

Flood Risk Assessment

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Flood risk, water and environment

AEG03368_EN4_Barnet_01

Site Address: 65 Crescent Road
Barnet
EN4 9RD

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

degadea

Flood risk, water and environment

Document Issue Record

Project: Flood Risk Assessment

Prepared for: Scott and Sampson Architects

Reference: AEG03368_EN4_Barnet_01

Site Location: 65 Crescent Road, Barnet, EN4 9RD

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Summary

Development Description	Existing	Proposed
Development Type	Residential dwelling	Demolition of existing dwelling and construction of 3no. new dwellings
EA Vulnerability Classification	More Vulnerable	More Vulnerable
Ground Floor Level	N/A ²	Finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD (840mm above the 1in100+20%CC flood level of 51.36m AOD and 1000mm above the approx. external ground level around the dwellings of 51.20m AOD)
Level of Sleeping Accommodation	First floor	No change
Impermeable Surface Area	N/A ¹	New hardstanding areas should be constructed using permeable surfacing
Surface Water Drainage	N/A ¹	Recommended to incorporate small-scale SuDS such as rainwater planters and water butts.
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zone 1, 2 and 3	
Flood Source	Fluvial	Pymmes Brook
SFRA Available	West London Strategic Flood Risk Assessment (2018)	
Management Measures	Summary	Comment
Ground floor level above extreme flood levels	Yes	Finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD (840mm above the 1in100+20%CC flood level of 51.36m AOD and 1000mm above the approx. external ground level around the dwellings of 51.20m AOD)
Safe Access/Egress Route	Yes	Sign up to the EA Flood Warning and Alert Service. (The Pymmes Brook at East Barnet). Crescent Road has been shown to be topographically higher than all modelled flood events.
Flood Resilient Design	Yes	Constructed in flood resilient manner in accordance with CLG Report Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007).
Site Drainage Plan	N/A ¹	Recommended to incorporate small-scale SuDS such as rainwater planters and water butts.

Flood Warning & Evacuation Plan	Yes	EA Flood Warning Service
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	Voids are to be incorporated underneath the proposed rear patio and should also be incorporated into the rear portion of the dwellings. The top of the void should be set no lower than 51.66m AOD (300mm above the 1in100+20%CC flood level). A comprehensive void management plan (detailed below) should also be adopted, which will be the responsibility of the owners of the dwelling to implement.
Increase in surface run-off generation	No	Discharge runoff as per existing surface water drainage infrastructure. Betterment can be provided through small-scale SuDS such as rainwater planters and water butts.
Impact on hydraulic performance of channels	No	All new development is located at least 8m from the adjacent watercourse.

¹ not required for this assessment

² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Scott and Sampson Architects 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 65 Crescent Road, Barnet, EN4 9RD (Figure 1). The site is bound to the north the Pymmes Brook, residential property boundaries to the east and west and Crescent Road on the southeastern site boundary.

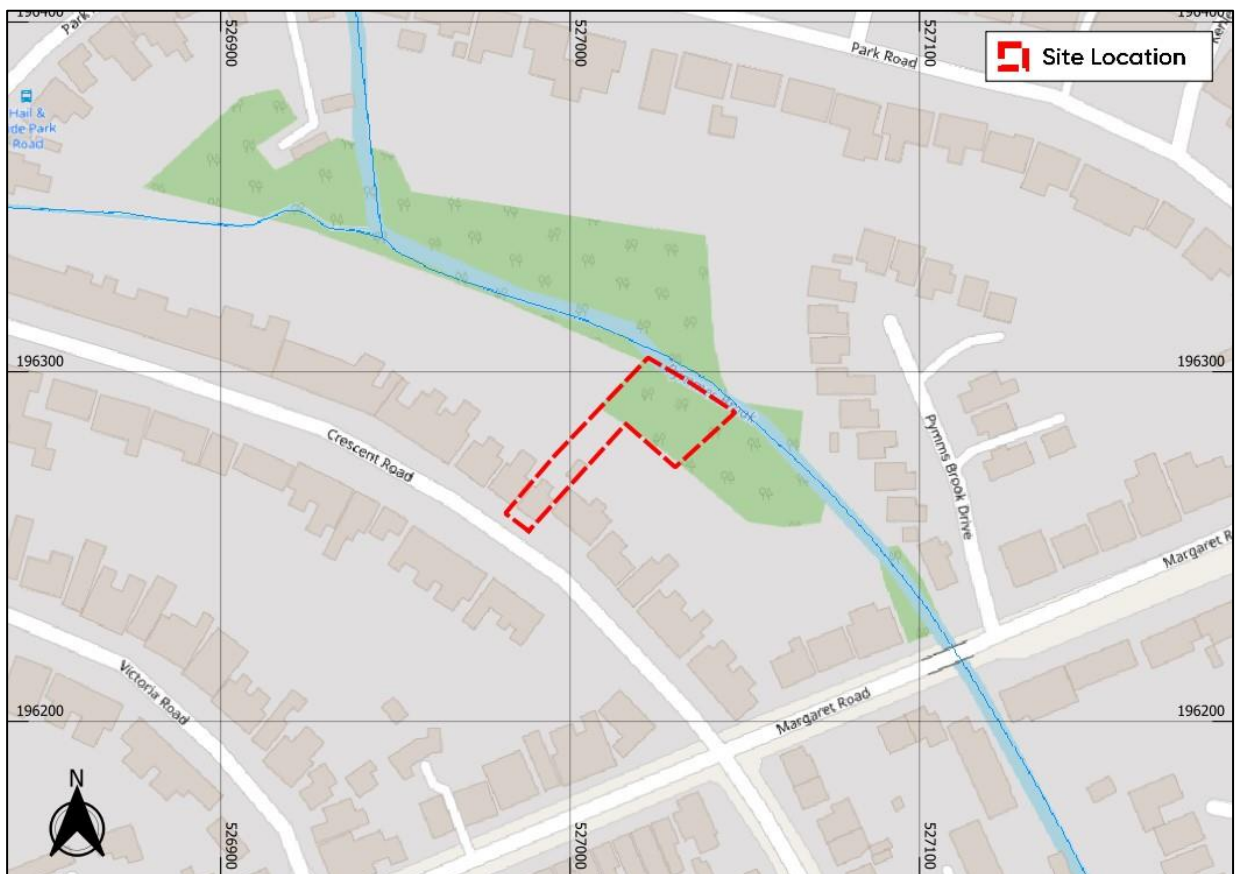


Figure 1: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.4. The existing site is a residential dwelling. The proposed development is for the demolition of the existing residential dwelling and detached garage and the construction of 3 new residential dwellings.
- 1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been utilised to review the topography of the site (Figure 2). Upon review, it shows that the site levels are generally higher on the southern side of the site (adjacent to Crescent Road) at approximately 55.00m AOD sloping to towards the northern side of the site at approximately 51.00m AOD.

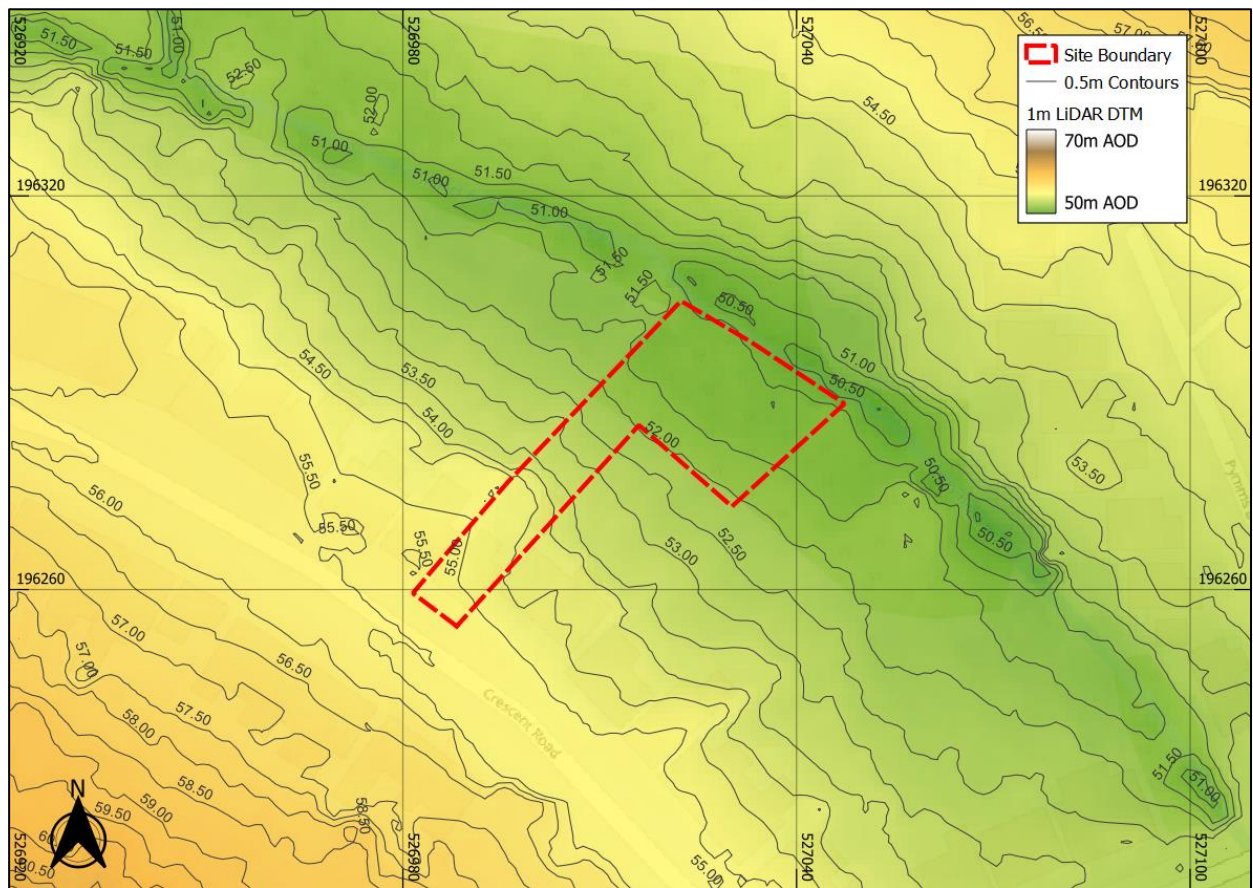


Figure 2: Site Topography in metres above Ordnance Datum (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.6. The London Borough of Barnet is the Local Planning Authority (LPA) for the site and is the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Thames region.

Planning Requirement

1.7. UK government planning guidance states¹ that an FRA is required for sites which are:

- *In Flood Zone 2 or 3 including minor development (in terms of flood risk) and change of use*
- *More than 1 hectare 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 river and the sea (for example surface water drains or reservoirs)*
- *In an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency*

1.8. The site is located within Flood Zone 3 therefore an FRA is required.

1.9. 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

National Planning Policy Framework

- 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.
- 2.2. The National Planning Policy Framework² (NPPF) (DCLG, 2021) includes Government policy on development and flood risk stating that:

"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. 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."

2.4. 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	<p>This zone comprises land where water has to flow or be stored in times of flood.</p> <p>Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or</p> <p>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).</p> <p>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)</p>

- 2.5. 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.
- 2.6. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Local Plan

- 2.7. The Barnet Local Plain EIP – Note on Water Management Notes policy ECC02A.

“Development can change the flow patterns of surface water and either create new or exacerbate existing flood risk. To prevent areas of existing surface water flood risk worsening as a result of development the Council needs to be proactive. For this reason the Council requests that developers provide a Flood Risk Assessment (FRA) for sites with the following flood risks:

- A development site over 1 hectare or greater in size within Flood Zone 1*
- A site within Flood Zones 2 or 3.*
- A site within 1% AEP plus 70% climate change fluvial flood extent and/or the 0.1% AEP RoFSW flood extent*
- Within an identified Critical Drainage Area”*

The London Plan

2.8. The London Plan (2021)³ provides an overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The proposed development lies within the jurisdiction of the London Plan and therefore should consider the policies contained within the document. Policy SI 12, quoted below, contains guidance on flood risk management;

Policy SI 12 Flood risk management

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

³ https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

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.

Sequential and Exception Tests

- 2.9. 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.

Sequential Test

- 2.10. The proposed development is for the demolition of the existing residential dwelling and detached garage and the construction of 2 new residential dwellings.
- 2.11. A separate Sequential Test has been undertaken (ref: AEG02679_EN4_Barnet_02) and should be read in conjunction with this FRA. Full details can be found within the report, a summary of the conclusions are as follows:

- 147 sites from the Barnet Borough Council SHLAA, brownfield land register and draft local plan were assessed against the 6 defined conditions. It was found that there are no available sites that are developable and deliverable whilst being viable alternatives to the application site.
- Analysis of available land within the Barnet Borough region has deemed that there is **no reasonably available land** suitable for the proposed development and as such it should be deemed that the preferred location for the development is within the site.

2.12. Therefore, the sequential test is passed, and the proposed development is suitable and required in the proposed location. This sequential test should be submitted as part of the planning application to satisfy the requirements under the NPPF.

Exception Test

2.13. The Flood Risk Vulnerability Classification table⁴ provided below in Table 2 shows which vulnerabilities are appropriate in each Flood Zone.

2.14. The proposed development sits wholly within Flood Zone 3 and the existing and proposed development comprises 'More Vulnerable' uses (residential). As such, the development is required to implement the Exception Test.

Table 1: Flood Risk Vulnerability Classification and Flood Zone 'incompatibility' taken from Table 3 of the PPG.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	x	Exception Test required	✓	✓

⁴ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2>

Zone 3b	Exception Test required	x	x	x	✓
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- 2.15. The site is located in Flood Zone 3, and therefore the planning application submitted by the applicant is required to be accompanied by an FRA which shows that the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and surrounding area.
- 2.16. It is also important to note that as part of the proposals the development will incorporate flood resilience measures into the design of the building.

Summary

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

3. Consultation and Review

Sources of Information

Consultation

- 3.1. The site is within the remit of London Borough of Barnet as Lead Local Flood Authority (LLFA). As part of the consultation process, the EA have provided Aegaea with modelled outputs (P5 and 6) from the River Lee 2D Modelling study (CH2M Hill, 2014). These outputs have been used to assess the risk of flooding to the site.

Documents

- 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:
- Interactive Flood Risk Mapping available on the Environment Agency (EA) website⁵.
 - The National Planning Policy Framework (NPPF) (Communities and Local Government, 2021).
 - Planning Practice Guidance - Flood Risk and Coastal Change (2022)
 - British Geological Survey - Geoindex Onshore (British Geological Survey, 2022).
 - The London Plan (Greater London Authority, 2021⁶) and Core Strategy (Barnet Council, 2012)⁷

⁵ Environment Agency, Flood Map for Planning, <https://flood-map-for-planning.service.gov.uk/>, 2017

⁶ https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

⁷ [CDF.2 Local Plan Core Strategy \(September 2012\) | Barnet Council](#)

- Preliminary Flood Risk Assessment (Barnet Council, 2011)⁸
- West London Strategic Flood Risk Assessment (West London Boroughs, 2018)⁹

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

⁸ [\[ARCHIVED CONTENT\] \(nationalarchives.gov.uk\)](#)

⁹ [West London Strategic Flood Risk Assessment - West London SFRA](#)

4. Sources of Flood Risk

Fluvial Flood Risk

- 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.
- 4.2. The site is located partially within Flood Zone 1, 2 and 3. Flood Zone 3 denotes a risk of greater than 1 in 100 (1%), Flood Zone 2 denotes a risk of between a 1 in 100 (1%) and 1 in 1,000 (0.1%) and Flood Zone 1 denotes a risk of less than 1 in 1000 (0.1%) (Figure 3).

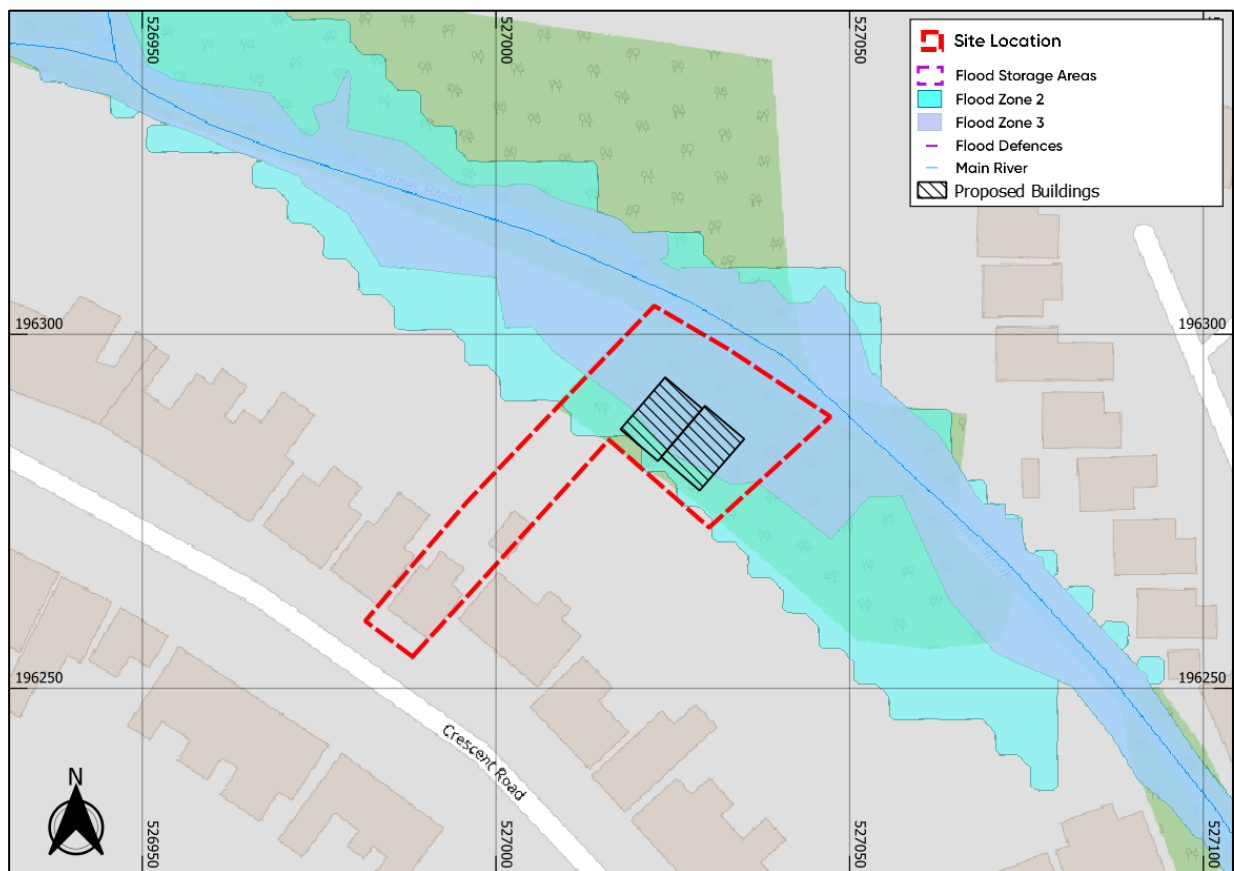


Figure 3: Flood Zone Map (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). ©<https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.3. The nearest EA Main River to the site is the Pymmes Brook, which flows west to east along the northern site boundary.
- 4.4. There are no other watercourses in the vicinity of the site.

Historical Flooding

- 4.5. Based on the EA Recorded Flood Outlines dataset (Figure 4) the site has not been previously affected by flooding.

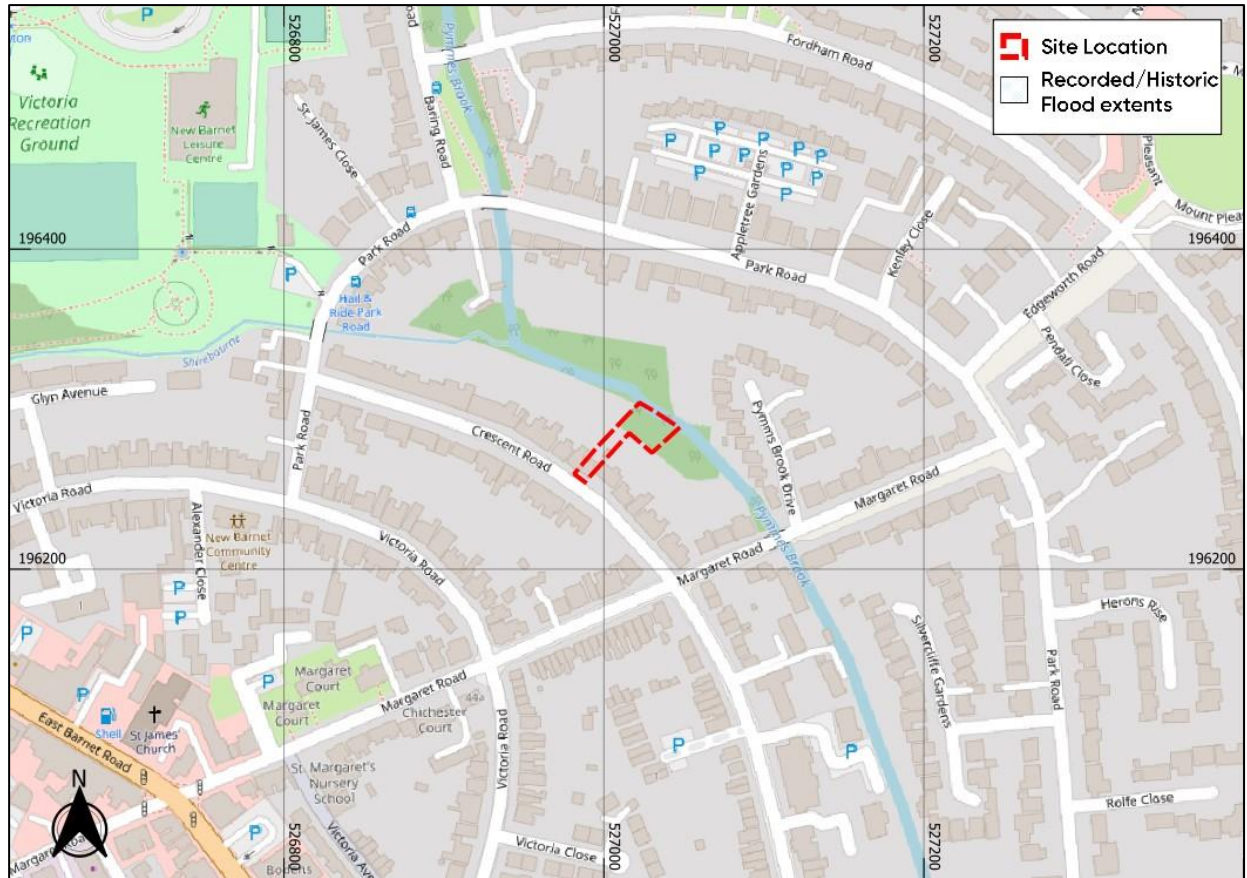


Figure 4: EA Historic Flood Mapping

River Lee 2D Modelling study (2014)

- 4.6. As part of the consultation process, the EA have provided Aegaea with modelled outputs (P5 and 6) from the River Lee 2D Modelling study (CH2M Hill, 2014). These outputs have been used to assess the risk of flooding to the site.
- 4.7. For development located within Flood Zone 3, it is first necessary to delineate between Flood Zones 3a and 3b. It should be noted that the definition of Flood Zone 3b has changed since the modelling was undertaken in 2019. Flood Zone 3b is now classified as the 1:30 year (3.3% AEP) event. No modelled data has been provided for the 30 year fluvial flood event. Therefore, the

1:50 year event has been used as a proxy for the 1:30 year event. Analysis of these extents show that the northern part of the site may be affected by flooding.

- 4.8. The flood level associated with this event is 51.03m AOD. The proposed dwellings are located on land between 51.20m AOD and 51.80m AOD. Therefore, the proposed new dwellings are not located in Flood Zone 3b (Figure 5).

