



Flood Risk Assessment for Planning

January 2021

Our reference:

89973-Engdeby-DelemereRd

Prepared for:

Vijay Gandhi

Location:

59 Delamere Road

Hayes

UB40NN



Document Issue Record

Project: Flood Risk Assessment for Planning
Client: Vijay Gandhi
Application: Construction of a residential extension
Location: 59 Delamere Road, Hayes, UB4 0NN
Our reference: 89973-Engeby-DelemereRd
Version: v2.0 080121

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1. Key Facts

1.1 Flood Risk Posed:

- EA Flood Zone 2 (Medium Risk).
- Potential fluvial flood risk, from Yeading Brook located approximately 55m west of the site.
- Risk of pluvial flooding would appear to be “low” to “medium”.
- Risk of sewer flooding would appear to be low.
- No historical records of flooding provided.
- Comparison of modelled flood levels with topographic site levels shows that the site is at least 0.50m above the fluvial flood level for the 1:100 year +70% (Upper End) allowance for climate change flood level.

1.2 Flood Risk Mitigation:

- The application is for the construction of a residential extension.
- Flood proofing of the development will be incorporated as appropriate.
- The additional footprint created by the development will not exceed 250m².
- No new bedrooms will be created on the ground floor.
- Internal access will be maintained from the ground floor to the above floors of the development.
- The applicant will register with the Environment Agency Floodline Alert/Warnings Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

2. Introduction

Unda Consulting Limited have been appointed by Vijay Gandhi (hereinafter referred to as “the applicant”) to undertake a Flood Risk Assessment for the proposed development at 59 Delamere Road, Hayes, UB4 0NN (hereinafter referred to as “the site”). The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The purpose of the study is to support a planning application for the proposed development. This report presents our findings based on the readily available information and data relating to the site and surrounding drainage area.

The site appears to be located within Flood Zones 2 as defined by the Environment Agency (EA) on their Flood Map for Planning. Under the National Planning Policy Framework (NPPF), a FRA is required if a proposed development:

- includes building or engineering works in Flood Zone 2 or 3;
- includes building or engineering works on land classified by the Environment Agency as having critical drainage problem;
- changes the use of land or buildings in a location at risk of flooding from rivers or the sea, or with critical drainage problems;
- changes the use of land or buildings in a way that increases the flood vulnerability of the development where it may be subject to other sources of flooding;
- is larger than 1 hectare.

The assessment should demonstrate to the Local Planning Authority (LPA) and EA how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its potential users.

- whether the proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate.

3. Existing Situation

3.1 Site Usage:

The site currently consists of a single existing residential dwelling. The site is understood to have lawful planning permission for residential use.



Figure 1: Aerial photograph of site and surrounding area (Source: Google Earth)

3.2 Geography and Topography:

The site is situated at the southern end of Delemere Road and is approximately 900m east of Lombardy Retail Park.

Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LIDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to +0.15m every 1m. This dataset is derived from a combination of our full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital

Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

LiDAR remotely sensed digital elevation data suggests that the ground topography on site is undulating and ranges between approximately 28.59mAOD and 29.54mAOD.

The lidar levels for the current dwelling and location of the extension are between 28.75mAOD and 29.04mAOD.

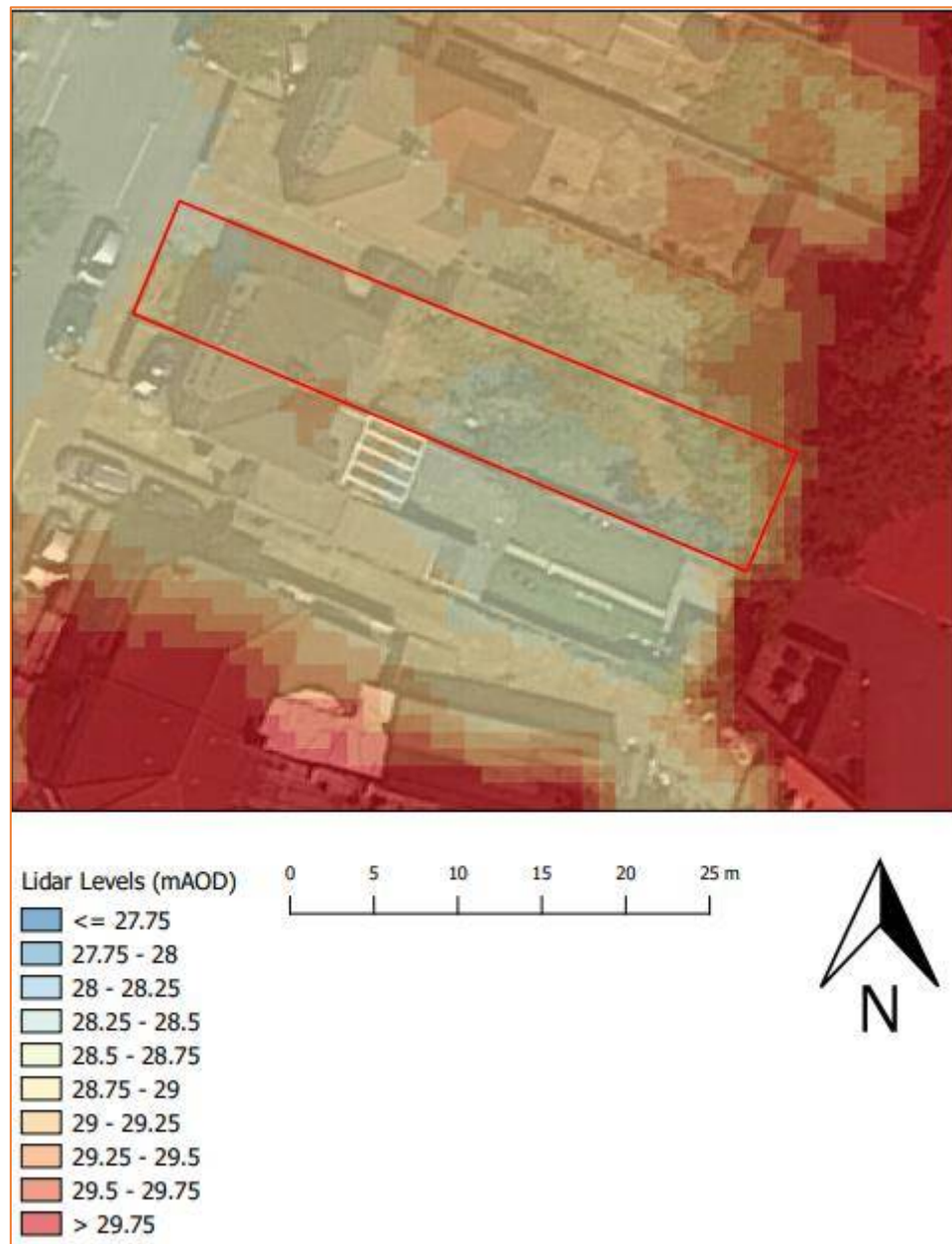


Figure 2: Topographic Lidar Levels (Source: EA and Google Earth)

3.3 Geology and Soil:

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site is London Clay Formation – Clay, Silt and Sand, with Langley Silt Member – Clay and Silt superficial deposits.

The soil type taken from the UK Soil Observatory website is relatively deep soils from residual clay and loamy loess soil parent material, with a silt to silty loam texture.

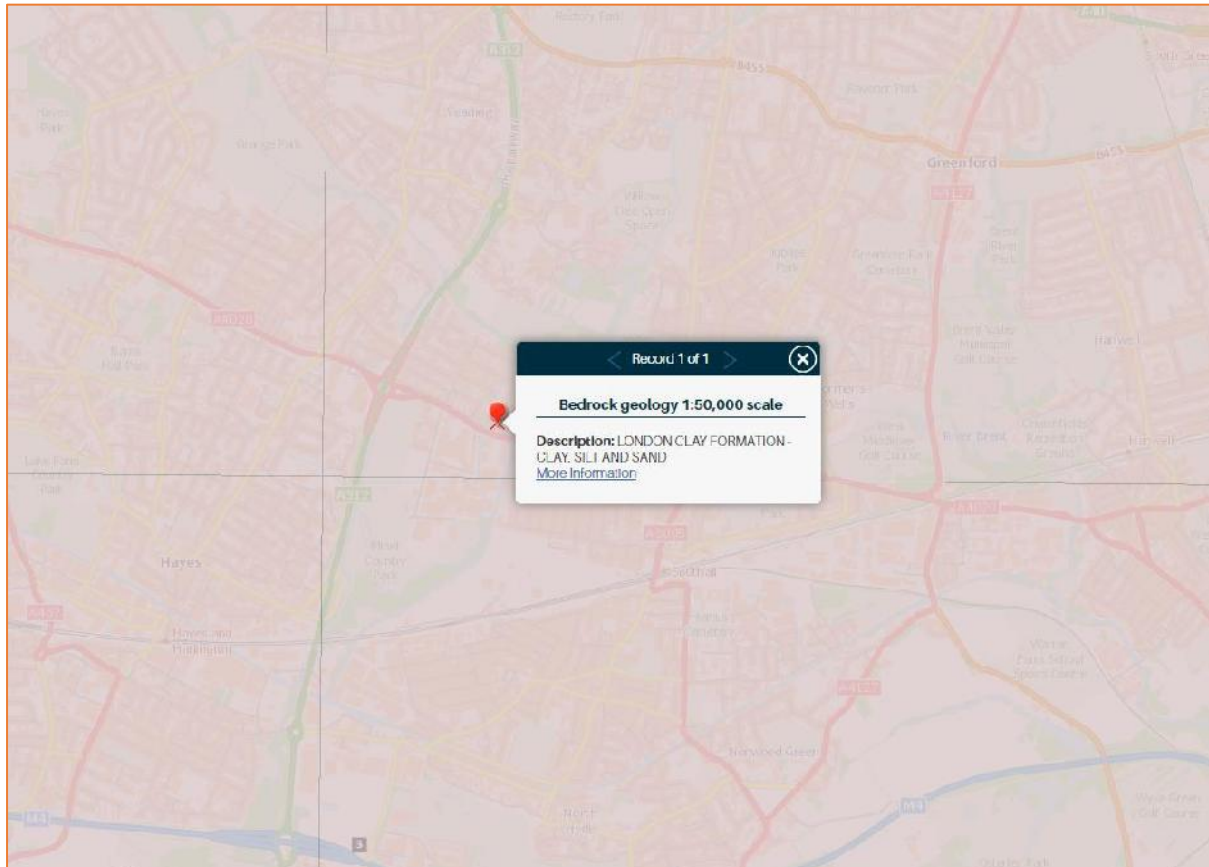


Figure 3: Local bedrock geology (Source: BGS)

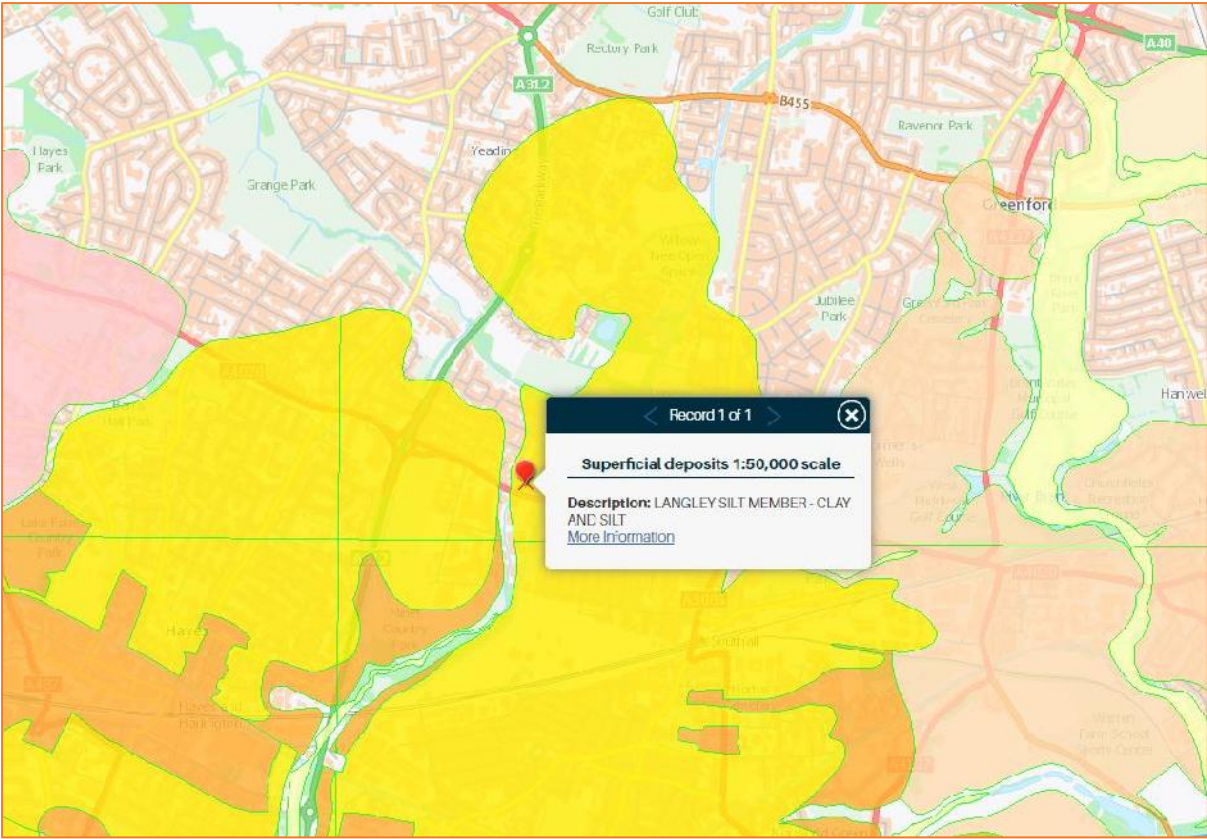


Figure 4: Local superficial deposits (Source: BGS)

