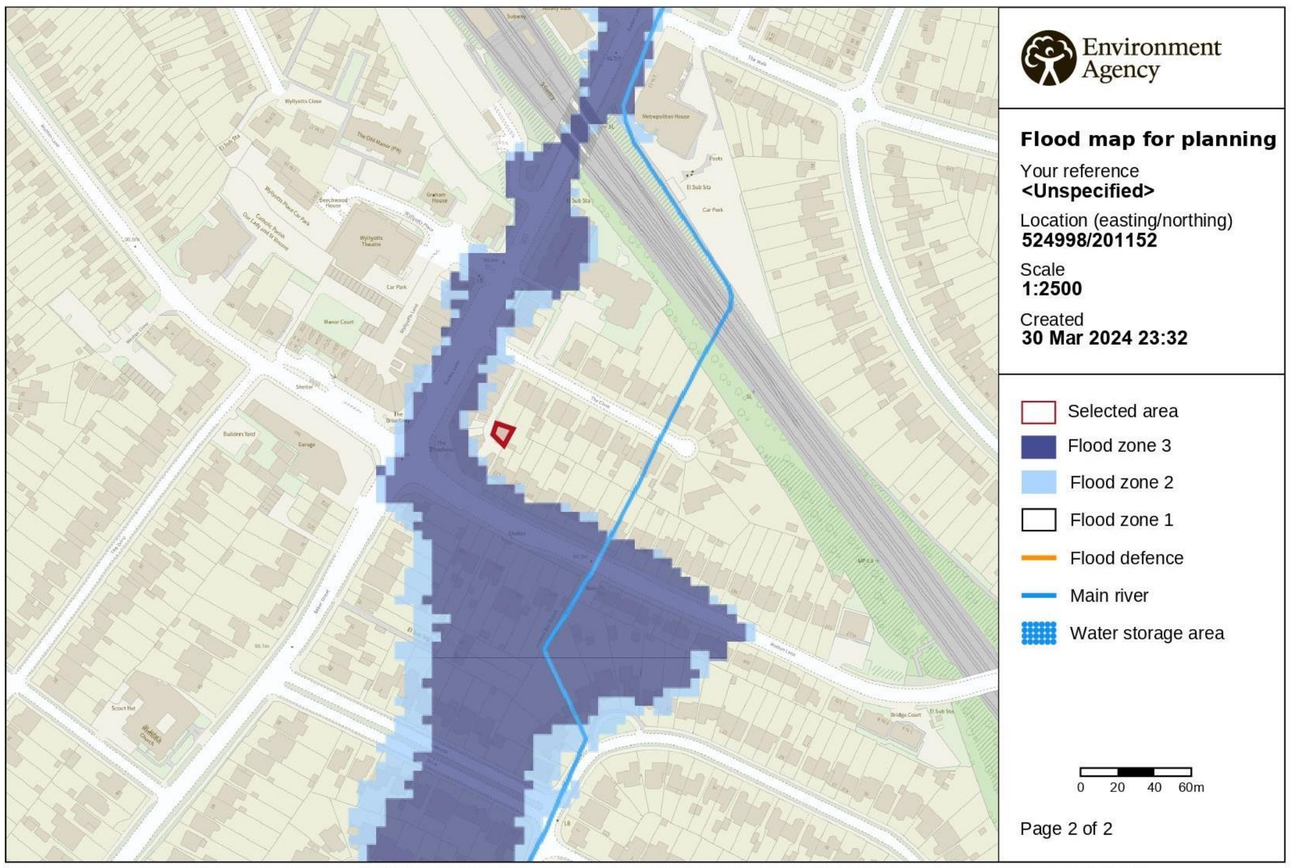
1. Communities and Local Government - National Planning Policy Framework NPPF, March 2012
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment - Hertsmere Borough Council, May 2008
4. CIRIA, Defra, Environment Agency - UK SuDS Manual, 2015.
5. Greater London Authority —London Sustainable Drainage Action Plan, 2015
6. Google Maps accessed July 2017.