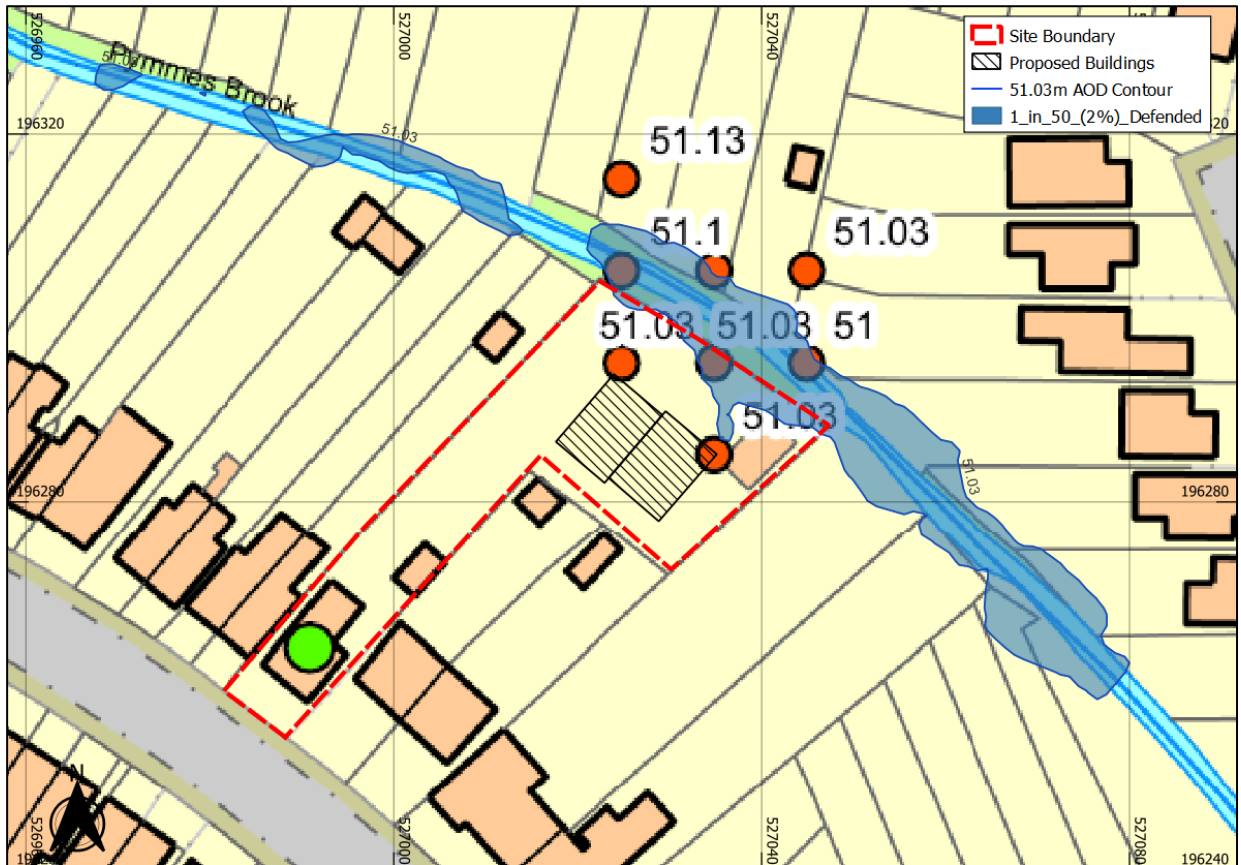


Figure 5 Modelled Defended 50 Year Fluvial Flood Event Flood Extent (Contains public sector information licensed under the Open Government Licence v3.0)

- 4.9. The site is shown to be within the extent of the 1:100 year defended fluvial flood event, however, only affects a small portion of the site directly adjacent to the watercourse. The flood level associated with this event is 51.19m AOD. The proposed dwellings are located on land between 51.20m AOD and 51.80m AOD and therefore only a small portion of the eastern corner of the dwellings may be affected by flood depths of circa. 0.01m (Figure 6).

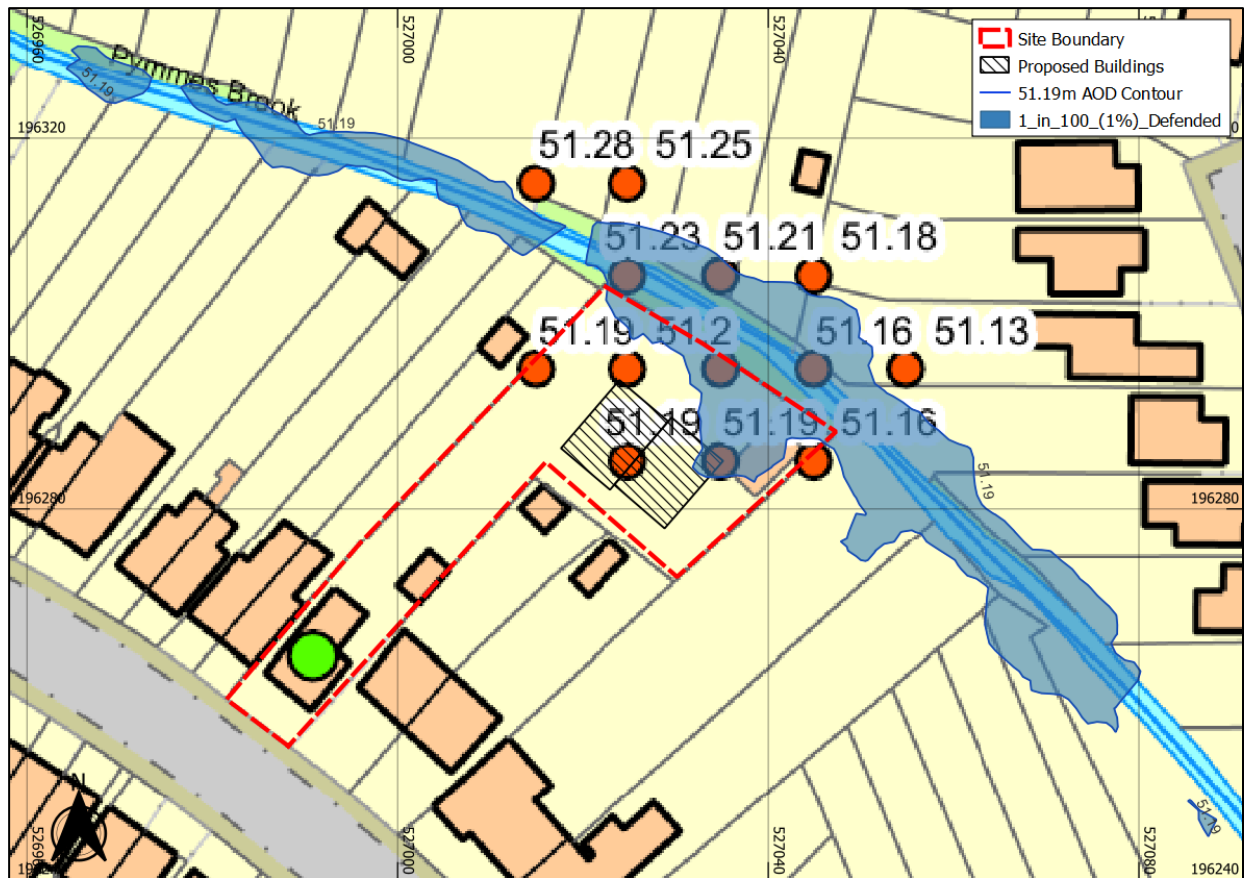


Figure 6 Modelled Defended 100 Year Fluvial Flood Event Flood Depths (Contains public sector information licensed under the Open Government Licence v3.0)

Climate Change

- 4.10. Predicted future change in peak river flows as a result of climate change are provided by the Environment Agency with a range of projections applied to regionalised 'River Management Catchments'.
- 4.11. The site is located within the Thames River Basin District and the 'London' Management Catchment. The relevant peak river flow allowances for this river basin district are identified below.

Table 2: Maidenhead and Sunbury Management Catchment Climate Change Allowances

Epoch	Central	Higher	Upper
2020s	10%	14%	26%
2050s	7%	14%	30%
2080s	17%	27%	54%

- 4.12. The proposed development is for the construction of 2 residential dwellings on site. Residential development should be considered to have an anticipated lifetime of a minimum of 100 years.
- 4.13. Guidance suggests that 'More Vulnerable' developments in Flood Zone 2 or 3a should utilise the 'central' climate change allowance. The increase in peak river flow for the 2080's epoch for the 'central' allowance is +17%.
- 4.14. No data has been provided from the River Lee 2D Modelling study (2014) for the 1:100+17%CC event. However, data has been provided for the 1:100+20%CC event. Given that the +20%CC event is the best available data, it has been deemed to be an appropriate proxy for the +17%CC event.
- 4.15. The flood level associated with this event is 51.36m AOD. The proposed dwellings are located on land between 51.20m AOD and 51.80m AOD and therefore the northern half of the dwellings may be affected by flood depths of circa. 0.16m (based on the lowest topographic level of 51.20m AOD) (Figure 7).

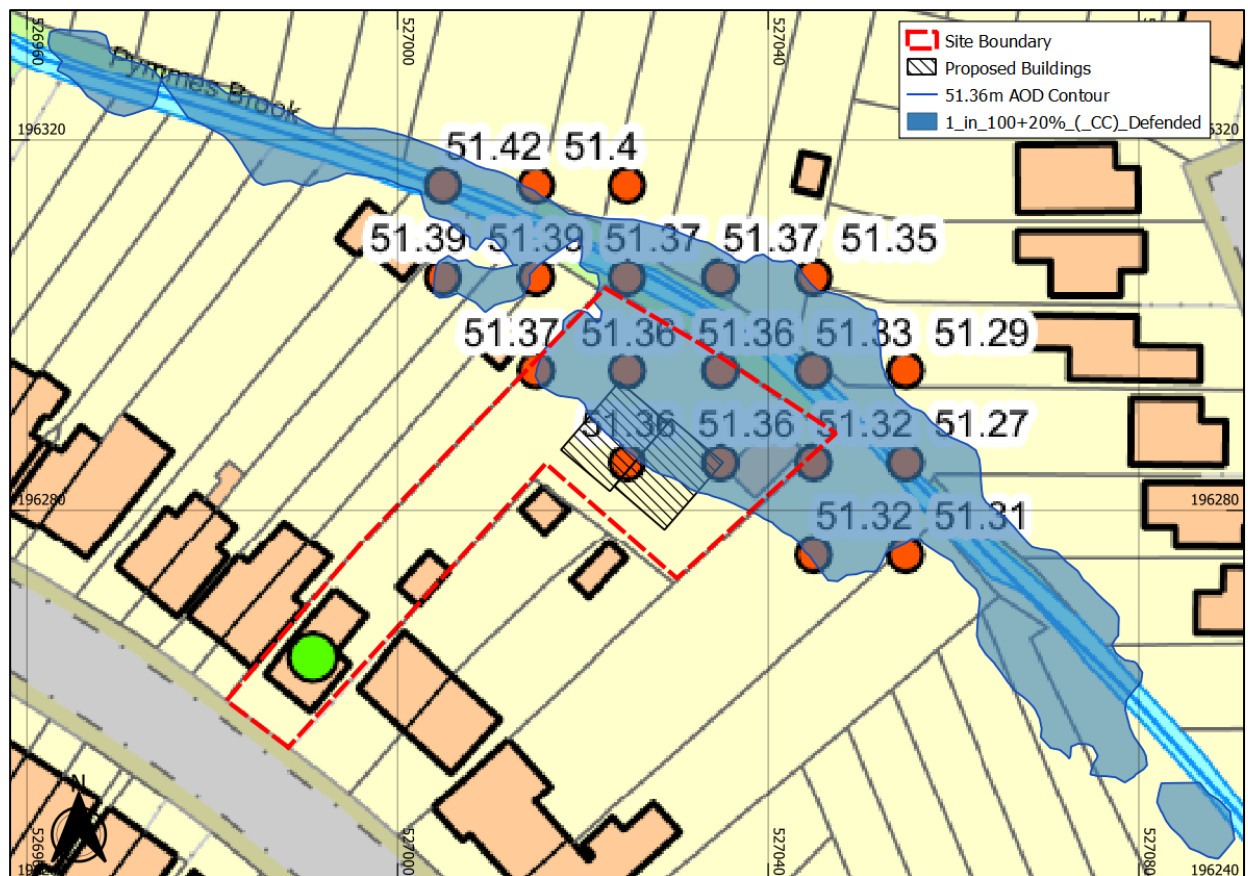


Figure 7: Modelled Defended 100+20%CC Year Fluvial Flood Event Flood Depths (Contains public sector information licensed under the Open Government Licence v3.0)

Summary

- 4.16. Overall, the site has no recorded incidents of historic flooding however analysis of the modelling shows the dwellings may be partially affected by flooding during the 1:100+20%CC scenario. Given that flood depths may only be circa. 0.16m the risk of flooding can be considered moderate.

Canals

- 4.17. 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.
- 4.18. 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.

- 4.19. Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 4.20. The site is not located within the vicinity of any canals and as such the risk from this source of flooding can be considered low.

Pluvial Flood Risk

- 4.21. 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.
- 4.22. The EA 'Flood Risk from Surface Water' online map provides a high-level indication of the risk of flooding. The following definitions of the annual surface water flood risk labels are given by the EA:
- 'High Risk'; >3.3% AEP (greater than 1 in 30 probability in any year).
 - 'Medium Risk'; 3.3% to 1.1% AEP (between 1 in 30 and 1 in 100 probability in any year).
 - 'Low Risk'; 1% to 0.1% AEP (between 1 in 100 and 1 in 1000 probability in any year).
 - 'Very Low Risk'; <0.1% AEP (less than 1 in 1000 probability in any year).
- 4.23. The map indicates the proposed dwellings are located within an area 'low', 'medium' and 'high' risk of flooding (Figure 8).

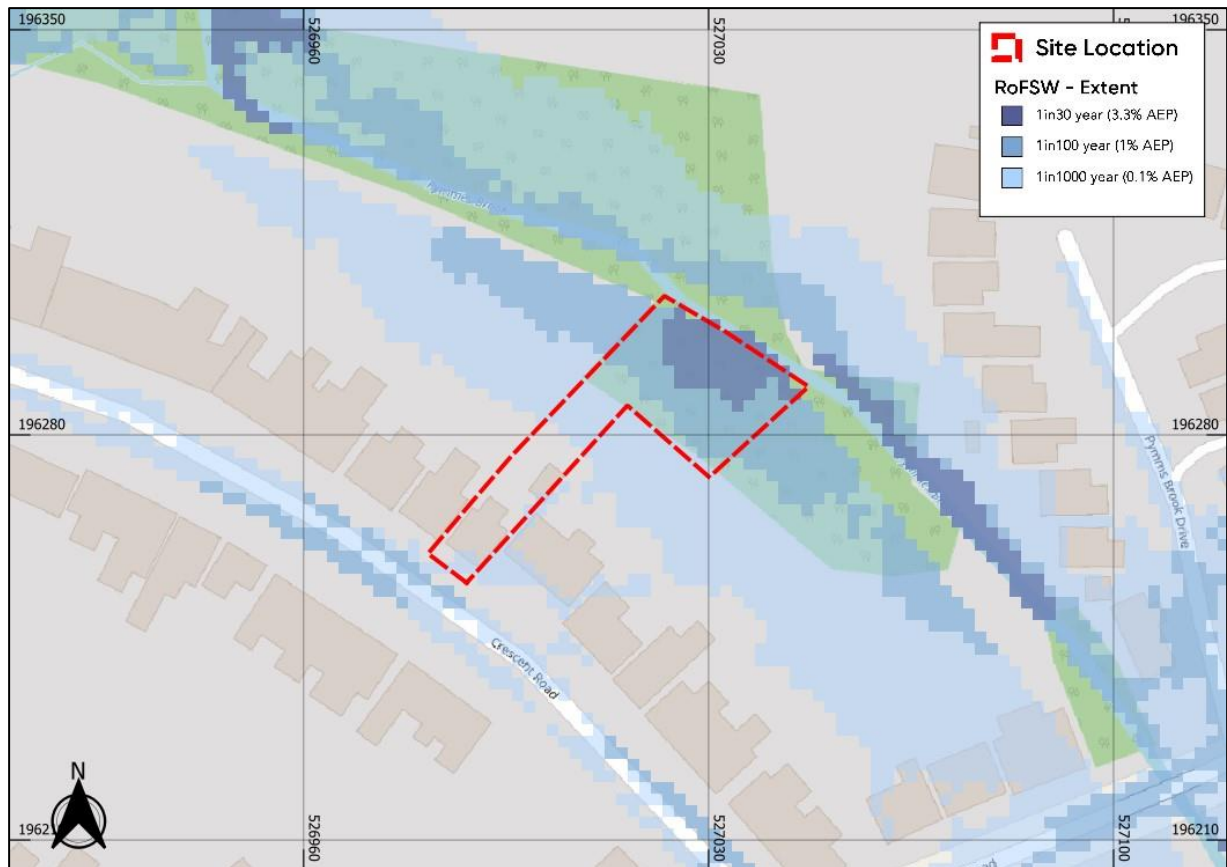


Figure 8: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.24. Analysis of the 'high' risk event (Figure 9) shows that the majority of the site would remain unaffected by flooding. A small part of the site, located adjacent to the northern site boundary, may be affected by flooding of between 300mm and 600mm. However, this would not directly affect the proposed dwellings.



Figure 9 RoFSW Surface Water Depths for a High Risk (1 in 30 year) Scenario (Contains public sector information licensed under the Open Government Licence v3.0)

4.25. The medium-risk event (equivalent to the 1 in 100 year event) is shown in Figure 10. The southern half of the site would remain unaffected by flooding, however the northern parts of the site may be affected by flooding with flood depths between 900mm and 1200mm.

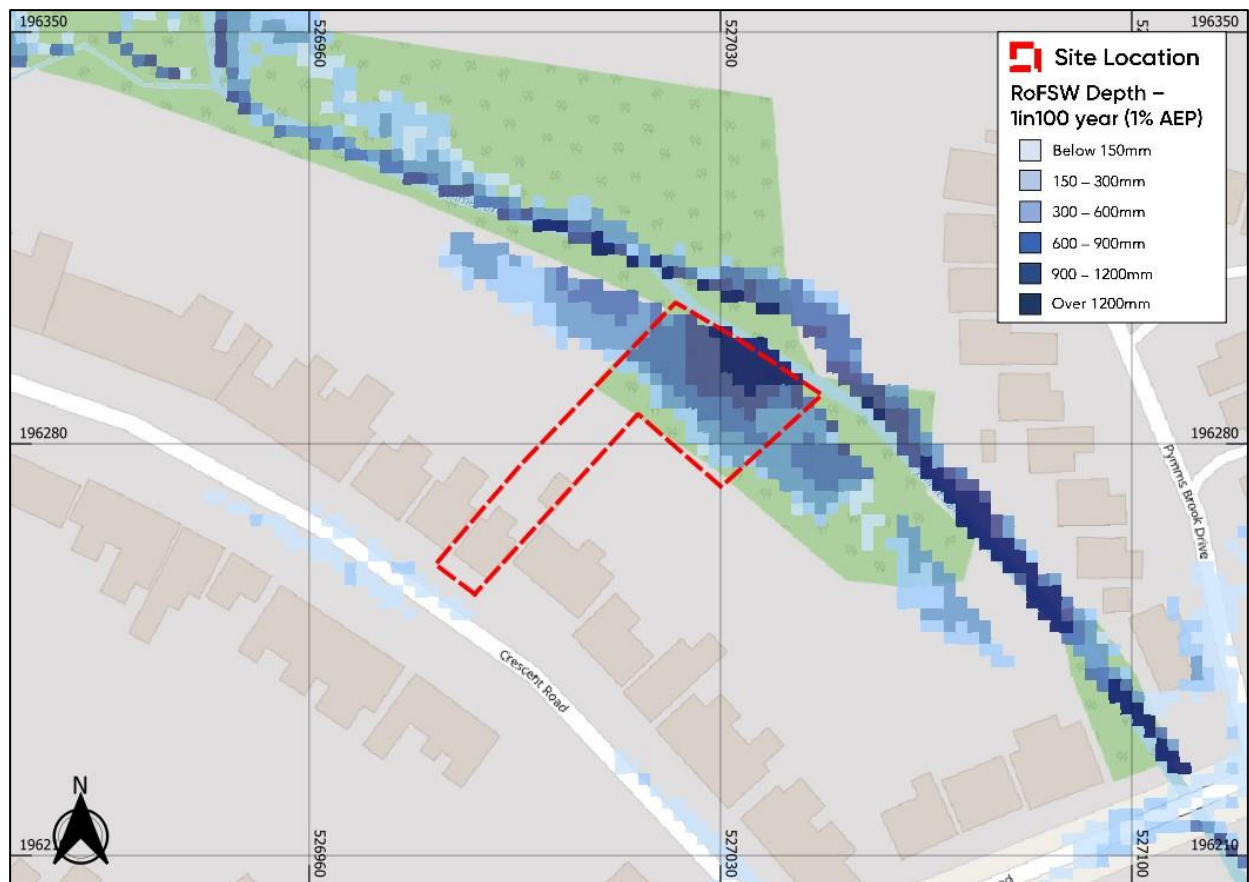


Figure 10 RoFSW Surface Water Depths for a Moderate Risk (1 in 100 year) Scenario (Contains public sector information licensed under the Open Government Licence v3.0)

4.26. The Low-risk event (equivalent to the 1 in 1000 year event) is shown in Figure 11. The southern half of the site would remain unaffected by flooding; however, the northern half of the site may experience flood depths of greater than 1200mm. It should also be noted that the 1 in 1000 year event is considered to be an 'extreme' event.

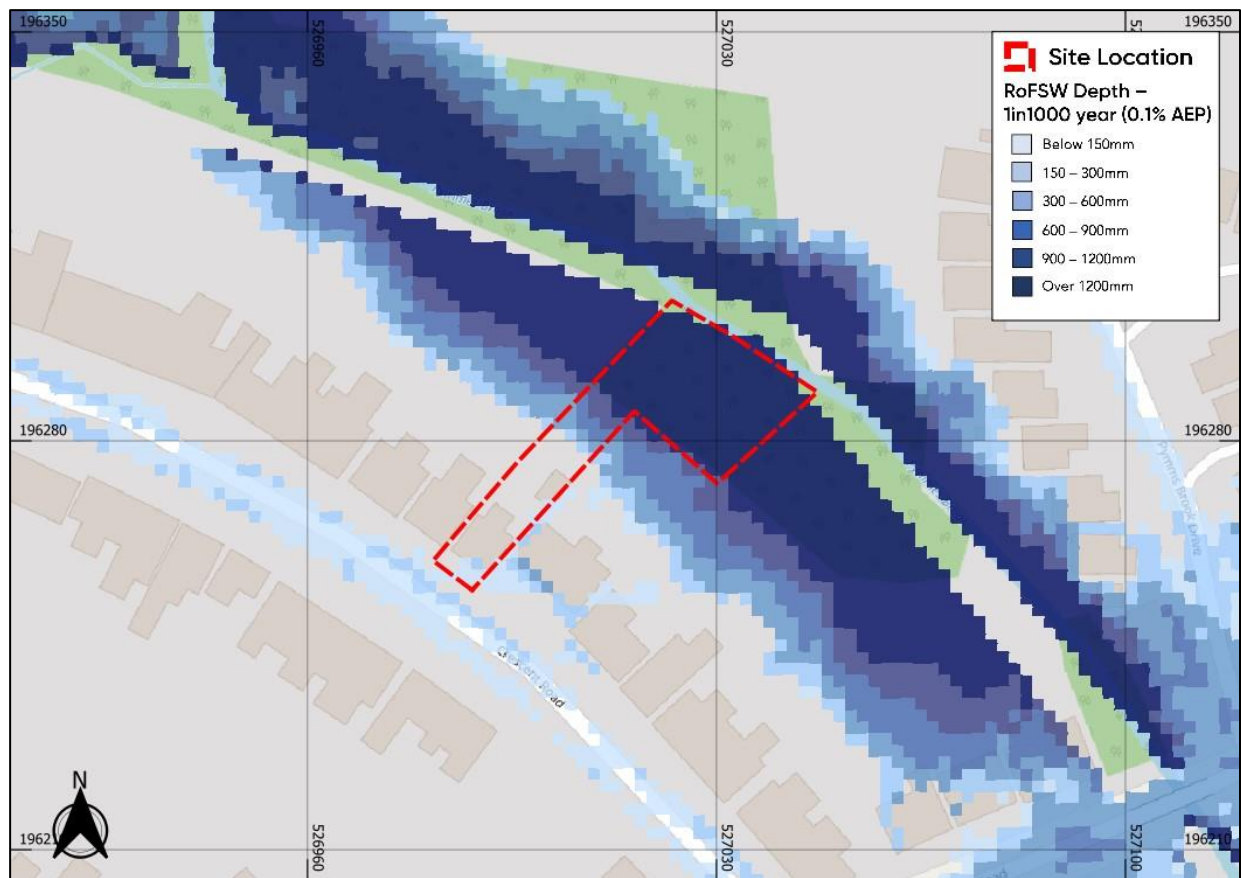


Figure 11 RoFSW Surface Water Depths for a Low Risk (1 in 1000 year) Scenario (Contains public sector information licensed under the Open Government Licence v3.0)

- 4.27. The flooding along the northern boundary is considered to be an overestimate of the risk as the watercourse to the north is not explicitly represented within the modelling used to derive this mapping and the watercourse would act to intercept surface water runoff and drain the local area. The site has been shown to be located at moderate risk of fluvial flooding and any flooding in this location is more likely to be attributed to fluvial floodwaters rather than pluvial.
- 4.28. The SFRA provides mapping of historical surface water flood incident records. No historical pluvial incidents have been recorded in the vicinity of the site.
- 4.29. As such, the risk to the site is considered to be moderate.