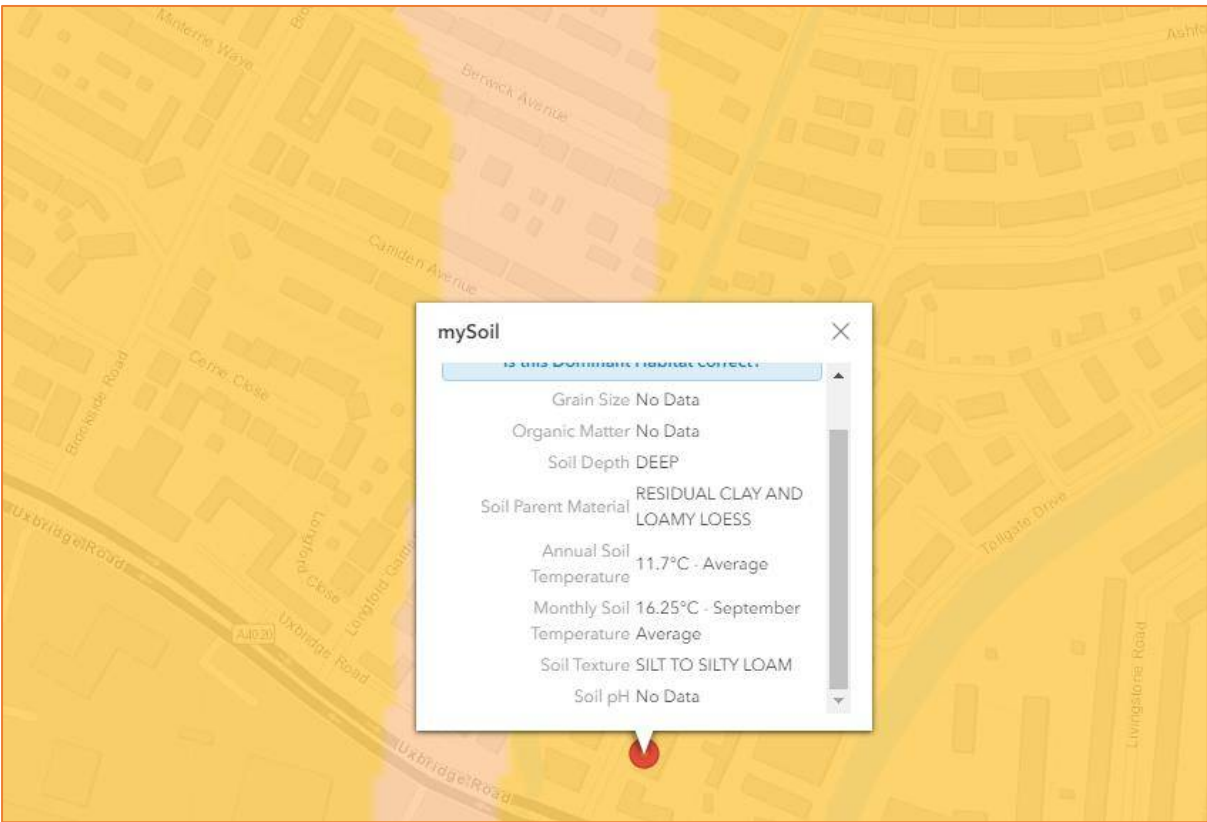


Figure 5: Local soil types (Source: UKSO)

4. Development Proposal

The proposed application is for the construction of a residential extension.

Proposed plans can be found in the report Appendix.

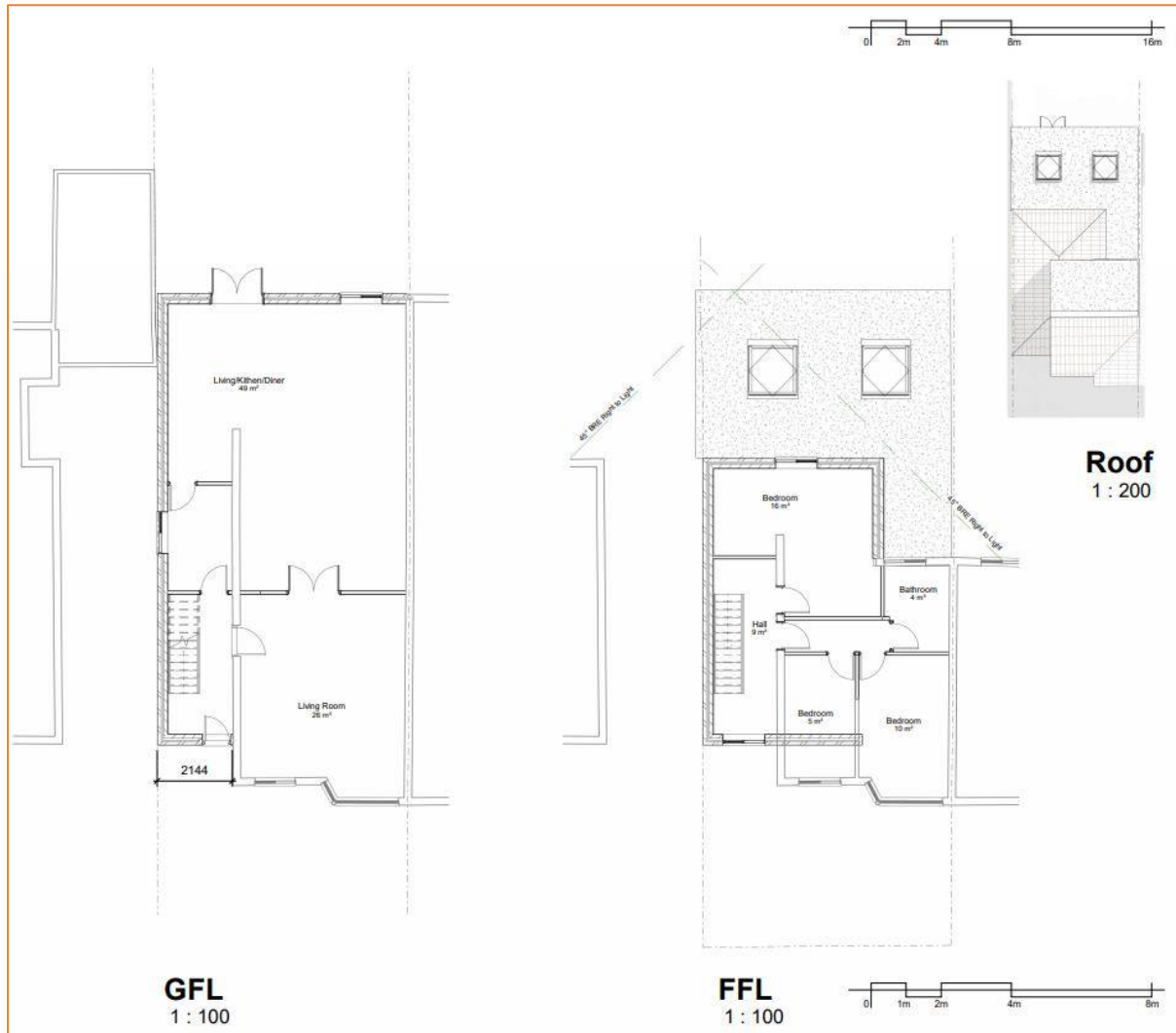


Figure 6: Proposed development plans (Source: Engineering design BY)

5. Assessment of Flood Risk

5.1 Flood Zones:

Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 1: Flood Zones

The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

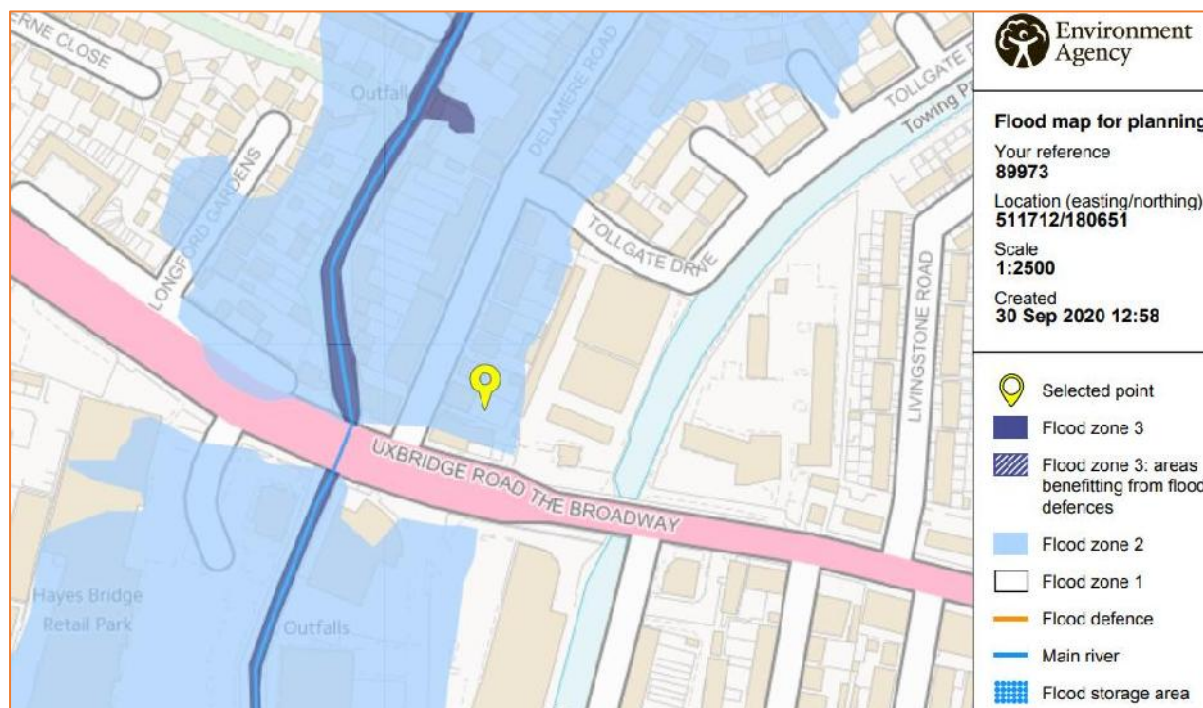


Figure 7: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

The site is located within Flood Zones 2 (Medium Probability), which means it is defined as land having between a 1 in 1000 and 1 in 100 annual probability of fluvial flooding.

The risk would appear to be potential fluvial flood risk, from the Yeading Brook located approximately 55m west of the site.

5.2 Fluvial (Yeading Brook):

Yeading Book is a tributary of the River Crane which is in turn a tributary of the River Thames. Yeading Brook has a length of 16 miles with its source located in Harrow.

5.2.1 Modelled flood levels and extents:

Product 4 modelled flood levels and extents have been requested from the Environment Agency for use within this report.

The following modelled flood levels for in-channel nodes within the River Crane mapping study (Halcrow 2008) model have been provided for use within this report. This table should be used in conjunction with the node map provided below and within the report appendix.

