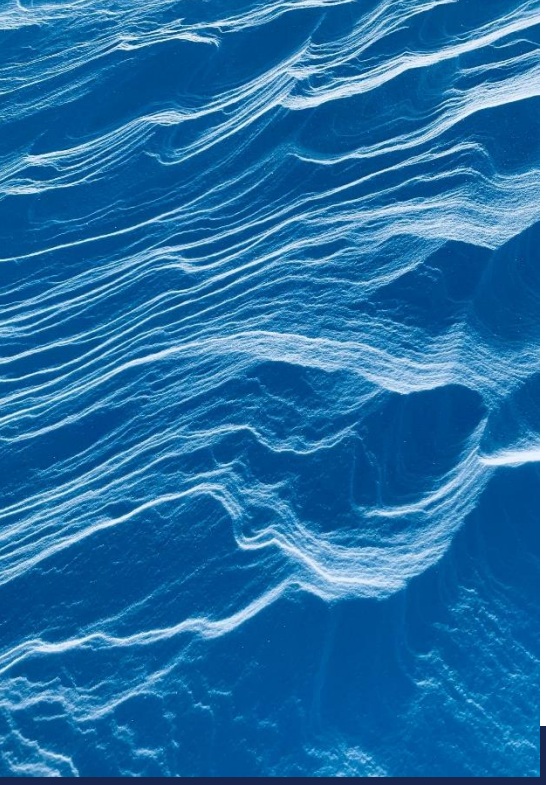




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Flood risk, water and environment

Flood Risk Assessment
AEG02196_UB10_Uxbridge_01

Site Address: 95 and 97 Halford Road

Ickenham

Uxbridge

London

UB10 8QA

UK Experts in Flood Modelling, Flood Risk Assessments, and Surface Water Drainage Strategies

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Flood risk, water and environment

Document Issue Record

Project: Flood Risk Assessment

Prepared for: Noa Ram

Reference: AEG02196_UB10_Uxbridge_01

Site Location: 95 and 97 Halford Road, Ickenham, Uxbridge, London, UB10 8QA

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Table of Contents

Summary 1

1. Introduction 3

Site Overview 3

Planning Policy and Guidance 6

2. Planning Policy 7

National Planning Policy Framework (NPPF) 7

The London Plan 9

Hillingdon Local Plan: Part 1 Strategic Policies 11

Sequential and Exception Tests 11

Summary 12

3. Consultation and Review 13

Consultation 13

Documents and Online Mapping 13

4. Sources of Flood Risk 16

Fluvial 16

Tidal 22

Canals 22

Pluvial 23

Reservoirs 26

Groundwater 28

Sewers 29

5. Flood Risk Mitigation 31

Fluvial 31

Pluvial 32

Other Sources 32

Offsite Impacts 32

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Flood risk, water and environment

Flood Warnings 35

6. Conclusions 37

Appendix A - Development Proposals 39

Appendix B - Consultation 40

Summary

Development Description	Existing	Proposed
Development Type	A number of residential dwellings (detached bungalows)	Construction of extensions and alterations to the existing adjacent properties (detached bungalows).
EA Vulnerability Classification	More Vulnerable	More Vulnerable
Ground Floor Level	No.95 - Approximately 35.46m AOD and 38.08m AOD. No.97 - Approximately 35.58m AOD and 38.23m AOD.	FFLs of proposed extension should be set no lower than existing FFLs in line with EA Standing Advice for Minor Extensions.
Level of Sleeping Accommodation	No.95 - Ground Floor and First Floor No.97 - Ground Floor	No change
Surface Water Drainage	N/A[1]	Runoff from the extensions could be discharged via the existing system, given that proposal is a Minor Development. Betterment could be provided through small-scale SuDS such as rainwater planters and water butts.
Site Size	1840m^2 in total	No change
Risk to Development	**Summary**	**Comment**
EA Flood Zone	Flood Zone 1, 2 and 3	The EA flood map shows that the majority of the main dwellings are located in Flood Zone 1 area. However, small sections at the rear of the dwellings are in located in Flood Zone 2 and the majority of the rear gardens are located in Flood Zone 2 and 3
Flood Source	Fluvial and Pluvial	River Penn
SFRA Available	West London Online SFRA - 2018	
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels	N/A[2]	Finished Floor Levels (FFLs) of extension should be set no lower than the existing FFLs in line with EA Standing Advice for Minor Extensions.
Safe Access/Egress Route	Access/egress potentially affected during the modelled low risk pluvial event.	Sign up to the EA Flood Warning and Alert Service - River Pinn at Ickenham Area. Access/ egress

		arrangements would not differ from existing as proposal is Minor Development.
Flood Resilient Design	Yes	Extension should be constructed in flood resilient manner in accordance with DCLG *Report Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007)*
Site Drainage Plan	N/A[1]	Runoff from extension could be discharged via existing system given that proposal is Minor Development. Betterment could be provided through small-scale SuDS such as rainwater planters and water butts.
Flood Warning & Evacuation Plan	Yes	Sign up to the EA Flood Warning Service - River Pinn at Ickenham Area.
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater	Negligible	Proposal is Minor Development which may not result in significant impact of floodplain storage in isolation in accordance with paragraph 051 of the Flood Risk and Coastal Change PPG.
Increase in surface run-off generation		Runoff from extension could be discharged via existing system given that proposal is Minor Development. Betterment could be provided through small-scale SuDS such as rainwater planters and water butts
Impact on hydraulic performance of channels	Negligible	The development should not affect watercourse.

[1] not required for this assessment.

[2] data not available.

1. Introduction

1.1. Aegaea were commissioned by Noa Ram to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

1.3. The site of the proposed development is 95 and 97 Halford Road, Ickenham, Uxbridge, London, UB10 8QA (Figure 1).



Figure 1: Site Location Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors).

1.4. The existing site is currently two adjacent residential properties (no.95 and no.97) comprising one-storey detached house (detached bungalows) associated with parking spaces and rear gardens.

1.5. It is understood that the proposed development is for the construction of extensions and alterations to the existing adjacent properties.

1.6. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been utilized to review the topography of the site. Analysis of the 1m LiDAR data shows that the site ground elevation across property No.95 boundaries varies between approximately 35.46m AOD and 38.08m AOD and across property no.97 varies between approximately 35.58m AOD and 38.23m AOD. Analysis of the topographic levels indicates that the site generally slopes from northwest to southeast (Figure 2).

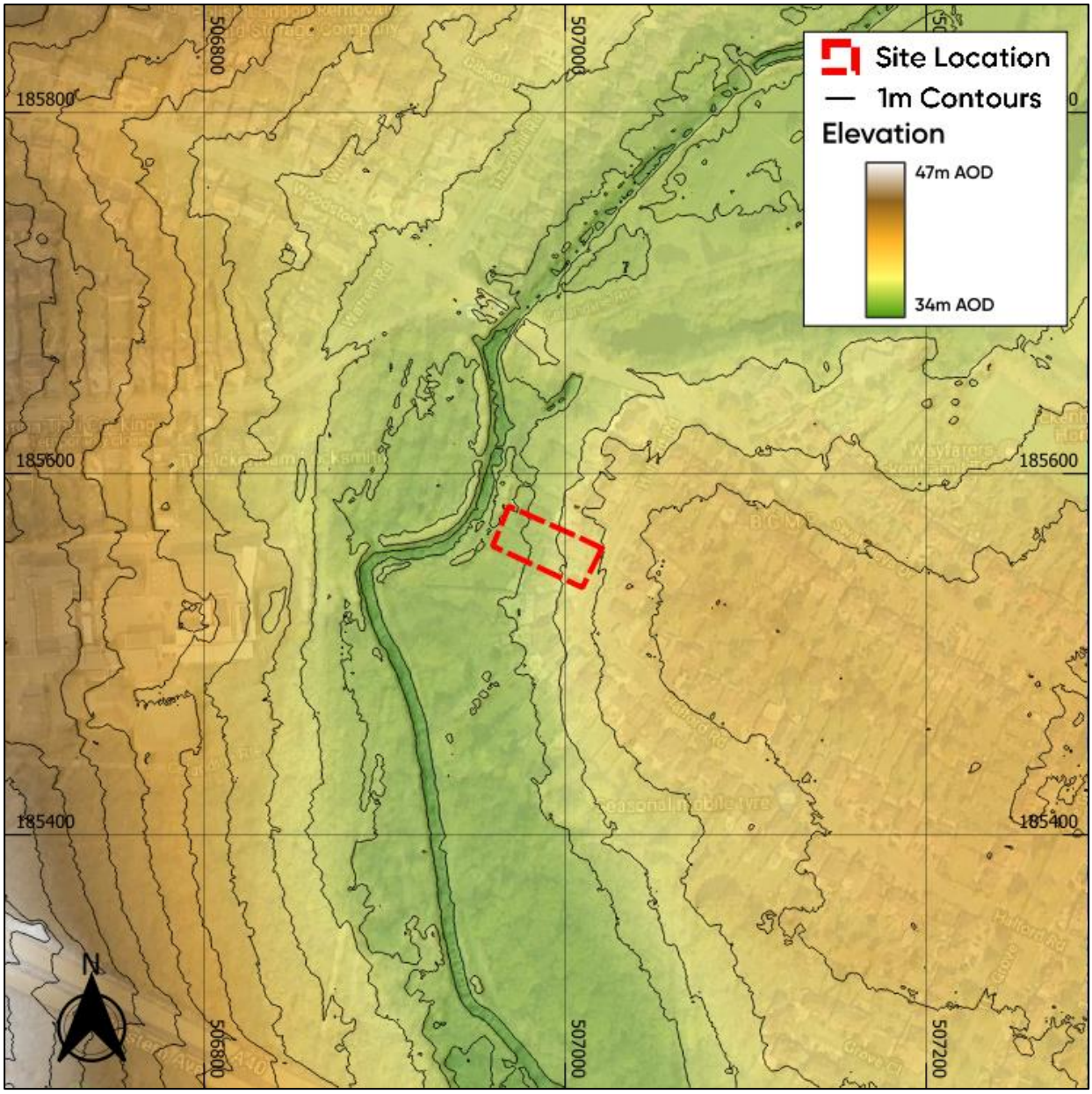


Figure 2: Site Topography (© Environment Agency, Base map, and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA) © https://www.openstreetmap.org and contributors).

1.7. Hillingdon Council is the Local Planning Authority (LPA) for the site, and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Hertfordshire and North London region.

Planning Policy and Guidance

1.8. UK government planning guidance states[1] that an FRA is required for developments which are:

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

1.9. The site is in Flood Zone 3 therefore the NPPF states that an FRA is required.

1.10. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial flood risk
- Surface water flood risk
- Risk of flooding from other sources

[1] **https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment**

2. Planning Policy

2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

National Planning Policy Framework (NPPF)

2.2. The National Planning Policy Framework[2] (NPPF) (DLUHC, 2021) which includes UK Government policy on development and flood risk states:

> *"159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*
>
> *167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
>
> *a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
>
> *b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

[2] https://www.gov.uk/guidance/national-planning-policy-framework, **last updated July 2021**

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

168. Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55. "

2.3. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

Minor development means:

- *minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 250 square metres.*
- *alterations: development that does not increase the size of buildings, e.g. alterations to external appearance.*
- *householder development: for example, sheds, garages, games rooms etc within the curtilage of the existing dwelling,* ***in addition to physical extensions to the existing dwelling itself.*** *This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling (eg subdivision of houses into flats) or any other development with a purpose not incidental to the enjoyment of the dwelling.*

2.4. As such, the proposal would be considered a Minor Development under the PPG.

2.5. Footnote 55 of the NPPF states:

"A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

2.7. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

The London Plan

2.8. The London Plan prepared by the Greater London Authority in 2021 sets out the policies for development in the region.

2.9. Policy SI 12 Flood risk management outlines the requirements for new development within the region. It states:

- A. Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.

- B. Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.

- C. Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

- D. Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

- E. Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

- F. Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

- G. Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

Hillingdon Local Plan: Part 1 Strategic Policies

2.10. The Local Plan prepared by the Local Planning Authority, Hillingdon Council, sets out the policies for development in the local area. The plan set out a vision for 2026 and was adopted in November 2012.

2.11. Policy EM6 Flood Risk Management outlines the requirements for new development within the area. It states:

The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF).

The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF.

Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated.

The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SUDS is to an appropriate standard.

Sequential and Exception Tests

2.12. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

2.13. Under the NPPF all new planning applications should undergo a Sequential Test unless a minor household development or a change of use application in accordance with paragraph 168 and

footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the flood plain.

2.14. Paragraph 168 of the 2021 NPPF states that:

> *168. Applications for some* ***minor development*** *and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55. "*

2.15. Therefore, in accordance with Paragraph 168 and footnotes 55 and 56 of the NPPF, the proposed development is classified as a minor development (in terms of flood risk) application and should not be subject to the sequential or exception tests but should still meet the requirement for the site-specific flood risk assessments.

Summary

2.16. This flood risk assessment has been prepared with due consideration to the above local and national policy.

3. Consultation and Review

Consultation

3.1. A product 4 was requested in March 2023 and received from the EA. This data has been reviewed in Section 4 of this report and a full copy of the data received will be included in Appendix B of this report.

Documents and Online Mapping

3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.

3.3. The following sources of information have been reviewed for this assessment:

- Flood Map for Planning on the Environment Agency website *https://flood-map-for-planning.service.gov.uk/*
- Long Term Flood Risk Information on the Environment Agency website *https://www.gov.uk/check-long-term-flood-risk*
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2022)
- The London Plan (Greater London Authority, 2021)[3]
- Local Plan: Part 1 - Strategic Policies (Hillingdon Council, 2012)[4]

[3]https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
[4]https://www.hillingdon.gov.uk/media/3080/Local-Plan-Part-1---Strategic-Policies/pdf/Local_Plan_Part_1_Strategic_Policies_15_feb_2013_a_1_1.pdf?m=1598370401647

- Preliminary Flood Risk Assessment (Hillingdon Council, 2011)[5]
- West London Strategic Flood Risk Assessment (Hillingdon Council, 2018)[6]
- Local Flood Risk Management Strategy 2015 (Hillingdon Council, 2016)[7]

Preliminary Flood Risk Assessment (PFRA)

3.4. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority Hillingdon Council. The flood risk from all sources, including fluvial, surface water, groundwater and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.

3.5. The PFRA summarises historical flood incidents in Hillingdon Council. The site is recorded as having been affected by a flood event.

Strategic Flood Risk Assessment (SFRA)

3.6. The SFRA, published in 2018, provides the evidence base for the Local Planning Authority Hillingdon Council Local Plan and guidance for consideration when determining planning applications. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.

3.7. The SFRA mapping provided by Hillingdon Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

Local Flood Risk Management Strategy (LFRMS)

3.8. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives and actions of the Lead Local Flood Authority. The

[5]https://modgov.hillingdon.gov.uk/documents/s8734/Appendix%20-%20Flood%20Appraisal.pdf
[6]https://westlondonsfra.london/
[7]https://www.hillingdon.gov.uk/media/4499/Local-Flooding-Risk-Management-Strategy/pdf/Appendix_A_-_Local_Flood_Risk_Management_Strategy_2016_1.pdf?m=1610451478887

Hillingdon Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

4. Sources of Flood Risk

Fluvial

4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

Main Rivers and Ordinary Watercourses

4.2. The River Pinn flows north to south approximately 12m to the west of the site boundary. The watercourse is classified as an EA main river.

4.3. There is an unnamed ordinary watercourse, located approximately 60m to the northeast of the site.

EA Flood Map for Planning

4.4. The EA Flood Map for Planning shows the site is located within Flood Zone 3 (high risk), Flood Zone 2 (medium risk) and Flood Zone 1 (low risk). The Flood Zones are defined as follows;

- Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%).
- Flood Zone 2 denotes a risk of flooding from fluvial sources between a 1 in 100 (1%) and 1 in 1,000 (0.1%).
- Flood Zone 1 denotes a risk of flooding fluvial sources less than 0.1% annually.

4.5. The EA Flood Map for Planning shows that the majority of the main dwellings are located in Flood Zone 1 area. However, a section at the rear of the dwellings is in located in Flood Zone 2 and the majority of the rear gardens are located in Flood Zone 2 and 3 (Figure 3). Note that the proposed new extensions are presented in a blue pattern footprint and the existing in black colour footprint.

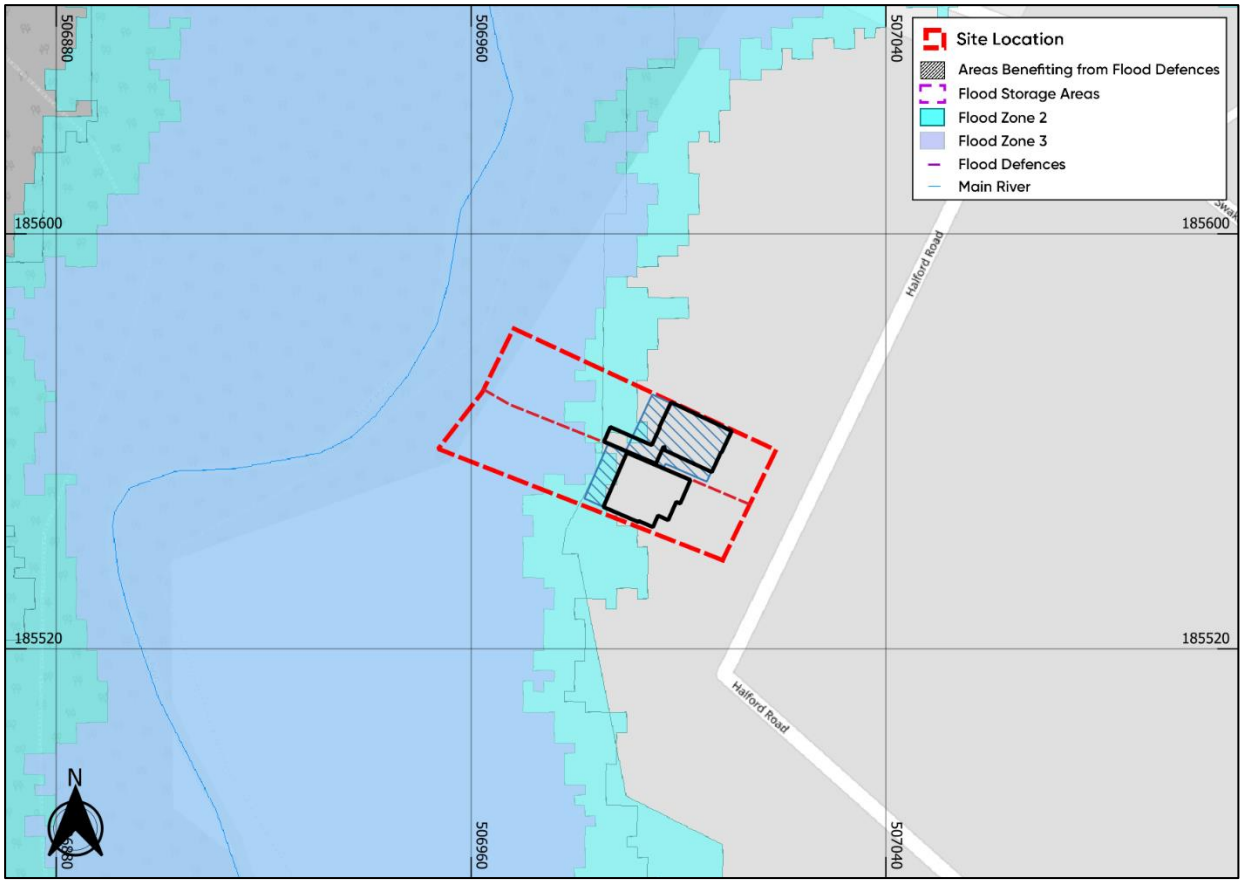


Figure 3: EA Flood Map for Planning. (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors). Contains public sector information licensed under the Open Government Licence v3.0.

Climate Change

4.6. The site is located within the Colne Management Catchment, which has updated central peak flow river allowances of: 10% for the 2020s, 8% for the 2050s, and 21% for the 2080s. As the proposed development is for the construction of extensions and alterations to the existing adjacent properties, the peak flow allowance of 21% for the 2080s would be required for fluvial flood flows.

4.7. The river Pinn model (2015) Product 4 results include climate change (CC) allowances for the 1.0% Annual Exceedance Probability (AEP) event. A climate change allowance of +21% was not included, however a +20% event was provided. These results have been analysed in the following section of this report as an estimate for the added climate change allowance scenario.

River Pinn Model (2015)

4.8. The EA were contacted (March 2023) and have provided detailed modelling results for the site location in the form of Product 4 information extracted from the River Pinn (2015) fluvial model. These results have been used to determine the fluvial flood risk to the site.

4.9. It should be noted that no undefended scenario was provided in the EA data.

4.10. Figure 4 shows that the proposed development lies outside the extent of each of the defended modelled 50%AEP and 20%AEP events. However, part of the rear garden of property no.95 only is inside the extent of the defended modelled 10%AEP event. The majority of the flood extent in each of these events remains within the channel of the River Pinn.