15 Appendices

1. Appendix 1 —Site Photographs (Google Streetview)

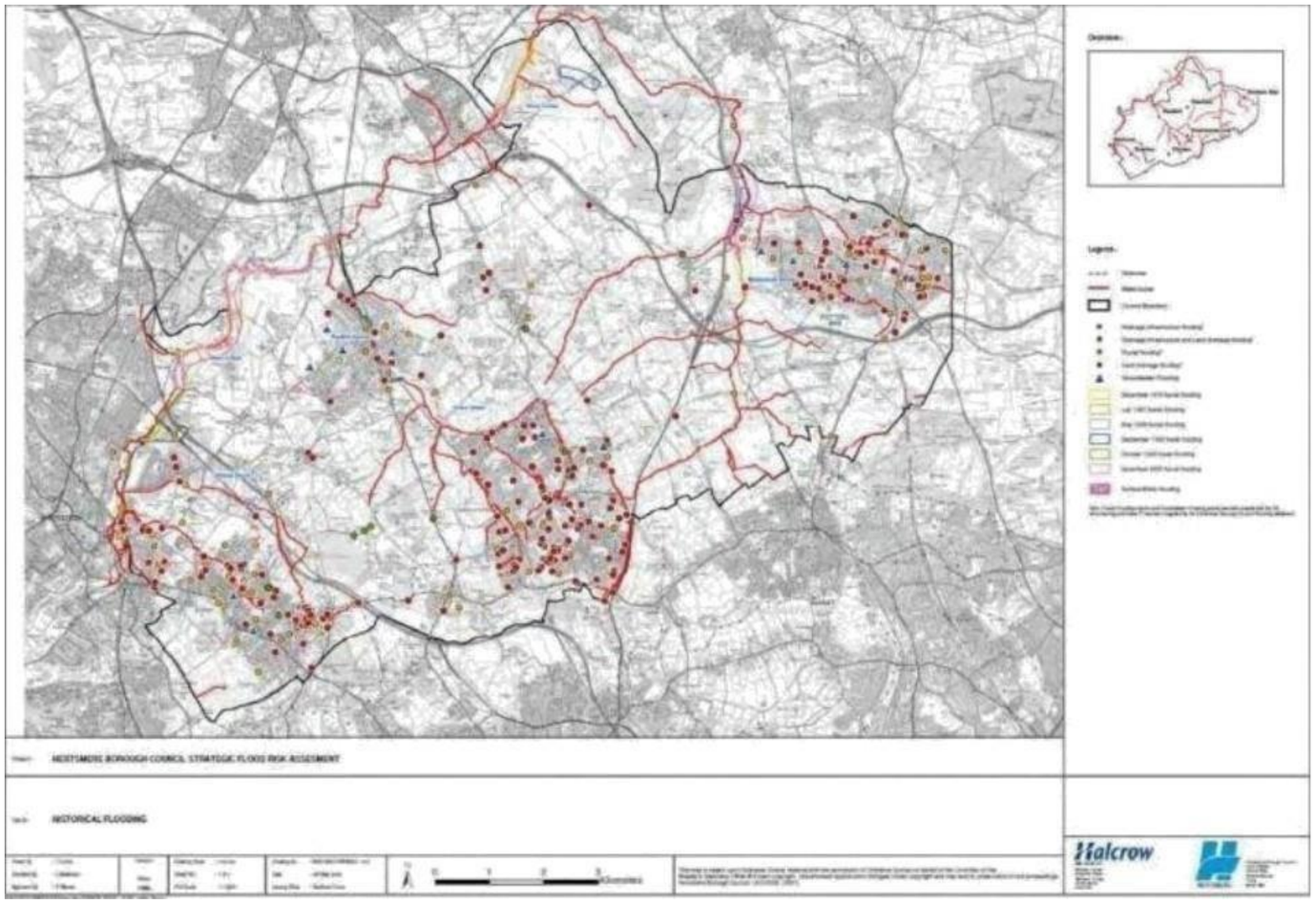
The site

3. Appendix 3 —Environmental Characteristics



4. Appendix 4 —Historical Flood Incident Maps

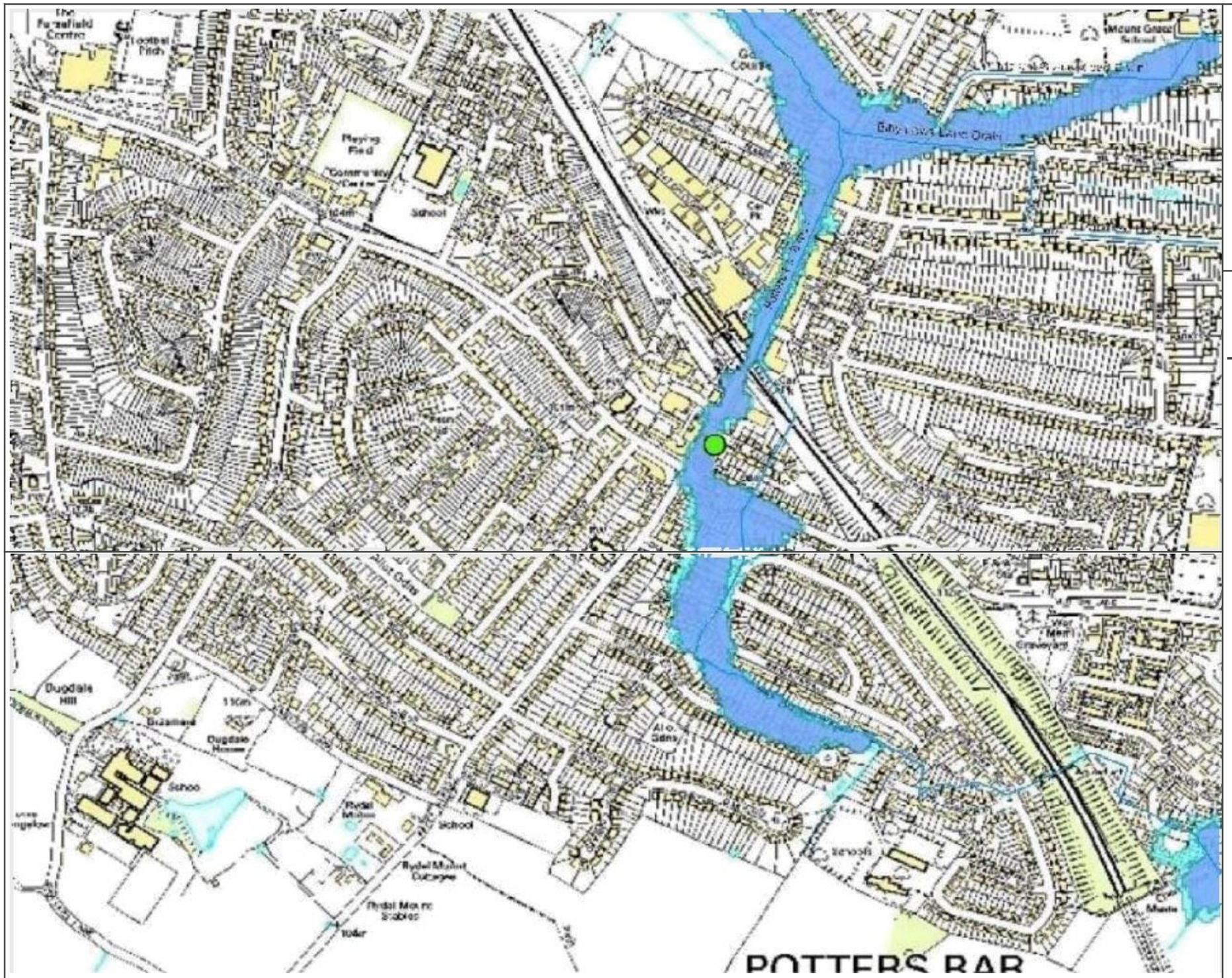
1. LLFA Recorded Floods



17.8.2 Long Term Flood Rish Maps

18.8.1

Flood Map for Planning centred on Baker House, The Closs, Potters Bar, EN6 2HY



Lns'iruniticnt Agency

Environment Agency
Achemy,
Bessamer Road,
Welwyn Garden Ciiy,
Herefordshire.

