

**FLOOD RISK ASSESSMENT
FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENT
AT STOW ROAD, MAGDALEN**

FINAL REPORT

ECL0443/REEVE DESIGN LTD

DATE MARCH 2021

ELLINGHAM CONSULTING LTD

Email: tim@ellinghamconsulting.co.uk

DISCLAIMER

This document has been prepared solely as a Flood Risk Assessment in support of a planning application for proposed commercial and residential development at Stow Road, Magdalen. "Ellingham Consulting Ltd" accepts no responsibility or liability whatsoever for any use made of this document other than by the client "Mrs S Bektas" for the purposes it was originally commissioned and prepared. All comments and opinions made are based upon information available to "Ellingham Consulting Ltd" during the necessary investigative process, and the conclusions and recommendations, could therefore, differ in the event of material subsequently being found erroneous, incomplete, or misleading. "Ellingham Consulting Ltd" therefore, accepts no liability should this prove to be the case.

CONTENTS

- 1.0 INTRODUCTION

- 2.0 SITE LOCATION AND DESCRIPTION
 - 2.1 Site Location
 - 2.2 Existing Site
 - 2.3 Proposed Development
 - 2.4 Local Development Documents
 - 2.5 Available Flood Risk Information

- 3.0 FLOOD RISK VULNERABILITY
 - 3.1 The Sequential and Exception Test
 - 3.2 Vulnerability Classification
 - 3.3 Application of the Sequential and Exception Test

- 4.0 SITE SPECIFIC FLOOD RISK
 - 4.1 Local Flood Assets
 - 4.2 Sources of Flooding
 - 4.3 Probability of Flooding
 - 4.4 Historic Flooding
 - 4.5 Climate Change
 - 4.6 Residual Risk

- 5.0 FLOOD RISK MITIGATION
 - 5.1 Summary of Risks
 - 5.2 Mitigation Measures

- 6.0 CONCLUSIONS

ATTACHMENT 1 – Plans as Proposed (Dwg 2055.02 A)

1.0 INTRODUCTION

This Flood Risk Assessment has been prepared in accordance with National Planning Policy Framework (NPPF) and supporting planning practice guidance (PPG) on Flood Risk and Coastal Change.

In areas at risk of flooding or for sites of 1 hectare or more, developers are required to undertake a site-specific Flood Risk Assessment to accompany an application for planning permission. This Flood Risk Assessment has been produced on behalf of Mrs S Bektas in respect of a development that consists of a shop and flat at 15 Stow Road, Magdalen.

A planning application for the proposed development is to be submitted by Reeve Design Ltd.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site is at 15 Stow Road, Magdalen, King's Lynn, PE34 3BT. The National Grid Reference of the site is 55975/31118.

The location of the site is shown on Figure 1.

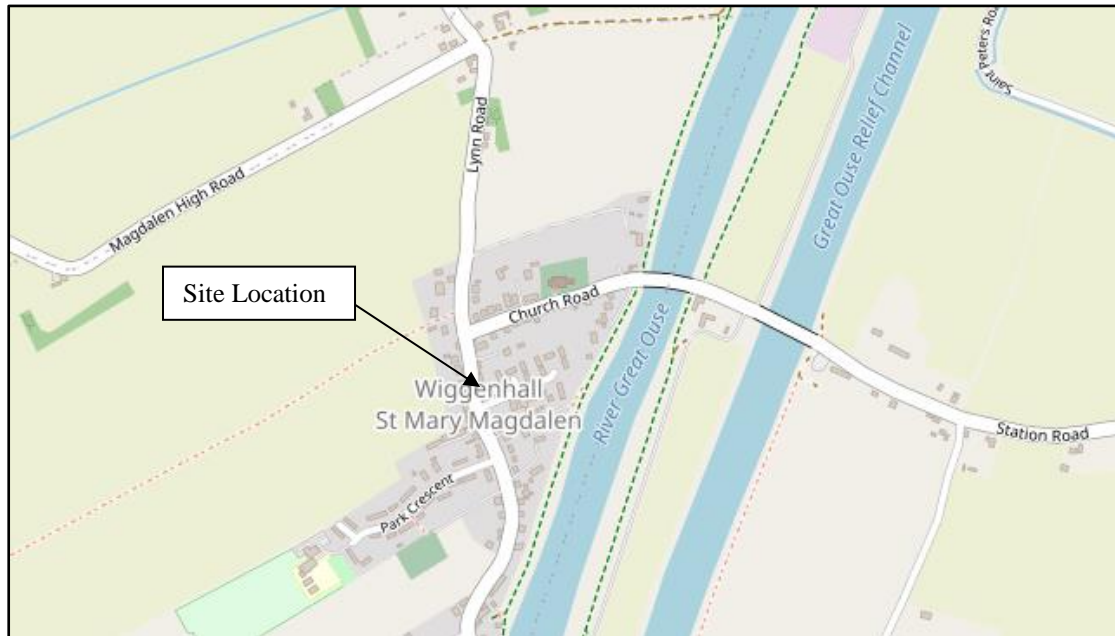


Figure 1 – Location Plan (© OpenStreetMap contributors)

2.2 Existing Site

The site is on the eastern side of Stow Road to the north east of the junction with Church Close. The site consists of a shop. The area of development is approximately 0.02 hectares.

