

FloodSmart Plus



Flood Risk Assessment

Site Address

18 Marjoram Close
Oxford
Oxfordshire
OX4 6QQ

Date

2024-03-13

Report Status

DRAFT

Grid Reference

456109, 202542

Site Area

0.033 ha

Report Prepared for

Ox Living

Report Reference

81754R1



RISK – Very Low to Medium

The Site is located in Flood Zones 1, 2 and 3. According to the EA's RoFRS the area proposed for development is at medium risk of flooding from rivers and the sea. Surface water (pluvial) flood risks are Very Low to Low. Groundwater flood risks are moderate and flooding risks from artificial sources (i.e. canals, reservoirs and sewers) are Negligible. Mitigation measures are recommended in this report to reduce the risks to an acceptable level over the lifetime of the development.

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1. Executive summary



A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with the National Planning Policy Framework (NPPF) (2023) and National Planning Practice Guidance (NPPG) (Published in 2014 and updated in August 2022). A site-specific flood risk assessment, to assess the flood risk to and from the development Site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline*	Final **
River (fluvial) flooding	Medium	Low
Sea (coastal/tidal) flooding	Very Low	N/A
Surface water (pluvial) flooding	Low	Very Low
Groundwater flooding	Moderate	Low
Other flood risk factors present	No	N/A
Is any other further work recommended?	Yes	Yes (see below)

*BASELINE risks have been calculated for the whole Site, using national risk maps, including the benefit of EA flood defences. **FINAL RISK RATING Includes a detailed analyses of flooding risks over the lifetime of the proposed development, including allowances for climate change AND assumes recommended mitigation measures are implemented. N/A indicates where mitigation is not required.

Summary of existing and proposed development

The Site is currently used within a residential capacity as a two-storey, semi-detached, five-bedroom C3 dwelling including associated access and landscaping.

Development proposals comprise a change of use from a C3 dwelling to an eight-bedroom House of Multiple Occupation (HMO). Internal reconfigurations will create an additional three bedrooms on the ground floor. The existing landscaped areas and access will be retained. The existing threshold levels of the building are above adjacent ground levels, although this

has not been surveyed. We would estimate that floor levels are set approximately 100 to 150mm above adjacent ground levels of 63.70 mAOD, which would equate to 63.80 mAOD.

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

Historical flooding related to 18 Marjoram Close is understood to not have previously occurred at/in the vicinity of the Site.

River (fluvial) and Sea (Estuarine/Coastal) flooding

According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located partially within a fluvial Flood Zones 1 (Low Probability), 2 (Medium Probability) and 3 (High Probability).

The Site benefits from the presence of flood defences, 10 m away in fair condition, which provide a 1 in 2 year event standard of protection.

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a risk of flooding ranging from Very Low to Medium. from the nearby watercourse, the Northfield Brook.

The Site could potentially be at risk from flooding due to blockage or failure of a bridge located on the water course 50 m from the Site.

Modelled flood data obtained from the EA and analysed in line with the most up to date guidance on climate change (EA, 2022), confirms in a 1 in 100 year plus 26% climate change allowance flood "design" event, the flood level at the Site would be 63.94 mAOD.

When compared to the estimated existing floor level of 63.80 mAOD, the flood depths which could potentially ingress into the building in this event could be up to 0.14m. Flood mitigation measures are included in the next section.

Emergency evacuation routes are available to the north west. In the event of a flood, safe refuge can be taken on the 1st floor levels and above.

Surface water (pluvial) flooding

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site has a risk of pluvial flooding ranging from Very Low to Low.

Flooding would not affect the area proposed for development in the 1 in 100 year present day scenario event.

Flood depths in the area proposed for development could be up to 0.3 m in the 1 in 100 year plus climate change event.

As there is no change in the built footprint at the Site and although the area proposed for development is affected by the design flood level, there won't be an increase in the displacement of flood water. This is discussed further in Section 5 of this report.

Groundwater flooding

Groundwater Flood Risk screening data indicates there is a Moderate potential risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event.

Artificial sources of flooding

The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:

- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding. The potential for a breach of a reservoir to occur and flooding affecting the Site is low.
- Ordnance Survey (OS) data confirms there are no canals near to the Site.
- The Strategic Flood Risk Assessment (SFRA) (WHS, 2017) does not confirm any incidences of flooding as a result of surcharging sewers at the Site. Records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site.

The risk of flooding from artificial sources is considered to be Negligible.

The risk to the development has been assessed over its expected 100 year lifetime, including appropriate allowances for the impacts of climate change which could increase the flood risk to the Site. Risks identified include increases in river flooding and increased potential for surface water flooding and appropriate mitigation measures are proposed.

In accordance with paragraphs 167, 174 and footnote 60 of the NPPF (2023), as the development proposals are comprised of the change of use of an existing building within Flood Zone 1, 2 and 3 and although, the Site has not been allocated within the Councils Local Plan, the Sequential Test is not required.

Recommendations

Recommendations for flood mitigation are provided below, based upon the proposed development and the flood risk identified at the Site.

Option 1: Raise ground floor FFL's 300mm above the max flood level.

In this instance, in line with the EA's FRSA the recommended minimum Finished Floor Level (FFL) should be set at least 0.3m above 1 in 100 year plus 26% allowance for climate change flood level of 63.94 mAOD to at least 64.24 mAOD.

- This would be 0.44m above the estimated level of the existing FFL of 63.80 mAOD and would likely require steps up to a floating floor. This may require reconfiguration of entrances, windows and other thresholds.
- If it is unfeasible to raise the levels across the entire ground floor area, each residential unit (bedroom) could be raised with steps implemented to allow for access to provide a studio type apartment.

Option 2: If raising of FFL's is infeasible, then the HMO element should be avoided on the ground floor and adopted only at first floor level.

If FFL's cannot be raised, then the HMO element on the ground floor should be avoided. As sleeping accommodation is not allowed on ground floors if the floor levels cannot be raised to the required elevation.

Additional mitigation, where either Option 1 or 2 is proposed:

As there is a risk of flooding from groundwater sources at the surface risk to buried infrastructure should be considered along with standard flood resilient design and non-return valves on the sewer inlet. French drains and/or pumping systems may also be considered.

A Flood Warning and Evacuation Plan (FWEP) is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning.

- o Occupants of the Site should also be signed up to receive EA Flood Alerts and Flood Warnings.

The ongoing management and maintenance of existing and any proposed drainage networks, under the riparian ownership of the developer, should be undertaken in perpetuity with the development.

As the Site is located within approximately 8m of a main river, any external works will likely require Flood Risk Activity Permit.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction



Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development Site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2023) and the source(s) of any flood risk present, guided by the NPPG (Published in 2014 and updated in August 2022). Finally, a preliminary assessment of the steps that can be taken to manage flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2023) and NPPG (2022).

"The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied" (NPPF, 2023).

The NPPF (2023) and NPPG (2022) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding" (Paragraph: 023. NPPG, 2022).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2022 (Paragraph: 021 Reference ID: 7-021-20220825), a thorough review of publicly and commercially available flood risk data and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Oxford City Council Strategic Flood Risk Assessment (SFRA) (WHS, 2017) are used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2023).

The existing and future flood risk to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation

measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the Site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk.

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency (Appendix B)	Thames Water (Appendix C)	OS Data
Historical	X	X	X		
River (fluvial) / Sea (tidal/coastal)	X	X	X		

Source of flooding	Datasets consulted				
	Commercial Flood Maps	Local Policy & Guidance Documents*	Environment Agency (Appendix B)	Thames Water (Appendix C)	OS Data
Surface water (pluvial)	X	X	X		
Groundwater	X	X			
Sewer		X		X	
Culvert/bridges		X			X
Reservoir		X	X		

*Local guidance and policy, referenced in Section 6, has been consulted to determine local flood conditions and requirements for flood mitigation measures.

Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Oxford Local Plan (Oxford City Council, 2020):

Policy RE 3: Flood risk management

Planning permission will not be granted for development in Flood zone 3b except where it is for water-compatible uses or essential infrastructure; or where it is on previously developed land and it will represent an improvement for the existing situation in terms of flood risk. All of the following criteria must be met:

- a) it will not lead to a net increase in the built footprint of the existing building and where possible lead to a decrease; and
- b) it will not lead to a reduction in flood storage (through the use of flood compensation measures) and where possible increase flood storage; and
- c) it will not lead to an increased risk of flooding elsewhere; and
- d) it will not put any future occupants of the development at risk.

New development will be directed towards areas of low flood risk (Flood Zone 1). In considering proposals elsewhere, the sequential and exception tests will be applied.

Planning applications for development within Flood Zone 2, 3, on sites larger than 1 ha in Flood Zone 1 and, in areas identified as Critical Drainage Areas, must be accompanied by a Site Specific Flood Risk Assessment (FRA) to align with National Policy. The FRA must be undertaken in accordance with up to date flood data, national and local guidance on flooding and consider flooding from all sources. The suitability of developments proposed will be assessed according to the sequential approach and exceptions test as set out in Planning Practice Guidance.

Planning permission will only be granted where the FRA demonstrates that:

- e) the proposed development will not increase flood risk on site or off site; and
- f) safe access and egress in the event of a flood can be provided; and
- g) details of the necessary mitigation measures to be implemented have been provided.

Minor householder extensions may be permitted in Flood Zone 3b, as they have a lower risk of increasing flooding. Proposals for this type of development will be assessed on a case by case basis, taking into account the effect on flood risk on and off site.

Policy RE 4: Sustainable and foul drainage, surface and groundwater flow

All development proposals will be required to manage surface water through Sustainable Drainage Systems (SuDS) or techniques to limit run-off and reduce the existing rate of run-off on previously developed sites¹⁸. Surface water runoff should be managed as close to its source as possible, in line with the following drainage hierarchy:

- a) store rainwater for later use; then:
- b) discharge into the ground (infiltration); then:
- c) discharge to a surface water body; then:
- d) discharge to a surface water sewer, highway drain or other drainage system; and finally:
- e) discharge to a combined sewer.

Oxford City Council Level 1 Strategic Flood Risk Assessment (Wallingford HydroSolutions Limited (WHS), 2017):

Planning permission will not be granted for developments that will have an adverse impact on groundwater flow. Where necessary, effective preventative measures will be implemented to ensure that groundwater flow is not obstructed.

OCC and the EA have confirmed that there are no designated CDAs within the OCC administrative boundary.

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both r

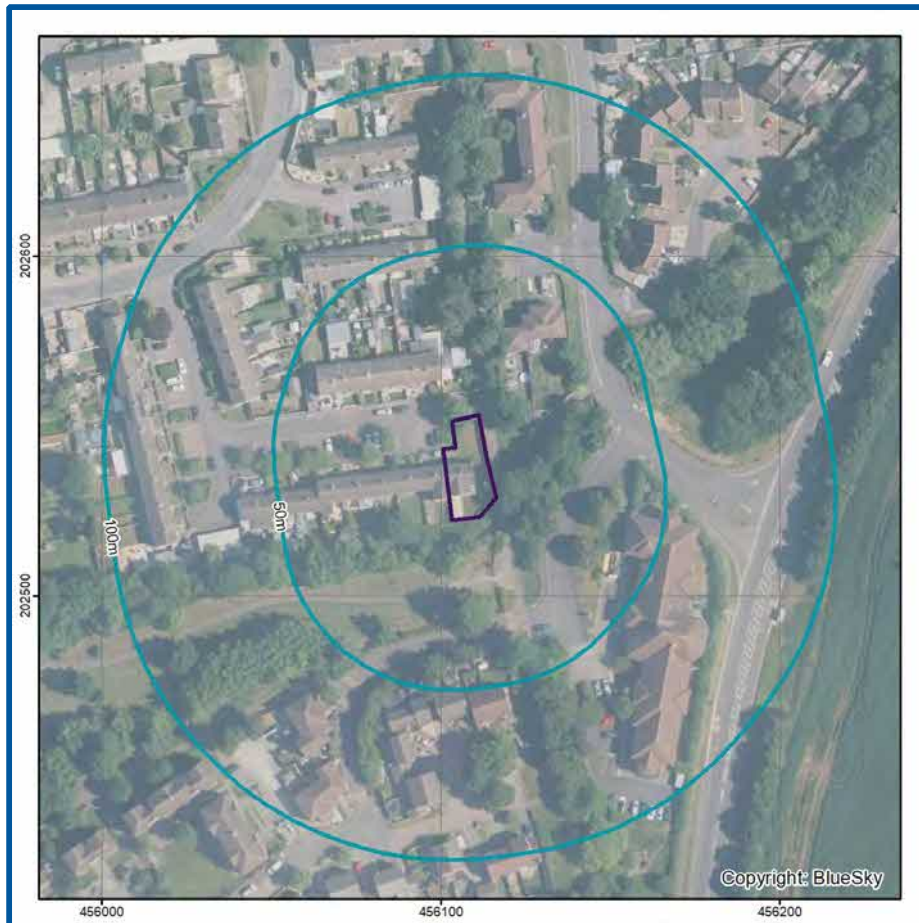
and in the future due to climate change. They are used to inform planning decision ensure inappropriate development is avoided (NPPF, 2023).



Site information

The Site is located in Oxford in a setting of residential land use at National Grid Reference SP 56109 02542.

