60 Caldy Road
Belvedere

Flood Risk Assessment

Job Number: 1086

Date	Version	Notes/Amendments
April 2021	1	Issued for Information
July 2021	2	Updated to EA's Breach Levels

Contents **Page**

Acronyms	
AOD	Above Ordnance Datum
CIRIA	Construction Industry Research and Information Association
EA	Environment Agency
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance

Report by: Tom Quigg BSc MSc CEng MICE

Introduction

Flume Consultants have been appointed to undertake a Flood Risk Assessment (FRA) for the proposed development at 60 Caldy Road, Belvedere, Kent DA17 6JS.

This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance 'Flood Risk and Coastal Change'. This FRA also incorporates advice and guidance from the Environment Agency (EA), the Strategic Flood Risk Assessment (SFRA) produced by London Borough of Bexley and CIRIA documents.

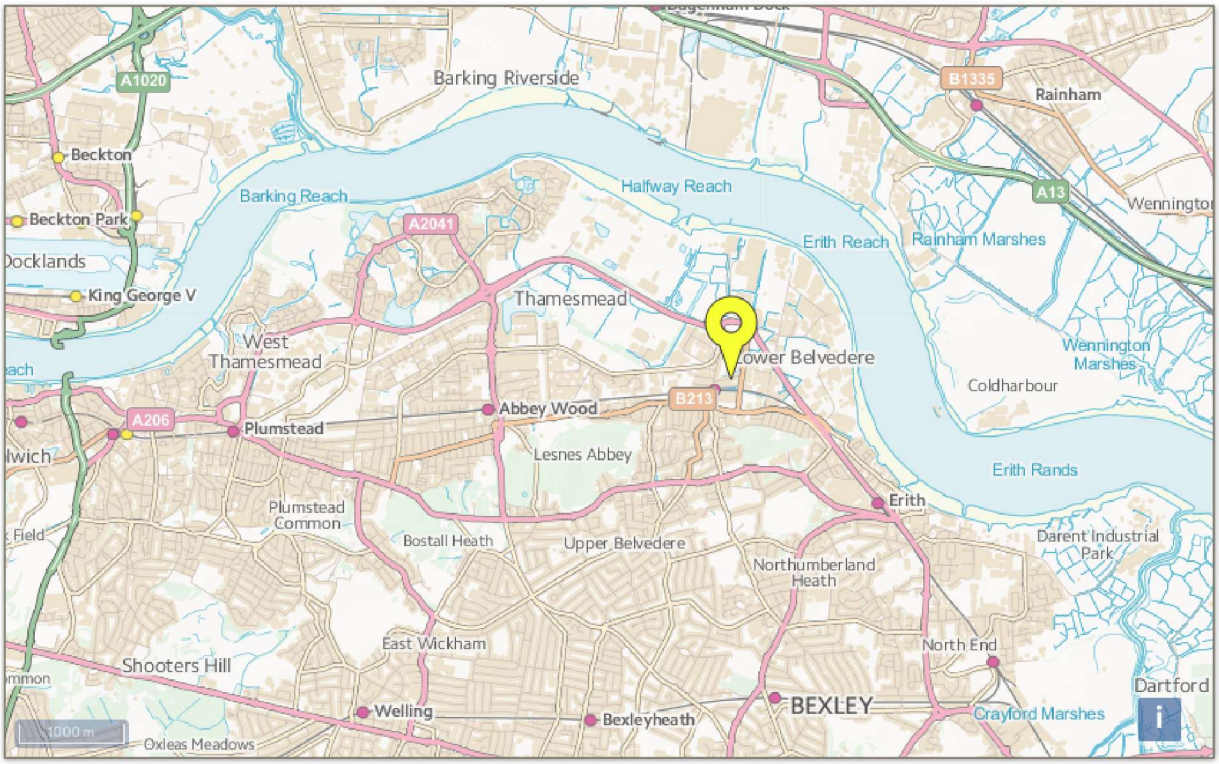
The Environment Agency's (EA) indicative floodplain map shows that the site is located in Flood Zone 3, in an area which benefits from flood defences. Our assessment will therefore focus on the flood risk to the site from watercourses from a breach in defences or from overtopping.

Site Description and Location

The development is located to the south of the River Thames, located along Caldy Road, close to the junction to North Road. The existing development comprises of a single-storey detached bungalow, with hard landscaped areas surround the building. Pedestrian access from the front and rear of the building. Vehicular access from Caldy Road.

The River Thames runs north of the development, and is the source of flood risk associated with the development.

The site postcode is DA17 6JS and the OS grid reference is TQ 49683 79327.



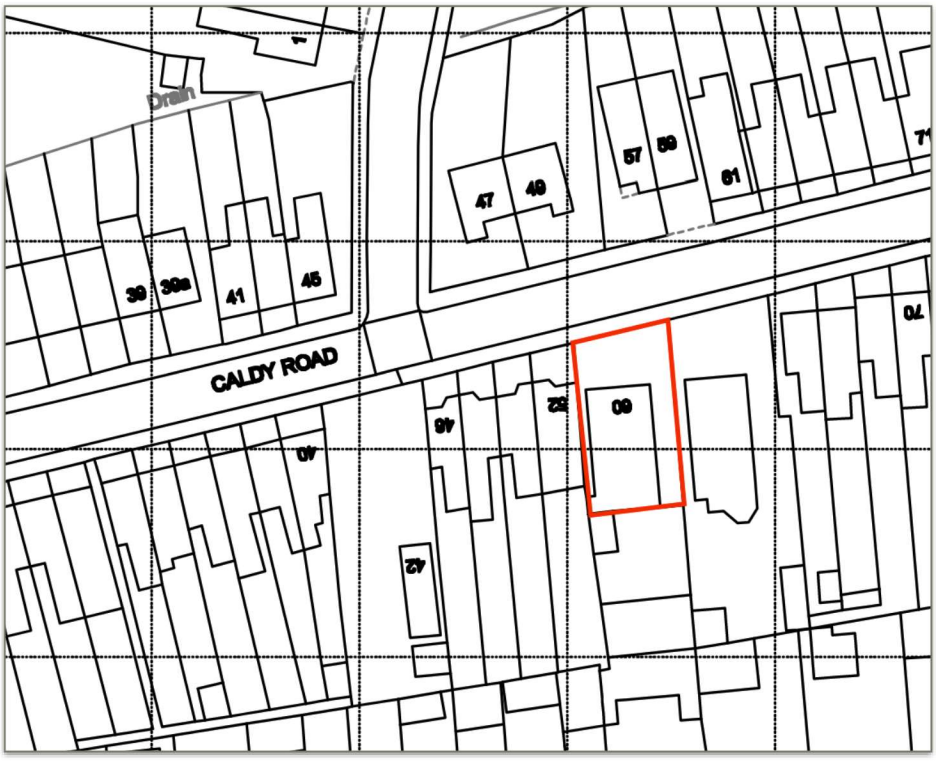


FIGURE 1. SITE LOCATION

Development Proposal

The development proposals include the demolition of the existing bungalow and the construction of 2no. three bedroom houses.

