FRA & SuDS Strategy

March 2024

EAS

Acorn Lodge
London Road
Flamstead

Founthill

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK ■ TOPOGRAPHICAL SURVEYS
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The content of this report is based on information available as of March 2024, the validity of the statements made may therefore vary over time as planning guidance / policies and the evidence base change.

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1 Introduction

1.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report in order to inform a planning application for a proposed redevelopment of part of the site at Acorn Lodge, London Road, Flamstead, St Albans AL3 8HB (hereafter referred to as 'the site'). At present the site comprises storage units. It is proposed to redevelop the site into four residential dwellings. The site location plan is included in **Appendix A** and the proposed development plans are in **Appendix B**.

1.2 The site is shown to be in Flood Zones 1, 2 and 3 on the EA Flood Map for Planning and as such a full flood risk assessment is required to meet the requirements of the National Planning Policy Framework (NPPF). This report assesses all sources of flooding and details mitigation measures. It should be noted that the proposed residential dwellings have been sequentially located outside Flood Zones 2 and 3 and are entirely in Flood Zone 1.

1.3 The contents of this FRA are based on the advice set out in the National Planning Policy Framework (NPPF) published in December 2023, Annex 3: Flood risk vulnerability classification, also from the NPPF and PPG 'Guidance for Flood Risk and Coastal Change', updated in August 2022.

1.4 This report is based on the Environment Agency Flood Maps, geology mapping, OS mapping, topographic survey, Strategic Flood Risk Assessment and local policy.

1.5 This document includes the following sections:

Section 2 - describes the relevant policy;

Section 3 - site description, including site levels, proximity to watercourses etc.;

Section 4 - outlines potential sources of flooding;

Section 5 – details the proposed drainage strategy;

Section 6 - concludes the report.

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2 Policy Context

Introduction

2.1 The contents of this FRA are based on the advice set out in the National Planning Policy Framework (NPPF) published in December 2023, Annex 3: Flood risk vulnerability classification, also from the NPPF and PPG 'Guidance for Flood Risk and Coastal Change', updated in August 2022.

National Planning Policy Framework

2.2 This section sets out the policy context. This report is based on the advice set out in the National Planning Policy Framework (NPPF) last updated December 2023 and the Planning Practical Guidance (PPG) updated in August 2022.

2.3 Paragraph 167 footnote 59 of the NPPF states:

"A site-specific flood risk assessment should be provided for all developments 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 The flood zones are defined as:

a. Flood Zone 1 - less than a 0.1% (1 in 1000) annual probability of river or tidal flooding.

b. Flood Zone 2 - between a 0.1% and 1% (1 in 1000 and 1 in 100) annual probability of river flooding; or between a 0.1% and 0.5% (1 in 1000 and 1 in 200) annual probability of flooding from tidal sources.

c. Flood Zone 3a- This zone comprises land assessed as having a 1% (1 in 100) or greater annual probability of river flooding; and for tidal flooding at least a 0.5% (1 in 200) annual probability of flooding from tidal sources.

d. Flood Zone 3b - This zone comprises land where water has to flow or be stored in times of flood. This classification is usually classified as land which had a 3.33% (1 in 30) annual probability of flooding.

2.5 Paragraph 165 discusses the suitability of development location, particularly with regards to future risks induced by climate change:

"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".

2.6 Paragraph 166 of the National Planning Policy Framework (NPPF) sets out how:

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"Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards".

2.7 Paragraphs 175 NPPF discusses the application of sustainable drainage systems:

"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) Take account of advice from the lead local flood authority;

b) Have appropriate proposed minimum operational standards;

c) Have maintenance arrangements in place to ensure an acceptable standard of operation of the lifetime of the development; and

d) Where possible, provide multifunctional benefits."

2.8 2The EA Flood Map for Planning shows the site to be located in Flood Zones 1, 2 and 3. The EA Flood Map for Planning is enclosed in Appendix C. The site layout has been overlaid with the Flood Map for Planning and all properties are located in Flood Zone 1.

Local Policy

South West Hertfordshire Level 1 Strategic Flood Risk Assessment (SFRA)

2.9 The Level 1 Strategic Flood Risk Assessment (SFRA) was published in 2019 to provide suitable guidance and mapping to inform development control decisions within South-West Hertfordshire.

2.10 Chapter 11 provides guidance for planners and developers regarding surface water runoff and drainage. Paragraph 11.2.1. of the SFRA sets out what is expected from a Drainage Strategy in the Borough:

"SuDS can be integrated into the design of all new development within South West Hertfordshire. The effectiveness of SuDS within a site is defined by site characteristics including (but not limited to) topography, geology, soil permeability, water table, existing flow paths across the site, land ownership and the proportion of site area necessary to effectively manage surface water runoff and drainage."

2.11 Paragraph 11.2.3. of the SFRA sets out details related to runoff rates and storage volumes:

"Hertfordshire guidance on designing runoff rates and storage volumes is in keeping with, or an improvement on, best practice (Defra Non-Statutory Technical Standards for Sustainable Drainage), with the following requirements for developments on greenfield and previously developed sites

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• The peak runoff rate and volume from the development for the 1 in 1-year and the 1 in 100-year events must not exceed the peak greenfield runoff rate for the same event. • Flooding must not occur on any part of the site for a 1 in 30-year rainfall event.

• Flooding must not occur during a 1 in 100-year plus climate change rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

• Rainfall in excess of a 1 in 100-year plus climate change rainfall event must be managed via exceedance routes that minimise the risks to people and property.

On previously developed sites, runoff rates should be restricted to the greenfield rate. Where this can be demonstrated to be unfeasible, the site is required to meet a "betterment" rate, which is considerably lower than the previously developed state.:."

2.12 Paragraph 11.2.3. of the SFRA sets out details related to discharge locations:

"The destination of surface water that is not collected for use on site should be prioritised, with water re-use preferred, followed by infiltration, then discharge to surface waters, such as a watercourse or lake.

New connections to existing surface waters or combined sewers are the least preferred options, and should only be considered where other discharge routes are proven to be infeasible. Discharge to a foul sewer is not a viable option, as it is a major contributor to sewer flooding.

The sewerage undertaker should be consulted at an early stage to ensure that sufficient capacity is available in the existing drainage system. Where a connection is to be made to the surface water or combined sewer, the FRA should include confirmation from the sewage undertaker that the connection will not result in an increase in the flood risk off-site."

2.13 Paragraph 11.2.3. of the SFRA sets out details related to water quality:

"Several stages of treatment are required before surface water runoff enters the ground or a surface water body, to ensure the removal of pollutants. The initial 10-15mm of rainfall, or "first flush" of pollutants, is required to be treated where it falls. Developments in Hertfordshire are required to ensure the subsequent levels of treatment are proportionate to the water quality sensitivity of the receiving water body.

The concept of delivering multiple benefits through SuDS is central to the guidance for Hertfordshire. SuDS are encouraged to be incorporated into public spaces, schools and play areas to provide multifunctional spaces, which also manage flood risk. SuDS in Hertfordshire are also recommended to use natural, native planting, to provide habitats for local wildlife."

New Dacorum Local Plan

2.14 The New Dacorum Local Plan was published in November 2020, to provide suitable guidance and policy to inform development control decisions within the Dacorum borough. Relevant Policy for the site is as follows:

2.15 Policy SP10 - Climate Change Mitigation and Adaptation

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"4. The policies will ensure that new developments are resilient and contribute to climate change adaptation by:

a. using green infrastructure to reduce flood risk, tackle urban heat island effects and provide solar shading; and

b. adapting to climate change by ensuring development avoids areas of flood risk and reduces the risk of flooding elsewhere, through the use of measures including sustainable urban drainage systems, green roofs and walls, and permeable surfaces."

2.16 Policy DM22 - Sustainable Design and Construction

"4. Adaptation measures

a. Minimise water usage and risk of flooding by including SuDS (including green roofs and permeable surfaces around the curtilage of buildings and in street design), surface water storage and grey water recycling."

2.17 Policy DM34 - Flood Risk and Protection

"Development will be supported where:

1. It is designed to ensure that flood risk is not increased elsewhere and is located in areas at lowest risk of flooding (of all sources);

2. It avoids Flood Zones 2 and 3 unless it is for a compatible use: Where development is proposed in these zones:

a. Flood Risk Assessments (FRA) must accompany planning applications, explaining how the sequential approach (23) (and the Exception Test (24) if required) to development has been undertaken and which the Council is satisfied demonstrates that the site is appropriate for development and its intended use, taking into account wider sustainable development objectives;

b. a sequential approach to site layout must be satisfied, directing the most vulnerable uses to the areas on the site at lowest risk from of flooding from all sources;

c. opportunities to reduce the cause and impact of flooding, such as using green infrastructure for flood storage, must be incorporated; and

d. proposals must not cause harm to existing or proposed flood defences;

3. For development in Flood Zone 1, a FRA or statement is submitted following the criteria in this policy and the NPPF which sets out appropriate flood risk management measures;

4. It incorporates flood resistant and resilient measures, and is shown to be safe for the lifetime of the development, taking into account climate change implications;

5. If necessary, it demonstrates that safe access and escape routes will be included as part of an emergency plan;

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6. Measures for the control and reduction of surface water run-off to pre-development rates or better through SuDS are integrated into the design and layout of the development and with existing green infrastructure wherever possible; and

7. For any major development (26) SuDS are accompanied by a management and maintenance plan detailing how they will be maintained throughout the lifetime of the development."

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3 Existing Site Assessment

Site Description

3.1 The site consists of storage facilities include several small outbuilds and shipping container units. The full address of the site is Acorn Lodge, London Road, Flamstead St Albans AL3 8HB. A location plan is included at **Appendix A**.

3.2 The nearest town centres to the site are Harpenden (located c. 5km to the east), Luton (c. 6.5km to the north) and Hemel Hempstead (c. 8.5km to the south). St Albans is located 9.8km to the south-east. The site is bound to the north by London Road, to the east by a hotel, to the west by a transport depot and to the south by undeveloped land. To the immediate north-east is a single storey residential property associated with the wider Acorn Lodge site.

3.3 The proposed development is for the provision of 4no. semi-detached residential properties with associated car parking areas and landscaping. The proposed development plans are included in **Appendix B**.

Local Watercourses

3.4 The River Ver, an EA Main River is located circa. 126m north east and 57m north of the site. The watercourse enters a 24m long culvert (EA Asset ID:454920) under London Road 126m north-east of the site.

3.5 There is a ditch located parallel to London Road that runs along the length of the site fronting London Road however ceases at the site access. The topographical survey did not identify any outlets or headwalls within the ditch as much of this area was not able to be surveyed due to overgrown vegetation.

3.6 Highways runoff appears to be directed to this ditch, evident by the presence of a beany block kerb. Assessing levels on the topographic survey, the ditch falls to the south east. The ditch is open for circa 240m along London Road and is assumed to enter a culvert at the access to the hotel east of the site. It is anticipated flows ultimately discharge into the River Ver downstream.

Site Levels

3.7 The topographical survey is included in **Appendix D**. Levels in the southern half of the site are around 110mAOD, falling to a low of 108.9mAOD at the site access along the northern boundary of the site.

Geology

3.8 The online British Geological Survey resource (www.bgs.ac.uk) shows the site in a bedrock geology of Holywell Nodular Chalk Formation and New Pit Chalk Formation – Chalk with superficial deposits of Alluvium - clay, silt, sand and gravel.

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3.9 No borehole records within the close vicinity of the site are available and as such it is not possible to comment on the depths of the superficial deposits.

3.10 Infiltration tests have been undertaken at the site to determine the viability of the use of soakaways to dispose of surface water runoff from the proposed development. Testing to BRE 365 Standard was undertaken by SubSurface Consultants on 11th Aug 2023. The results are contained in **Appendix E** and show an infiltration rate of 3.20E-05 m/sec at a depth of 2.5m below ground level and an infiltration rate of 7.77E-05 m/sec at a depth of 0.7m below ground level. These rates prove that infiltration to ground is viable.

3.11 An Interpretative Environmental Desk Study was undertaken by G&J Geoenvironmental Consultant Limited in September 2022 which identified some potential for contamination on site. It is anticipated that further testing shall be undertaken post-planning to inform detailed design.

Public Sewer Mapping

3.12 Thames Water sewer mapping was obtained and is enclosed in **Appendix F.** There are no adopted surface or foul sewers within the vicinity of the site. A small section of foul sewer is shown to discharge into a private rising main circa 175m east of the site. The rising main then flows south east across the field circa 150m south east of the site.

Existing Drainage

3.13 Observations within the Interpretative Desk Study confirm roof runoff from the larger storage shed is directed to intermediate bulk containers where rainwater is then reused within the site. Runoff from the outbuildings and sheds is understood to simply shed to ground. The topographical survey notes the site has a surface of gravel with areas of tarmac. In the areas of hardstanding, it is assumed runoff simply sheds to the surrounding grassed areas and infiltrate to ground. Likewise, rainfall falling on the area of gravel is also assumed to simply infiltrate to ground.

3.14 It is noted that the existing Acorn Lodge house and a storage building to the east of it, both of which are outside the red-line application, benefit from a positive drainage outfall to the ditch along the northern boundary of the site.

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4 Potential Sources of Flooding

Fluvial

4.1 A copy of the Environment Agency's Flood Map for Planning is enclosed in **Appendix C**. The site layout has been overlaid with the Flood Map for Planning and is also enclosed in **Appendix C.** All properties are located in Flood Zone 1, the site access is located in Flood Zones 2 and 3.

4.2 A Flood Data Request was submitted to the Environment Agency to further assess the fluvial flood risk at the site. Modelled flood extents, flows and levels were provided from the Ver Study undertaken by JBA in 2019. The received EA Product 4 data is also enclosed in **Appendix C.**

4.3 The location of the proposed properties remains outside all modelled flood extents, including the 1000yr extent. The site access remains outside the modelled flood extents up to the 20yr event. To clarify, the proposed residential dwellings have been sequentially located outside Flood Zones 2 and 3 and are entirely in Flood Zone 1.

2D Fluvial Flood Levels

4.4 2D levels are considered to be more accurate and representative of the flood level across the floodplain. 1D flood levels however can overestimate a flood level on the floodplain as these are in channel levels. As 2D levels have been provided, these have been used for the purpose of this assessment.

4.5 The site is located in the 'Upper Lee Management Catchment' which has a 2080s central river flow climate change allowance of 10%. This climate change allowance has not been modelled however for the purpose of this assessment the 100yr+25% climate change results will be utilised as this is the most complete available data set.

4.6 The 100yr+25% climate change 2D modelled flood levels within the site is 108.88mAOD. When compared with the lowest level in the location of the site access of 108.78mAOD, a maximum fluvial flood depth of 100mm would occur.

4.7 The 1000yr 2D flood level is 108.93mAOD, resulting in a flood depth of 150mm.

4.8 No velocity data is given for the 2D fluvial flood scenarios, however based on the flood depth of 100mm and velocity of 0.75m/s (which we might anticipate in this scenario), a very low hazard rating would apply. If velocities above this (up to 1.5m/s) the flood hazard rating raises to a maximum of 1.1 'danger for some'.

4.9 Based on this maximum flood hazard rating, emergency vehicles could access the site. In addition to the west of the site, London Road is shown to be within flood Zone 1 and as such, emergency vehicles could also reach the site from this direction unimpeded.

4.10 In addition a separate pedestrian emergency access will be available to the west of the site as discussed in detail in Section 5.

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4.11 Mitigation measures are discussed in Section 5 which shall also take into consideration other sources of flooding.

Historic Flood Outlines

4.12 The site is not located in any recorded historic flood outlines.

Surface Water

4.13 Surface water flooding refers to flooding caused when the intensity of rainfall, particularly in urban areas, can create runoff which temporarily overwhelms the capacity of the local drainage systems or does not infiltrate into the ground. The water ponds on the ground and flows towards low-lying land. This source of flood risk is also known as 'pluvial'.