Figure 1. Aerial imagery of the Site (Bluesky, 2024)

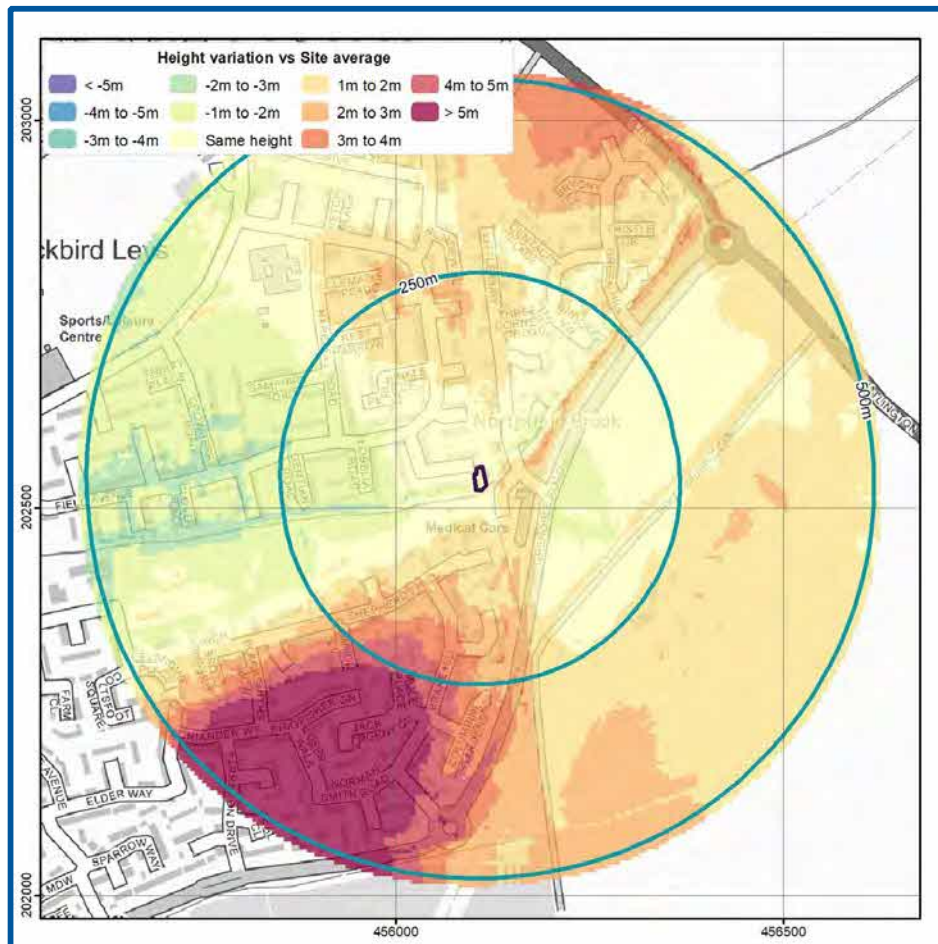


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Figure 2 indicates ground levels within 500m of the Site fall in a westerly direction.

The general ground levels on the Site are between 63.35 and 63.80 mAOD with the Site falling gradually in an easterly direction. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ± 0.15 m (Appendix D).

Figure 2. Site Location and Relative Elevations (GeoSmart, 2024)



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Development

The Site is currently used within a residential capacity as a two-storey semi-detached, five-bedroom dwelling including associated access and landscaping.

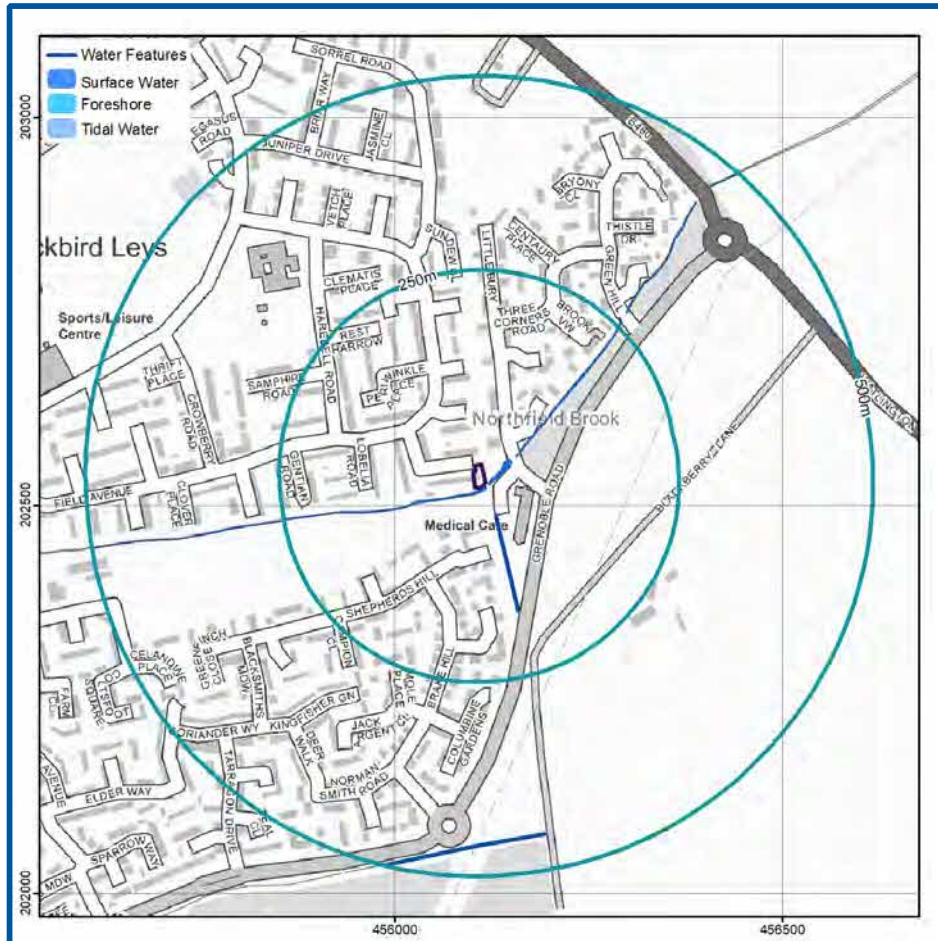
Development proposals comprise a change of use from a C3 dwelling to an eight bedroom House of Multiple Occupation (HMO). Internal reconfigurations will create an additional three bedrooms on the ground floor. The existing landscaped areas and access will be retained. Site plans are included within Appendix A.

The effect of the overall development will result in an increase in number of occupants and/or users of the Site but will not result in the change of use, nature or times of occupation. According to Annex 3 of the NPPG (2022), the vulnerability classification of the existing development is More Vulnerable and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

According to Ordnance Survey (OS) mapping included in the following figure, a single surface water feature is located within 500 m of the Site.

Figure 3. Surface water features (EA, 2024)



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Northfield Brook is located approximately 5m to the south of the Site boundary.

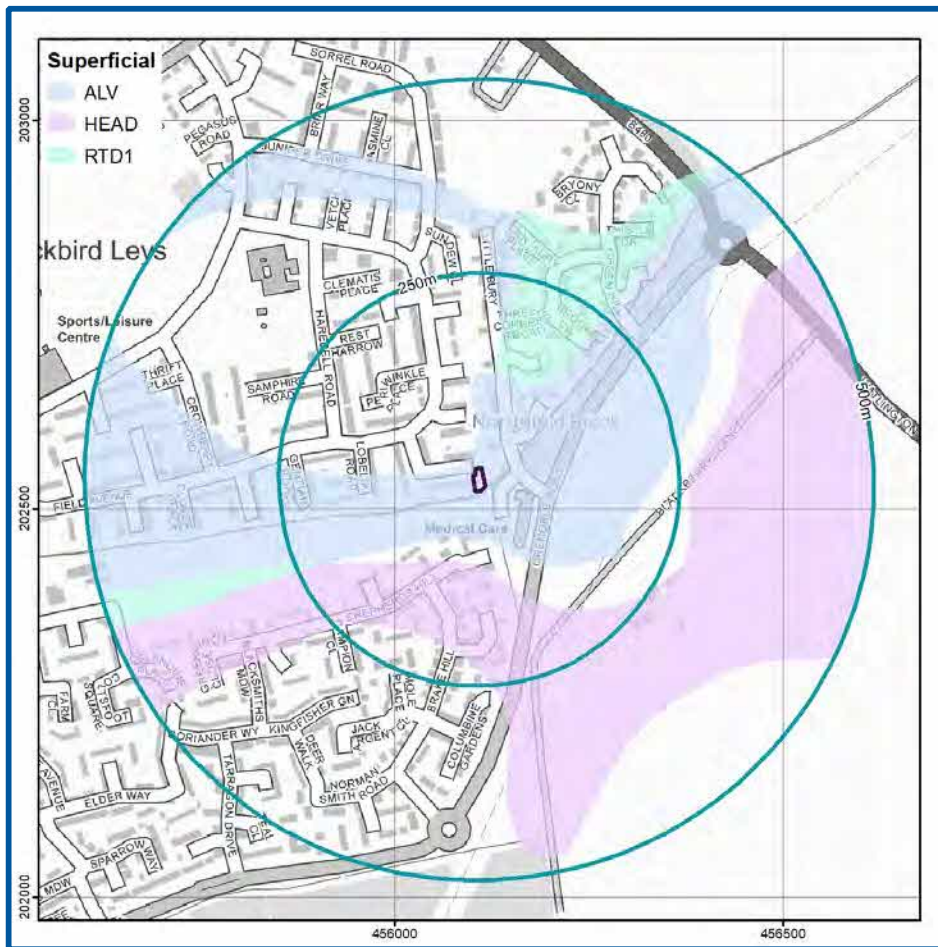
Proximity to relevant infrastructure

Little Bury road bridges the Northfield Brook approximately 50m to the east of the Site boundary.

Hydrogeological features

British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 4) consists of Alluvium (ALV) (BGS, 2024) and is classified as a Secondary (A) Aquifer (EA, 2024).

Figure 4. Superficial Geology (BGS, 2024)



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BGS mapping indicates the underlying bedrock geology (Figure 5) consists of the Littlemore Member (LITC) (BGS, 2024) and is classified as a Secondary (A) Aquifer (EA, 2024).

Figure 5. Bedrock Geology (BGS, 2024)



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Geological conditions

A review of the BGS borehole database (BGS, 2024) indicates the nearest and most relevant borehole to the Site (ref: SP50SE58) is located approximately 20m to the north east of the Site boundary and indicates the underlying geology to consist of Topsoil to a depth of 0.30m below ground level (bgl), overlying soft to firm slightly sandy silty clay to a depth of 1.50m bgl, overlying silty sand and gravel of shelly Limestone to a depth of 2.00m bgl, overlying interbedded shelly Limestone and silty sand to a depth of 2.80m bgl, overlying interbedded silty medium Sandstone and silty medium sand to a depth of 10m bgl, where the borehole ends.

The second nearest and most relevant borehole to the Site (ref: SP50SE101) is located approximately 40m to the northeast of the Site boundary, at an elevation of 63.18 mAOD, and indicates the underlying geology to consist of Topsoil to a depth of 0.30m bgl, overlying firm sandy clayey silt with gravel of silty fine to medium grained Limestone to a depth of 0.60m bgl, overlying firm brown fissured silty clay with occasional gravel of Limestone to a depth of 1.00m bgl, overlying soft silty clay with occasional gravel and cobbles of Limestone and occasional fragments of wood to a depth of 1.80m bgl, overlying mottled slightly clayey silty sand and gravel becoming very sandy to a depth of 2.40m bgl, overlying slightly weathered

silty fine to medium grained shelly Limestone to a depth of 2.50m bgl, where the borehole ends.

Groundwater

The most relevant borehole (ref: SP50SE58) did not record groundwater in its 10m depth, on 20/04/1985, subject to seasonal variations.

The second most relevant borehole (ref: SP50SE101) encountered groundwater at a depth of 1.90m bgl, on 10/01/1985, subject to seasonal variations. Thus, the groundwater level at the Site is estimated to be 61.28 mAOD, compared to ground levels on the Site of 63.35 to 63.80 mAOD.

4. Flood risk to the development

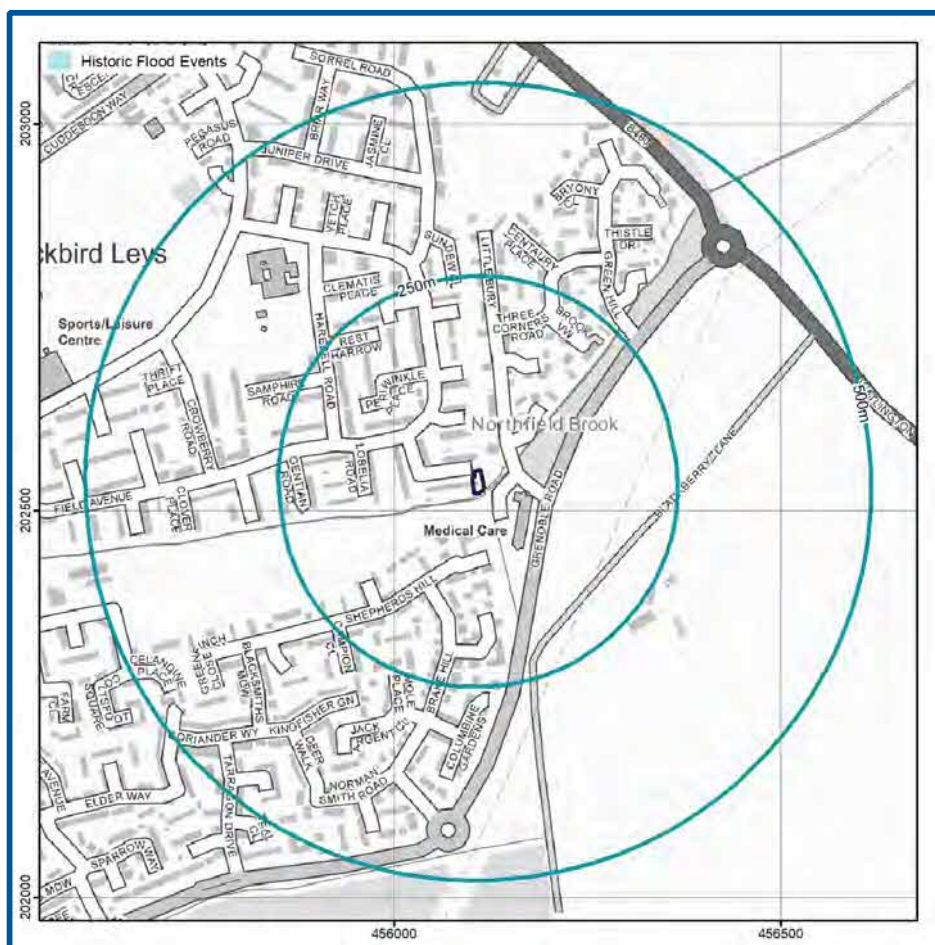


Historical flood events

According to the EA's Historical Flood Map (Figure 6) and Appendix 7 of the SFRA (WHS, 2017), there has been no flooding events affecting the Site.