Environment Agency LIDAR information shows that ground levels within the site are typically +1.6m OD. The carriageway level of Stow Road adjacent to the site is +1.5m OD.

The site is in the King's Lynn Internal Drainage Board's (IDB) area. Surface water at the site would naturally drain through soakaway and hence to the IDB drain system. There is an IDB watercourses approximately 150m south of the site.

The online British Geological Survey maps indicate that the site is likely to be underlain by the Kimmeridge Clay Formation mudstone. The bedrock is shown to be overlain with superficial deposits of clay and silt.

2.3 Proposed Development

The proposed development consists of a new shop with first floor flat above. The existing shop at the site will be demolished. A Site Plan is provided in Attachment 1.

2.4 Local Development Documents

The King's Lynn & West Norfolk Borough Council Local Development Framework - Core Strategy is the adopted Local Plan for the district. Policy CS08 for Sustainable Development states the requirements for flood risk reduction.

The King's Lynn and West Norfolk Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) was prepared in November 2018. The Level 2 SFRA was prepared in March 2019.

The Norfolk LLFA Statutory Consultee Guidance Document has been drafted to support the development of Norfolk County Council (NCC) as Lead Local Flood Authority's (LLFA) role as a statutory consultee to planning and to inform stakeholders in this process such as Local Planning Authorities (LPAs) and developers.

2.5 Available Flood Risk Information

The site is located within Flood Zone 3, an area with a high probability of flooding benefitting from defences, of the Environment Agency Flood Maps for Planning as shown in Figure 2.

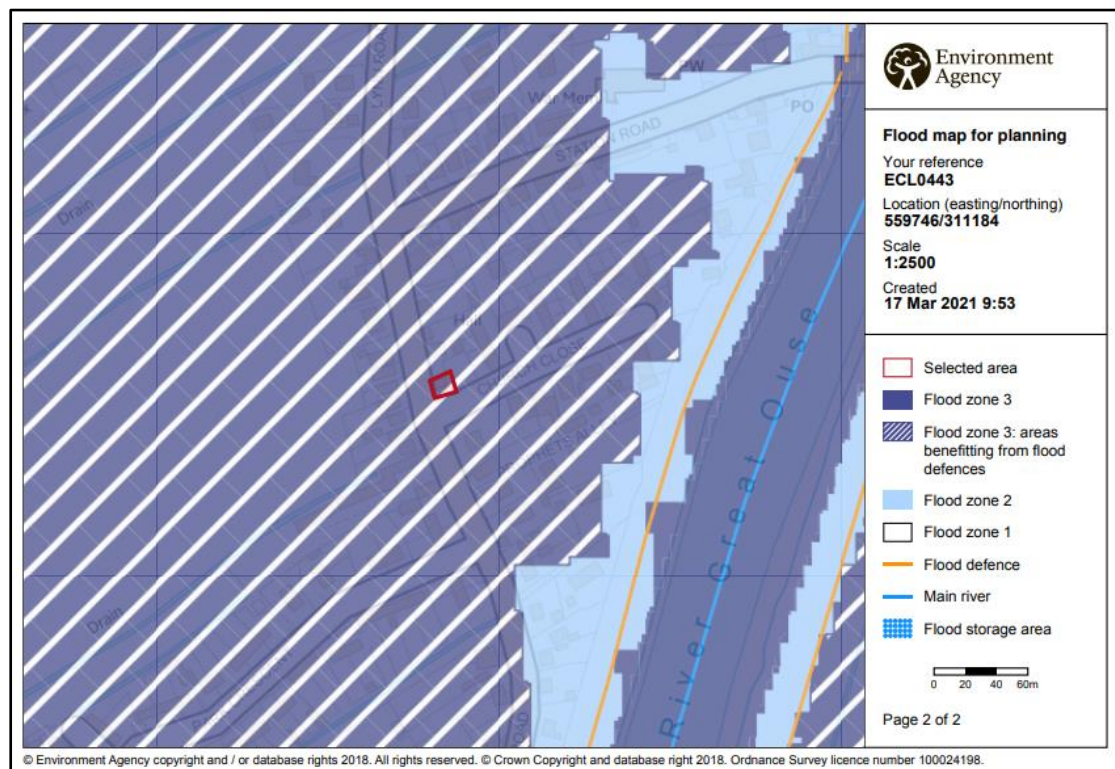


Figure 2 – Environment Agency Flood Map for Planning

The Environment Agency Long Term Flood Risk maps show that:

- the site has a medium risk of flooding from rivers or the sea (annual probability between 1.0% and 3.3%);
- the site has a very low risk of surface water flooding (annual probability less than 0.1%) however the area to the east of the site is at risk; and
- the site is not within an area at risk of reservoir flooding.