MODELLED FLOOD LEVEL			Return Period									
Node Label	Easting	Northing	5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
Y732u	511735	180957	27.90	27.93	27.97	28.05	28.10	28.19	28.21	28.25	28.36	29.38
Y732d	511734	180955	27.88	27.91	27.95	28.03	28.08	28.16	28.18	28.22	28.33	29.27
Y731	511669	180803	27.74	27.78	27.82	27.90	27.96	28.06	28.08	28.12	28.25	29.26
Y730u	511638	180644	27.61	27.65	27.70	27.79	27.85	27.95	27.97	28.01	28.15	29.19
Y730d	511629	180617	27.58	27.62	27.67	27.76	27.82	27.92	27.94	27.98	28.12	29.11
Y729	511601	180509	27.45	27.49	27.54	27.63	27.70	27.79	27.82	27.86	28.03	29.13
Y728u	511587	180483	27.47	27.51	27.56	27.65	27.72	27.81	27.84	27.88	28.05	29.13
Y728d	511587	180482	27.46	27.51	27.56	27.65	27.71	27.81	27.83	27.87	28.04	29.12
Y727u	511587	180388	27.40	27.44	27.49	27.58	27.64	27.74	27.76	27.81	27.99	29.11
Y727d	511586	180384	27.37	27.42	27.46	27.55	27.61	27.70	27.73	27.77	27.95	29.11

Table 2: Modelled River Crane in channel flood levels (Source: EA)

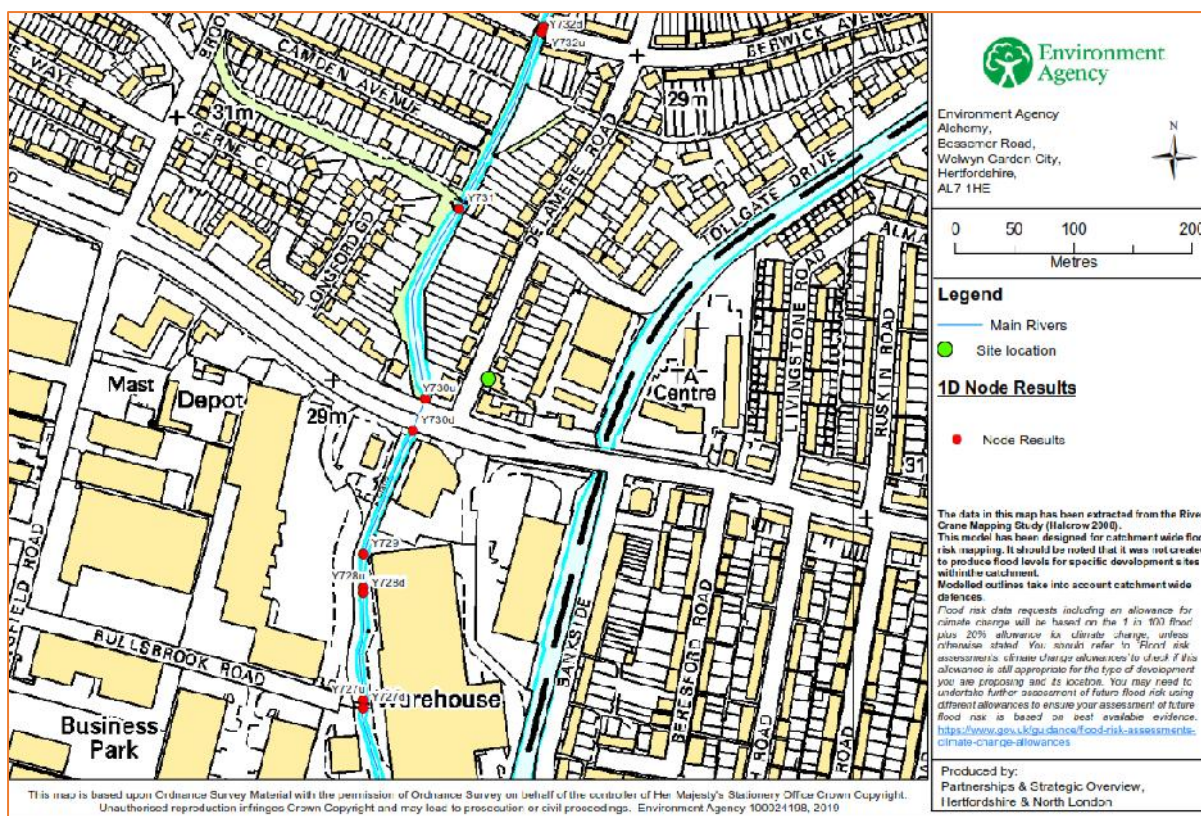


Figure 8: Modelled River Crane nodes (Source: EA)

Having reviewed the data provided Node “Y731” is positioned upstream of the site, and is considered to provide the most suitable levels for use within this assessment. Of importance are the 1:20 year fluvial modelled flood level of 27.82mAOD, the 1:100 year fluvial modelled flood level of 27.96mAOD, and the 1:1000 year fluvial modelled level of 29.26mAOD.

In line with current climate change guidance, published in February 2016, a precautionary approach should apply both the 35% and 70% increase in river flows to allow for climate change (More vulnerable development for the Thames River Basin District should use the Higher Central and Upper End allowances).

The model has provided a 1:100 climate change (+35%) flood level of 28.12mAOD and a 1:100 climate change (+70%) flood level of 28.25mAOD.

Comparison of the modelled 1:100 year flood level, including an allowance for climate change (+35% and +70%), with topographic levels for the development area (approximately 28.75mAOD and 29.04mAOD) confirm that the site is at least 0.63m above the flood level for the 35% allowance for climate change and at least 0.50m above the flood level for the 70% allowance for climate change.

5.2.3 Flood Defences

According to the EA, the flood defences for the Yeadon Brook in this reach are timber bank protection with sheet steel piling in places and a natural vegetated channel with timber toe-boarding in places. Both of these defences have been designed to a standard of protection of 1:200 years.

5.2.4 Residual risk (breach or overtopping of flood defences):

Breaching of flood defences can cause rapid inundation of areas behind flood defences as flow in the river channel discharges through the breach. A breach can occur with little or no warning, although they are much more likely to concur with extreme river levels or tides when the stresses on flood defences are highest. Flood water flowing through a breach will normally discharge at a high velocity, rapidly filling up the areas behind the defences, resulting in significant damage to buildings and a high risk of loss of life. Breaches are most likely to occur in soft defences such as earth embankments although poorly maintained hard defences can also be a potential source of breach.

Overtopping of flood defences occurs when water levels exceed the protection level of raised flood defences. The worst case occurs when the fluvial or tidal levels exceed the defence level as this can lead to prolonged flooding. Less severe overtopping can occur when flood levels are below defence levels, but wave action causes cyclic overtopping, with intermittent discharge over the crest level of the defence. Flood defences are commonly designed with a freeboard to provide protection against overtopping from waves. The risk from overtopping due to exceedance of the flood defence level is much more significant than the risk posed by wave overtopping. Exceedance of the flood defence level can lead to prolonged and rapid flooding with properties immediately behind the defences at highest risk.

Flood defences act to defend the site from direct inundation, but there is residual risk from each (failure) and overtopping (exceedance) of flood defences.

Comparison of modelled flood levels with topographic site levels shows that the site is entirely above the fluvial flood level for the 1:100 year +70% (Upper End) allowance for climate change flood level.

5.2.5 Historical flood events:

The EA has confirmed that they have no record of historic flooding at the site. The site is shown to be entirely outside of the recorded 1977 historic flood extent upstream of the site.

5.3 Pluvial (Surface Water):

Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1:30 (3.3%)

- 1:100 (1%)
- 1:1000 (0.1%)

The mapping below shows the Risk of Flooding from Surface Water centred on the postcode. Please note that the EA do not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

The EA Risk of Flooding from Surface Water Map suggests that the site lies in an area of “Low” and “Medium” risk of flooding from surface water. The location of the proposed extension and current dwelling are located within an area at “Low” risk from surface water flooding.



Figure 9: Extract from Environment Agency Surface Water Flood Map (Source: EA)

5.4 Groundwater:

Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater

flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

The West London SFRA indicates that the site lies within an area where there is a <25% susceptibility to groundwater flooding.

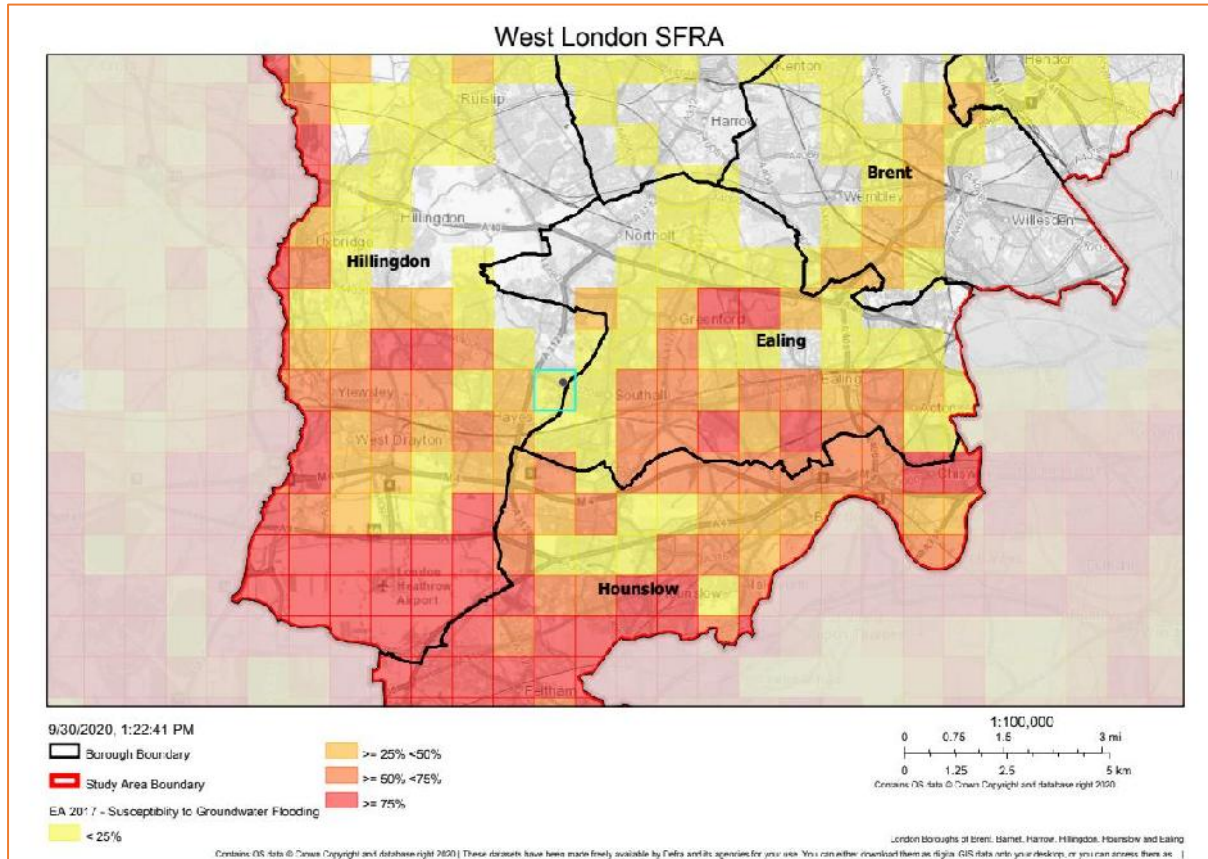


Figure 10: Areas susceptible to Groundwater (West London SFRA)

No further records have been provided to suggest that the building has been affected by groundwater flooding previously.

The Environment Agency has defined Source Protection Zones for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.

The zones are used in conjunction with the EA Groundwater Protection Policy to set up pollution prevention measures in areas that are at a higher risk, and to monitor the activities of potential polluters nearby.

The published Environment Agency Groundwater Vulnerability map shows the site to be located outside of a Source Protection Zone.

5.5 Sewer Surcharge:

Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface

water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

The West London SFRA indicates that the site lies within an area with zero instances of sewer flooding on record.

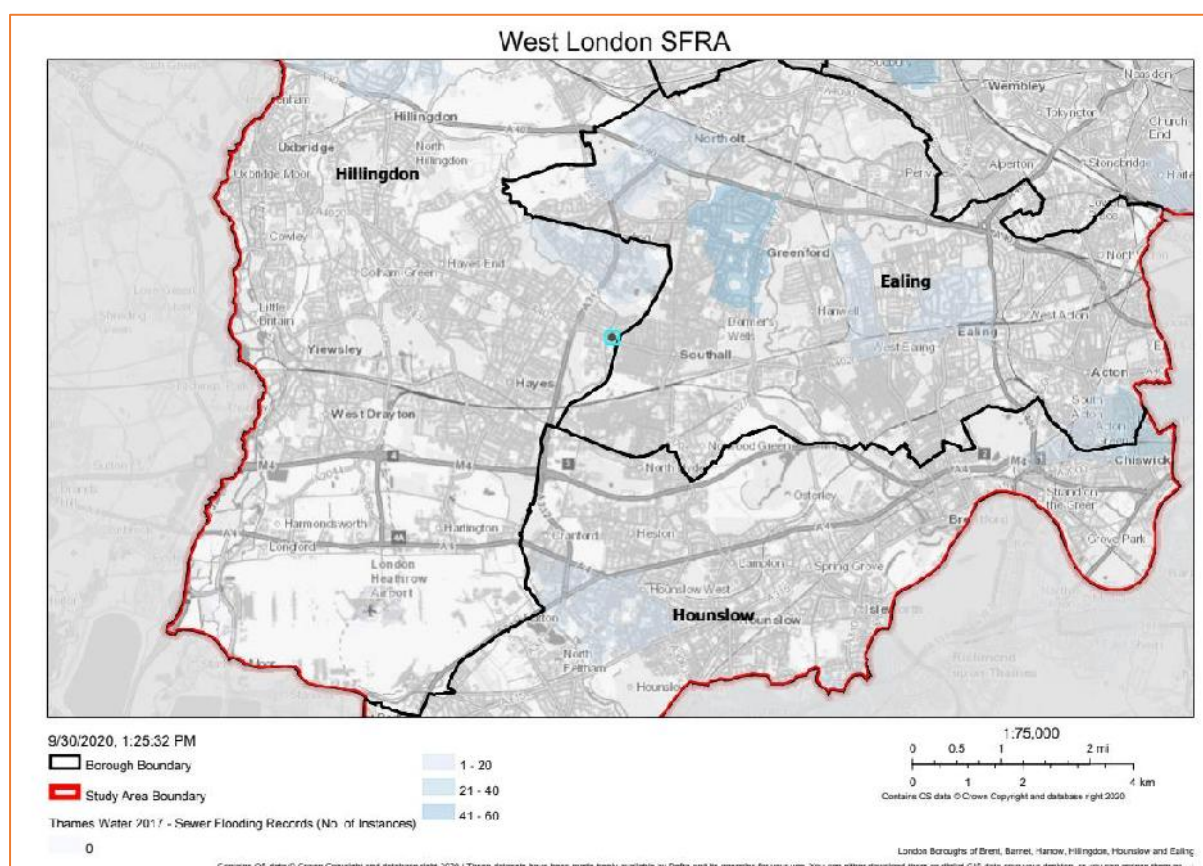


Figure 11: Sewer Flooding register map (West London SFRA)

No further information has been provided to suggest that the site is susceptible to sewer surcharge flooding.