Reservoirs

- 4.30. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely,

reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

- 4.31. According to EA flood risk from reservoirs mapping the site is outside flood extents in the event of reservoir flooding (Figure 12).
- 4.32. The risk of flooding from this source is therefore considered to be low.

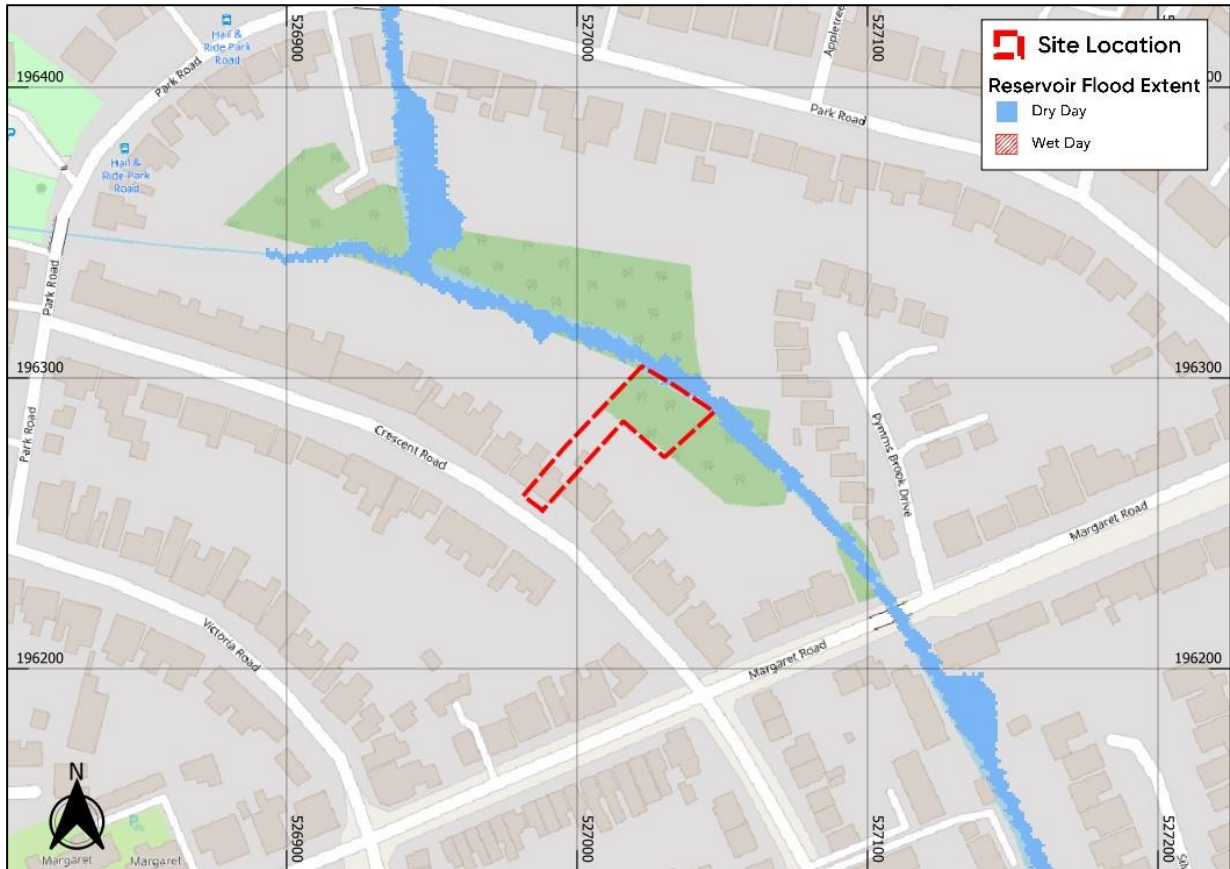


Figure 12: EA Reservoir Flood Risk Mapping (Contains public sector information licensed under the Open Government Licence v3.0)

Groundwater

- 4.33. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.34. The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated). This formation is considered to be a Principal aquifer (Source: EA; Magic Map

online resource). A Principal aquifer is highly permeable, supporting water supply and/or river base flow on a strategic scale.

- 4.35. The British Geological Survey (BGS) Geology of Britain Viewer indicates that the superficial deposits underlying the site is London Clay comprising clay, silt and sand. No superficial deposits have been recorded on site.
- 4.36. The West London SFRA indicates that the site is not located within a 1km grid square considered susceptible to groundwater flooding. An excerpt of the SFRA mapping is shown in Figure 13 below.

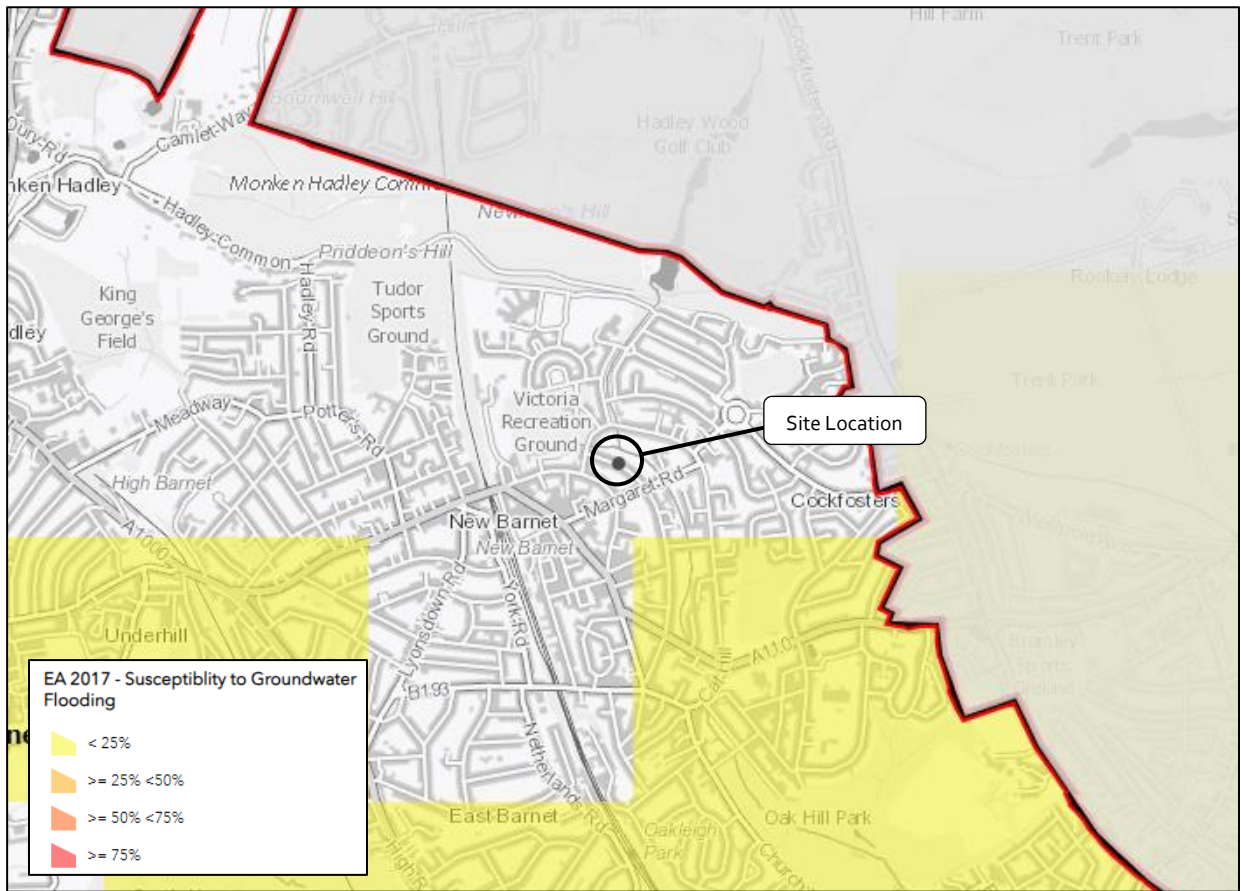


Figure 13 Areas Susceptible to Groundwater Flooding (West London SFRA, 2018)

- 4.37. Neither the West London SFRA (2018) or EA provided any records to indicate that the site, or immediate surrounding area, has been previously affected by flooding from this source.
- 4.38. The proposals do not include any below ground development or basement excavations. The risk of flooding to the site is therefore considered low. Appropriate waterproofing should minimise the risk of groundwater flooding.

Sewer Flooding

- 4.39. Sewers can be a cause of flooding where the drainage network has become overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.40. The SFRA provides mapping of historical sewer flood incident records. No historical sewer surcharging incidents have been recorded in the vicinity of the site.
- 4.41. Local policy documentation does not identify the site as being in a Critical Drainage Area.
- 4.42. The development is therefore considered to be at low risk of flooding from sewers. Any new sewer connection from the site should be agreed with the local sewer provider and fitted with non-return valves to minimise the risk of flooding from sewer sources.

5. Flood Risk Mitigation

Fluvial and Pluvial

- 5.1. The flood level associated with the 1:100+20%CC event is 51.36m AOD. Finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD, 840mm above the design flood level.
- 5.2. The RoFSW medium-risk event (equivalent to the 1 in 100 year event) flood depth map shows that the southern half of the site would remain unaffected by flooding, however the northern parts of the site may be affected by flooding with flood depths between 900mm and 1200mm.
- 5.3. The proposed dwellings should be constructed in a flood resilient manner, in accordance with CLG Report *Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)* (standards for the installation and retrofit of resistance measures are available in British Standard 851188-1:2019+A1:2021). The following mitigation measures are recommended:
 - Finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD (840mm above the 1in100+20%CC flood level of 51.36m AOD and 1000mm above the approx. external ground level around the dwellings of 51.20m AOD).
 - Exterior ventilation outlets, utility points and air bricks to be fitted with removable waterproof covers.
 - Non-return valves are to be installed on the new drainage systems throughout the site. It is also recommended that these valves are retrofitted on to any existing sewer connections to prevent back-flow of diluted sewage. Maintenance of these valves is important to ensure their continued effectiveness so should be maintained in line with manufacturers recommendations.
 - Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane sections are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum).
 - External renders are effective barriers to water penetration and should be used with blocks (or bricks) to at least the predicted flood level (approx. 0.3m), ideally with an additional 0.3m

freeboard. External cement renders with lime content (in addition to cement) can induce faster surface drying.

- Cavity insulation should preferably incorporate rigid closed cell materials as these retain integrity and have low moisture take-up. Other common types are not generally recommended as they can remain wet several months after exposure to flood water which slows down the wall drying process. Blown-in insulation can slump due to excessive moisture uptake, and some types can retain high levels of moisture for long periods of time (under natural drying conditions).
- Ground floor to be solid (i.e. concrete floors), with waterproof membrane/screed.
- Proposed dwellings on the northern side of the site are to be raised on voids to allow flood water to flow freely around the site to ensure flood risk is not increased elsewhere.
- Patio doors may be susceptible to ingress of flood water. Any PVC window/door sills should be adequately sealed.
- Residents to sign up to EA Flood Warning/Alerts and formalise a flood plan/evacuation procedures.

Tidal, Groundwater, Sewers Reservoirs and Canals

- 5.4. Flood risk from other sources is considered to be low, therefore mitigation is not required.

Increase to Flood Risk Elsewhere

- 5.5. The proposed development is for the construction of 3x new residential dwellings. The two new dwellings located on the northern side of the site have been shown to be partially affected by flooding during the design 1in100+20%CC event, with possible maximum flood depths of 0.16m.
- 5.6. As discussed above, finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD (840mm above the 1in100+20%CC flood level of 51.36m AOD and 1000mm above the approx. external ground level around the dwellings of 51.20m AOD).

- 5.7. Voids are to be incorporated underneath the proposed rear patio and should also be incorporated into the rear portion of the dwellings. The top of the void should be set no lower than 51.66m AOD (300mm above the 1in100+20%CC flood level).
- 5.8. A comprehensive void management plan (detailed below) should also be adopted, which will be the responsibility of the owners of the dwelling to implement.
- 5.9. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.

Void Maintenance Plan

- 5.10. The following considerations should be given for maintenance and usage of the void below the property.
 - The void space should not be used for storage at any time.
 - The void space and openings should be visually inspected by building management/ property owner on a weekly basis to ensure there are no sudden obstructions to the openings, or impediments to the potential capacity of the void space (i.e incorrectly stored items, debris, incorrectly parked vehicles etc). Any material that is placed in front of the voids must be removed immediately. Any neighbouring property that is seen to have material blocking the void opening should be notified of their responsibility in accordance with the void maintenance plan.
 - A monthly maintenance programme will ensure the voids are kept clear. Silt etc should be cleared away and vegetation cleared from void openings.
 - An annual maintenance (inspection) report will be prepared by the building management/ building owner and shared with the local authority (infrastructure team through email) to assure them the voids are maintained as planned.
 - An inspection by an engineer or surveyor or similar competent person will be carried out within 5 years and thereafter once in every 10 years to check the voids are structurally sound and the void is fit for purpose. After this inspection the building management/ building owner should write to the local authority to assure them the voids are structurally sound and functional.
 - In the event that any steel bars or security fixings are damaged, they should be rectified. If repair is not possible, they should be repaired like for like.

- After this inspection, the building management/ property owner should write to the local authority to assure them that the voids are fully functional in line with the planning permission.

Table 3 - Void Maintenance Plan

Frequency	Inspection	Remediation
Weekly	Material blockage the voids. Ensure void space not used for storage	Remove material
Monthly	Carry out routine inspection for obstructions or damage	Remove obstruction and repair/ replace damaged sections
Annual	Inspect steel bars or security covering for damage or damage to any structural element of the void	Repair/ replace damaged sections
	Carry out visual inspection of the void space for siltation or debris.	If there are signs of derbis such as leaves or other detritus, they should be removed immediately
	Inspect for any evidence of vermin	Eradicate vermin (if any)
Five Yearly	Carry out regular weekly/ monthly/ annual inspections	Remedy as above
	Commission an engineers structural inspection to ensure voids are structurally sound and fit for purpose	Repair/ replace damaged sections
	Remove access panels for visual inspection	Remove any debris and silt build-up, scrape back to ensure minimum amount of clear space between the underside of the slab and the ground
Post-Flooding	Carry out full inspection as detailed above and remove debris as needed	As soon as practically possible after the flood event; remedy as above. Ensure no debris is blocking the openings or void space reducing capacity

EA Flood Warning Service

- 5.11. As a further precaution and risk reduction, the owner of the site should sign up the EA flood warning service (The Pymmes Brook at East Barnet). 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.
- 5.12. 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.

- 5.13. It is recommended that residents subscribe to weather warnings from the Environment Agency and formalise a flood plan/evacuation procedures.
- 5.14. In addition to the Environment Agency flood warning service. These provide an indication of when weather warnings (e.g. extreme rainfall) are forecast and enable appropriate action to be taken.

Met Office Warnings

- 5.15. The analysis within the report has shown that some surrounding roads may be at risk from surface water flooding. 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.
- 5.16. During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. 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 65 Crescent Road, Barnet, EN4 9RD. 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. The FRA supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.

Source of Flooding	Flood Risk Summary
Fluvial	<p>The site is located partially within Flood Zone 1, 2 and 3. Flood Zone 3 denotes a risk of greater than 1 in 100 (1%), Flood Zone 2 denotes a risk of between a 1 in 100 (1%) and 1 in 1,000 (0.1%) and Flood Zone 1 denotes a risk of less than 1 in 1000 (0.1%)</p> <p>No modelled data has been provided for the 30 year fluvial flood event. Therefore, the 1:50 year event has been used as a proxy for the 1:30 year event. The flood level associated with this event is 51.03m AOD. The proposed dwellings are located on land between 51.20m AOD and 51.80m AOD. Therefore, the proposed new dwellings are not located in Flood Zone 3b.</p> <p>No data has been provided from the River Lee 2D Modelling study (2014) for the 1:100+17%CC event. However, data has been provided for the 1:100+20%CC event. The flood level associated with this event is 51.36m AOD. The northern half of the dwellings may be affected by flood depths of circa. 0.16m (based on the lowest topographic level of 51.20m AOD).</p> <p>Finished floor levels of the proposed northern dwellings are to be set at 52.20m AOD (840mm above the 1in100+20%CC flood level of 51.36m AOD and 1000mm above the approx. external ground level around the dwellings of 51.20m AOD).</p>
Pluvial	<p>The RoFSW medium-risk event (equivalent to the 1 in 100 year event) flood depth map shows that the southern half of the site would remain unaffected by flooding, however the northern parts of the site may be affected by flooding with flood depths between 900mm and 1200mm.</p> <p>The flooding along the northern boundary is considered to be an overestimate of the risk as the watercourse to the north is not explicitly represented within the modelling used to derive this mapping and the watercourse would act to intercept</p>

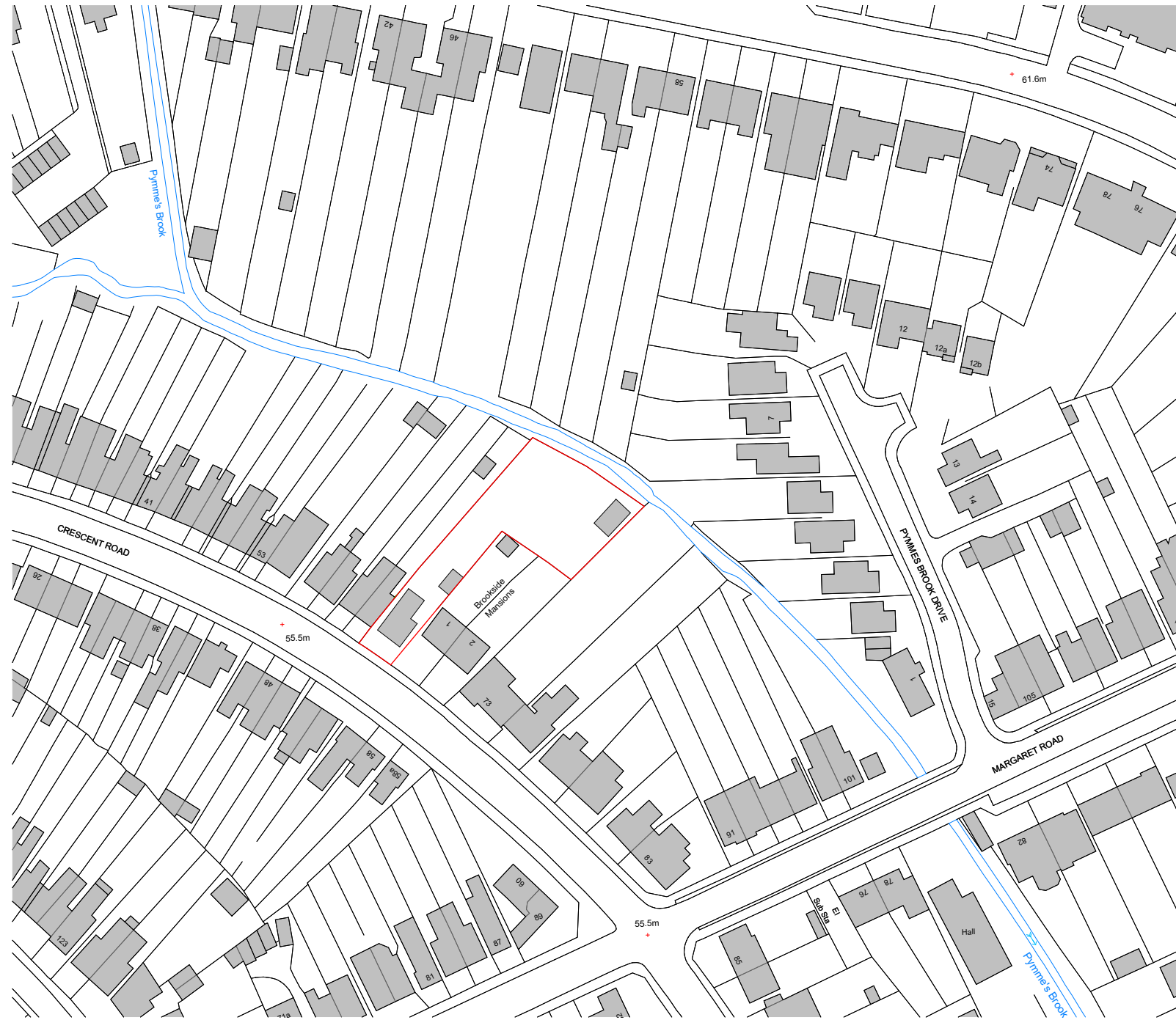
	surface water runoff and drain the local area. The site has been shown to be located at moderate risk of fluvial flooding and any flooding in this location is more likely to be attributed to fluvial floodwaters rather than pluvial.
Groundwater Reservoirs Canals Sewers	The site is generally considered to be at low risk from other sources

6.3. The following conclusions can be drawn from this level 1 FRA:

- This FRA has identified no prohibitive constraints in developing the proposed site for the proposed usage.
- With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zone 1, 2 and 3. The site is located in an area that benefits from the presence of flood defences.
- The existing site currently consists of a single residential dwelling and therefore, due to the residential use, would be classified as 'More Vulnerable'. The proposed development is for the construction of 3x new dwellings and therefore the site will continue to be classified as 'More Vulnerable' post-development.
- Voids are to be incorporated underneath the proposed rear patio and should also be incorporated into the rear portion of the dwellings. The top of the void should be set no lower than 51.66m AOD (300mm above the 1in100+20%CC flood level). A comprehensive void management plan (detailed below) should also be adopted, which will be the responsibility of the owners of the dwelling to implement.
- Mitigation measures, in line with guidance set out in 'Improving the flood performance of new buildings, 2007' (standards for the installation and retrofit of resistance measures are available in British Standard 851188-1:2019+A1:2021) are incorporated into the proposed development, where possible.
- Residents should sign up to the EA Flood Warning Service and formalise a flood plan/evacuation procedures.