The site is not within one of the settlements considered within the King's Lynn and West Norfolk Borough Council Level 2 SFRA. As such the Level 1 SFRA maps have been reviewed and they show that:

- the site is in Flood Zone 3a;
- the site is not at risk during a 1% annual probability (1 in 100 chance each year) fluvial event including allowance for climate change;
- the site is not at risk during a 0.5% annual probability (1 in 200 chance each year) tidal event including allowance for climate change;
- the site is not at risk of surface water flooding including allowance for climate change however the area to the east of the site is at risk;
- the site is not susceptible to groundwater flooding;
- the site is at risk from a tidal breach; and
- the site is not at risk from reservoir flooding.

The 2015 Tidal Hazard Mapping merged model extents provided by the Environment Agency have been used to estimate the flood level during a breach.

3.0 FLOOD RISK VULNERABILITY

3.1 The Sequential and Exception Test

The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding.

The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

3.2 Vulnerability Classification

Table 2 of the PPG Flood Risk and Coastal Change categorises different types of uses and development according to their vulnerability to flood risk. The proposed development is covered by the description of buildings used for dwellings and is classified as 'More Vulnerable'.

Table 3 of the PPG Flood Risk and Coastal Change sets out Flood Risk Vulnerability and flood zone 'compatibility'. The site is in Flood Zone 3 and the development is 'More Vulnerable' therefore it is necessary to complete the Exception Test.

PPG Flood Risk and Coastal Change defines that the lifetime of the development in terms of flood risk and coastal change is 100 years.

3.3 Application of the Sequential and Exception Test

It is for the Local Planning Authority, taking advice from the Environment Agency as appropriate, to consider the Sequential Test.

The proposed development includes the replacement of the existing shop. It is not necessary to apply the Sequential Test to replacement developments.

It is proposed that there is a first floor flat above the shop. The River Great Ouse has defences that provide protection during the 0.5% annual probability (1 in 200 chance each year) event including climate change. The 'actual risk' of flooding at the site is therefore low and the development is considered to pass the Sequential Test.

The Exception Test requires consideration of the wider sustainability benefits of a development and that the development would be safe and residual risks managed.

The Core Strategy defines the housing distribution for new dwellings across the Borough. Small Villages and hamlets have a target of at least 351 new dwellings over the period from 2011 to 2026. The proposed dwelling will contribute to this target.

Section 5 of this Flood Risk Assessment describes the flood mitigation measures and the management of the residual risks, demonstrating that this development will be

safe and not increase flood risk elsewhere. The development is considered to pass the Exception Test.

4.0 SITE SPECIFIC FLOOD RISK

4.1 Local Flood Assets

The site is 150m west of the River Great Ouse. The site is protected by the Great Ouse tidal defences. The River Great Ouse is the responsibility of the Environment Agency.

There is a long-term strategy for the maintenance of the Environment Agency defences which is reviewed and updated every 5 years.

There is an extensive local drainage network managed by King's Lynn IDB. There is an IDB Watercourse approximately 150m south of the site. The site, and surrounding land, is part of the Mary Magdalen catchment which drains by gravity to the Crabbs Abbey Pumping Station which discharges to the River Great Ouse.

During the operation and maintenance of its pumping stations, associated structures, and channel systems, the IDB seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought.

The site is approximately 2.2km east of the Middle Level Main Drain, an embanked channel which flows to St German Pumping Station to discharge to the tidal River Great Ouse. The Middle Level Main Drain is the responsibility of the Middle Level Commissioners.

Current maintenance standards of the King's Lynn IDB's, the Middle Level Commissioners and the Environment Agency's defences are generally good.

4.2 Sources of Flooding

The potential sources of flooding that have been identified during this assessment are:

- local blockages in the drainage system;
- an event in the local drainage network that exceeds the standard of protection;
- failure of the outfall to the Crabbe Abbey Pumping Station;
- overtopping and/or breaching of the River Great Ouse tidal defences; and
- overtopping and/or breaching of the Middle Level Main Drain.

The likelihood of overtopping and/or breach of the Middle Level Main Drain is considered less likely and less significant than a tidal breach. As such it has not been considered further in this assessment.

4.3 Probability of Flooding

The probability of flooding associated with blockages in the IDB's drainage system is low due to the maintenance standards already achieved and managed by the IDB.

The standard of drainage provided by King's Lynn IDB is assessed at 1% annual probability (1 in 100 chance each year) in line with their target standard of protection to residential properties. This exceeds the Department of the Environment, Food and Rural Affairs (DEFRA) target level of service for rural drainage and flood defence works. The risk associated with flooding due to events greater than 1% annual probability (1 in 100 chance each year) is lowered due to the King's Lynn IDB main drains incorporating freeboard. This provides storage during events greater than 1% annual probability (1 in 100 chance each year).