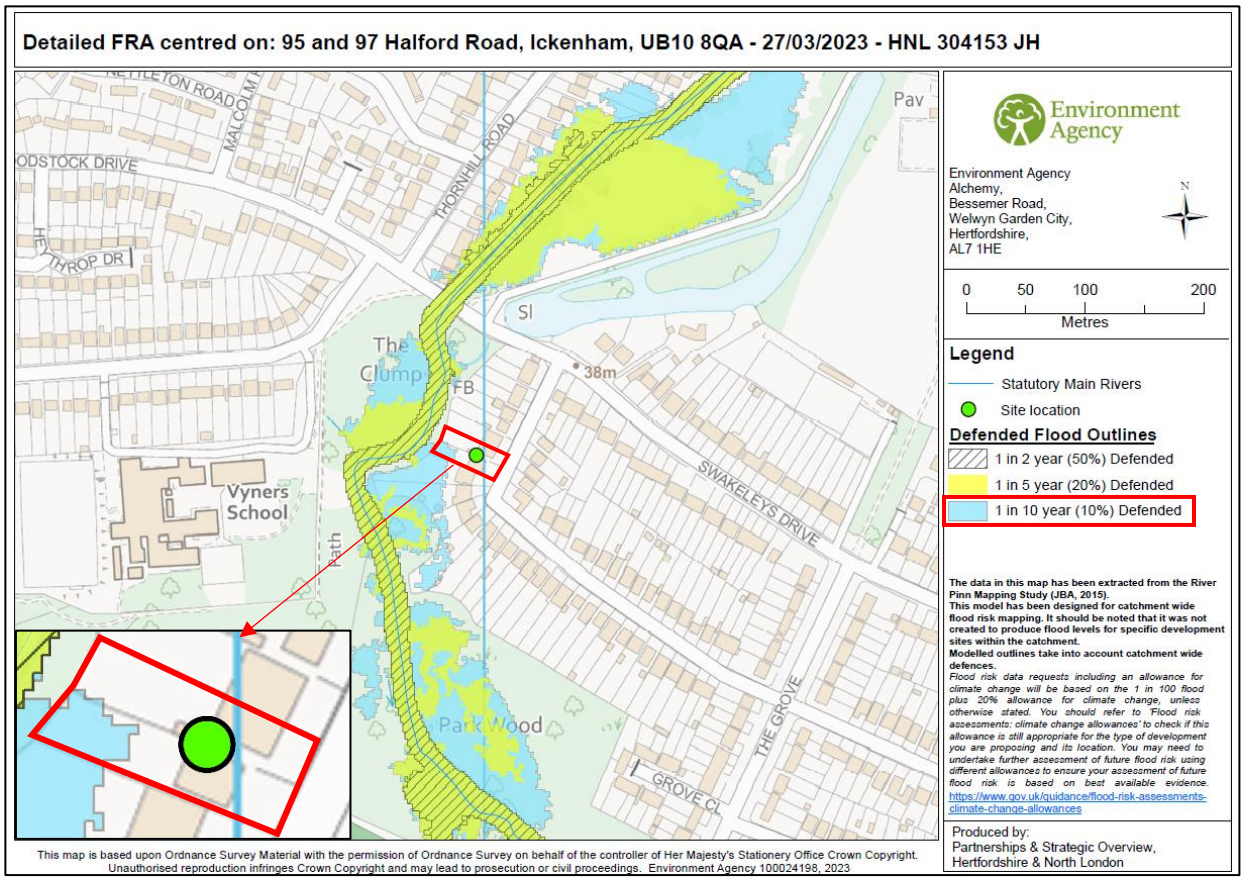


Figure 4: EA Product 4 River Pinn Model Outputs (50%AEP, 20%AEP, and 10%AEP events) (Proposed Development located in Red Rectangle)

4.10. Figure 5 shows that in the defended modelled 3.3%AEP event, the proposed development lies outside the extent of flood Zone 3b, however, it lies inside the extent of flood Zone 3a.

4.11. Based on the EA Product 4 data, in the defended modelled 3.3% AEP event, the flood level is 36.08m AOD.

4.12. Comparison with topographic levels derived from LiDAR for the proposed extension at property no.95 (36.09m AOD - 36.43m AOD) show that the location of the proposed extension lies at least 0.01m above the modelled 3.3%AEP flood level.

4.13. Comparison with topographic levels derived from LiDAR for the proposed extension at property no.97 (36.43m AOD - 37.35m AOD) show that the location of the proposed extension lies at least 0.35m above the modelled 3.3%AEP flood level.

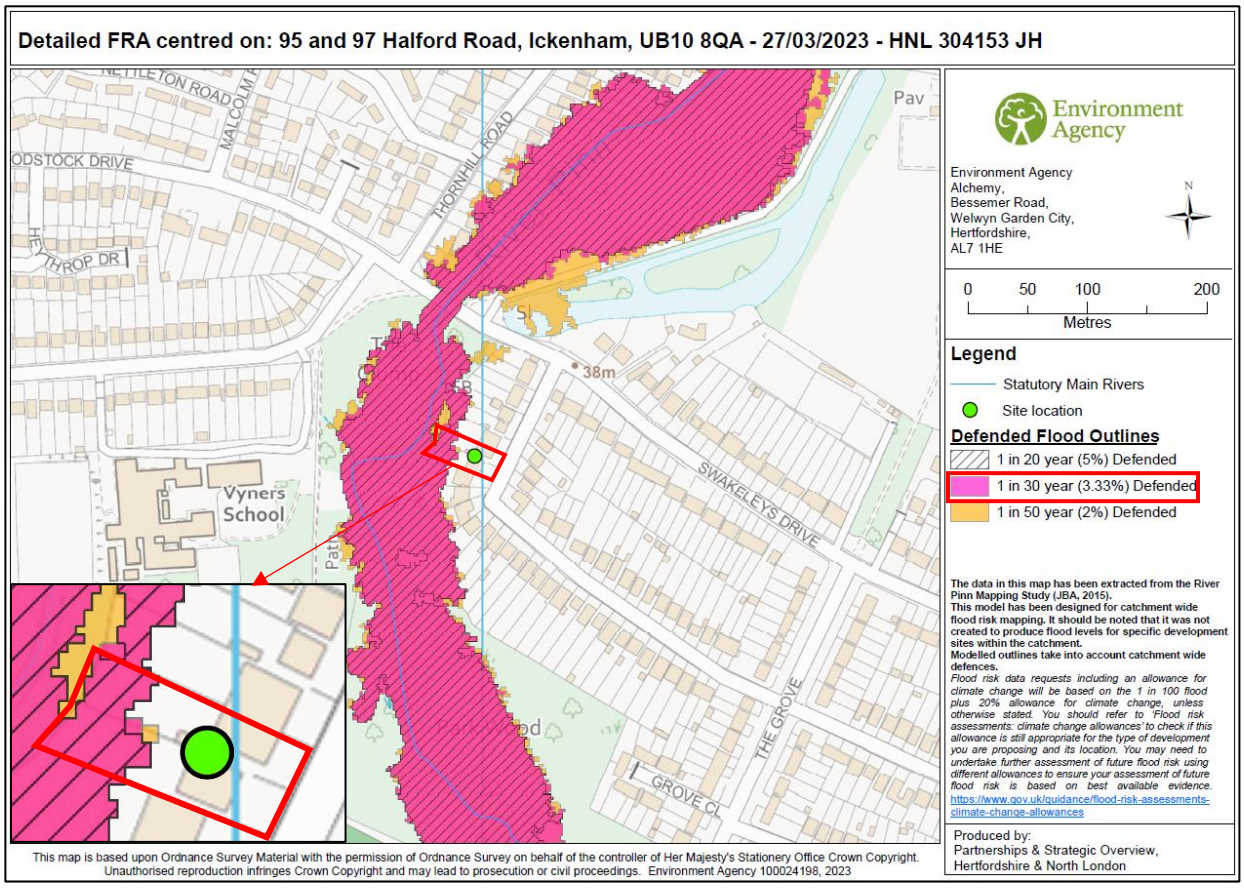


Figure 5: EA Product 4 River Pinn Model Outputs (3.3% AEP event) (Proposed Development located in Red Rectangle)

4.14. Figure 6 shows that in the defended modelled 1.0%AEP+20%CC event, the rear gardens of the proposed development and a section at the rear of property no.95 could be affected by fluvial flooding.

4.15. Based on the EA Product 4 data, in the defended modelled 1.0% AEP+20%CC event, the flood level is 36.31m AOD.

4.16. Comparison with topographic levels derived from LiDAR for the proposed extension at property no.95 (36.09m AOD - 36.43m AOD) show that the flood depth at the location of the proposed extension could reach up to 0.22m.

4.17. Comparison with topographic levels derived from LiDAR for the proposed extension at property no.97 (36.43m AOD - 37.35m AOD) show that the location of the proposed extension lies at least 0.12m above the modelled 1.0%AEP+20%CC allowance flood level.

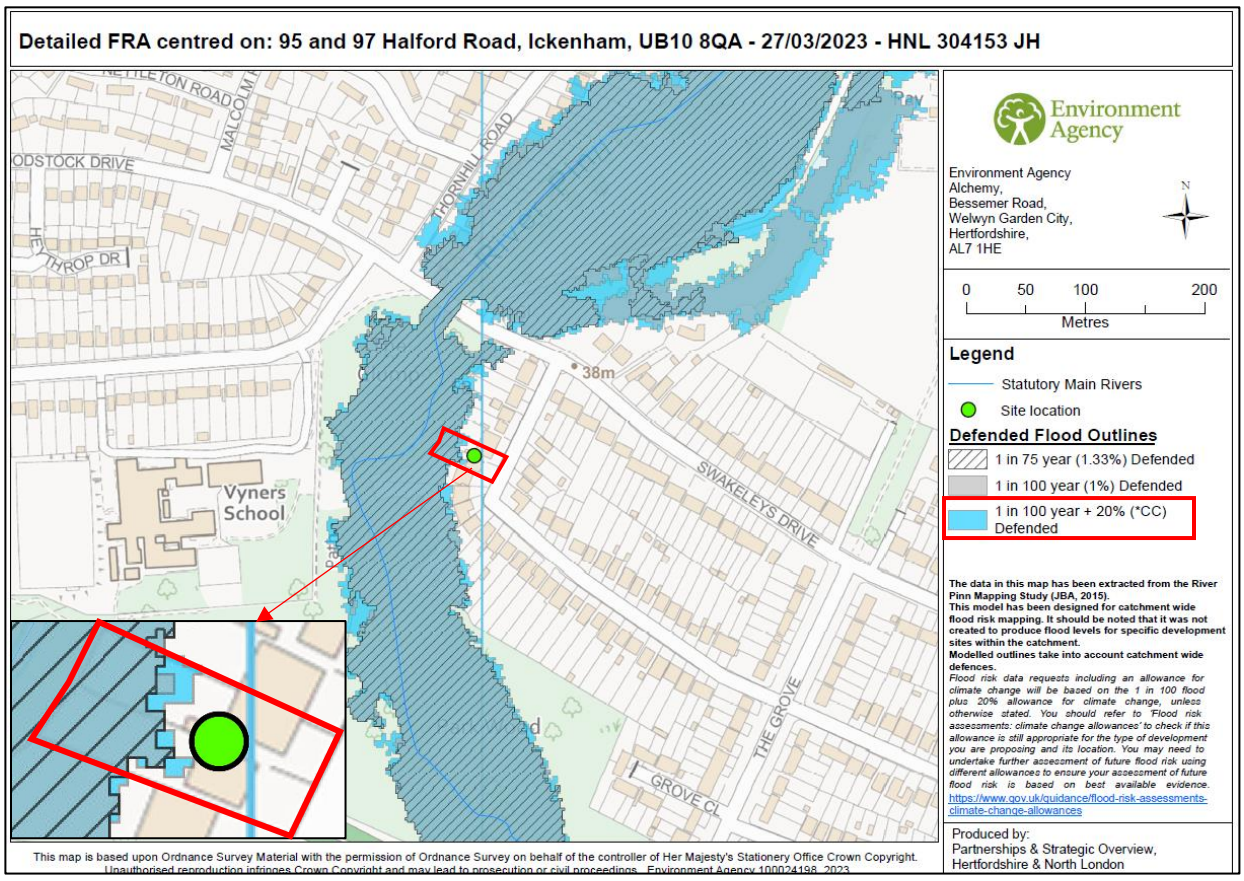


Figure 6: EA Product 4 River Pinn Model Outputs (1.0%AEP+20%CC defended event) (Proposed Development located in Red Rectangle)

4.18. The results also shows that in the defended modelled 0.1% AEP event, the rear gardens of the proposed development and a section at the rear of property no.95 could be affected by fluvial flooding.

4.19. Based on the EA Product 4 data, in the defended modelled 0.1% AEP events, the flood level is 36.71 m AOD.

Historical Fluvial Flooding

4.20. The rear of the site is inside the extent of EA historical flood mapping (Figure 10). Additionally, mapping within the Hillingdon Council PFRA (2011) and the West London SFRA Fluvial and Tidal Flood Risk Map show records of historical fluvial flood incidents within the vicinity of the site.

4.21. Our review of Recorded and Historical Flood Outlines shows main river fluvial flooding on-site in 1988 and 1977 (Figure 7).



Figure 7: EA Historic Flood Mapping. (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors). Contains public sector information licensed under the Open Government Licence v3.0.

Fluvial Flood Risk Summary

4.22. Based on the information above, the proposed development is considered to be at medium risk of fluvial flooding.

Tidal

4.23. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the riverbank or river defences when tide levels are high.

4.24. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change.

4.25. The risk of flooding from tidal sources is low.

Canals

4.26. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.

4.27. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.

4.28. Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.

4.29. The site is not in the vicinity of any canals and therefore flood risk from this source is considered low.

Pluvial

4.30. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.

4.31. Annual surface water flood risk is labelled by the EA as:

- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
- 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
- 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.32. Examination of EA surface water flood risk (RoFSW) mapping (Figure 8) shows that the site is at 'Low' to 'Medium' risk of flooding from surface water. The majority of the flood risk is located at the rear of the dwellings (garden areas).

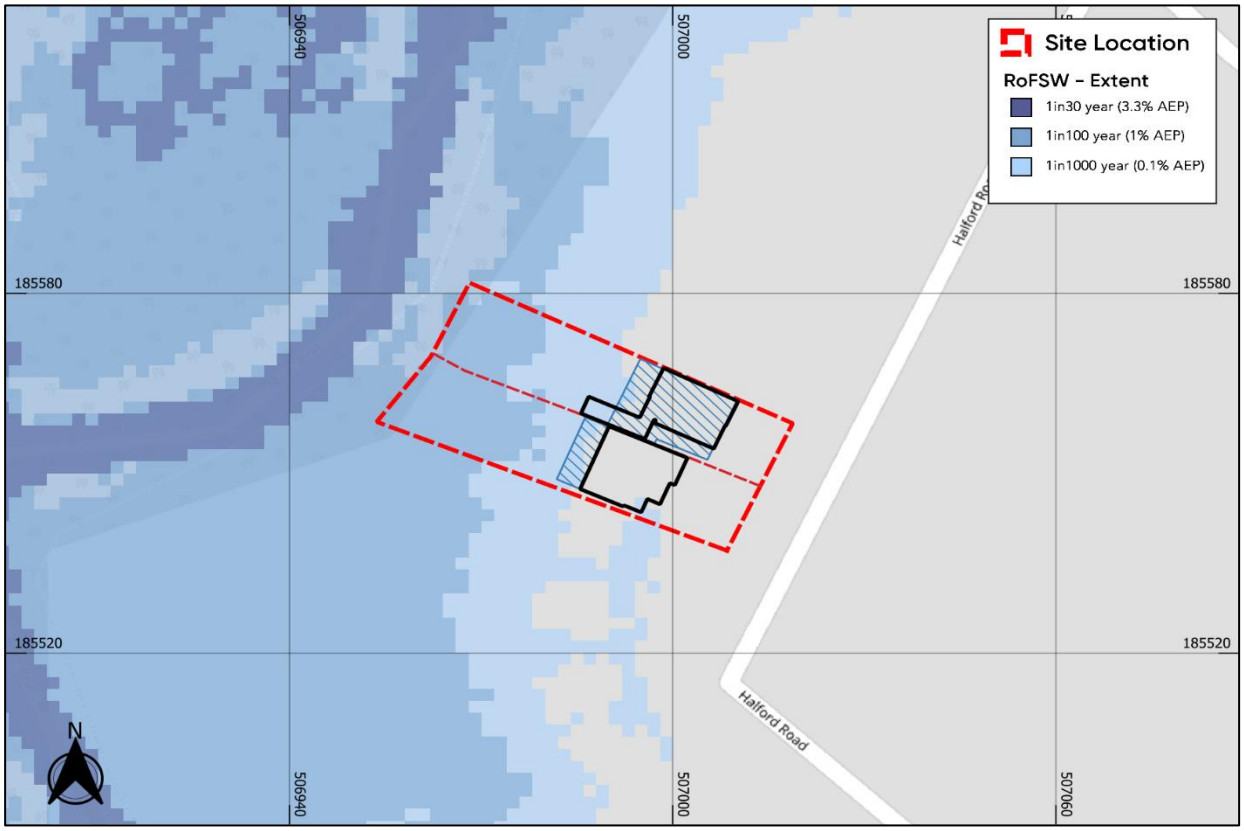


Figure 8: RoFSW - Extent (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, EA RoFSW: © Environment Agency copyright and/or database right 2015. All rights reserved.)

4.33. The Risk of Flooding from Surface Water (RoFSW) dataset provided by Defra have been used to determine the pluvial flood risk to the site on a closer scale.

RoFSW for the 1 in 100 (1% AEP) - Medium Risk

4.34. Analysis of the EA Surface Water Depth map for the modelled 'medium' risk event (equivalent to the 1 in 100 year event - 1%) in Figure 9 shows that the main dwellings would remain unaffected by flooding. Flood depths could reach up to 600mm within the garden of no.95 and up to 300mm within the garden of no.97.

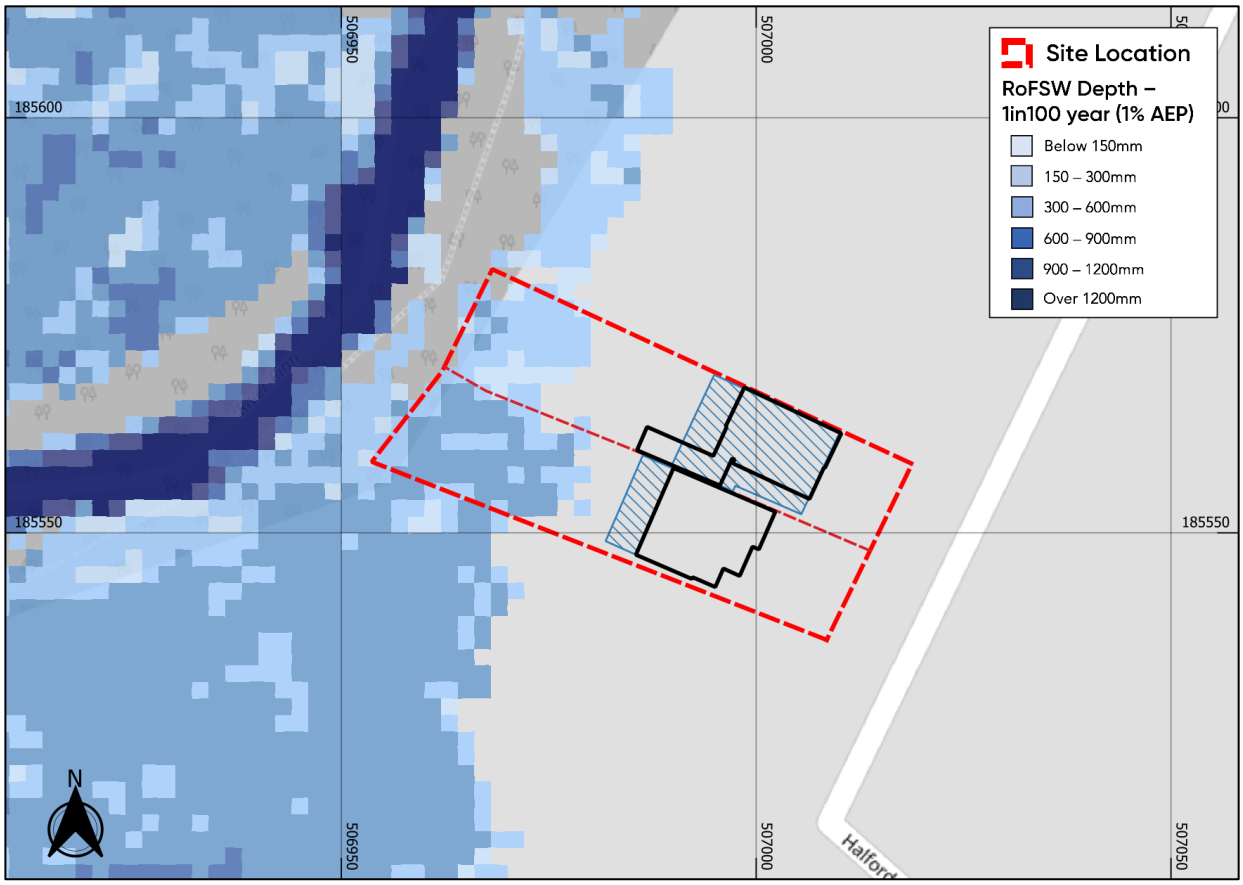


Figure 9: RoFSW, 1in100 Year Depths (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, EA RoFSW: © Environment Agency copyright and/or database right 2015. All rights reserved.)

RoFSW for the 1 in 1000 (0.1% AEP) - Low Risk

4.35. Analysis of the EA Surface Water Depth map for the modelled 'medium' risk event (equivalent to the 1 in 1000 year event – 0.1%) in Figure 10 shows that small section of rear the main dwellings would be affected by flooding. The proposed extension in property no.95 could experience

flood depth up to 900mm and an area at the front of the property could experience flood depths up to 300mm. However, the proposed extensions in property no.97 could experience flood depth up to 600mm.