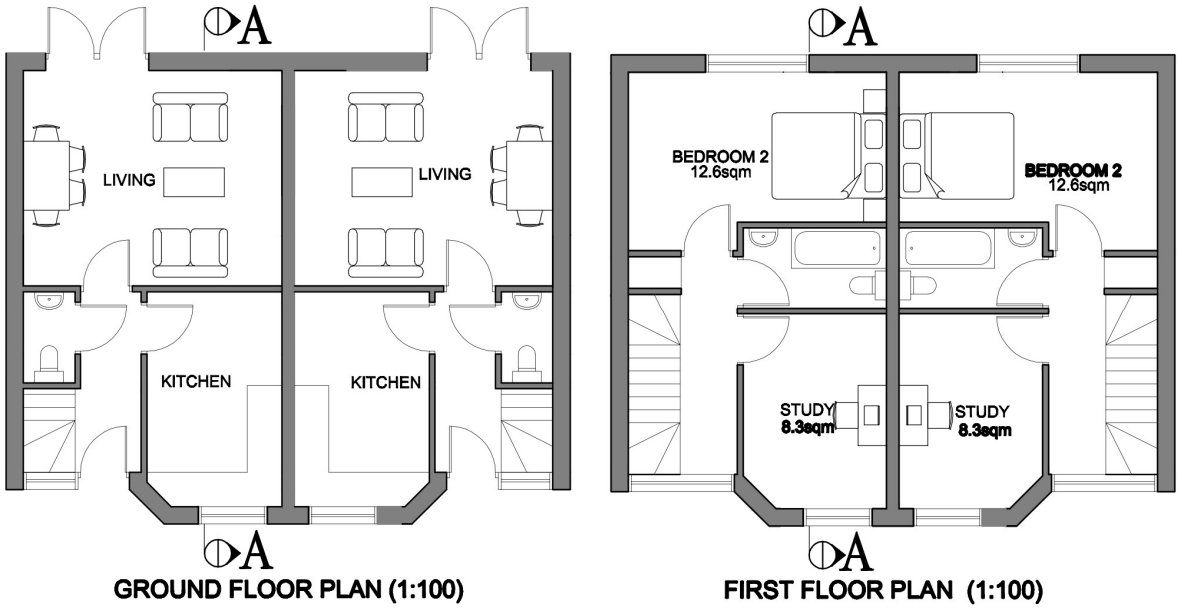


FIGURE 2. PROPOSED FLOOR PLANS

Flood Risk Assessment

Flood Risk from Watercourses

The EA's indicative floodplain map shows that the site is located in Flood Zone 3 and is at risk of flooding from the River Thames, and as such the Local Planning Authority has requested a site specific Flood Risk Assessment to be carried out. Land in this flood zone is assessed as having annual probability of river flooding greater than 1%. The EA's indicative fluvial/tidal flood risk maps, Figure 3, suggest that the site is located in an area which benefits from flood defences however the EA's website also states that not all defences are shown on the map.

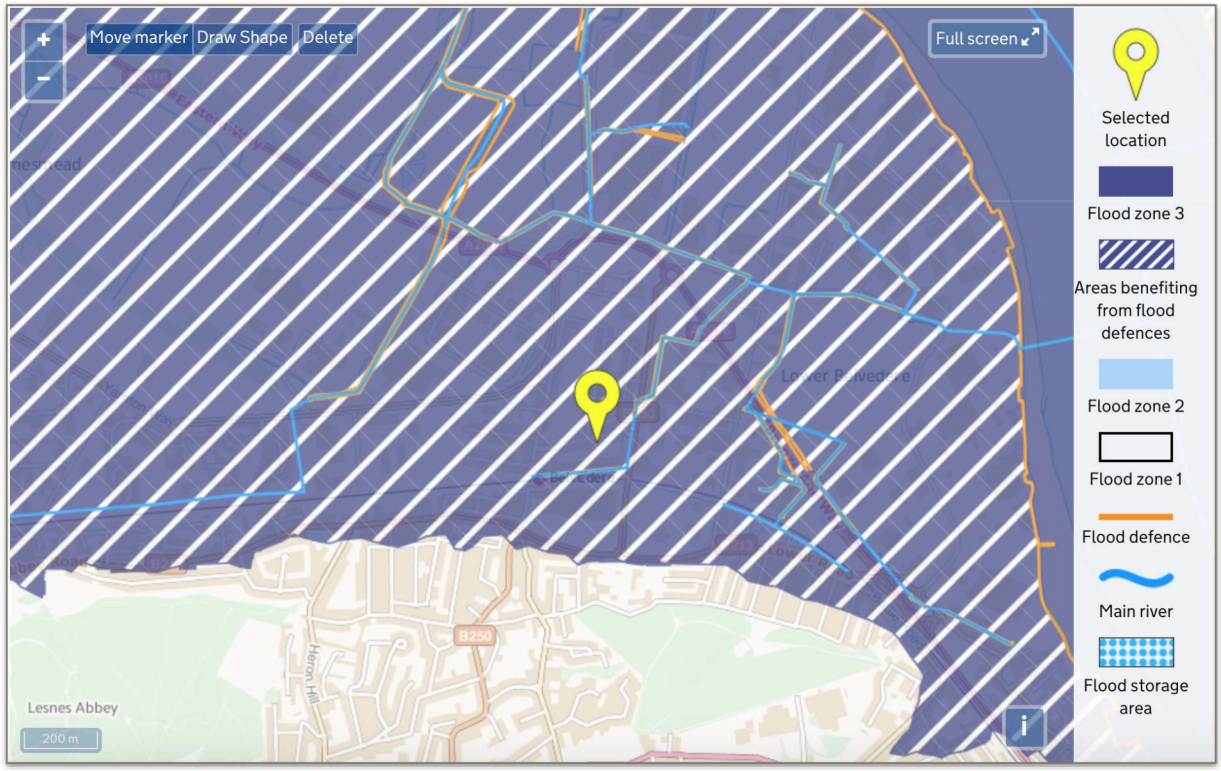


FIGURE 3. ENVIRONMENT AGENCY FLOOD RISK FROM RIVERS OR SEA MAP (GOV.UK, 2020)

Tidal flood risk is extensive, but at present Bexley is fully defended against the 0.1% annual probability extreme tide level with climate change to 2107.

Following receipt of Product 8 Information of the River Thames to account for Breach. The modelled flood level at this location for the 1 in 200 year storm event with an allowance for climate change is 2.490m AOD. This ensures that Sleeping accommodation is raised 1.20m above the breach (2115) flood levels.