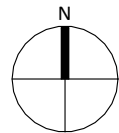
6.4. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A – Development Proposals



0m 25m 50m 75m 100m 125m

VISUAL SCALE 1:1250 @ A3



Rev	Date	Drawn	Description

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Project: 65 Crescent Road, EN4 9RD

Client: Dr. Sampson

Title: Site Location Plan

Scale @ A1: 1 : 1250

Dwg No: 1620. P1.01

Drawn: MS

Checked: MS

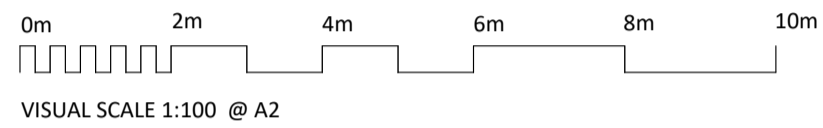
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Status: Pre-app

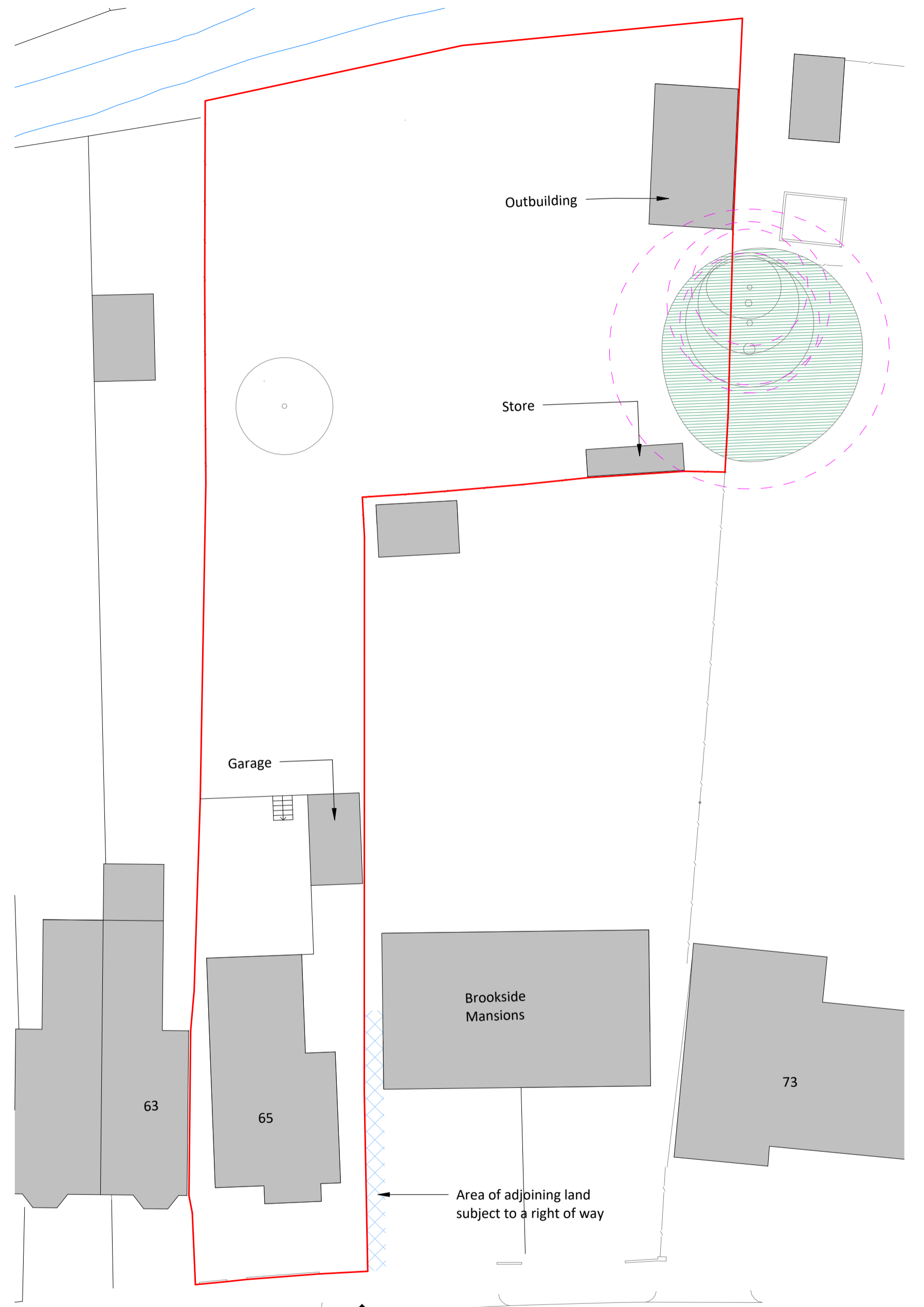
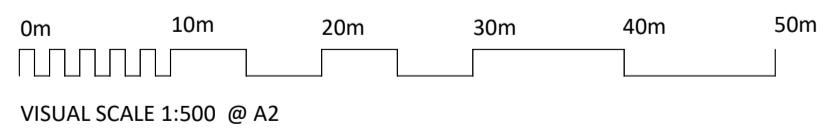
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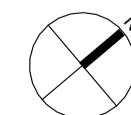
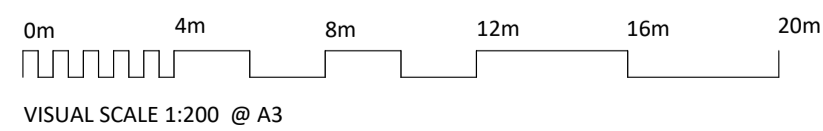
Existing Street Scape
1 : 100



Existing Block Plan
1 : 500



Existing Site Plan
1 : 200



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Project: 65 Crescent Road, EN4 9RD
 Client: Dr. Sampson
 Title: Existing Site Plan & Street Scape
 Scale @ A1: As indicated
 Dwg No: 1620. P1.02

Drawn: Author
 Checked: Checker
 Date: 10/21/23
 Status: Pre-app
 Revision:

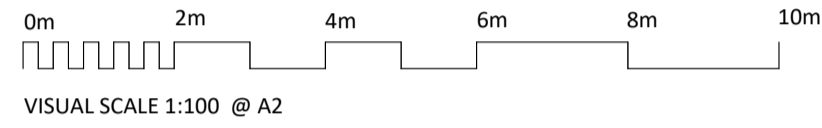
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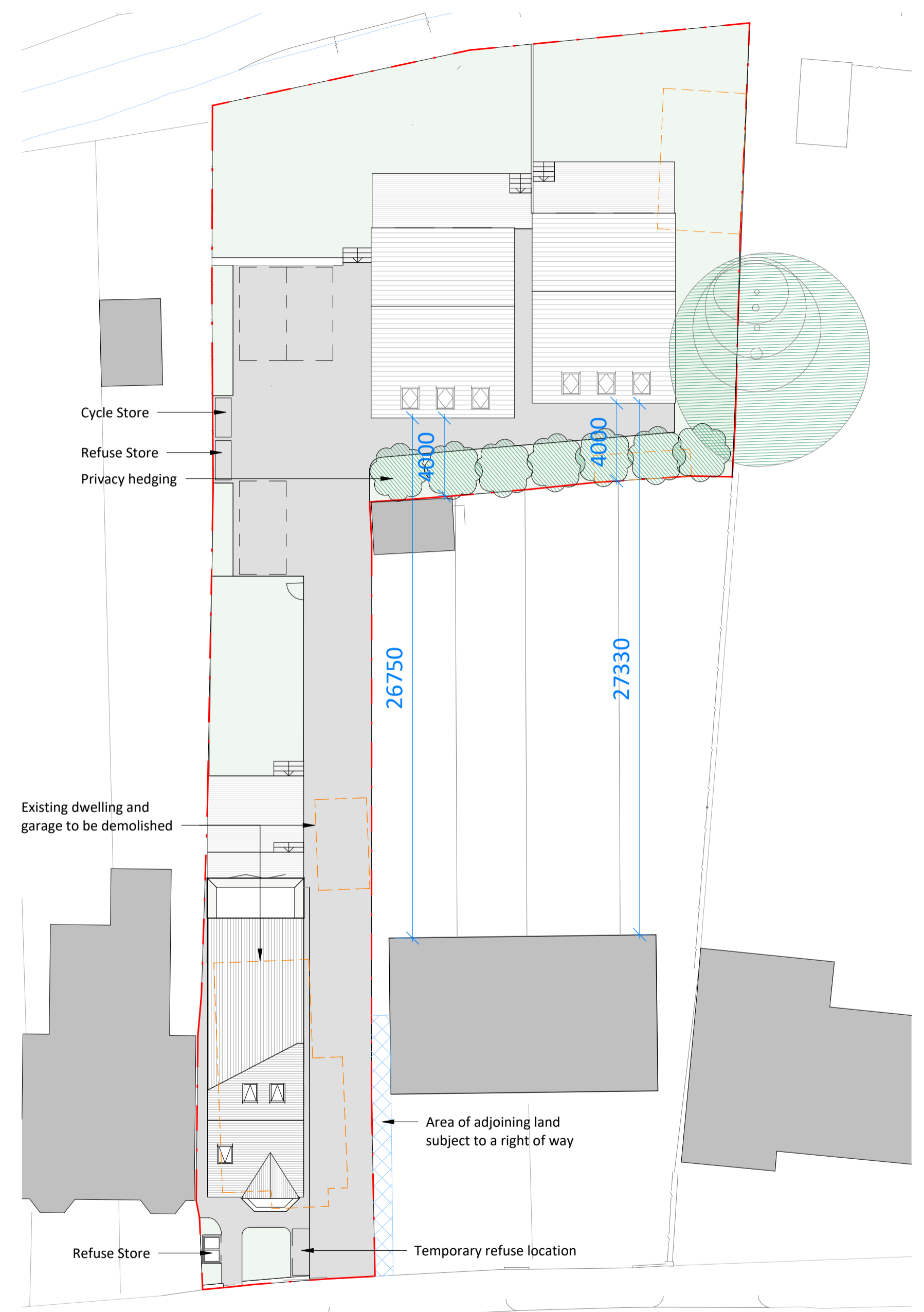
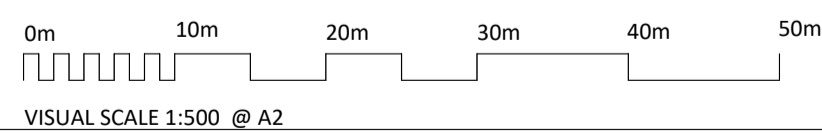
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Proposed Street Scape
1 : 100



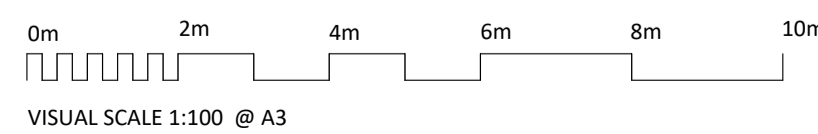
Proposed Block Plan
1 : 500



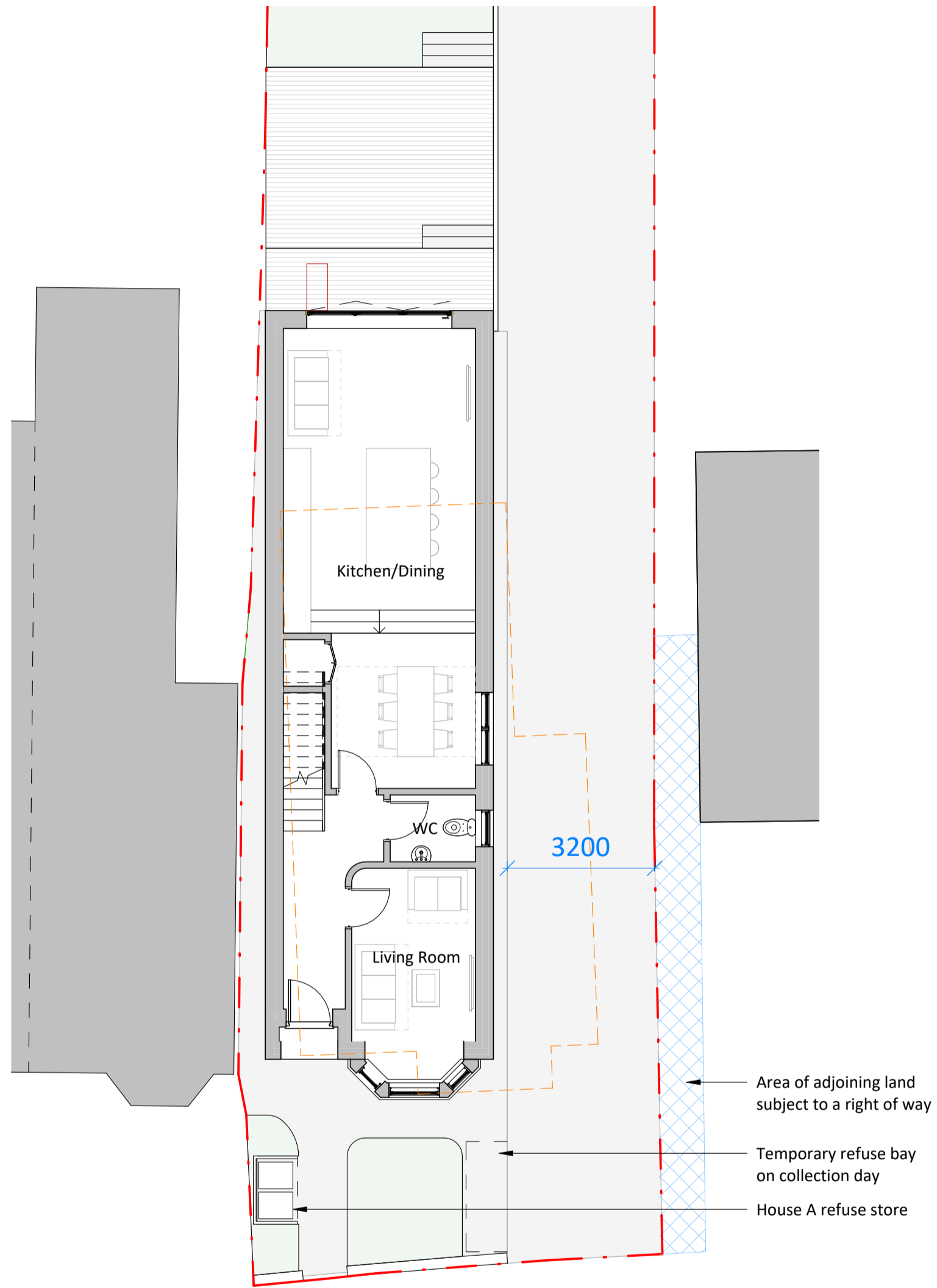
Proposed Site Plan
1 : 200

EXISTING VEHICULAR CROSSOVER

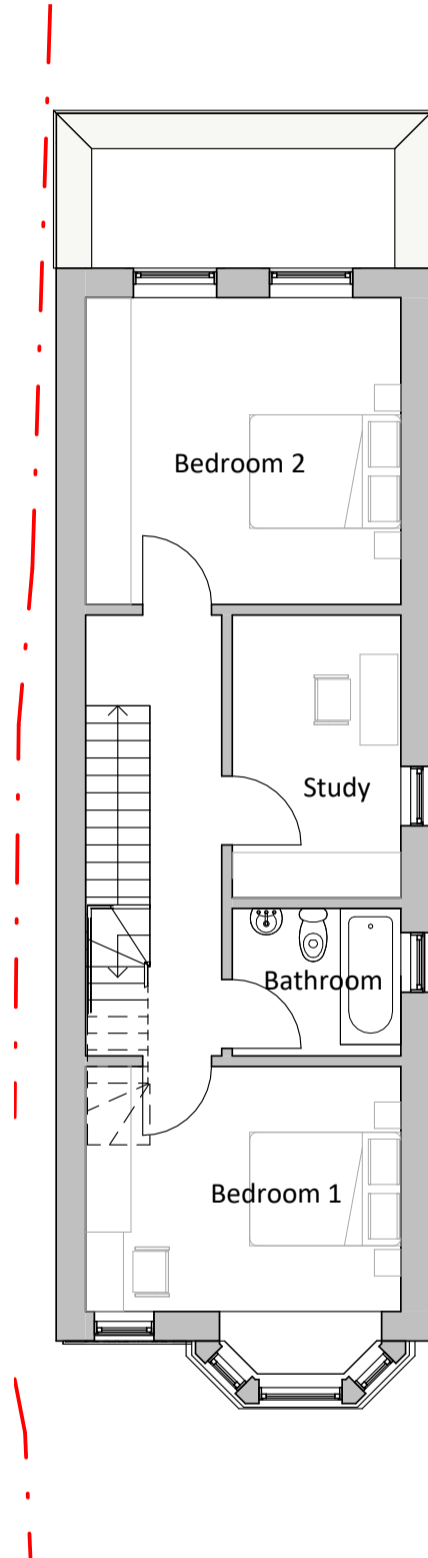
CRESCENT ROAD



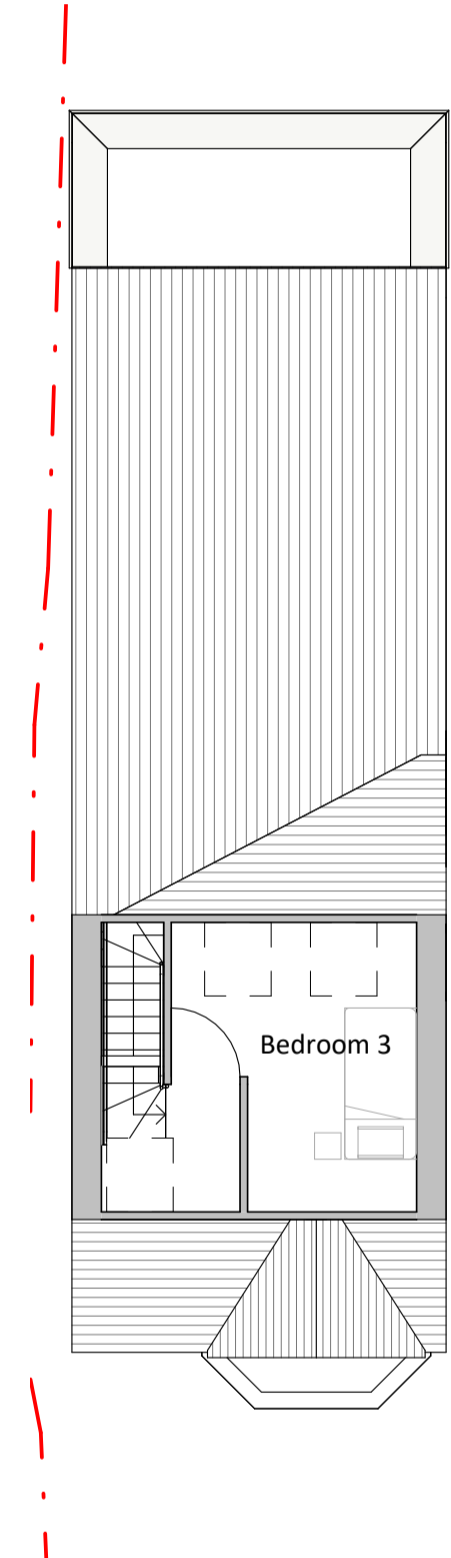
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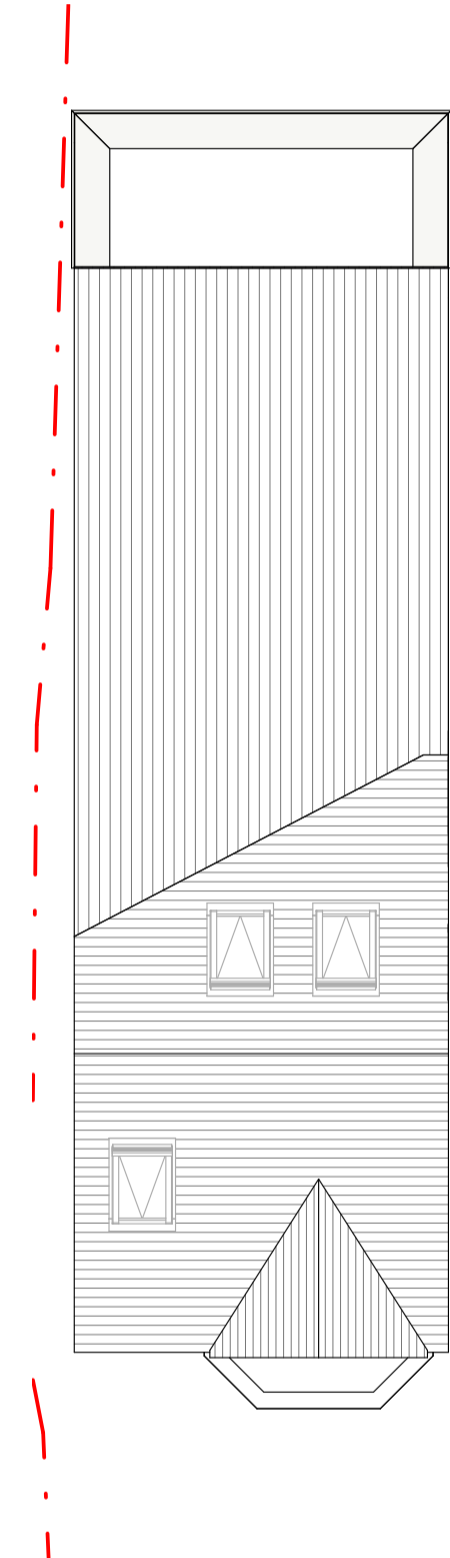
House A - Ground Floor
1 : 100



House A - First Floor
1 : 100



House A - Second Floor
1 : 100



House A - Roof Plan
1 : 100

Area of adjoining land
subject to a right of way

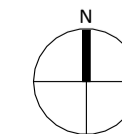
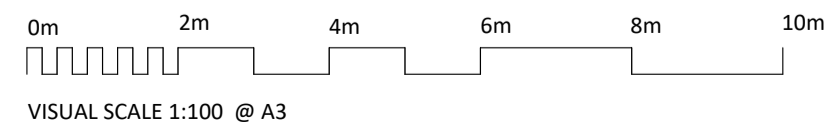
Temporary refuse bay
on collection day