St Germans Pumping Station offers protection against the 1% annual probability (1 in 100 chance each year) fluvial event with an allowance for climate change. The St German Pumping Station was replaced in 2011 so that a standard of protection against the 1% annual probability (1 in 100 chance each year) event could be maintained.

The site benefits from defences on the River Great Ouse that provide protection during an event with a 0.5% annual probability (1 in 200 chance each year).

4.4 Historic Flooding

During the preparation of this assessment, no evidence was discovered of the site being flooded.

4.5 Climate Change

Climate change is likely to impact the site through increased rainfall intensity and duration affecting the local drainage network and increased flood levels in the River Great Ouse.

The SFRA maps show that the site is not at risk during the 0.5% annual probability (1 in 200 chance each year) tidal event with climate change. When this event is considered in the River Great Ouse it is likely to lead to some overtopping of the defences. However, the level of overtopping is such that it would not affect the site.

In summary the existing systems and defences are appropriate for the design life of the development (i.e., 100 years).

4.6 Residual Risk

The SFRA indicates that there is a residual risk of flooding at the site during a breach.

The Environment Agency Hazard Mapping indicates the maximum flood depths in the event of a combined breach. The maximum flood depth at the site for the 0.5% annual probability (1 in 200 chance each year) event with climate change is between 1.0m and 2.0m as shown in Figure 3.

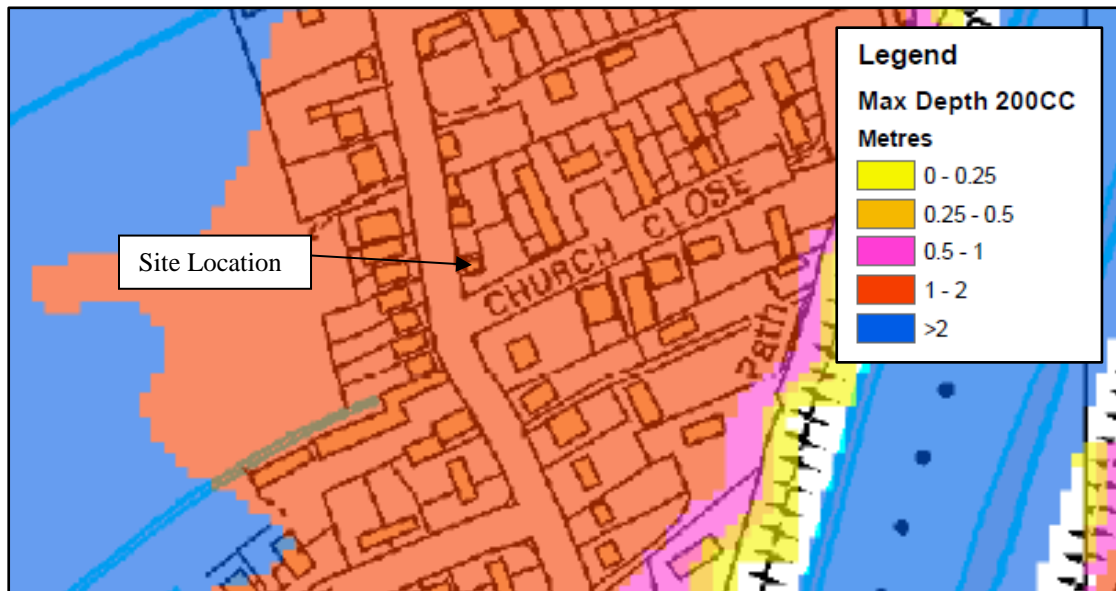


Figure 3 – Environment Agency Hazard Map Maximum Flood Depth

The 2015 Tidal Hazard Mapping merged model extents provided by the Environment Agency have been used to estimate the breach flood level. At three locations which are within the area at risk the tidal hazard mapping model estimated depth and LiDAR ground level have been used to estimate the flood level.

Point	Easting	Northing	Ground Level	Depth	Water Level
1	559730	311180	+1.48m OD	1.49 m	2.97m OD
2	559745	311180	+1.58m OD	1.49m	3.07m OD
3	559730	311170	+1.48m OD	1.48m	2.96m OD

Table 1 – Estimated Flood Water Level during a breach

The approximate locations of the Points are shown in Figure 4.