5.6 Other Sources:

Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act and are listed on a register held by the

Environment Agency. The site lies within the maximum inundation extent on the EA Reservoir Inundation Map. The EA also advise on their website that reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. All major reservoirs have to be inspected by specialist dam and reservoir Engineers. In accordance with the Reservoirs Act 1975 in England, these inspections are monitored and enforced by the EA themselves. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial / tidal flooding to occur. The Environment Agency Reservoir Flood Map illustrated below, illustrates the largest area that might be flooded if the storage area were to fail and release the water it is designed to hold during a flood event.

Records of flooding from reservoirs and canals are erratic as there is no requirement for the Environment Agency to provide information on historic flooding from canals and raised reservoirs on plans. In particular, the NPPF does not require flood risk from canals and raised reservoirs to be shown on the Environment Agency flood zones.

Overflows from canals can be common as they are often fed by land drainage, and often do not have controlled overflow spillways. Occasionally, major bank breaches also occur, leading to rapid and deep flooding of adjacent land. The site is situated between the Yeading Brook and the Grand Union Canal. The Grand Union Canal is however not shown to be raised above ground level in this reach.

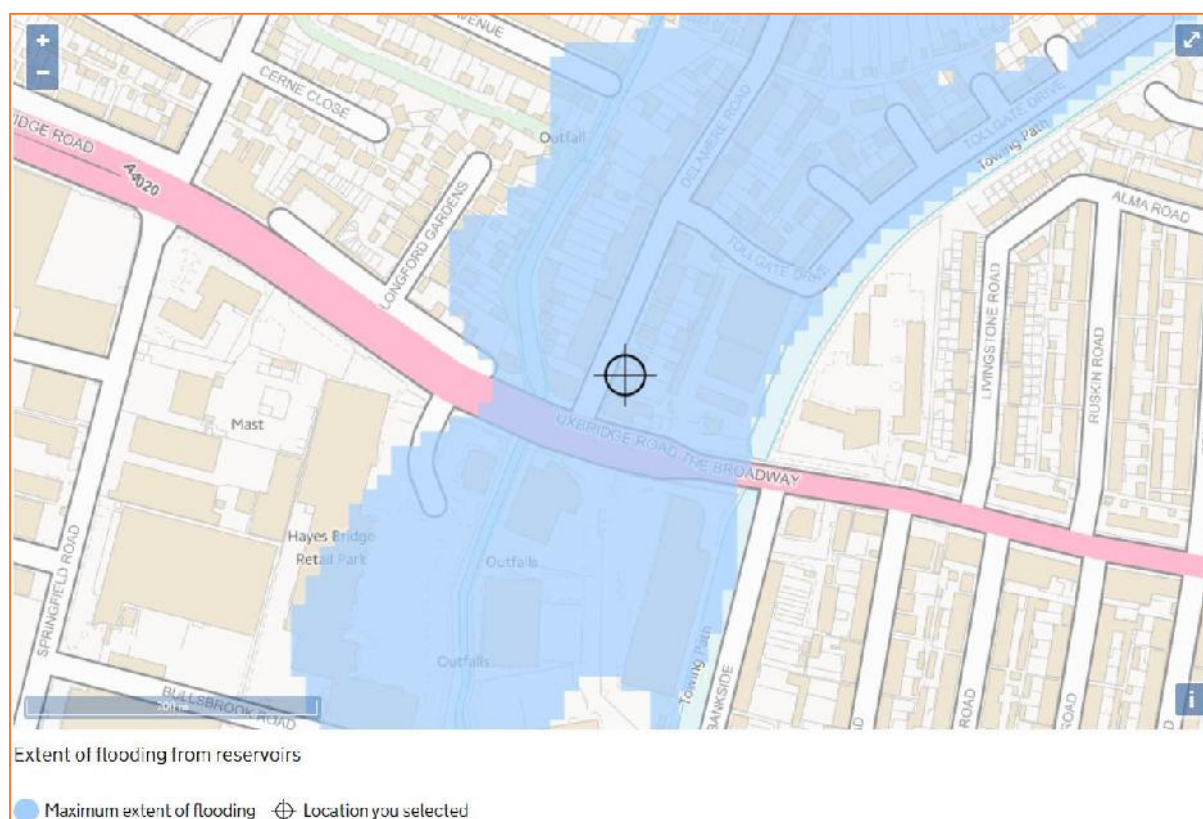


Figure 12: Extract from Environment Agency Risk of Flooding from Reservoirs Map (Source: EA)

6. Flood Risk Management

6.1 Vulnerability to flooding:

The NPPF classifies property usage by vulnerability to flooding.

The existing building is a residential dwelling, which is classified as “more vulnerable” under the NPPF.

Post development, the site will remain “more vulnerable”, as the application is for the construction of a residential extension.

Accordingly, it is considered that the vulnerability of the site as a whole will not increase post development.

6.2 EA Standing Advice:

The EA Standing Advice guidance is for domestic extensions and non-domestic extensions where the additional footprint created by the development does not exceed 250m². It should not be applied if an additional dwelling is being created, e.g. a self-contained annexe or additional commercial unit.

No additional residential units will be created as part of the development. The proposed application is for the construction of an extension which does not exceed 250m². As such, the development as a whole is considered to fit within EA standing advice for domestic extensions.

6.3 Physical Design Measures:

The NPPF requires new residential floor levels be set at least 300mm above suitable modelled 1:100 year plus allowance for climate change flood levels. Comparison of modelled flood levels with topographic site levels shows that the site is at least 0.50m above the fluvial flood level for the 1:100 year +70% (Upper End) allowance for climate change flood level.

Given that the proposed application is for an extension to finished floor levels will be set no lower than existing floor levels.

To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the proposal, in consultation with the Local Authority building control department. These measures can include the following:

- Electrical main ring run from ceiling level;
- Electrical incomer and meter situated at a high level;
- Boilers, control and water storage / immersion installed at a high level;
- Plumbing insulation of closed-cell design;
- Non-return valves fitted to all drain and sewer outlets;
- Manhole covers secured;
- Anti-syphon fitted to all toilets.

6.4 Safe Escape and Flood Action Plan:

The NPPF requires a route of safe escape for all residents and users to be provided from new residential properties in Flood Zone 3. Safe escape is usually defined as being through slow moving flood water no deeper than 25cm.

As the entire site is located within Flood Zone 2 and situated at least 0.50m above the 1:100 +70% allowance for climate change flood level, the entire site is completely dry at the design flood level, and safe escape is therefore not required.

Residents and users should follow the warning and evacuation procedure detailed in the following section.

6.5 Flood Warning:

The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.

Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door to door visits by the police or locally appointed flood wardens.

The site lies within an Environment Agency Flood Warning Area. The EA issue flood warnings/alerts to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at www.gov.uk/sign-up-for-flood-warnings to receive flood warnings by phone, text or email.

The site is located within a flood warning area.

The flood warning service has three types of warnings that will help you prepare for flooding and take action:

Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
			
What it means?	Flooding is possible. Be prepared.	Flooding is expected. Immediate action required.	Severe flooding. Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
What to do?	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 3: EA Flood Warning Service

6.6 Flood Plan:

It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood.
- Know how to turn off electricity and water supplies to the site.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.

During a flood:

- Activate the evacuation plan and evacuate the site.
- Remove cars from the site if there is sufficient warning and the water levels are not rising rapidly.
- Switch off water and electricity for the site.

- Tune into your local radio station on a battery or wind-up radio.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you don't have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics and water checked by qualified engineers before switching them back on.

6.7 Off-Site Impacts:**6.7.1 Fluvial floodplain storage:**

The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.

In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.

The site is situated in Flood Zones 2 when using the Environment Agency Flood Map for Planning (Rivers and Sea). Comparison of modelled flood levels with topographic site levels shows that the site is entirely above the fluvial flood level for the 1:100 year +70% (Upper End) allowance for climate change flood level. Therefore there will be no unacceptable loss of floodplain storage.

6.7.2 Surface Water Drainage:

The development will utilise Sustainable drainage systems (SuDS) design in accordance with the NPPF for Planning Applications and the drainage hierarchy as follows:

1. Store rainwater for later use;
2. Infiltration techniques;
3. Attenuate rainwater by storing in tanks for gradual release;
4. Discharge rainwater direct into watercourse;
5. Discharge rainwater into surface water sewer;
6. Discharge rainwater into a combined sewer;
7. Attenuation of rainwater in ponds or open water features with controlled discharge into the local watercourse.

Due to the small scale of the development, a full Surface Water Drainage Strategy is not required at this stage of planning.

As such, any change in surface water runoff from the site will likely be negligible.

7. Sequential and Exception Test

The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

The site is situated within Flood Zones 2 when using the Environment Agency Flood Map for Planning (Rivers and Sea). Post development, the site will remain “more vulnerable”, as the application is for the construction of a residential extension. The existing building and proposed extension are located within Flood Zone 2, and entirely outside of Flood Zone 3.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Table 4: Flood risk vulnerability and flood zone ‘compatibility’

Using the table above, the proposed application is considered to be suitable within Flood Zone 2.

The Sequential and Exception Tests do not need to be applied to minor developments and changes of use (this application is for ‘minor development’ – a residential extension).

8. Discussion and Conclusions

Unda Consulting Limited have been appointed by Vijay Gandhi to undertake a Flood Risk Assessment for the proposed development at 59 Delamere Road, Hayes, UB4 0NN. The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the associated technical guidance.

The proposed application is for the construction of a residential extension. Post development, the site will remain "more vulnerable", as the application is for construction of a residential extension. Post development, the site will remain "more vulnerable", as the application is for the construction of a residential extension. Accordingly, it is considered that the vulnerability of the site as a whole will not increase post development.

The site is located within Flood Zone 2 (Medium), which means it is defined as land having between a greater than 1 in 1000, and less than 1 in 100 annual probability of fluvial flooding. The risk would appear to be potential fluvial flood risk, from the Yeading Brook located approximately 55m west of the site.

Product 4 modelled flood levels and extents have been requested from the Environment Agency for use within this report.

Having reviewed the data provided Node "Y731" is positioned upstream of the site, and is considered to provide the most suitable levels for use within this assessment. Of importance are the 1:20 year fluvial modelled flood level of 27.82mAOD, the 1:100 year fluvial modelled flood level of 27.96mAOD, and the 1:1000 year fluvial modelled level of 29.26mAOD.

In line with current climate change guidance, published in February 2016, a precautionary approach should apply both the 35% and 70% increase in river flows to allow for climate change (More vulnerable development for the Thames River Basin District should use the Higher Central and Upper End allowances).

The model has provided a 1:100 climate change (+35%) flood level of 28.12mAOD and a 1:100 climate change (+70%) flood level of 28.25mAOD.

Comparison of the modelled 1:100 year flood level, including an allowance for climate change (+35% and +70%), with topographic levels for the development area (approximately 28.75mAOD and 29.04mAOD) confirm that the site is at least 0.63m above the flood level for the 35% allowance for climate change and at least 0.50m above the flood level for the 70% allowance for climate change.

The EA has confirmed that following examination of their records of historic flooding, they have no record of flooding in the area.

The West London SFRA indicates that the site lies within an area where there is a <25% susceptibility to groundwater flooding.

The West London SFRA indicates that the site lies within an area with zero instances of sewer flooding on record.

No further information has been provided to suggest that the site is susceptible to groundwater or sewer surcharge flooding.

Given that the proposed application is for an extension, finished floor levels will be set no lower than existing floor levels.

As the entire site is located within Flood Zone 2 and situated at least 0.50m above the 1:100 +70% allowance for climate change flood level, the entire site is completely dry at the design flood level, and safe escape is therefore not required.

The EA Risk of Flooding from Surface Water Map suggests that the site lies in an area of "Low" and "Medium" risk of flooding from surface water. The location of the proposed extension is located in an area at "Low" from surface water flooding.

The proposed application is for an extension to the existing property (and will not introduce any additional or separate residential units), finished floor levels will be set no lower than existing floor levels, and internal access will be maintained from the ground floor to the first floor of the property. In addition, no new bedrooms are proposed on the ground floor.

In summary:

- EA Flood Zone 2 (Medium Risk).
- Potential fluvial flood risk, from Yeading Brook located approximately 55m west of the site.
- Risk of pluvial flooding would appear to be "low" to "medium".
- Risk of sewer flooding would appear to be low.
- No historical records of flooding provided.
- Comparison of modelled flood levels with topographic site levels shows that the site is at least 0.50m above the fluvial flood level for the 1:100 year +70% (Upper End) allowance for climate change flood level.
- The application is for the construction of a residential extension.
- The additional footprint created by the development will not exceed 250m².
- No new bedrooms will be created on the ground floor.
- Internal access will be maintained from the ground floor to the above floors of the development.
- Flood proofing of the development will be incorporated as appropriate.
- The applicant will register with the Environment Agency Floodline Alert/Warnings Direct service.