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 6. EA Historic Flood Map (EA, 2024)



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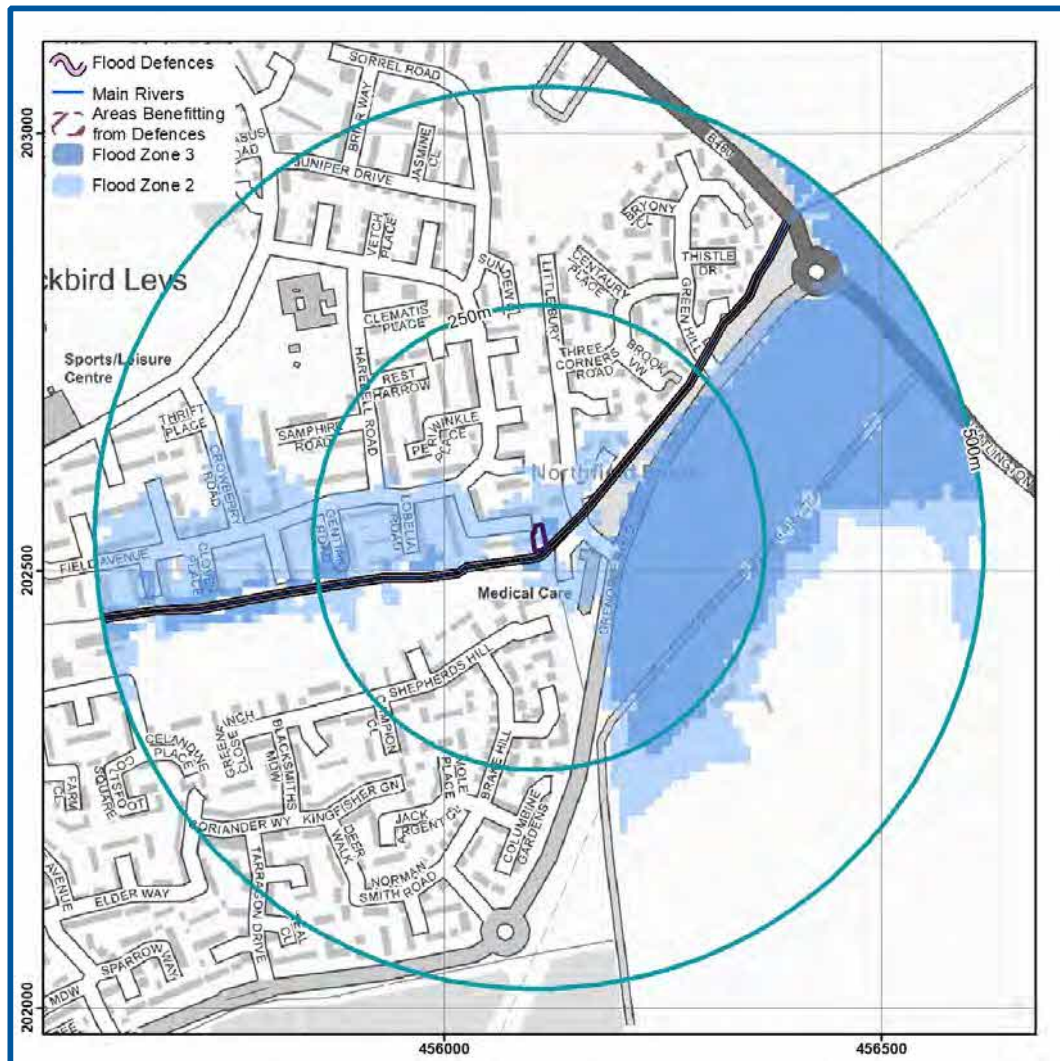
Rivers (fluvial) / Sea (coastal) / Estuarine (tidal) flooding

The predominant risk at the Site is from flooding from rivers, termed as fluvial flooding. The Site is located in an inland location and the risk of flooding from coastal and tidal processes are therefore considered to be Negligible.

River (fluvial) flooding occurs during times of heavy rainfall or snow melt when watercourses' capacity can be exceeded, over topping the banks and flood defences.

According to the EA's Flood Map for Planning Purposes (Figure 7), the Site is located on the boundary of a fluvial Flood Zone 1, 2 and 3 and is therefore classified as having a High to Low probability of fluvial flooding from Rivers. Approximately 25% of the Site is in Flood Zone 3 (eastern edge), 50% is in Flood Zone 2 and the remaining 25% is in Flood Zone 1 (southern edge).

Figure 7. EA Flood Map for Planning Purposes (EA, 2024)



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As defined in the NPPF (2023):

Ignoring the presence of any defences, land located in a Flood Zone 3 is considered to have High probability, land in a Flood Zone 2 is considered to have a Medium probability and land located in a Flood Zone 1 is considered to have a Low probability of flooding with a 1 in 100 year or greater annual probability of fluvial flooding or a 1 in 200 or greater annual probability of coastal flooding in any one year.

Development of “Water-Compatible”, “Essential Infrastructure”, “Less Vulnerable” and “More Vulnerable” land uses are suitable for this zone with “Highly Vulnerable” land uses requiring an Exception Test to be passed prior to development taking place (see glossary for terminology).

Flood defences

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250 m) may require a more detailed FRA subject to local topography.

Existing flood defences

The Site is in an area which benefits from flood defences but is not within the EA's ABD.¹

There are flood defences within 10m of the Site.

There are no proposed flood defences within 100 m of the Site.

Information from the EA relating to the flood defences is outlined below.

According to the EA (2024) the flood defences in this area defend up to a 1 in 2 year flood event.

The nearest and most applicable flood defences are natural high ground with an unconfirmed crest level.

The EA classifies their current condition as “Fair (Condition Grade: 3)”.

¹ The EA maps Areas which Benefit from the presence of Defences (ABD) in a 1 in 100 (1%) chance of flooding each year from rivers; or 1 in 200 (0.5 %) chance of flooding each year from the sea. If the defences were not there, these areas would flood in a 1 in 100 (1%)/ 1 in 200 (0.5 %) or larger flooding incident. The EA do not show all areas that benefit from all flood defences, some defences are designed to protect against a smaller flood with a higher chance of occurring in any year, for example a flood defence which protects against a 1 in 30 chance of flooding in any year. Such a defence may be overtopped in a flood with a 1 in 100 (1%)/ 1 in 200 (0.5%) chance of occurring in any year, but the defence may still reduce the affected area or delay (rather than prevent) a flood, giving people more time to act and therefore reduce the consequences of flooding.

Model data

As the Site is located within the EA’s fluvial floodplain, modelled flood elevation data was obtained from the EA and has been used to assess flood risk and to provide recommendations for mitigation for the proposed development.

Defended modelled data from the Littlemore and Northfield Brooks Flood Risk Mapping Study (Halcrow Group Limited, 2010) has been extracted from the 2D floodplain data provided at the Site². The data is provided in the table below and within Appendix B.

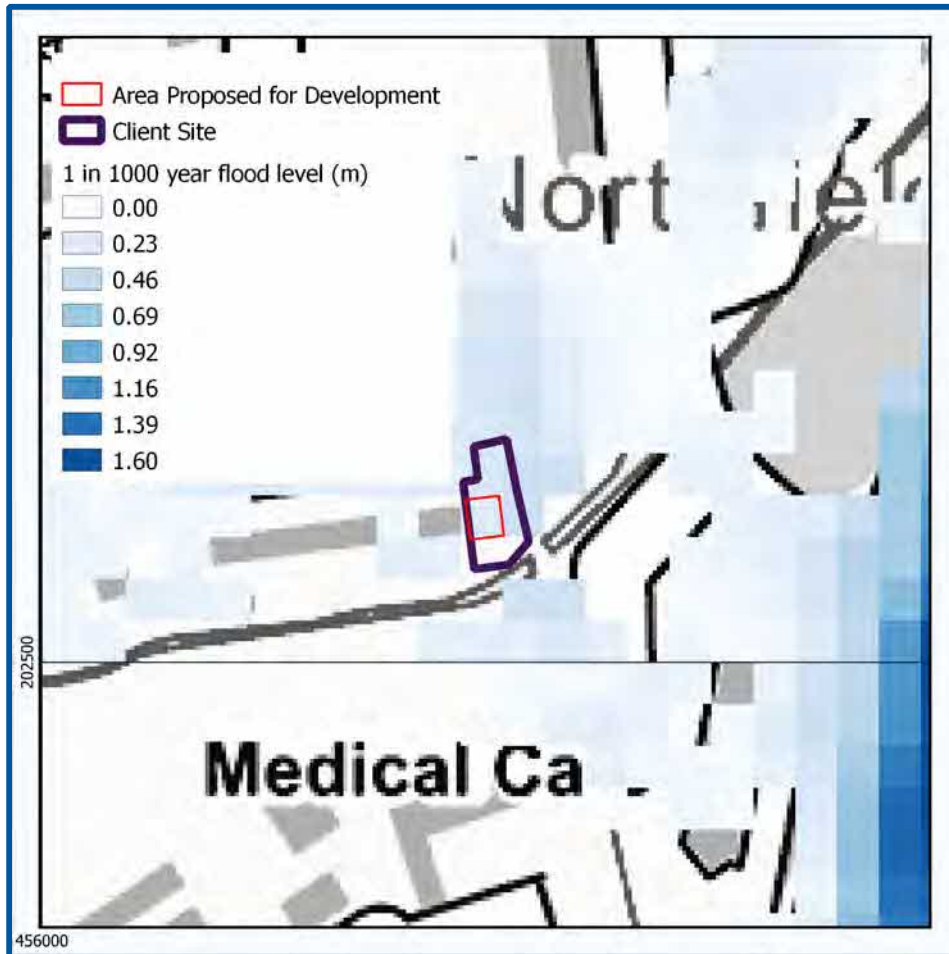
Table 2. EA present day modelled flood data.

Ground levels in area proposed for development (mAOD)	Modelled Flood Levels (mAOD)			
	1 in 5 year	1 in 20 year	1 in 100 year	1 in 1000 year
63.66 to 63.80	N/A	N/A	63.32	64.05
Flood depths (m)	No Flooding	No Flooding	No Flooding	0.25

The following figure confirms the flood depth associated with overtopping of the flood defences in the present day 1 in 1000 year flooding scenario.

² The accuracy of the modelled flood levels are not known. These are dependent on the accuracy of input datasets such as LiDAR data, used to model the impacts of flooding within the 2D domain. Confirmation of the accuracy of the modelled flood data can be obtained separately from the Environment Agency.

Figure 8. Modelled present day 1 in 1000 year flooding scenario (EA, 2024)



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Climate change factors

The EA's *Flood risk assessments: climate change allowances* guidance (Published 19 February 2016 and updated May 2022) has been used to inform a suitable increase in peak river flows for the proposed development. The updated guidance confirms 'More Vulnerable' developments are required to undertake a Basic assessment approach.

As the Site is located within the Gloucestershire and the Vale Management Catchment, and the proposed development is classed as More Vulnerable, where the proposed lifespan is approximately 100 years, the Central (26%) allowance has been used to determine a suitable climate change factor to apply to river data.

Modelled in-channel flow and level data has not been provided with the required 26% allowance for climate change and so a stage graph has been produced (Appendix B) using the EA's modelled flood level data. The climate change allowances have been derived as a proportion of the 100 year peak flow to the 1 in 1000 year event, using the Flood Studies Report (FSR) (1975) growth curves. In the Thames region, the 1 in 1000 year event flow is approximately 62% greater than the 1 in 100 year flow, therefore the following flood levels

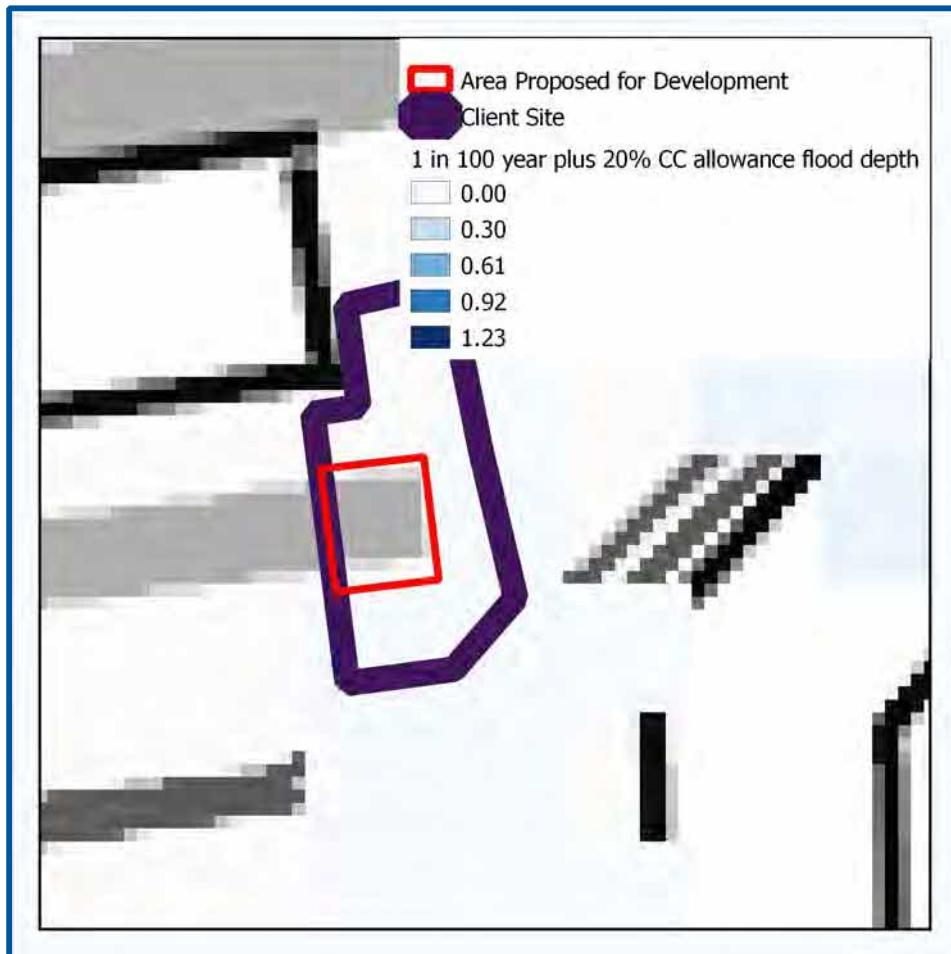
apply. The EA provided a modelled flood level for a 1 in 100 year plus 20% climate change allowance, this however, does not impact the area proposed for development as it uses a lower climate change allowance.

Table 3. Flood levels plus climate change allowances.

Ground levels in area proposed for development (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 year plus 20% allowance for climate change flood level (mAOD)	1 in 100 year plus 26% 2080 central allowance for climate change flood level (mAOD)
63.66 to 63.80	63.58	63.94
Flood depths (m)	No flooding	Up to 0.28

The following figure confirms the extent and depth of the flooding in the provided model of the 1 in 100 year plus 20% allowance for climate change.