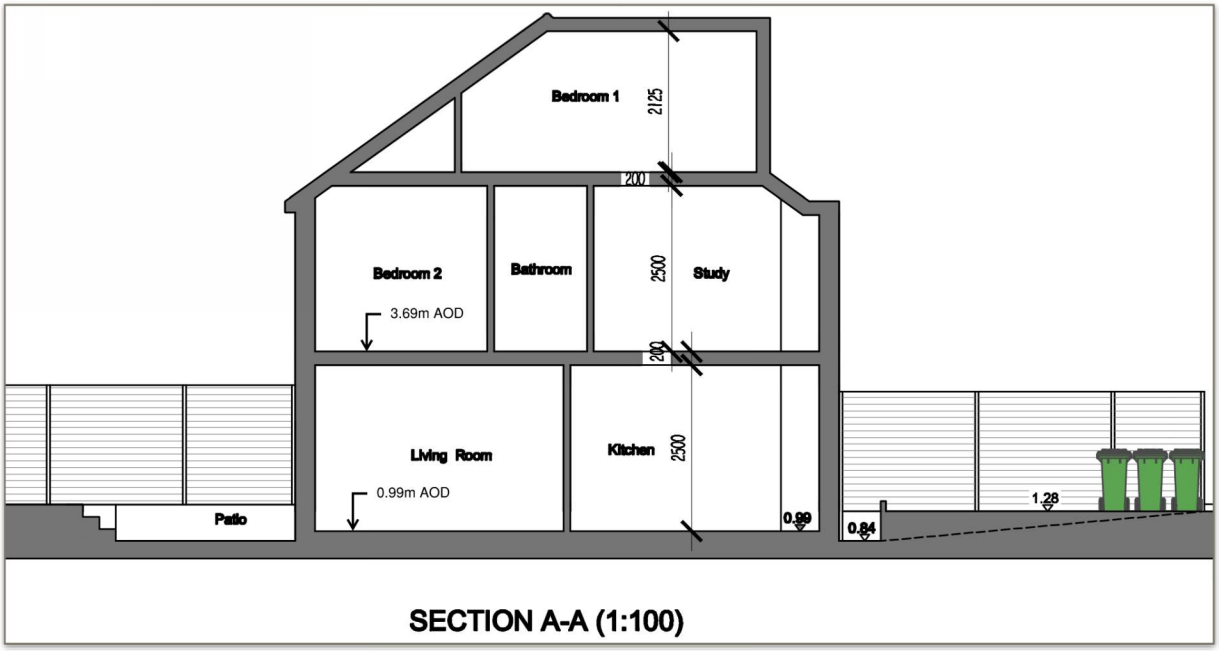


FIGURE 4. SECTION THROUGH PROPOSED BUILDING

More on flood risk from breach and failure of defence is outlined in the chapter *"Flood Risk from Infrastructure Failure"*.

Flood Risk from Groundwater

A ground investigation report was not available at the time of writing this report. The British Geological Survey (BGS) Map shows that superficial deposits of Alluvium - Clay, Silt, Sand And Peat underlay the site, Figure 5. The Thanet Formation forms the bedrock geology.

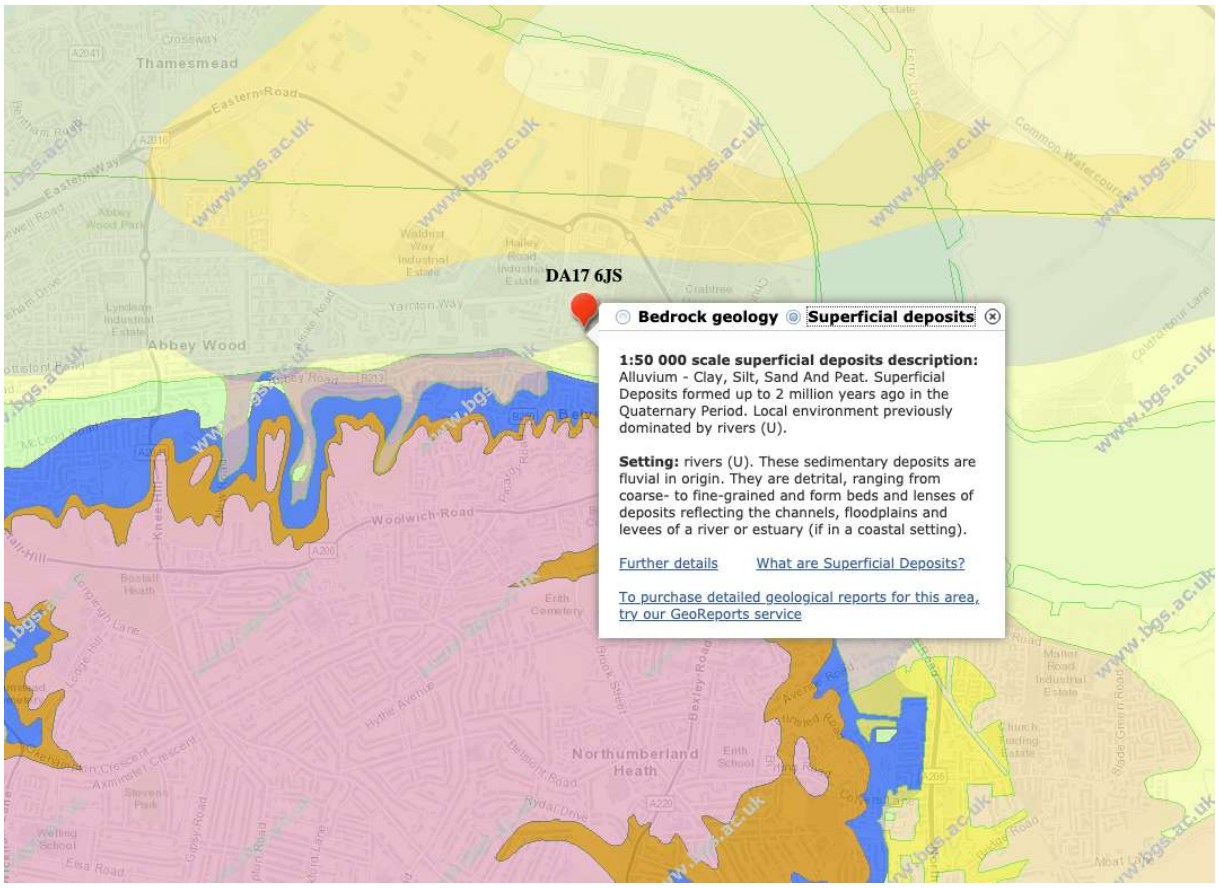


FIGURE 5: BGS' GEOLOGICAL MAP - SUPERFICIAL DEPOSITS (BGS, 2021)