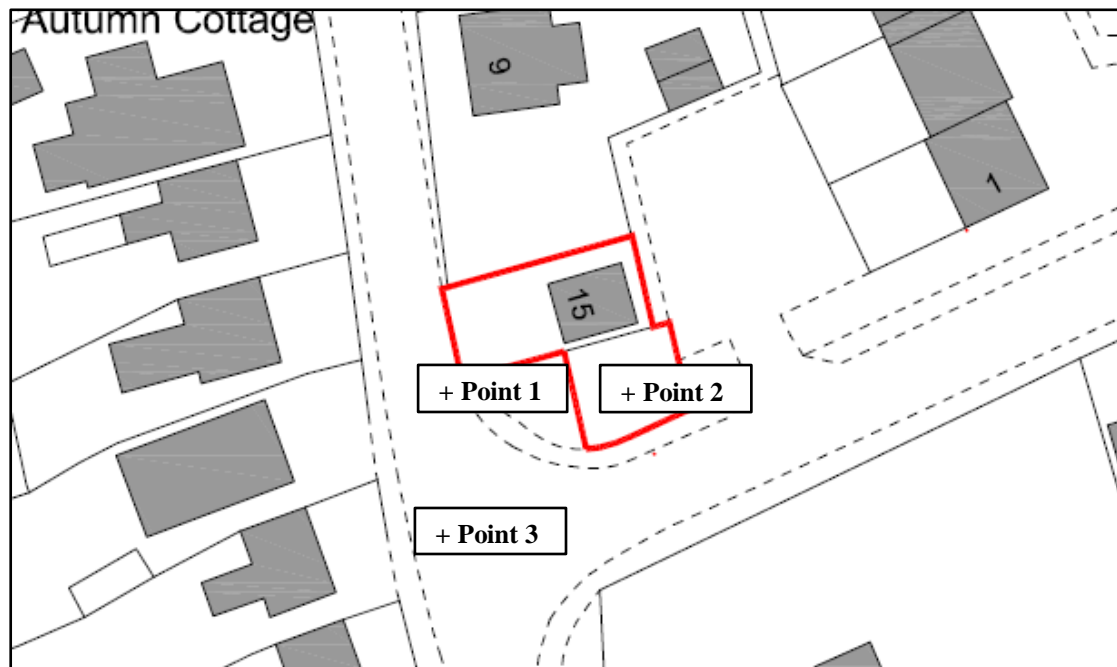


Figure 4 – Locations Used to Estimate Flood Water Level During a Breach

The analysis shows that a conservative estimate of the flood level at the site is +3.1m OD. Based upon the ground levels around the proposed development being 1.6m OD a maximum flood depth of 1.5m can be estimated.

5.0 FLOOD RISK MITIGATION

5.1 Summary of Risks

The probability of this development flooding from localised drainage systems is low. Failure of Crabbe Abbey Pumping Station could lead to an increased level of risk at the site.

The probability of the site flooding from any Environment Agency system is less than 1% annual probability (1 in 100 chance each year) because of the standards of the existing flood defence systems. Over time there will be a gradual increase in risk to the site due to climate change. During the design life of the development, it is not anticipated that the site would flood.

There is a residual risk to the site should there be a breach of the Environment Agency tidal defences. The peak flood level that could occur at the site due to combined breaches is +3.1m OD, a depth of 1.5m in the vicinity of the proposed development.

The proposed arrangement increases the impermeable area so there will be an increased volume of surface water. This has the potential to increase flood risk.

5.2 Mitigation Measures

The proposed residential development is above the flood level during a breach and as such there are no mitigation measures proposed for the design of the dwelling.

The NPPF Planning Practice Guidance (PPG) on Flood Risk and Coastal Change provides direction regarding Making Development Safe from Flood Risk. Paragraphs 059 and 060 advise on flood resistance and flood resilience. The PPG states that resistance and resilience measures may be suitable in some circumstances. One example given when they are suitable is as a measure to manage residual flood risk. The mitigation measures required at this site are to manage the residual risk from a breach in the defences therefore flood resistance and resilience are appropriate.

It is recommended that the finished floor level of the commercial development should be raised to a minimum of 0.3m above surrounding ground levels. The development should incorporate flood resilient construction to a level of +3.1m OD.

The developer should ensure that the occupier of the dwelling and user of the shop are sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency provides a Flood Warning Service which includes Flood Warning Codes and uses direct warning methods where the risks and impacts of flooding are high.

In addition to direct and indirect flood warnings, the Environment Agency operates a 24 hour a day Floodline Service providing advice and information on flooding. The occupier of the dwelling and user of the shop should register with the Floodline Direct Warnings Service to receive any future flood warnings.

During an extreme event it is anticipated that sufficient time would be available to take precautionary actions to limit the potential impact of flooding. Safe access and egress, in the case of evacuation being required, would be in a north westerly direction towards Tilney St Lawrence to an area not at risk during a breach.

Failure of Crabbe Abbey Pumping Station may occur. However, in these circumstances, if conditions were such to put properties and land at risk of flooding, the Internal Drainage Board would take emergency action to maintain the drainage level of service by utilising temporary pumping equipment.

6.0 CONCLUSIONS

As a result of the assessment, the following conclusions have been reached.