Figure 9. Modelled present day 1 in 100 year plus 20% CC flooding scenario (EA, 2024)



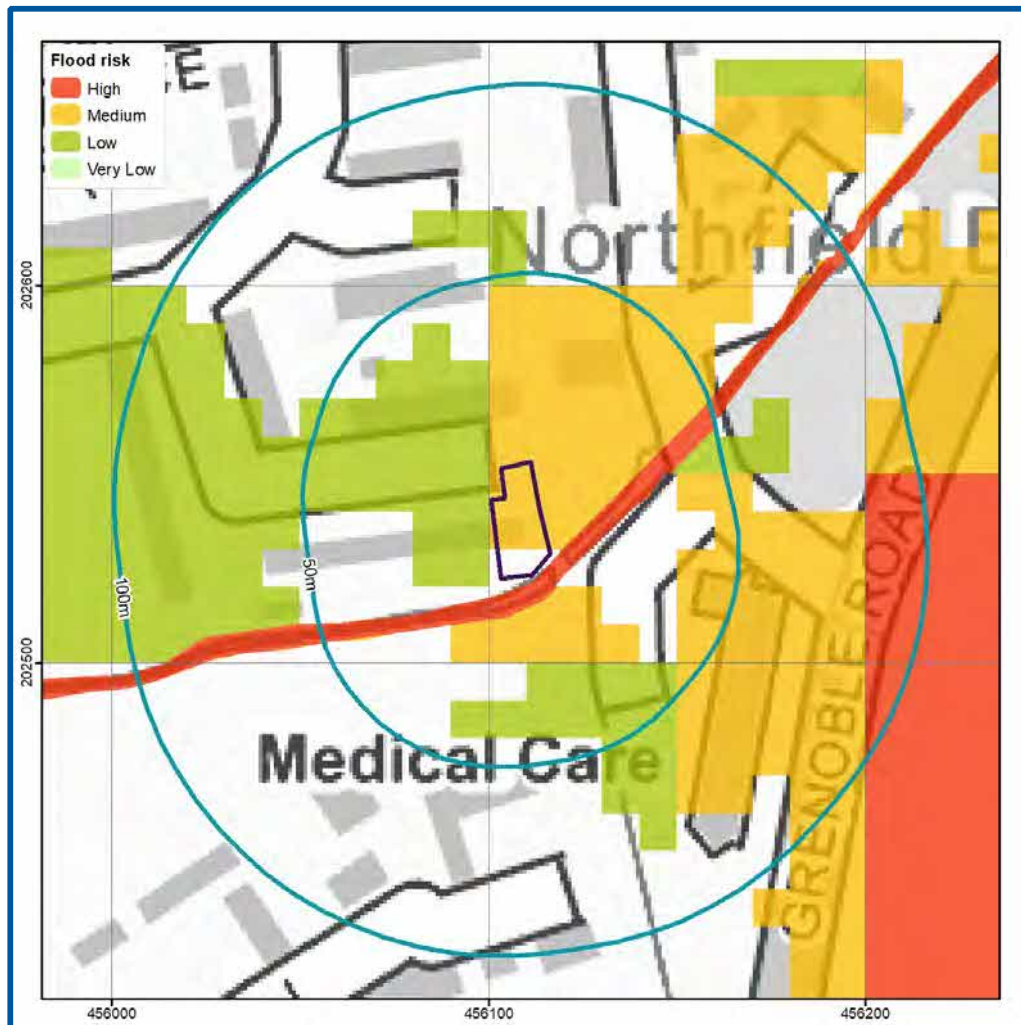
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Flood risk including the benefit of defences

The type and condition of existing flood defences influence the ‘actual’ risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA’s Risk of Flooding from Rivers and Sea (RoFRS) map (Figure below), which considers the type, condition and crest height of flood defences, the Site has a risk of flooding ranging from Very Low to Medium from the nearby watercourse, the Northfield Brook.

Figure 10. Risk of Flooding from Rivers and Sea map (EA, 2024)



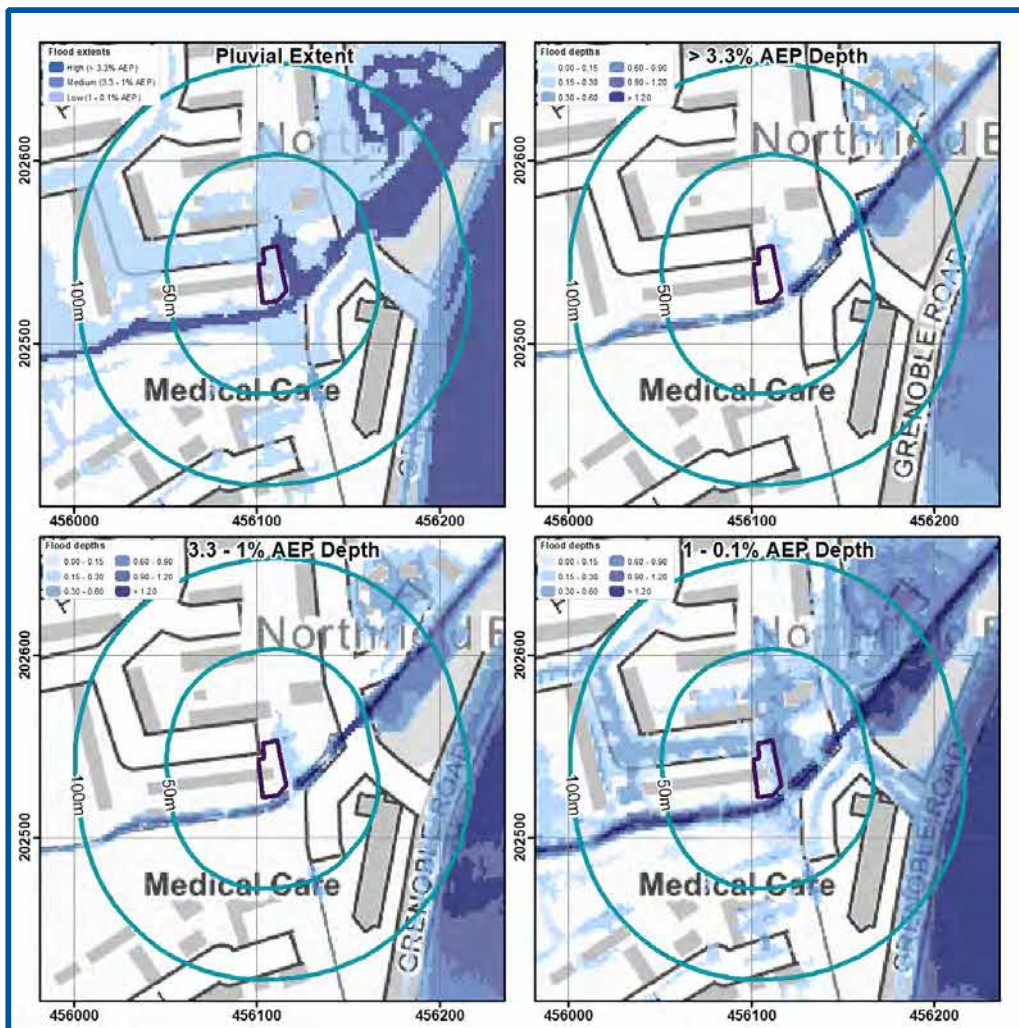
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Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA’s Risk of Flooding from Surface Water (pluvial) flood mapping (Figure 11), the Site is at a variable risk of pluvial flooding ranging from Very Low to Low. The southwestern corner of the Site is the area at Very Low risk of pluvial flooding.

Figure 11. EA surface water flood extent and depth map (EA, 2024)



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Guidance

According to EA’s surface water flood risk map the Site is at:

Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).

Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).

The SFRA does indicate reported incidents of historical surface water flooding within 100 m of the Site and confirms the Site is not located within a Critical Drainage Area (CDA)³ (WHS, 2017).

Figure 11 confirms the extent and depth of flooding in multiple modelled flood scenarios. Flooding depths of up to 0.30 m would impact the area proposed for development in the 1 - 0.1% AEP (Low) risk event.

Flooding depths of up to 0.60 m would impact the access routes to and from the Site in the 1 - 0.1% AEP (Low) risk event.

Guidance

According to EA's surface water flood risk map the following advisory guidance applies to the Site:

Flood Depth

0.15 to 0.3 m - Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas

Climate change factors

Paragraph 002 of the National Planning Practice Guidance (August, 2022) requires consideration of the 1% AP (1 in 100 year) event, including an appropriate allowance for climate change.

As the Site is located within the Gloucestershire and the Vale Management Catchment and the proposed development is classed as More Vulnerable, where the proposed lifespan is approximately 100 years, the Upper End allowance is required to determine a suitable climate change factor to apply to rainfall data.

The 0.1% AP (1 in 1000 year) surface water flooding event has been used as a proxy in this instance for the 1% AP (1 in 100 year) plus climate change event.

Surface water flooding flow routes

Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000 year (Low probability) event confirms the Site is located on a potential overland flow route.

³ A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2023). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

The 1 in 1000 year (low probability) event indicates the extent of flooding in a worst-case future 100 year with climate change scenario, where a flood flow route does develop within the Site.

During a 1 in 100 year event some of flow velocities are greater than 0.25 m/s. The flows are unlikely to affect the buildings and/or access routes to the Site.

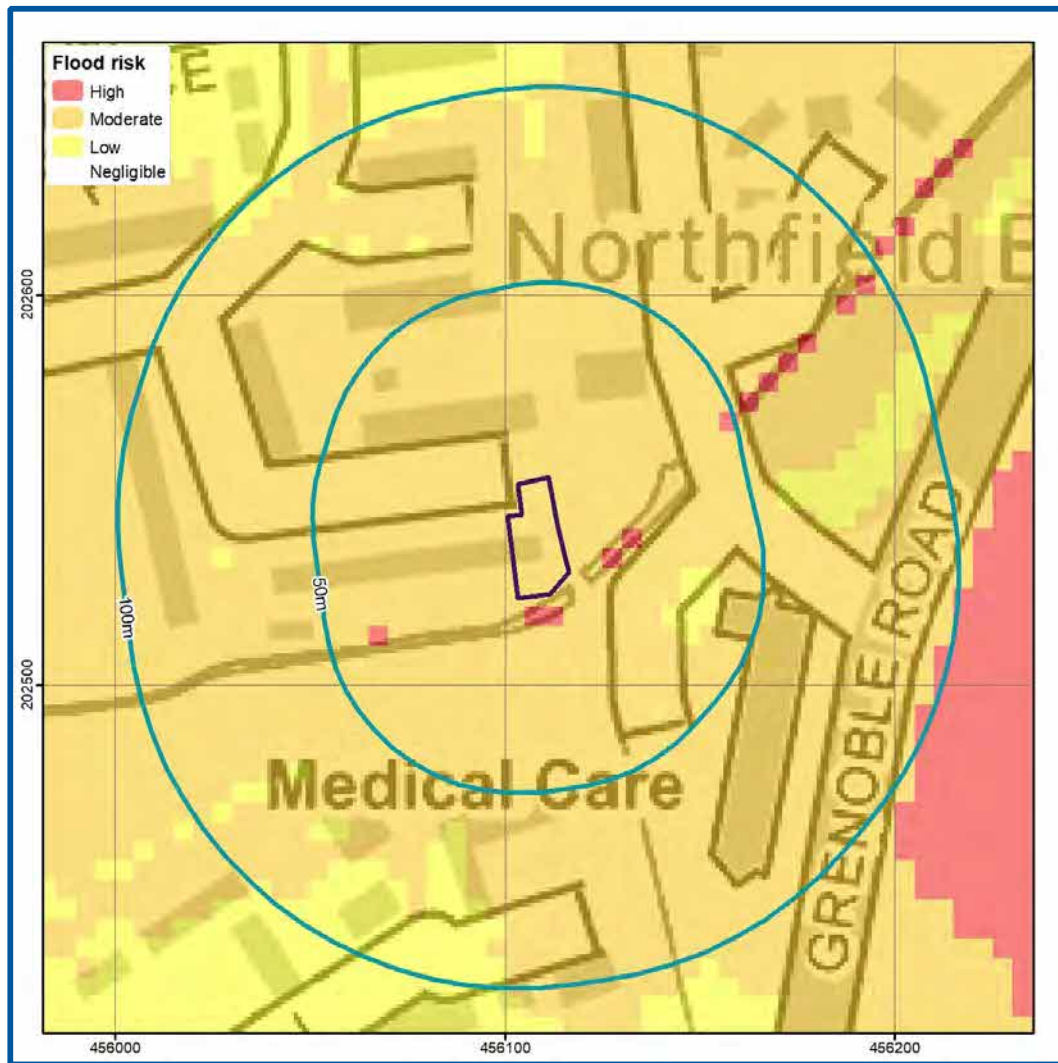
A review of the Site plans, topography and the EA's Risk of Flooding from Surface Water Direction mapping indicates any overland flows on the Site would not be obstructed by the proposed development and occur across non-essential areas of the Site.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 12) indicates there is a Moderate risk of groundwater flooding at surface in the vicinity from permeable bedrock and superficial deposits during a 1 in 100 year event.

Figure 12. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2024)



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Mapped classes within the screening map combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including BGS borehole data, and the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater, have also been considered.

It is understood there are no existing basements, and a basement is not proposed as part of the development. The risks are higher for basements, buried infrastructure and soakaway systems which may be affected by high groundwater levels.

According to a review of the hydrogeology (Section 3), the Site is underlain by permeable superficial deposits above permeable bedrock. Groundwater levels may rise in the bedrock and superficial aquifers in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.

Groundwater levels may also rise in the bedrock and superficial aquifers in response to high riverevents due to the potential hydraulic continuity with the nearby Northfield Brook.

It is noted groundwater flooding may occur in response to prolonged high water levels, by-passing flood defences even if overtopping does not occur.

Despite the presence of an aquifer the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.

According to a review of the hydrogeology (Section 3), the nearby borehole (ref: SP50SE58) did not encounter groundwater during their 10m depth. However, another borehole (ref: SP50SE101) encountered groundwater at 61.28 mAOD, 1.90m bgl, within the permeable superficial geology.

Spring lines have not been identified in close proximity to the Site.

The hydrogeological characteristics suggest there is potential for a groundwater table beneath the Site.

The baseline groundwater flood risk rating is Moderate, but on the basis of the site-specific assessment the groundwater flood risk is considered to be Low.

Guidance

Low Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment. Sea level rises of between 0.4m and 1m are predicted by 2100, leading to a rise in average groundwater levels in the adjacent coastal aquifer systems, and potential increases in water levels in the associated drainage systems. The 'backing up' of groundwater levels from both coast and tidal estuary locations may extend a significant distance inland and affect infrastructure previously constructed above average groundwater levels.

The impact of climate change on groundwater levels beneath the Site is linked to the predicted rise in peak river levels.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.).

Sewer flooding

The SFRA does not include any information regarding flooding events from sewers (WHS, 2017) at the Site. Records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site (Thames Water, 2024; Appendix C).

Guidance

Properties classified as “at risk” are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading c sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Thames Water).