AL7 1HE

0 125 250 500

Metres

Legend

Main Rivers

Flood Map for Planning

Flood Storage Area

Areas Benefiting from Flood Defences

Flood Zone 3

Flc›od Zone 2

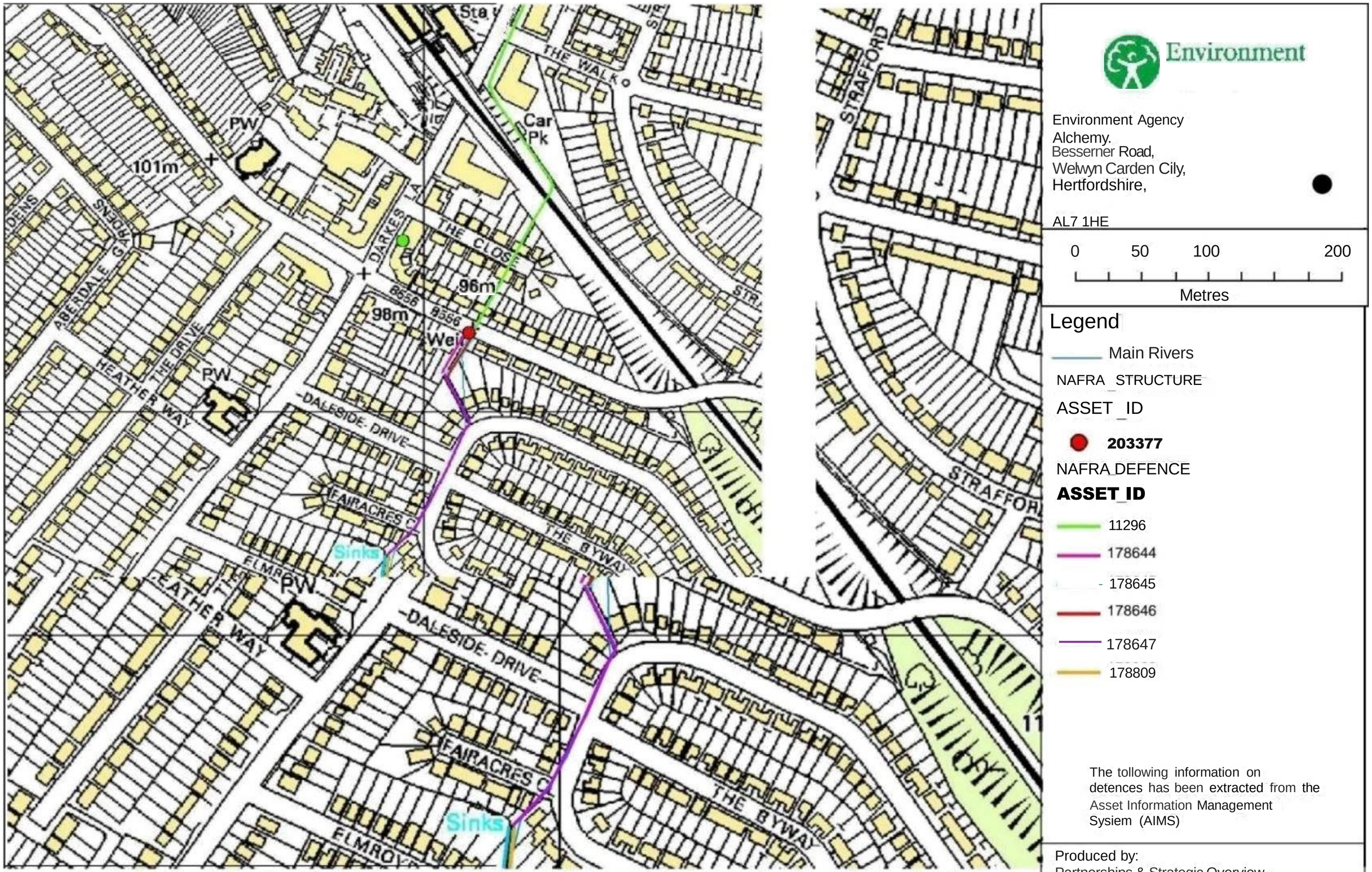
Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could ba affected by flooding:
- from the sea with a 1 in 200 or greater chance ol happening each year
-or (rom a river with a 1 in 100or greater chance of happening each year