- The proposed development consists of a new shop with first floor flat above at Stow Road, Magdalen.
- The proposed development is in Flood Zone 3. The site benefits from defences on the Tidal River Great Ouse that provide protection against the 0.5% annual probability (1 in 200 chance each year) event including climate change.
- The site is located within an Internal Drainage Board catchment with a minimum standard of drainage of 1% annual probability (1 in 100 chance each year) which exceeds the DEFRA target level of service for rural drainage and flood defence works. The risk of flooding is lowered further due to the King's Lynn IDB main drains incorporating freeboard. This provides storage during events greater than 1% annual probability (1 in 100 chance each year).
- The ground floor of the commercial development should be 0.3m above surrounding ground levels. It is recommended that there is flood resilient construction to a level of +3.1m OD. The residential development is above the flood level during a breach.
- The development passes the Sequential Test and Exception Test and is therefore suitable for the proposed location.

ATTACHMENT 1

PLANS AS PROPOSED (Dwg 2055.02.A)



WEST ELEVATION
Scale 1:100

SOUTH ELEVATION
Scale 1:100

EAST ELEVATION
Scale 1:100

NORTH ELEVATION
Scale 1:100

NOTES:

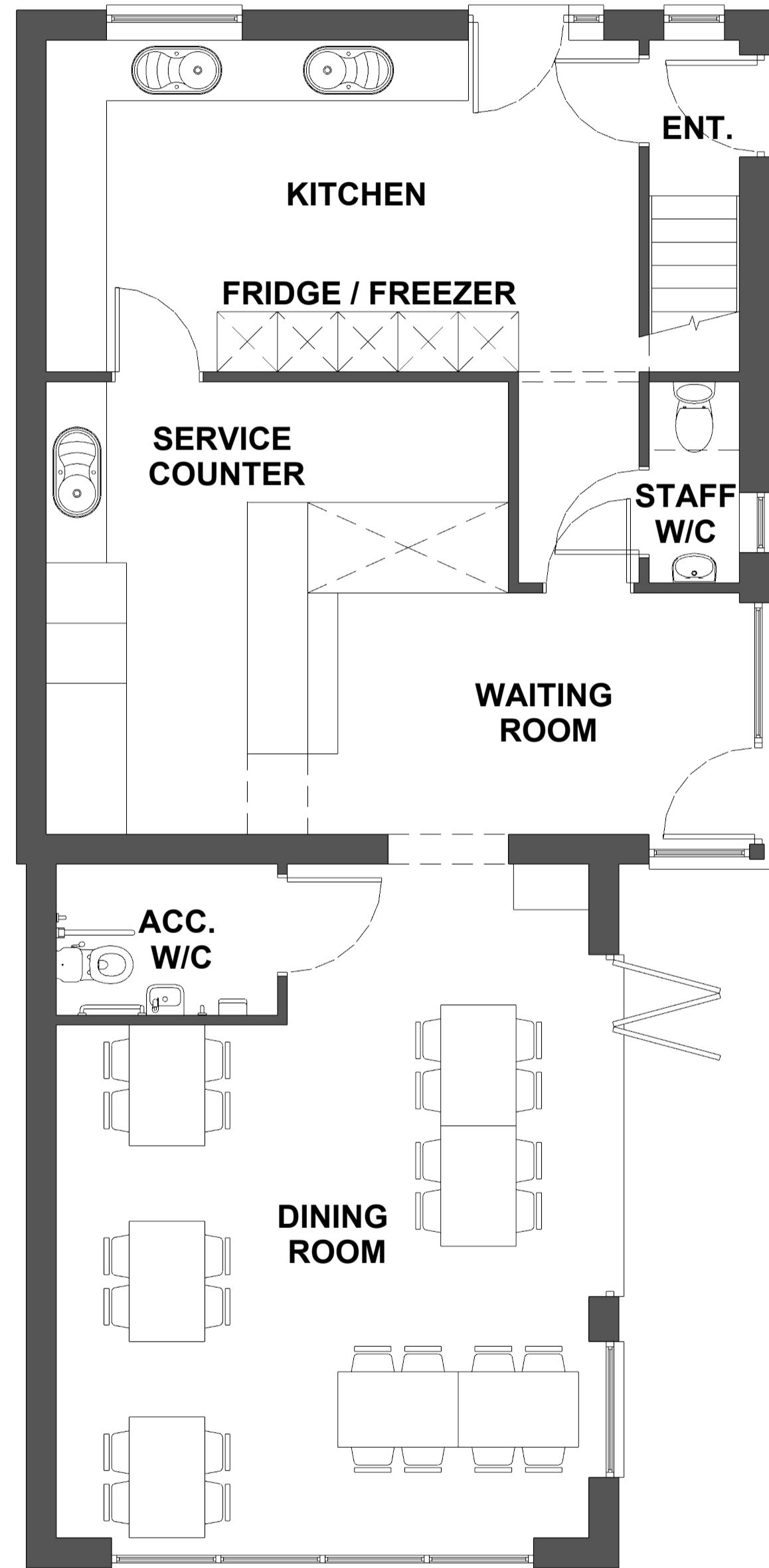
The details depicted on this drawing are the copyright of 'REEVE Design Ltd' and may not be reproduced without permission. This drawing must not be re-issued, loaned or copied without the consent of the originator. Errors, omissions and discrepancies should be reported to the originator immediately.