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

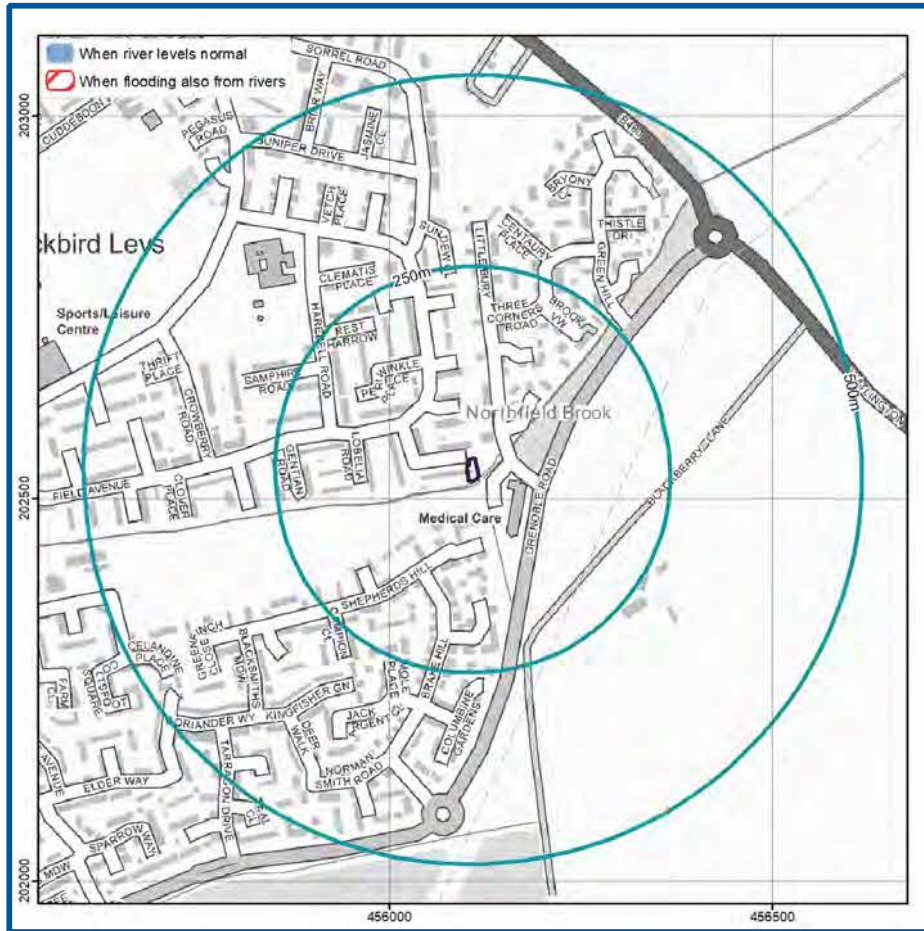
Culverts and bridges have been identified within close proximity to the Site. These structures may pose a flood risk to the Site should they become blocked or damaged.

The SFRA has not identified any historic drainage issues within the Site area (WHS, 2017).

Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 13) (EA, 2024).

Figure 13. EA Risk of Reservoir Flooding (EA, 2024)



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Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding extremely unlikely to occur (EA, 2024).

5. Flood risk from the development



Floodplain storage

Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked.

The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

The development is located within a fluvial Flood Zone 2/3 but does not involve an increase in building footprint. Therefore, there would be no displacement of flood water and compensatory flood storage is not required.

Drainage and run-off

Based on the topography and low surface water flood risk in the vicinity, interference or interaction with overland flow paths and inflows from off-Site is considered unlikely.

The development proposals are for a change of use and will not involve the alteration of any external features (or any changes to existing impermeable and permeable areas), an estimation of surface water runoff is not considered to be required.

Any changes to the existing drainage system will be undertaken in accordance with best practice and care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

6. Suitability of the proposed development



The information below outlines the suitability of the proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance

Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2023). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered.

Exception test: In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within the table overleaf (Table 2 of the NPPG (2022)).

The Site is located within Flood Zone 3a, and the proposed development is defined as More Vulnerable. As the application is considered a 'Change of Use' of the existing building and in line with Paragraph 174 of the NPPF (2023), it is not subject to the Sequential or Exception Tests.

Paragraph 174 of the NPPF (2023) states: "*Applications for some minor development and changes of use⁶⁰ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.*"

Footnote 60 of the NPPF (2023) states: "*This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.*"

Table 4. Flood risk vulnerability and flood zone ‘incompatibility’ (taken from NPPG, 2022)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a - high probability	Exception test required	✓	X	Exception test required*	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

*As the development proposals are for the change of use of the existing building the Sequential and Exception Tests are not required.

EA Flood Risk Standing Advice for vulnerable developments located in Flood Zones 2 or 3 (February, 2022)

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:

- Surface water management;
- Access and evacuation; and
- Floor levels.

Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority’s:

- Surface water management plan where available; OR

Strategic flood risk assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.

Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5m².

Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level:

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;

- Basement rooms have clear internal access to an upper level, e.g. a staircase;

- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

Floor levels

The following should be provided:

- average ground level of your site

- ground level of the access road(s) next to your building

- finished floor level of the lowest room in your building

Finished floor levels should be a minimum of whichever is higher of 300mm above the:

- average ground level of the site

- adjacent road level to the building

- estimated river or sea flood level

You should also use construction materials that have low permeability up to at least the same height as finished floor levels.

If you cannot raise floor levels to meet the minimum requirement, you will need to:

- raise them as much as possible

- consider moving vulnerable uses to upper floors

- include extra flood resistance and resilience measures

When considering the height of floor levels, you should also consider any additional requirements set out in the SFRA. Flood water can put pressure on buildings causing structural issues. If your design aims to keep out a depth of more than 600mm of water, you should get advice from a structural engineer. They will need to check the design is safe.

Extra flood resistance and resilience measures

Follow the guidance in this section for developments in flood risk areas where you cannot raise the finished floor levels to the required height. You should design buildings to exclude flood water where possible and to speed recovery in case water gets in.

Make sure your flood resilience plans for the development follow the guidance in the CIRIA Property Flood Resilience Code of Practice. Please note that the code of practice uses the term 'recovery measures'. In this guide we use 'resilience measures'.

Flooding can affect the structural stability of buildings. If your building design would exclude more than 600mm of flood water, you should get advice from a structural engineer. They will need to check the design is safe. Only use resistance measures that will not cause structural stability issues during flooding. If it is not possible to safely exclude the estimated flood level, exclude it to the structural limit then allow additional water to flow through the property.

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level
- making it easy for water to drain away after flooding such as installing a sump and a pump
- making sure there is access to all spaces to enable drying and cleaning
- ensuring that soil pipes are protected from back-flow such as by using non-return valves

Temporary or demountable flood barriers are not appropriate for new buildings. Only consider them for existing buildings when:

- there is clear evidence that it would be inappropriate to raise floor levels and include passive resistance measures
- an appropriate flood warning or other appropriate trigger is available

If proposals involve the development of buildings constructed before 1919, refer to Flooding and Historic Buildings guidance produced by Historic England.

7. Resilience and mitigation



Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

The Site is located within an area which is affected by flooding from rivers, the following table confirms the flood depths associated with the area proposed for development.

Table 5. Flood levels compared to ground levels in the area proposed for development.

Ground levels in area proposed for development (mAOD)	Modelled Flood Levels (mAOD)		
	1 in 100 year (mAOD)	1 in 100 year plus 26% CC (mAOD)	1 in 1000 year (mAOD)
63.66 to 63.80	63.32	63.94	64.07
Flood depths (m)	No Flooding	Up to 0.28	Up to 0.41

Raising minimum floor levels

The vulnerability classification of the Site and the Flood Zone means proposals for the Site fall under the EA's Flood Risk Standing Advice (FRSA) for more vulnerable developments.

In this instance, in line with the EA's FRSA the recommended minimum Finished Floor Level (FFL) should be set at least 0.3m above 1 in 100 year plus 26% allowance for climate change flood level of 63.94 mAOD, existing floor levels are estimated to be approximately 63.80 AOD. Finished floor levels would be required to be raised to at least 64.24 mAOD.

A floating floor may be used to raise the FFL's where it is unfeasible to raise the levels conventionally, in addition, rather than using a floating floor across the whole ground floor, each residential unit could be raised with stairs being implemented to allow for access. However, raising FFL's would potentially require the reconfiguration door heights, window heights etc...

If FFL's cannot be raised, then the HMO element on the ground floor should be avoided. As sleeping accommodation is not allowed on ground floors if the floor levels cannot be raised to the required elevation.

If these mitigation measures are implemented this could reduce the flood risk to the development from Medium to Low.

Surface water (pluvial) flood mitigation measures

The mitigation measures detailed above for river and sea flood risk are likely to be suitable for the relatively shallow flood depths of up to 0.30m which could be experienced in a 1 in 100 year pluvial flood event.

In addition, the regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the flood risk.

If these mitigation measures are implemented this would reduce the flood risk to the development from Low to Very Low.

Groundwater flood mitigation measures

It is likely the flood mitigation measures recommended for river/sea or surface water (pluvial) risk will reduce the groundwater flood risk at the development. However specific additional groundwater measures that may also be considered for the Moderate risk identified include:

- Waterproof tanking of the ground floor;

- Interceptor drains;

- Automatic sump to extract flood water; and

- Non-return flap valves on the existing and proposed foul and surface water sewer lines.

If these mitigation measures are implemented this could reduce the flood risk to the development from Moderate to Low.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure

of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Emergency evacuation to land outside of the floodplain should be provided if feasible. Where this is not possible, 'more vulnerable' developments and, where possible, development in general (including basements), should have internal stair access to an area of safe refuge within the building to a level higher than the maximum likely water level. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

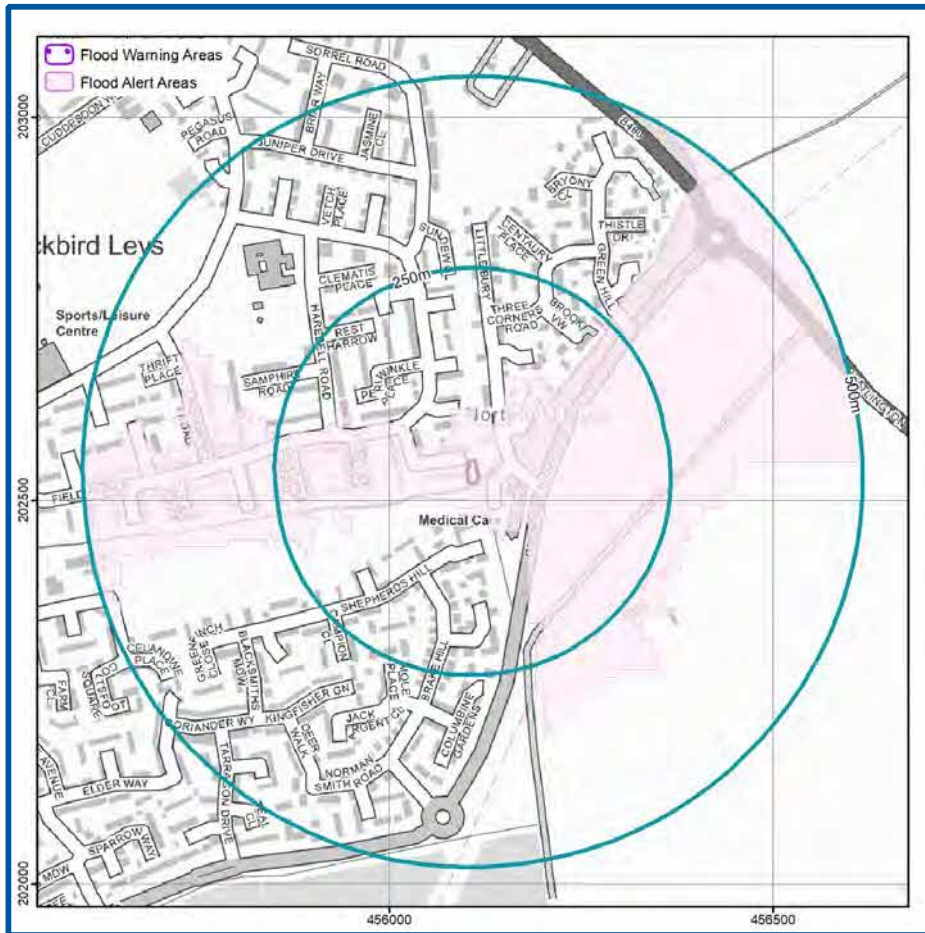
Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The EA operates a flood warning service in all areas at risk of flooding; this is available on their website: <https://www.gov.uk/check-flood-risk>. The Site is located within an EA Flood Alerts coverage area (ref: 061WAF23Oxford) so is able to receive alerts (Figure 14). All warnings are also available through the EA's 24 hour Floodline Service 0345 988 1188.

The EA aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Figure 14. EA Flood Warning Coverage for the local area (EA, 2024).



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Emergency evacuation

Where possible, a safe access and egress route rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated.

Based on the EA's Flood Zone Map the closest dry evacuation area within Flood Zone 1 is along Field Avenue (c.100 m north west –direct measurement). The majority of this route has a hazard rating of 'Very Low'. It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that residents prepare to evacuate as soon as an EA Flood Warning is issued in order to completely avoid flood waters.

On-Site refuge

Evacuation should be the primary action in preference, however safe refuge could be sought at first floor level in a worst-case scenario as the residential areas of the development are situated on the first and second floor.

Other relevant information

Occupants should be signed up to receive the EAs Flood Alerts.

Registration to the Environment Agency's flood warning scheme can be done by following this link: <https://www.gov.uk/sign-up-for-flood-warnings>.

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters. Where possible these should all be raised above the extreme flood level.

8. Conclusions and recommendations



Table 6. Risk ratings following Site analysis.

Source of Flood Risk	Baseline ¹	After analysis ²	After Mitigation ³
River (fluvial) flooding	Medium to Very Low		Low
Sea (coastal/tidal) flooding	Very Low		N/A
Surface water (pluvial) flooding	Very Low to Low		Very Low
Groundwater flooding	Moderate	Low	Low
Other flood risk factors present	No		N/A
Is any other further work recommended?	Yes (see below)		

1 BASELINE risks assigned for the whole Site, using national risk maps, including the benefit of EA flood defences.

2 AFTER ANALYSIS modification of risk assessment based on detailed site specific analysis including some or all of the following: flood model data, high resolution mapping, building location, access routes, topographic and CCTV surveys. Reasons for the change in classification are provided in the text.

3 AFTER MITIGATION risks include risks to proposed development / asset and occupants if mitigation measures recommended in this report are implemented, including the impacts of climate change.