4.36. The rear garden would be entirely affected by flooding and flood depth could reach over 1200mm within the garden of no.95 and up to 1200mm within the garden of no.97.

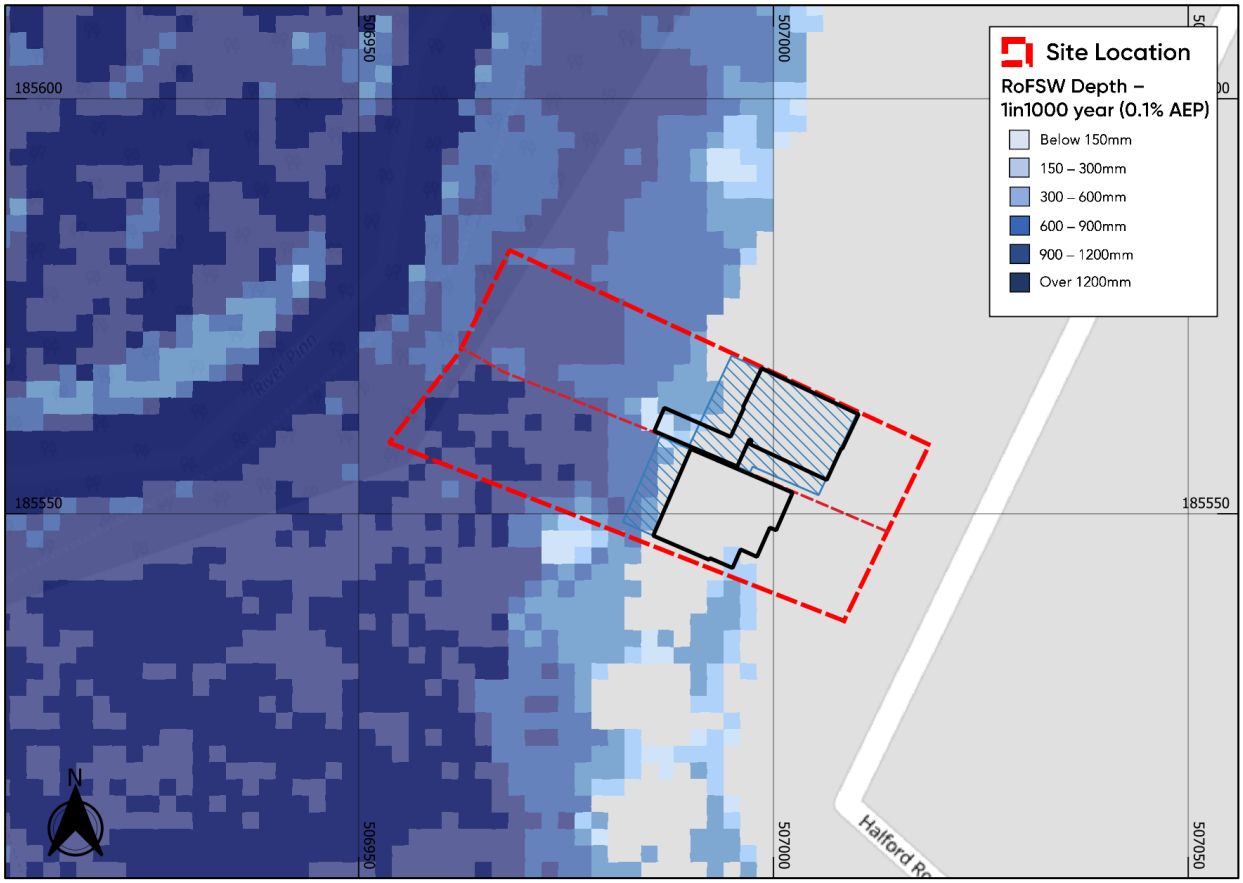


Figure 10: RoFSW, 1in1000 Year Depths (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, EA RoFSW: © Environment Agency copyright and/or database right 2015. All rights reserved.)

4.37. Whilst the EA Hazard rating to the rear of the properties is 'Moderate' (Figure 11), the front of the house is unaffected by flooding, therefore, access and egress are possible via the front.

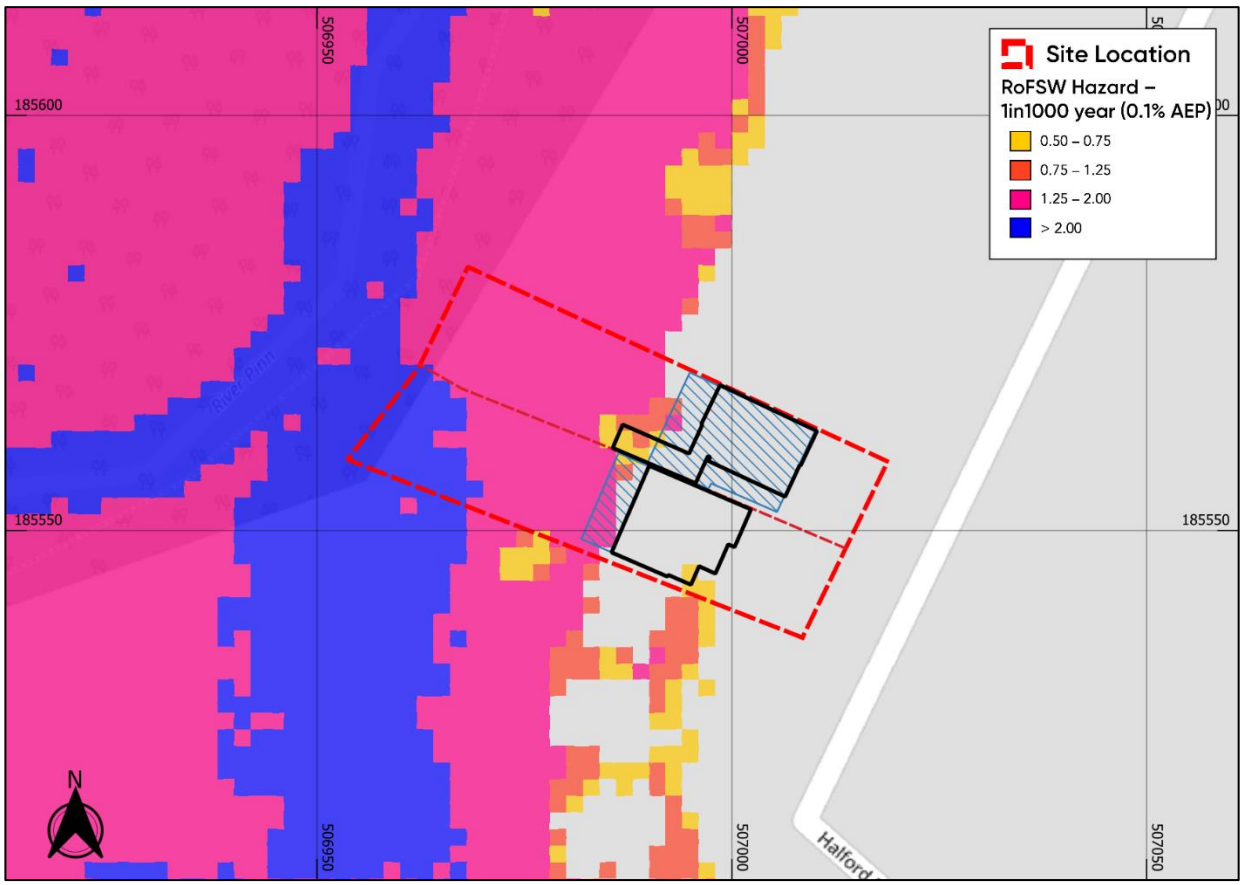


Figure 11: RoFSW, 1in1000 Year Hazard map (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors, EA RoFSW: © Environment Agency copyright and/or database right 2015. All rights reserved.)

Pluvial Flood Risk Summary

4.38. Although the site is affected in the 'medium' (1.0% AEP) and 'low' (0.1% AEP) events, the footprints of the extensions are only affected in the 0.1%AEP event where safe access/egress is still possible. Therefore, the proposed development is only affected in the low risk modelled pluvial event, as such the risk of flooding is considered to be low.

Reservoirs

4.39. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.40. According to the EA's Flood Risk from Reservoirs mapping in Figure 12, the rear of the site is at risk of flooding in the event of a breach at the Ruislip Lido reservoir. The reservoir failure model is a 'dry day' scenario meaning that it could be caused by reservoir walls failing due to old age, accident, or because excess flood water has been added to the reservoir.

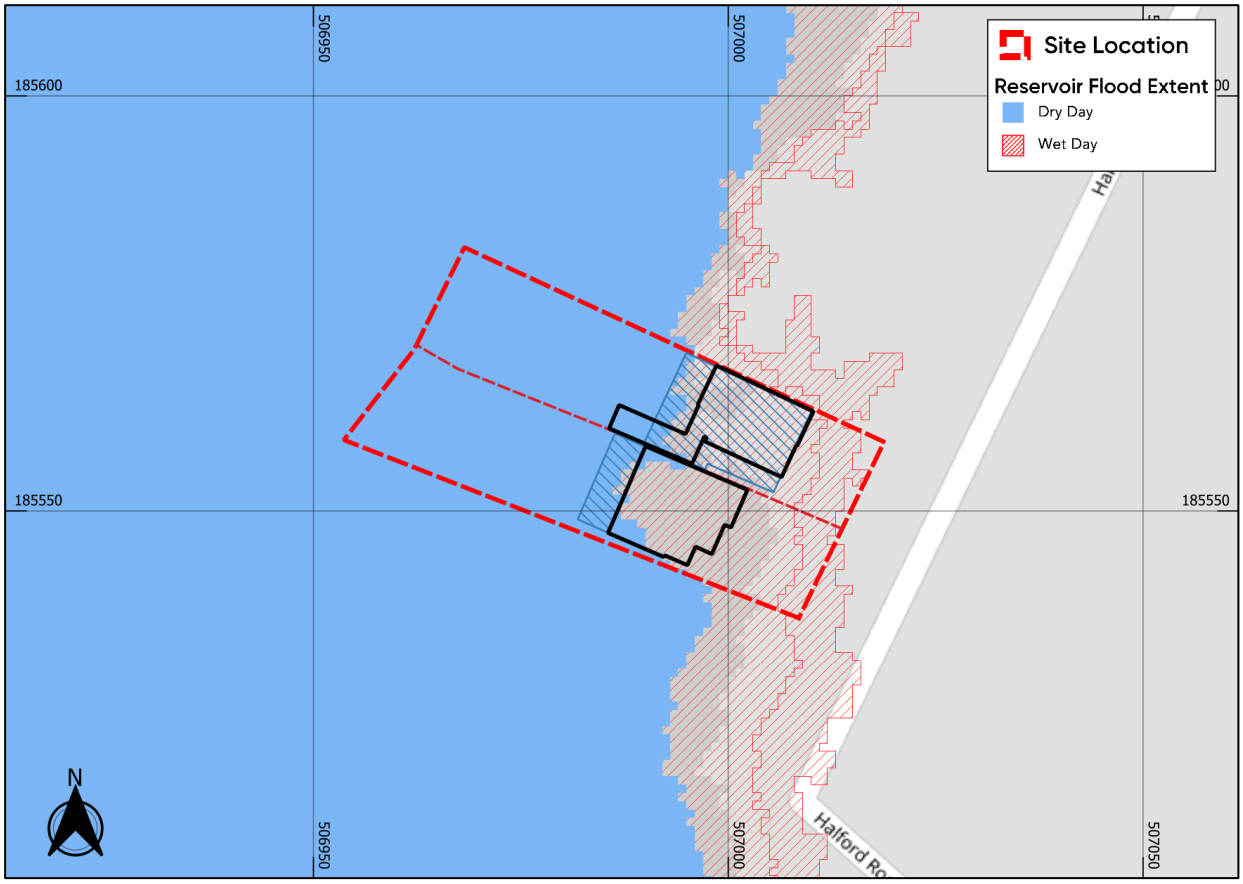


Figure 12: EA Reservoir Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors. © Environment Agency copyright and/or database right 2015. All rights reserved.)

4.41. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the Reservoirs Act 1975 in England and Wales. The EA are responsible to ensure that reservoirs are inspected regularly, and essential safety work carried out. As reservoirs are highly managed the maximum flood extent provided in the EA Risk of Flooding from Reservoirs mapping is considered a worst-case scenario. As reservoir flooding is unlikely and the modelled flood depths are based on the worst-case scenario, flooding from this source may be considered as a relatively low risk.

Groundwater

4.42. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.

4.43. The British Geological Survey's (BGS) mapping shows superficial deposits of Alluvium comprising Clay, Silt, Sand and Gravel underlying the site. The bedrock underlying the site is Lambeth Group comprising Clay, Silt and Sand.

4.44. The West London SFRA (2018) includes the EA's Areas Susceptible to Groundwater Flooding mapping. The site is within a 1km square grid of which less than 25% has been marked as being susceptible to groundwater flooding (Figure 13**Error! Reference source not found.**).

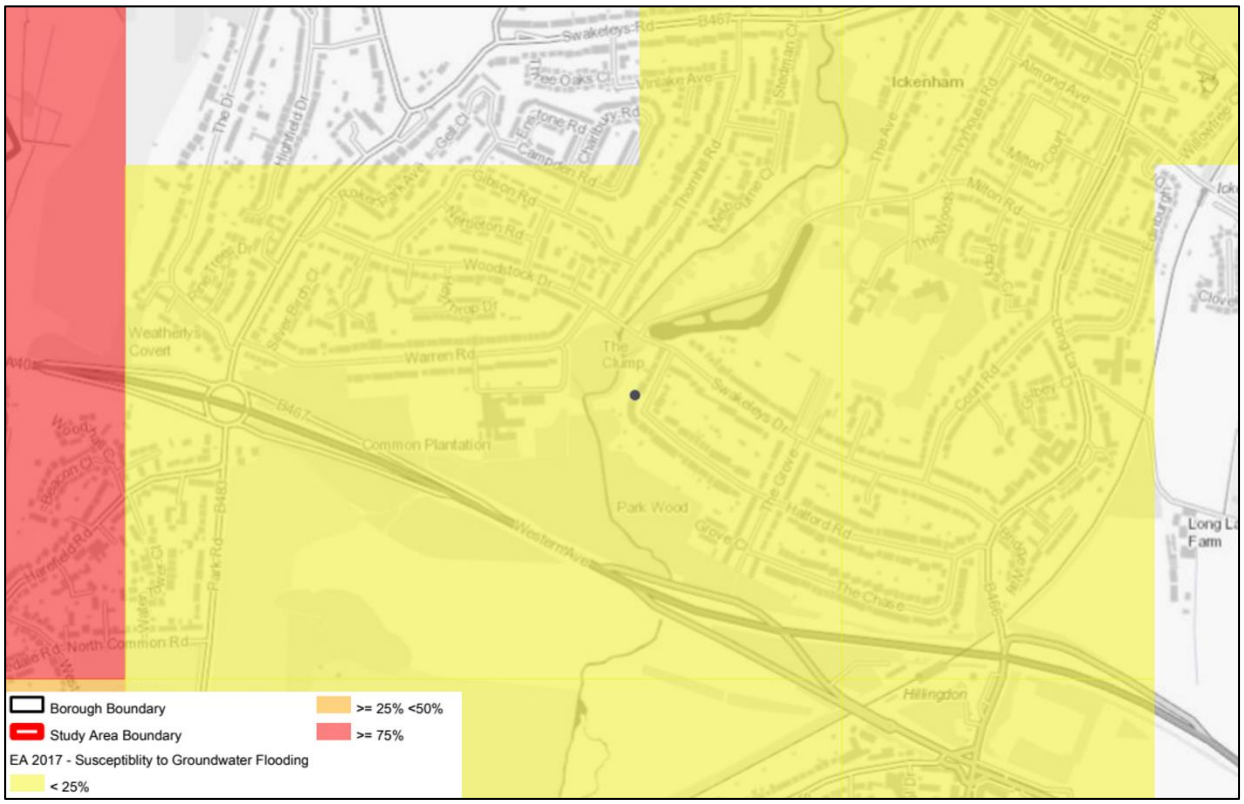


Figure 13: Areas Susceptible to Groundwater Flooding, (West London SFRA) (Site Location at Black Dot)

4.45. Historic BGS online borehole records were reviewed and the nearest borehole (Ref: TQ08NE52) is approximately 334.77m south of the site. The records indicate the presence of clay and gravel, at 36m ground level. However, water level was not recorded.

4.46. Furthermore, the PFRA presents contains mapping of areas with potential for elevated groundwater levels (Figure 14). The site is shown to be neither on permeable superficial deposits

nor on a consolidated aquifer. Additionally, the map shows that there are no recorded groundwater flooding incidents in the vicinity of the site in any records.

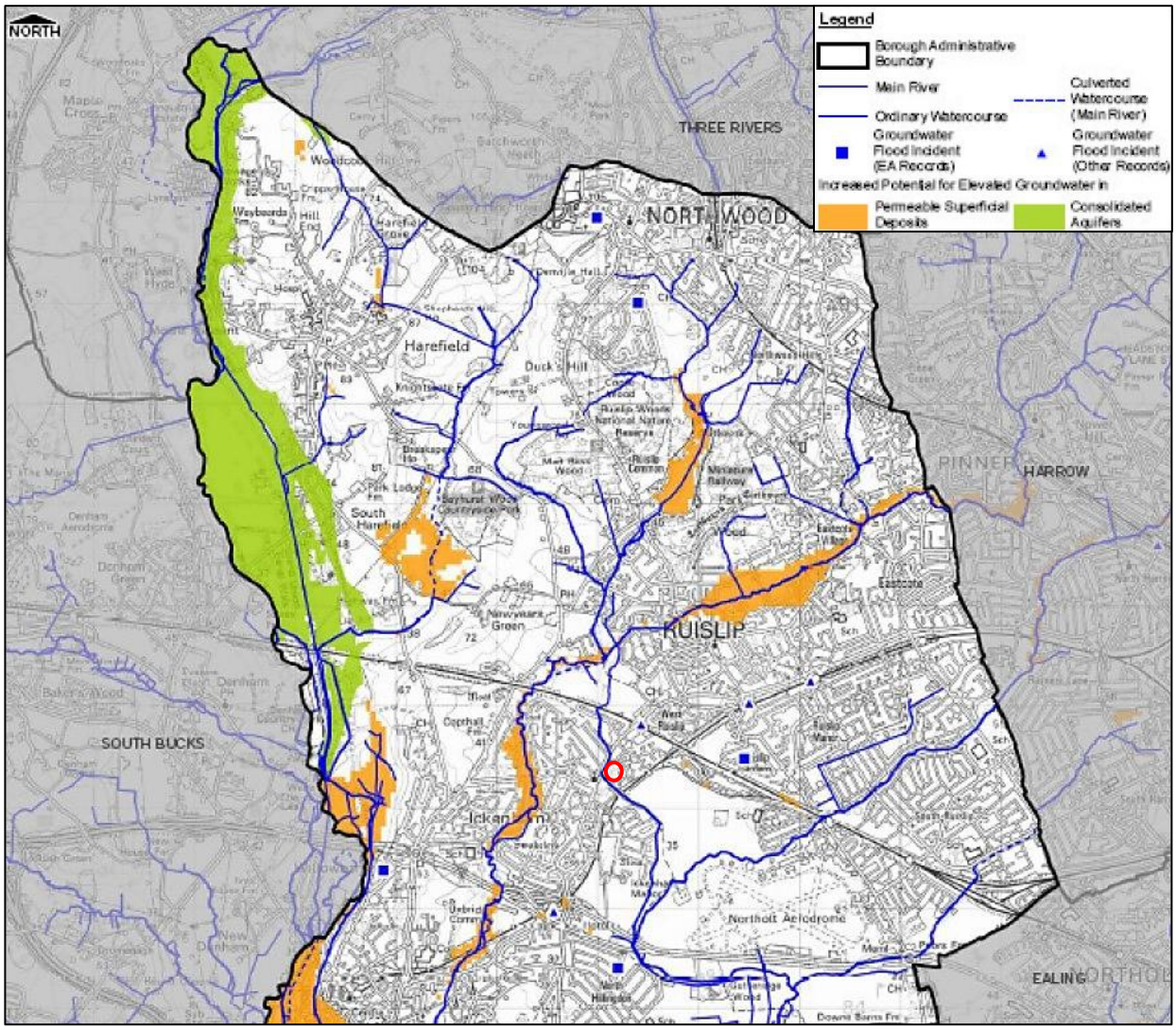


Figure 14: Potential for Elevated Groundwater (source: London Borough of Hillingdon PFRA 2011); the approximate location of the site is marked by the red circle.

4.47. Taking the above into consideration, and as the development proposals do not include any proposed basements the risk from groundwater to the development is considered to be low.

Sewers

4.48. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.

4.49. The PFRA provides mapping of historical sewer flood incident records kept by the local authority (Thames Water). The site is shown to be in the area 'UB10 8' where 11-20 sewer incidents (internal and external) were recorded between December 2011 and June 2017 (addendum by London Borough of Hillingdon 2017) or 11-20 incidents as of 2010 (Hillingdon PFRA 2011) (Figure 15).