All dimensions to be checked before site or off-site fabrication by the Contractor, his Sub-contractor or Supplier.

Structure, structural members & geotechnical investigations are to be carried out & approved by the appointed Structural Engineer. Any deviations to these elements are to be reported to the appointed consultant immediately.

IF IN DOUBT ASK !

PLANS AS PROPOSED



GROUND FLOOR PLAN
Scale 1:50

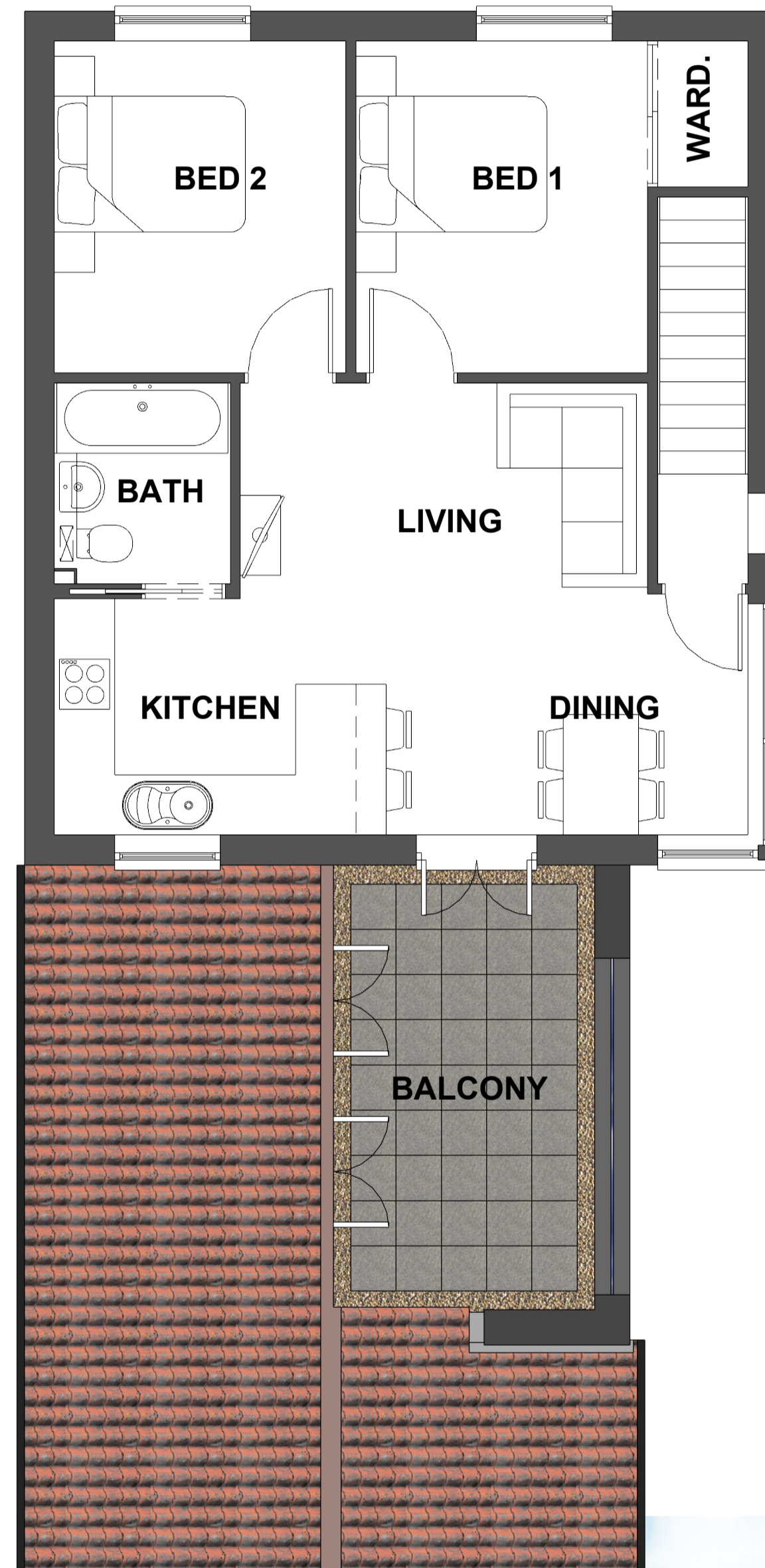
MATERIALS SCHEDULE

WALLS:
Multi Facing Brick.
Through coloured render system.