*N/A indicates where mitigation is not required.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

More vulnerable developments in a Flood Zone 2 and 3 are acceptable according to the NPPF and providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.



Table 7. Summary of responses to key questions in the report

Key sources of flood risks identified	Fluvial (rivers), Pluvial (Surface Water) and Groundwater (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes (See exec summary and section 7)

9. Further information



The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products		
Additional assessment:		<p>The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs.</p> <p>Please contact info@geosmartinfo.co.uk for further information.</p>
Additional assessment:		<p>Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective.</p> <p>Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements.</p> <p>Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions.</p> <p>Please contact info@geosmartinfo.co.uk for further information.</p>



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Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is $\pm 0.25\text{m}$ for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council

SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).
------	--

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
-------------------	---

Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
---------------------	---

Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
---------------------	--

Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
----------------------------	--

Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.
---------------------	---

NPPF (2023) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
----------------	---

Sequential test	Aims to steer new development to areas with the lowest probability of flooding.
-----------------	---

Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.
--------------------------	---

Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2024 BlueSky copyright and database rights 2024
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)	Environment Agency copyright and database rights 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2024) Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2024
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2024 Environment Agency copyright and database rights 2024

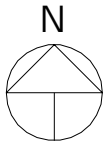
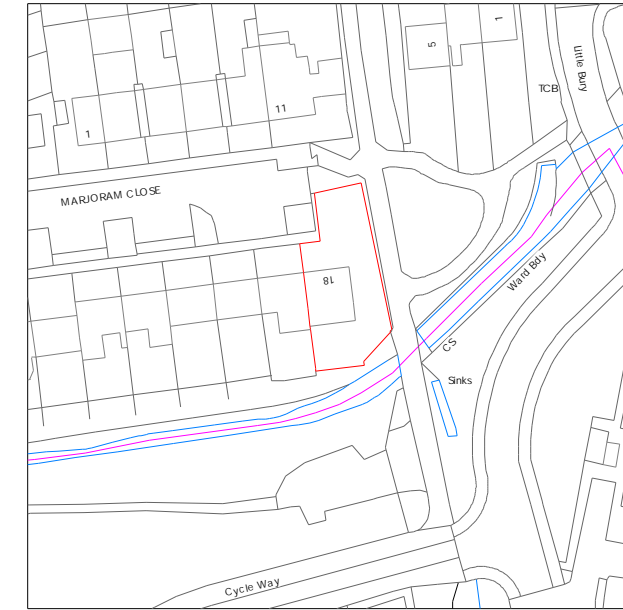
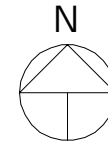
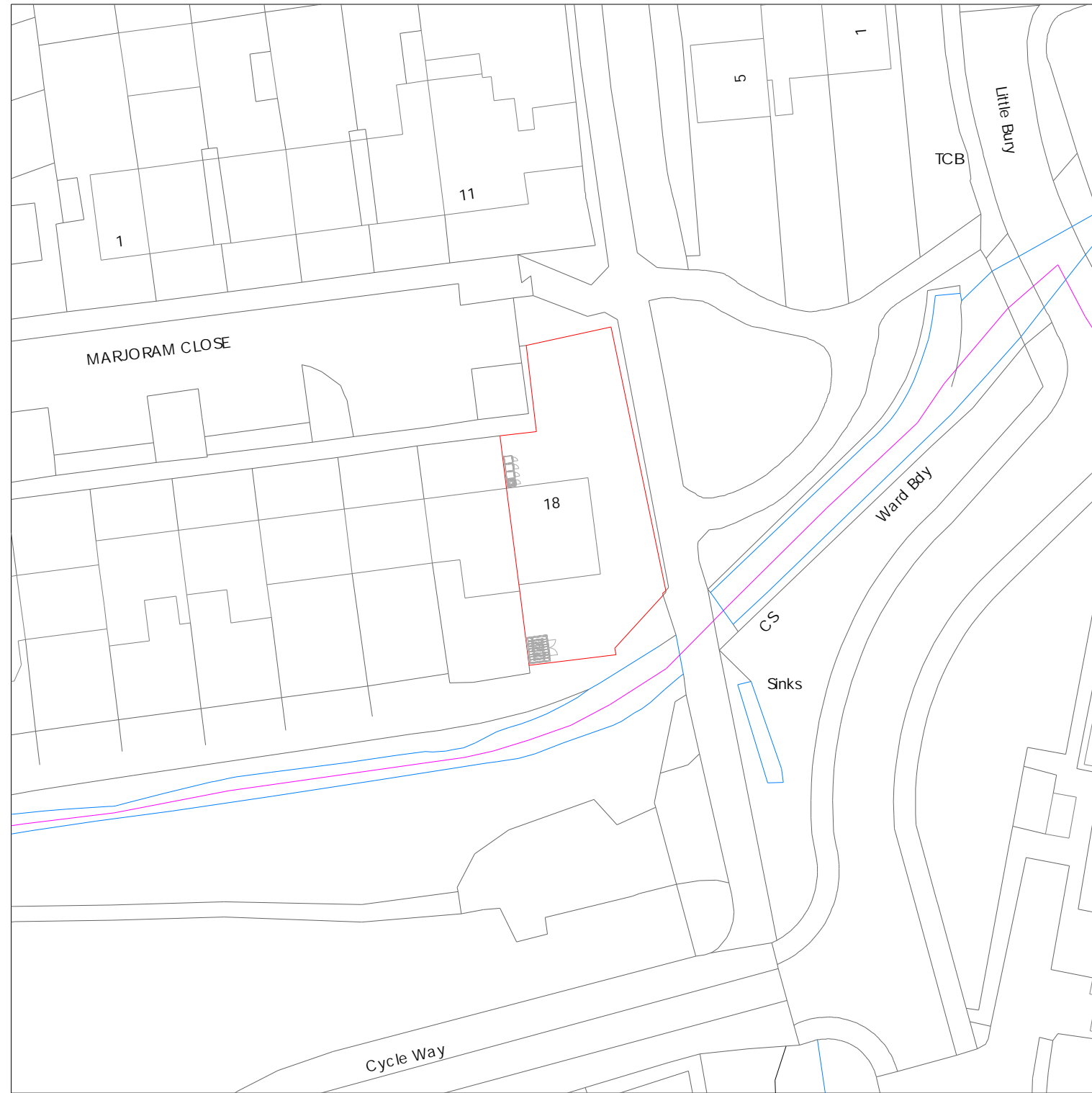
11. Appendices



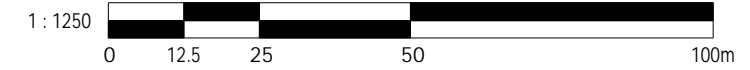
Appendix A



Site plans



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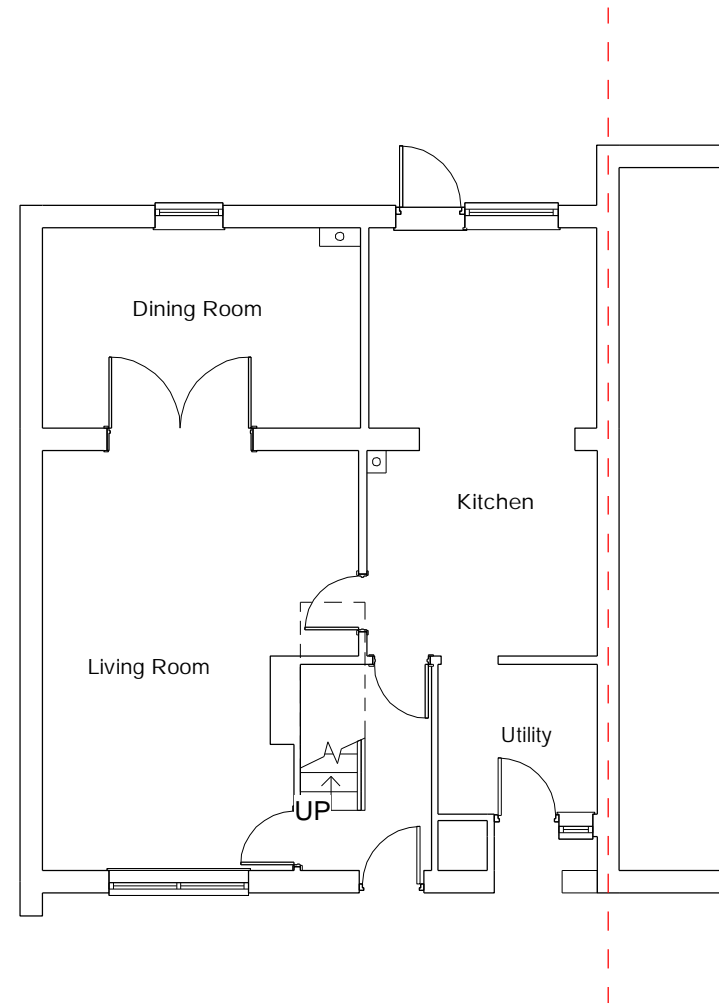
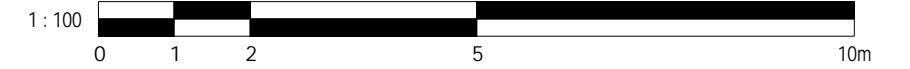
Block Plan
Scale - 1:1250

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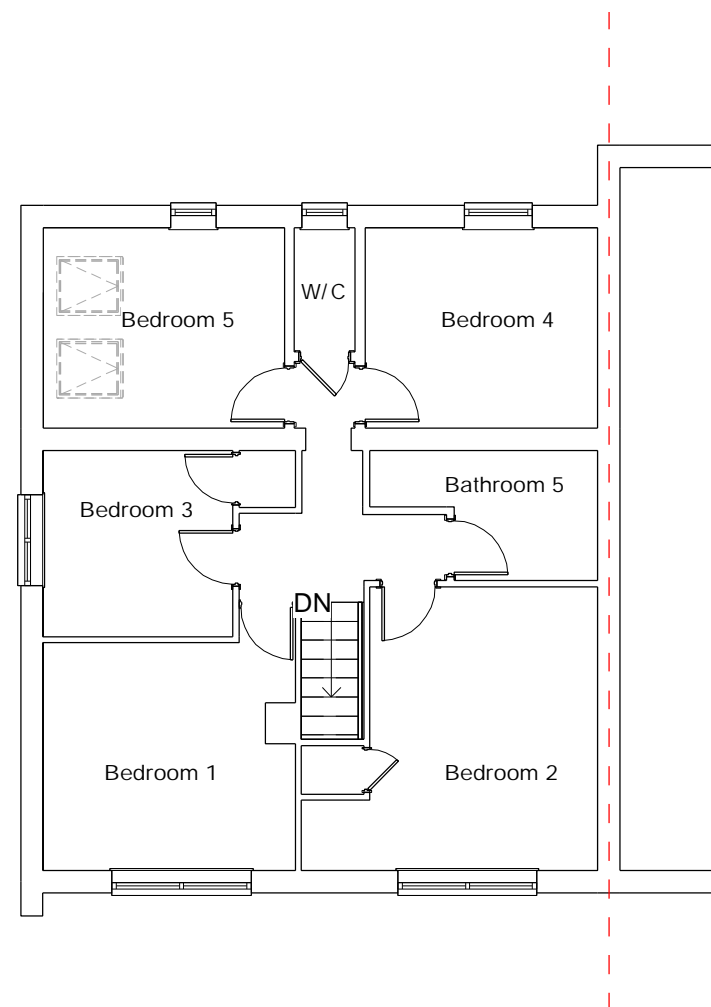
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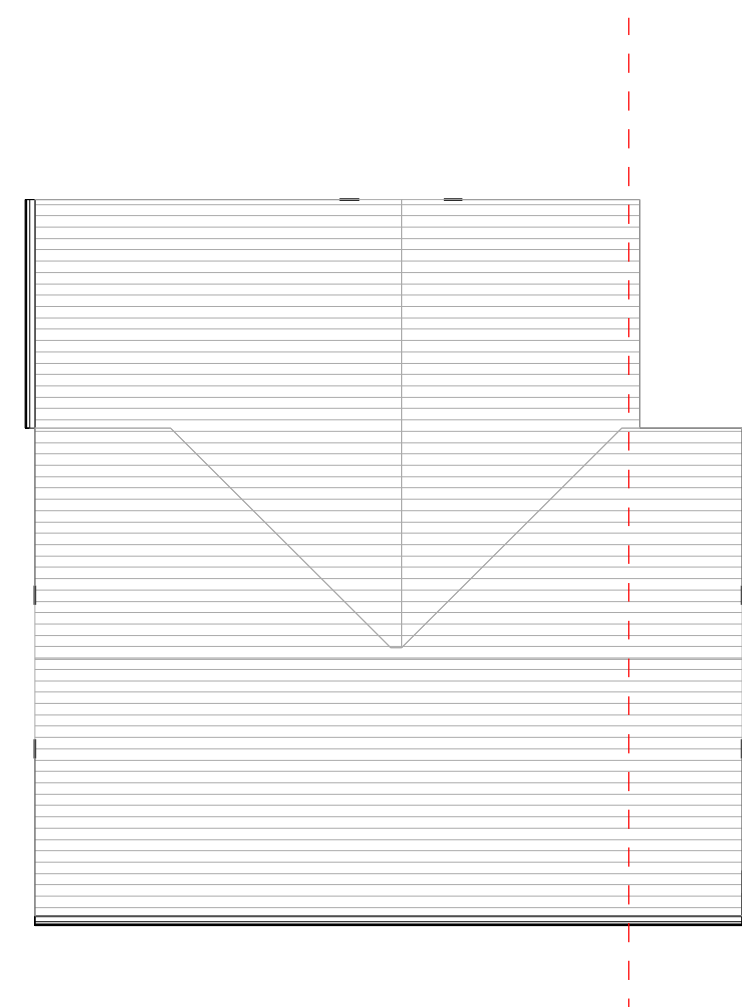
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		STATUS P		SHEET Site Location & Block Plan		Date 29/02/2024	Project number OXL-15	Scale (@ A3) As indicated
						Drawn by OF	DRAWING NUMBER OXL-24-15-05	
						Checked by OF	REV	