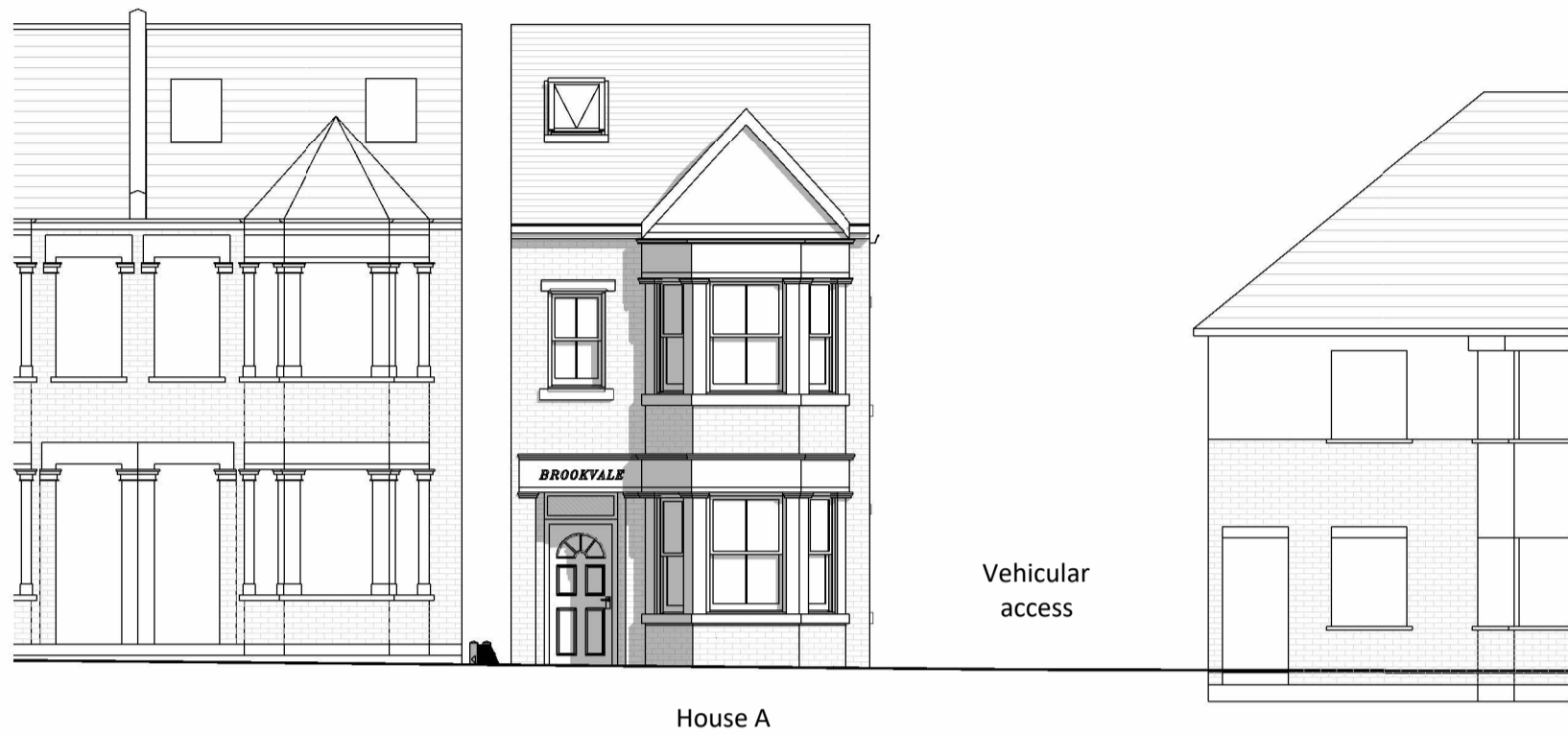
House A refuse store

Rev	Date	Drawn	Description

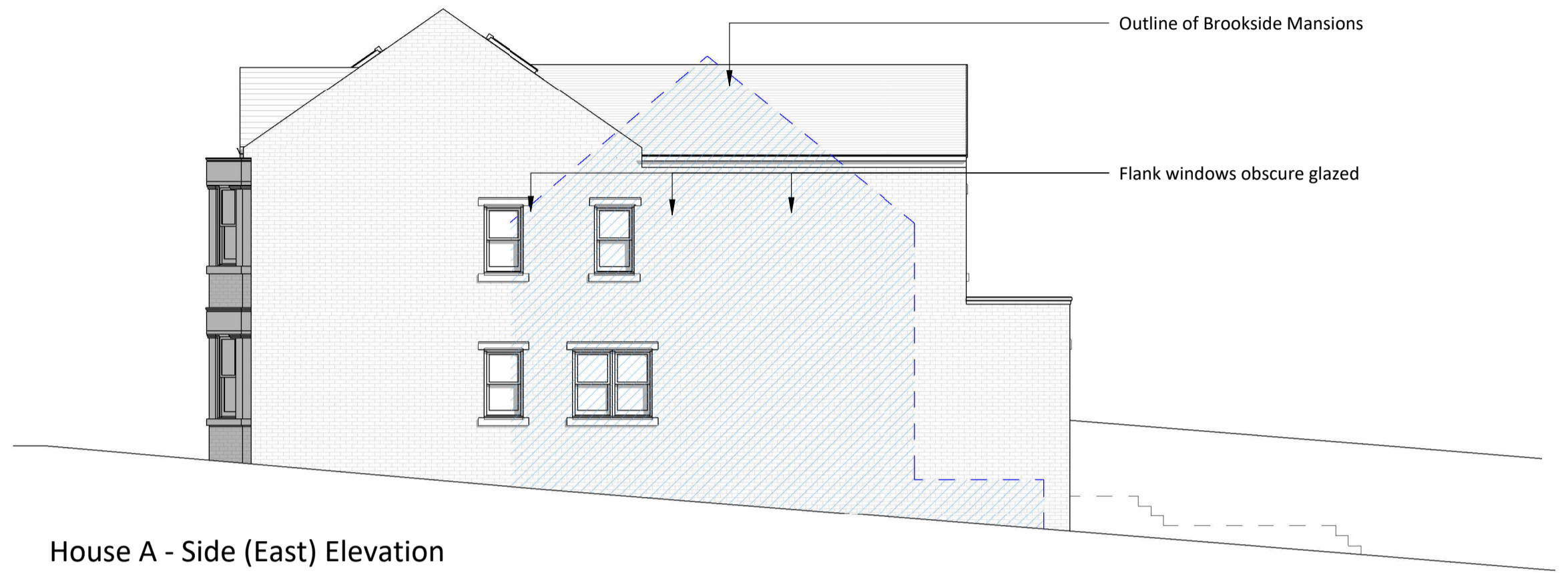
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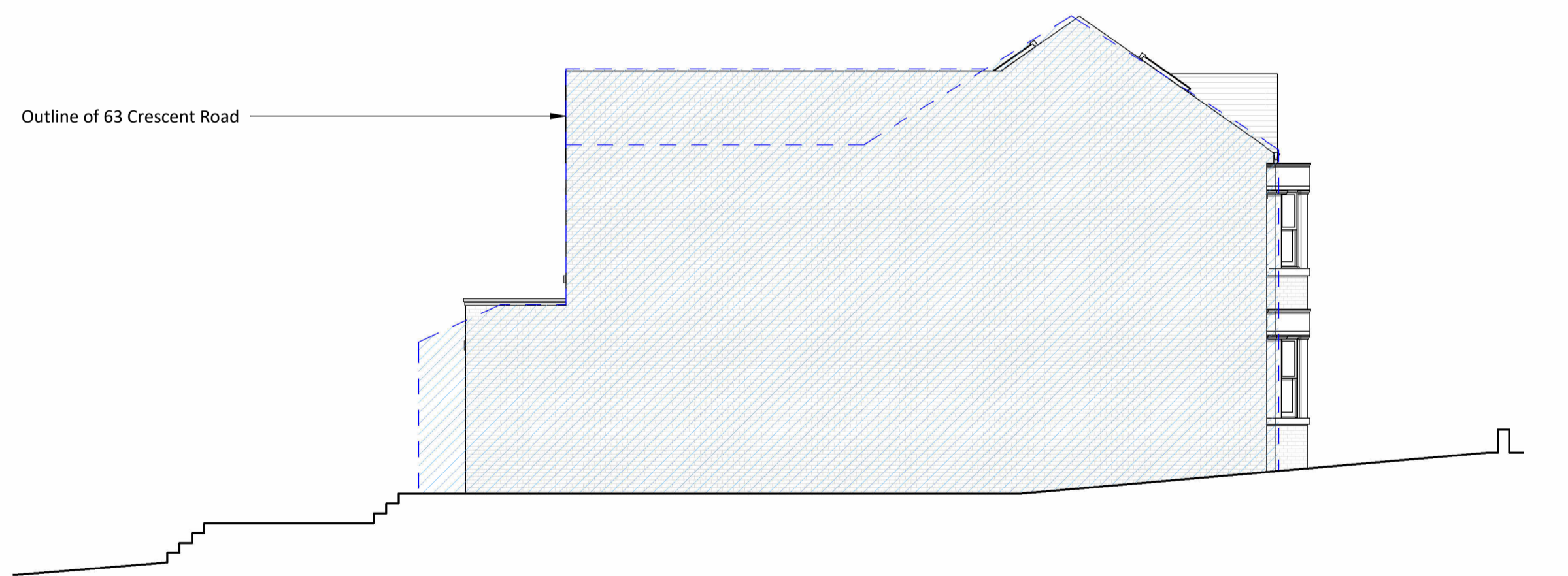
House A - Front Elevation
1 : 100



House A - Side (East) Elevation
1 : 100



House A - Rear Elevation
1 : 100

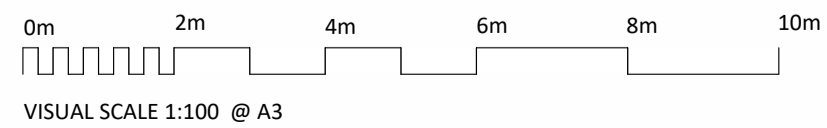


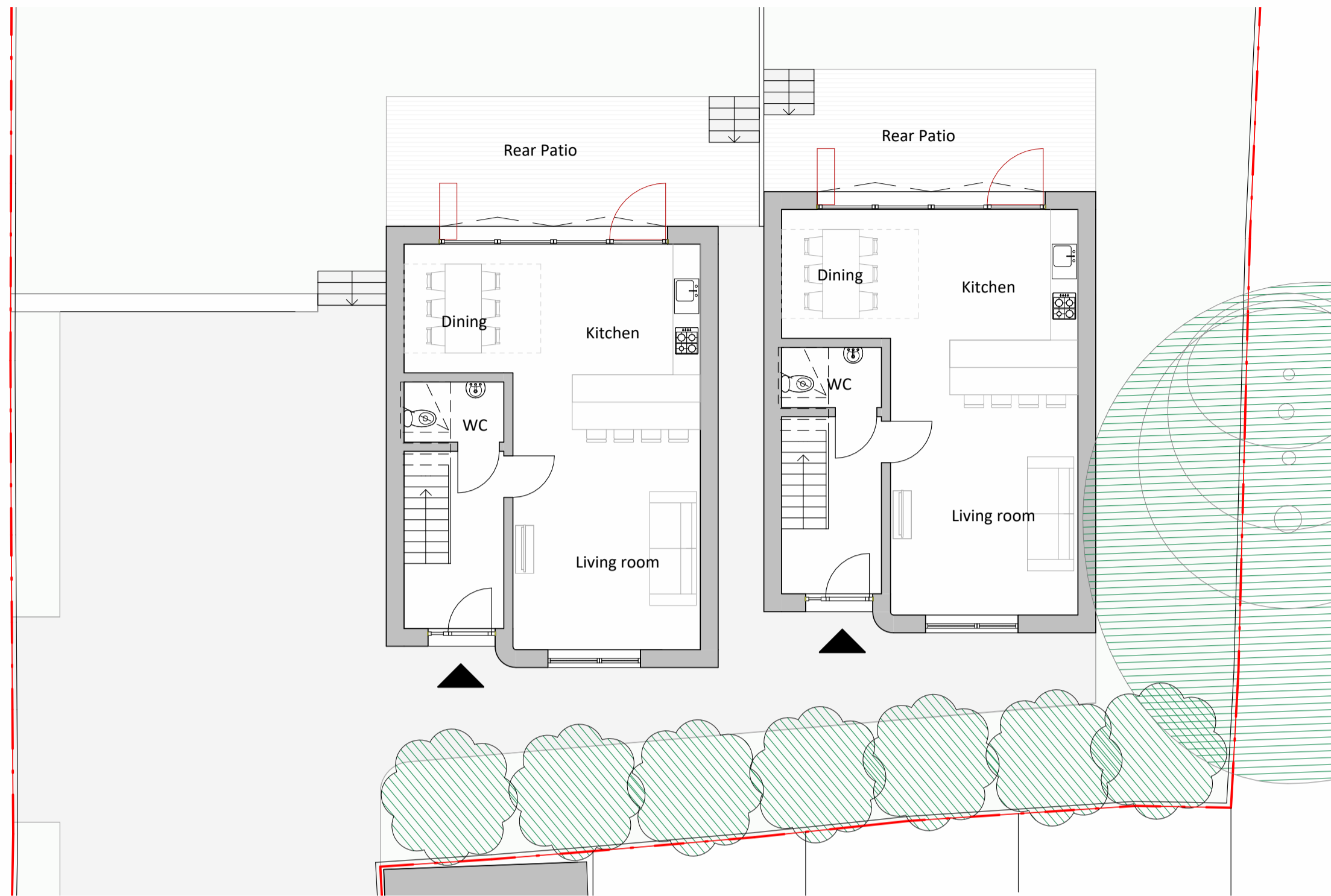
House A - Side (West) Elevation
1 : 100

Rev	Date	Drawn	Description

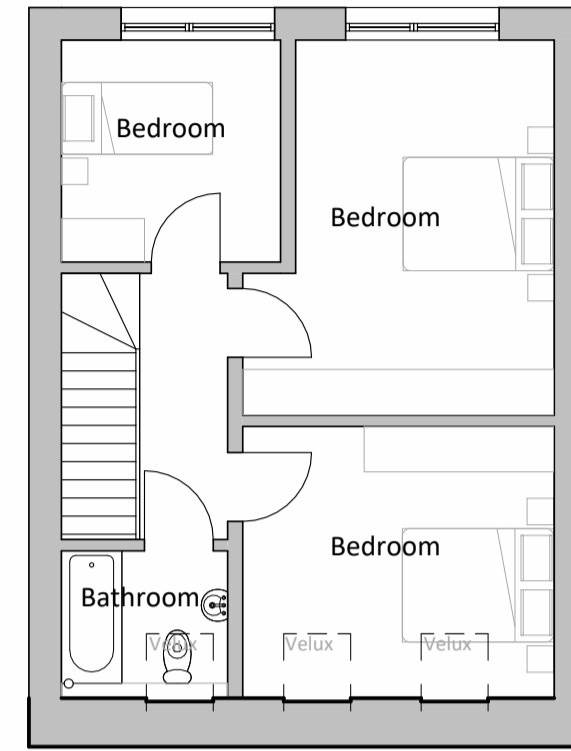
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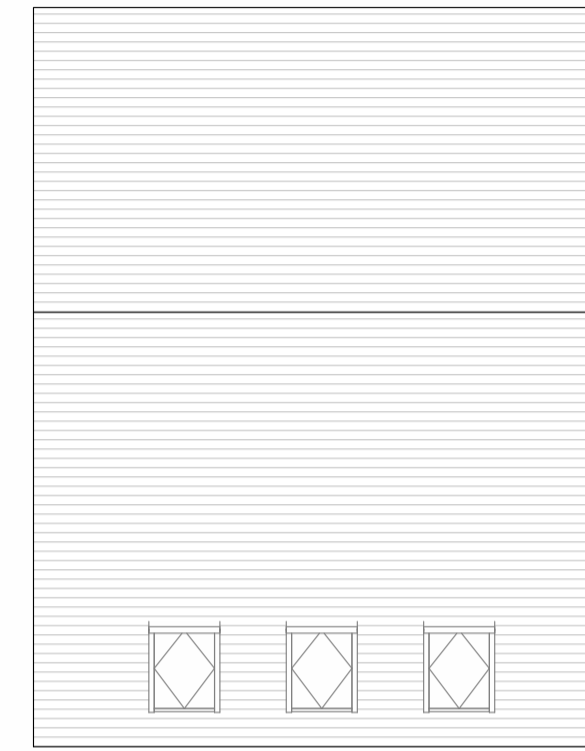




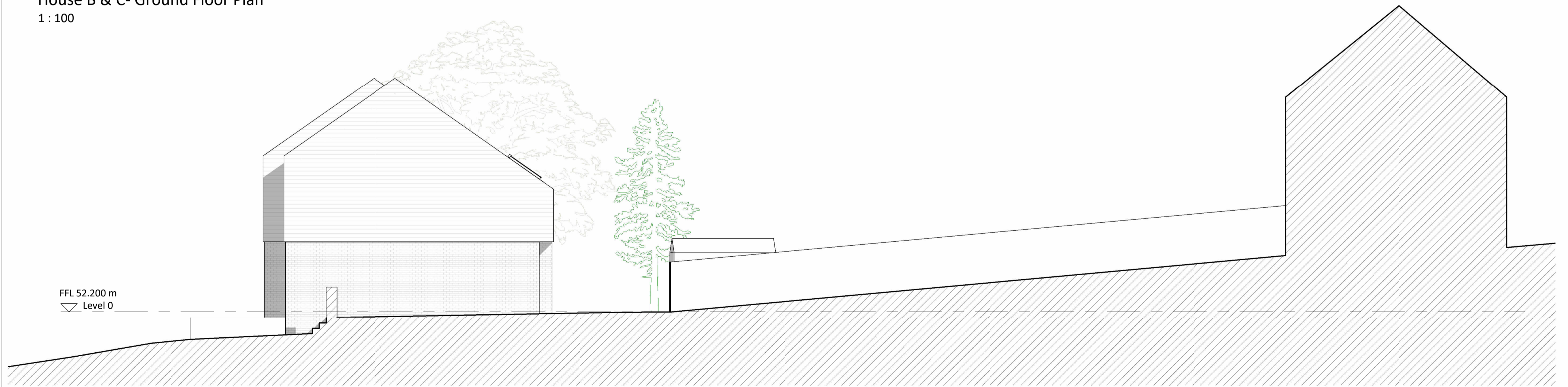
House B & C- Ground Floor Plan
1 : 100



House B & C- First Floor Plan
1 : 100



House B & C - Roof Plan
1 : 100

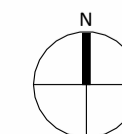
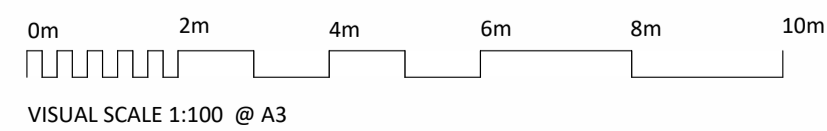


Site Section
1 : 100

Rev	Date	Drawn	Description

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Project: 65 Crescent Road, EN4 9RD
Client: Dr. Sampson
Title: House B & C - Floor Plans
Scale @ A1: 1 : 100
Dwg No: 1620. P1.06

Drawn: Author
Checked: Checker
Date: 10/21/23
Status: Pre-app
Revision:



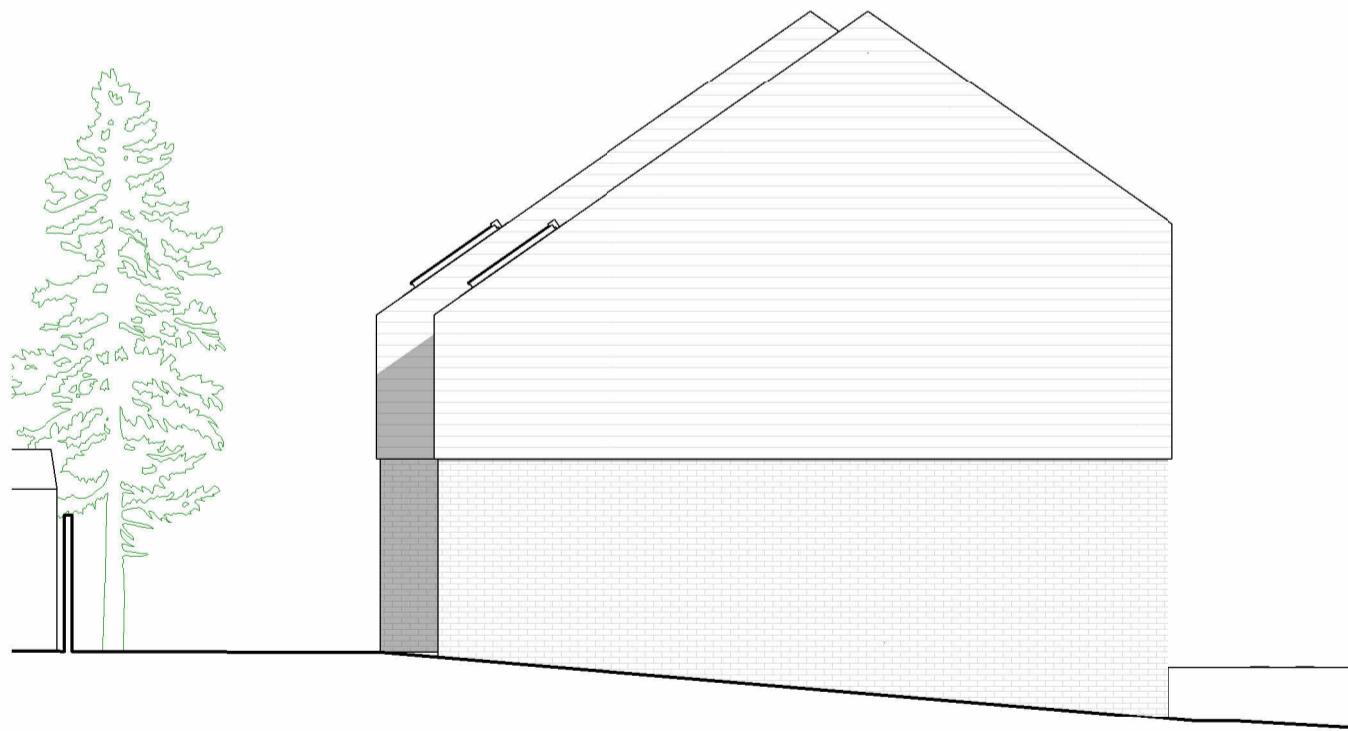
House B & C- Front Elevation
1 : 100



House B - Side Elevation
1 : 100



House B & C- Rear Elevation
1 : 100

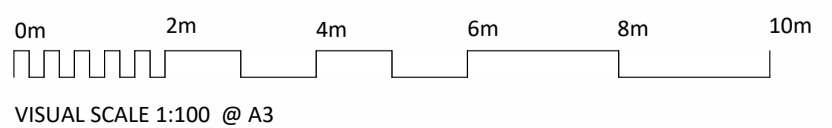


House C - Side (West) Elevation1
1 : 100

Rev	Date	Drawn	Description

Note:
Do Not Scale from Drawings- except for Local Authority Planning purposes only. These drawings are not intended for construction.

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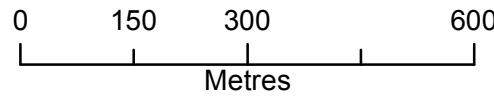


Appendix B – EA Product 4

Flood Map for Planning centred on: 65 Crescent Road, Barnet, EN4 9RD - 16/07/2019 - HNL 134753 BC



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Legend

- Main Rivers
- Site location
- Flood Storage Area
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

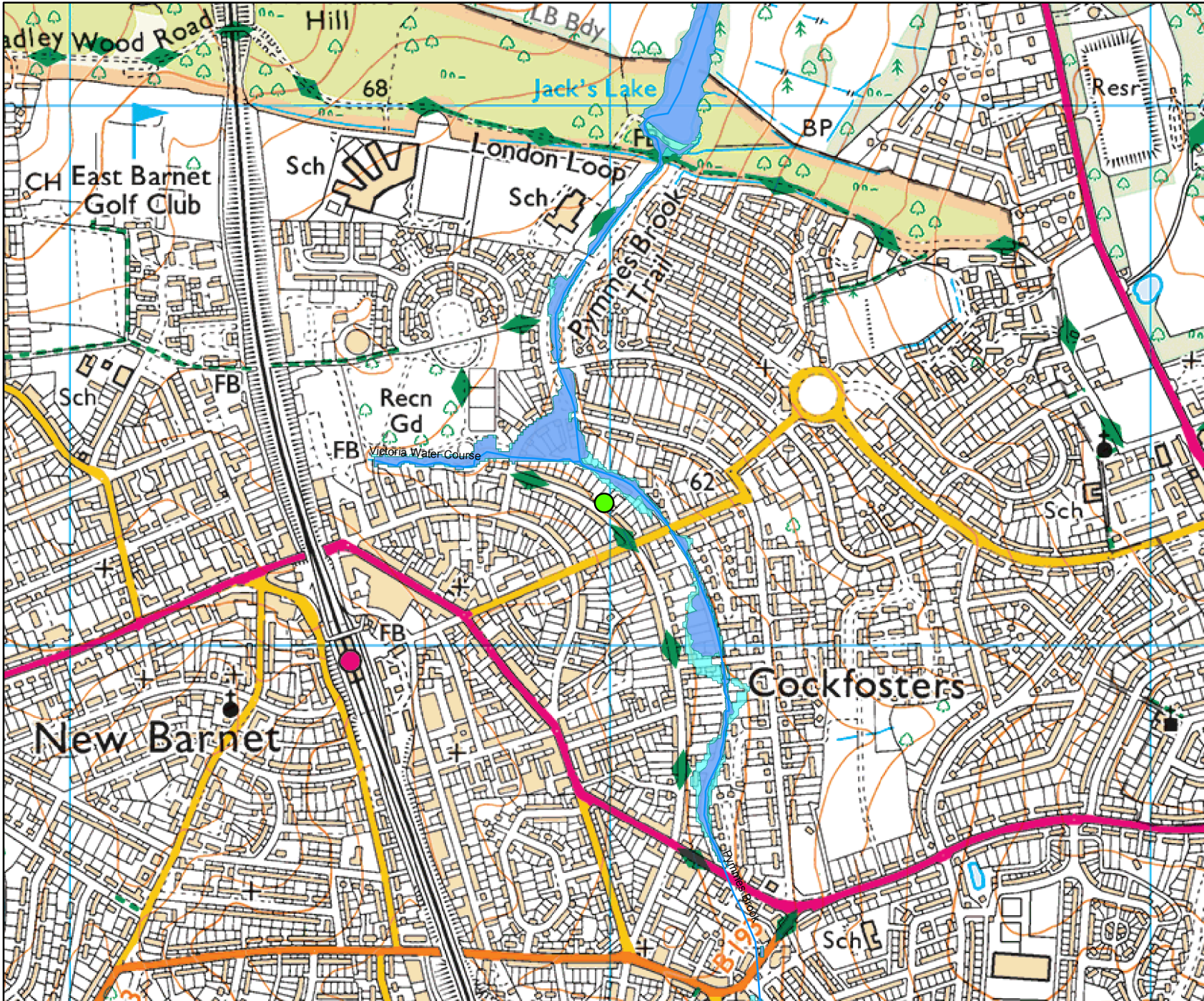
Flood Map for Planning

Flood Map for Planning (assuming no defences)

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

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

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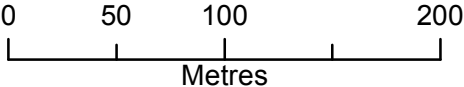


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Detailed FRA centred on: 65 Crescent Road, Barnet, EN4 9RD - 16/07/2019 - HNL 134753 BC



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Legend

- Main Rivers
- Site location

Defended Flood Outlines

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

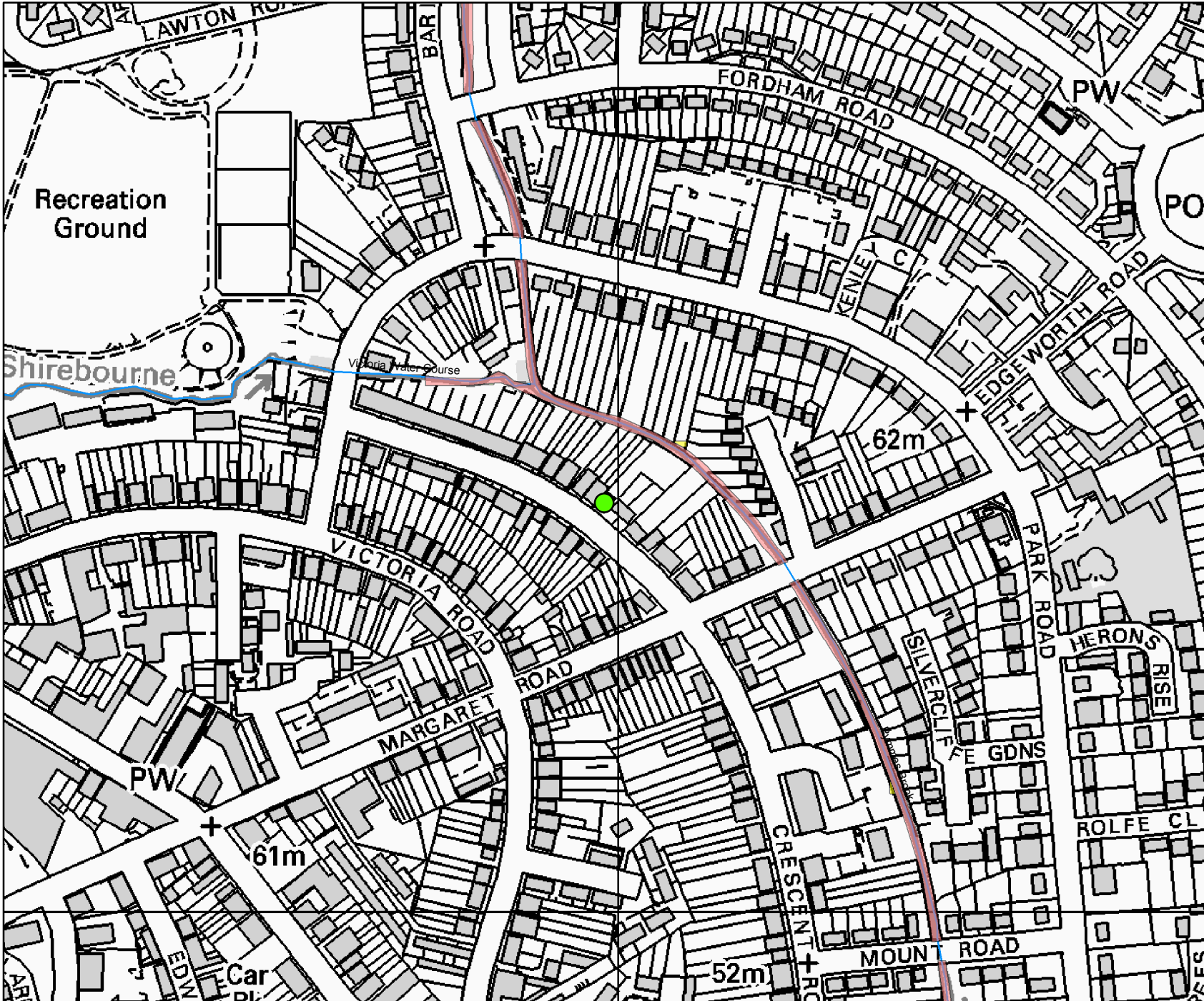
The data in this map has been extracted from the River Lee 2D Flood Mapping Study (CH2M Hill, 2014). This was a catchment-scale mapping study, so may need local updates for site-specific decisions. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.