Assuming accordance with these flood risk management measures, Unda Consulting Limited consider the proposed application to be suitable in flood risk terms.

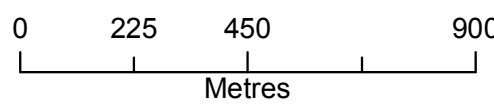
Appendix

- Proposed Plans.
- EA Product 4 Flood Map.

Flood Map for Planning centred on: 64 - 66 Delamere Road, Hayes, UB4 0NN - 29/10/2019 - HNL147185BC



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- Main Rivers
- Site location

Flood Map for Planning

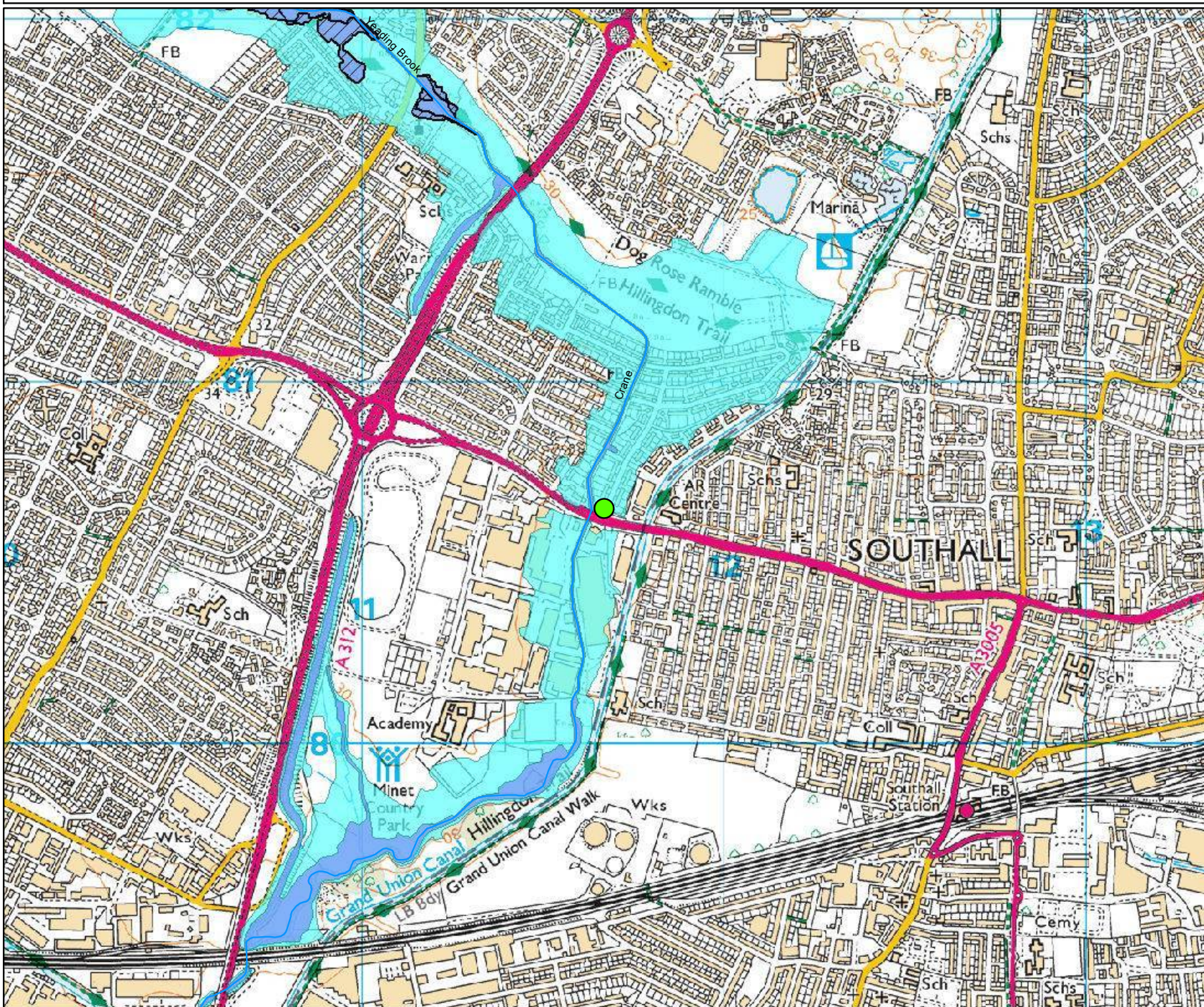
- Flood Storage Area
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

Flood Map for Planning (assuming no defences)

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

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

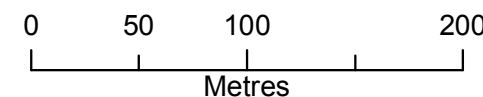
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Legend

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- Site location

Defended Flood Outlines

- 1 in 5 (20%) Defended
- 1 in 10 (10%) Defended
- 1 in 20 (5%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

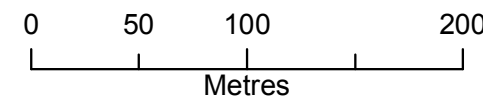
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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Legend

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- Site location

Defended Flood Outlines

- 1 in 50 (2%) Defended
- 1 in 100 (1%) Defended
- 1 in 100+20% (*CC) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

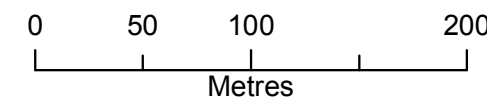
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 100+25% (*CC) Defended
- 1 in 100+30% (*CC) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

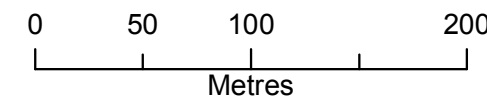
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 100+70% (*CC) Defended
- 1 in 1000 (0.1%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

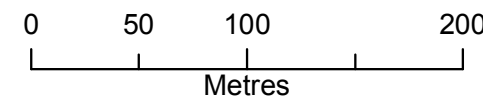
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Legend

- Main Rivers
- Site location

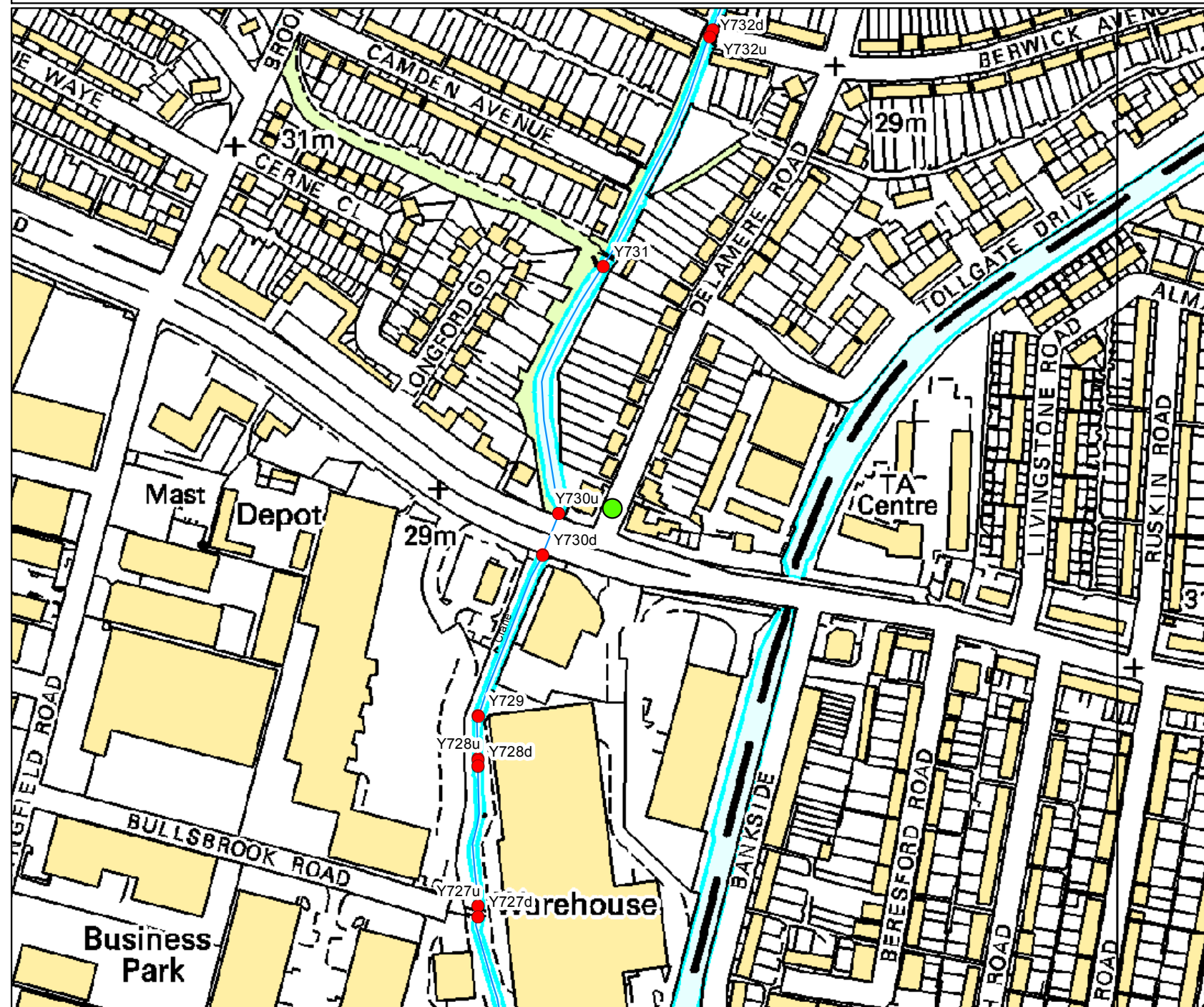
1D Node Results

- Node Results

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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The following information has been extracted from the River Crane Mapping Study (Halcrow 2008)

Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to ‘Flood risk assessments: climate change allowances’ to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Caution:

The modelled flood levels and extents are appropriate for catchment wide strategic flood risk mapping. However, for more detailed flood risk assessment it is recommended that each of the underlying flood mapping, hydraulic modelling and hydrological assumptions are re-evaluated to determine the appropriateness in a more detailed analysis.

All flood levels are given in metres Above Ordnance Datum (mAOD)

All flows are given in cubic metres per second (cumecs)

MODELLED FLOOD LEVEL

			Return Period									
Node Label	Easting	Northing	5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
Y732u	511735	180957	27.90	27.93	27.97	28.05	28.10	28.19	28.21	28.25	28.36	29.38
Y732d	511734	180955	27.88	27.91	27.95	28.03	28.08	28.16	28.18	28.22	28.33	29.27
Y731	511669	180803	27.74	27.78	27.82	27.90	27.96	28.06	28.08	28.12	28.25	29.26
Y730u	511638	180644	27.61	27.65	27.70	27.79	27.85	27.95	27.97	28.01	28.15	29.19
Y730d	511629	180617	27.58	27.62	27.67	27.76	27.82	27.92	27.94	27.98	28.12	29.11
Y729	511601	180509	27.45	27.49	27.54	27.63	27.70	27.79	27.82	27.86	28.03	29.13
Y728u	511587	180483	27.47	27.51	27.56	27.65	27.72	27.81	27.84	27.88	28.05	29.13
Y728d	511587	180482	27.46	27.51	27.56	27.65	27.71	27.81	27.83	27.87	28.04	29.12
Y727u	511587	180388	27.40	27.44	27.49	27.58	27.64	27.74	27.76	27.81	27.99	29.11
Y727d	511586	180384	27.37	27.42	27.46	27.55	27.61	27.70	27.73	27.77	27.95	29.11

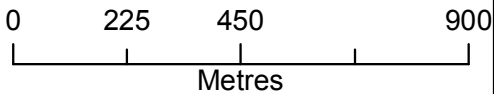
MODELLED FLOWS

			Return Period									
Node Label	Easting	Northing	5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
Y732u	511735	180957	7.64	7.91	8.22	8.76	9.16	9.80	9.96	10.24	11.11	24.70
Y732d	511734	180955	7.64	7.91	8.22	8.76	9.16	9.80	9.96	10.24	11.11	24.70
Y731	511669	180803	7.64	7.92	8.23	8.76	9.16	9.78	9.92	10.18	10.97	24.46
Y730u	511638	180644	7.76	8.06	8.40	9.01	9.46	10.17	10.33	10.62	11.51	24.37
Y730d	511629	180617	7.76	8.06	8.40	9.01	9.46	10.17	10.33	10.62	11.51	24.37
Y729	511601	180509	7.97	8.32	8.70	9.43	9.98	10.83	11.03	11.39	12.50	24.31
Y728u	511587	180483	7.97	8.32	8.70	9.43	9.97	10.83	11.03	11.39	12.49	24.27
Y728d	511587	180482	7.97	8.32	8.70	9.43	9.97	10.83	11.03	11.39	12.49	24.27
Y727u	511587	180388	7.97	8.32	8.70	9.43	9.97	10.82	11.01	11.37	12.46	24.13
Y727d	511586	180384	7.97	8.32	8.70	9.43	9.97	10.82	11.01	11.37	12.46	24.13

Historic Flood Map centred on: 64 - 66 Delamere Road, Hayes, UB4 0NN - 29/10/2019 - HNL147185BC



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Legend

- Main Rivers
- Site location

Flood Event Outlines

- 1977

The historic flood event outlines are based on a combination of anecdotal evidence, Environment Agency staff observations and survey. Our historic flood event outlines do not provide a definitive record of flooding. It is possible that there will be an absence of data in places where we have not been able to record the extent of flooding. It is also possible for errors occur in the digitisation of historic records of flooding.