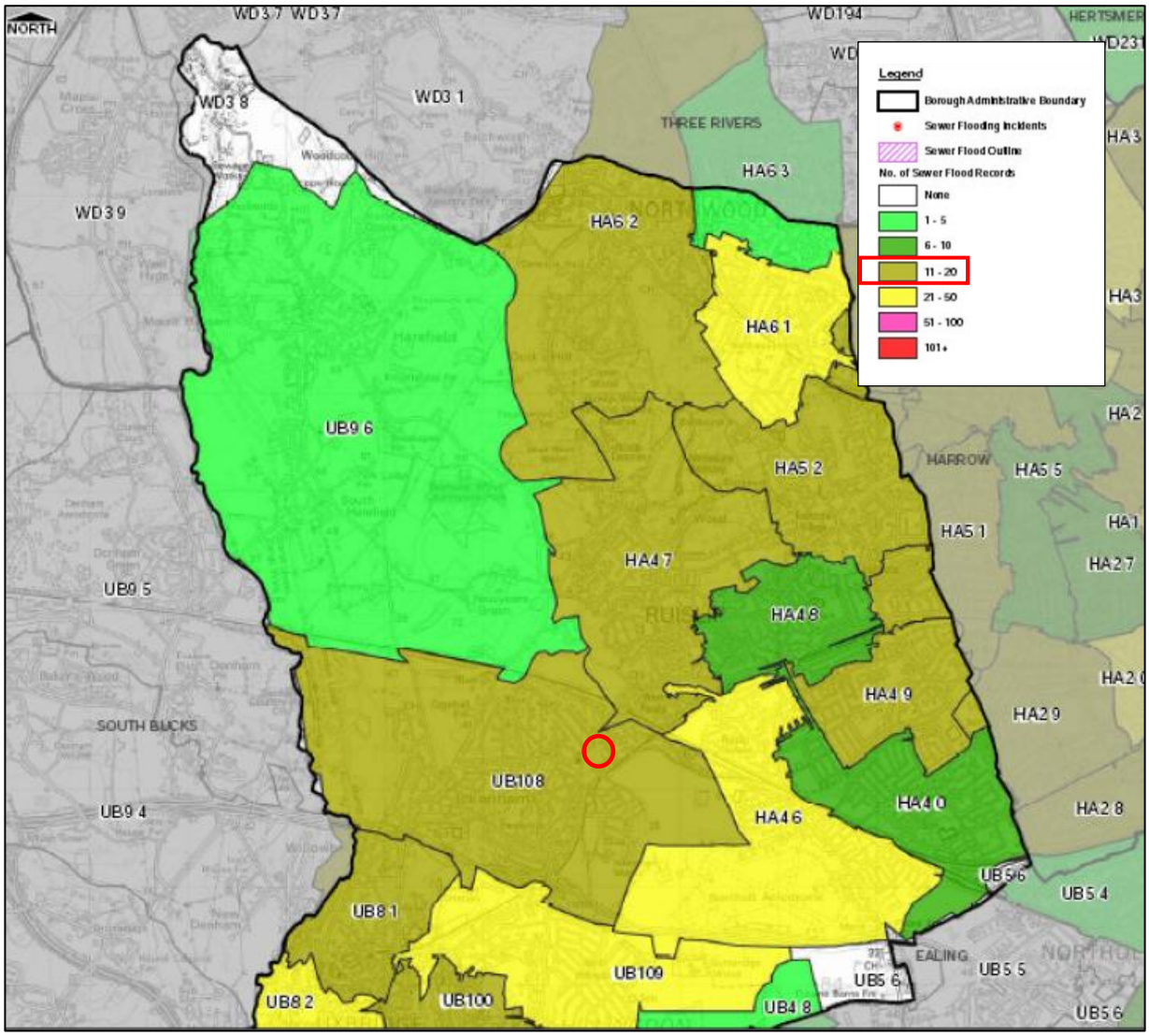


Figure 15: Historic Sewer Flooding Incidents (source: London Borough of Hillingdon PFRA 2011); the approximate location of the site is marked by the red circle.

4.50. The proposed development is considered a 'Minor' Development and as such, given the type of development and the lack of specific recorded incidents (data from West London SFRA is provided at a 4-digit postcode level) at the site location from this source, the risk of flooding from this source is considered to be relatively low.

5. Flood Risk Mitigation

Fluvial

5.1. Based on the EA Flood Map for Planning and Product 4 data, the risk of flooding from fluvial sources is considered to be medium. However, based on the EA Product 4 data, in the defended modelled 1.0% AEP+20%CC event, only a section at the rear of property no.95 could be affected by fluvial flooding.

5.2. This FRA has shown that small section of the proposed development and the rear garden would be affected during the modelled 1:100 year and 1:100 year+20%CC events. In line with EA Standing Advice for Minor Extensions, where it is not possible to raise the floor level 300mm above the design flood level, finished floor levels (FFLs) of the proposed extensions should be set no lower than those of the existing dwelling.

5.3. Furthermore, the extension should be constructed in a flood resilient manner in accordance with the DCLG Report, *Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007).* The report states that for a flood depth less than 300mm a "water exclusion" strategy should be adopted using flood resistance measures. These could include, but not limited to, the measures listed below:

- Solid (i.e. concrete floors) with waterproof screed.
- Raised wiring and power outlets at ground level.
- Units to be raised on legs above plinth.
- Waterproof plasterboard used at ground floor.
- Air brick covers to be installed.
- Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.
- Patio/front doors may be susceptible to ingress of flood water. Any PVC window/door sills should be adequately sealed. Double glazing should be used to provide resistance against external flood water pressure. Of concern would be excessive water pressure on the glazing of patio doors. Flood door/barrier is recommended.
- Puddle Pump/Wet Vac to enable the efficient dewatering of the properties in the event of water ingress (should be kept internally).

- Residents should sign to the EA Flood Warning Service (River Pinn).

Pluvial

5.4. It has been shown that although the site is affected in the modelled 1.0%AEP and 0.1%AEP events, the footprints of the extensions are only affected in the 0.1%AEP event. Therefore, the proposed development is only affected in the low risk modelled pluvial event, as such the risk of flooding is considered to be low. No specific mitigation measures are required given the low risk level at the proposed development. The mitigation required for fluvial flooding should provide additional protection against the 0.1% AEP event.

5.5. Access/egress are unaffected during the high (3.3% AEP) and medium (1% AEP) pluvial events but may be affected during the low risk (0.1%) event. However, the front of the house is unaffected by flooding, therefore, access and egress are possible via those area.

Other Sources

5.6. Flood risk from all other sources is deemed to be low, therefore no mitigation other than that recommended above is required.

Offsite Impacts

5.7. The West London SFRA (2018) states the following requirements for Minor Development site specific Flood Risk Assessments within Hillingdon;

> *If permissible development decreases the volume of a fluvial floodplain or surface water flood area, flood storage compensation must be provided. The compensatory storage provided must equal or exceed the storage lost to ensure there will be no net loss of flood storage. Where developments are proposed within Flood Zone 3a (surface water), floodplain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling.*

5.8. As such, Compensatory Flood Storage (CFS) is required to evidence that the proposed development can be achieved without increasing flood risk elsewhere.

5.9. Firstly, to calculate how much compensatory storage is required, the volume of flood water displacement in the modelled 1:100 year+20%CC allowance event (1.0%AEP+20%CC) should

be calculated. It should be noted that the proposed extension to property no.97 lies above the modelled 1.0%AEP+20%CC flood level and as such will not require CFS.

5.10. By using the 1m LiDAR data for the existing ground elevations of the site and utilising the raster surface volume tool within QGIS; the flood volume beneath the design flood level of 36.31m AOD within the extent of the extension footprint for no. 95 (i.e flood affected area), is calculated as approximately 4.00m^3.

5.11. As the majority of the rear garden of the site is within the modelled 1:100 year +20%CC fluvial flood extent, the provision of level for level compensation CFS outside the floodplain is not possible.

5.12. As such, CFS calculations have been undertaken to lower an area in the rear garden of property no.95 (approximately 13.33m^2 in total) by 300mm to provide 4.00m^3 of storage. The proposed CFS area is shown hatched in Figure 16 below.

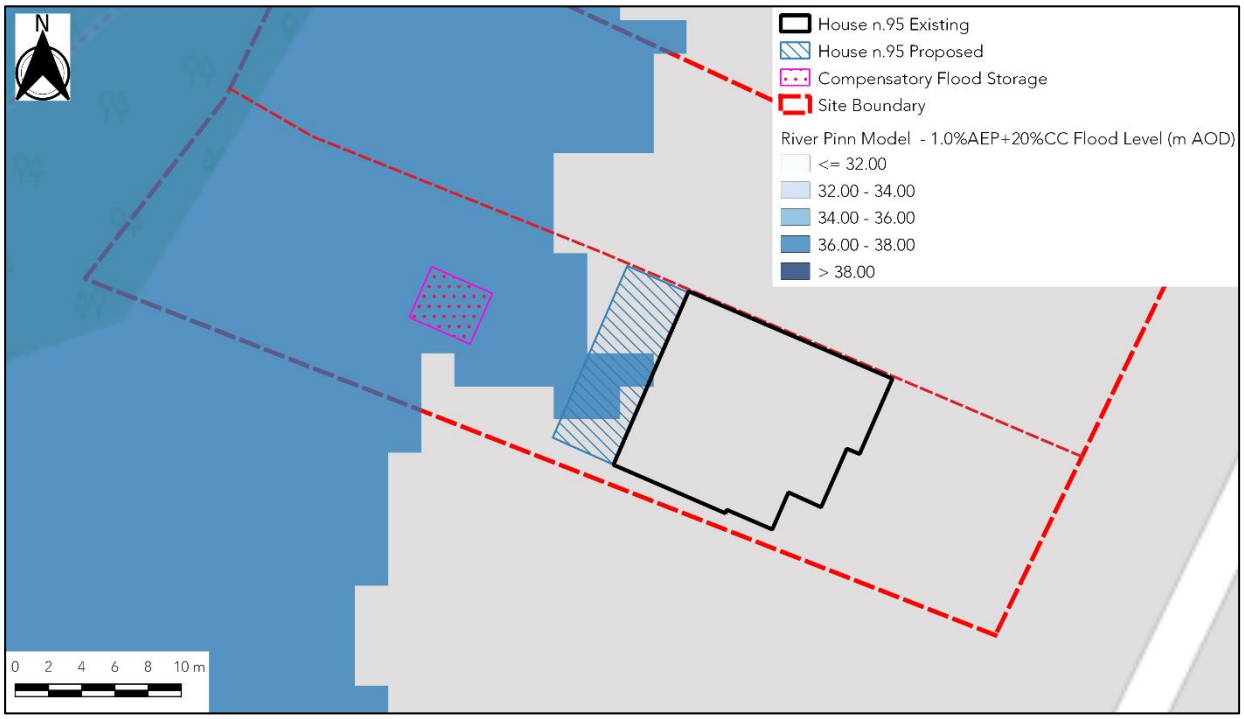


Figure 16: Proposed CFS Areas (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

5.13. Using GIS, an altered site elevation model has been generated showing the area lowered by 300mm. This is shown in Figure 17 and Figure 18, which provides cross sections of site topography using 1m LiDAR, for pre- and post-excavation situations.

5.14. The alteration to the LiDAR tile has assumed no slopes to the CFS area and as such, Figure 17 and Figure 18 indicates a 300mm drop around the CFS areas compared to existing surrounding ground levels.

5.15. As such, the calculations within this report have demonstrated that by lowering approximately 13.33m^2 in total of the rear garden by a maximum of 300mm, sufficient CFS can be provided to offset the volume displaced in the modelled 1:100 year +20%CC fluvial event by the proposed development; thus, meeting the policy requirements of Hillingdon Council.

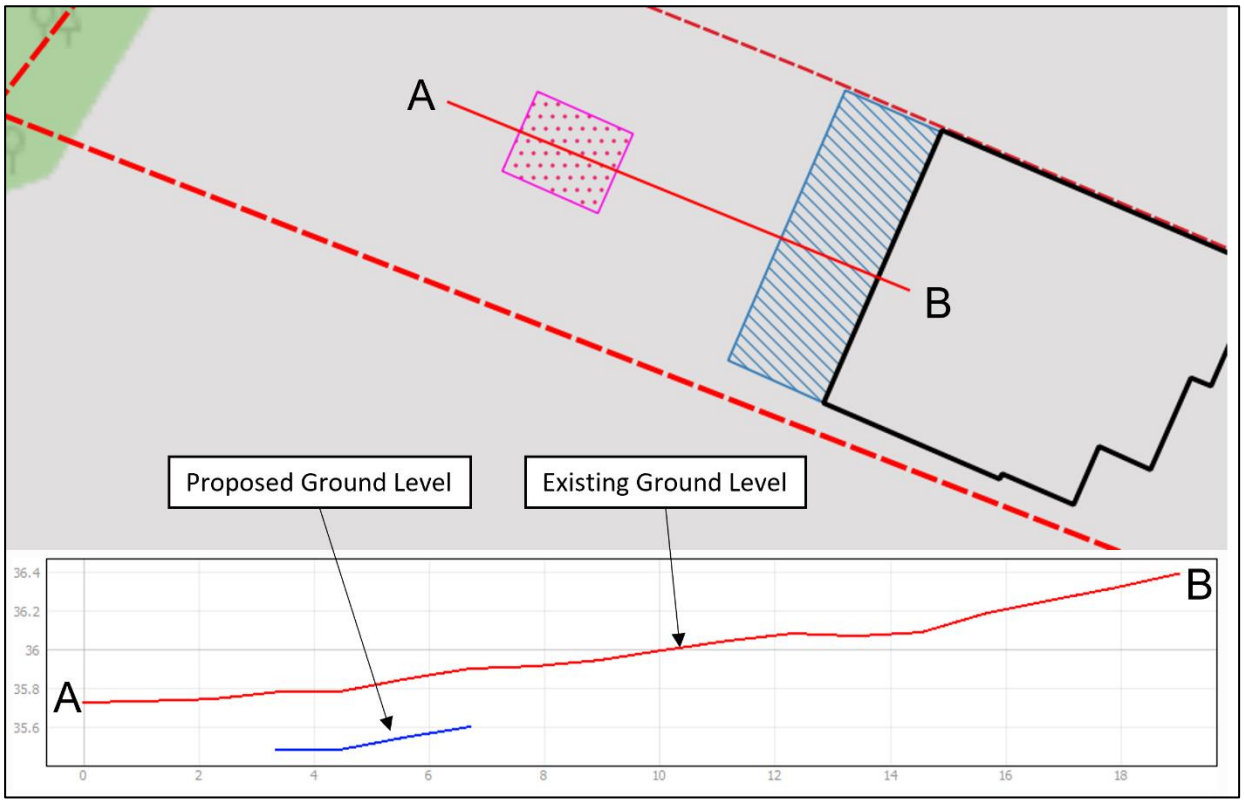


Figure 17: CFS Cross Section (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

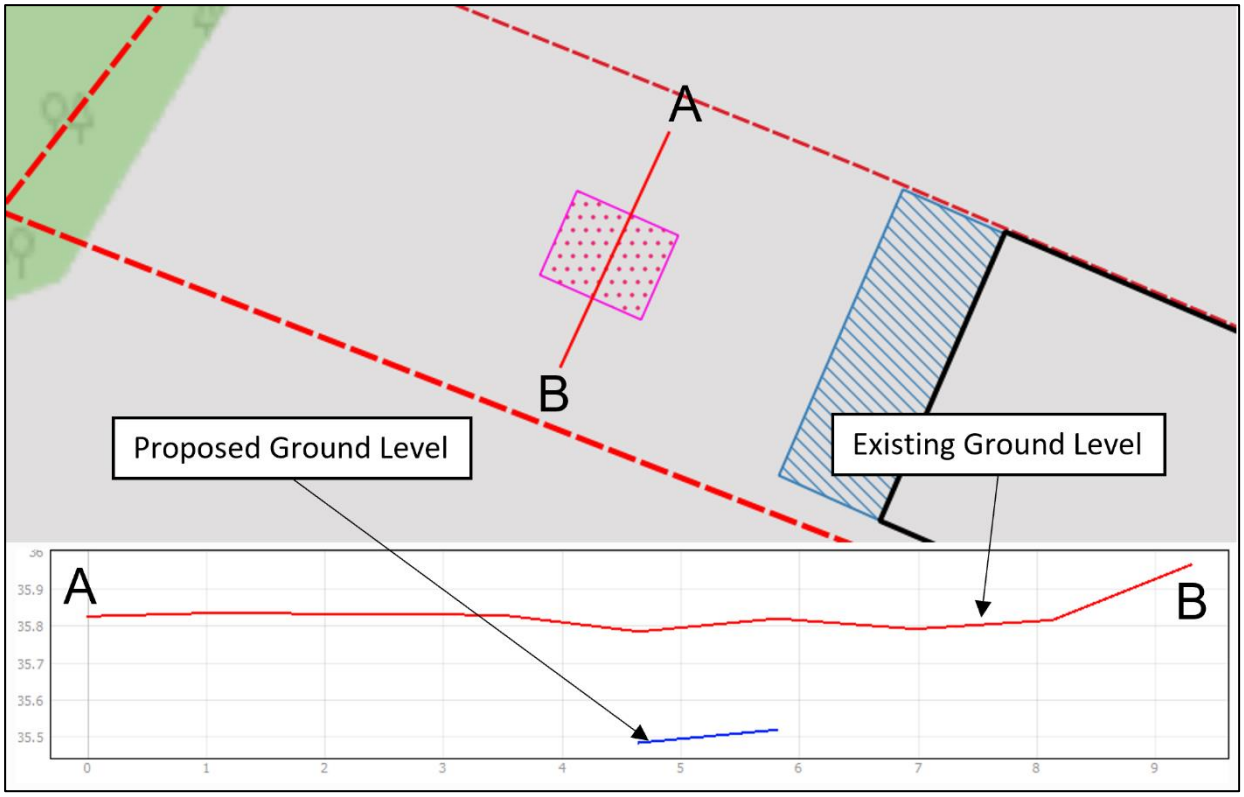


Figure 18: CFS Cross Section (Source: OpenStreetMaps © Contains public sector information licensed under the Open Government License v3.0)

Flood Warnings

5.16. The site is within River Pinn at Ickenham EA Flood Warning, and River Pinn and Woodridings Stream Alert Areas. As a further precaution and risk reduction, the owner of the site should sign up the EA flood warning service for River Pinn at Ickenham. This service allows site owners to register an address, which is at risk of flooding, along with contact details so that in the event of a flood being forecast, the site owner will be sent an alert directly to their chosen method of contact.

5.17. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of

occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site specific flood defences.

5.18. During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. The Met Office issues weather warnings up to 5 days in advance, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is also possible to stay up to date with weather warnings through the Met Office app (available on both android and apple), social media (twitter, Facebook) or email alerts. Warnings can be monitored through an Apple/Android app, Twitter or directly via emails.

6. Conclusions

6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 95 and 97 Halford Road, Ickenham, Uxbridge, London, UB10 8QA. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.

6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Fluvial	The EA flood map shows that the majority of the main dwellings from the front side are located in Flood Zone 1 area. However, small sections at the rear of the dwellings are located in Flood Zone 2 and the majority of the rear gardens are located in Flood Zone 2 and 3. This FRA has shown that small section of the proposed development and the rear garden would be affected during the modelled 1:100 year and 1:1000 year+CC events. Based on the EA Flood Map for Planning and Product 4 data, the risk of flooding from fluvial sources is considered to be medium. In line with EA Standing Advice for Minor Extensions, where it is not possible to raise the floor level 300mm above the design flood level, finished floor levels (FFLs) of the proposed extensions should be set no lower than those of the existing dwelling. The extension should be constructed in a flood resilient manner in accordance with the DCLG Report, Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007).
Pluvial	Although the site is affected in the 1.0% and 0.1%AEP events, the footprints of the extensions are only affected in the 0.1%AEP event. Therefore, the proposed development is only affected in the low risk modelled pluvial event, as such the risk of flooding is considered to be low.