4.14 The EA's surface water flood map is included in **Appendix H** (Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map). The surface water flooding as shown is likely attributable to the presence of the culvert under London Road. Once capacity of the culvert has been exceeded, flows back up and flow along London Road in a south easterly direction, parallel to the course of the Ver on the northern side of the carriageway.

4.15 A high-risk scenario indicates a greater than 1 in 30 probability of surface water flooding each year, i.e., the most frequently occurring scenario. In a high-risk scenario, surface water flooding remains in the northern half of the site. Depths are shown to be below 300mm with small isolated parcels showing depths of up to 900mm. Depths within London Road at the site access are shown to be below 300mm.

4.16 A medium risk scenario indicates a probability of surface water flooding between 1 in 30 and 1 in 100 each year. In a medium risk scenario, flooding remains limited to the northern half of the site with depths between 300mm-900mm.

4.17 A low risk scenario indicates a probability of surface water flooding between 1 in 100 and 1 in 1000 each year (i.e., the least frequent but worst-case scenario). In a low risk scenario, flood depths are shown to exceed 900mm however remain limited to the north of the site.

4.18 Surface water flood depths for the 1000yr modelled event were downloaded from the DEFRA Data Services Platform to more accurately assess the flood depths within the site access. The data was processed in QGIS and the surface water mapping can also be viewed in **Appendix H.**

4.19 In this modelled scenario, depths are modelled to exceed 1.2m within the access and within the carriageway of London Road. Depths then fall to a low of 0-150mm within the site.

4.20 All dwellings have been sequentially located outside the area identified to be at risk of surface water flooding.

4.21 Surface water velocity data for the 1000yr modelled event were downloaded from the DEFRA Data Services Platform and processed in QGIS, as mapped in **Appendix G**. Velocities of up to 0.5m/s are identified within the site access road and based on a flood depth up to 1.2m and Table 13.1 of FD2320/TR2, a flood hazard rating of up to 2.2 could be observed which would result in a 'danger to all'. Under such extreme conditions safe access would not be

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available via the access road, however residents could remain safe within their homes or use an emergency access for pedestrians which is proposed to the west of the site and is detailed along with other mitigation measures in Section 5.

Reservoir

4.22 The EA long term risk maps also display the risk from reservoirs. The northern half of the site with the reservoir flood extent even the river levels are normal. The remainder of the site is outside of the reservoir flood extent.

4.23 Reservoirs are maintained to a high standard and therefore the likelihood of flooding occurring from a reservoir is considered to be extremely low. It should be noted that the proposed residential dwellings have been sequentially located outside the area identified to be at risk of reservoir flooding as shown in **Appendix I**.

Groundwater

4.24 The SFRA notes that due to the chalk geology of the Borough, groundwater levels have been recorded to be very shallow in some locations. However, site investigations undertaken at the site concluded that groundwater was not encountered within trial pits that were dug 2.5m below ground level. It is possible that in lower lying areas, ground water may be closer to ground level, though in the location of proposed residential dwellings, groundwater is unlikely to pose a flood risk.

4.25 The MAGIC Map website (https://magic.defra.gov.uk/MagicMap.aspx) shows that the site is within a Zone I - Inner Protection Zone.

4.26 The site is located above a Principal Aquifer. A Principal Aquifer is defined as:

> *"layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage and transmission. They may support water supply and/or river base flow on a strategic scale".*

4.27 The Groundwater Vulnerability Map on the MAGIC Map website shows the site to be in an area with 'Medium to High' groundwater vulnerability." Areas at high risk of groundwater vulnerability are defined as:

> *"areas that can easily transmit pollution to groundwater. They are characterised by high-leaching soils and the absence of low-permeability superficial deposits."*

4.28 Based on the above the site is vulnerable to groundwater contamination and pollution pathways must not be introduced as a result of the proposals. As discussed in paragraph 3.8 to 3.16, no option for surface water disposal is deemed viable other than infiltration and as such further site investigations will be required at detailed design stage to assess contamination and confirm any required remediation – this can be Conditioned.

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Sewer

4.29 Figure 1-4 of the SFRA notes the site is located in a post-code area with 6-10 recorded incidents of sewer flooding. As no adopted sewers are mapped within the vicinity of the site the risk of sewer flooding is considered to be low.

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5 Mitigation Measures

5.1 Paragraph 004 states: “within sites, using site layout to locate the most vulnerable aspects of development in areas of lowest flood risk unless there are overriding reasons to prefer a different location”.

5.2 The proposed residential properties are located wholly in Flood Zone 1 and are located outside of the surface water flood and reservoir flood extents, thus have been located in the area of lowest risk within the red line boundary.

5.3 Finished Floor Levels will be set at 110.300mAOD. The highest defended flood depth within the site boundary for the 1:100yr + 25% Climate Change is 108.870mAOD, providing a freeboard of 1.43m. Looking at the Surface Water Flood Risk, in a 1:100yr scenario, a maximum flood depth of 0 to 0.15m at the southern-most extremity, where ground levels are around 109.50mAOD would give a flood level of 109.65mAOD and therefore a freeboard of 0.65m.

5.4 Paragraph 047 states: “Wherever possible, safe access routes should be provided that are located above design flood levels and which avoid flow paths. Where this is not possible, limited depths of flooding may be acceptable, provided that the proposed access is designed with appropriate signage etc. to make it safe.”

5.5 In all flood risk scenarios, the proposed residential dwellings are located above the anticipated flood level and are in an area of the site which shall remain ‘dry’.

5.6 As discussed in Section 4, no velocity data is given for the 2D fluvial flood scenarios, however based on the flood depth of 100mm and velocity of 0.75m/s (which we might anticipate in this scenario), a very low hazard rating would apply. If velocities above this (up to 1.5m/s) the flood hazard rating raises to a maximum of 1.1 ‘danger for some’. Based on this maximum flood hazard rating emergency vehicles could access the site. In addition to the west of the site, London Road is shown to be within flood Zone 1 and as such, emergency vehicles could also reach the site from this direction unimpeded.

5.7 In a surface water flood risk scenario, surface water velocity data for the 1000yr modelled event downloaded from the DEFRA Data Services Platform, identifies velocities of up to 0.5m/s within the site access road. Based on a flood depth up to 1.2m and Table 13.1 of FD2320/TR2, a flood hazard rating of up to 2.2 could be observed which would result in a ‘danger to all’. Under these extreme conditions safe access would not be available via the access road, however residents could remain safe within their homes.

5.8 In the unlikely event that pedestrians need to exit the site or emergency services have access to the site at a time when the access road is inundated with flood water, emergency pedestrian access will be available to the existing Public Right of Way (PRoW) path no. 21 to the south and also to Chequers Hill Road to the west.

5.9 This will be possible via a new private unpaved route, west out of Acorn Lodge, prior to a new Public Right of Way proposed both to the west to Chequers Hill and South to PRoW 21, as illustrated on Figure 5.1 below and shown in more detail on a sketch contained in **Appendix J**.

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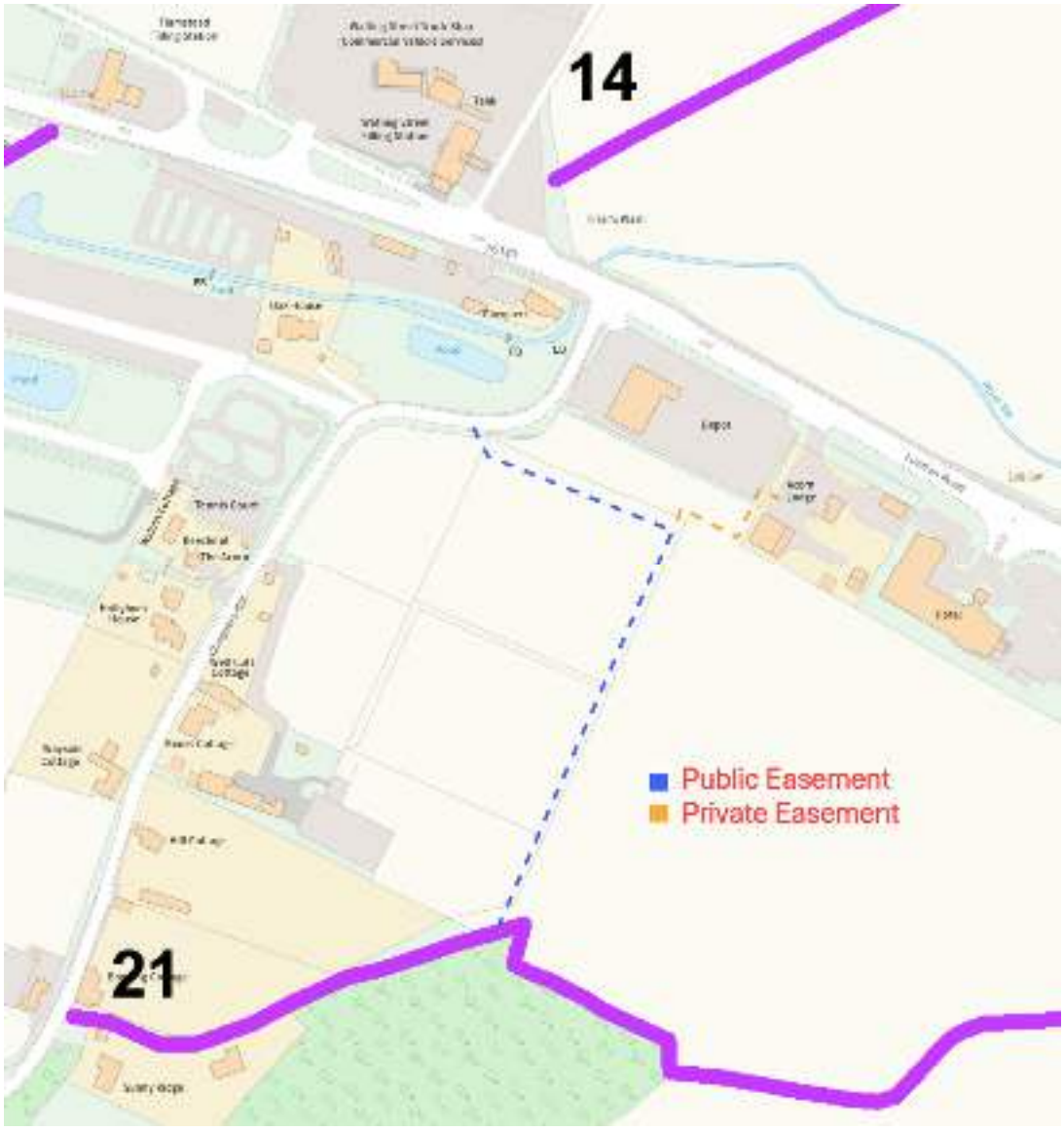

Figure 5.1 – Emergency Pedestrian Access and Proposed PRoW

5.10 It can be seen from the Surface water flood maps in **Appendix H** that the proposed two alternative pedestrian routes illustrated above are outside of the area at risk of surface water flooding, other than in the worst case 1000yr surface water flood event, where there is flooding shown where the pedestrian route meets Chequers Hill. However, flooding to the south of this point, along Chequers Hill is designated as being a low risk and doesn't extend to the full road width. As such emergency access should still be possible in this direction.

5.11 The details of this alternative access address, are intended to be added to the first responders dispatch system, so that they are aware of the alternative access on any emergency being called in.

Flood Warning and Evacuation

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5.12 The site is located within the “River Ver at Markyate including Flamstead, Harpenden” flood warning area. To improve flood awareness and preparedness it is recommended all residents subscribe to the EA flood warning service by using the link: https://www.fws.environment-agency.gov.uk/app/olr/home.

5.13 Alternatively, they can call the EA Floodline on 0345 988 1188. The EA will then send out automated warnings to a selected phone number should there be high water levels anticipated on the River Ver.

5.14 Whilst residents would remain safe and dry within their properties, should they choose to evacuate this should take place upon receipt of a flood warning prior to the onset of flooding and whilst access and egress is dry/less than 100mm of flood depth. Residents should head north out of the site and then head west along London Road towards Markyate.

5.15 It is recommended a Flood Warning and Evacuation Plan is issued to all residents, including the provision of a flood warning notice at the site entrance. An example flood warning notice can be viewed in Figure 5.2 below.

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FLOOD WARNING NOTICE

The site is at risk of flooding from The River Ver and access could be lost in a flood event

You are advised to subscribe to the Environment Agency Floodline Service and check the current flood warning status issued by the Environment Agency.

Do not attempt to access or egress the site if flood waters exceed 100mm depth. It is advised to wait within your properties until flood waters receded and call emergency services in case of emergency only.

FLOOD ALERT- BE PREPARED!

FLOOD WARNING- ACT NOW! ACCESS COULD GET CUT OFF IN A FLOOD EVENT. EVACUTAE NOW

SEVERE FLOOD WARNING- EXTREME DANGER TO PEOPLE AND PROPERTY.

REMAIN IN YOUR PROPERTY. DO NOT WALK OR DRIVE THROUGH FLOOD WATERS

For more information call the Floodline or visit the Environment Agency website here: https://flood-warning-information.service.gov.uk/ **Floodline: 0345 988 1188 (24 hours a day, calls charged at local rate)**

Figure 5.2 Example Flood Warning Notice

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6 Proposed Drainage Strategy

Relevant SuDS Policy

6.1 SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.

6.2 The SuDS management train incorporates a hierarchy of techniques and considers all three SuDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefits. In decreasing order of preference, the preferred means of disposal of surface water runoff is:

- Discharge to ground.
- Discharge to a surface water body.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

6.3 The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site predevelopment and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:

- Reducing runoff rates, thus reducing the flood risk downstream;
- Reducing pollutant concentrations, thus protecting the quality of the receiving water body;
- Groundwater recharge;
- Contributing to the enhanced amenity and aesthetic value of development areas; and
- Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site Specific SuDS

6.4 The various SuDS methods have been considered in relation to site-specific constraints. **Table 6.1** outlines the constraints and opportunities to each of the SUDS devices in accordance with the hierarchical approach outlined in The SUDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

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Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Not suitable for the pitch of roof	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	An infiltration strategy is proposed.	Yes
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Permeable paving is proposed.	Yes
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the Site by reusing water for non-potable uses e.g., toilet flushing, recycling processes.	Rainwater harvesting may be proposed at a later date.	Maybe
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	No suitable location within the site	No
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Not required	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	No suitable location within the site.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	No suitable location within the site.	No
Attenuation Underground (end of pipe treatment	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Not required.	No
Raingardens	Rain gardens are relatively small depressions in the ground that can act as infiltration points for roof water and other 'clean' surface water.	Raingardens have been proposed	Yes

Table 6.1: Site-Specific Sustainable Drainage Techniques

Consideration of SuDS Hierarchy

6.5 Infiltration tests were undertaken at the site to determine the viability of the use of soakaways to dispose of surface water runoff from the proposed development. Testing to BRE 365 Standard was undertaken by SubSurface Consultants on 11th Aug 2023. The results are contained in **Appendix E** and show an infiltration rate of 3.20E-05 m/sec at a depth of 2.5m below ground level and an infiltration rate of 7.77E-05 m/sec at a depth of 0.7m below ground level. These rates prove that infiltration to ground is viable and an infiltration strategy is therefore proposed.

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6.6 It is noted that the existing Acorn Lodge house and a storage building to the east of it, both of which are outside the red-line application, benefit from a positive drainage outfall to the ditch along the northern boundary of the site. It is understood that the ditch is currently defined as a highway ditch/drain, however the presence of the outfall would indicate it may be defined as an ordinary watercourse. It is unknown if Hertfordshire County Council would grant permission for a new outfall to the ditch; as such this could be explored further at a detailed design stage should an alternative be required to the infiltration strategy.

Surface Water Drainage Design Parameters

6.7 Climate Change Allowance – The 2070s 'Upper End' Climate Change allowance is 40% and shall be applied to the hydraulic drainage network design. This is based on Colne Management Catchment peak rainfall allowances.