Flood Zone 2 shows the extenl of an extreme flood from rivers or lhe sea with up to a 1 in 1000 chance of occurring each year

Produced by:
Partnerships & Strategic Overview.
Hertfordshire & North London

Structures and Defences centred on Baker House, The Closs, Potters Bar, EN6 2HY



The 1oikr••mg k\rc<ma1ion on defer•ms has been e•\racteo from Ihe Asset information Hanap8menl System lAih"S›

Defences

Asset ID	Asset Type	Asset Protection	Asset Comment	Aaset Description	Deeign She+dard of	Oownatresm	UpsFeam	Condition of Defences (1=Good,
178B09	h•gh_yround	fluvial	Co De accesses at leasi at even s via garoans ol o0-operaive ripadan ownes	Natural banh		No Data	NcDaa	3
I ' 296	simple . culvert	fluvial	Ow NER: MCl (LA 6 BR iHSPOI5TR: C6r rra BOx c• I Ort. cor'c''e b"'cn •' ' " xD0O02tCB:AT trie'edcuñenme marhdes CCTV ROO Concrete box cvf•en which ours :rto brick arch cclven LUB = AB	ZgPO0‹01CLI06 RA LWA Y TO gggg		NoFaa	No Data	3
AIdd45	h*gF'_grOUn0	nuviai	I'‹alurnl banx between gardens	^ ‹•! °-*	5	to Data	no oata	
178647	simple culven	fluvial	"m F'rcmst cmctote cuYe•1r>uo. U S access Mr.John Randall (U1707 657846)	Culvert	25	No Data	No Data	3
1f8644	h€h_gfound	fluvial	culverts	Natural berik		No Data	No Da\a	
178846	high ground	fluyial	Natural bank sectıon between two	Naturai Bank	5	No Data	No Data	2

Strucrur as

Asset ID	Asset Type	Asset Protection	Asset Comment	Asset Dascripeon	Cond•••on of Structures
203377	screen	fluvial	Munun Lana Trash Soaen Bar screen. 3m wida in good condition. Requires c.eanirg oT debris. XD0300	SCREEN	2

18.11 Appendix 11 – Safe Egress to Flood Zone 1 Map

Table 4: Flood Hazard Ratin g Scores —based on DF score of 1

Depth/ Velocity	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.0	2.25	2.50
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.5	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.0	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.5	1.2S	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Table 5: Summary of Scores

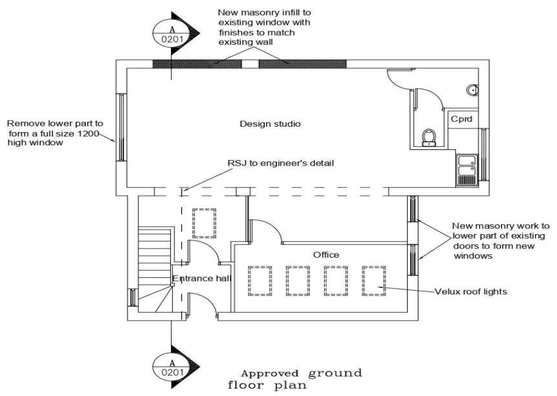
	Score From	Score To	Flood Hazard	Description
	<0.75	0.75	Low	Exercise Caution
Class 1	0.75	1.5	Moderate	Danger for some
Class 2	1.5	2A	Significant	Danger for most
Class 3	».5		Extreme	Danger for all

Table 6: Values for Debris Factor for different flood depths

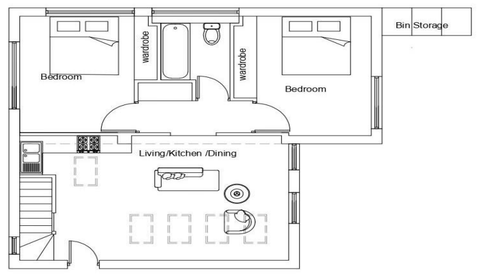
Depths	Pasture/Arable Land	Woodland	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0.5	1	1
d>0.75 and/or v > 2	0.5	1	1

- The “danger to some” category includes vulnerable groups such as children, the elderly and infirm. “Danger: Flood zone with deep or
- fast flowing water”
- The “danger to most” category includes the general public.
- The danger to all category includes the emergency services.