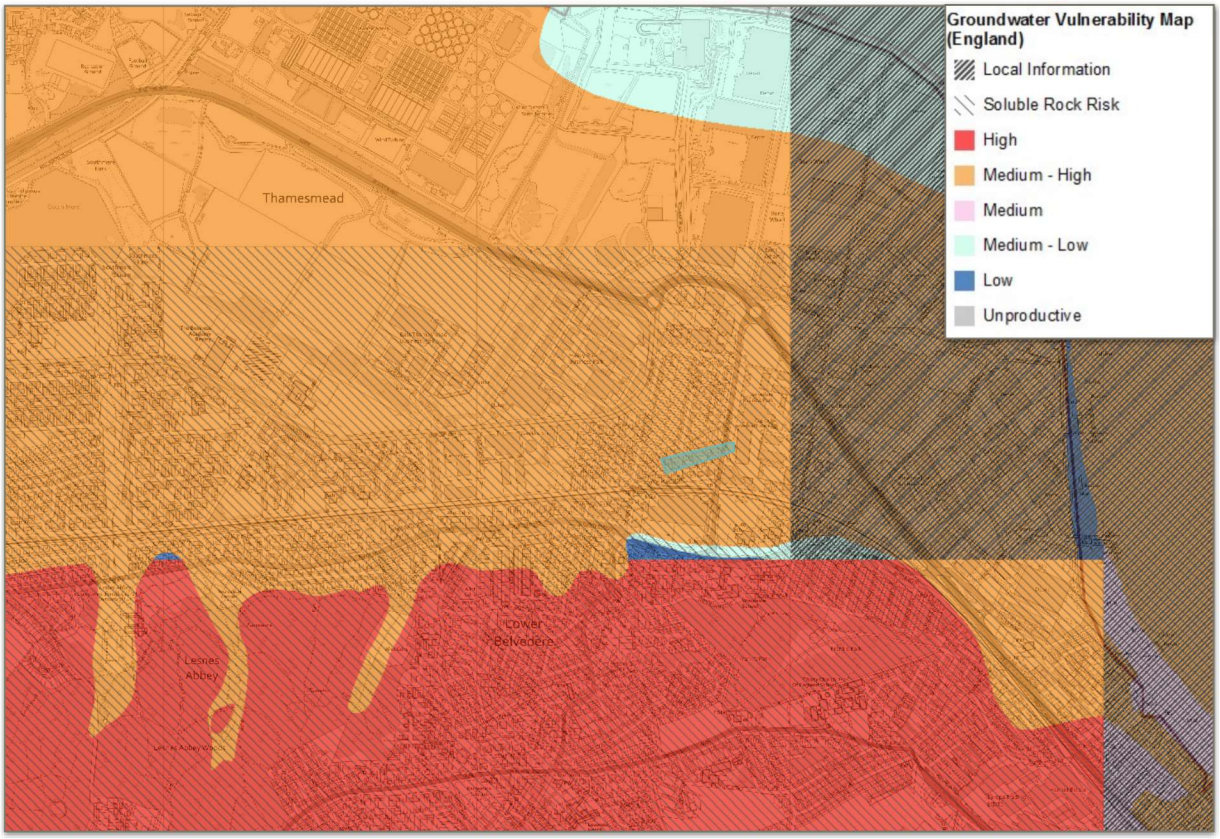


FIGURE 6: DEFRA'S GROUNDWATER SUSCEPTIBILITY MAP (MAGIC.DEFRA.GOV.UK, 2021)

The groundwater vulnerability maps indicate a *Medium-High* risk of groundwater flooding in the area, Figure 6. The outlines of each classification correlates with the underlaying bedrock geology.

These maps consider very large areas of the underlying geology, and ignore subtle shifts in local geology and ground levels. Furthermore, Groundwater flooding is an important consideration for subterranean basements. However, no basements are proposed in this instance. Finally, proposed levels will be designed to ensure surface water (and groundwater) is directed away from building thresholds, should it migrate to surface level.

Therefore, the likelihood of groundwater flooding is considered to be low risk.

Flood Risk from Surface Water and Overland Flows

Surface water flooding occurs when intense rainfall is unable to infiltrate into the ground or overwhelms the drainage system. This surface water runs across the surface of the ground causing flooding. Overland flows can also be generated by burst water mains, failed dams and any failure in a system storing or transferring water.

The EA's Surface Water Flooding Map, Figure 7, shows that the site is at *very low - low* risk of surface water flooding.

FIGURE 7. FLOOD RISK FROM SURFACE WATER MAP (SFRA, 2017)

The building footprint is at *Very Low* risk of Surface Water flooding. *Very Low* risk means that each year this area has a chance of flooding of less than 0.1% Annual Exceedance Period (AEP). The map also shows that only the landscaped areas to the rear of 60 Caldy Road has a chance of flooding of between 0.1% and 1% each year. These maps suggest that surface water will be largely maintained within the roads' channels. Flood water within road channels is expected during extreme storm events, considering that most surface water drainage system will be surcharged during high storm event.

Furthermore, ground levels on site will be encouraged to fall away from the building thresholds and positively drained. It's also worth reinforcing that flooding from surface water is difficult to predict, or indeed model accurately, as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Therefore, the likelihood of surface water flooding is considered to be low risk.

Flood Risk from Reservoir Failure

The EA's information states that reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Reservoir Act of 1975 ensures that reservoirs are inspected regularly and essential safety work is carried out.

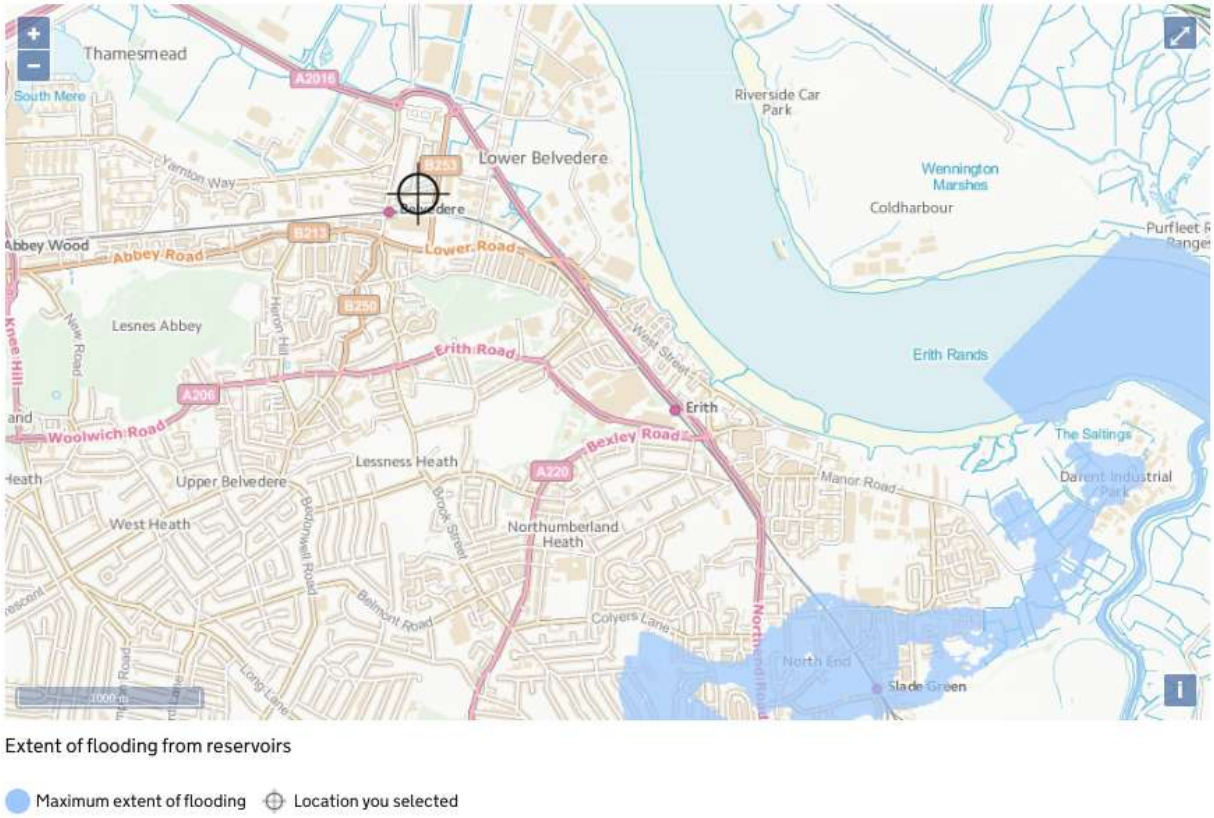


FIGURE 8. ENVIRONMENT AGENCY FLOOD RISK FROM RESERVOIRS MAP (GOV.UK, 2020)

Figure 8 shows that there is no flood risk associated with Reservoir Failure for the proposed site.