Existing Ground Floor

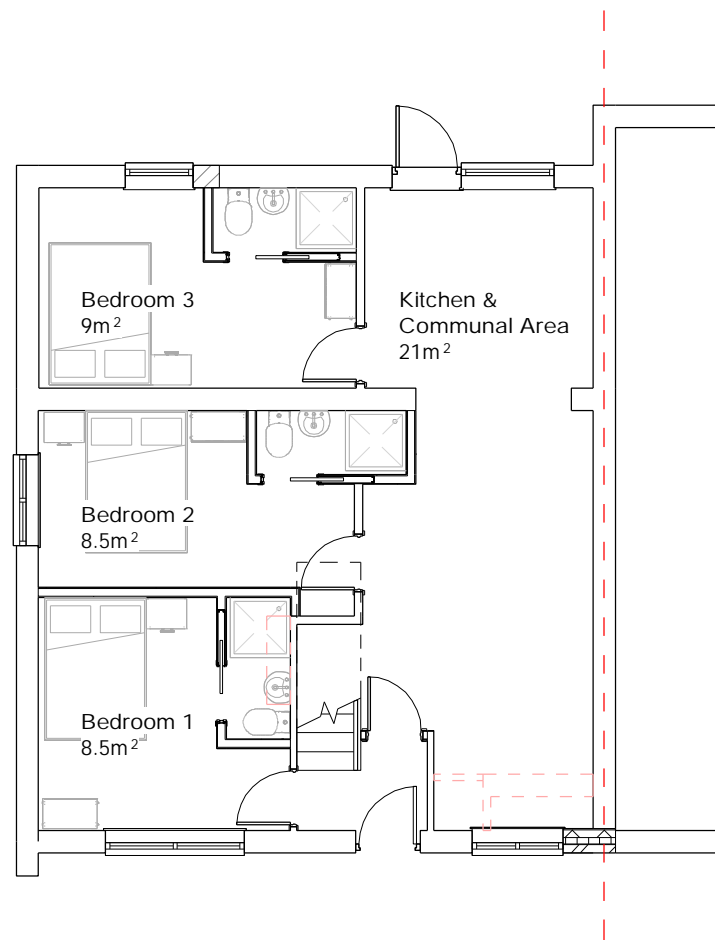


Existing First Floor

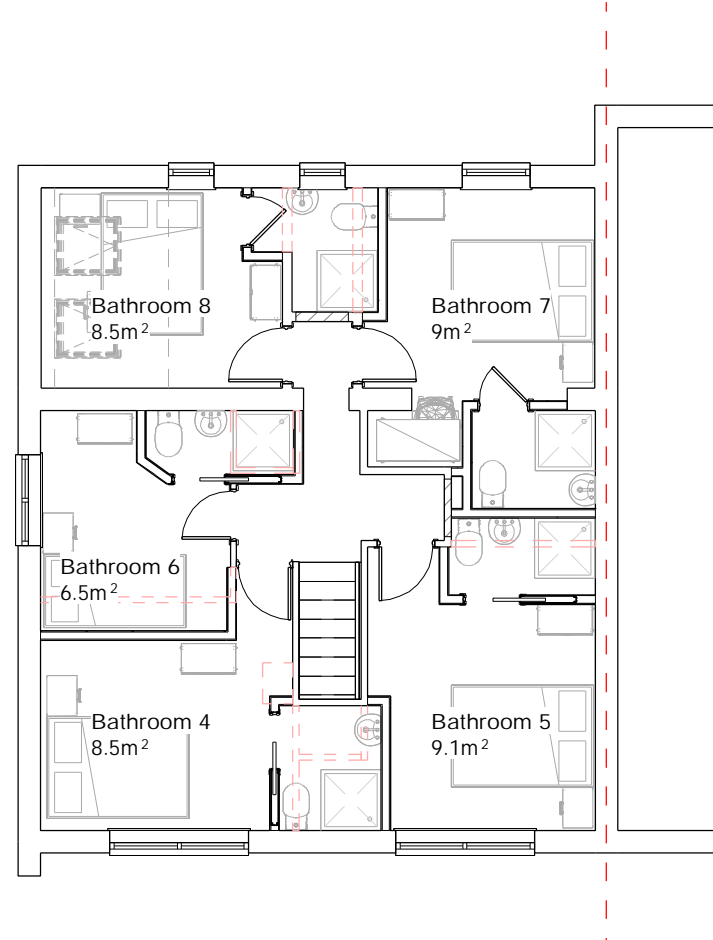


Existing Roof Plan

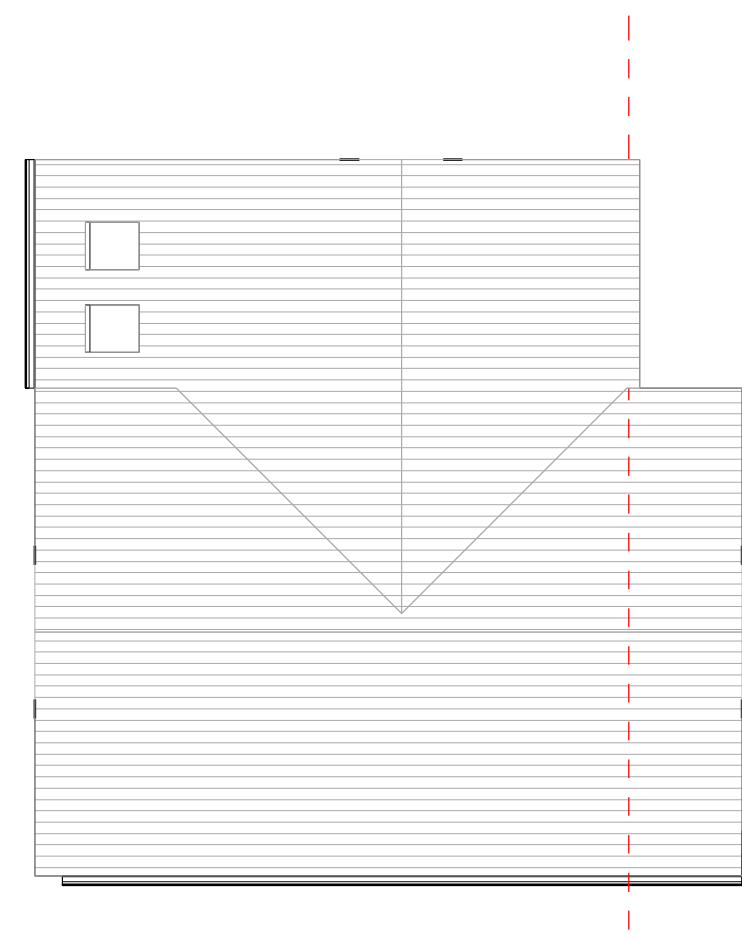
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			SHEET Existing Floorplans		Date 29/02/2024	Project number OXL-15
STATUS P					Drawn by OF	DRAWING NUMBER OXL-24-15-01
					Checked by OF	REV



Proposed Ground Floor

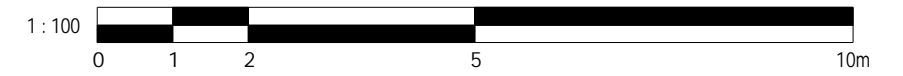


Proposed First Floor



Proposed Roof Plan

DESCRIPTION PLANNING		GENERAL NOTES:		CLIENT	
		THIS DRAWING IS FOR PLANNING USE ONLY DO NOT USE THIS DRAWING FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS ISSUED. STRUCTURAL DESIGN AND BUILDING CONTROL APPROVAL IS REQUIRED BEFORE CONSTRUCTION COMMENCES. THIS DRAWING IS SUBJECT TO COPYRIGHT DO NOT REPRODUCE THIS DRAWING WITHOUT PRIOR PERMISSION.		Co-Living Capital LTD	
STATUS P			18 Marjoram Close, Oxford OX4 6QQ		Date 29/02/2024
			SHEET Proposed Floorplans		Project number OXL-15
				DRAWING NUMBER OXL-24-15-03	REV



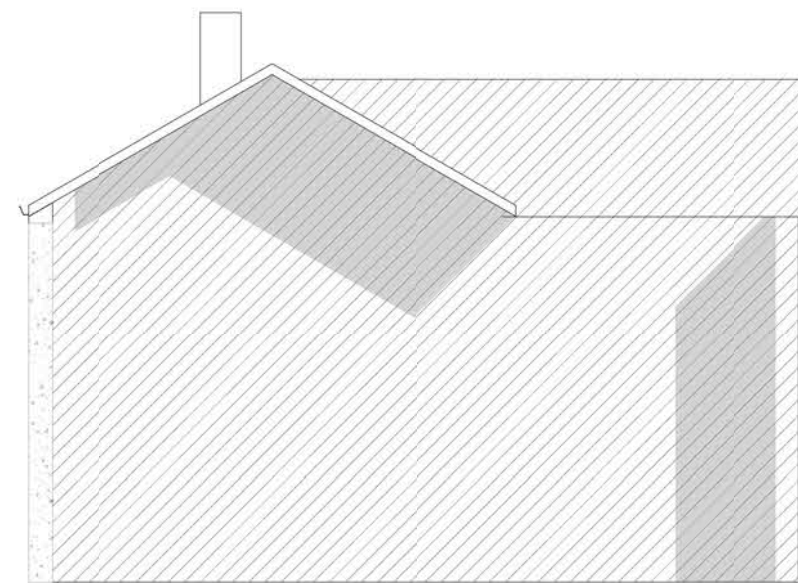
Existing Front Elevation



Existing Rear Elevation

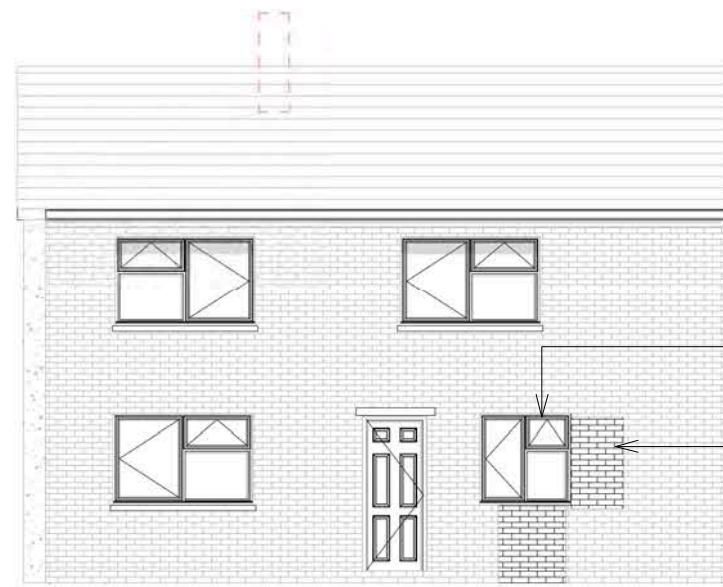
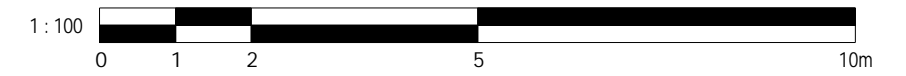


Existing Front Elevation



Existing Rear Elevation

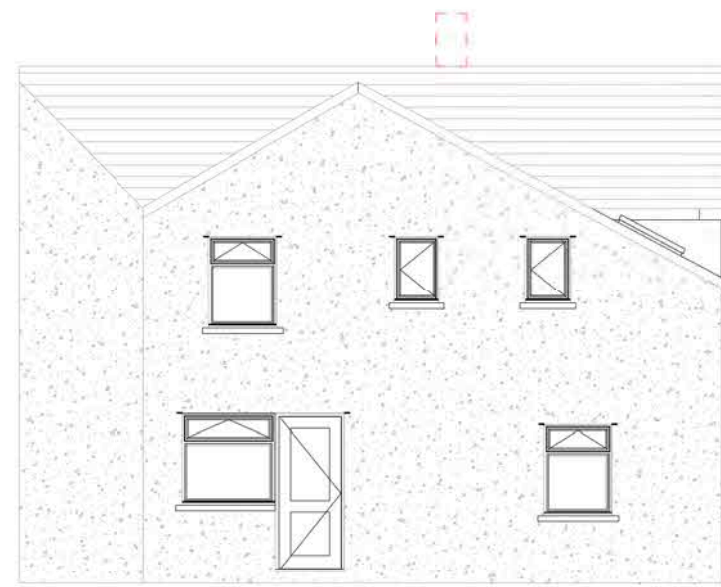
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			SHEET Existing Elevations		Date 29/02/2024	Project number OXL-15
STATUS P					Drawn by OF	DRAWING NUMBER OXL-24-15-02
					Checked by OF	REV



Proposed window to match style and colour of existing

Opening to be blocked up and made good

Proposed Front Elevation

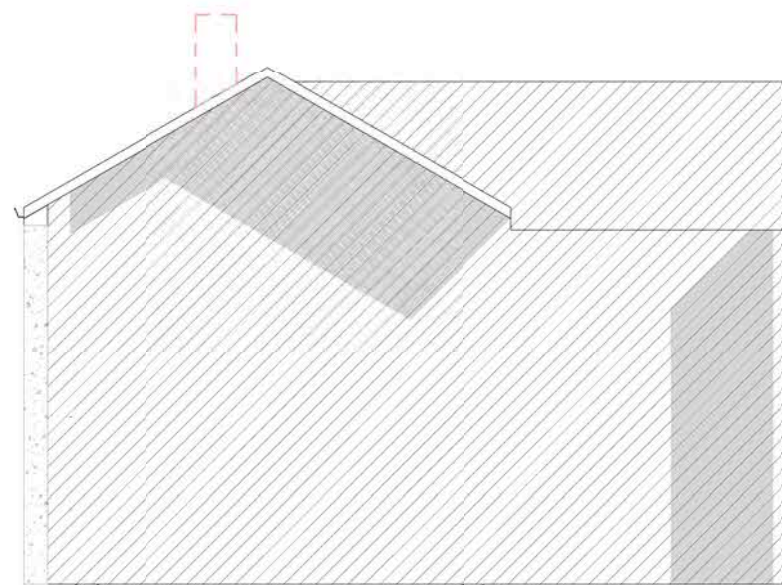


Proposed Rear Elevation



Proposed Window to match style and colour of existing

Proposed Front Elevation



Proposed Rear Elevation

DESCRIPTION PLANNING		GENERAL NOTES: THIS DRAWING IS FOR PLANNING USE ONLY DO NOT USE THIS DRAWING FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS ISSUED. STRUCTURAL DESIGN AND BUILDING CONTROL APPROVAL IS REQUIRED BEFORE CONSTRUCTION COMMENCES. THIS DRAWING IS SUBJECT TO COPYRIGHT DO NOT REPRODUCE THIS DRAWING WITHOUT PRIOR PERMISSION.	DETAIL 18 Marjoram Close, Oxford OX4 6QQ		CLIENT Co-Living Capital LTD		
			SHEET Proposed Elevations	Date 29/02/2024	Project number OXL-15	Scale (@ A3) 1 : 100	REV
STATUS P	Checked by OF	DRAWING NUMBER OXL-24-15-04					