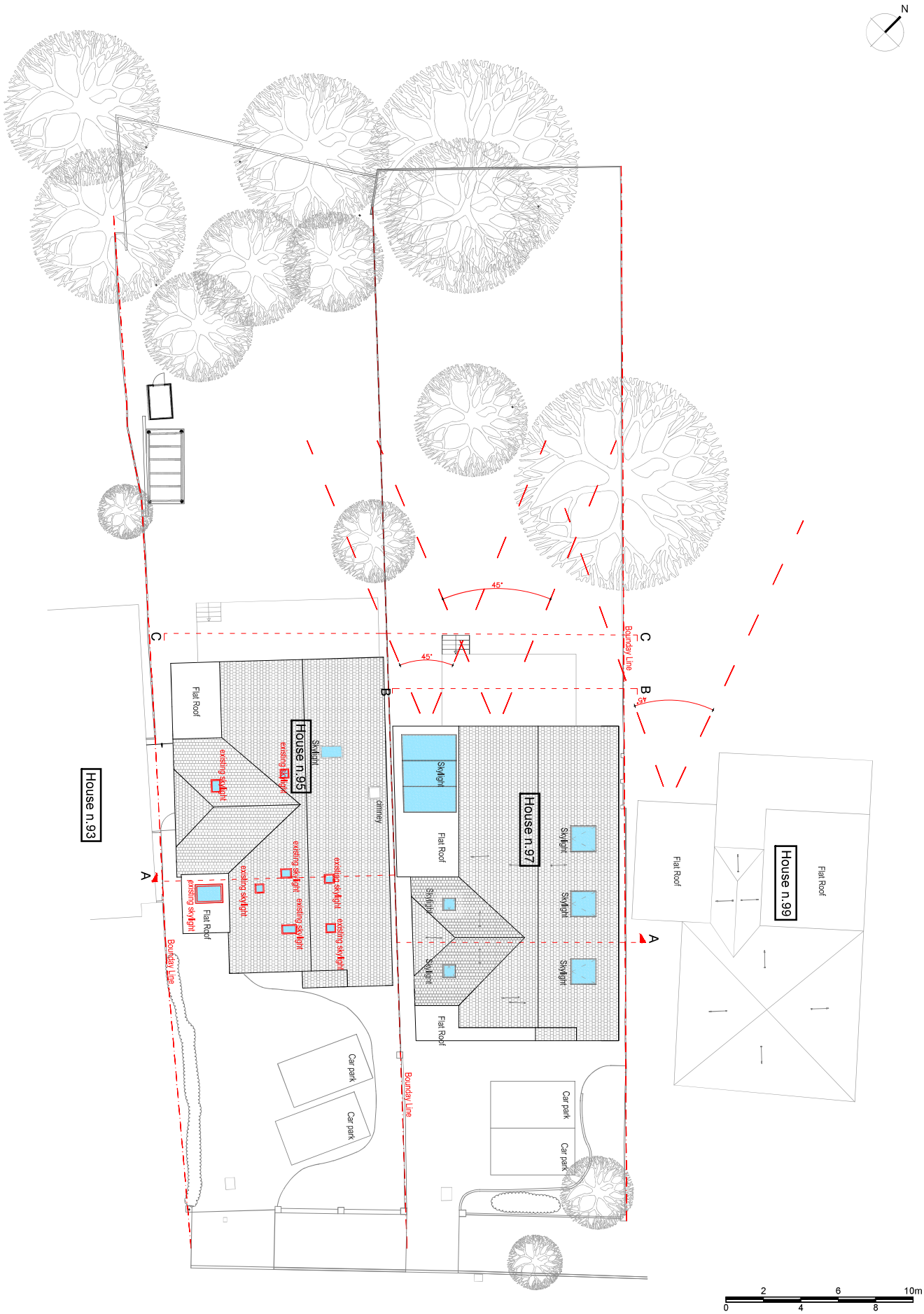
	No specific mitigation measures are required given the low risk level at the proposed development. The mitigation required for fluvial flooding should provide additional protection against the 0.1% AEP event. Access and egress are possible via the front of the properties.
Tidal Reservoirs Groundwater Sewers Canals	The site is considered to be at low risk from other sources.

6.3. This FRA has identified no prohibitive constraints in developing the proposed site for the proposed usage.

6.4. A Compensatory Flood Storage (CFS) scheme is provided within this report which has been designed to provide sufficient volumes to negate displacement of flood water in the modelled 1:100 year+20%CC, in line with Hillingdon Council guidance. Based on calculations within this report, the extension could displace a maximum of 4.00m^3 for the modelled 1:100 year+20%CC event. The proposed CFS scheme offers approximately 4.00m^3 of storage, so should provide a betterment over the existing situation. It should be noted that CFS is only required for the extension to property no.95. As a result of the proposed CFS, the proposed development is not expected to cause any increase in flood risk either onsite or elsewhere over the lifetime of the development.

6.5. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals



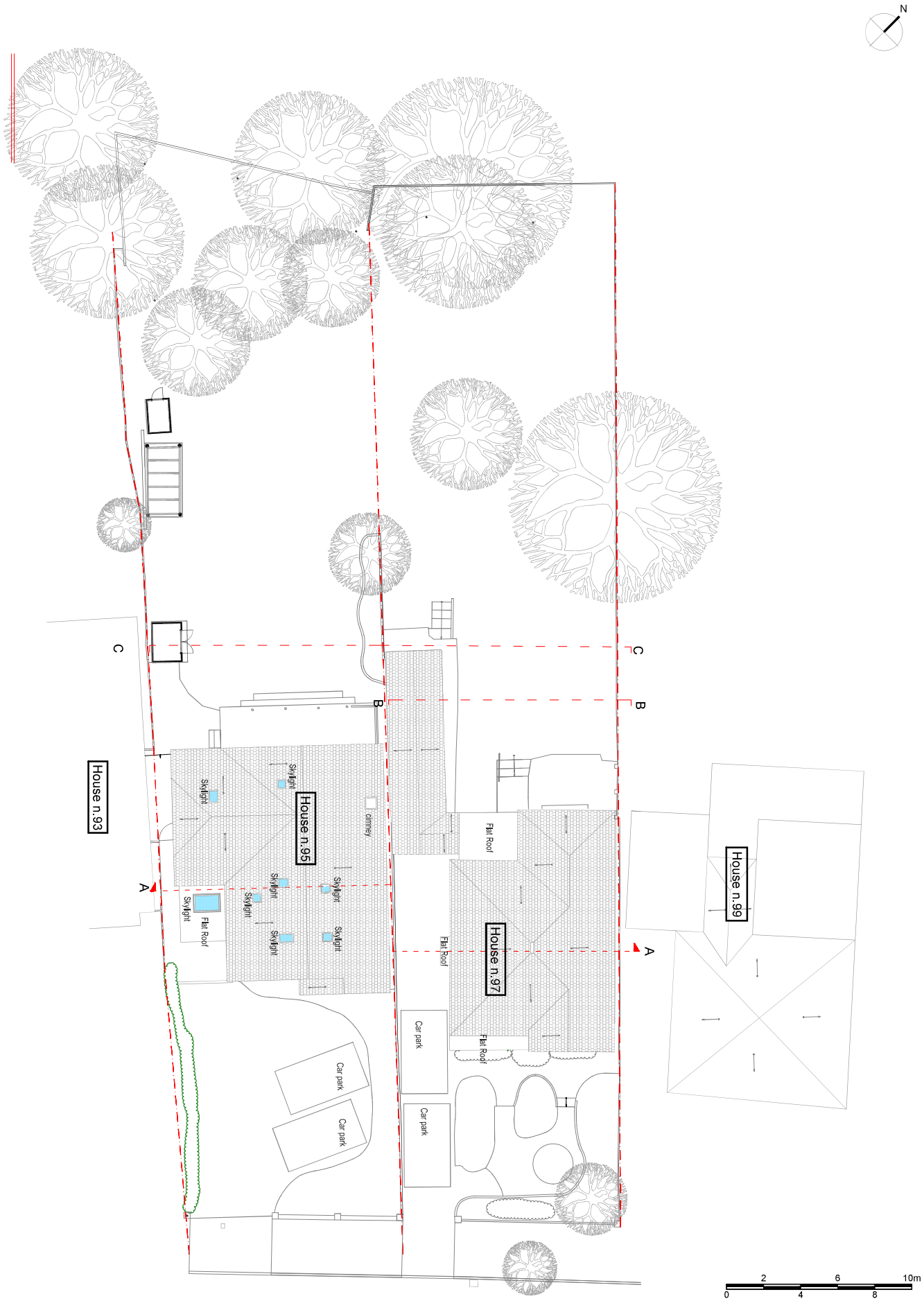
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Project stage: Planning Application	Scale: 1:200	Sheet: A3
Drawing Nr: 09		
Description: Prop. Roof Plan - n.95 and 97		
Edition - 1	Change num: 3	
File name: 97HAR_Plan Appl.dwg	Date: 1-Mar-23	

Project Address
97 Halford Road - UB10 8QA

COMMENTS:

Architecture & Design
noa@noaram.co.uk
020 78799063



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Project stage: Planning Application	Scale: 1:200	Sheet: A3
Drawing Nr: 00		
Description: Existing Roof Plan - n.95 and 97		
Edition - 1	Change num: 3	
File name: 97HAR_Plan Appl.dwg	Date: 1-Mar-23	

Project Address

97 Halford Road - UB10 8QA

COMMENTS:

Architecture & Design
noa@noaram.co.uk
020 78799063

Appendix B - Consultation

Detailed FRA centred on: 95 and 97 Halford Road, Ickenham, UB10 8QA - 27/03/2023 - HNL 304153 JH



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 50 100 200
Metres

Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

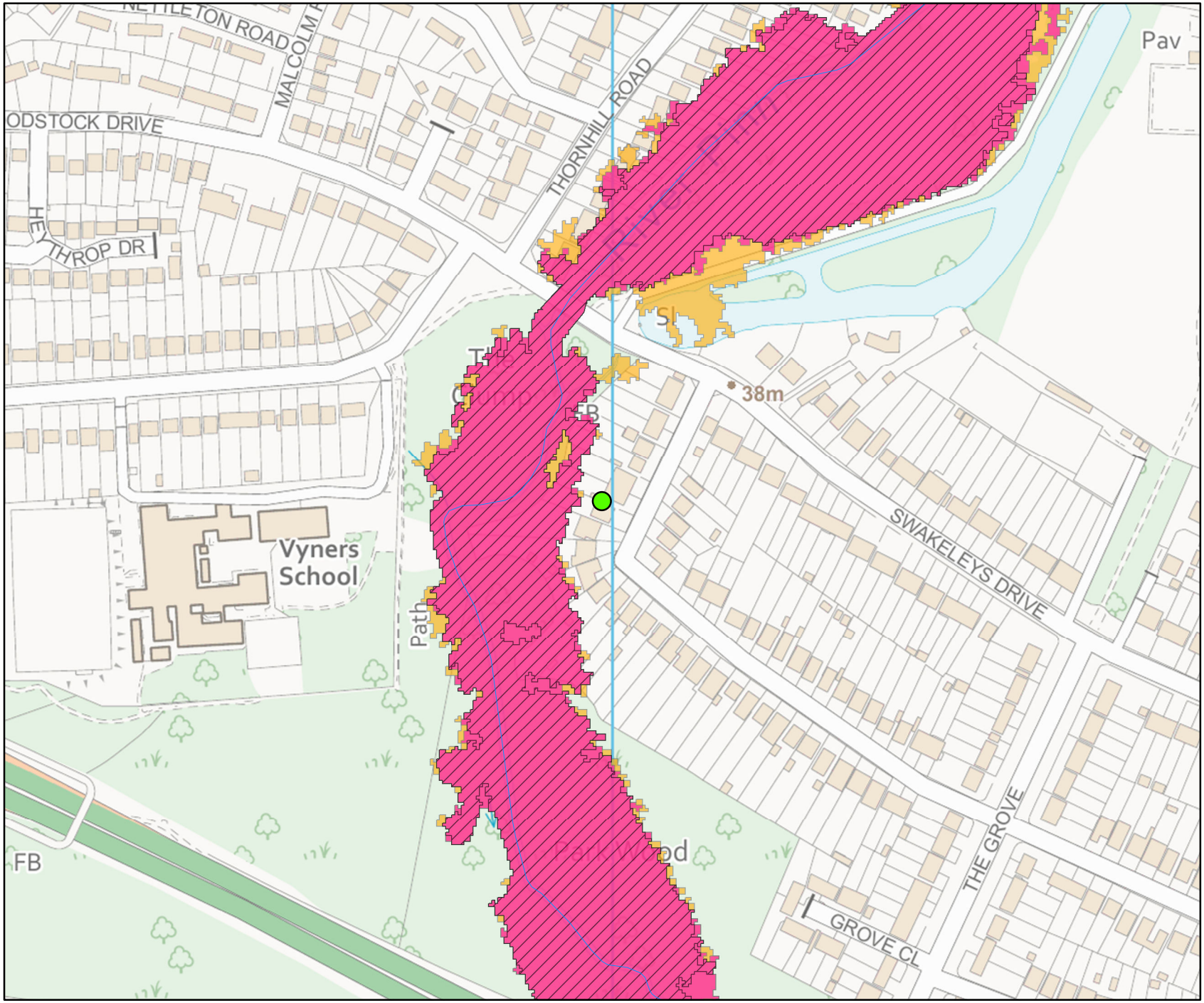
- 1 in 2 year (50%) Defended
- 1 in 5 year (20%) Defended
- 1 in 10 year (10%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.
Modelled outlines take into account catchment wide defences.
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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Detailed FRA centred on: 95 and 97 Halford Road, Ickenham, UB10 8QA - 27/03/2023 - HNL 304153 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

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0 50 100 200
Metres

Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

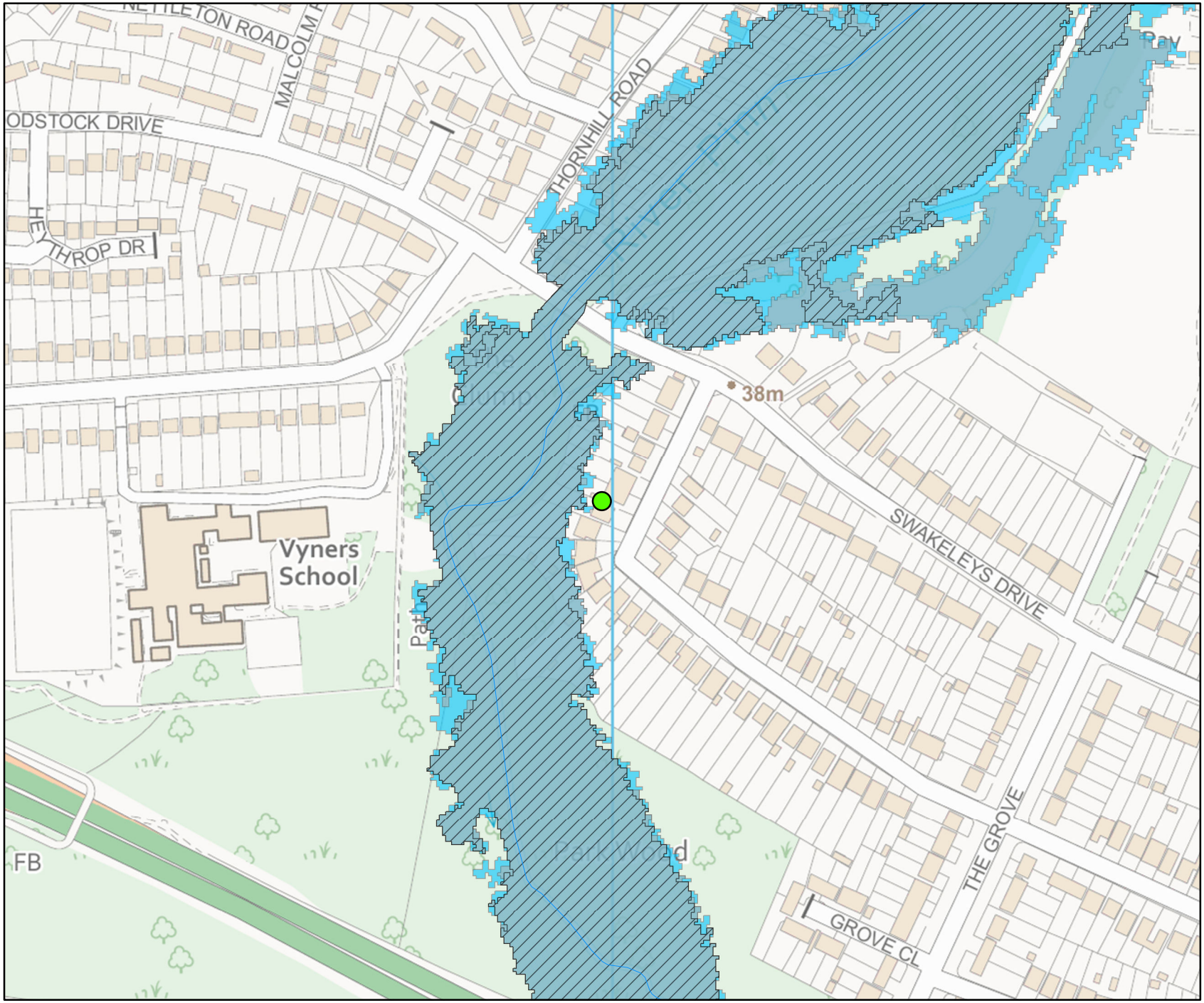
- 1 in 20 year (5%) Defended
- 1 in 30 year (3.33%) Defended
- 1 in 50 year (2%) Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.
Modelled outlines take into account catchment wide defences.
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
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0 50 100 200
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Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

- 1 in 75 year (1.33%) Defended
- 1 in 100 year (1%) Defended
- 1 in 100 year + 20% (*CC) Defended

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

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AL7 1HE

N

0 50 100 200
Metres

Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

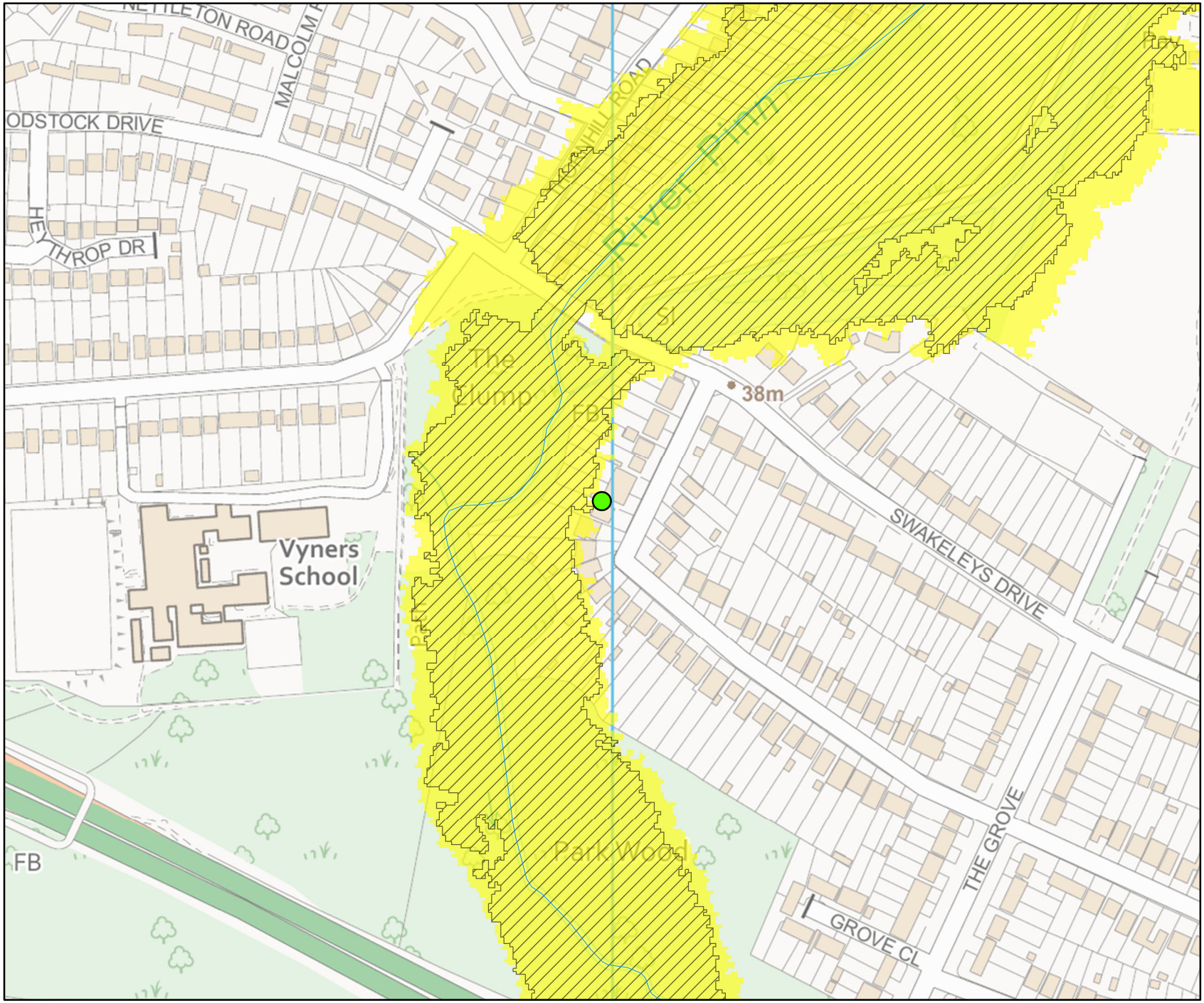
- 1 in 100 year + 25% (*CC) Defended
- 1 in 100 year + 35% (*CC) Defended
- 1 in 100 year + 70% (*CC) Defended

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0 50 100 200
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Legend

- Statutory Main Rivers
- Site location

Defended Flood Outlines

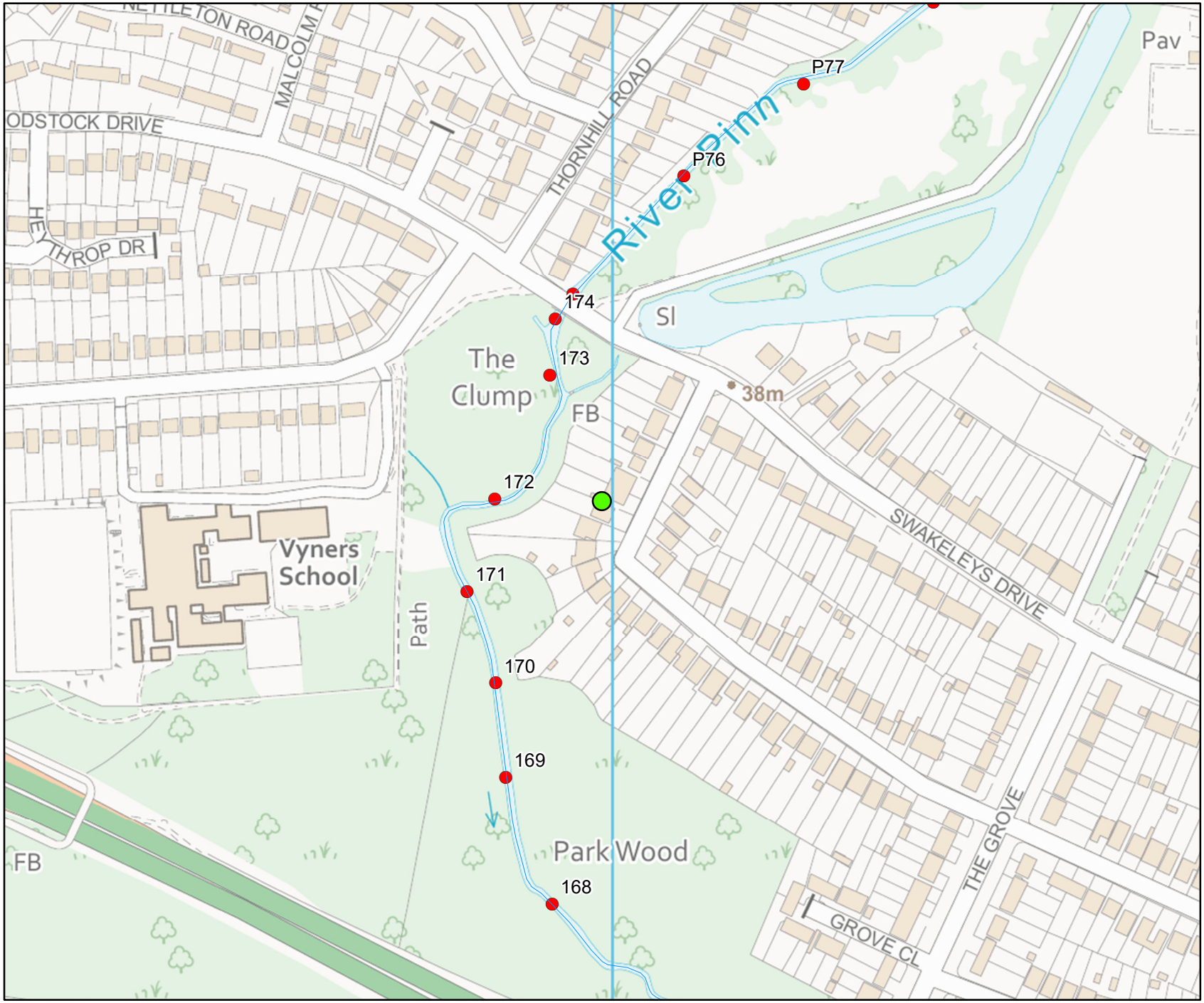
- 1 in 250 year (0.4%) Defended
- 1 in 1000 year (0.1%) Defended

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Metres

Legend

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- Site location

1D Node Results

- Nodes

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
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Environment Agency ref: HNL 304153 JH

The following information has been extracted from the River Pinn Mapping Study (JBA, 2015)

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

Caution:
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites across the entire catchment.