6.8 Storm Events - The Hydraulic Model shall be run for a 1:2yr Storm Event, 1:30yr Storm Event, 1:30yr + 40% Climate Change Event, 1:100yr Storm Event and 1:100yr + 40% Climate Change Storm Event. For Storm durations of less than 60mins, the hydraulic model shall be run using FSR Rainfall Data.

6.9 Rainfall Data – FEH2022 Rainfall Data has been used in this assessment.

6.10 CV (Coefficient of volumetric run-off) – The CV Value for Winter and Summer Storms has been set to 1.0 to represent 100% of runoff from impermeable areas entering the proposed drainage system. A robust approach.

6.11 Time of Entry – a standard 5min time of entry is used.

6.12 Pre-and Post Runoff Rates – Pre-development runoff rates shall be calculated for information only. NB: post development shall outfall to ground as such zero outfall rate from the site.

6.13 Pre and Post Discharge Volumes and Long Term Storage – as infiltration is proposed, this is not applicable.

6.14 Half-Drain Time – In line with Hertfordshire's LLFA Guidelines, unlined storage devices should drain within 24hrs (1440mins), lined devices (tanks and lined ponds, lined permeable paving) to half-drain within 48hrs (2880mins). If this is not achieved, the storage device shall be sized to accommodate a further 1:30yr + 40% Climate Change Storm Event.

6.15 Factor of Safety – CIRIA SuDS Manual Table 25.2 sets out recommended Factor of Safety for use of infiltration systems. In this case a drained area of less than 1000m2

6.16 Exceedance Routes – Exceedance routes shall be demonstrated.

Pre-development Runoff Rate

6.17 The site is a brownfield site currently consisting of areas of hardstanding and roof area. The current total impermeable area of the site has been calculated to be 411m2. Using the Modified Rational Method detailed in Butler, D and Davies, J. (2006), Urban Drainage, 2nd ed., SPON, the surface water runoff for the existing site has been calculated as follows: -

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Q = CiA where Q = maximum flow rate (l/s)

C= PIMP/PR

i= rainfall intensity (mm/hr),

A=area (ha)

6.18 It should be noted that a fixed rainfall intensity of 50mm/hr is used in this case, which has been recommended by Butler & Davies (2006) to avoid using inappropriately high intensities for very low concentration times, i.e., small sites.

6.19 Using the Modified Rationale Method (Butler and Davies, 2006) the total existing run off rate is estimated to be 5.67l/s. This runoff rate does not include areas of landscaping flowing off site at the greenfield runoff.

Proposed SuDS Strategy

6.20 As outlined in Table 5.1 above, a number of SuDS Features shall be utilised to form the Surface Water Drainage Strategy in order to meet the 4 Pillars of SuDS.

- Water Quantity – Permeable Paving with infiltration and Geocellular Soakaways.
- Water Quality – Permeable Paving with infiltration.
- Biodiversity – Raingarden Planters.
- Amenity – Raingarden Planters.

6.21 The proposed SuDS Layout is included in **Appendix K** and Causeway Flow Hydraulic Model Outputs are contained in **Appendix L**.

6.22 The proposed drainage strategy comprises of permeable paving in parking and road areas where levels allow and outside FZ3. For hardstanding areas where gradients preclude the use of permeable paving for infiltration purposes and within areas of FZ3, permeable paving shall be used for water quality and conveyance purposes only. Waters shall be collected at the low-point in a diffuser unit which shall direct waters to a geocellular soakaway device (also located outside FZ3).

6.23 Surface water runoff from roof areas shall drain to a private geocellular soakaway device in each back garden.

6.24 The total proposed impermeable area is 960m^2 or 980m^2 with Urban Creep Allowance.

6.25 The proposed dwellings shall have a finished floor level of 110.300mAOD. Permeable Paving (PP1) shall therefore have a cover level of 110.150mAOD. This covers an area of 338m^2. Causeway Flow has been used to calculate the subbase thickness requirement for this area using the infiltration rate of 7.77E-05 m/sec. In accordance with CIRIA SuDS Manual Table 25.2 a Safety Factor of 3 has been applied for areas over 100m^2 and up to 1000m^2. The results om **Appendix L** show a maximum depth of water of 0.072m (72mm) in a 1:100yr + 40% Climate Change Storm Event. As such a minimum Type 3 subbase thickness of 450mm

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with 30% voids (also anticipated to be suitable for structural purposes when used with a geogrid) is required. Half Drain Time of 16mins is achieved. No flooding occurs in all events.

6.26 For the hardstanding area which drains to a soakaway, this covers an area of 222m^2. Causeway Flow has been used to calculate the required geocellular storage device size for this area using the infiltration rate of 3.20E-05 m/sec. In accordance with CIRIA SuDS Manual Table 25.2 a Safety Factor of 3 has been applied for areas over 100m^2 and up to 1000m2. The results om **Appendix L** show a geocellular storage device sized at 1.67m deep, 4.8m long and 2.4m wide is required. A void-ratio of 95% has been applied. Half Drain Time of 264mins is achieved. No flooding occurs in all events.

6.27 For the private roof area: Each property has a roof area of 100m2, with 10% urban creep this equates to 110m^2 per dwelling. A Raingarden Planter shall be provided at rainwater downpipes prior to outfall to a geocellular storage device. Causeway Flow has been used to calculate the required geocellular storage device size for this area using the infiltration rate of 3.20E-05 m/sec. In accordance with CIRIA SuDS Manual Table 25.2 a Safety Factor of 3 has been applied for areas over 100m^2 and up to 1000m^2. The results contained in **Appendix L** show a geocellular storage device sized at 1.67m deep, 3.2m long and 2.4m wide is required. A void-ratio of 95% has been applied. Half Drain Time of 634mins is achieved. No flooding occurs in all events. Each property will have its own soakaway located in the rear garden at least 5m from the building line.

Exceedance Event

6.28 The proposed surface water drainage strategy is designed to accommodate a 1:100yr + 40% Climate Change Storm Event. In the unlikely event that an exceedance event occurs, any flood waters would flow in an easterly direction along London Road towards the River Ver. An Exceedance Route Plan is included in **Appendix M.**

Water Quality

6.29 The proposed drainage strategies are to meet the water quality requirements set out by Table 26.2 of the CIRIA SuDS Manual C753 which sets out the specific pollution hazard indices for residential roofs and low traffic roads in Table 6.2 below.

Land Use	Hazard Level	Pollution Hazard Indices		
		Suspended Solids	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways and low traffic roads	Low	0.5	0.4	0.4

Table 6.2 Land Use Pollution Hazard Ratings. Extracted from the CIRIA SuDS Manual C753 Simple Index Approach Tool

6.30 Surface water runoff from all hardstanding areas shall infiltrate to ground via the base and sides of permeable paving or to soakaway. The permeable paving construction itself offers pollution mitigation as set out below in Table 6.3 and demonstrates that Water Quality is met by its use for surface water runoff in these locations.

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SuDS Component	Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
Permeable Paving Total Pollution Mitigation Provided	0.7	0.6	0.7

Table 6.3 SuDS Component Pollution Mitigation for Permeable Paving Extracted and adapted from the CIRIA SuDS Manual C753 Simple Index Approach Tool

6.31 Surface water runoff from roof areas shall infiltrate to ground via soakaway. Raingarden Planters (bioretention system) at rainwater down-pipe locations shall cleanse waters prior to outfall to ground. Pollution mitigation as set out below in Table 6.4 for raingarden planters demonstrates that Water Quality is met by its use for surface water runoff of residential roofs.

SuDS Component	Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
Raingarden Planter Total Pollution Mitigation Provided	0.8	0.8	0.8

Table 6.4 SuDS Component Pollution Mitigation for Raingarden Planters Extracted and adapted from the CIRIA SuDS Manual C753 Simple Index Approach Tool

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7 Maintenance of the Proposed Drainage System

7.1 The maintenance of communal SuDS features such as the permeable paving and soakaway for the conveyance permeable paving will remain the responsibility an appointed management/maintenance company. The appointed management company will be responsible for maintaining the outfalls and the permeable paving. It is anticipated that a restricted covenant will be put in place to prevent any owners of parking bays from changing the construction to non-permeable.

7.2 Regular inspections and maintenance should be carried out for each of these elements, particularly after periods of heavy rainfall. Maintenance tasks and frequencies for permeable paving, raingardens and geocellular soakaway devices are detailed in the CIRIA SUDS Manual (C753) and summarised below in Table 7.1.

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid-summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas. Removal of weeds.	As required. As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50mm of the level of the paving. Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of a hazard to the user. Rehabilitation of surface and upper sub-surface.	As required As required As required (if infiltration performance is reduced as a result of significant clogging.)
Monitoring	Initial inspection Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Monitor inspection chambers.	Monthly for 3 months after installation. 3 monthly, 48 hours after large storms. Annually. Annually.

Table 7.1: Maintenance tasks for permeable paving (Source: CIRIA C753, The SUDS Manual)

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7.3 Property owners shall be responsible for the maintenance of private manholes and inspection chambers, Raingarden Planters and Private Geocellular Soakaway Devices.

7.4 Regular inspections and maintenance should be carried out for each of these elements, particularly after periods of heavy rainfall. Maintenance tasks and frequencies for raingarden planters and geocellular soakaways is detailed in the CIRIA SUDS Manual (C753) and is summarised below in Table 7.2 and 7.3 below.

Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular Maintenance	Remove litter and surface debris and weeds	Quarterly
	Replace any plants, to maintain planting density	As required
	Remove sediment, littler and debris build up from around inlets or from forebays	Quarterly to biannually
Occasional Maintenance	Infill and holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 7.2: Maintenance tasks for raingarden planters/bioretention systems (Source: CIRIA C753, The SUDS Manual)

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Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	As required based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of geotextile	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Table 7.3: Maintenance tasks for soakaway devices (Source: CIRIA C753, The SUDS Manual)

7.5 Manhole covers on the pipes should be lifted each year to remove visible debris and check for blockages – it is suggested that this is undertaken every November after the heaviest leaf-fall has occurred. The orifice plate filter should be regularly inspected (every 4 months) and cleared of silt and debris if necessary.

7.6 Should a blockage occur at any time, it is advised to seek professional help to jet the drainage system to clean and clear the system.

7.7 It is good practice to ensure that gutters and downpipes are occasionally inspected to ensure they are in good order and free of leaves & debris. Once every 6 months should be sufficient.

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8 Conclusion

8.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report in order to inform a planning application for a proposed redevelopment of part of the site at Acorn Lodge, London Road, Flamstead, St Albans AL3 8HB. It is proposed to redevelop the site into four residential dwellings.

Flood Risk Summary

8.2 The proposed residential properties are located wholly in Flood Zone 1 and are outside of the surface water flood and reservoir flood extents. Thus, have been sequentially located in the area of lowest risk within the red line boundary.

8.3 Finished Floor Levels will be set at 110.300mAOD. The highest defended flood depth within the site boundary for the 1:100yr + 25% Climate Change is 108.870mAOD, providing a freeboard of 1.43m. Looking at the Surface Water Flood Risk, in a 1:100yr scenario, a maximum flood depth of 0 to 0.15m at the southern-most extremity, where ground levels are around 109.50mAOD would give a flood level of 109.65mAOD and therefore a freeboard of 0.65m.

8.4 In all flood risk scenarios, the proposed residential dwellings are located above the anticipated flood level and are in an area of the site which shall remain 'dry'.

8.5 As discussed in Section 4, no velocity data is given for the 2D fluvial flood scenarios, however based on the flood depth of 100mm and velocity of 0.75m/s (which we might anticipate in this scenario), a very low hazard rating would apply. If velocities above this (up to 1.5m/s) the flood hazard rating raises to a maximum of 1.1 'danger for some'. Based on this maximum flood hazard rating emergency vehicles could access the site. In addition to the west of the site, London Road is shown to be within flood Zone 1 and as such, emergency vehicles could also reach the site from this direction unimpeded.

8.6 In a surface water flood risk scenario, surface water velocity data for the 1000yr modelled event downloaded from the DEFRA Data Services Platform, identifies velocities of up to 0.5m/s within the site access road. Based on a flood depth up to 1.2m and Table 13.1 of FD2320/TR2, a flood hazard rating of up to 2.2 could be observed which would result in a 'danger to all'. Under these extreme conditions safe access would not be available via the access road, however residents could remain safe within their homes or use the emergency pedestrian access to the west.

8.7 In the unlikely event that pedestrians need to exit the site or emergency services have to access the site at a time when the access road is inundated with flood water, emergency pedestrian access will be available to the existing Public Right of Way (PRoW) path no. 21 to the south and also to Chequers Hill Road to the west. This will be possible via a new private unpaved route, west out of Acorn Lodge, joining a new Public Right of Way proposed both to the west to Chequers Hill and to the south to PRoW 21, as illustrated on Figure 5.1 in Section 5, and shown in more detail on a sketch contained in **Appendix J**.

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8.8 It can be seen from the Surface water flood maps in **Appendix H** that the two alternative pedestrian routes (either to Chequers Hill to the west of the site, or to the south via PRoW no.21) are outside of the area at risk of surface water flooding, other than in the worst case 1000yr surface water flood event, where there is flooding shown where the pedestrian route meets Chequers Hill. However, flooding to the south of this point, along Chequers Hill is designated as being a low risk and doesn't extend to the full road width. As such emergency access should still be possible in this direction.

8.9 The details of this alternative access address, are intended to be added to the first responders dispatch system, so that they are aware of the alternative access on any emergency being called in.

8.10 It is recommended that signage is placed at the site entrance to ensure that residents do not attempt to cross flood waters that are in excess of 100mm deep. The signage shall advise to remain within their properties until flood waters have receded and to call emergency services only in case of emergency/risk to life.

8.11 It is recommended a Flood Warning and Evacuation Plan is issued to all residents, including the provision of a flood warning notice at the site entrance.

SuDS Summary

8.12 Disposal of surface water runoff from the site has been given consideration against the site constraints, implementation constraints and the SuDS Hierarchy.

8.13 Infiltration tests were undertaken at the site to determine the viability of the use of soakaways to dispose of surface water runoff from the proposed development. Testing to BRE 365 Standard was undertaken by SubSurface Consultants on 11th Aug 2023. The results are contained in Appendix E and show an infiltration rate of 3.20E-05 m/sec at a depth of 2.5m below ground level and an infiltration rate of 7.77E-05 m/sec at a depth of 0.7m below ground level. These rates prove that infiltration to ground is viable and an infiltration strategy is therefore proposed.

8.14 It is noted that the existing Acorn Lodge house and a storage building to the east of it, both of which are outside the red-line application, benefit from a positive drainage outfall to the ditch along the northern boundary of the site. It is understood that the ditch is currently defined as a highway ditch/drain, however the presence of the outfall would indicate it may be defined as an ordinary watercourse. It is unknown if Hertfordshire County Council would grant permission for a new outfall to the ditch; as such this could be explored further at a detailed design stage should an alternative be required to the infiltration strategy.

8.15 A number of SuDS Features shall be utilised to form the Surface Water Drainage Strategy in order to meet the 4 Pillars of SuDS:

- Water Quantity – Permeable Paving with infiltration and Geocellular Soakaways.
- Water Quality – Permeable Paving with infiltration.
- Biodiversity – Raingarden Planters.

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- Amenity – Raingarden Planters.

8.16 Permeable Paving is proposed for all hardstanding areas. Where levels are flat, permeable paving shall allow waters to infiltrate to ground. Where gradients are too steep or where paving is within the flood zone, permeable paving shall convey waters to a low-point where runoff shall then be directed to a geocellular soakaway device. Surface water runoff from roof areas shall be directed to individual geocellular soakaway devices.

8.17 Hydraulic modelling for all storms up to and including the 1:100yr + 40% Climate Change Event show that no flooding from the proposed surface water drainage system occurs in all events. Hertfordshire County Council's design parameters have been used such as FEH22 rainfall data, CV values of 1.0 and Factor of Safety for infiltration devices.