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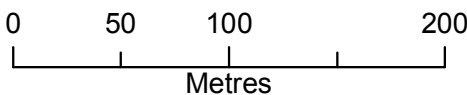


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Legend

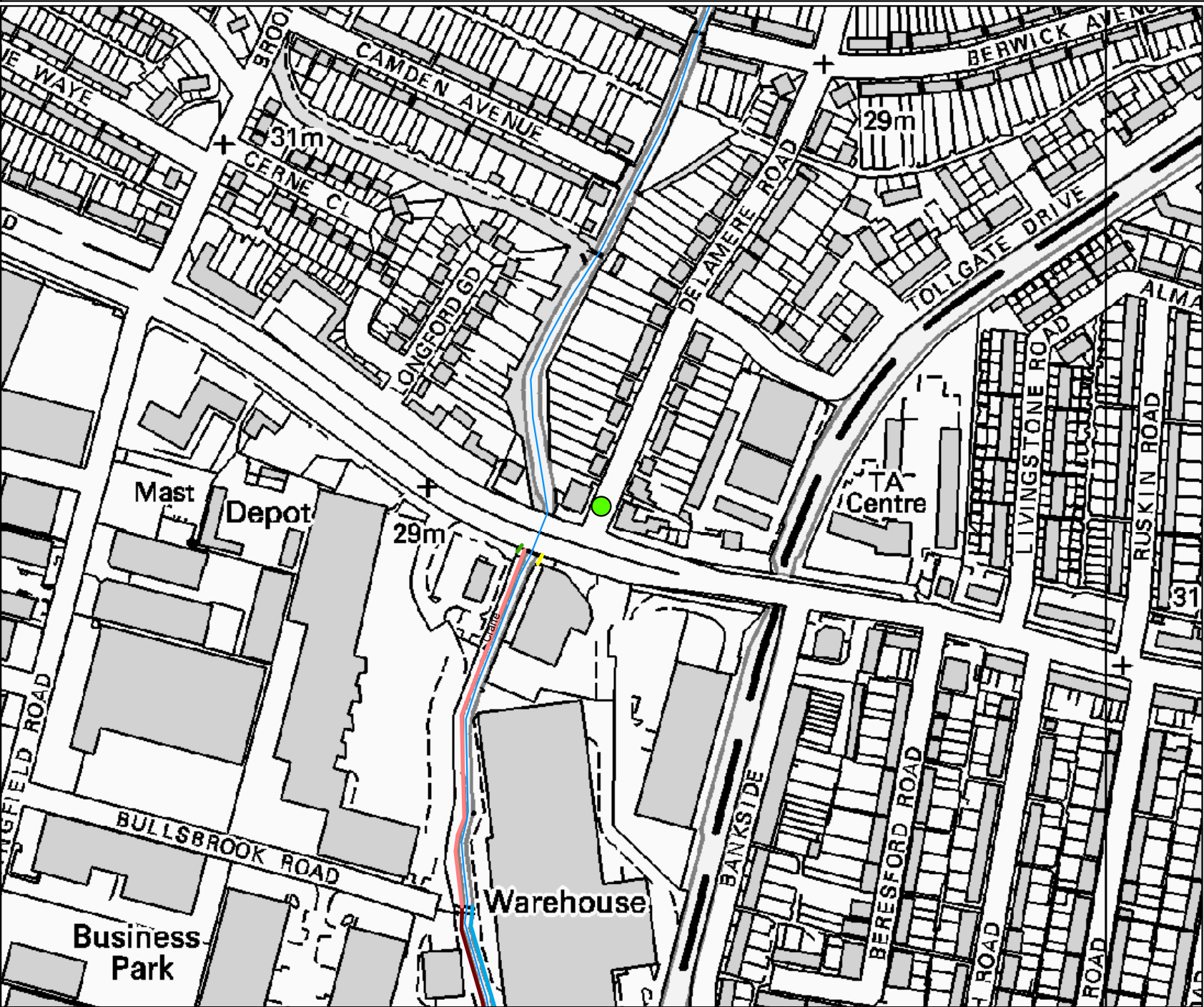
- Main Rivers
- Site location

NAFRA_DEFENCE

- 11366
- 11367
- 46786
- 47053
- 146573

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has been extracted from the Asset
Information Management System
(AIMS)

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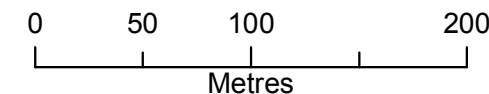


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Legend

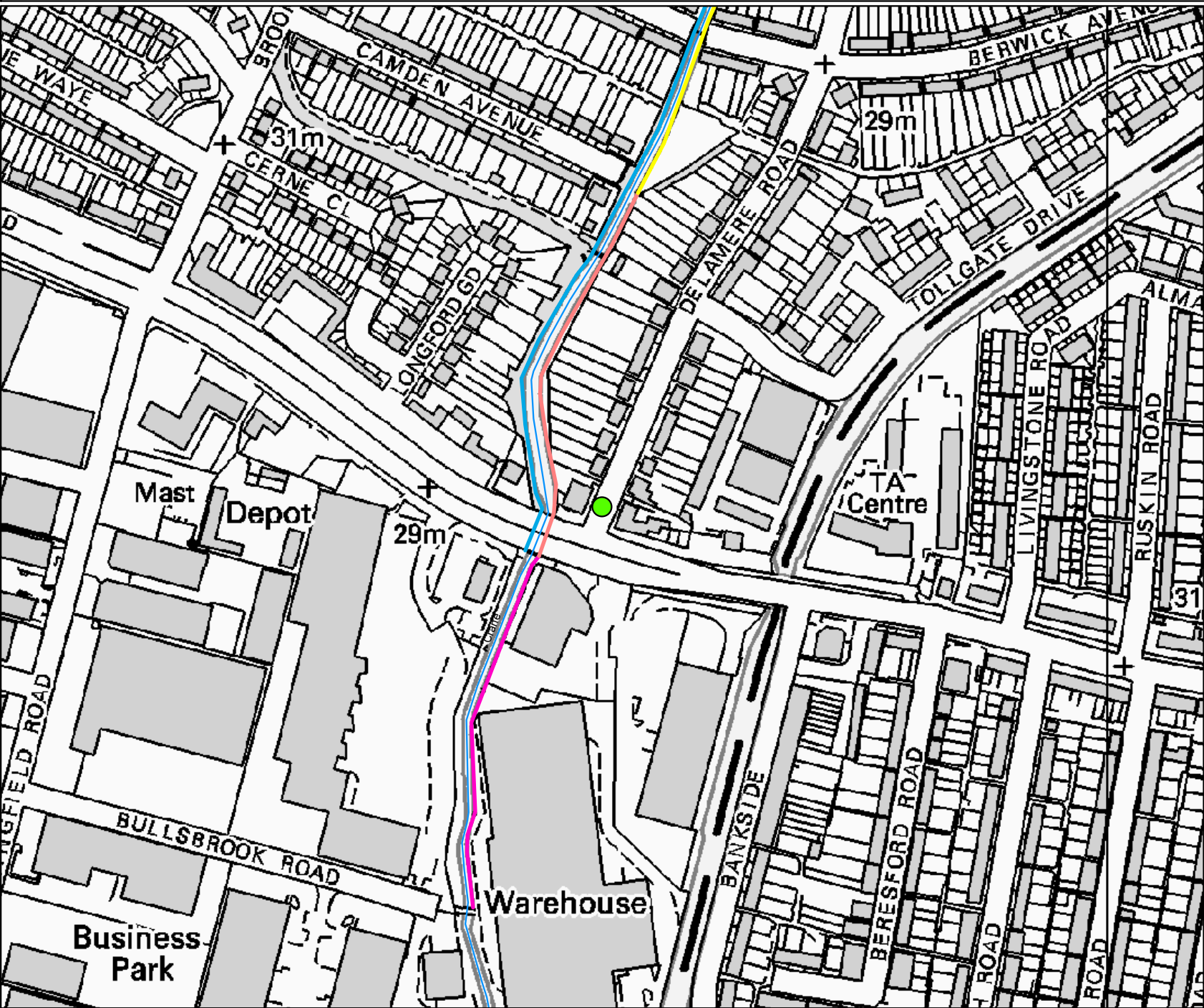
- Main Rivers
- Site location

NAFRA_DEFENCE

- 146574
- 146575
- 146576
- 153822

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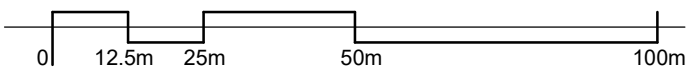
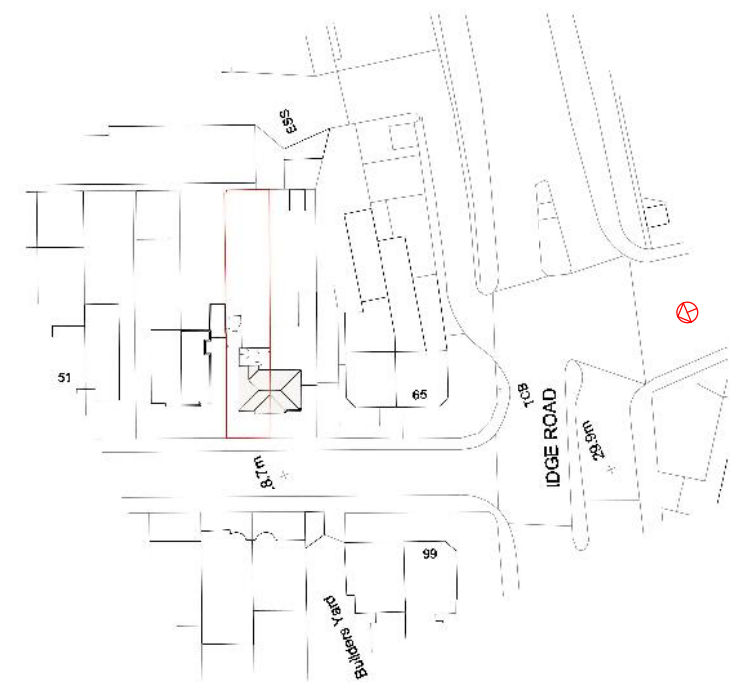
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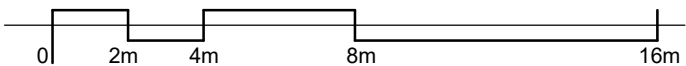
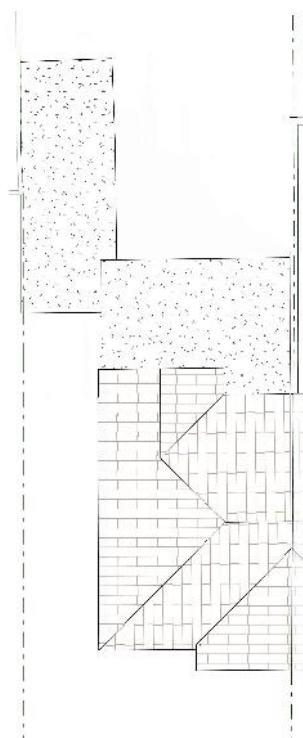
Defences

Asset ID	Asset Type	Asset Protection	Asset Comment	Asset Description	Design Standard of protection (years)	Downstream Crest Level	Upstream Crest Level	Condition of Defences (1=Good, 5 = Poor)
47053	high ground	fluvial	Natural vegetated channel	Natural Bank	2	26.1	28.29	3
46786	high ground	fluvial	Natural vegetated channel	Natural Bank	2	25.77	28.28	3
146573	high ground	fluvial	Natural Vegetated Channel with timber toe-boarding in places	Natural Bank	2	28.28	30.03	3
153822	high ground	fluvial	Natural vegetated channel with timber toeboarding in places	Natural Bank	200	28.29	30	3
11366	high ground	fluvial	Not visited	Natural bank.	1000	No data	No data	No data
146574	high ground	fluvial	Timber bank protection with sheet steel piling in places.	Bank protection.	200	29.85	No data	4
11367	high ground	fluvial	Not visited	Natural bank.	1000	No data	No data	No data
146576	high ground	fluvial	NATURAL VEGETATED CHANNEL WITH TIMBER TOE-BOARDING IN PARTS. SOME SECTIONS OF CHANNEL BRACED WITH STEEL BEAMS ACROSS CHANNEL.	Natural Bank	200	30.03	28.98	3
146575	high ground	fluvial	SHEET METAL PILING BANK PROTECTION WITH CONCRETE CAPPING. SOME SECTIONS OF BANK BRACED WITH STEEL BEAMS ACROSS CHANNEL	Bank protection.	200	No data	29.38	3