All flood levels are given in metres Above Ordnance Datum (mAOD)
All flows are given in cubic metres per second (cumecs)

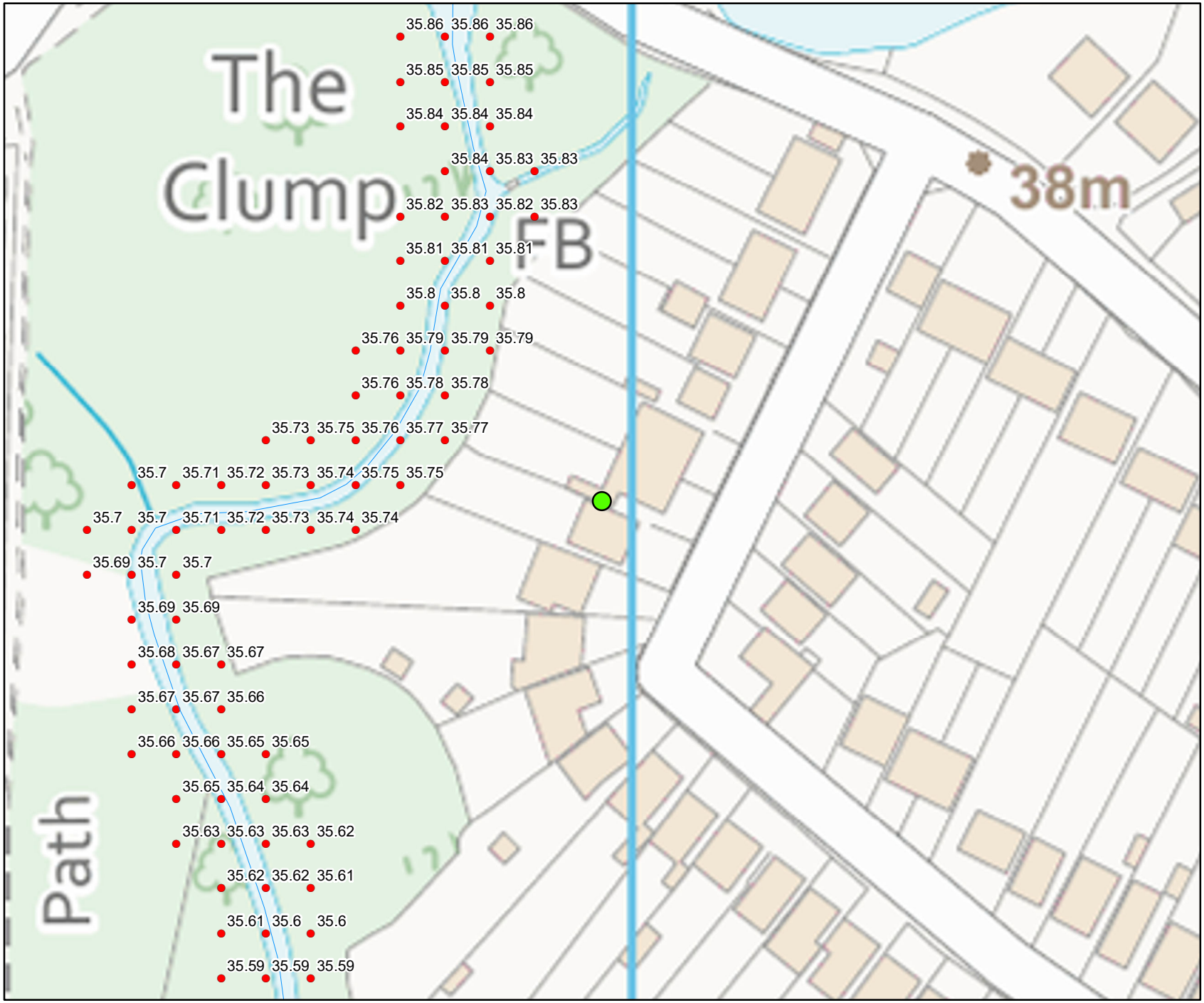
MODELLED FLOOD LEVEL

				Return Period												
Node Label	Easting	Northing	2 yr	5 yr	10 yr	20 yr	30 yr	50 yr	75 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	250 yr	1000yr
P78	507209	185882	36.15	36.35	36.44	36.52	36.55	36.60	36.65	36.68	36.81	36.84	36.90	37.12	36.87	37.24
P77	507125	185829	36.05	36.26	36.36	36.47	36.51	36.58	36.63	36.66	36.79	36.82	36.88	37.10	36.85	37.22
P76	507047	185769	35.98	36.18	36.30	36.41	36.46	36.53	36.59	36.63	36.78	36.81	36.88	37.11	36.85	37.23
P75	506975	185692	35.90	36.09	36.20	36.30	36.34	36.40	36.44	36.47	36.59	36.62	36.69	36.90	36.65	37.04
174	506963	185676	35.87	36.04	36.13	36.20	36.23	36.27	36.29	36.31	36.38	36.39	36.43	36.56	36.41	36.72
173	506960	185639	35.84	36.02	36.11	36.18	36.21	36.25	36.27	36.29	36.36	36.38	36.41	36.55	36.39	36.72
172	506924	185559	35.73	35.90	35.99	36.08	36.12	36.17	36.20	36.23	36.31	36.33	36.37	36.53	36.35	36.71
171	506906	185498	35.65	35.80	35.89	35.98	36.02	36.08	36.12	36.14	36.24	36.26	36.31	36.49	36.28	36.68
170	506925	185439	35.57	35.73	35.81	35.90	35.94	35.99	36.03	36.05	36.15	36.19	36.24	36.44	36.20	36.65
169	506931	185378	35.50	35.66	35.74	35.83	35.86	35.92	35.96	35.99	36.10	36.14	36.19	36.40	36.15	36.61
168	506961	185295	35.42	35.58	35.67	35.76	35.80	35.87	35.92	35.96	36.09	36.14	36.20	36.42	36.16	36.64

MODELLED FLOWS

				Return Period												
Node Label	Easting	Northing	2 yr	5 yr	10 yr	20 yr	30 yr	50 yr	75 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	250 yr	1000yr
P78	507209	185882	6.72	8.54	9.94	11.00	11.24	11.54	11.75	11.94	12.33	12.42	12.57	12.92	12.54	13.29
P77	507125	185829	6.71	8.30	8.99	9.22	9.28	9.33	9.32	9.32	9.27	9.25	9.22	9.11	9.24	9.82
P76	507047	185769	6.71	8.21	8.62	8.97	9.05	9.09	9.09	9.08	9.03	9.01	8.98	8.82	8.99	8.70
P75	506975	185692	6.82	8.63	9.93	11.62	12.42	13.65	14.63	15.31	17.98	18.59	19.87	23.67	19.26	24.69
174	506963	185676	6.82	8.63	9.93	11.62	12.42	13.65	14.63	15.31	17.98	18.59	19.87	23.67	19.26	24.69
173	506960	185639	6.82	8.63	9.81	11.14	11.69	12.55	13.28	13.76	15.76	16.21	17.14	20.31	16.70	21.54
172	506924	185559	6.82	8.52	9.25	9.63	9.70	9.78	9.88	9.99	10.35	10.41	10.67	11.37	10.60	12.00
171	506906	185498	6.92	8.74	9.76	10.77	11.07	11.34	11.55	11.77	12.21	12.24	12.41	13.15	12.42	13.95
170	506925	185439	6.92	8.73	10.00	11.50	12.16	13.10	13.87	14.35	15.51	15.54	15.90	16.30	15.94	16.68
169	506931	185378	6.92	8.70	9.82	11.13	11.68	12.31	12.67	12.89	13.69	13.76	14.17	15.45	14.09	16.60
168	506961	185295	6.92	8.45	9.19	9.97	10.09	10.16	10.20	10.23	10.26	10.23	10.23	10.22	10.26	10.23