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

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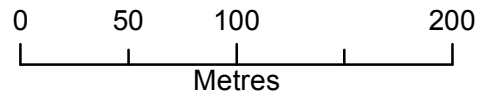


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Legend

- Main Rivers
 - Site location
- #### Defended Flood Outlines
- 1 in 50 (2%) Defended
 - 1 in 75 (1.33%) Defended
 - 1 in 100 (1%) Defended
 - 1 in 100+20% (*CC) Defended

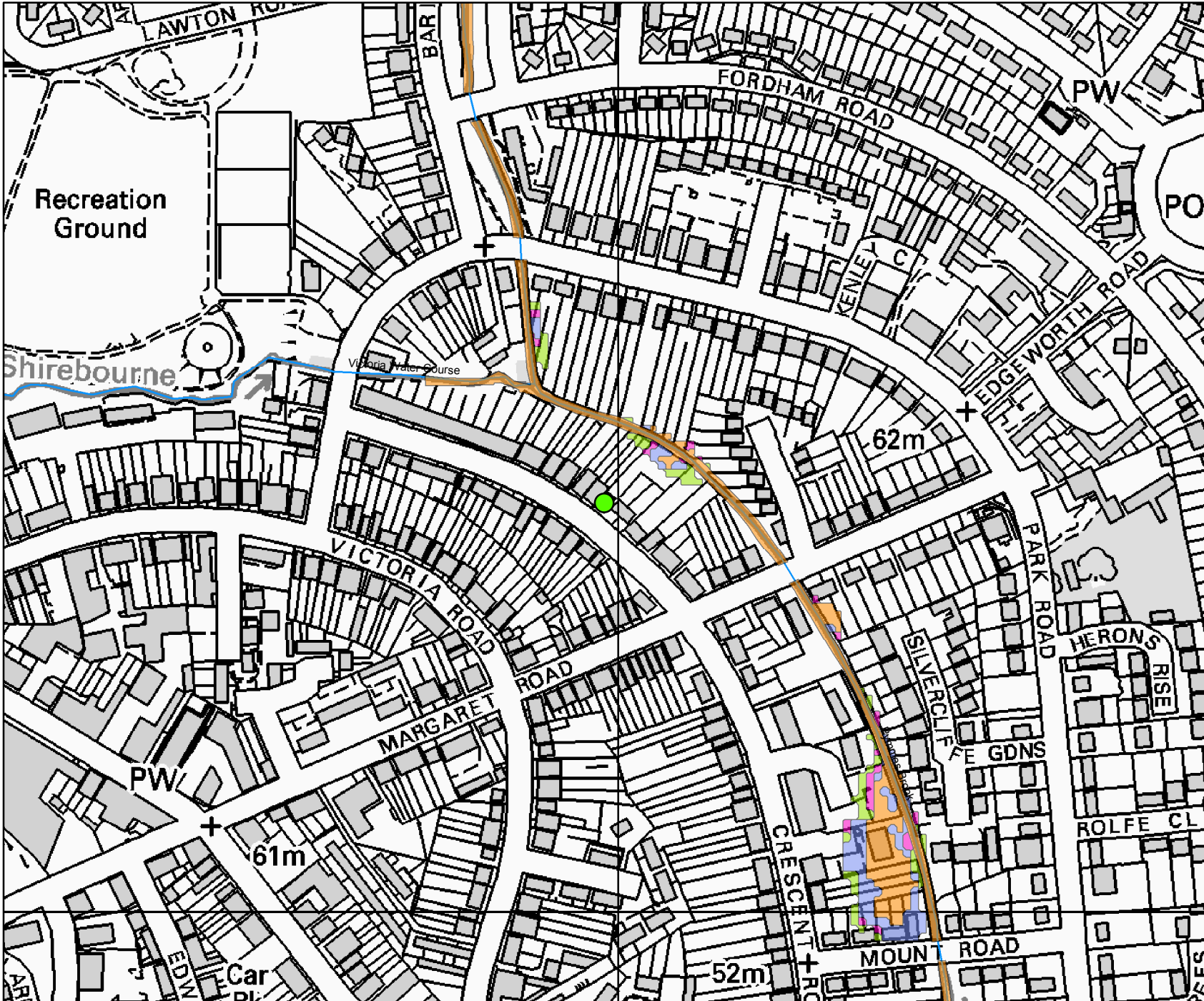
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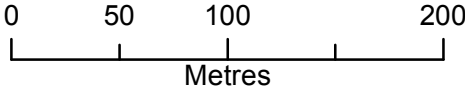


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Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 200 (0.5%) Defended
- 1 in 1000 (0.1%) Defended

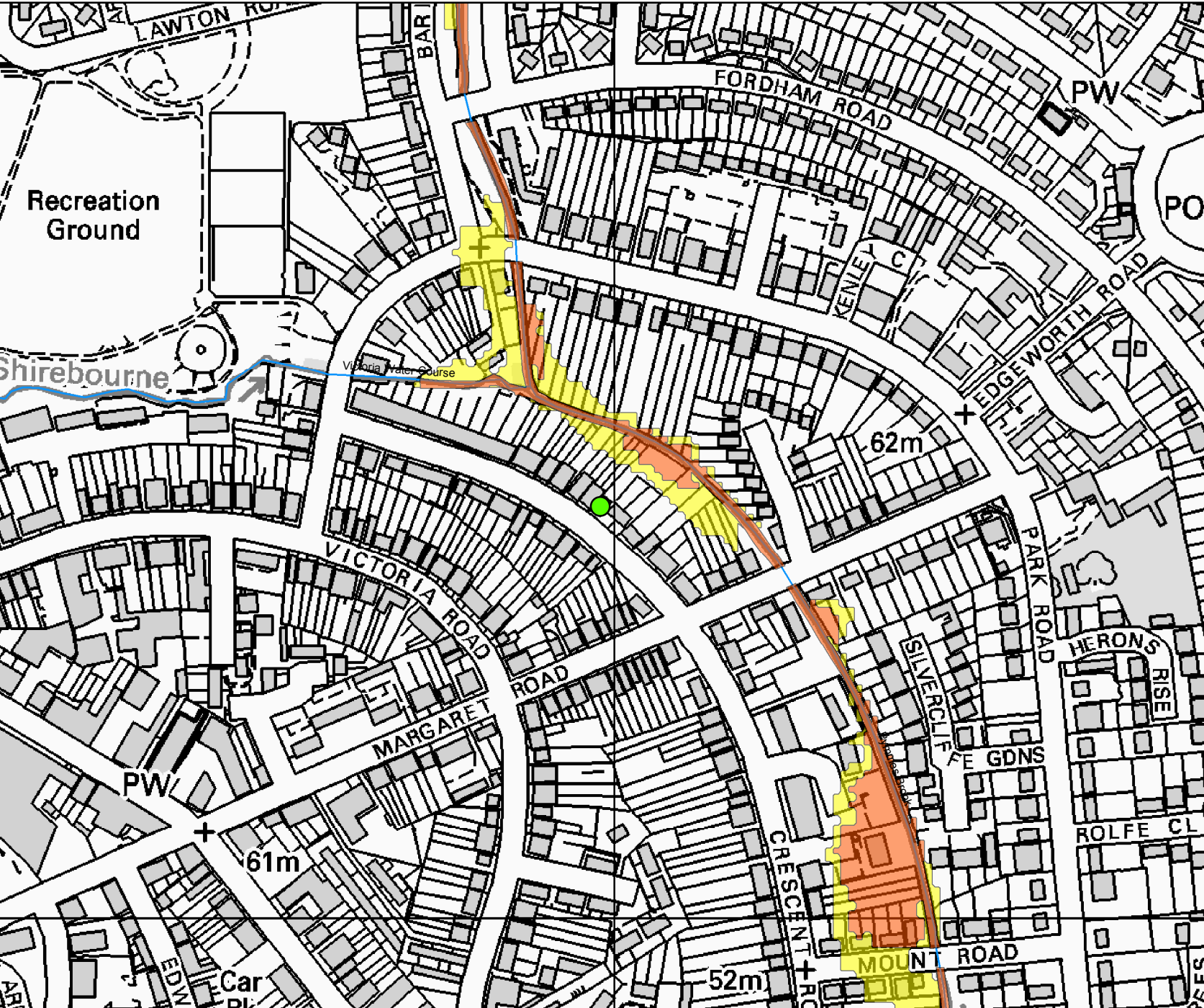
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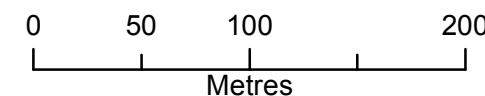
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Legend

- Main Rivers
- Site location

1D Node Results

- Node Results

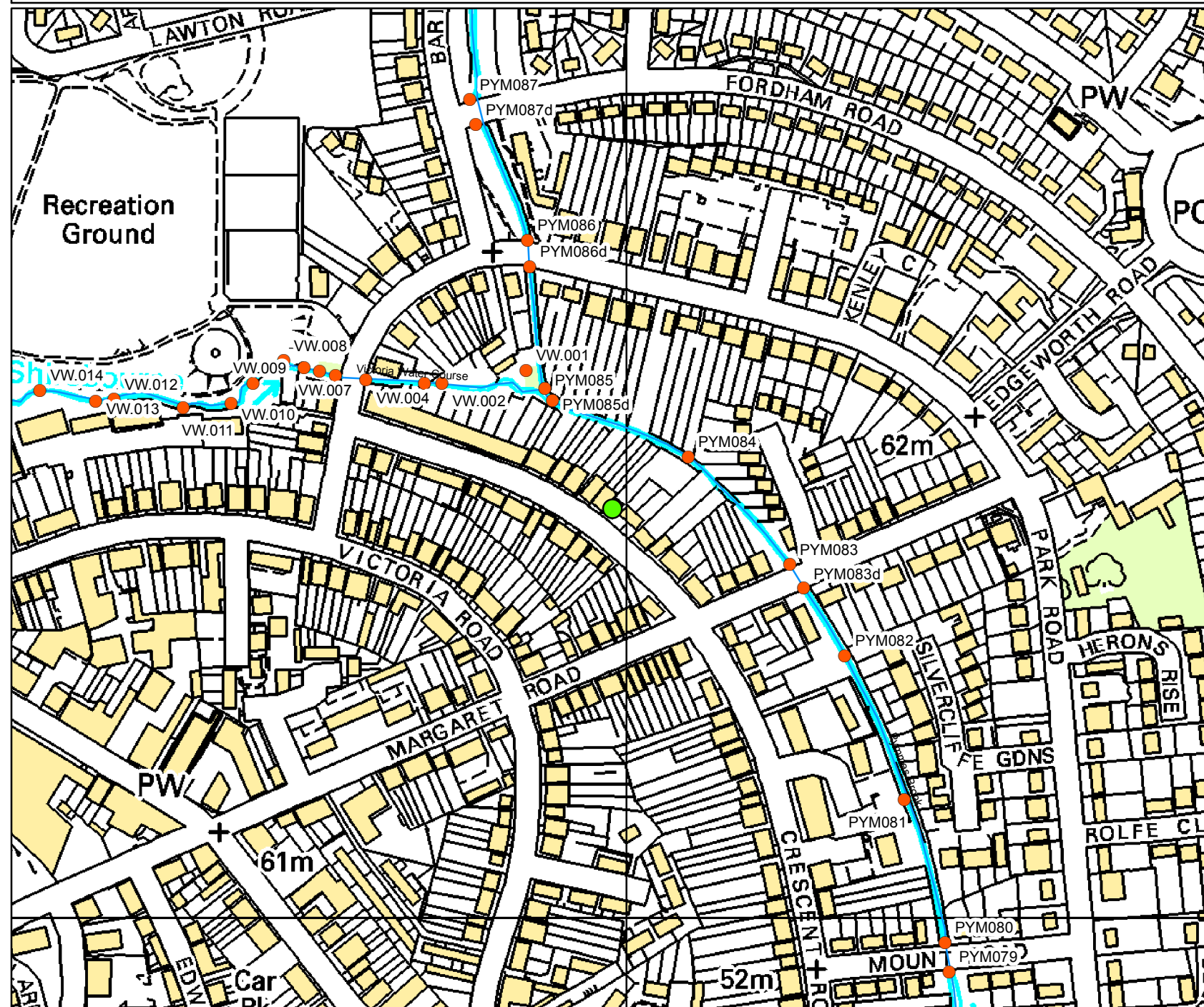
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<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Caution:

This model has been designed for catchmentwide 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.

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

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

MODELLED FLOOD LEVEL

Node Label	Easting	Northing	Return Period									
			2 yr	5 yr	10 yr	20 yr	50 yr	75 yr	100 yr	100 yr + 20%	200 yr	1000 yr
PYM079	527209	195965	47.07	47.13	47.19	47.28	47.37	47.42	47.49	47.59	47.61	48.27
PYM080	527206	195983	48.60	48.69	48.79	48.92	49.06	49.14	49.24	49.43	49.46	50.11
PYM081	527180	196076	49.13	49.21	49.28	49.39	49.48	49.55	49.63	49.82	49.85	50.38
PYM082	527141	196169	49.72	49.80	49.88	49.98	50.08	50.14	50.15	50.17	50.17	50.38
PYM083d	527115	196213	49.95	50.01	50.07	50.15	50.25	50.30	50.34	50.44	50.45	50.94
PYM083	527106	196228	50.18	50.26	50.34	50.46	50.61	50.70	50.77	50.94	50.96	51.96
PYM084	527040	196298	50.63	50.70	50.78	50.90	51.03	51.10	51.18	51.35	51.37	52.24
VW.011	526713	196330	54.51	54.59	54.66	54.75	54.78	54.84	54.88	54.97	54.98	56.74
VW.010	526744	196332	54.06	54.14	54.21	54.32	54.34	54.41	54.47	54.61	54.63	56.73
VW.013	526656	196334	55.13	55.19	55.25	55.32	55.34	55.39	55.43	55.52	55.53	56.73
PYM085d	526952	196334	51.26	51.32	51.37	51.45	51.55	51.60	51.64	51.74	51.75	52.29
VW.012	526668	196335	54.98	55.04	55.10	55.18	55.20	55.26	55.30	55.40	55.41	56.74
VW.014	526620	196341	55.51	55.60	55.67	55.78	55.80	55.86	55.91	56.02	56.03	56.77
PYM085	526947	196342	51.26	51.32	51.37	51.45	51.55	51.60	51.64	51.74	51.75	52.29
VW.009	526758	196346	53.83	53.91	53.99	54.10	54.13	54.21	54.29	54.44	54.46	56.73
VW.003	526869	196346	51.98	52.07	52.15	52.25	52.27	52.34	52.39	52.50	52.51	53.04
VW.002	526880	196346	51.89	51.97	52.04	52.12	52.14	52.19	52.23	52.32	52.33	52.80
VW.004	526831	196347	52.71	52.79	52.86	52.97	53.00	53.07	53.12	53.25	53.26	53.95
VW.005	526812	196350	53.11	53.24	53.36	53.55	53.59	53.70	53.80	54.02	54.04	56.72
VW.006	526801	196353	53.22	53.33	53.44	53.61	53.66	53.76	53.86	54.06	54.08	56.72
VW.001	526935	196354	51.36	51.43	51.49	51.59	51.66	51.72	51.77	51.87	51.88	52.46
VW.007	526791	196355	53.48	53.57	53.65	53.78	53.81	53.89	53.96	54.14	54.16	56.72
VW.008	526778	196360	53.72	53.80	53.89	54.03	54.07	54.16	54.25	54.42	54.43	56.73
PYM086d	526937	196421	52.10	52.13	52.17	52.20	52.48	52.54	52.59	52.72	52.74	52.93
PYM086	526936	196438	52.52	52.56	52.62	52.68	53.17	53.30	53.42	53.67	53.71	54.36
PYM087d	526902	196513	52.80	52.84	52.89	52.96	53.31	53.41	53.50	53.72	53.76	54.32
PYM087	526899	196529	52.90	52.94	52.99	53.05	53.44	53.55	53.65	53.87	53.91	54.56

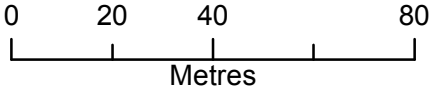
MODELLED FLOWS

Node Label	Easting	Northing	Return Period									
			2 yr	5 yr	10 yr	20 yr	50 yr	75 yr	100 yr	100 yr + 20%	200 yr	1000 yr
PYM079	527209	195965	3.54	4.12	4.71	5.62	6.57	7.19	7.95	9.40	9.61	14.92
PYM080	527206	195983	3.54	4.12	4.71	5.62	6.57	7.19	7.95	9.40	9.61	14.92
PYM081	527180	196076	3.54	4.12	4.72	5.62	6.59	7.22	7.40	7.58	7.59	7.92
PYM082	527141	196169	3.16	3.66	4.16	4.93	5.98	6.61	7.19	8.51	8.68	16.79
PYM083d	527115	196213	3.16	3.66	4.16	4.93	5.98	6.61	7.19	8.51	8.67	17.06
PYM083	527106	196228	3.16	3.66	4.16	4.93	5.98	6.61	7.19	8.51	8.67	17.05
PYM084	527040	196298	3.16	3.66	4.16	4.93	5.98	6.54	6.89	7.64	7.76	12.68
VW.011	526713	196330	1.69	2.10	2.51	3.13	3.28	3.69	4.06	4.87	4.97	10.82
VW.010	526744	196332	1.69	2.10	2.51	3.13	3.28	3.69	4.06	4.87	4.97	10.72
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PYM085d	526952	196334	2.79	3.20	3.62	4.25	5.37	5.93	6.45	7.65	7.81	15.03
VW.012	526668	196335	1.69	2.10	2.51	3.13	3.28	3.69	4.06	4.87	4.97	10.97
VW.014	526620	196341	1.69	2.10	2.51	3.13	3.28	3.69	4.06	4.87	4.97	11.04
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VW.004	526831	196347	1.69	2.09	2.50	3.12	3.28	3.69	4.05	4.86	4.96	10.60
VW.005	526812	196350	1.69	2.09	2.51	3.12	3.28	3.69	4.05	4.86	4.96	10.60
VW.006	526801	196353	1.69	2.09	2.51	3.12	3.28	3.69	4.05	4.86	4.96	10.61
VW.001	526935	196354	1.69	2.09	2.50	3.12	3.28	3.69	4.05	4.86	4.96	10.33
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PYM086d	526937	196421	1.53	1.67	1.88	2.09	4.08	4.62	5.10	6.16	6.34	8.51
PYM086	526936	196438	1.53	1.67	1.88	2.09	4.08	4.62	5.10	6.16	6.33	8.51
PYM087d	526902	196513	1.53	1.67	1.88	2.09	4.08	4.62	5.10	6.16	6.33	11.47
PYM087	526899	196529	1.53	1.67	1.88	2.09	4.08	4.62	5.10	6.16	6.33	11.47

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Legend

- Main Rivers
 - Site location
- 2D Node Results: Heights**
- 1 in 2 (50%) Defended M11

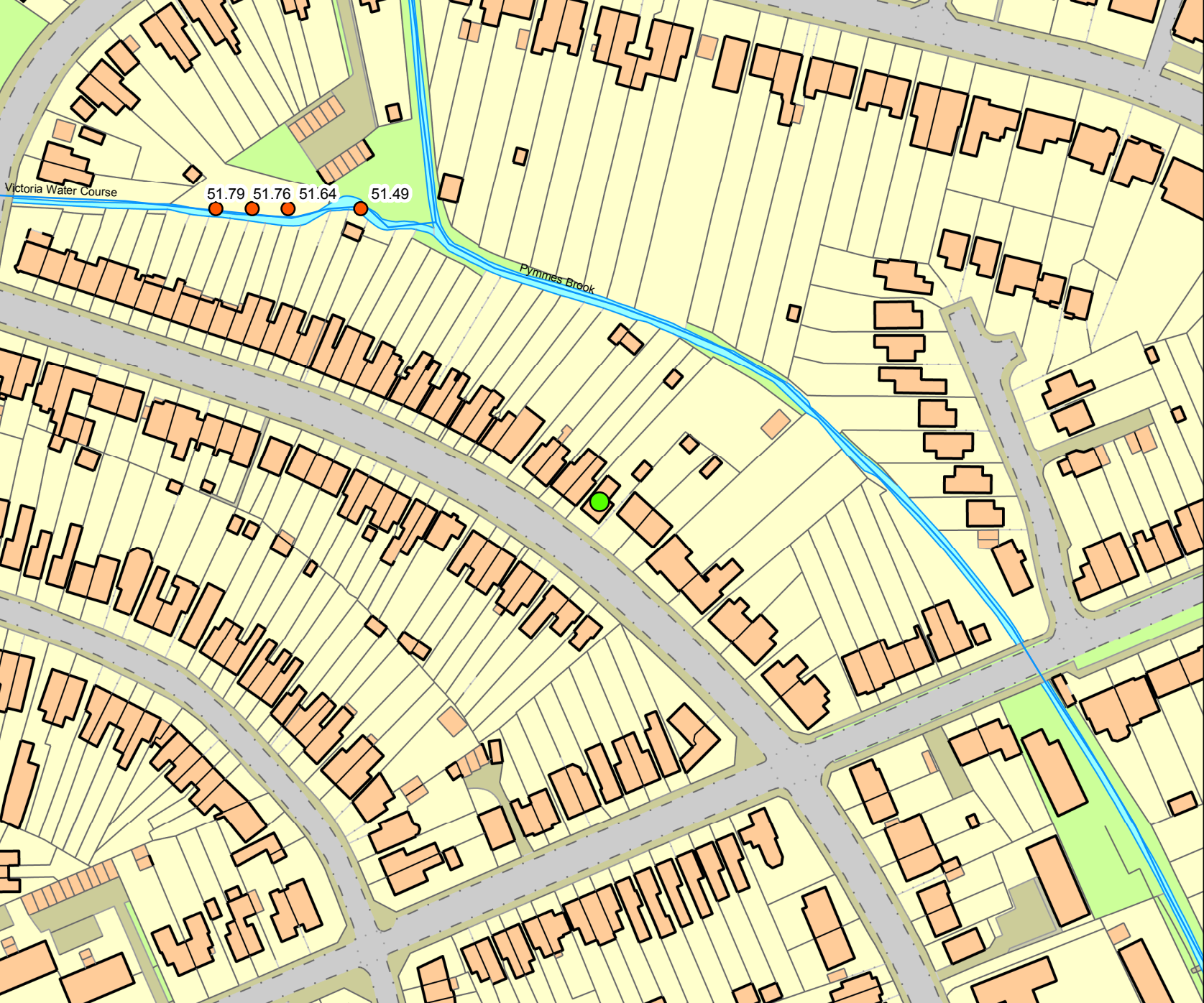
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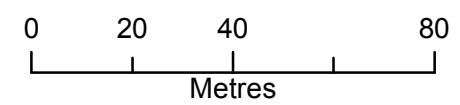
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Legend