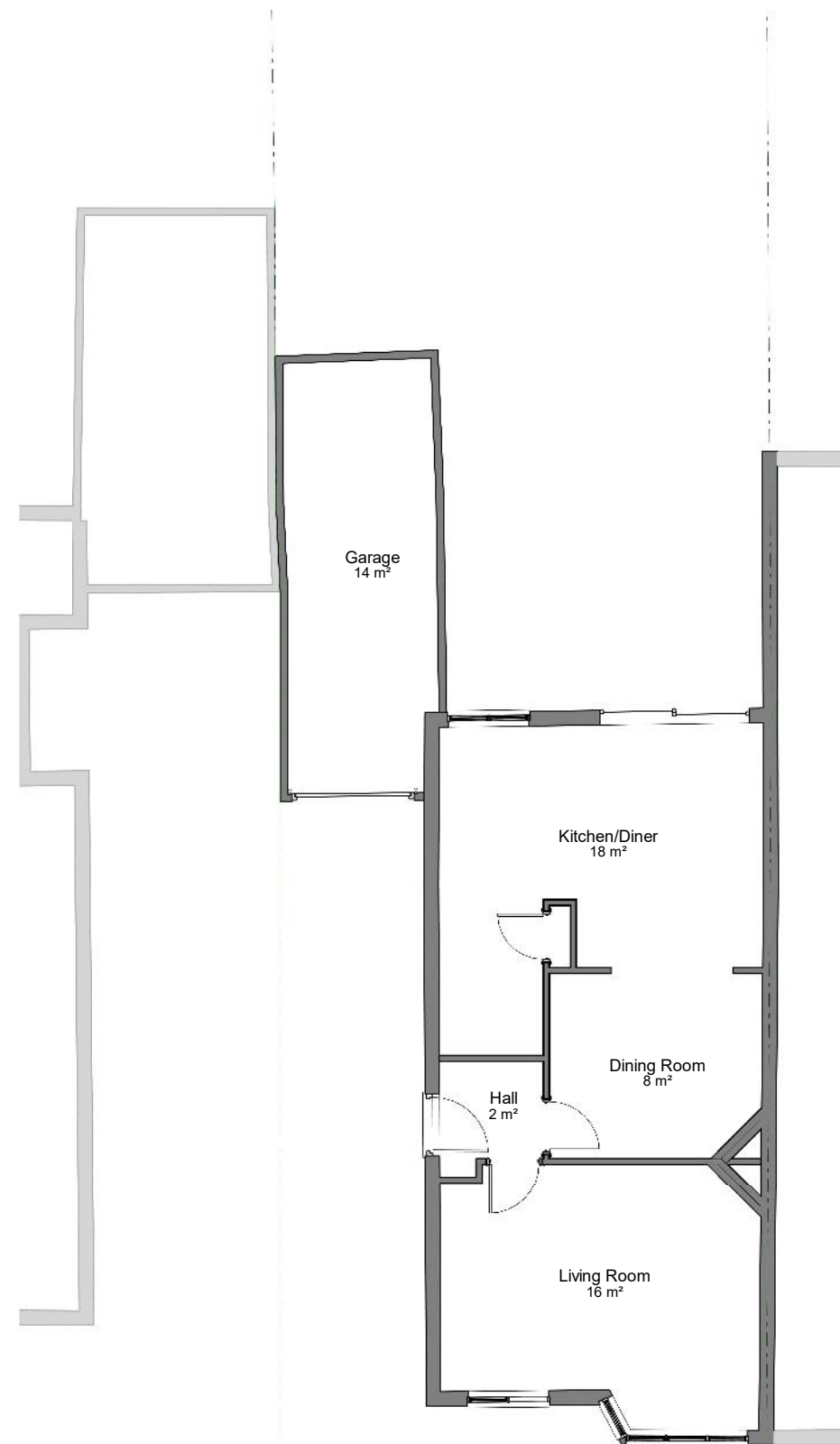
Site Plan

1 : 1250



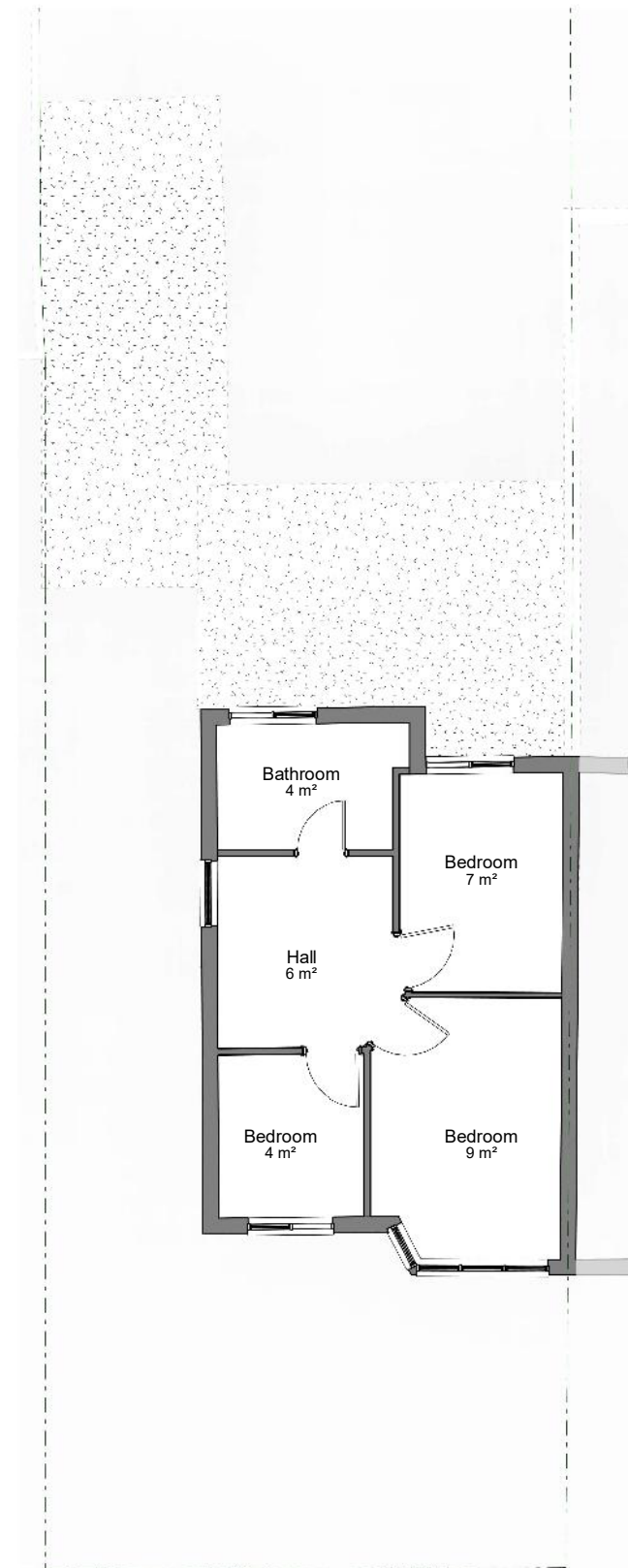
Roof

1 : 200



GFL

1 : 100



FFL

1 : 100

SITE:

59 Delamere Road
Hayes
UB4 0NN

TITLE:

Site & Existing Plans

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ALL DIMENSIONS to be confirmed on site before the manufacture of any article

DO NOT SCALE off Drawing except for approximate dimensions

ALL WORKMANSHIP to be undertaken in strict accordance with the approval of the LPA Building Control Officer and in strict adherence with current British Standards and codes of practice

ALL MATERIALS used in construction or manufacture to be in strict adherence with current British Standards and codes of practice

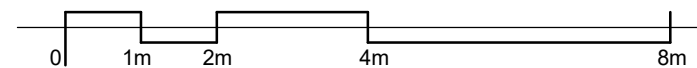
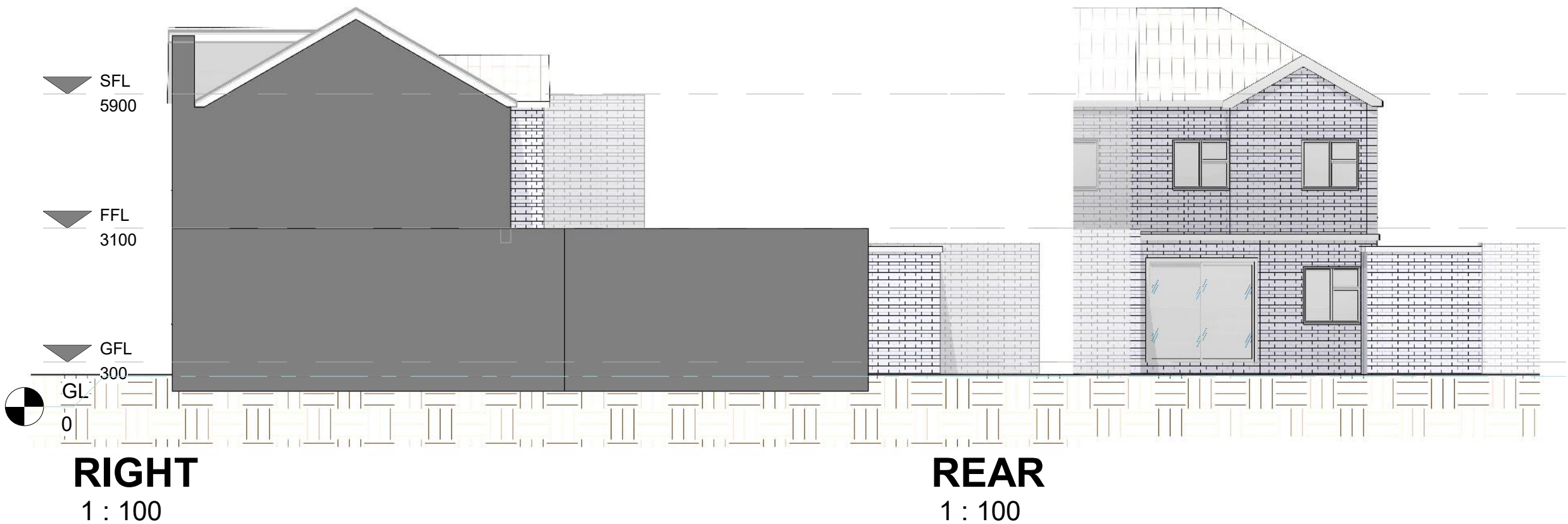
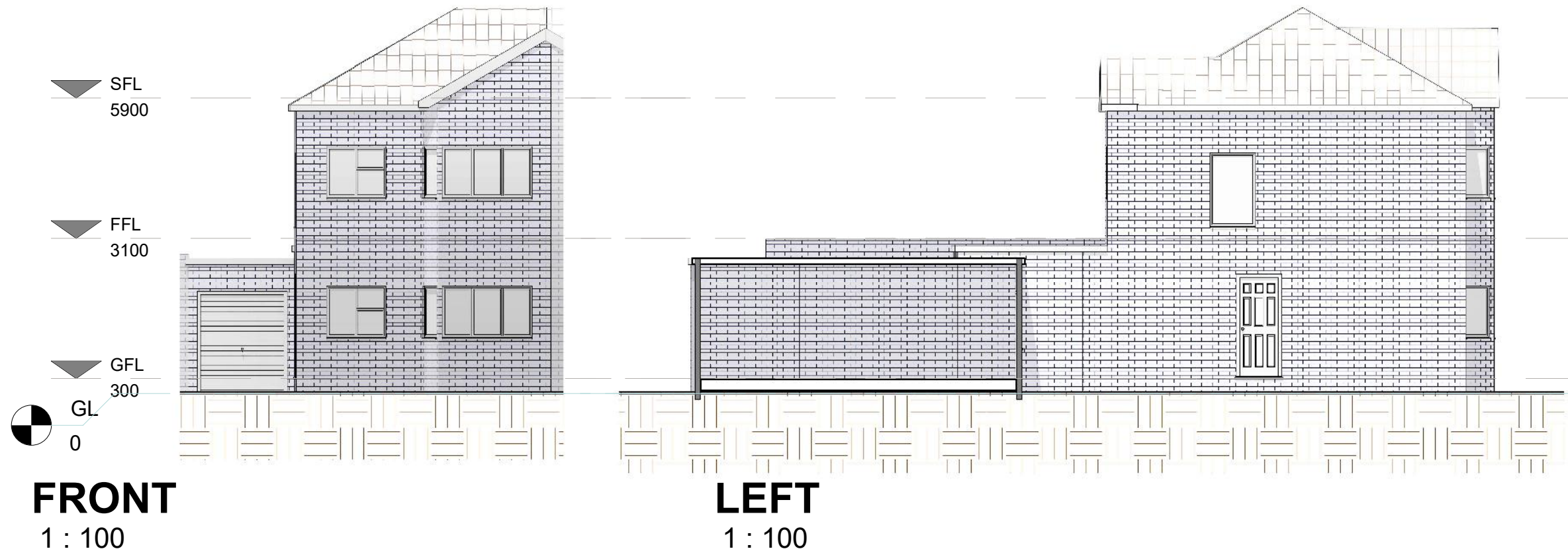
ALL NEW GLAZING AND WINDOWS to meet thermal and ventilation requirements of current LPA Building Regulations.