A flood emergency plan is considered to be an acceptable way of managing flood risk where the flood hazard has been given a “very low hazard” rating. In some instances, flood emergency plans may also be acceptable where the rating is "danger for some". However, it is unlikely to be an acceptable way of managing residual flood risk where the hazard to people classification is “danger for most" or "danger for all”.



Approved ground floor plan



Proposed ground floor plan

0 1 2 3m

NOTES

1.Dimensions should not be scaled from the drawings where accuracy is essential.

2.Details dimensions and levels to be checked on site by builder prior to commencement of works.Any works commenced prior to all necessary local authority approvals are entirely at the risk of the owner& builder.

3.Structural details are subject to exposure of existing construction and verification by L.A surveyor prior to carrying out the affected work.

4.All materials are to be used in accordance with the manufacturers' guidelines and all relevant British Standards Codes of Practice & Regulation 7 of Building Regs.

5.All works are to be carried out in accordance with Local Authority requirements .

6.The intended works fall within the Party Wall Act 1996 and any adjoining owners affected must be notified prior to commencement of any works.

7.Thames Water Authority permission to be obtained if building over or adjacent to sewers within 3 metres.(tel:08459 200 800)

8.No part of the extension to project into adjoining boundary lines.

Rev no.	Date	Description
Status	Planning	

project

Conversion of Class E commercial into Class C3 residential dwelling.

client

Mr Oluwaseun Morakinyo

drawing title

Section

Rocktower Solutions

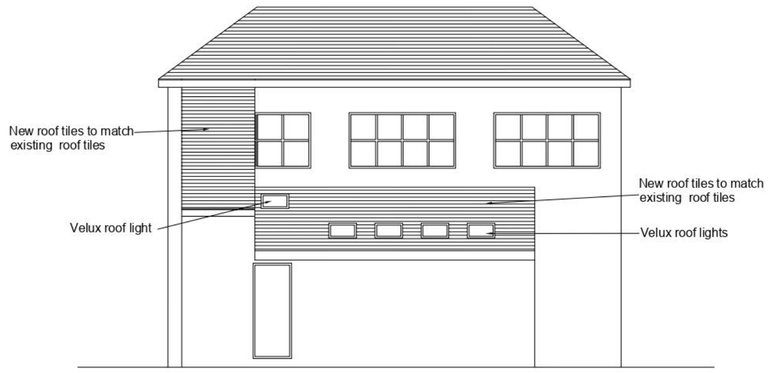
Address : Rocktower Solutions
90 Station Road
Rochester Kent ME24BT

Tel:
07834231569

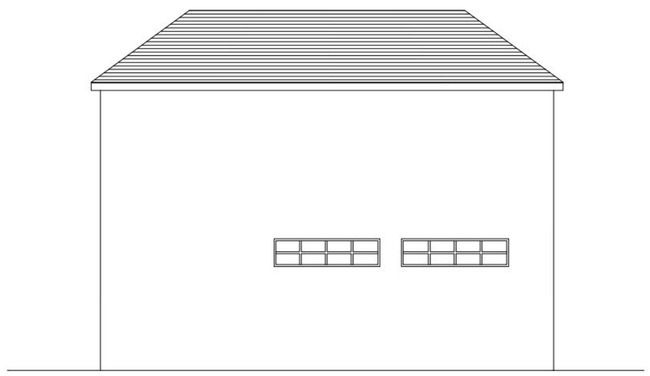
Gmail:
rocktowersolutions7@gmail.com

designed AA	date
drawn OA	scale 1:100@A3
checked AA	

sheet no



Approved andProposed front elevation



Existing/Proposed
rear elevation

0 1 2 3m

NOTES

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Rev no.	Date	Description
Status	Planning	

project

Conversion of Class E commercial into Class C3 residential dwelling.

client

Mr Oluwaseun Morakinyo

drawing title

Elevation

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Gmail: rocktowersolutions7@gmail.com

designed	date
AA	
drawn: OA	scale: 1:100@A3
checked: AA	

sheet no