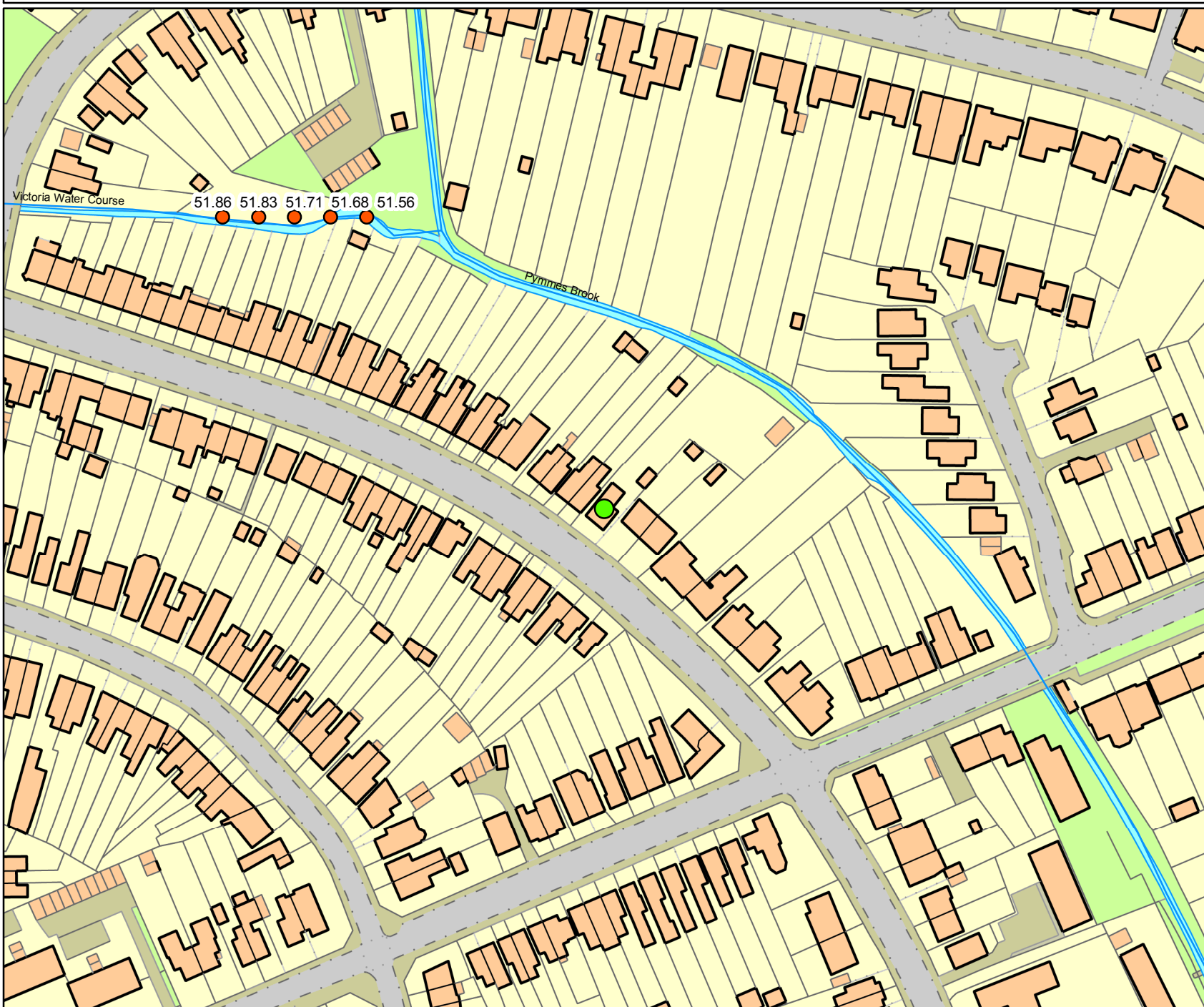
- Main Rivers
 - Site location
- 2D Node Results: Heights**
- 1 in 5 (20%) Defended M11

The data in this map has been extracted from the River Lee 2D Flood Mapping Study (CH2M Hill, 2014). This was a catchment-scale mapping study, so may need local updates for site-specific decisions. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.

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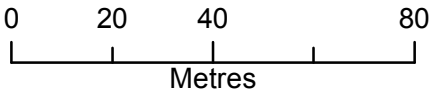
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Legend

-  Main Rivers
-  Site location

2D Node Results: Heights

-  1 in 10 (10%) Defended M11

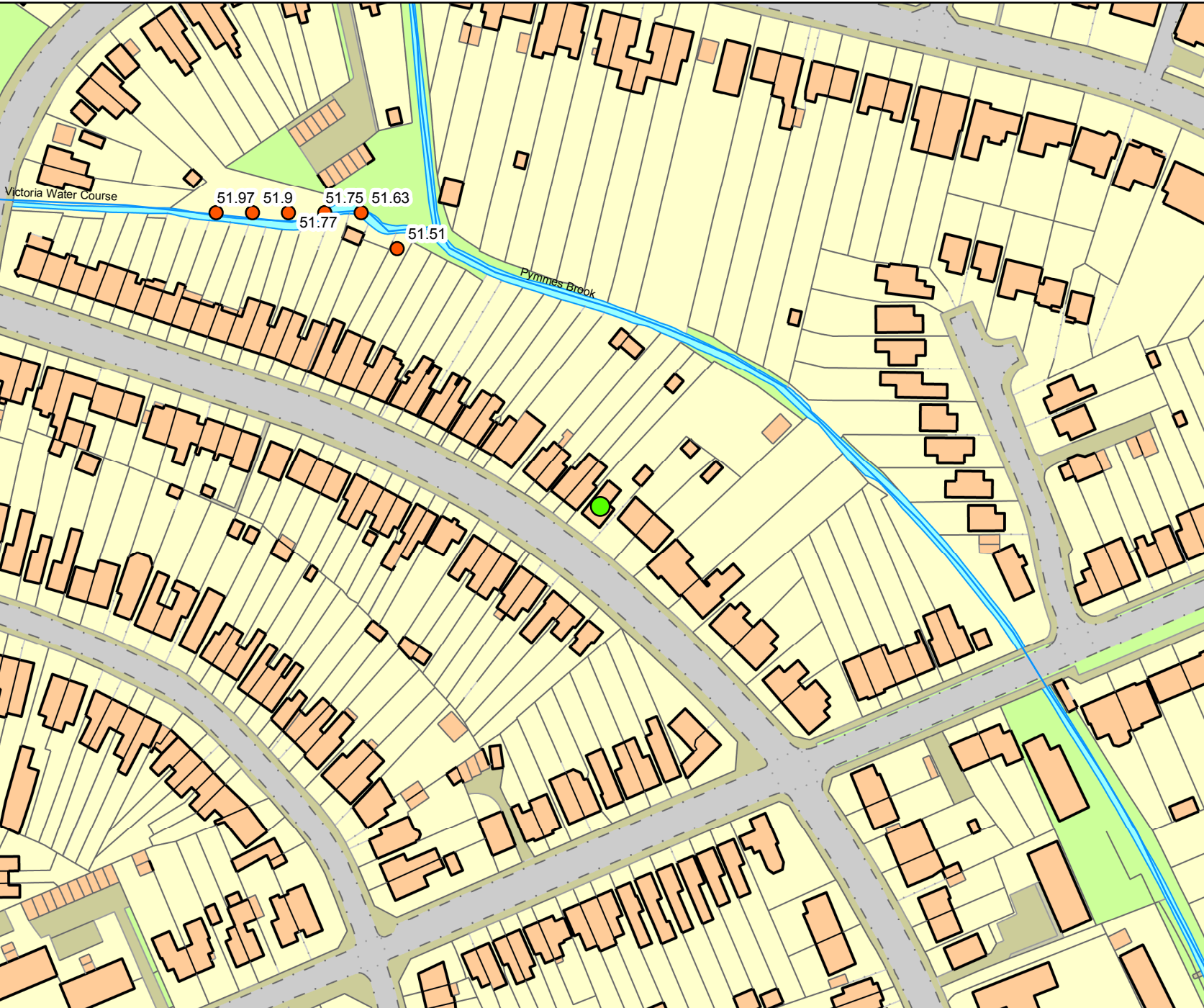
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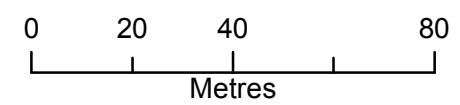
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Legend

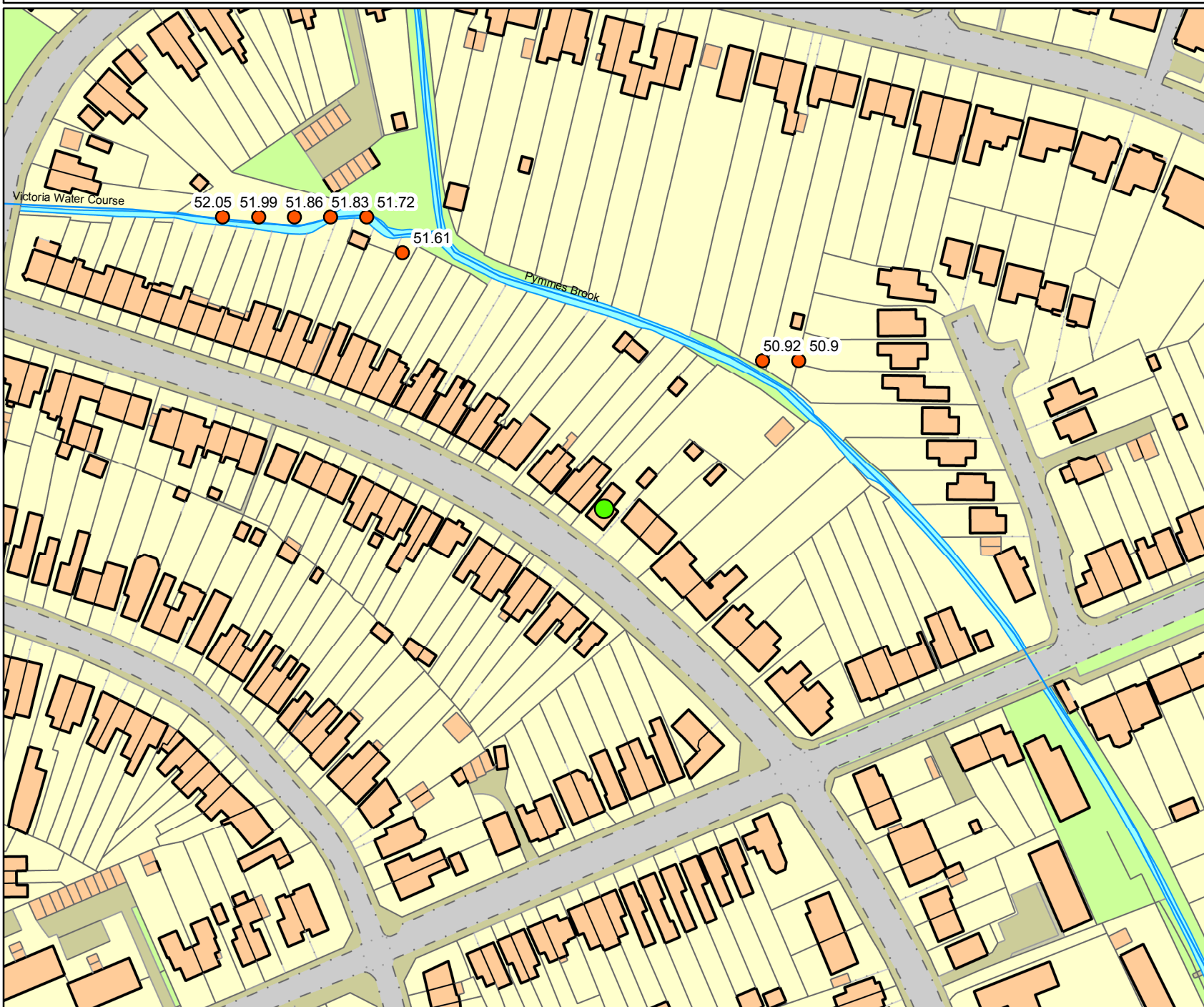
- Main Rivers
 - Site location
- 2D Node Results: Heights**
- 1 in 20 (5%) Defended M11

The data in this map has been extracted from the River Lee 2D Flood Mapping Study (CH2M Hill, 2014). This was a catchment-scale mapping study, so may need local updates for site-specific decisions. 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>

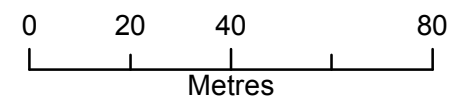
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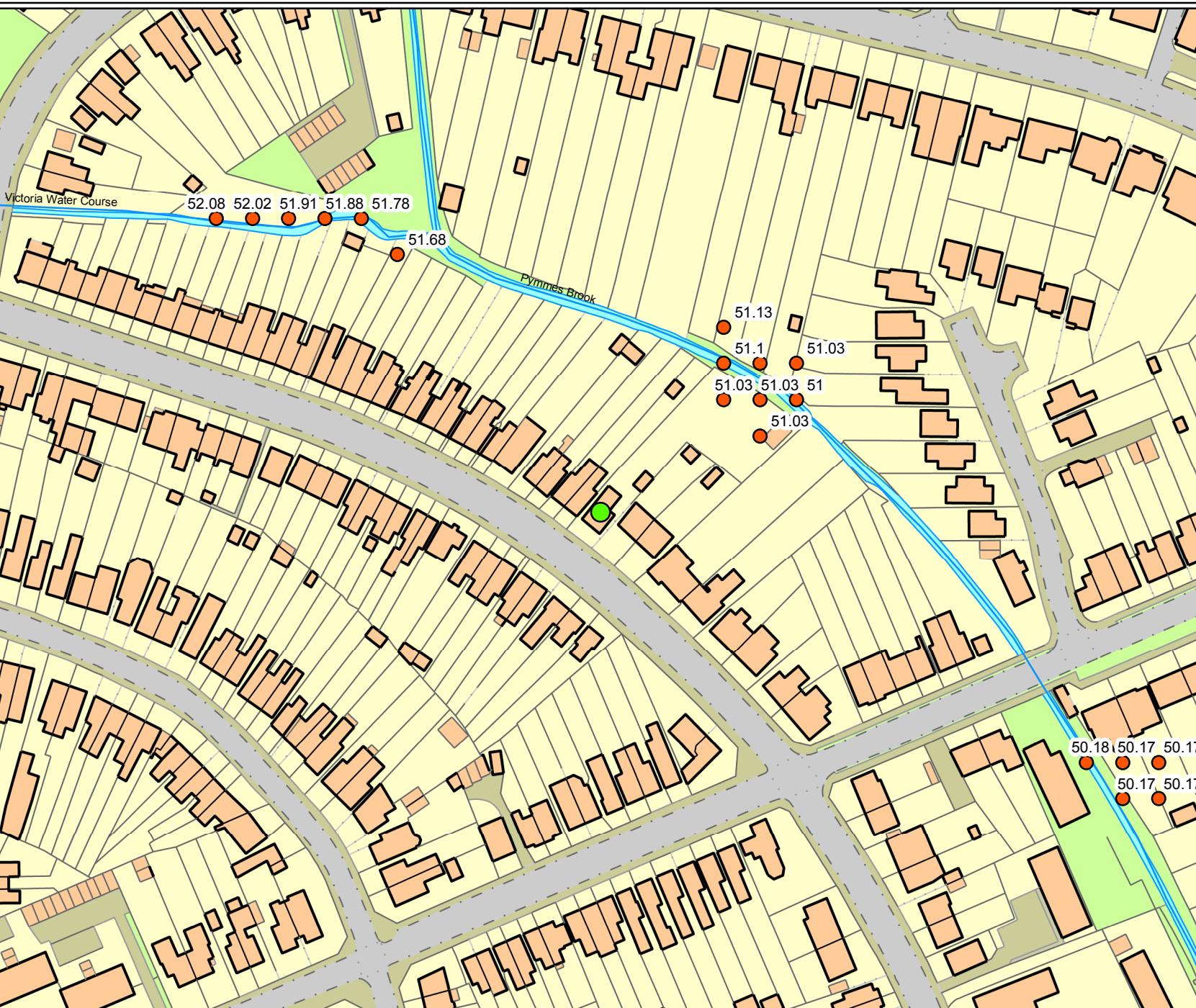
- Main Rivers
 - Site location
- 2D Node Results: Heights**
- 1 in 50 (2%) Defended M11

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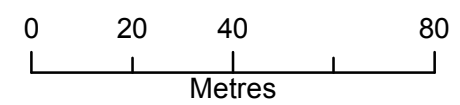
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Legend

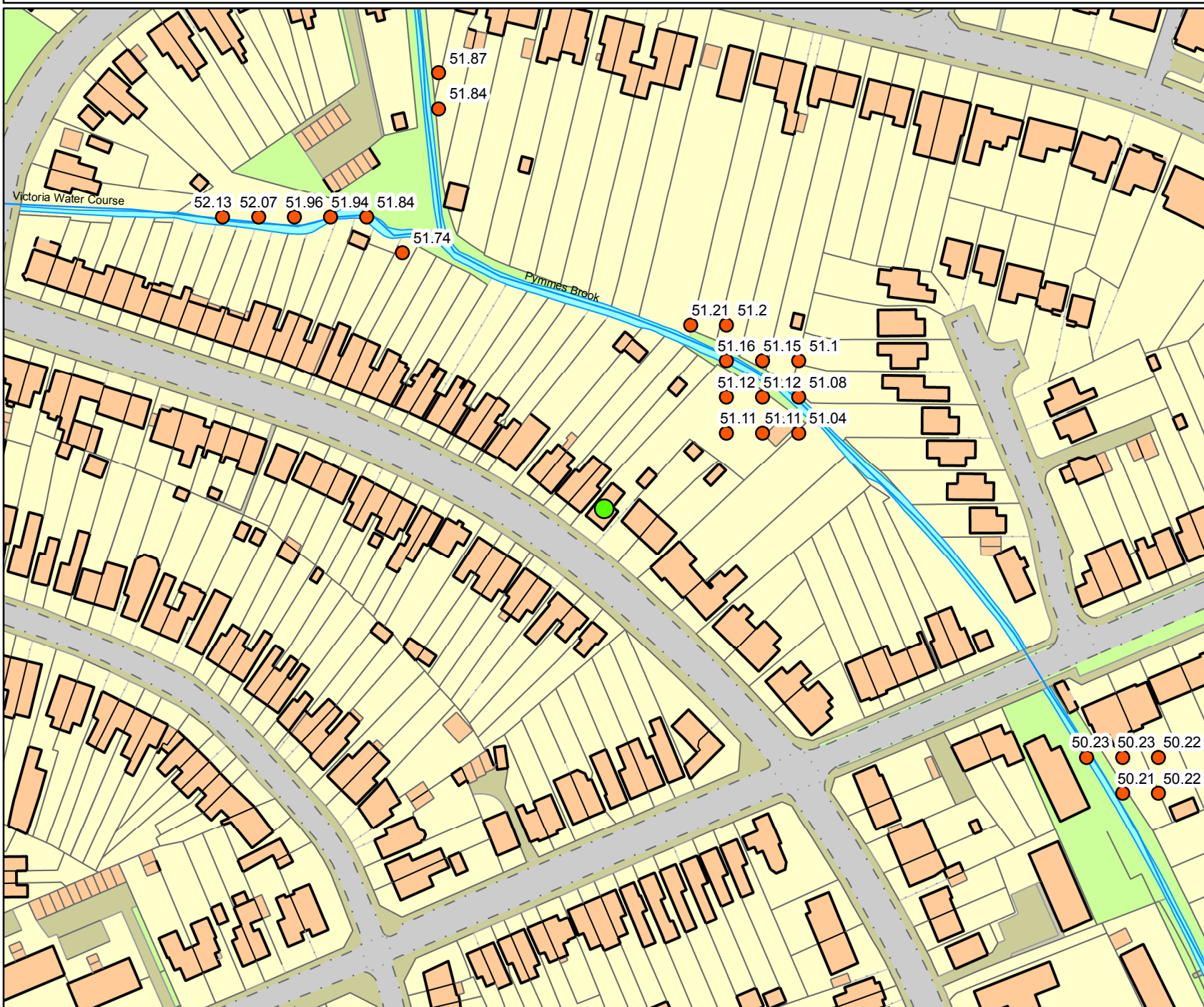
- Main Rivers
 - Site location
- ### 2D Node Results: Heights
- 1 in 75 (1.33%) Defended M11

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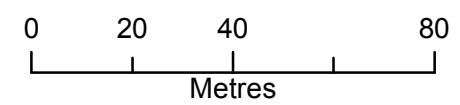
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Legend

- Main Rivers
 - Site location
- ### 2D Node Results: Heights
- 1 in 100 (1%) Defended M11

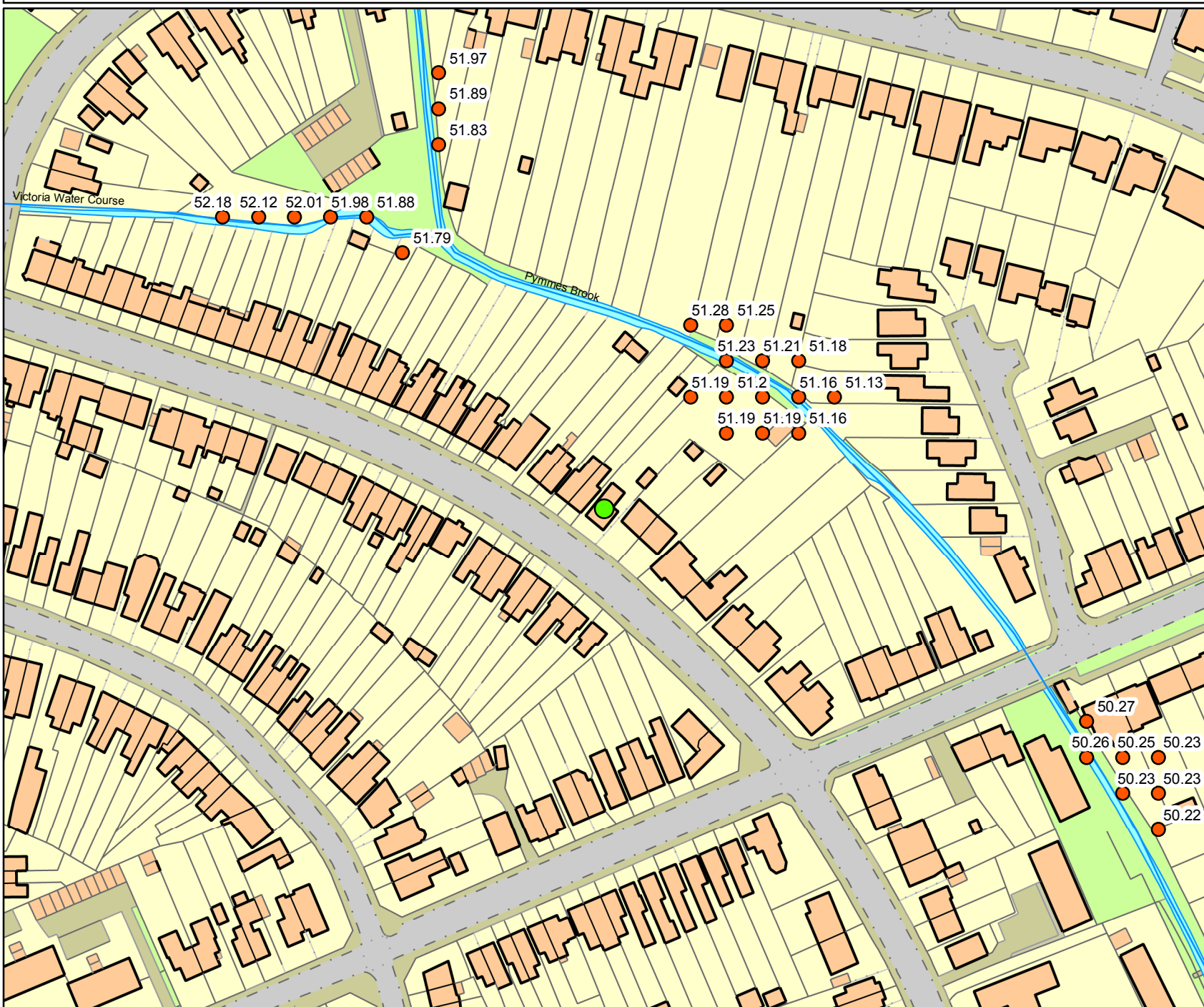
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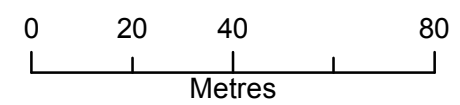
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Legend