ELECTRICAL EQUIPMENT/WIRING: design & installation of all electrical wiring & related fittings to be carried out by an appd. electrical engineer in strict adherence to current British Standards and codes of practice

GAS/PLUMBING APPLIANCES: design & installation of all gas & plumbing & related fittings, appliances and equipment to be carried out by an appd. gas engineer in strict adherence to current British Standards and codes of practice

No	R.Desc	R.Date
PROJECT NO. 2020_08_UB4_SIN		
SCALE AT A3	DRAWING NO.	DATE.
As indicated	A100	10/09/20
DRAWN.	CHECKED.	REVISION.
BY	BY	

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BYOHESWARAN
Architectural Design &
Structural Engineering services
in South East London
✉ info@engdeby.co.uk
☎ +44 (0)7886 701 813



SITE:

59 Delamere Road
Hayes
UB4 0NN

TITLE:

Existing Elevations

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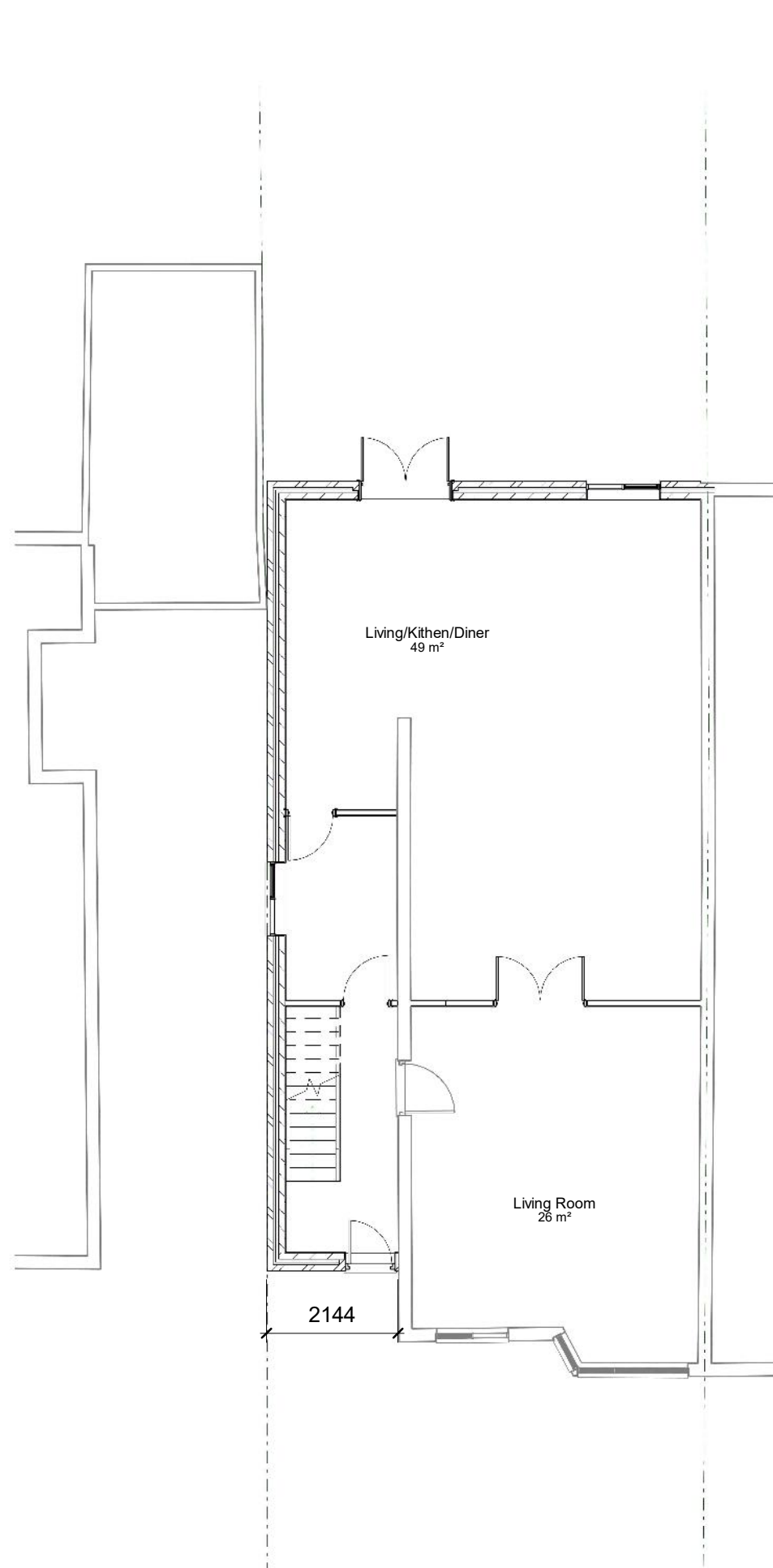
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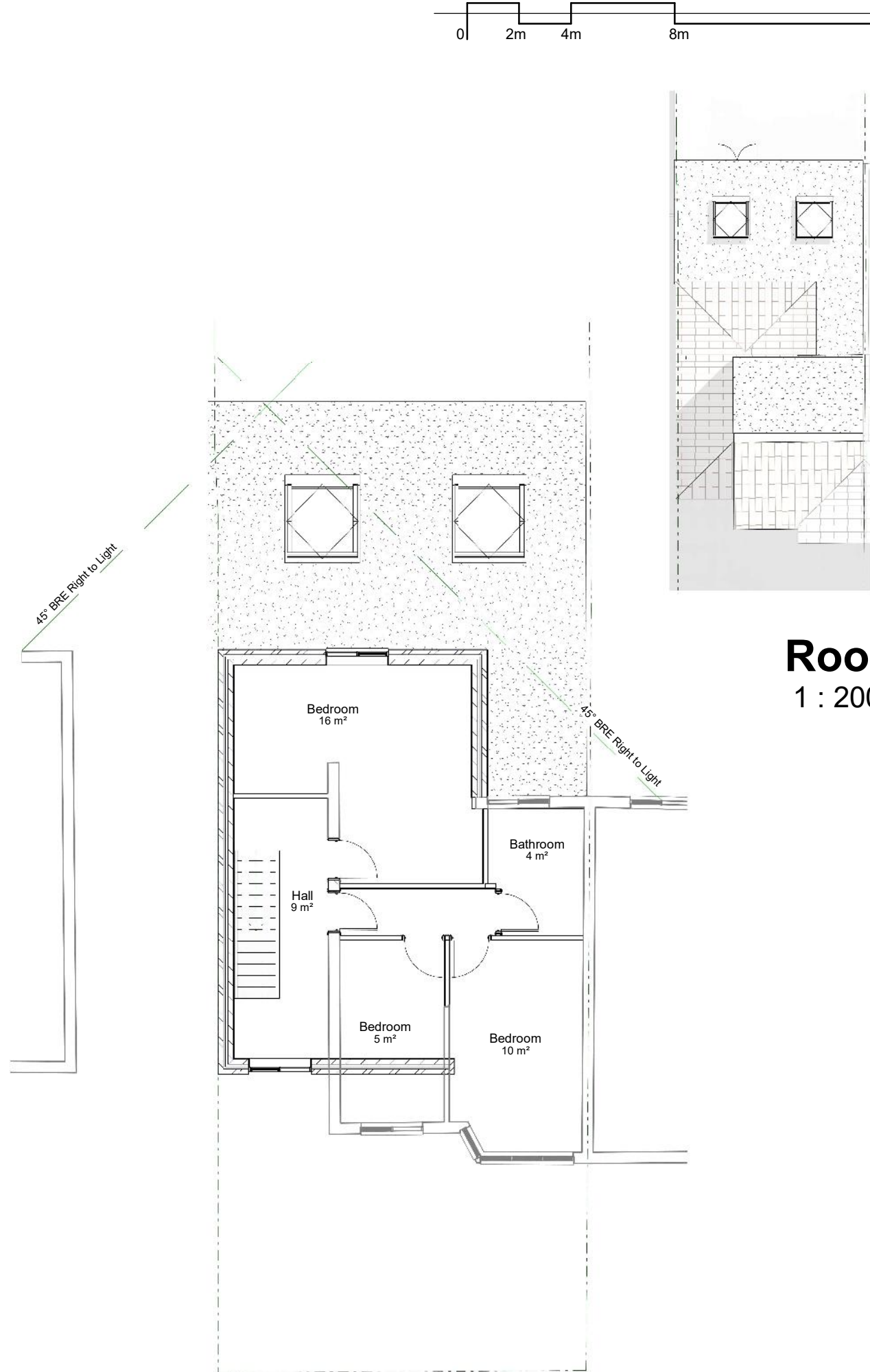
PROJECT NO.
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GFL
1 : 100



FFL
1 : 100

Roof
1 : 200

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TITLE:

Proposed Plans

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No	R.Desc	R.Date
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PROJECT NO.

2020_08_UB4_SIN

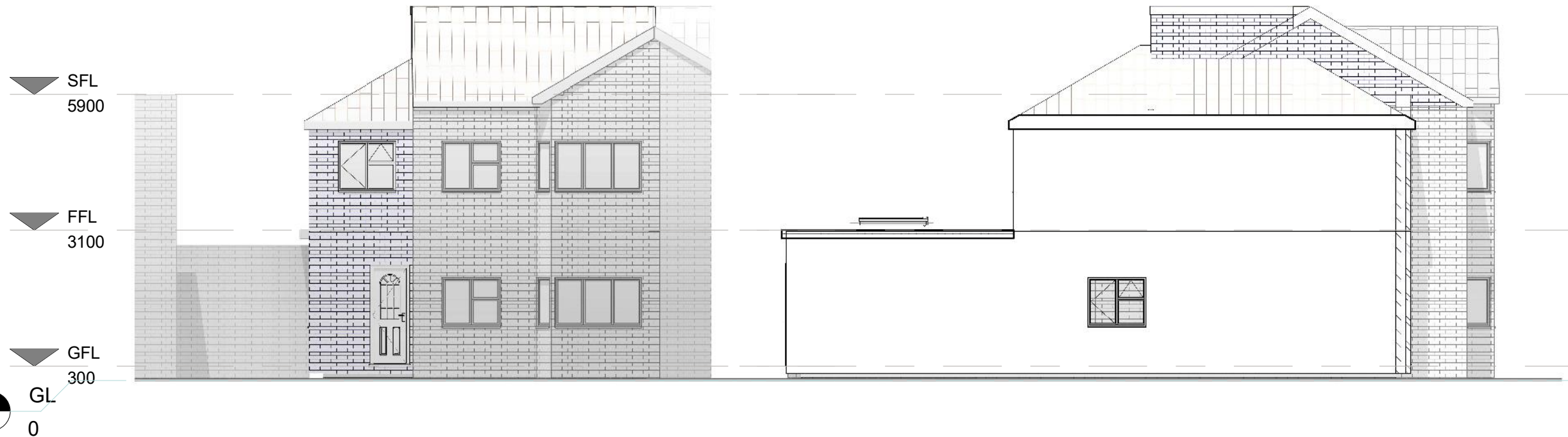
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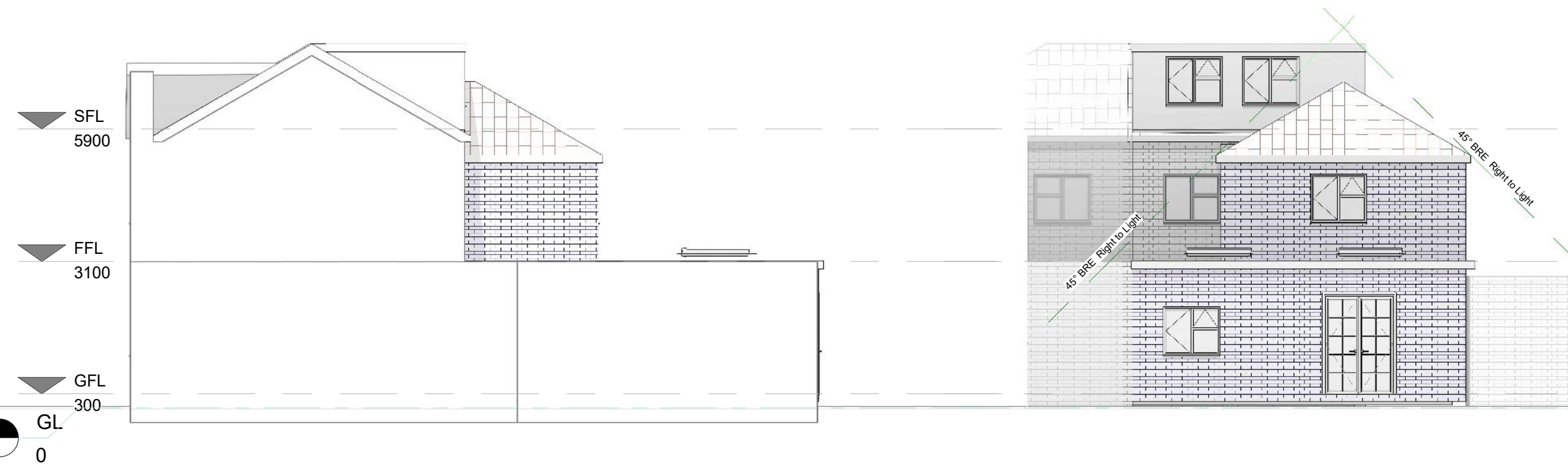
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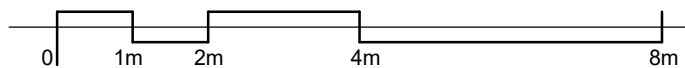
FRONT
1 : 100

LEFT
1 : 100



RIGHT
1 : 100

REAR
1 : 100



SITE:

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TITLE:

Proposed Elevations

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PROJECT NO.

2020_08_UB4_SIN

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