8.18 Maintenance tasks for the permeable paving, raingarden planters and soakaways have been discussed, which have been taken from the CIRIA SuDS Manual (C753). It is also important that the proposed SuDS devices are regularly inspected and any debris is removed to prevent a fluvial or surface water flood risk.

Conclusion

8.19 The proposed development application is considered to be acceptable on flood risk and drainage grounds and the appropriate mitigation measures to manage the identified flood risks have been detailed in line with the PPG.

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9 Appendices

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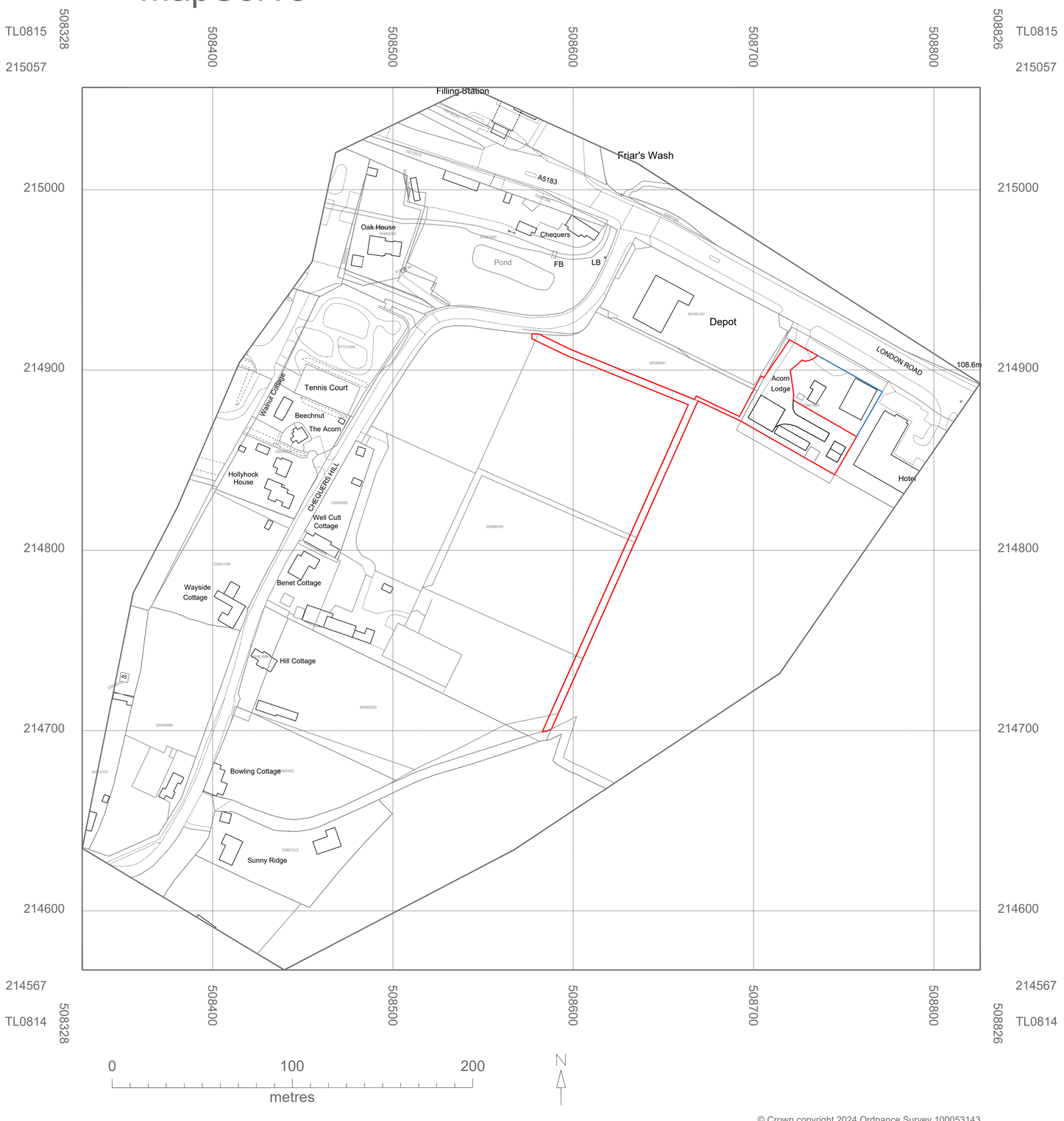
Appendix: A – Location Plan

MapServe®



EXISTING LOCATION PLAN 1:1250 @ A1

REVISION NOTES

REV	DESCRIPTION	DATE

STAGE

- [ ] PRE APPLICATION
- [ ] LAWFUL DEVELOPMENT
- [x] PLANNING APPLICATION
- [ ] CONDITIONS
- [ ] BUILDING CONTROL
- [ ] AS-BUILT

PROJECT

4NO NEW BUILD DWELLINGS
CREATION OF NEW FOOTPATH

DRAWING NUMBER	OAKPL-04
DATE	20/03/2024
SCALE	1:1250 @ A1
SHEET NUMBER	1 of 1
DRAWN BY	HD
REVISION	

ADDRESS

ACORN LODGE
LONDON ROAD
FLAMSTEAD

DRAWING TITLE

EXISTING LOCATION PLAN

OAKWOOD PLANNING & DESIGN LTD
CRN: 14467585
TEL: 07947 497352
MAIL: PLANNING@OAKWOODPLANS.CO.UK

Appendix: B – Proposed Plans

6198183

Depot

PROPOSED SITE PLAN 1:200

SCALE 1:200
0 5 2 4 6 8 10 12 14 16 18 20 [m]

N

All dimensions and levels are subject to a thorough and accurate on-site check by the contractor prior to the commencement of any construction work.
All sizes of structural components are to be verified by a structural engineer.
Electrical contractors must be members of the national inspection council for electrical installation & contracting (NICIEC) & the electrical contractors association.
Mechanical installation or modification to be in accordance with the latest edition of the CIBSE guide as produced by the chartered institute of building services engineers and to current BS specification.
All works are to comply with the latest revision of the British standards.
The client or appointed agent should advise of any known buried services and drainage location or restrictive covenants.
Build-over agreements and party wall concerns are the responsibility of the client if applicable.
This drawing should be read in conjunction with all other documents relating to the works.
Do not scale from the drawing for construction or design purposes, except for the purposes of planning.

REVISION NOTES

REV	DESCRIPTION	DATE

STAGE

- [ ] PRE APPLICATION
- [ ] LAWFUL DEVELOPMENT
- [x] PLANNING APPLICATION
- [ ] CONDITIONS
- [ ] BUILDING CONTROL
- [ ] AS-BUILT

PROJECT

4NO NEW BUILD DWELLINGS
CREATION OF NEW FOOTPATH

DRAWING NUMBER	OAKPL-04
DATE	20/03/2024
SCALE	1:200 @ A1
SHEET NUMBER	1 of 1
DRAWN BY	HD
REVISION	

ADDRESS

ACORN LODGE
LONDON ROAD
FLAMSTEAD

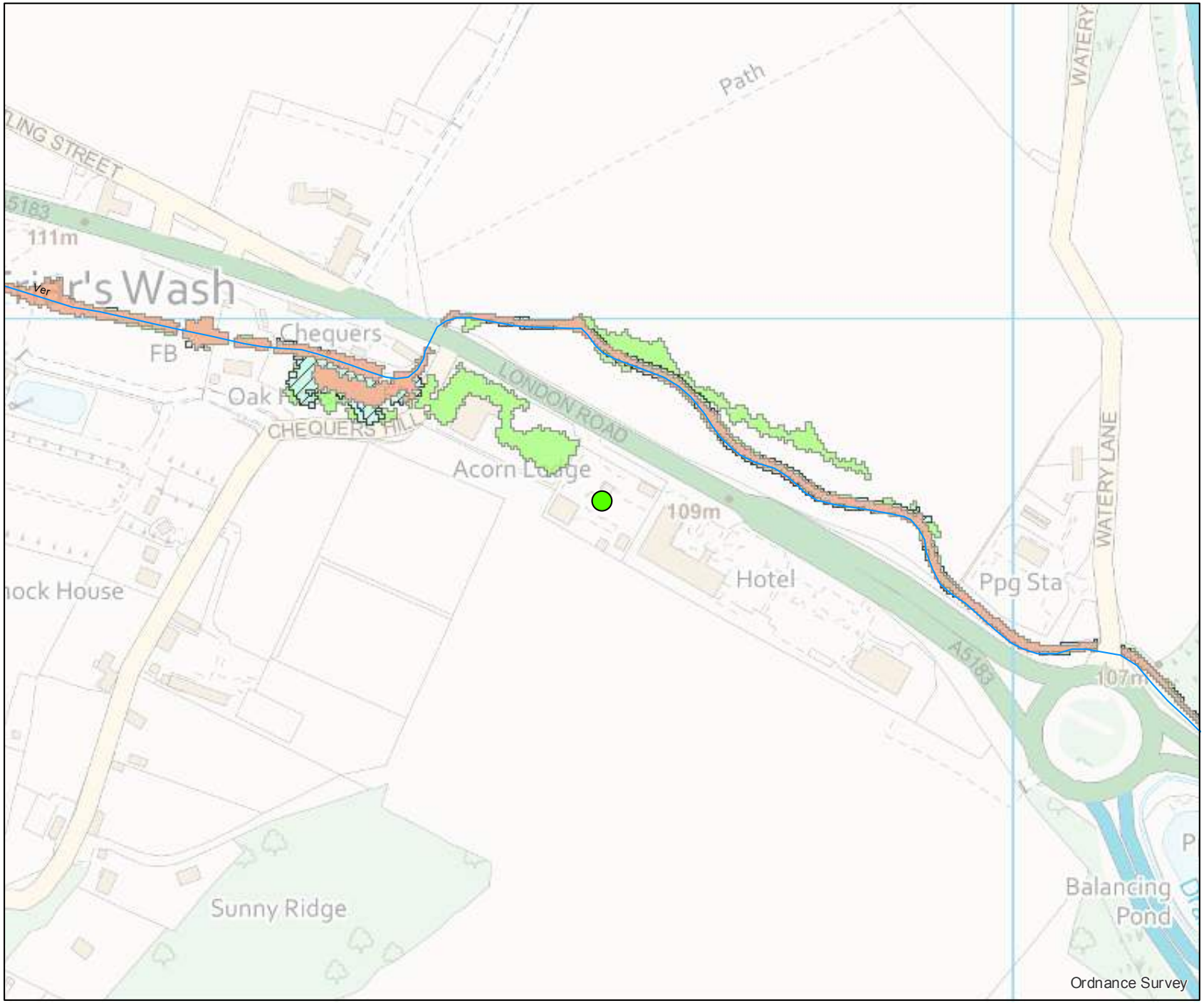
DRAWING TITLE

PROPOSED SITE PLAN 1:200

OAKWOOD PLANNING & DESIGN LTD
CRN: 14467585
TEL: 07947 497352
MAIL: PLANNING@OAKWOODPLANS.CO.UK

Appendix: C – EA Flood Map for Planning & EA Data

Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



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N

0 50 100 200
Metres

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 Ver Study (JBA, 2019).
This study is a catchment scale mapping study and 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.
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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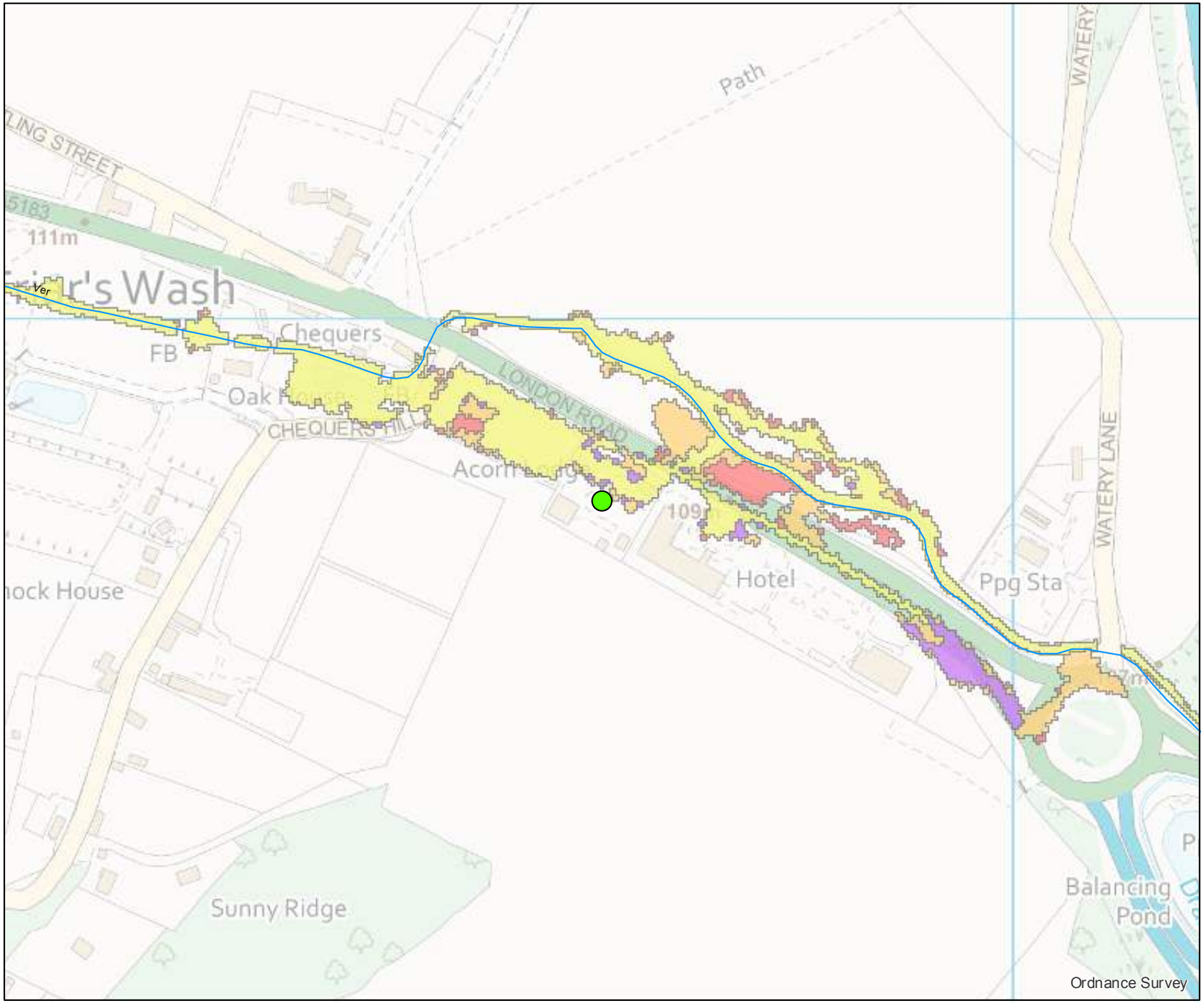
Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



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Hertfordshire,
AL7 1HE

N

0 50 100 200

Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 25 (4%) Defended
- 1 in 30 (3.33%) Defended
- 1 in 50 (2%) Defended
- 1 in 75 (1.33%) Defended

The data in this map has been extracted from the Ver Study (JBA, 2019).
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Modelled outlines take into account catchment wide defences.