Flood Risk from Infrastructure Failure

Although the development benefits from flood defences in the area, the flood defences reduce but do not eliminate the flood risk, as the risk of a breach or overtopping remains. With any man-made structure there is a possibility of failure, and that flood water will inundate the site. Therefore, a residual risk will remain.

Overtopping

Overtopping of the defence walls is unlikely given the operation of the Thames Barrier. Furthermore, the SFRA shows that Bexley is protected by well-maintained defences. This part of London benefits from the protection offered by the Thames flood defences, which currently offer protection against the 1 in 1000 year flood.

Breach

The results of the EA's breach maps show that the proposed development is inundated for the 1 in 200 and 1 in 1000 year return periods.

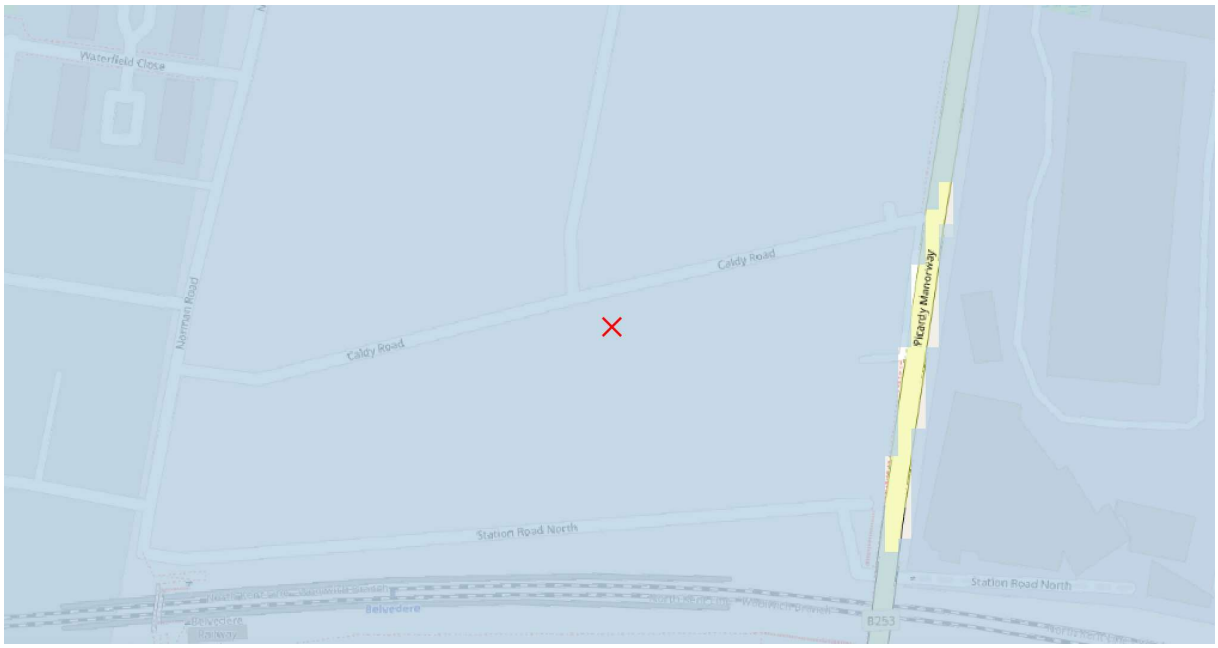


FIGURE 9. ENVIRONMENT AGENCY'S FLOOD RISK FROM BREACH MAP - 2100 EPOCH

The levels were obtained from a Product 6 and 8 request from the Environment Agency.

Thames Tidal Downriver Breach Levels

1 in 200 year 2005 flood level (mAOD): **1.959** (at No. 60 Caldy Road)

1 in 200 year 2100 flood level (mAOD): **2.490** (at No. 60 Caldy Road)

Proposed Ground Floor FFL (mAOD): **0.99**

Proposed First Floor FFL (mAOD): **3.69**

This provides a ‘Safe Haven’ for residents in the unlikely event a sudden breach was to occur. Furthermore, the EA and Government are committed to upgrading, improving and maintaining all flood defences in England, and therefore should mitigate the potential for any future breach. It appears that should a breach occur in the flood defences, there is safe passage from Picardy Manorway. Please refer to the Flood Evacuation Plan for further information.

Sewer Flooding

These risks have not been quantified in the Borough in its SFRA. However, is no record of any flood incidents with respect to sewer flooding, therefore, the likelihood of sewer flooding incidents within the development’s postal district appear to be low.

Flood Evacuation Plan

Although the site is categorised as having a Residual Risk of flooding from a breach in defences, the local authority have requested it be demonstrated that there is safe access egress arrangements on site, should a breach in defences occur.

I. The proposed development is located within Flood Zone 3 and is at risk of fluvial/tidal flooding, however the site benefits from the presence of formal flood defences.

II. Residents/tenants responsible for the Flood Plan should be registered to EA flood alerts, as these are important to enable safe flood evacuation of the site.

III. A primary evacuation route has been identified. This route should be explained to residents/tenants and displayed in the proposed dwelling, all common areas and adjacent to entrances to the building (if applicable). A poster for this purpose has been supplied as part of Appendix B.

IV. A contact list should be established by the site owner and regularly updated with changes in tenancy.

V. A flood kit must be prepared and regularly checked.

VI. It is recommended that further information is downloaded through the following link and distributed to residents of the site, and to advise residents of arrangements before a flood occurs: https://www.gov.uk/government/publications/flooding-what-to-do-before-during-and-after-a-flood

VII. If not already listed, it is recommended that the property is registered with the EA's Flood Warning Service. If you are unsure and/or you wish to register for this free service please contact Floodline Warning Service. Floodline is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone etc. The EA is responsible for monitoring flood events and for issuing warnings to people in properties and businesses at risk of flooding. To fulfil their responsibilities, the EA operates a coded warning system. This is a four-stage warning system and each stage will trigger a set of procedures for the various emergency services. This warning system is outlined below.

ONLINE FLOOD RISK FORECAST

Meaning

Be aware.

Keep an eye on the weather situation.

General advice

- Check weather conditions.
- Check for updated flood forecasts on the Environment Agency website.

FLOOD ALERT

Meaning

Flooding is possible

Be prepared.

General advice

- 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.

FLOOD WARNING

Meaning

Flooding is expected.

Immediate action required.

General advice

- 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.

SEVERE FLOOD WARNING

Meaning

Severe flooding.

Danger to life.