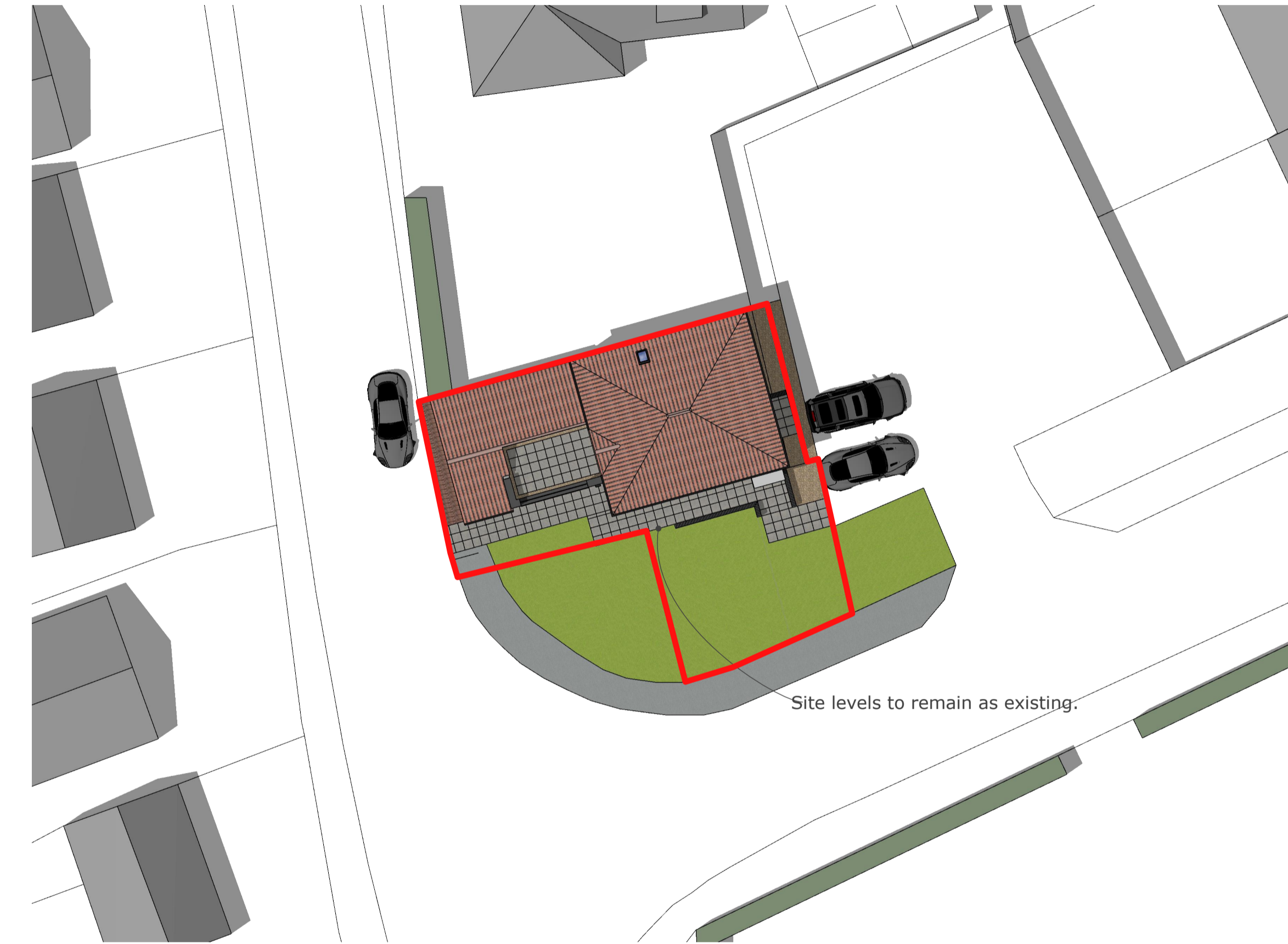
ROOF COVERINGS:
Flanders (Brindle) coloured pantile or similar.

JOINERY:
Anthracite Grey UPVC/Aluminium.

FASCIA, SOFFITS & BARGE BOARDS:
Anthracite Grey upvc fascia.



FIRST FLOOR PLAN
Scale 1:50



SITE PLAN
Scale 1:200



Project:
New shop and flat over following demo. of former Chip Shop at 15 Stow Road, Magdalen, King's Lynn, Norfolk, PE34 3BT.

Client: Mr Gazi Bektas
Issue Date: 23/11/2020

Title:
PLANS AS PROPOSED

Revision Details:
Amended to suit client comments.

Drawing Number: 2055.02
Rev: A

For and on behalf of 'REEVE Design Ltd'
8 Thomas Close, Watlington, King's Lynn, Norfolk, PE33 0TG
T: 07464 945103 W: www.reevedesign.co.uk
Registered in England No. 11744392 Paper Size: A1

This line measures 200mm in length when printed correctly