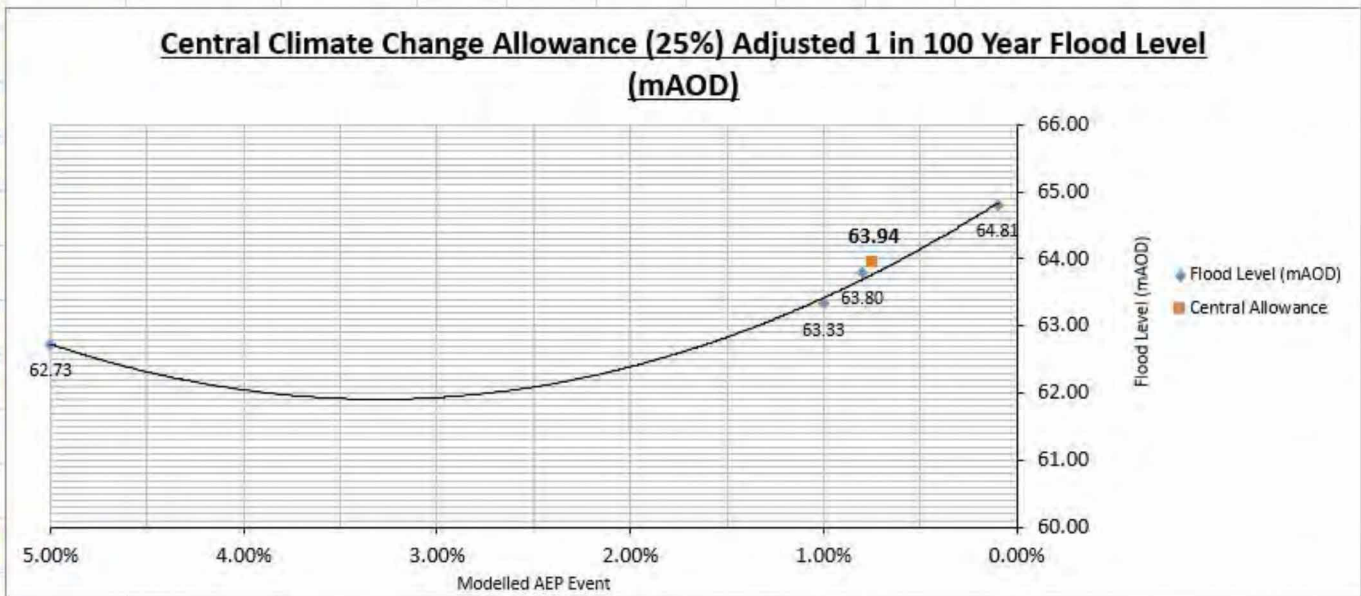


Environment Agency data

Development lifespan	100		Management Catchment	Req Allowance
Development lifespan end	2124		Gloucestershire and the Vale	26

If provided with a CC level < than your required CC allowance:

Hydrological region	6
1 in 20 year flood level (mAOD)	62.73
1 in 50 year flood level (mAOD)	
1 in 100 year flood level (mAOD)	63.33
Required climate change allowance (%)	26
Provided CC flood level %	20
Provided 1 in 100 year + CC flood level (mAOD)	63.80
1 in 200 year flood level (mAOD)	
Provided 1 in 200 year + CC flood level (mAOD)	
Difference between provided and required 1 in 100/200 year + CC %	6
1 in 1000 year proportion of 1 in 100 year event	62
What is your 1 in 1000 year flood level (mAOD)?	64.81
Years between provided 1 in 100/200 year CC % and equivalent 1 in 1000 year	42
Central climate change allowance adjusted 1 in 100/200 year flood level (mAOD)	63.94



Environment Agency

Littlemore and Northfield Brooks Flood Risk
Mapping Study 2009

Final Report

April 2010



Halcrow Group Limited

Environment Agency

Littlemore and Northfield Brooks Flood Risk

Mapping Study 2009

Final Report

April 2010

Halcrow Group Limited

Halcrow Group Limited

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Tel +44 (0)1793 812479 Fax +44 (0)1793 812089
www.halcrow.com

Halcrow Group Limited has prepared this report in accordance with the instructions of their client, Environment Agency, for their sole and specific use. Any other persons who use any information contained herein do so at their own risk.

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Area Proposed for Development

Client Site

1 in 1000 year flood level (m)

0.00

0.23

0.46

0.69

0.92

1.16

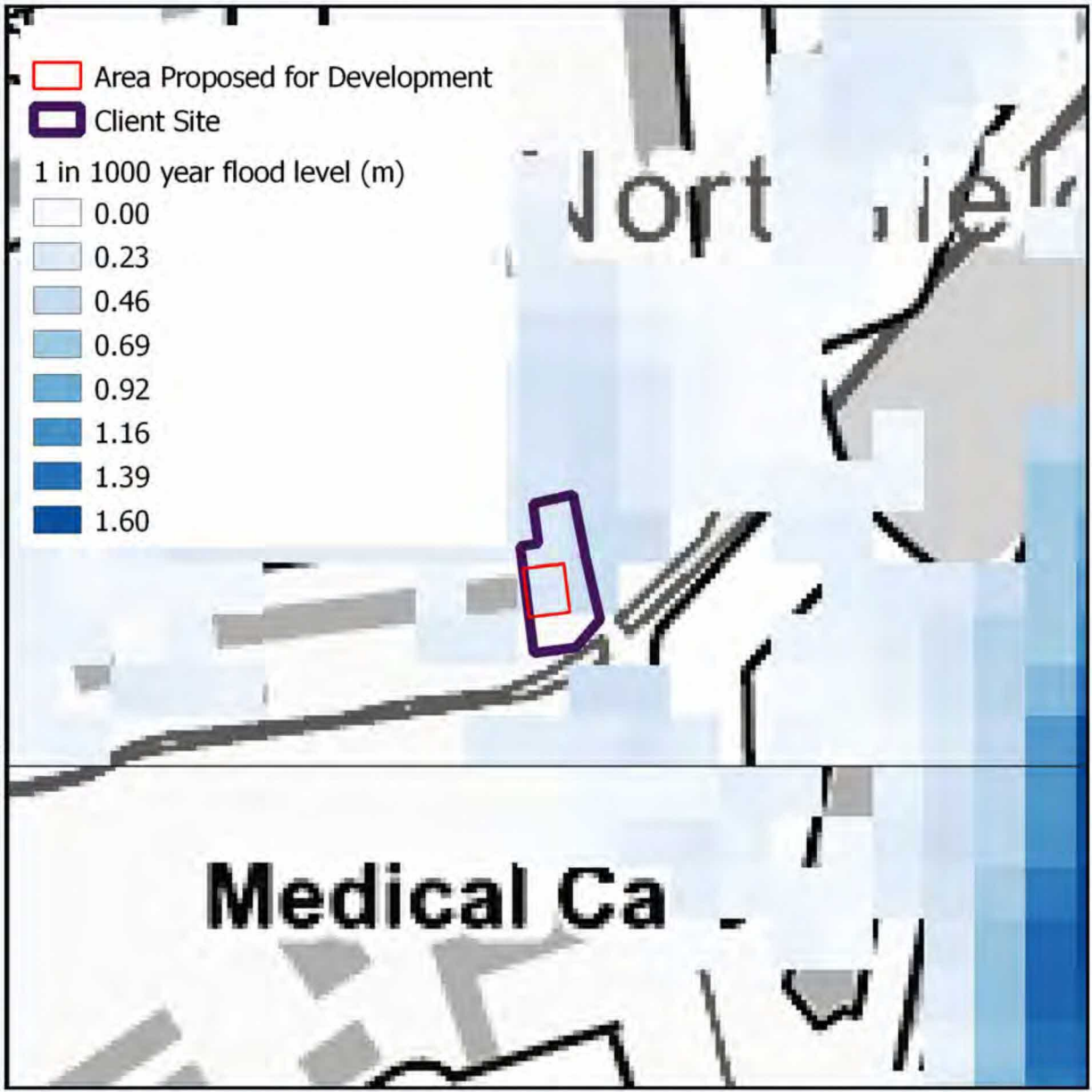
1.39


1.60

202500

Medical Ca

456000




 Area Proposed for Development

 Client Site

1 in 100 year plus 20% CC allowance flood depth

 0.00

 0.30

 0.61

 0.92

 1.23





Thames Water sewer flooding history

Sewer Flooding

History Enquiry



Property Searches

GeoSmart Information Ltd

Bellstone

Search address supplied 18
Marjoram Close
Oxford
OX4 6QQ

Your reference 81754

Our reference SFH/SFH Standard/2024_4955942

Received date 4 March 2024

Search date 4 March 2024



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Sewer Flooding

History Enquiry



Property Searches

Search address supplied: 18,Marjoram Close,Oxford,OX4 6QQ

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched;
- (ii) any negligent or incorrect interpretation of the records searched;
- (iii) and any negligent or incorrect recording of that interpretation in the search report
- (iv) compensation payments



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



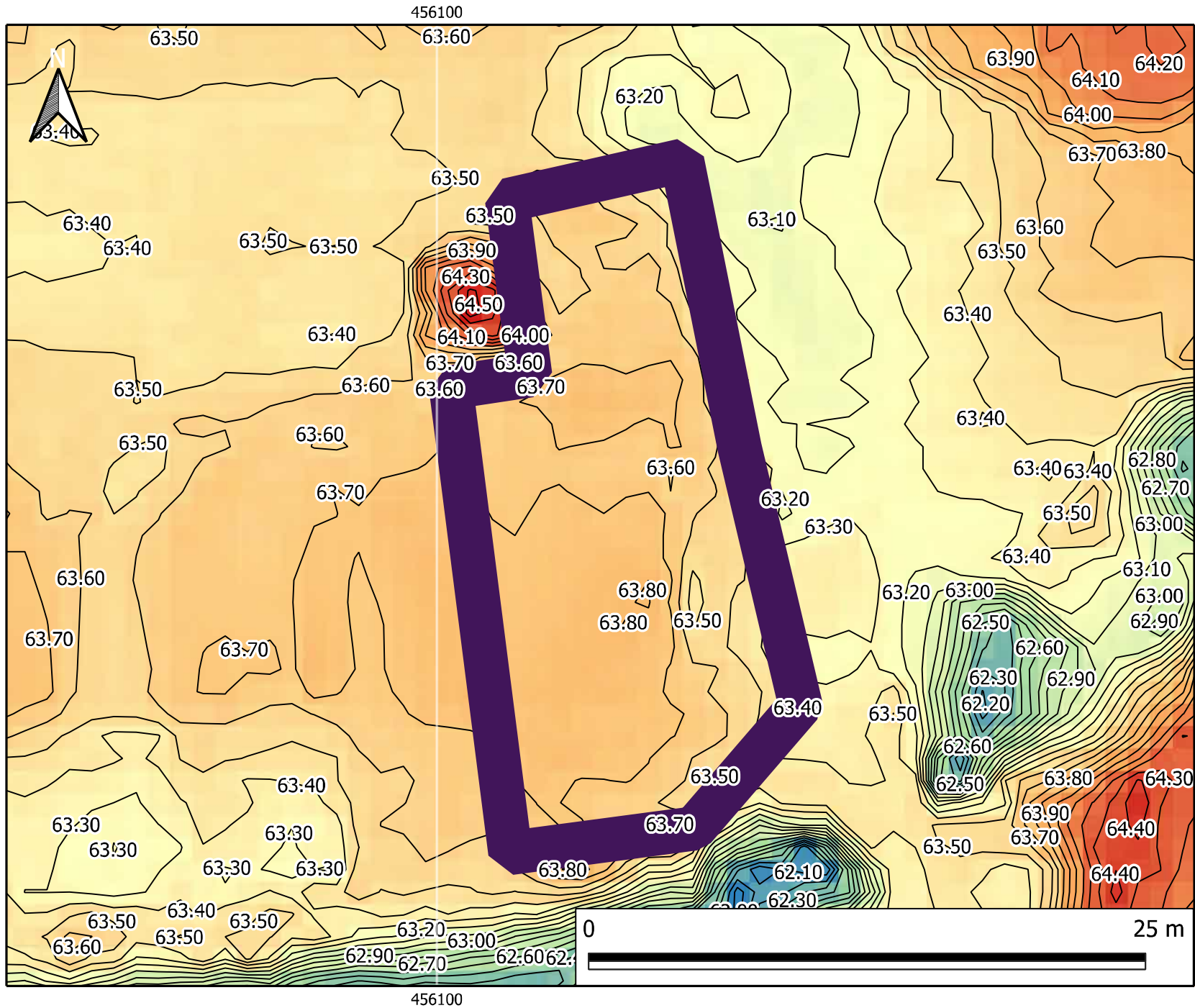
searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540








Environment Agency LiDAR ground elevation data



Elevation on Site
(LIDAR Data)

-  Client Site
-  0.1m Contours

Elevation (mAOD)

-  61.9280
-  62.5868
-  63.2455
-  63.9043
-  64.5630

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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For full T&Cs see <http://geosmartinfo.co.uk/terms-conditions>

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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The Search Code:

provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.

sets out minimum standards which firms compiling and selling search reports have to meet.

promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.

enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

display the Search Code logo prominently on their search reports.

act with integrity and carry out work with due skill, care and diligence.

at all times maintain adequate and appropriate insurance to protect consumers.

conduct business in an honest, fair and professional manner.

handle complaints speedily and fairly.

ensure that products and services comply with industry registration rules and standards and relevant laws.

monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk. Please ask your search provider if you would like a copy of the search code.

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

Acknowledge it within 5 working days of receipt.

Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.

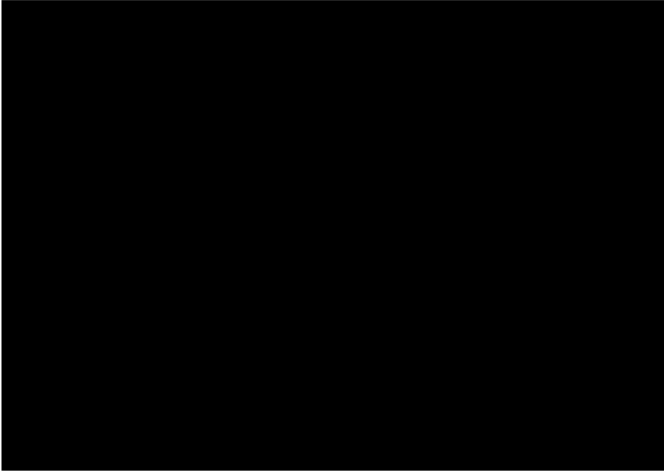
Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.

Provide a final response, in writing, at the latest within 40 working days of receipt.

Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:



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Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>