General advice

- Stay in a safe place with a means of escape.
- Be ready should you need to evacuate.
- Co-operate with the emergency services.
- Call 999 if you are in immediate danger.

WARNING NO LONGER IN FORCE

Meaning

No further flooding is currently expected in your area.

General advice

- Be careful. Flood water may still be around for several days.
- If you've been flooded, ring your insurance company as soon as possible.

Flood Mitigation Measures

The EA's flood maps show that the site is located within the tidal breach extents. The proposed first floor FFL will be constructed above the flood level due to breach: **3.69m AOD**, providing a safe haven for residents to evacuate to in the unlikely event of a sudden breach in defences. It is recommended the building include flood resilience measures in the design, in accordance with the SFRA. Therefore, to further reinforce the flood resilience of the building, any construction works at ground level should include an appropriate damp proof membrane. All drainage systems should be routinely maintained to reduce the risk of blockage and surface water flood risk. Furthermore, it is proposed flood resilient[1] materials will be used for flooring and on the walls at ground floor level to minimise the potential for damage, in the unlikely event of flood water inundating the building footprint.

It is recommended that external ground levels immediately outside the building entrance are set to fall away from the building thresholds, ensuring the minimisation of storm water ingress. If this is not possible, channel drainage along the building thresholds at the entrance should be introduced to positively drain overland flows.

If not already listed, it is recommended that the property is registered with the EA's Flood Warning Service. If you are unsure and/or you wish to register for this free service please contact Floodline Warning Service. Floodline is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone etc. The EA is responsible for monitoring flood events and for issuing warnings to people in properties and businesses at risk of flooding.

Anti-flood valves could be introduced at the outfall prior to connecting to the public sewer. A *'Pre-development enquiry'* to Thames Water is also recommended to determine capacity in the sewer. This is a free application, and should be submitted to Thames Water's Developer Services team.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

Conclusions

The EA's flood risk from watercourses map shows that the site is in Flood Zone 3. Flood defences reduce the actual flood risk from high to low.

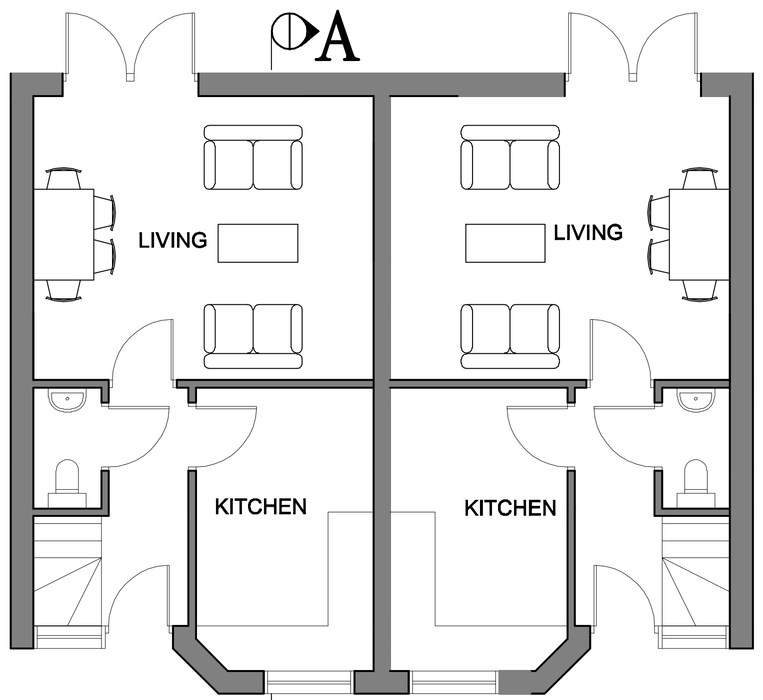
The EA's flood maps show that the site is located within the tidal breach extents. The proposed first floor FFL will be constructed above the flood level due to breach: **3.69m AOD**, providing a safe haven for residents to evacuate to in the unlikely event of a sudden breach in defences. It is proposed flood resilient materials will be used for flooring and on the walls up to minimise the potential for damage, in the unlikely event of breach or overtopping. Furthermore, should a breach in defences occur, unrestricted access to the first floor will be available at all times, in addition to an up-to-date Flood Evacuation Plan. Finally, only living space will be situated at ground floor, with sleeping accommodation proposed only at 1st and 2nd floor.

If not already listed, it is recommended that the property is registered with the EA's Flood Warning Service.

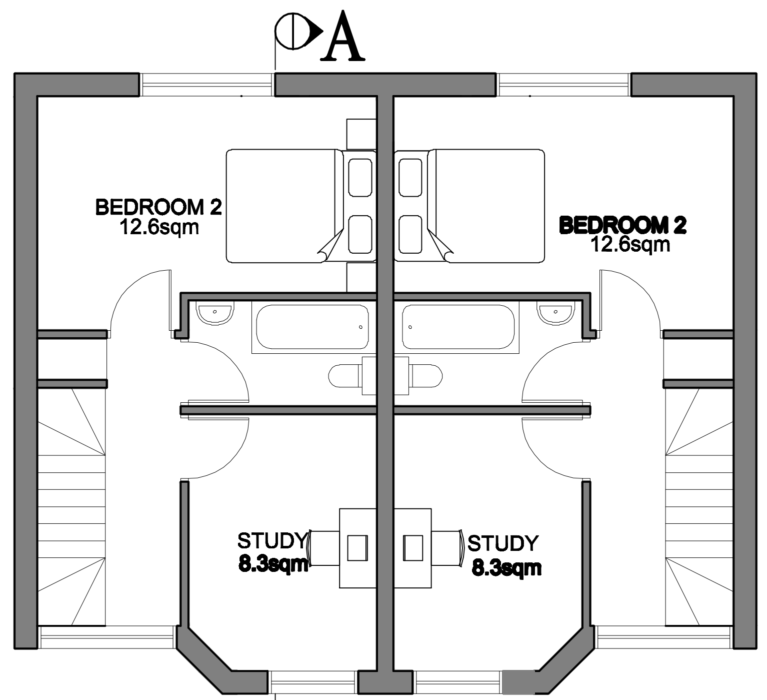
The proposed building footprint will not increase the impermeable areas on the site, as the external area is currently hardstanding. It will therefore not increase the flood risk from surface water, as there will be no increase in the surface water run-off rate or volumes.

The FRA has further demonstrated that the proposed development has an acceptable flood risk within the terms and requirements of the NPPF and accompanying technical guidance.