- Main Rivers
 - Site location
- ### 2D Node Results: Heights
- 1 in 100+20% (*CC) Defended M11

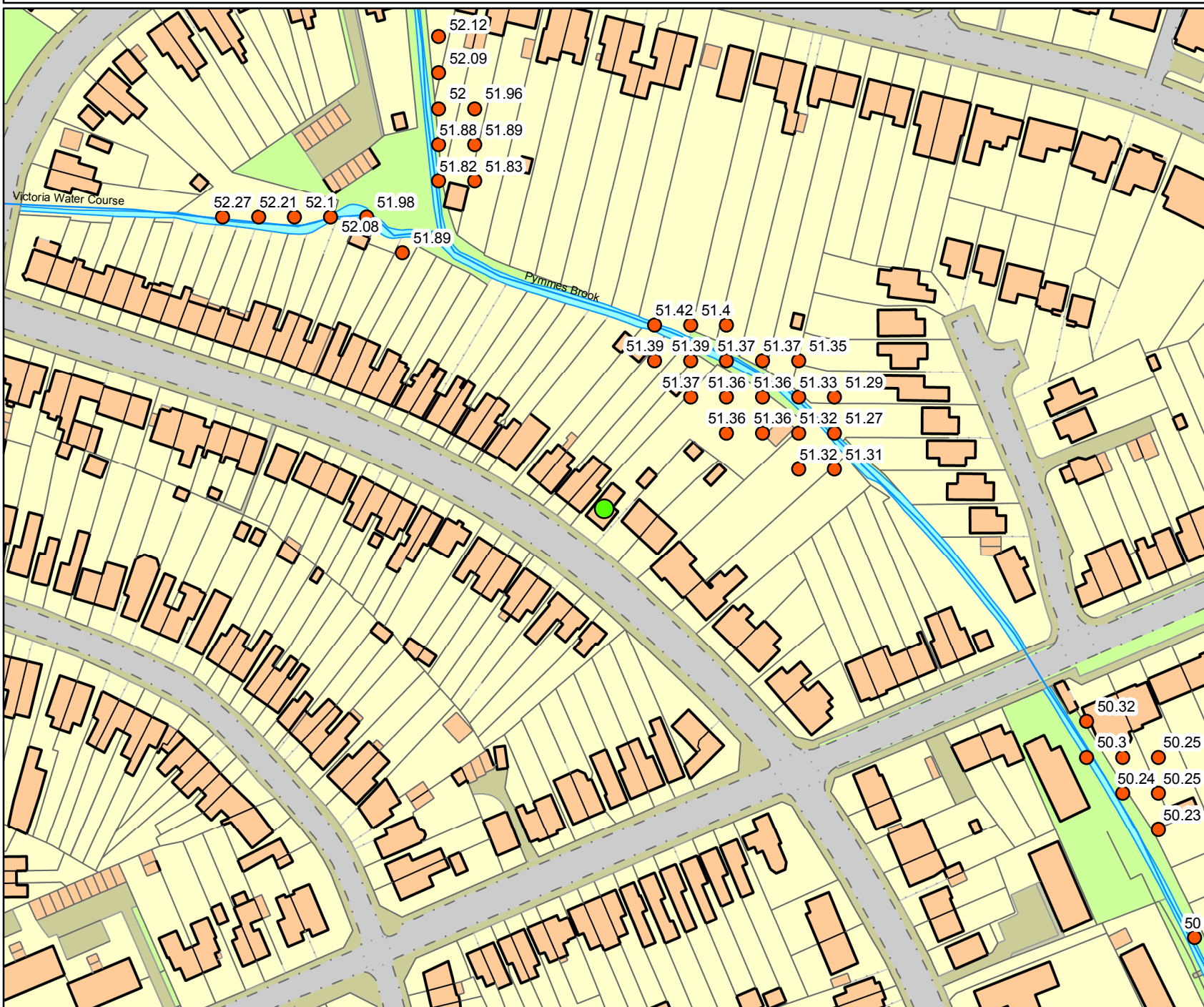
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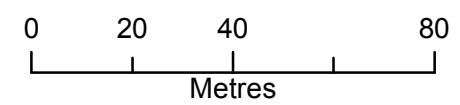
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- Main Rivers
 - Site location
- ### 2D Node Results: Heights
- 1 in 200 (0.5%) Defended M11

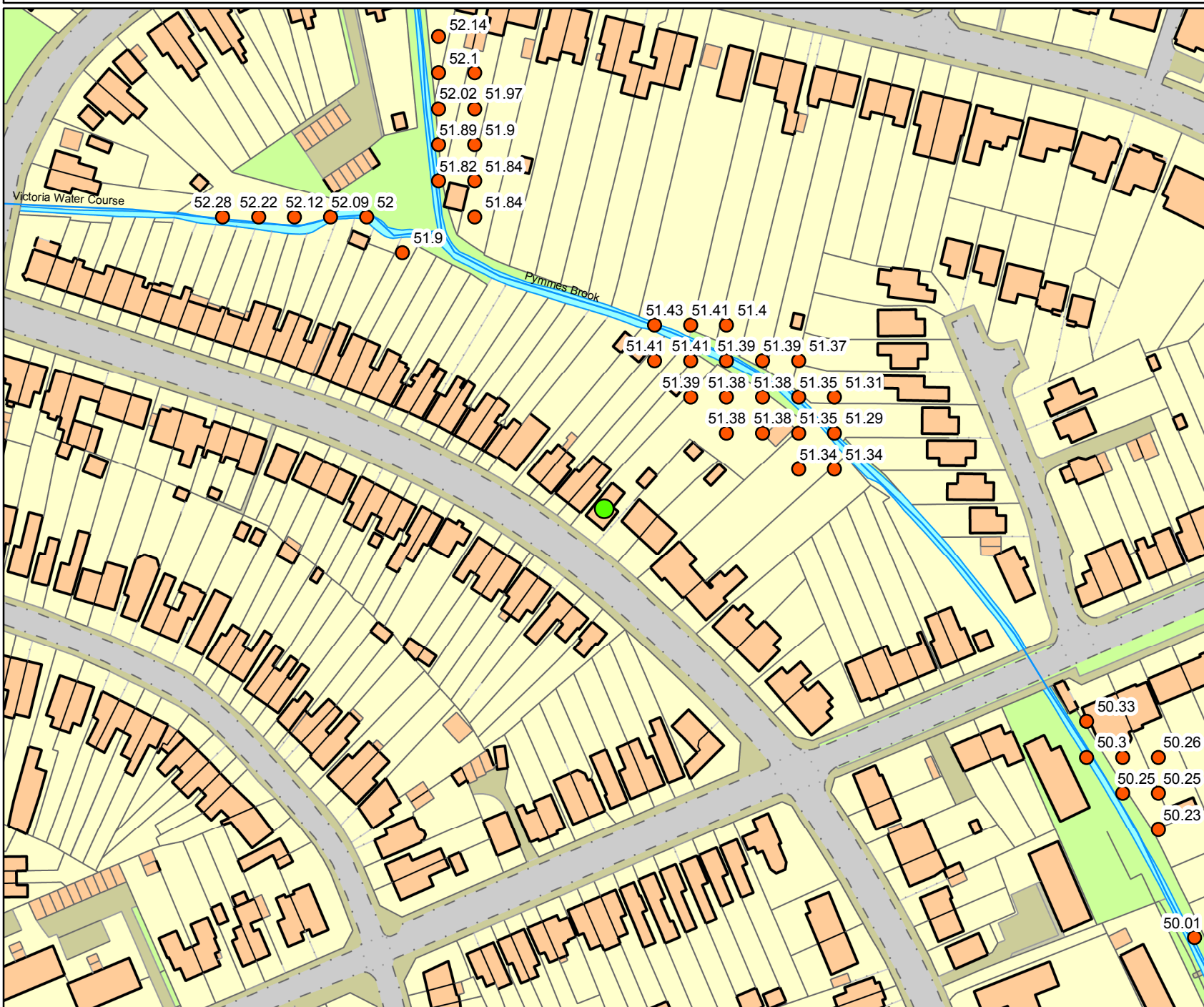
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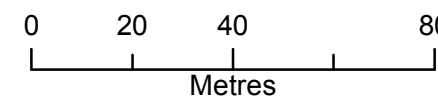
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- Main Rivers
- Site location

2D Node Results: Heights

- 1 in 1000 (0.1%) Defended M11

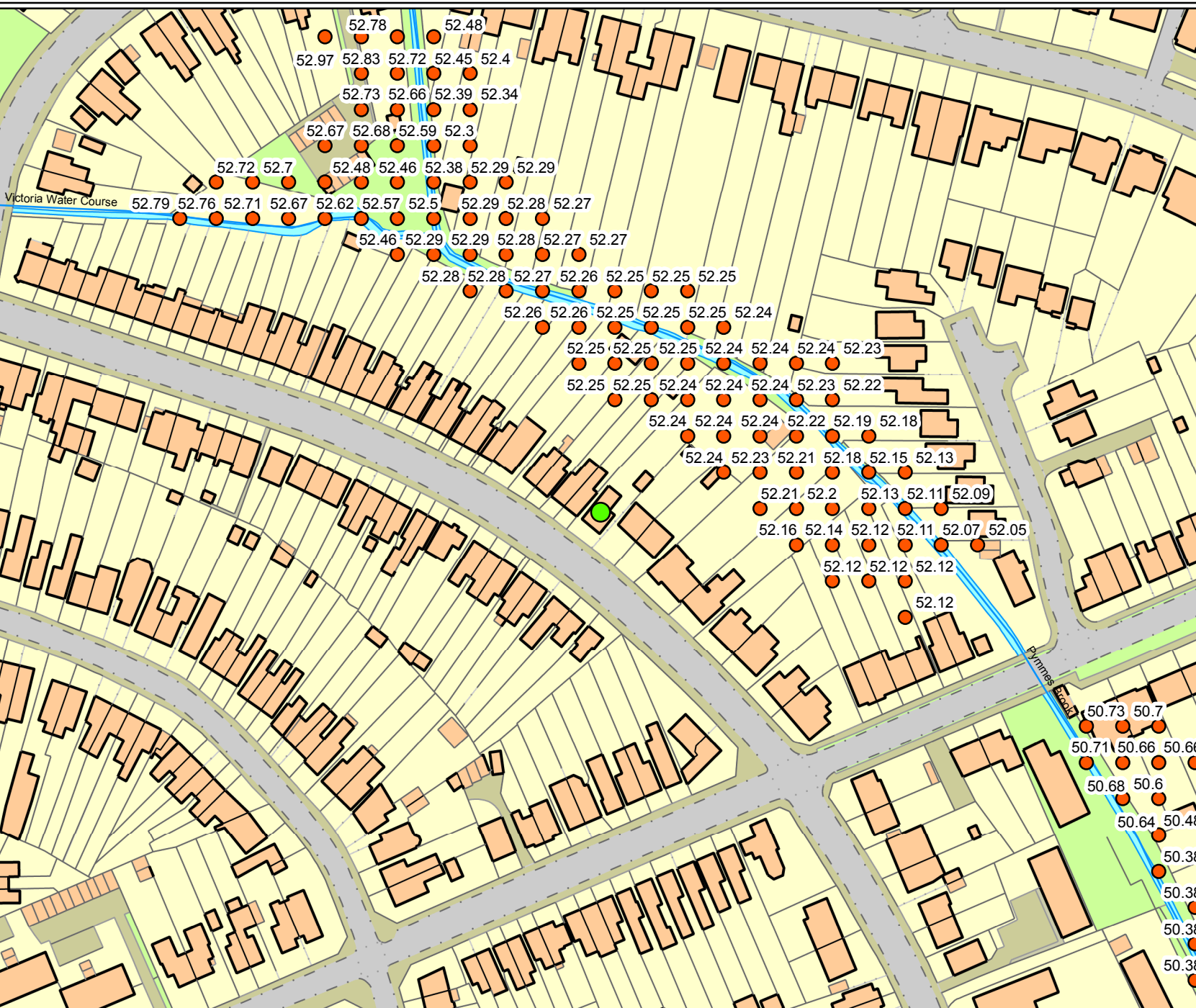
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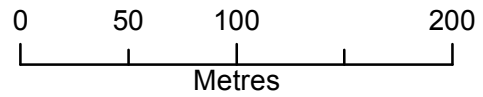
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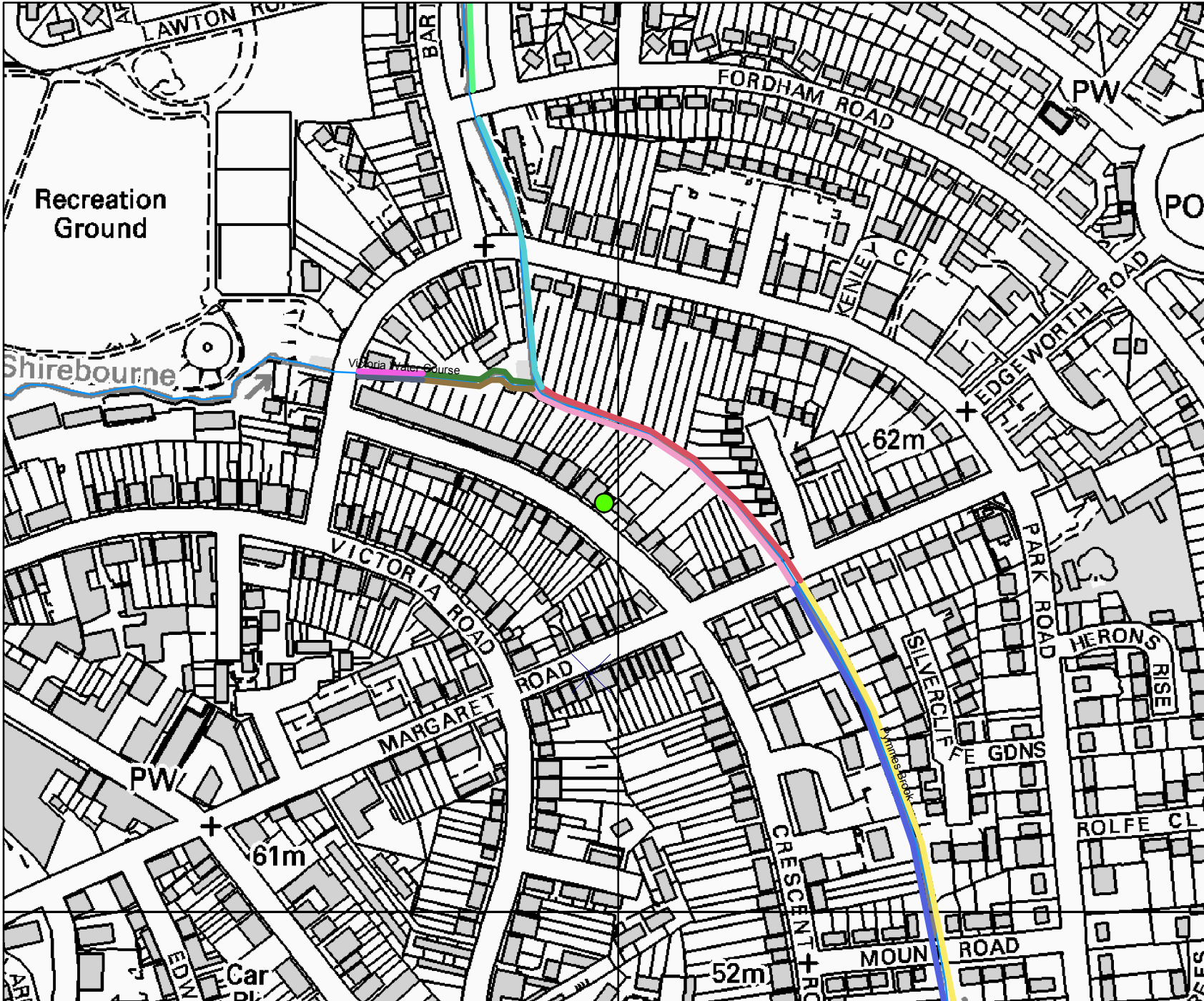
- Main Rivers
- Site location

ASSET_ID

- 44229
- 45954
- 45996
- 45997
- 45998
- 46821
- 46822
- 46823
- 134042
- 142988

The following information on defences has been extracted from the Asset Information Management System (AIMS)

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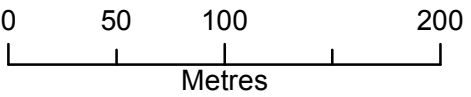


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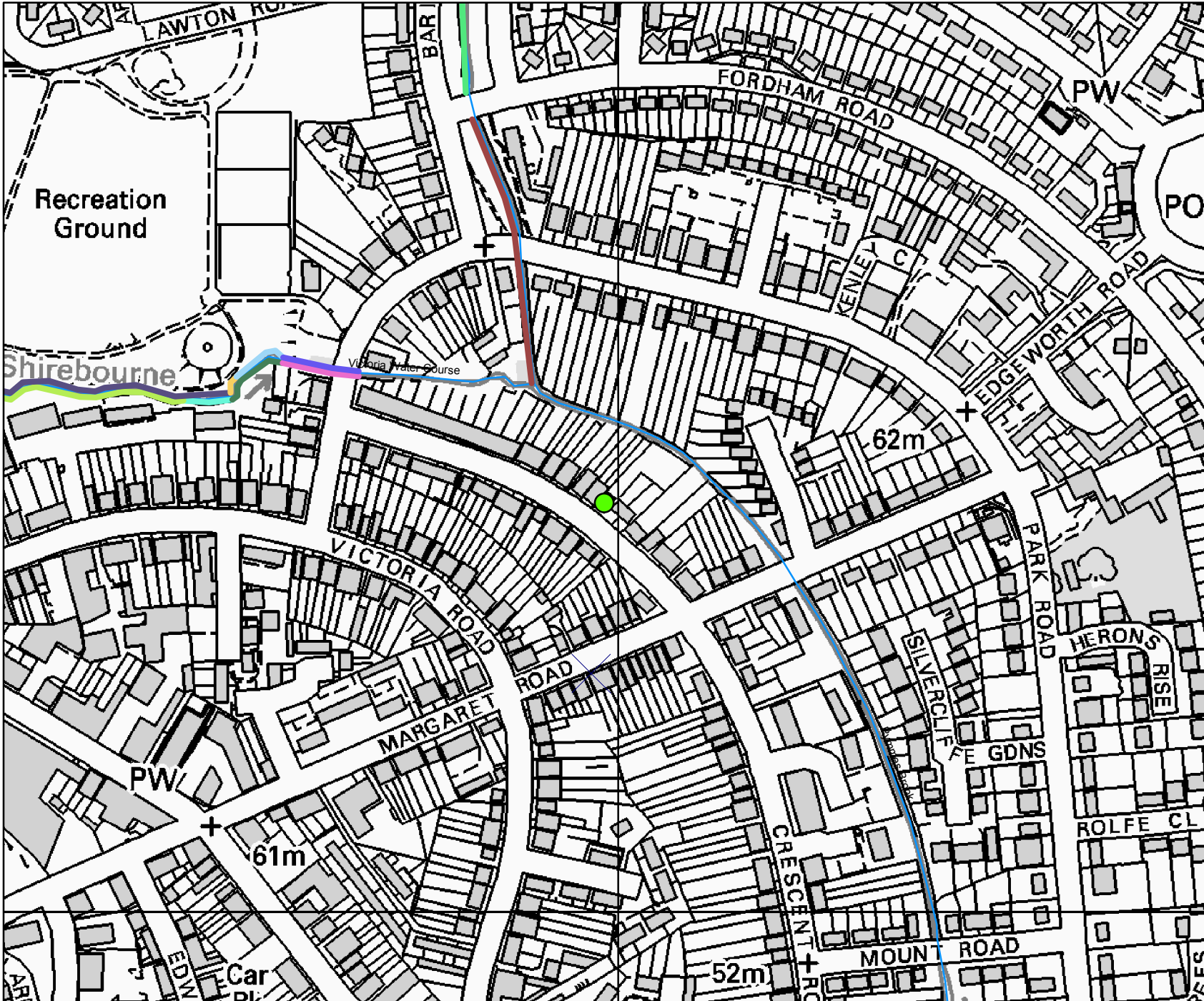
- Main Rivers
- Site location

ASSET_ID

- 142989
- 172224
- 185273
- 186258
- 186259
- 186260
- 186262
- 186263
- 186264
- 186392

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Defences

Asset ID	Asset Type	Asset Protection	Asset Comment	Asset Description	Design Standard of protection (years)	Downstream Crest Level	Upstream Crest Level	Condition of Defences (1=Good, 5 = Poor)
45954	high_ground	fluvial	Natural bank with lined sections	Natural bank	20	49.75	52.60	3
44229	high_ground	fluvial	natural bank with concrete and brickwork lined sections	Natural bank	20	50.35	52.52	3
142988	high_ground	fluvial	Natural bank	Natural bank	5	52.60	52.78	3
45996	high_ground	fluvial	Natural bank	Natural bank	10	52.52	52.37	3
186264	high_ground	fluvial	30m Channel side wall comprised of unworked stone gabions raising ground level to Flats behind right bank (Separated by 20m wide lawn). Wall essentially bank protection for housing foundations not for flood defence. 5-1-10 AP Changed Maintained channel, TC3	Gabion wall	25	No Data	No Data	3
186392	high_ground	fluvial	Natural channel with 15m section D/S of outfall - unworked stone gabion basket on natural earth bank.	Natural Channel	25	No Data	No Data	3
186263	high_ground	fluvial	Sections of brickwork defence in natural channel side. Building in progress - Ex-COW assumed given LA pre-consent	Maintained Channel	25	No Data	No Data	3
186260	high_ground	fluvial	Natural channel side maintained by park staff	Natural channel	25	No Data	No Data	2
186259	high_ground	fluvial	4m length - Steel piling erosion protection on tight bend	Steel piling defence	25	No Data	No Data	3
46822	high_ground	fluvial	Natural earth channel	Natural channel	25	No Data	No Data	3
45997	high_ground	fluvial	Natural bank with concrete lined section	Natural bank	60	52.37	55.38	3
142989	high_ground	fluvial	Natural bank	Natural bank	50	52.78	55.87	3
134042	high_ground	fluvial	Natural earth channel	Natural Channel	25	No Data	No Data	3
46823	high_ground	fluvial	P/C concrete lined channel. Residential properties behind. High channel side walls.	Lined Channel	25	No Data	No Data	2
186258	high_ground	fluvial	Natural channel	Natural Channel	25	No Data	No Data	2
186262	high_ground	fluvial	0.5m high Brick and/or P/C Concrete sections of lined channel topped with 2m gabions of unworked stone.	Lined Channel	25	No Data	No Data	3
46821	high_ground	fluvial	P/C concrete lined channel. Residential properties behind	Channel lining	25	No Data	No Data	2
185273	high_ground	fluvial	0.5m high P/C concrete lined channel with natural earth revetment.	Lined channel	25	No Data	No Data	3
172224	high_ground	fluvial	Natural bank	Natural bank	100	55.87	56.77	3
45998	high_ground	fluvial	Natural bank	Natural bank	100	55.38	58.13	3