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N

0 15 30 60
Metres

Legend

Statutory Main Rivers

Site location

2D Node Results: Heights

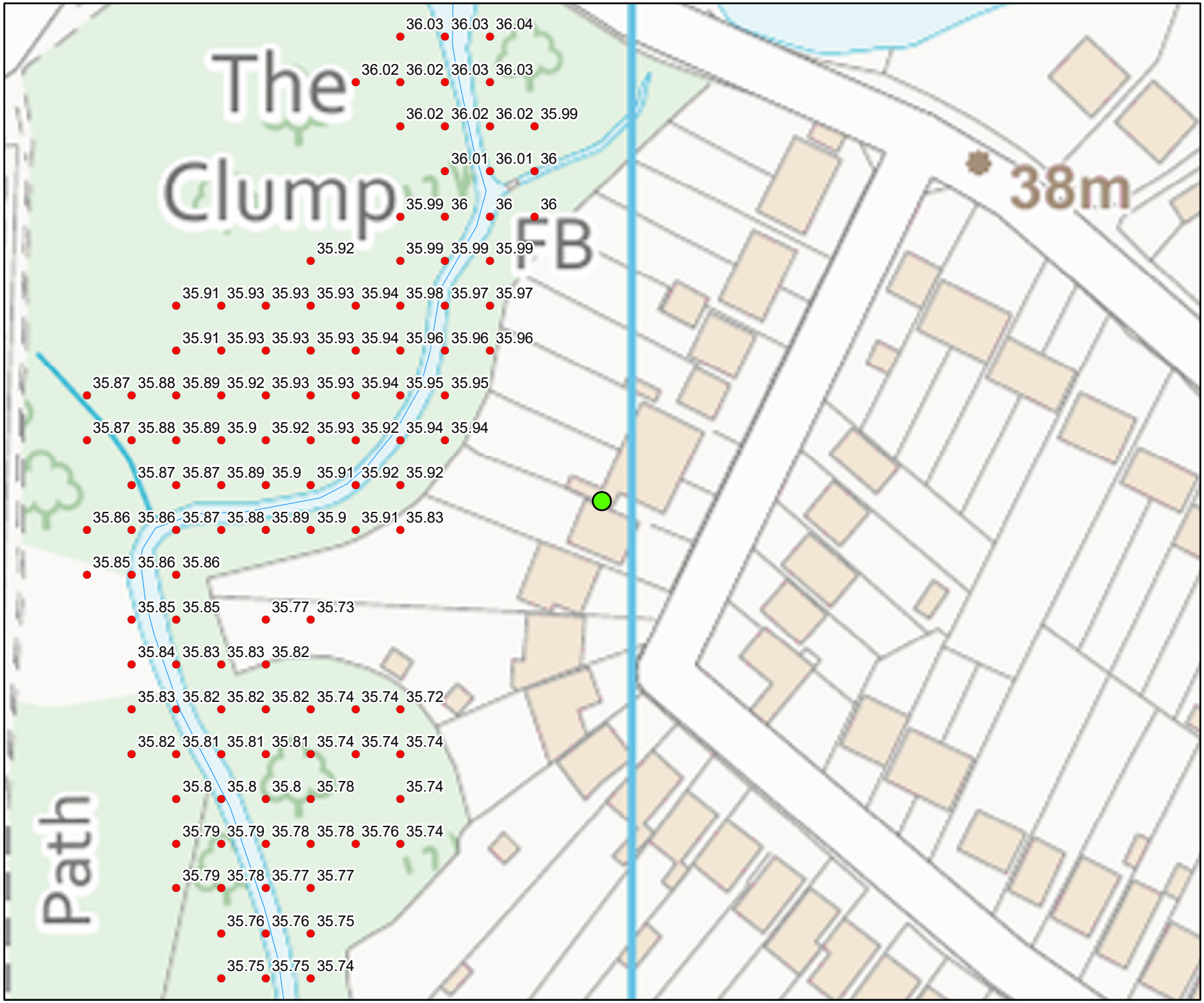
1 in 2 year (50%) Defended

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Legend

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- Site location

2D Node Results: Heights

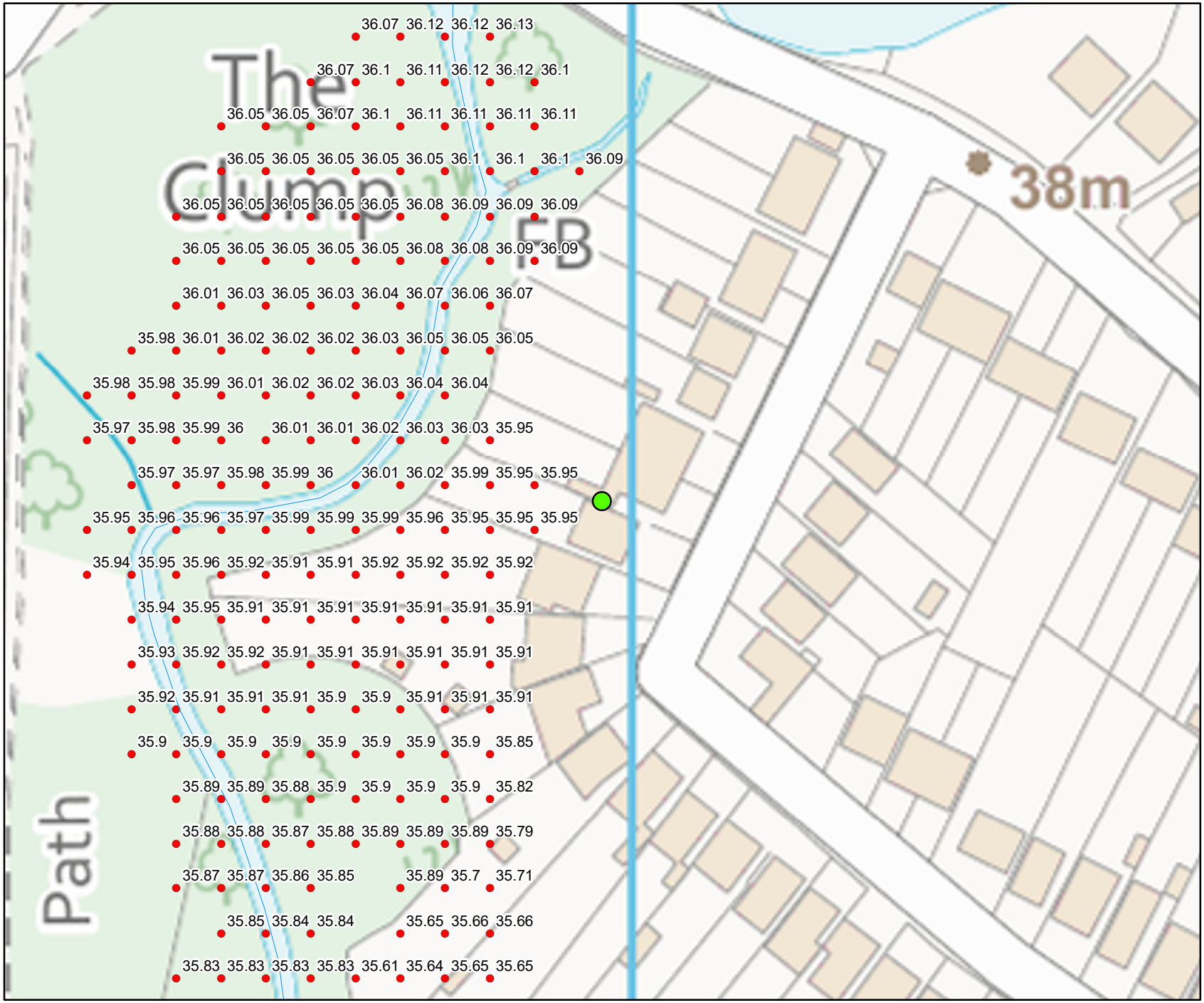
- 1 in 5 year (20%) Defended

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0 15 30 60
Metres

Legend

Statutory Main Rivers

Site location

2D Node Results: Heights

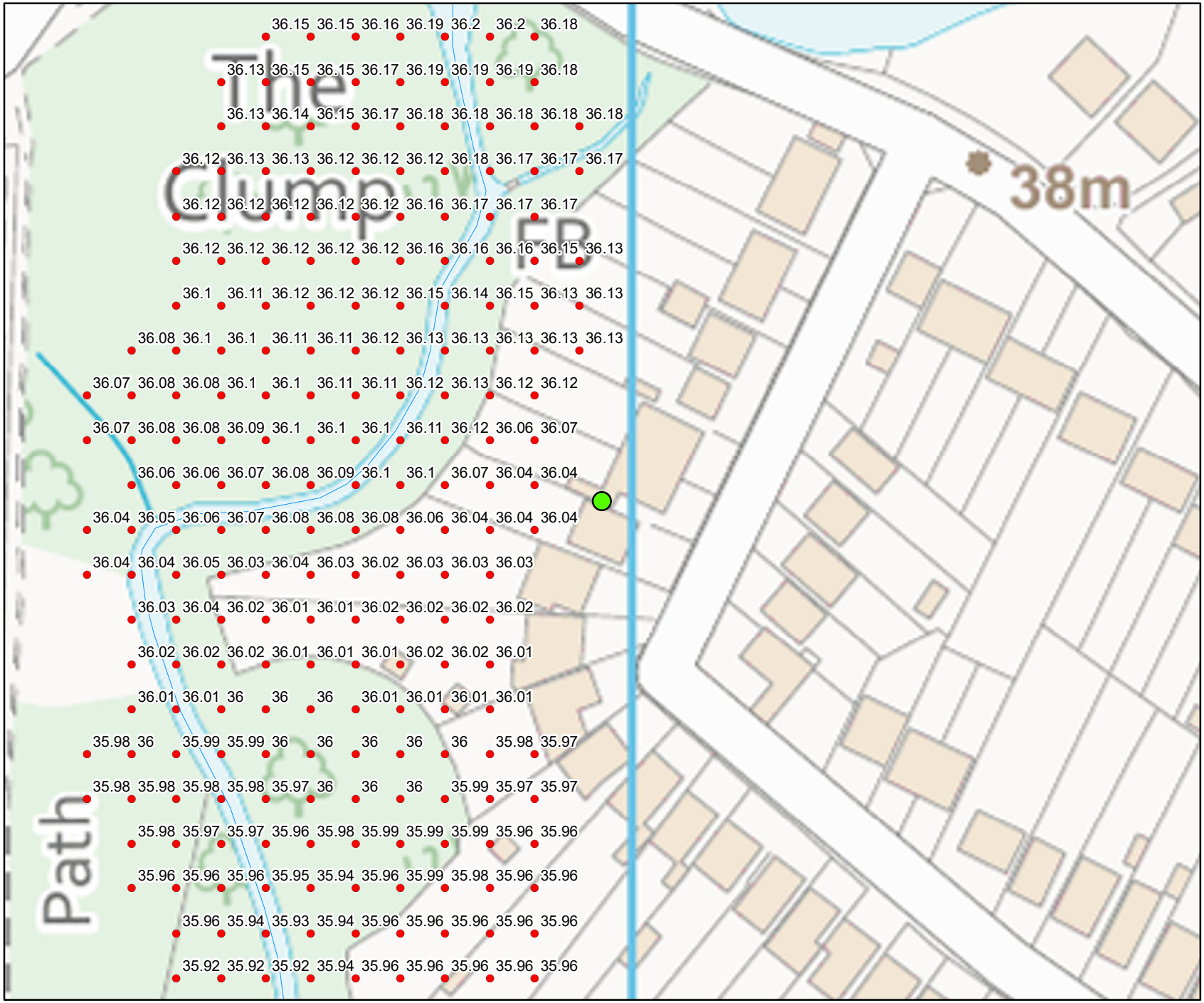
1 in 10 year (10%) Defended

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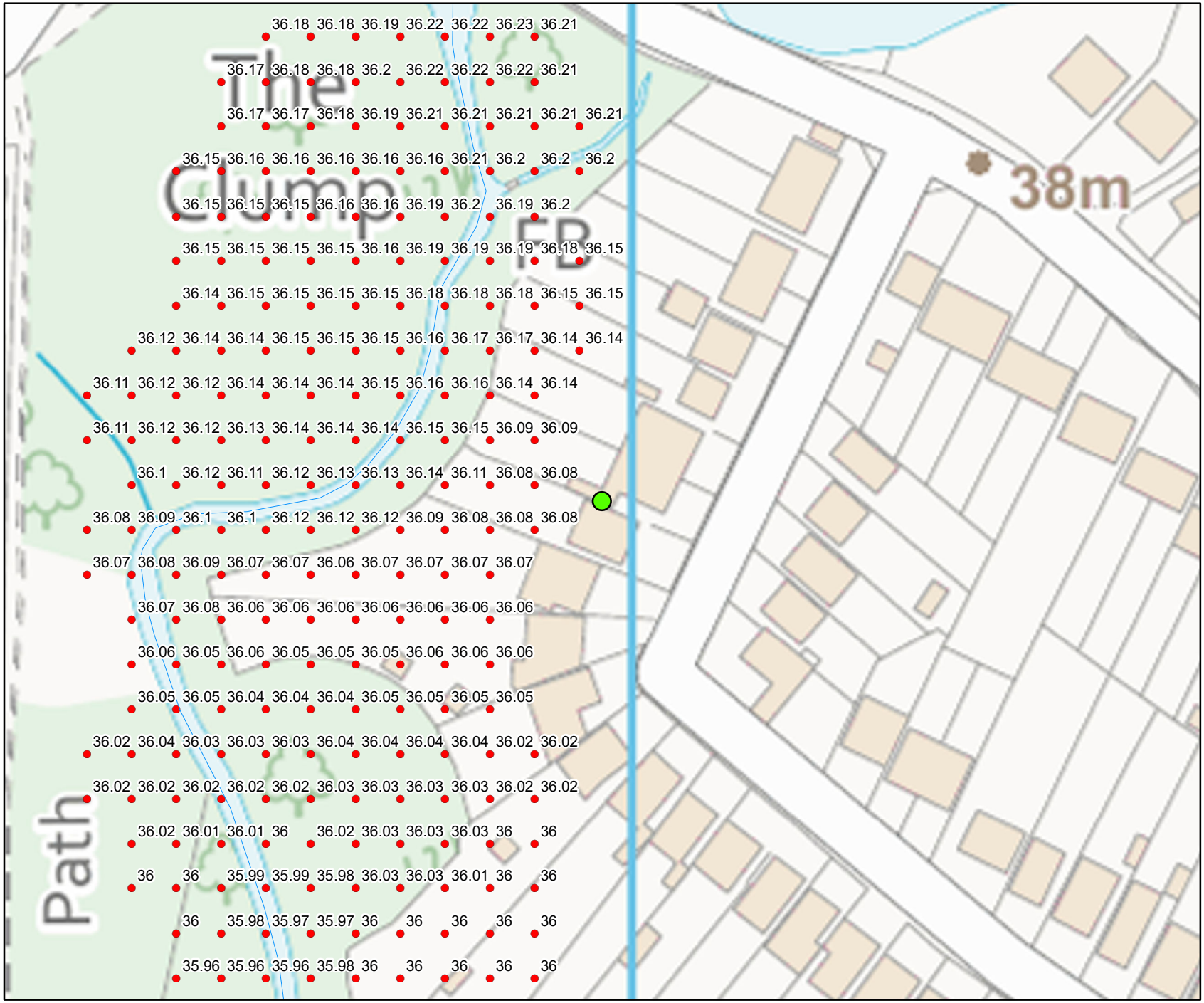
1 in 20 year (5%) Defended

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Site location

2D Node Results: Heights

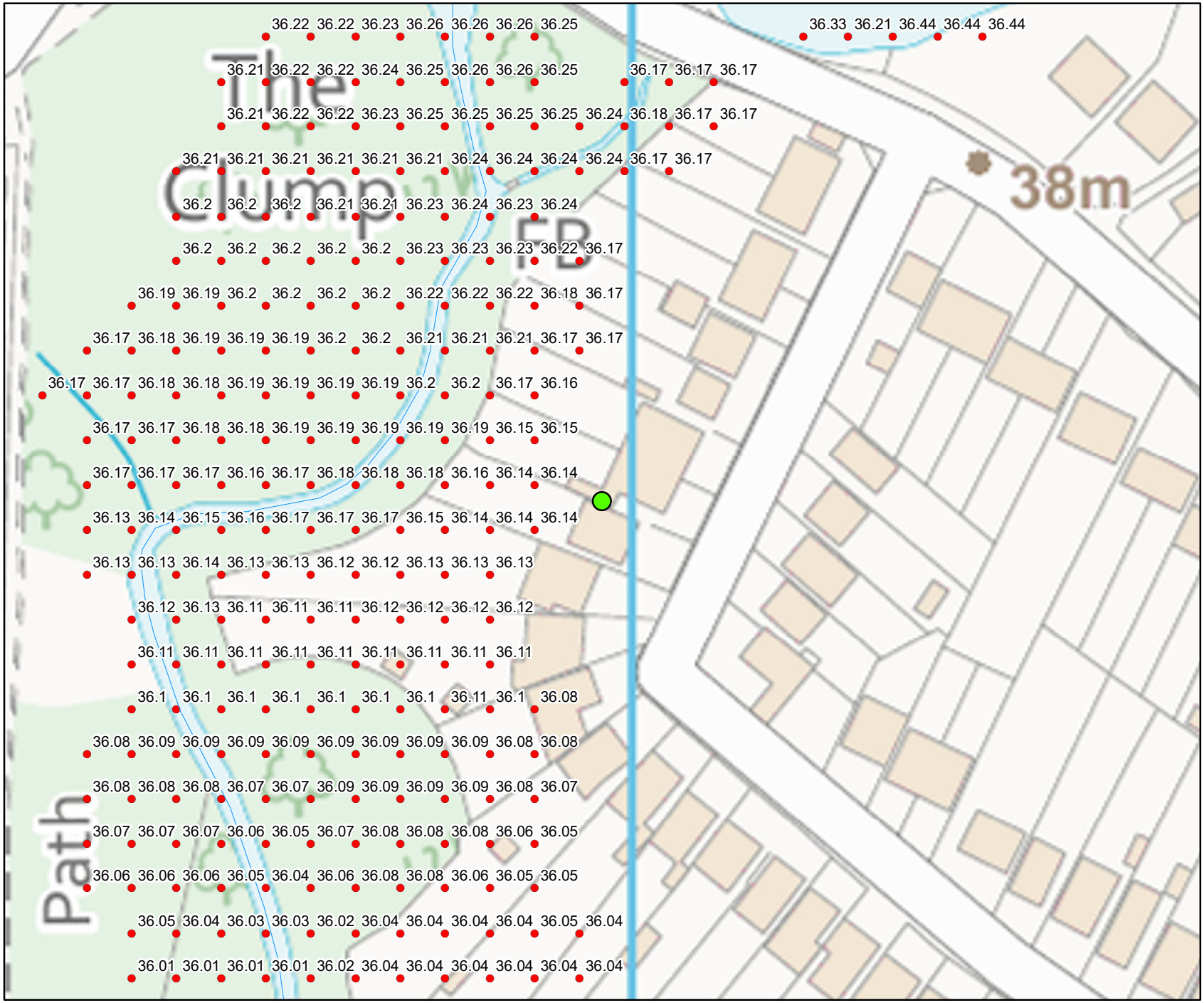
1 in 30 year (3.33%) Defended

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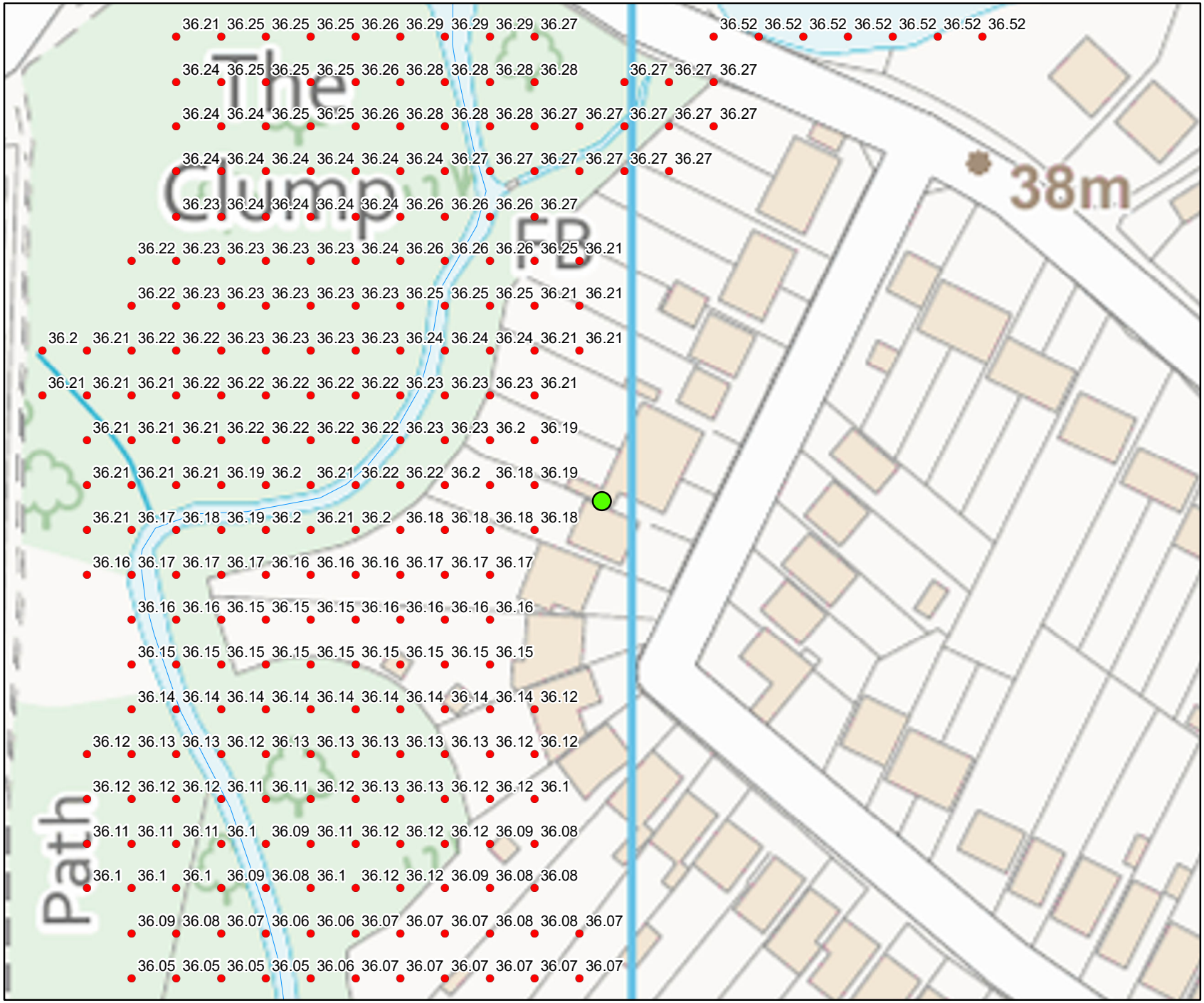
1 in 50 year (2%) Defended

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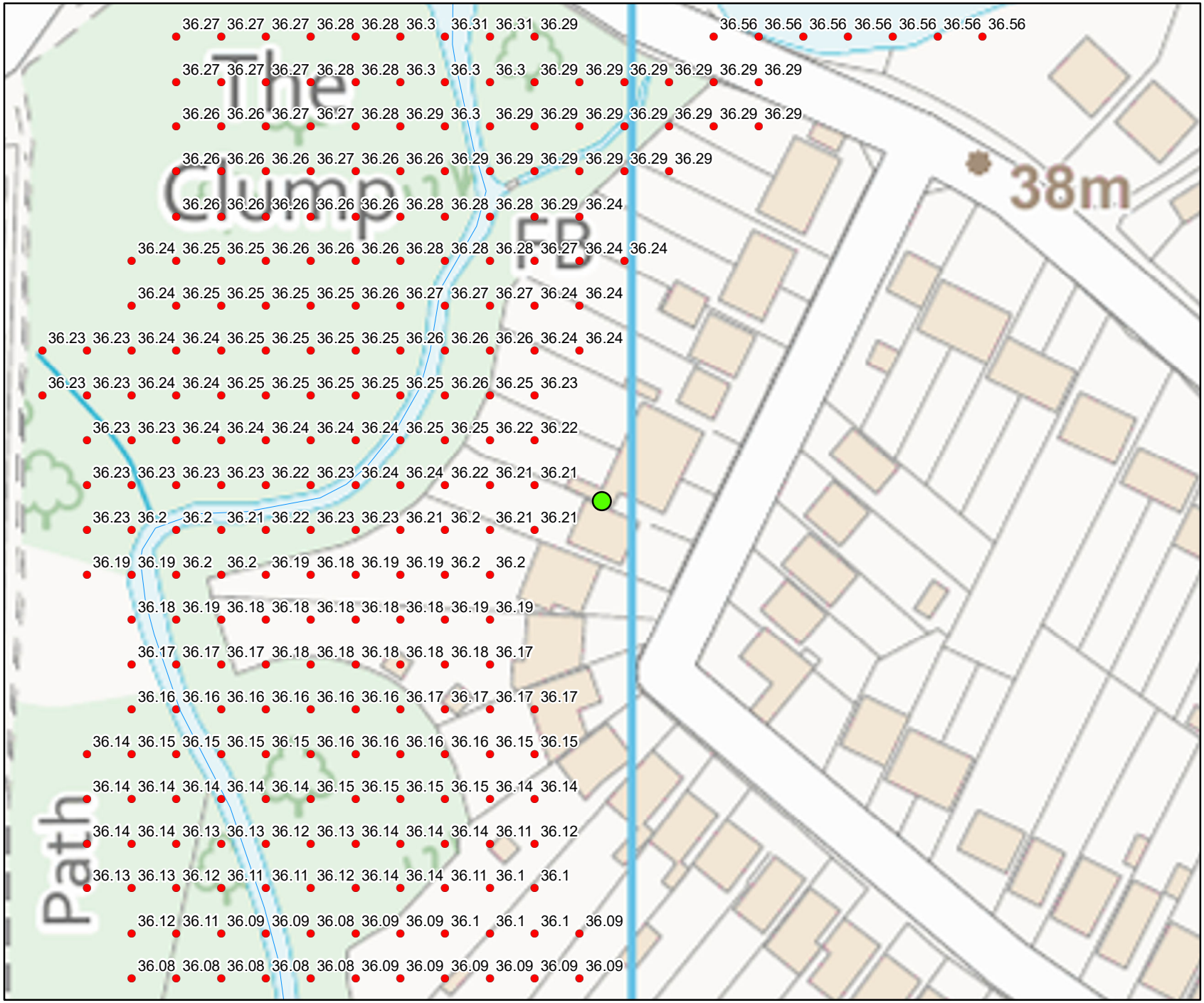
1 in 75 year (1.33%) Defended

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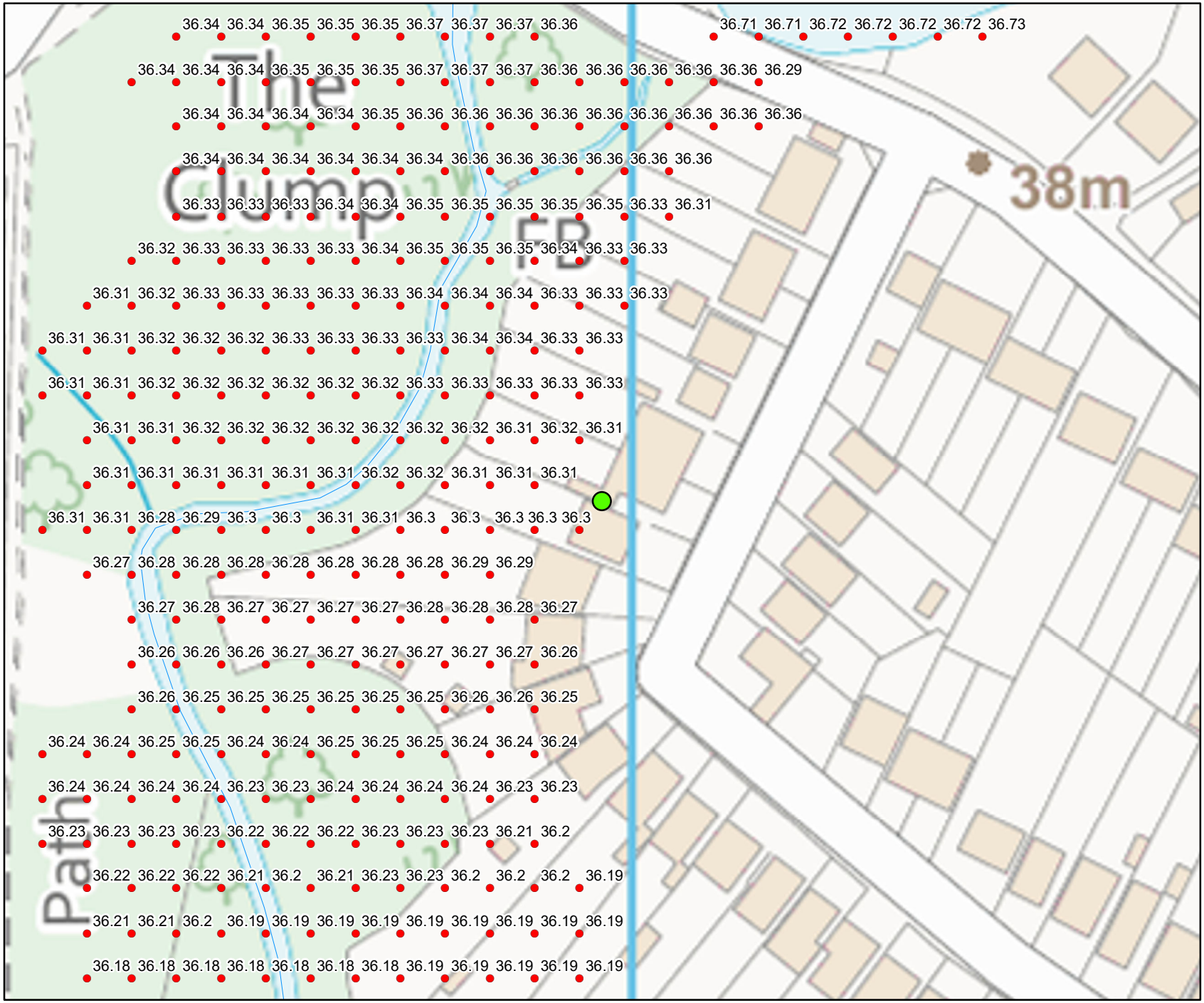
1 in 100 year (1%) Defended

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Detailed FRA centred on: 95 and 97 Halford Road, Ickenham, UB10 8QA - 27/03/2023 - HNL 304153 JH