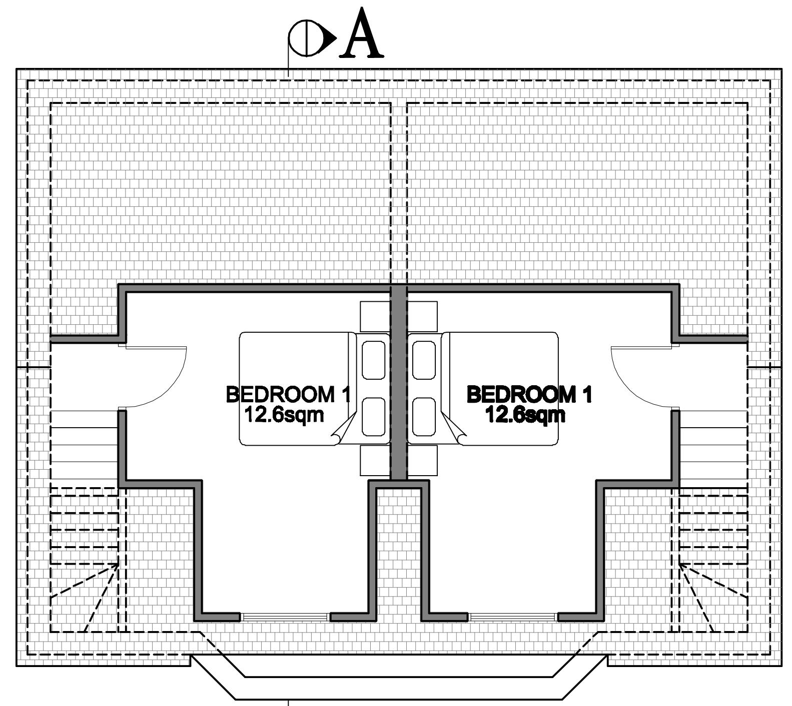
Appendix A - Proposed Architectural Plans



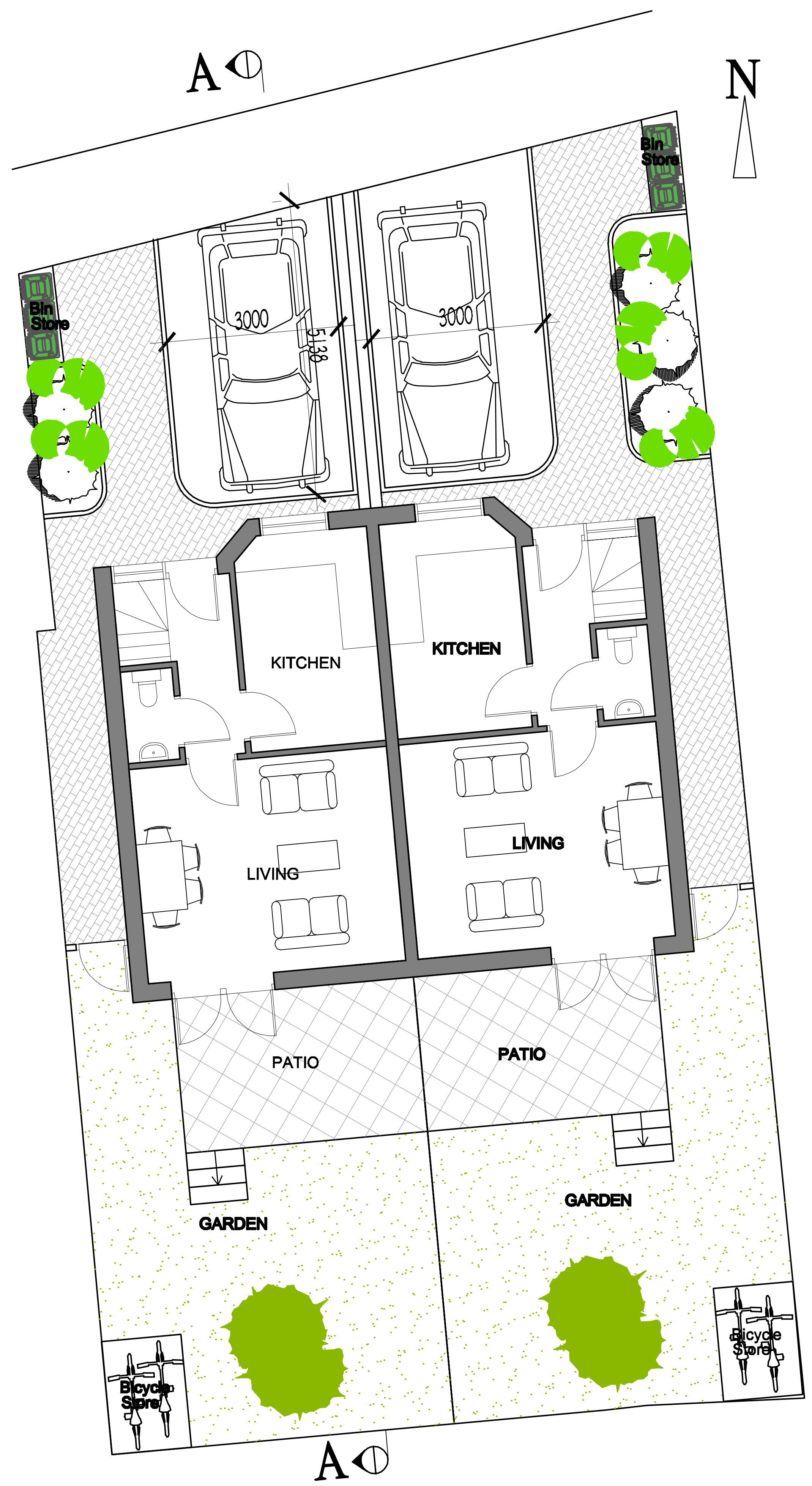
GROUND FLOOR PLAN (1:100)



FIRST FLOOR PLAN (1:100)

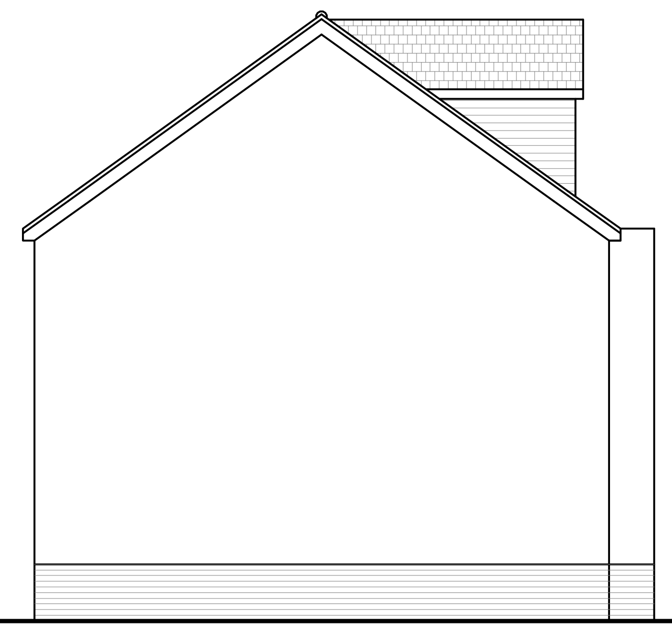


SECOND FLOOR PLAN (1:100)