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

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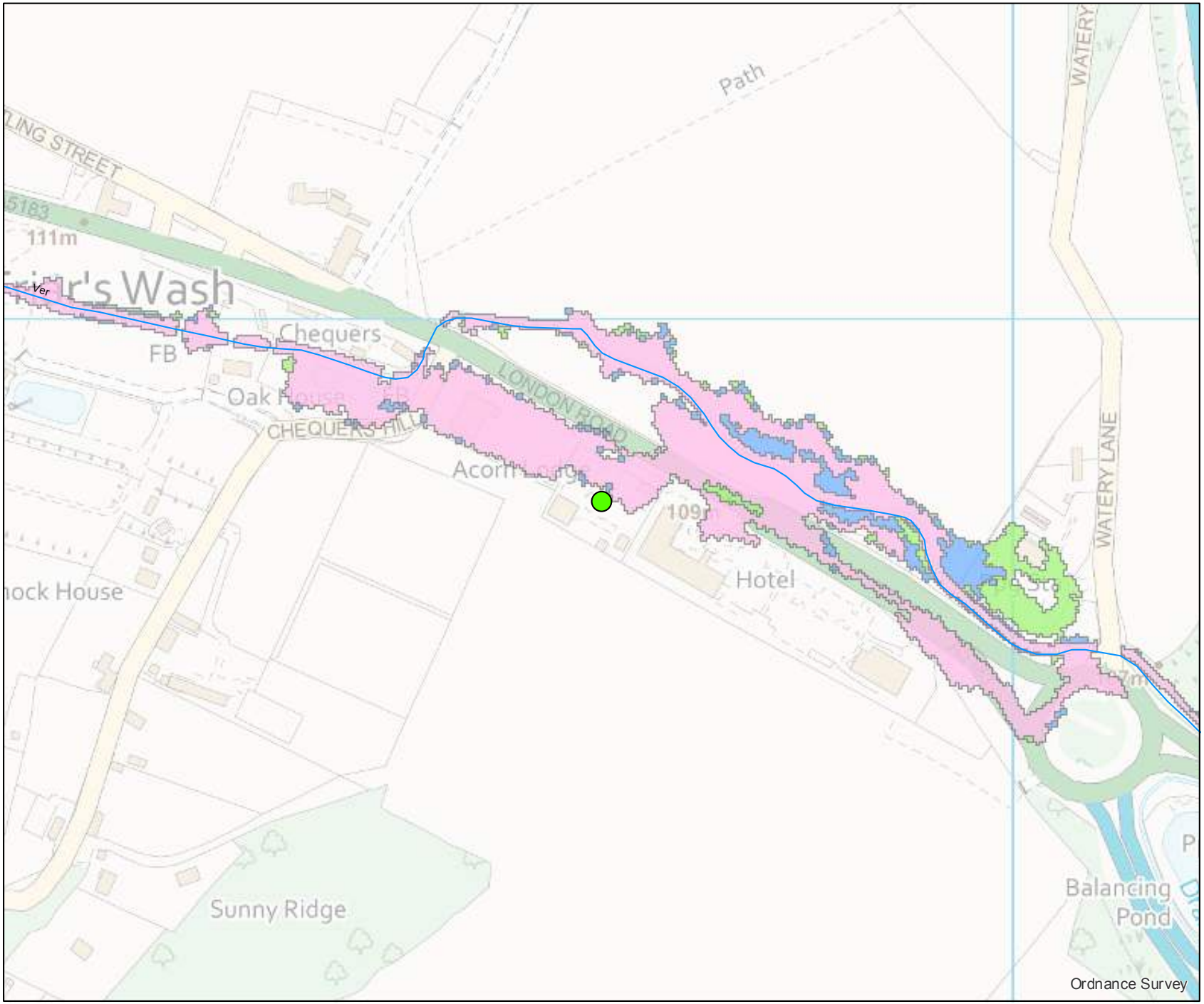
Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



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Hertfordshire,
AL7 1HE

N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

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

The data in this map has been extracted from the Ver Study (JBA, 2019).
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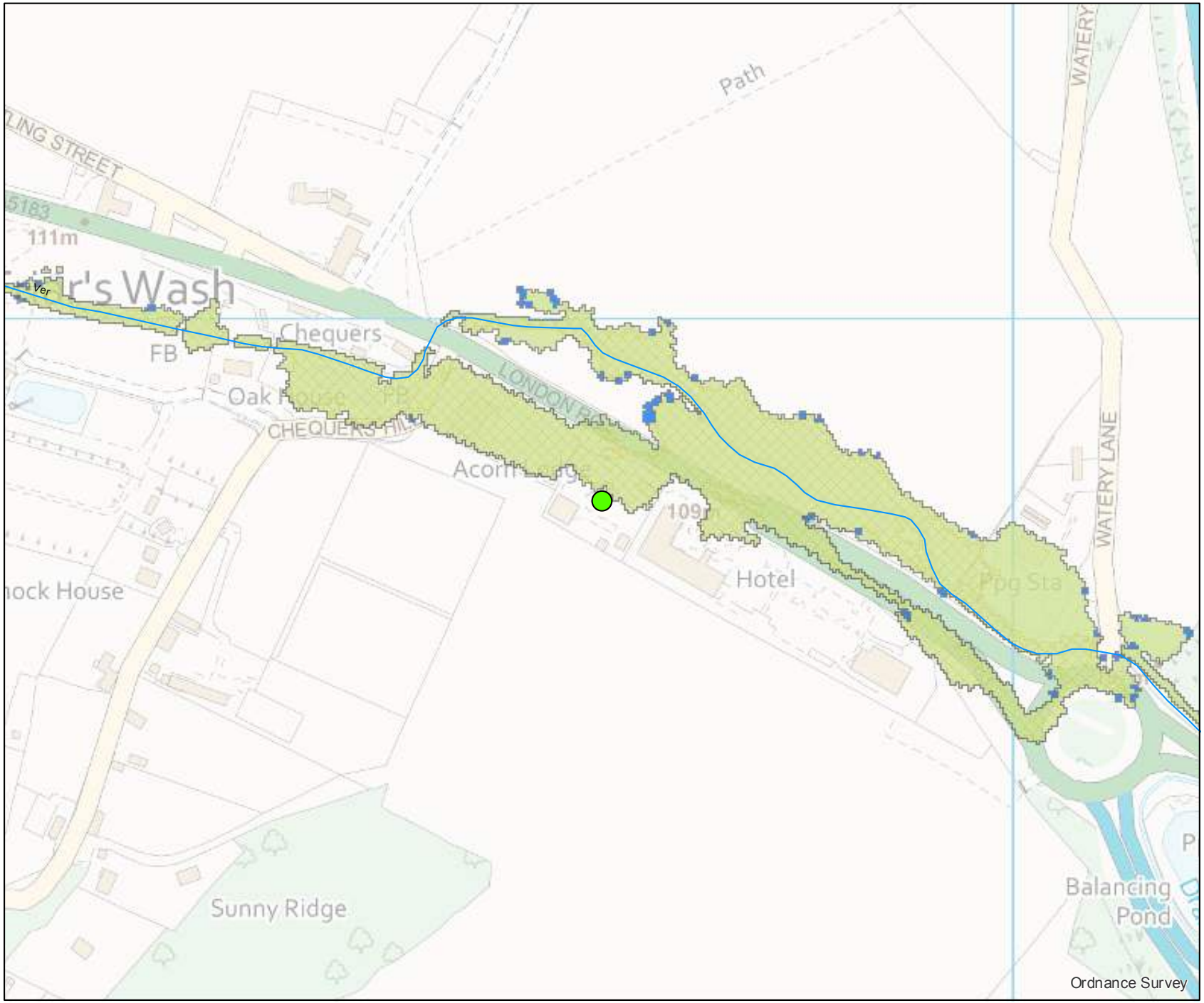

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Hertfordshire,
AL7 1HE

N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

Defended Flood Outlines

- 1 in 100+70% (*CC) Defended
- 1 in 200 (0.5%) Defended
- 1 in 1000 (0.1%) Defended

The data in this map has been extracted from the Ver Study (JBA, 2019).
This study is a catchment scale mapping study and 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

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Environment Agency ref: HNL 252943 BC

The data in this map has been extracted from the Ver Modelling Study (JBA, 2019)

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

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**	**2yr**	**5 yr**	**10yr**	**20 yr**	**25 yr**	**30yr**	**50 yr**	**75yr**	**100 yr**	**100yr + 25%**	**100yr +35%**	**100yr +70%**	**200yr**	**1000 yr**
VER_21969	508358	215017	108.84	108.92	108.97	109.04	109.05	109.06	109.09	109.11	109.11	109.16	109.18	109.24	109.15	109.26
VER_21955	508371	215015	108.83	108.92	108.97	109.04	109.05	109.06	109.09	109.11	109.11	109.16	109.18	109.24	109.15	109.26
VER_21940	508385	215009	108.83	108.91	108.97	109.04	109.05	109.05	109.09	109.11	109.11	109.16	109.18	109.23	109.15	109.25
VER_21867	508456	214993	108.82	108.90	108.96	109.03	109.04	109.04	109.08	109.10	109.10	109.15	109.17	109.22	109.14	109.24
VER_21867d	508460	214992	108.82	108.90	108.95	109.03	109.04	109.04	109.07	109.09	109.10	109.15	109.16	109.22	109.14	109.24
VER_21856	508467	214991	108.81	108.90	108.95	109.02	109.03	109.04	109.07	109.09	109.09	109.14	109.16	109.22	109.13	109.24
VER_21853	508470	214990	108.81	108.90	108.95	109.02	109.03	109.04	109.07	109.09	109.09	109.14	109.16	109.22	109.14	109.24
VER_21833	508490	214987	108.81	108.89	108.95	109.02	109.03	109.03	109.06	109.08	109.09	109.13	109.15	109.21	109.13	109.23
VER_21833d	508494	214987	108.81	108.89	108.94	109.01	109.02	109.03	109.05	109.07	109.07	109.12	109.13	109.18	109.11	109.20
VER_21806	508516	214982	108.80	108.89	108.94	109.00	109.01	109.02	109.05	109.06	109.06	109.11	109.12	109.16	109.10	109.18
VER_21806d	508520	214983	108.65	108.74	108.80	108.87	108.88	108.88	108.90	108.91	108.92	108.95	108.95	108.98	108.94	108.99
VER_21778	508544	214978	108.65	108.74	108.79	108.87	108.88	108.88	108.90	108.91	108.91	108.94	108.95	108.98	108.94	108.99
VER_21731	508589	214965	108.64	108.73	108.79	108.87	108.88	108.88	108.90	108.91	108.91	108.94	108.95	108.98	108.94	108.99
VER_21710	508610	214964	108.63	108.73	108.78	108.86	108.87	108.87	108.89	108.90	108.90	108.93	108.94	108.97	108.93	108.98
VER_21656	508643	215003	108.34	108.39	108.42	108.45	108.46	108.46	108.46	108.46	108.46	108.47	108.48	108.49	108.47	108.50
VER_21523	508765	214967	107.79	107.86	107.90	107.95	107.96	107.96	107.97	107.98	107.98	108.00	108.01	108.03	108.00	108.04
VER_21338	508918	214876	107.23	107.30	107.36	107.41	107.43	107.43	107.45	107.48	107.48	107.55	107.58	107.66	107.54	107.69
VER_21167	509043	214787	106.65	106.75	106.81	106.90	106.93	106.93	107.00	107.09	107.10	107.31	107.37	107.60	107.28	107.64
VER_21080	509115	214745	106.25	106.31	106.34	106.39	106.40	106.40	106.44	106.47	106.47	106.53	106.54	106.60	106.52	106.63
VER_21821	508501	214985	108.81	108.89	108.94	109.01	109.02	109.02	109.05	109.07	109.07	109.11	109.13	109.17	109.11	109.19
VER_21695	508618	214976	108.61	108.70	108.76	108.83	108.84	108.84	108.86	108.87	108.88	108.91	108.92	108.94	108.90	108.96
VER_21690	508620	214981	108.58	108.67	108.72	108.80	108.81	108.81	108.83	108.84	108.84	108.87	108.90	108.90	108.86	108.91
VER_21690d	508629	214997	108.45	108.50	108.53	108.56	108.56	108.56	108.57	108.57	108.57	108.58	108.60	108.61	108.58	108.61
VER_21156	509056	214789	106.64	106.74	106.80	106.90	106.93	106.93	107.00	107.08	107.09	107.30	107.36	107.59	107.27	107.64
VER_21156d	509071	214786	106.60	106.68	106.72	106.77	106.79	106.79	106.82	106.86	106.87	106.96	106.98	107.07	106.95	107.11
VER_21731d	508596	214963	108.64	108.73	108.79	108.87	108.88	108.88	108.90	108.91	108.91	108.94	108.95	108.98	108.94	108.99
VER_21523i	508829	214910	107.55	107.62	107.68	107.73	107.74	107.74	107.76	107.77	107.77	107.80	107.81	107.83	107.79	107.84
VER_21338i	508966	214821	106.96	107.04	107.09	107.15	107.17	107.17	107.22	107.27	107.28	107.41	107.45	107.62	107.39	107.66

Add your Data in the Input Sheet

You may need to drag down the formula rows to make all your data appear.

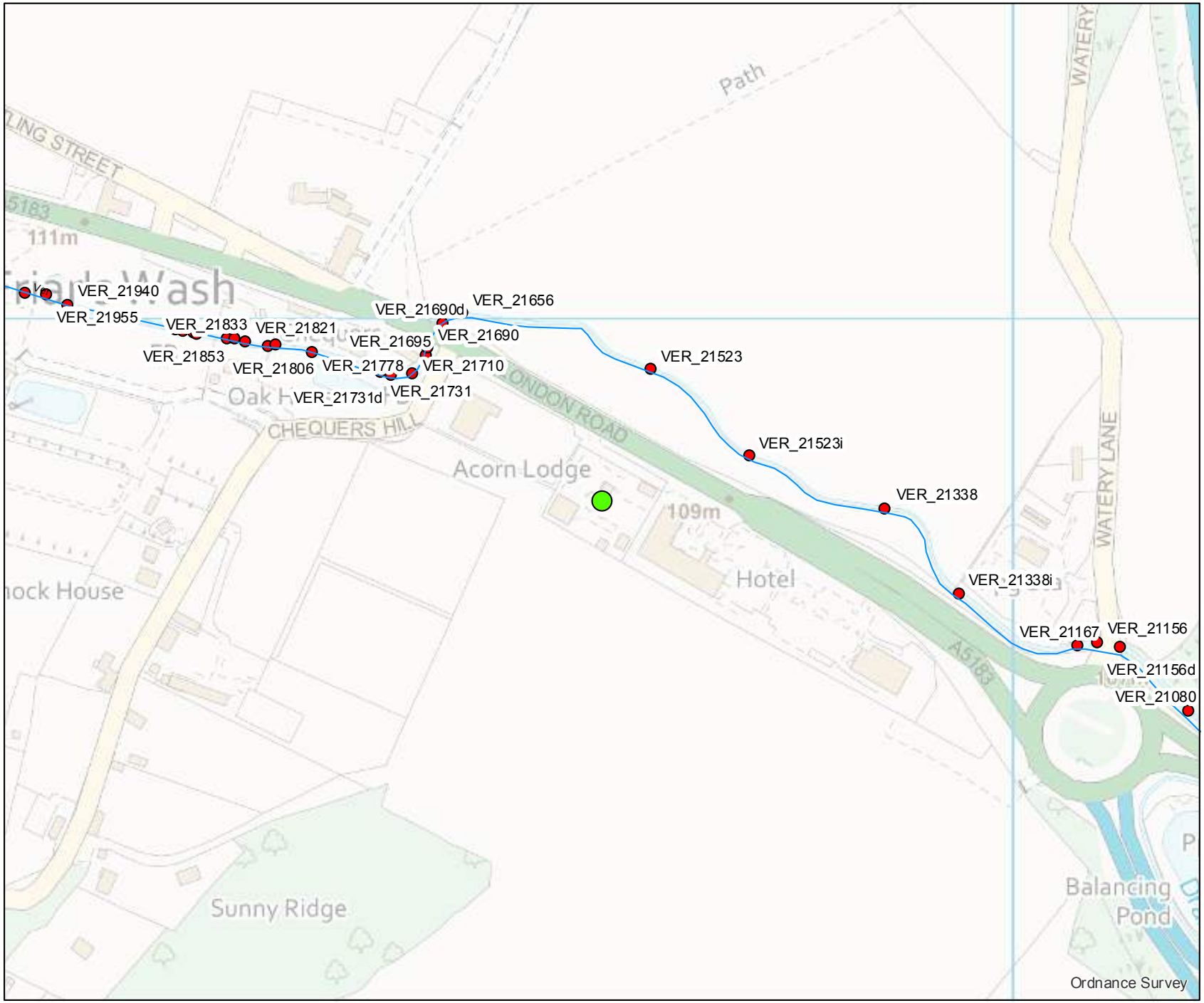
Remember to add a grid once all the data is displayed, and to change the print outlines before exporting.