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Statutory Main Rivers

Site location

2D Node Results: Heights

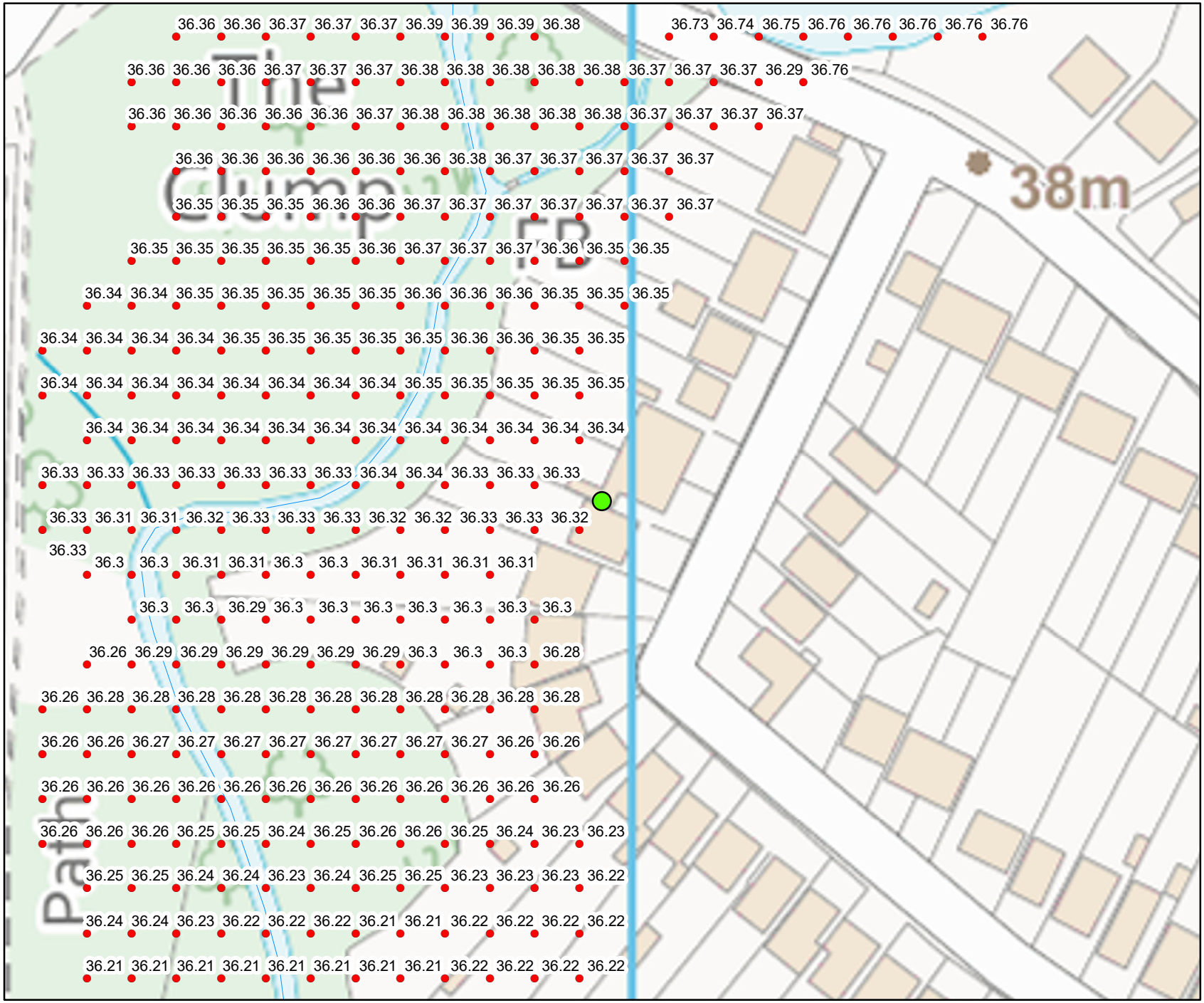
1 in 100 year + 20% (*CC)
Defended

The data in this map has been extracted from the River Pinn Mapping Study (JBA, 2015).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.
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https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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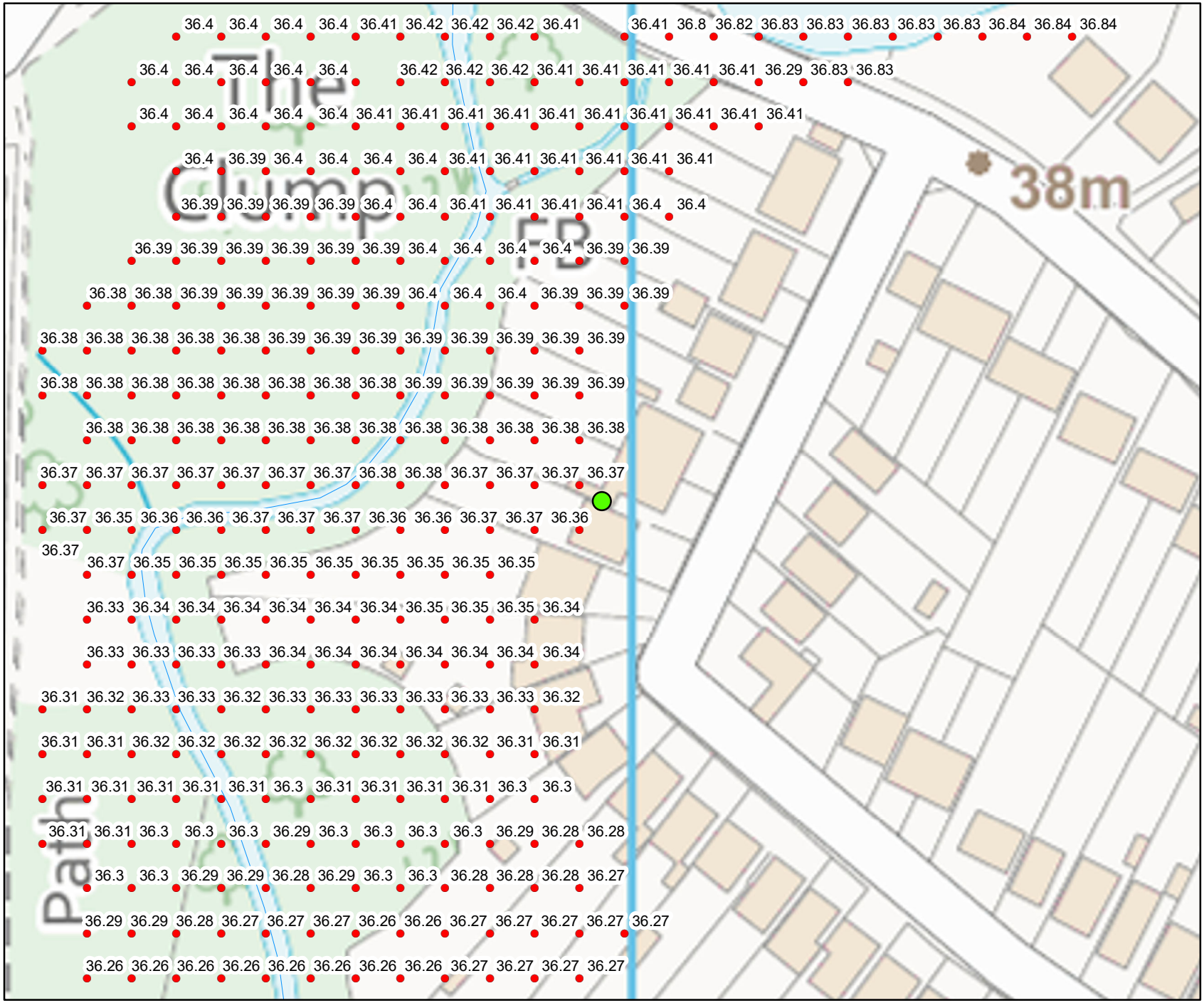
1 in 100 year + 25% (*CC)
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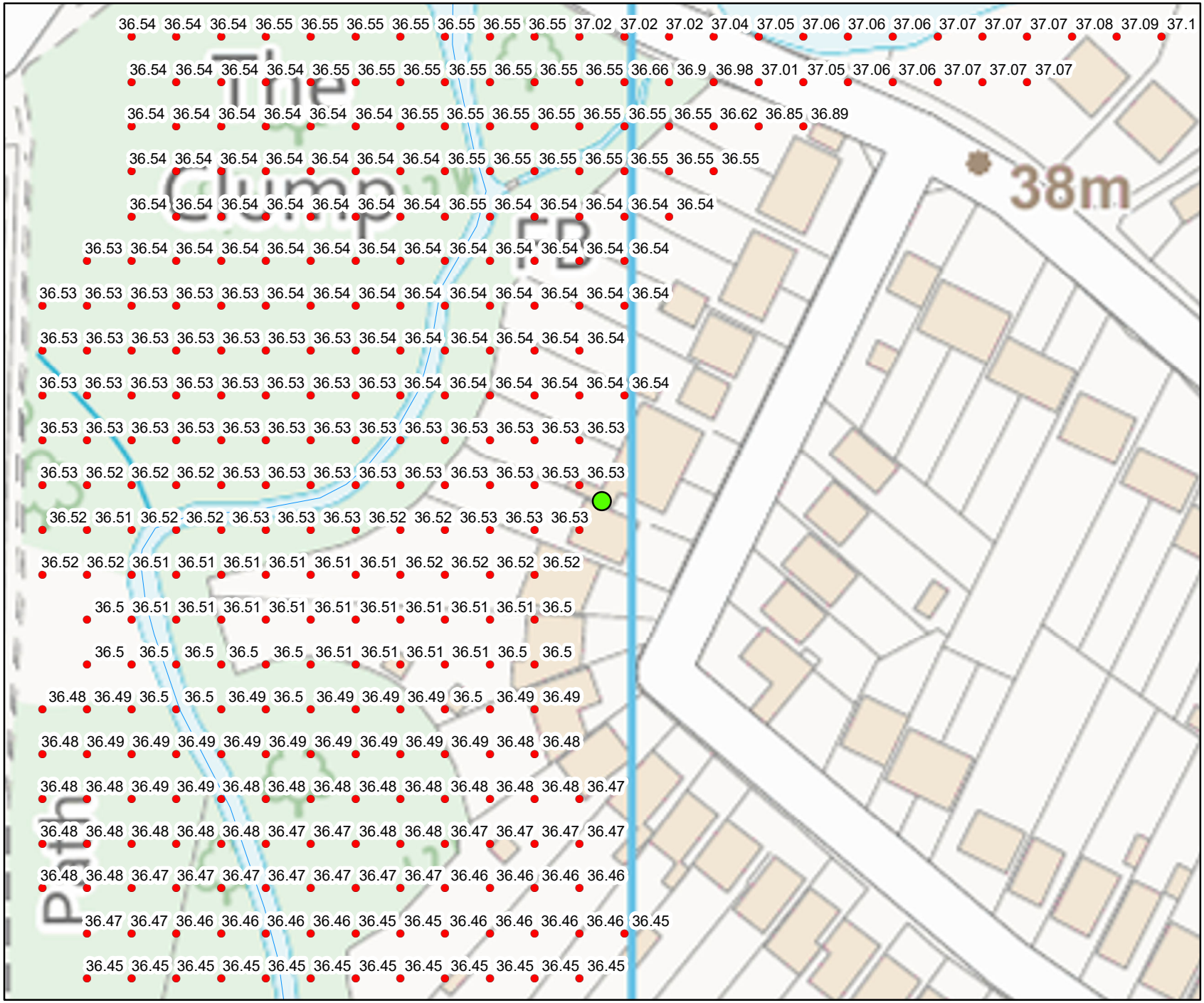
1 in 100 year + 35% (*CC)
Defended

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Site location

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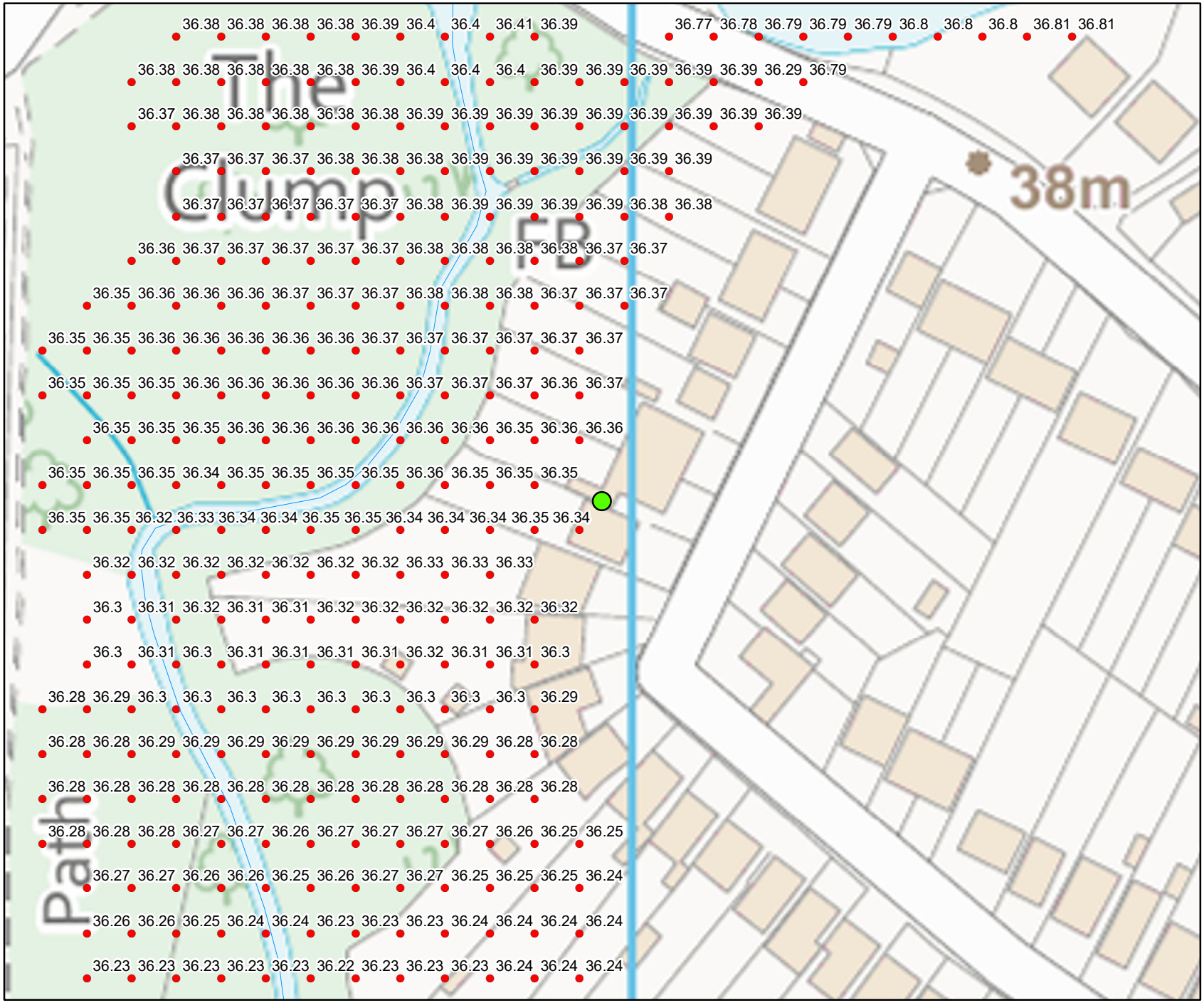
1 in 100 year + 70% (*CC)
Defended

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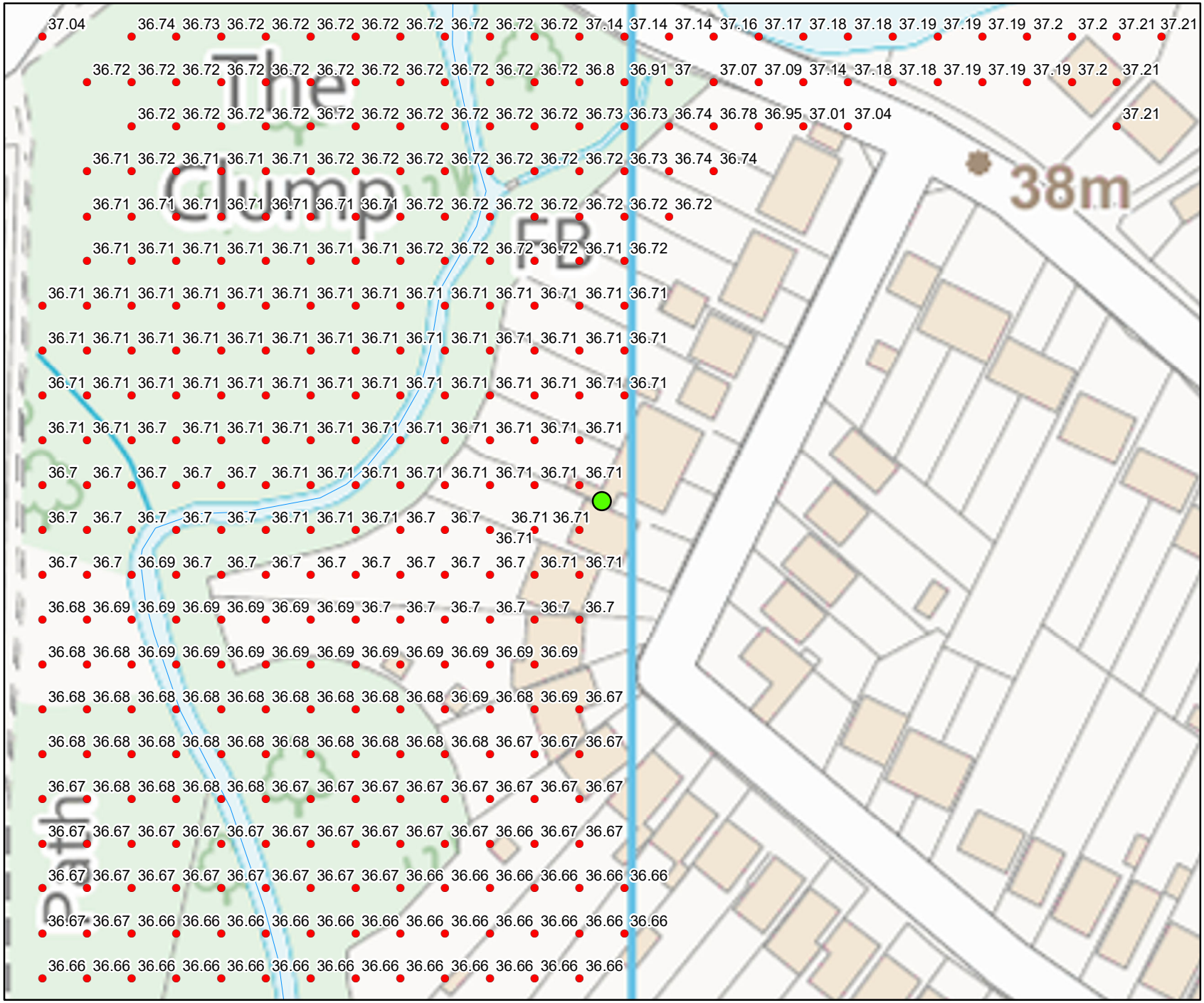
1 in 250 year (0.4%) Defended

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N

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Metres

Legend

Statutory Main Rivers

Site location

2D Node Results: Heights

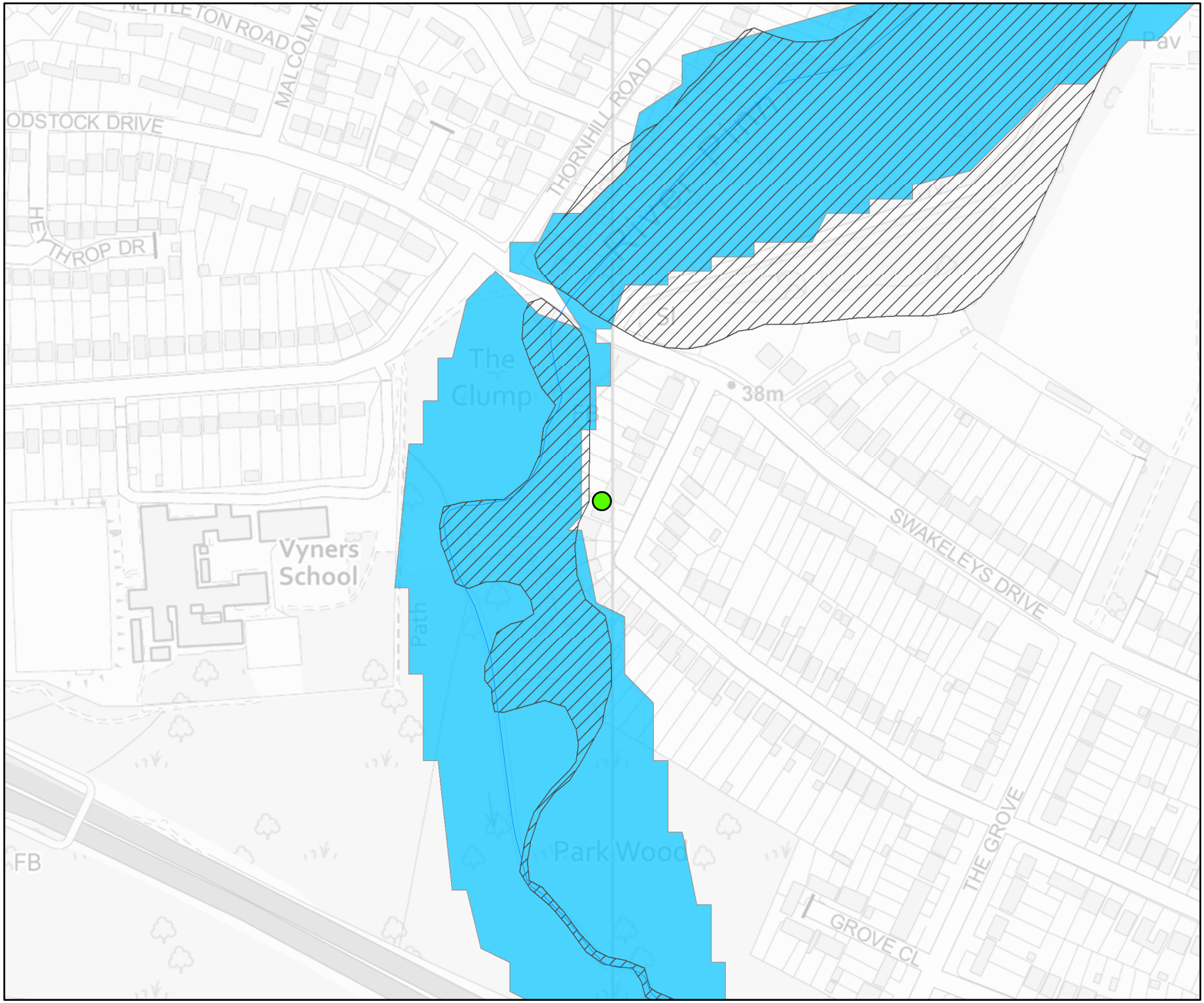
1 in 1000 year (0.1%) Defended

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Historic Flood Map centred on: 95 and 97 Halford Road, Ickenham, UB10 8QA - 27/03/2023 - HNL 304153 JH



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N

0 50 100 200
Metres

Legend

- Statutory Main Rivers
- Site location

Flood Event Outlines

- 1977
- 1988

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

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