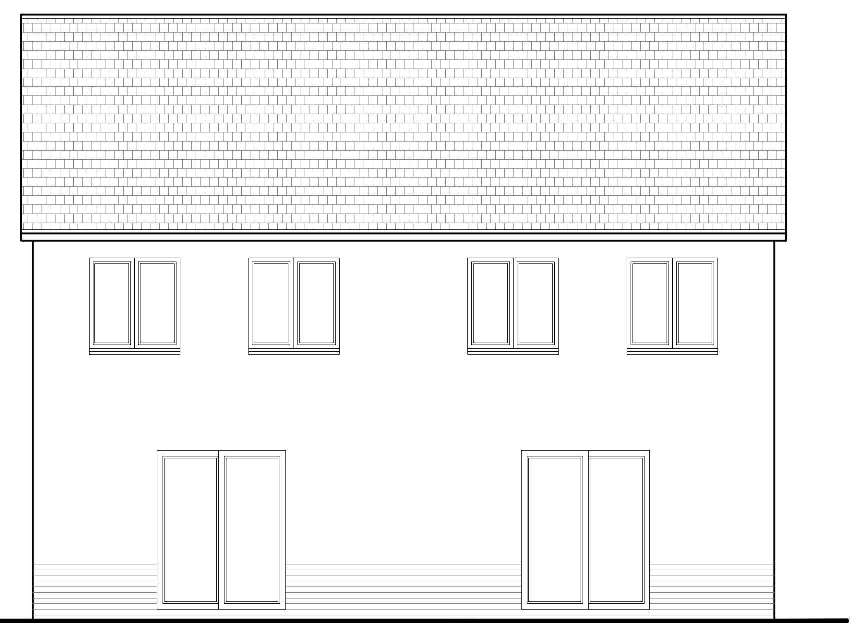


SITE PLAN (1:100)

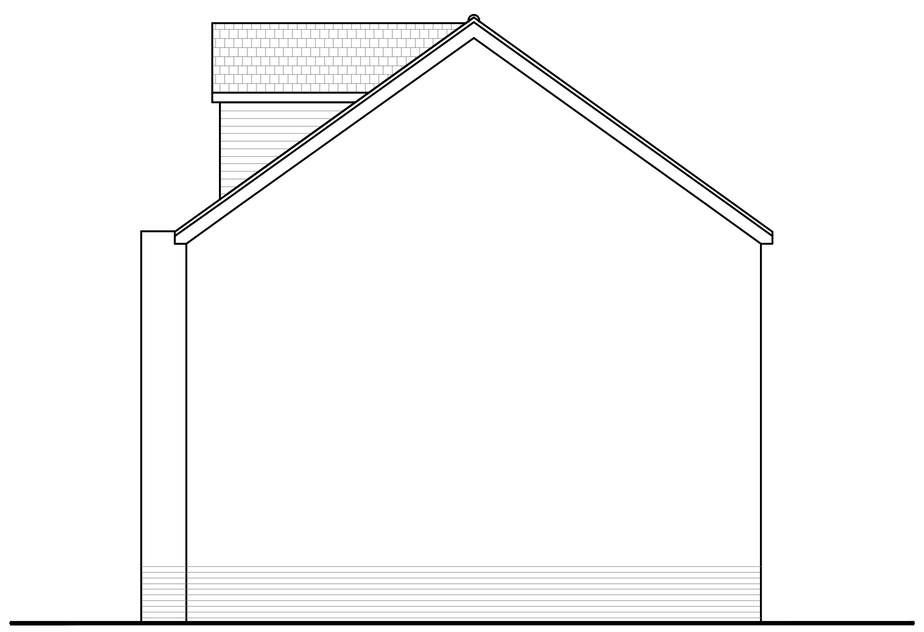
FRONT ELEVATION (1:100)



LEFT SIDE ELEVATION (1:100)



REAR ELEVATION (1:100)



RIGHT SIDE ELEVATION (1:100)

1:100

ENVIRONMENTAL DESIGN ARCHITECTS

07877155792

The designs contained herein are the property of Environmental Design Architects

60 Caldy Road

Belvedere DA17 6JS

Rev	Date	By	Chkd	Revisions

Client

Allied Venture Property Assets Ltd.

Drawing Title

Plans, Elevations & Site Plan

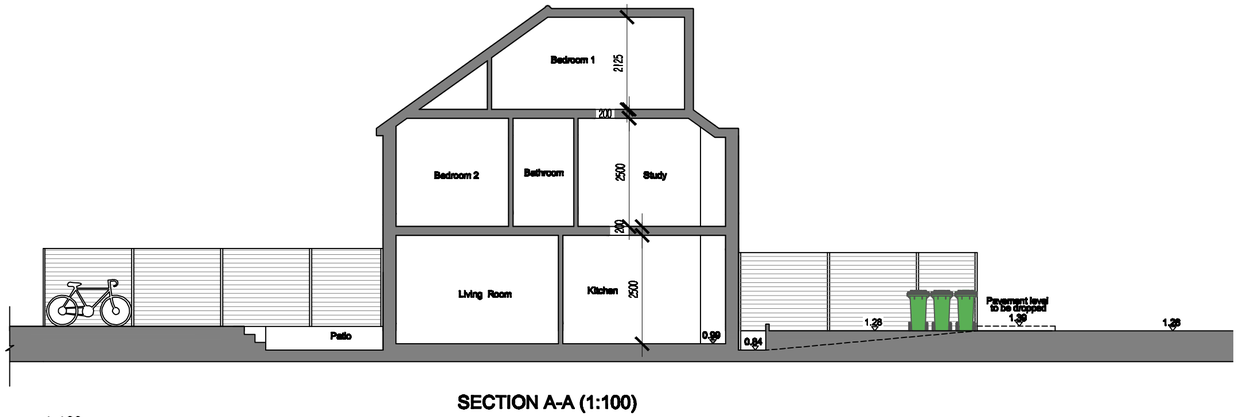
Scale 1:100@A2		Date 29/03/2021	
Designed by	Drawn by	Checked by	Approved by

Autocad file ref:

EDA Drawing No. 2021/04/01 Rev.

EXISITING STREET ELEVATION (1:100)

PROPOSED STREET ELEVATION (1:100)



SECTION A-A (1:100)

1:100

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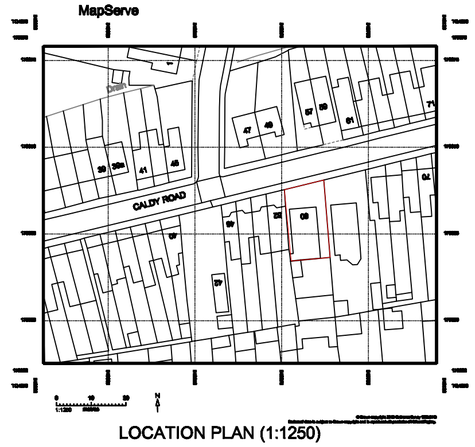

LOCATION PLAN (1:1250)

ENVIRONMENTAL DESIGN ARCHITECTS
07871799192

60 Caldy Road

Belvedere DA17 6JS

Rev | Date | By | Chkd | Revisions

Client
Allied Venture Property Assets Ltd.

Drawing Title
Street Elevaton, Location Plan & Section

Scale 1:100& 1:1250@A2 | Date 29/03/2021

Designed by | Drawn by | Checked by | Approved by

Autocad file ref:

Drawing No. 2021/04/02 | Rev.

Appendix B - Flood Evacuation Plan

Pedestrian Route to a zone outside the Flood Zone

Caldy Road Flood Evacuation Plan

Preliminary

19/04/2021