It is easiest to remove this page once you have combined it into the PDF.

MODELLED FLOWS

			Return Period													
Node Label	**Easting**	**Northing**	**2yr**	**5 yr**	**10yr**	**20 yr**	**25 yr**	**30yr**	**50 yr**	**75yr**	**100 yr**	**100yr + 25%**	**100yr +35%**	**100yr +70%**	**200yr**	**1000 yr**
VER_21969	508358	215017	0.27	0.38	0.39	0.45	0.47	0.48	0.52	0.55	0.56	0.63	0.65	0.76	0.62	0.78
VER_21955	508371	215015	0.27	0.37	0.39	0.46	0.47	0.48	0.52	0.55	0.56	0.63	0.66	0.76	0.62	0.78
VER_21940	508385	215009	0.27	0.34	0.39	0.46	0.47	0.48	0.52	0.55	0.56	0.63	0.66	0.76	0.62	0.78
VER_21867	508456	214993	0.28	0.34	0.39	0.46	0.48	0.49	0.52	0.55	0.57	0.64	0.67	0.77	0.63	0.79
VER_21867d	508460	214992	0.28	0.34	0.39	0.46	0.48	0.49	0.52	0.55	0.57	0.64	0.67	0.77	0.63	0.79
VER_21856	508467	214991	0.46	0.60	0.68	0.84	0.88	0.89	1.00	1.07	1.08	1.26	1.29	1.46	1.25	1.52
VER_21853	508470	214990	0.46	0.56	0.64	0.77	0.80	0.82	0.91	1.01	1.02	1.20	1.24	1.43	1.18	1.51
VER_21833	508490	214987	0.46	0.60	0.68	0.85	0.88	0.89	1.00	1.07	1.08	1.29	1.37	1.65	1.26	1.77
VER_21833d	508494	214987	0.46	0.60	0.68	0.85	0.88	0.89	1.00	1.07	1.08	1.29	1.37	1.65	1.26	1.77
VER_21806	508516	214982	0.46	0.59	0.68	0.85	0.87	0.89	1.00	1.07	1.08	1.29	1.37	1.65	1.26	1.77
VER_21806d	508520	214983	0.46	0.59	0.68	0.85	0.87	0.89	1.00	1.07	1.08	1.29	1.37	1.65	1.26	1.77
VER_21778	508544	214978	0.46	0.57	0.61	0.69	0.71	0.72	0.79	0.84	0.85	1.00	1.07	1.27	0.98	1.35
VER_21731	508589	214965	0.47	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.62	0.67	0.79	0.61	0.83
VER_21710	508610	214964	0.45	0.57	0.63	0.73	0.74	0.75	0.79	0.81	0.82	0.84	0.90	0.96	0.84	0.98
VER_21656	508643	215003	0.45	0.59	0.68	0.80	0.81	0.81	0.84	0.86	0.86	0.91	0.97	1.02	0.90	1.03
VER_21523	508765	214967	0.45	0.59	0.68	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.79	0.80	0.78	0.80
VER_21338	508918	214876	0.63	0.85	0.97	1.16	1.21	1.21	1.34	1.41	1.42	1.52	1.57	1.60	1.54	1.62
VER_21167	509043	214787	0.63	0.85	0.97	1.17	1.23	1.23	1.38	1.50	1.51	1.75	1.80	1.85	1.73	1.85
VER_21080	509115	214745	0.63	0.85	0.97	1.17	1.23	1.23	1.38	1.53	1.55	1.92	2.03	2.47	1.88	2.67
VER_21821	508501	214985	0.46	0.60	0.68	0.85	0.88	0.89	1.00	1.07	1.08	1.29	1.37	1.65	1.26	1.77
VER_21695	508618	214976	0.45	0.59	0.68	0.80	0.81	0.81	0.84	0.86	0.86	0.90	0.97	0.96	0.90	0.96
VER_21690	508620	214981	0.45	0.59	0.68	0.80	0.81	0.81	0.84	0.86	0.86	0.91	0.97	1.02	0.90	1.03
VER_21690d	508629	214997	0.45	0.59	0.68	0.80	0.81	0.81	0.84	0.86	0.86	0.91	1.00	1.02	0.90	1.03
VER_21156	509056	214789	0.63	0.85	0.97	1.17	1.23	1.23	1.38	1.53	1.55	1.92	2.03	2.41	1.88	2.43
VER_21156d	509071	214786	0.63	0.85	0.97	1.17	1.23	1.23	1.38	1.53	1.55	1.92	2.03	2.41	1.88	2.43
VER_21731d	508596	214963	0.47	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.62	0.67	0.79	0.61	0.83
VER_21523i	508829	214910	0.63	0.85	0.97	1.17	1.23	1.23	1.32	1.38	1.38	1.58	1.65	1.80	1.55	1.87
VER_21338i	508966	214821	0.63	0.85	0.97	1.17	1.23	1.23	1.39	1.50	1.51	1.84	1.93	1.97	1.79	1.98

Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



Environment Agency
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N

0 50 100 200
Metres

Legend

- Main Rivers
- Site location

1D Node Results

- 1D Nodes

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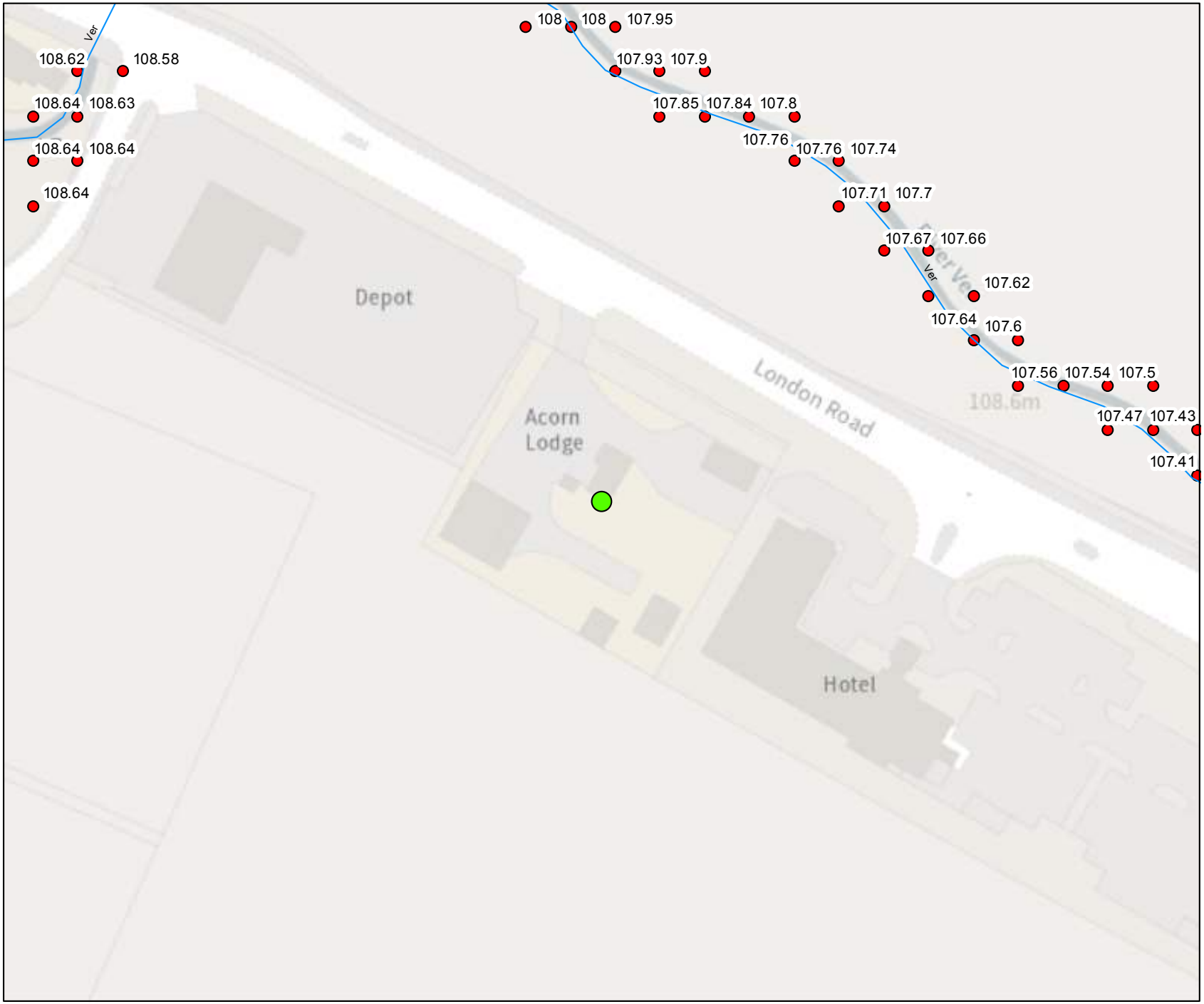
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



Environment Agency

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

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 2 (50%) Defended

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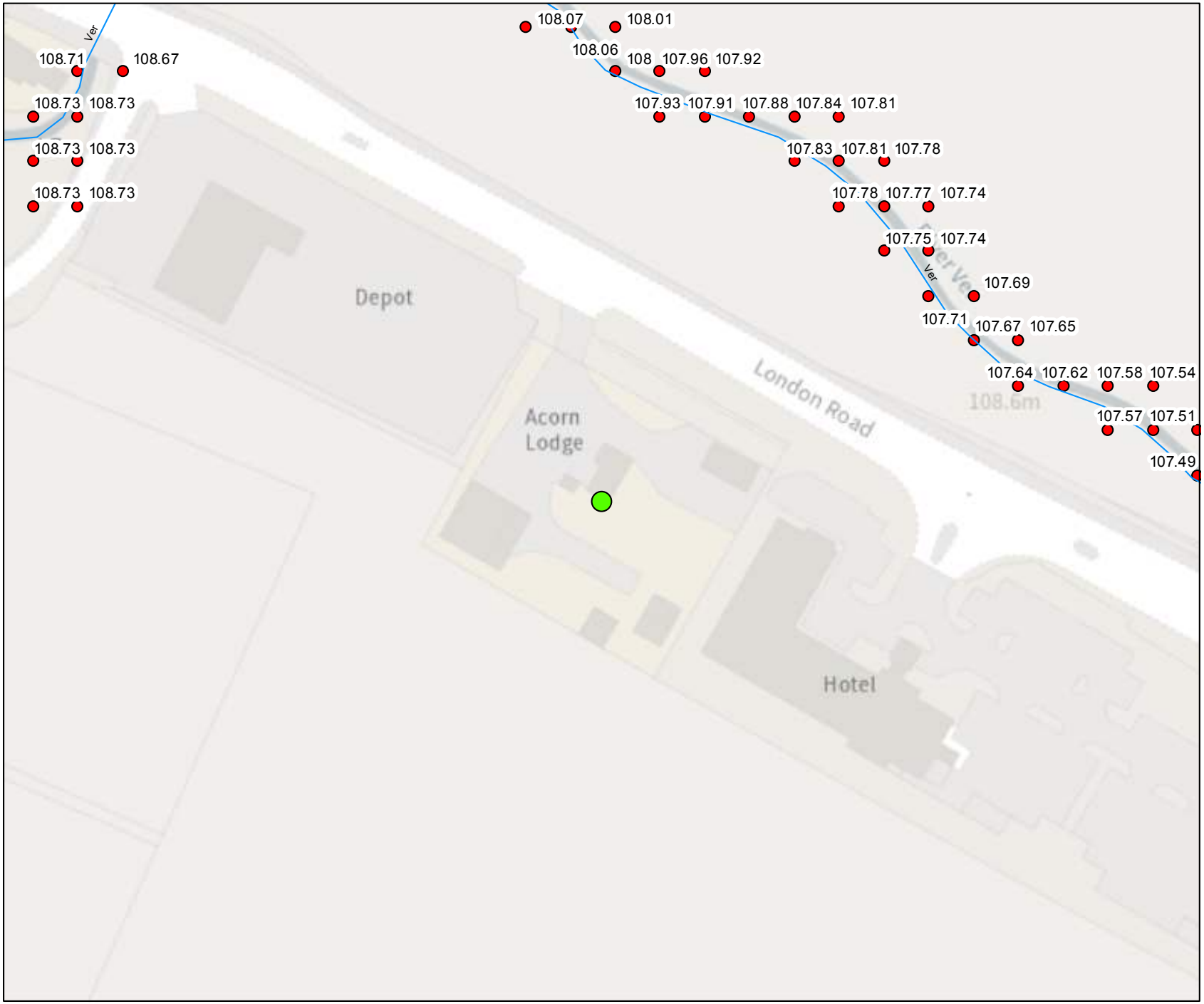

Environment Agency

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

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 5 (20%) Defended

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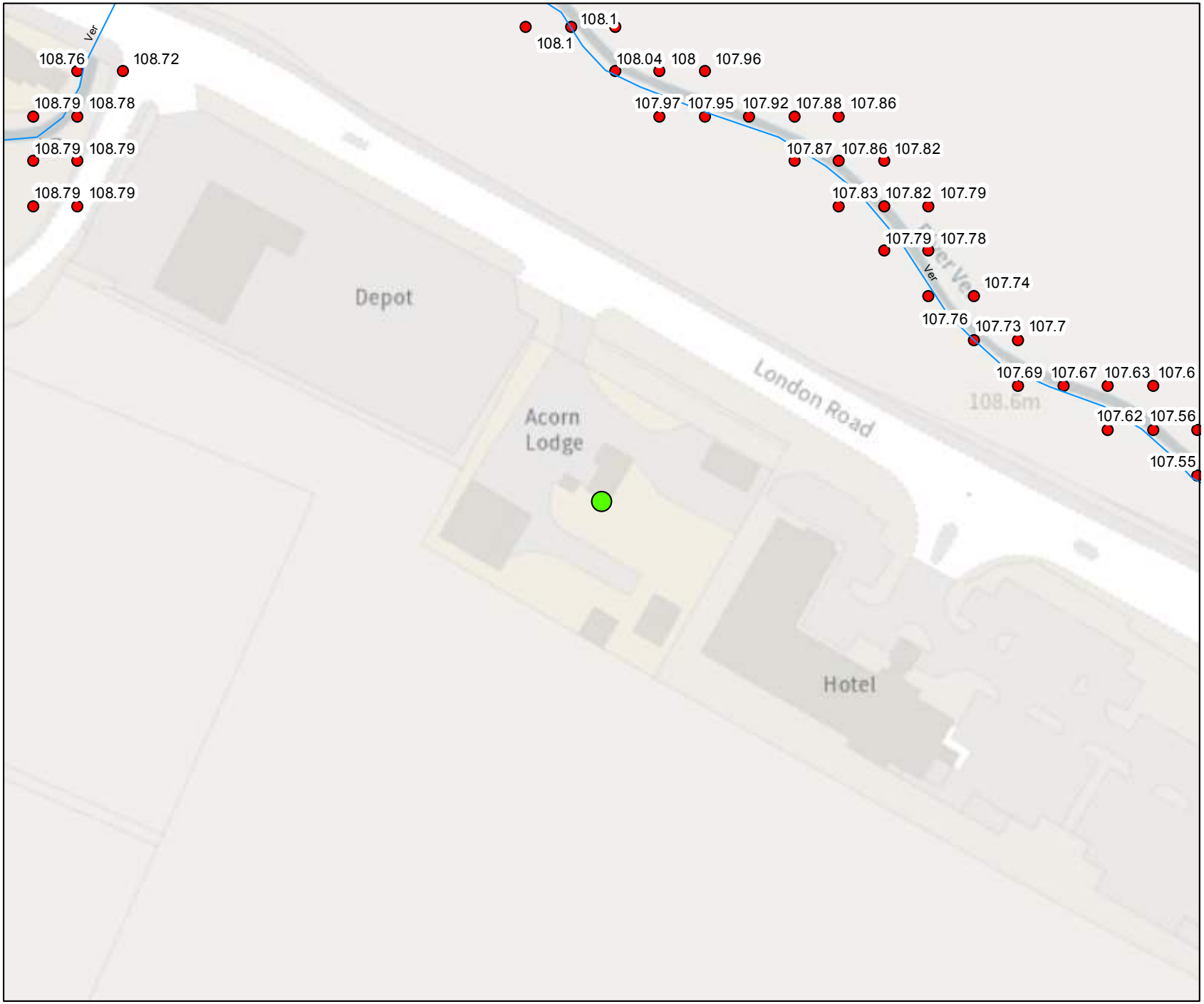

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 10 (10%) Defended

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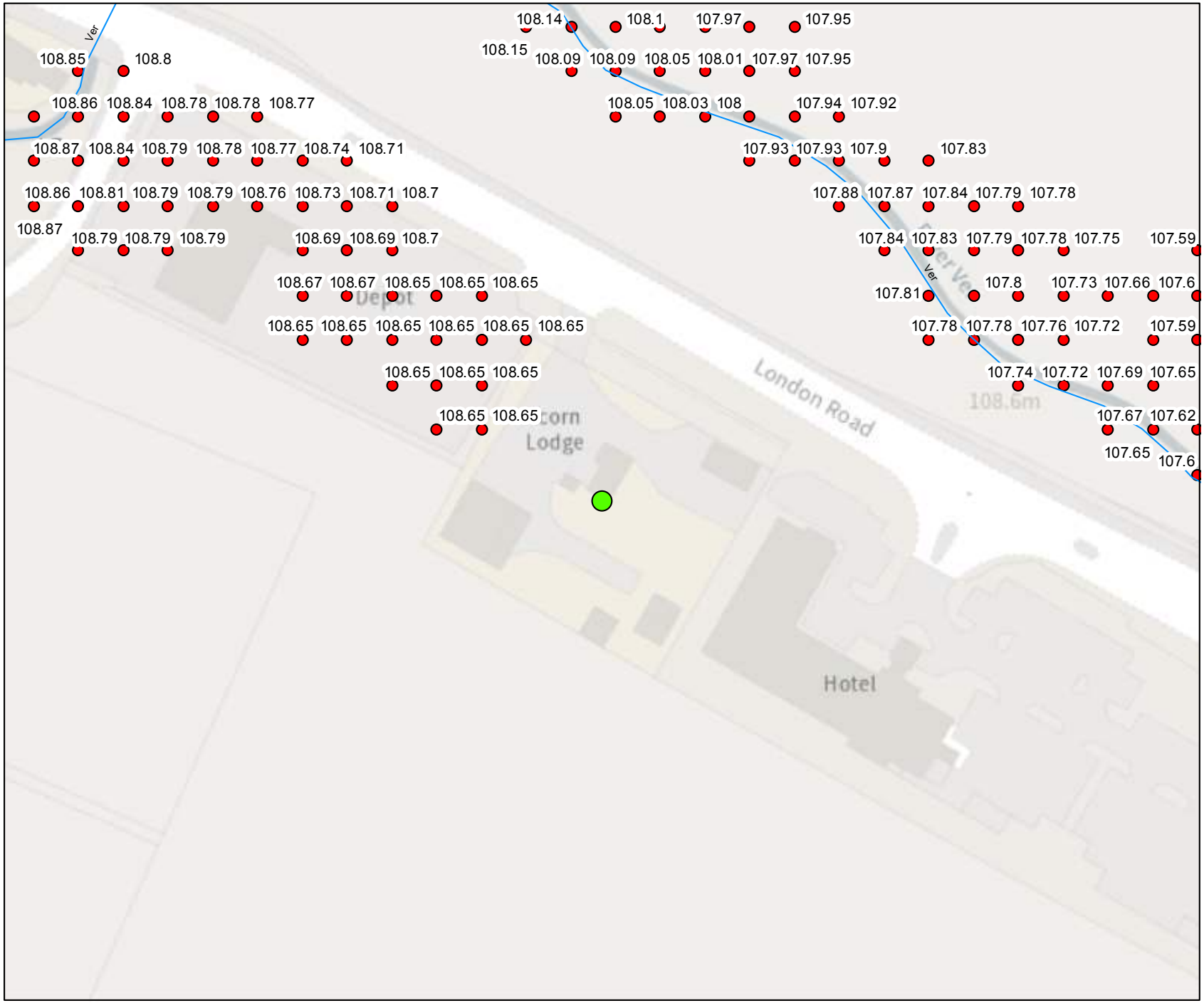

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60

Metres

Legend

- Main Rivers
- Site location

2D Node Results: Heights

- 1 in 20 (5%) Defended

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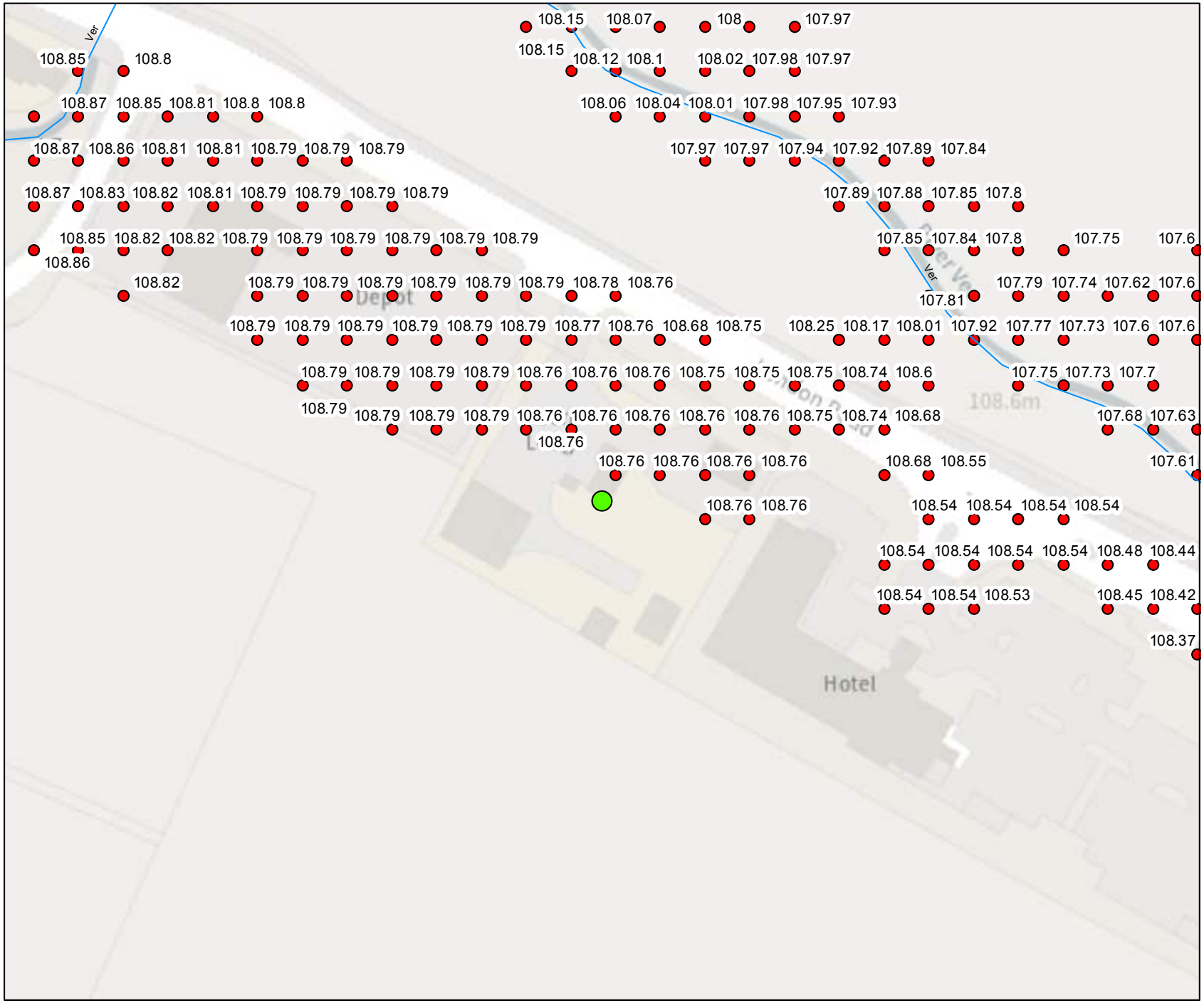

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 25 (4%) Defended

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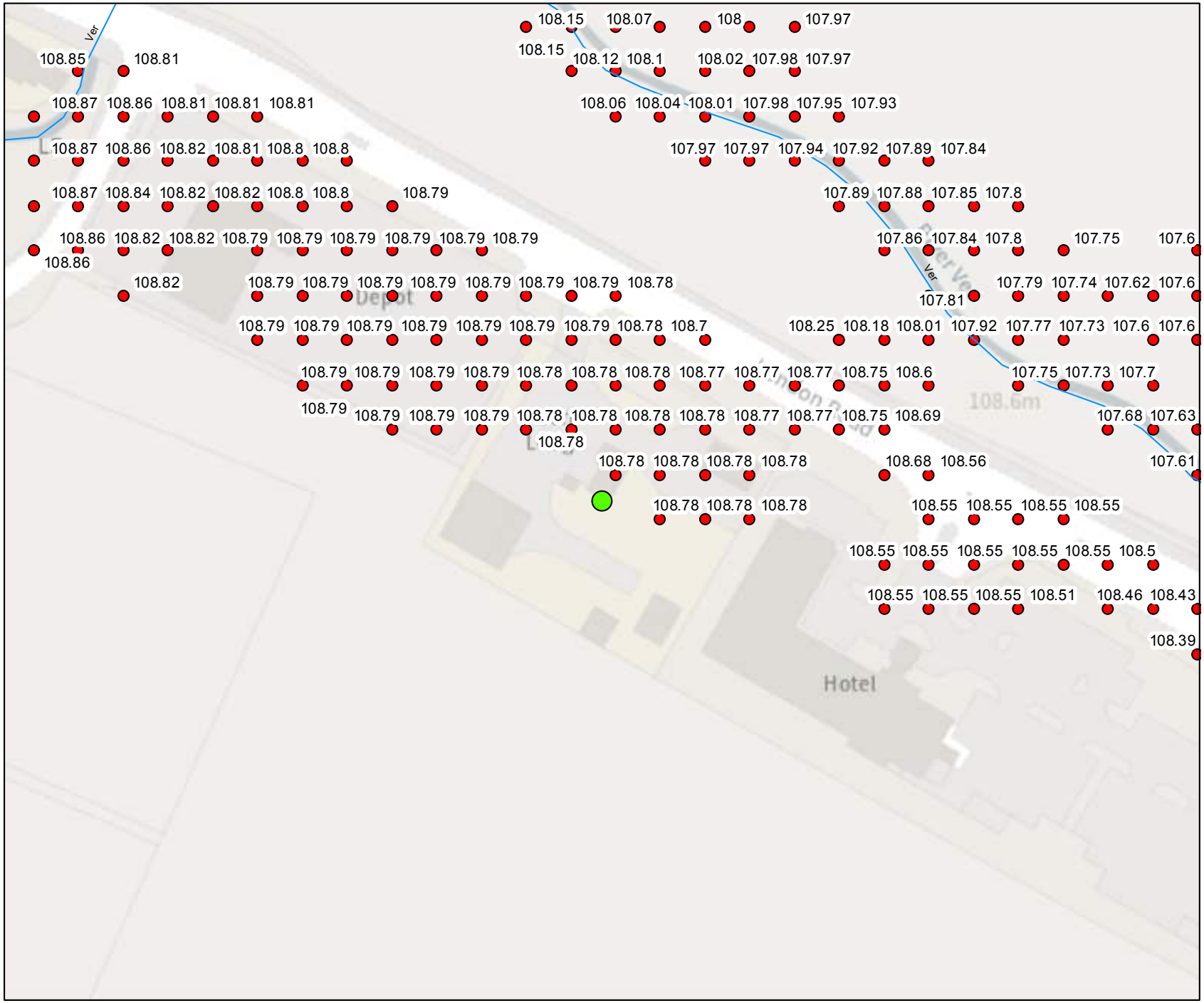

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 30 (3.33%) Defended

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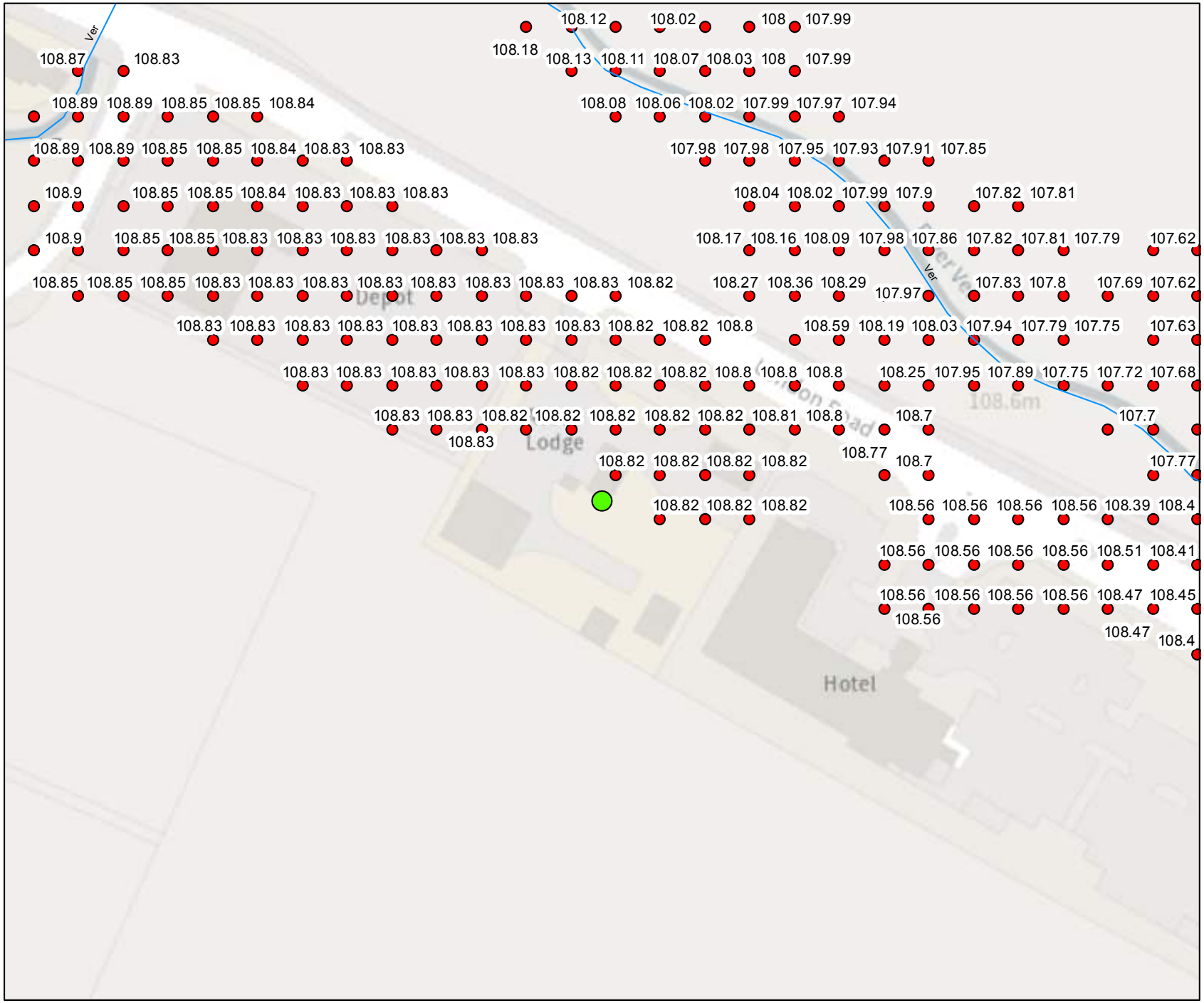

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 50 (2%) Defended

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Hertfordshire & North London

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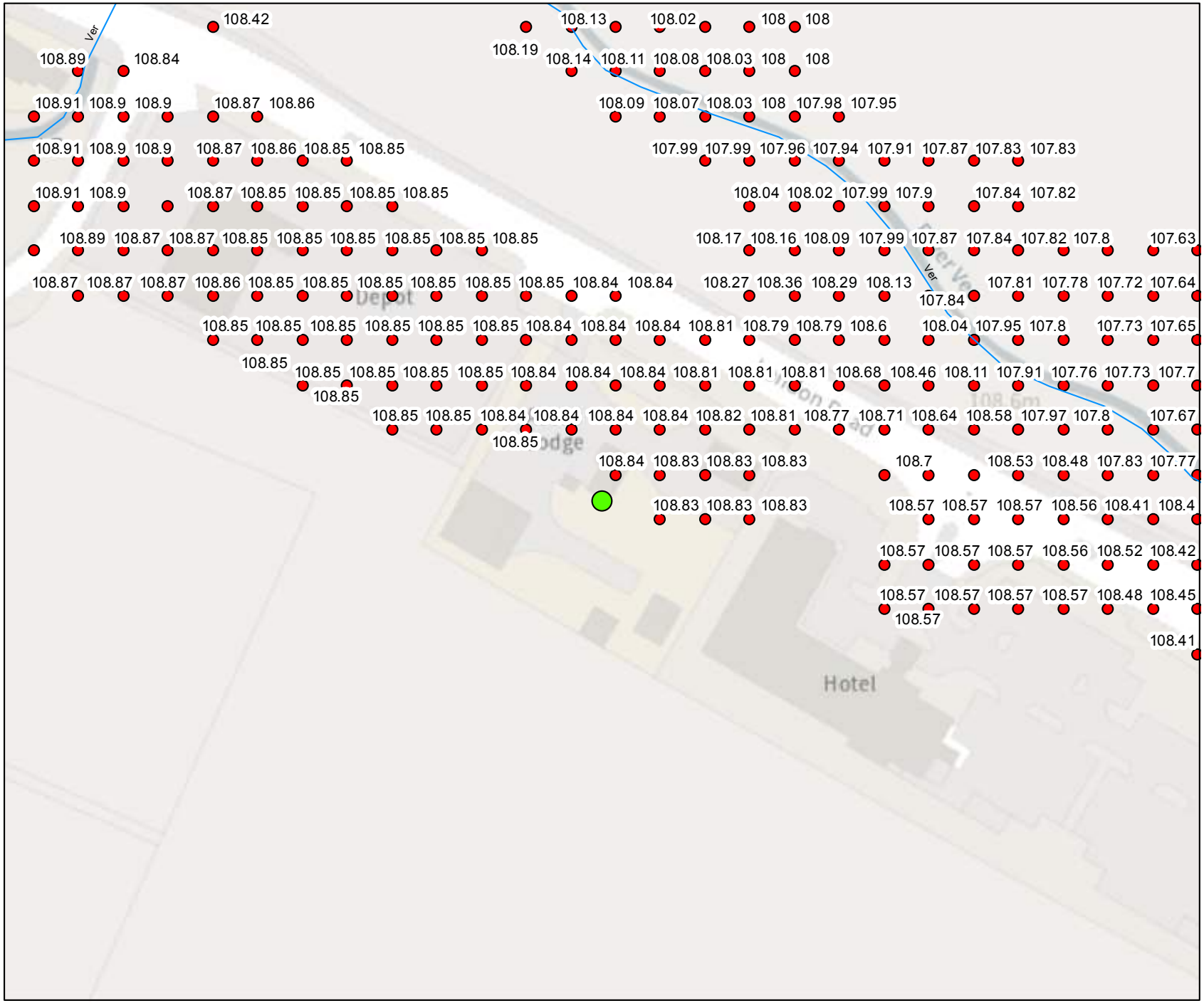

Environment Agency

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

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 75 (1.33%) Defended

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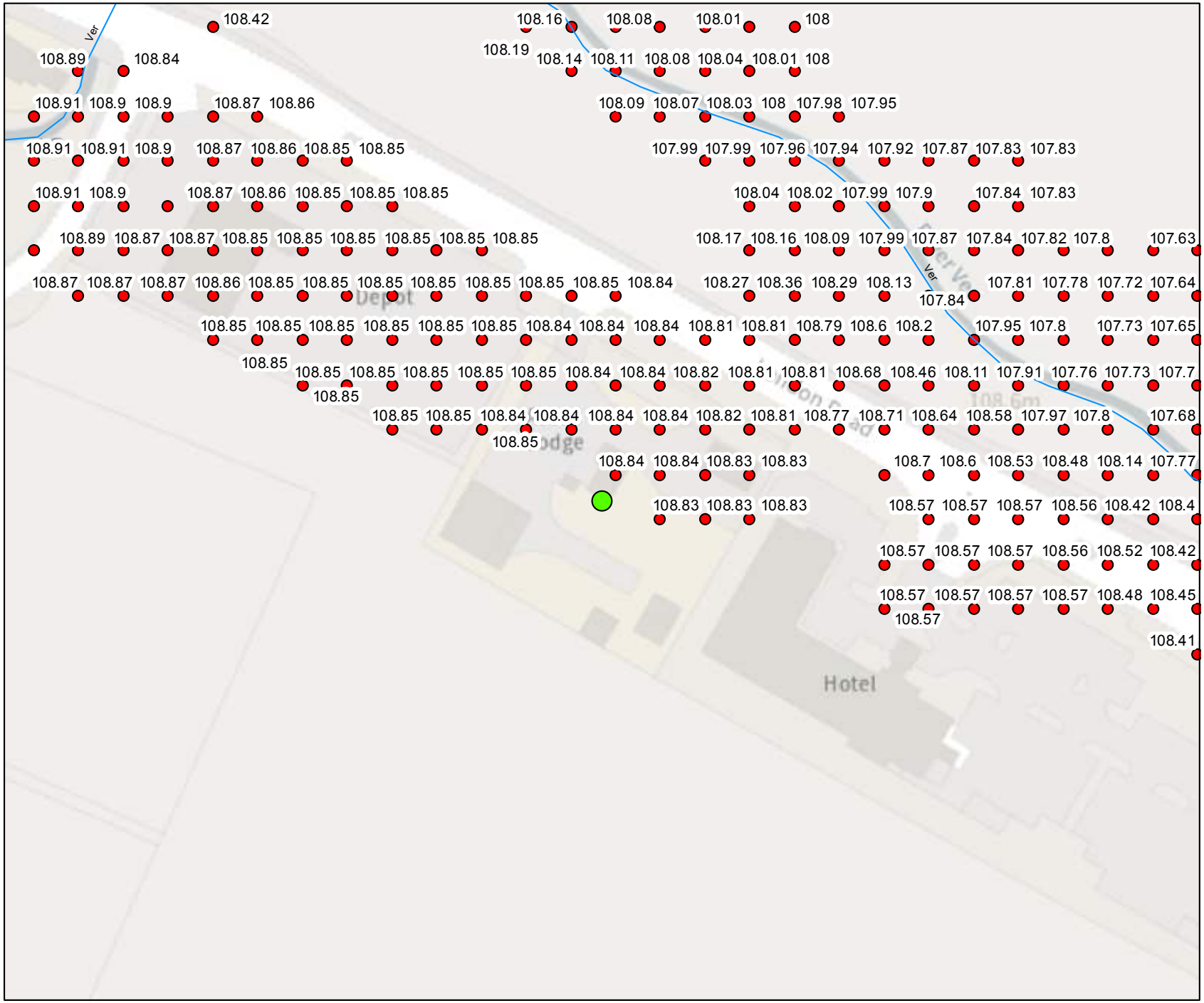

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100 (1%) Defended

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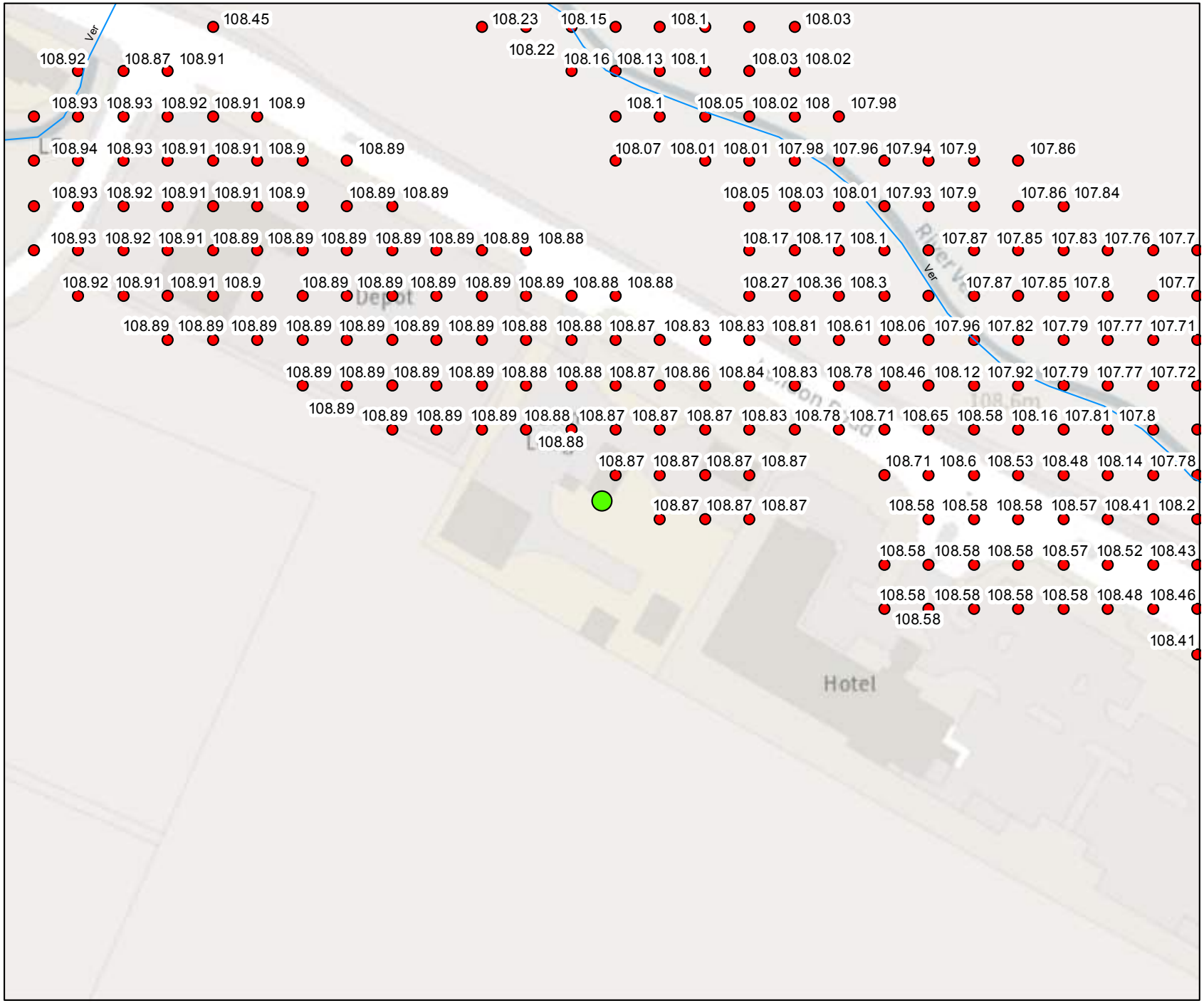

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

- Main Rivers
- Site location

2D Node Results: Heights

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

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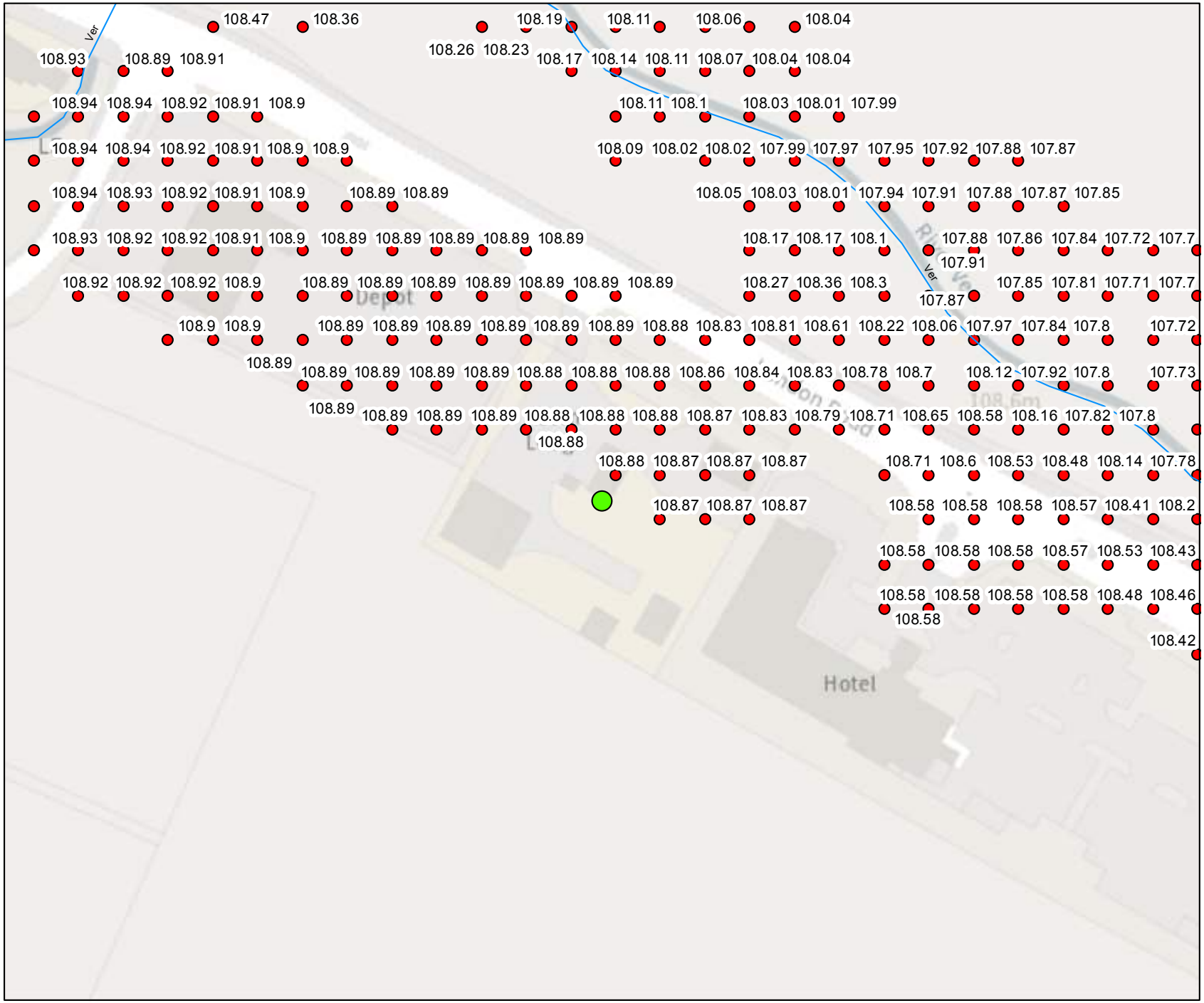
Detailed FRA centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



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

N

0 15 30 60
Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 100+35% (*CC) Defended

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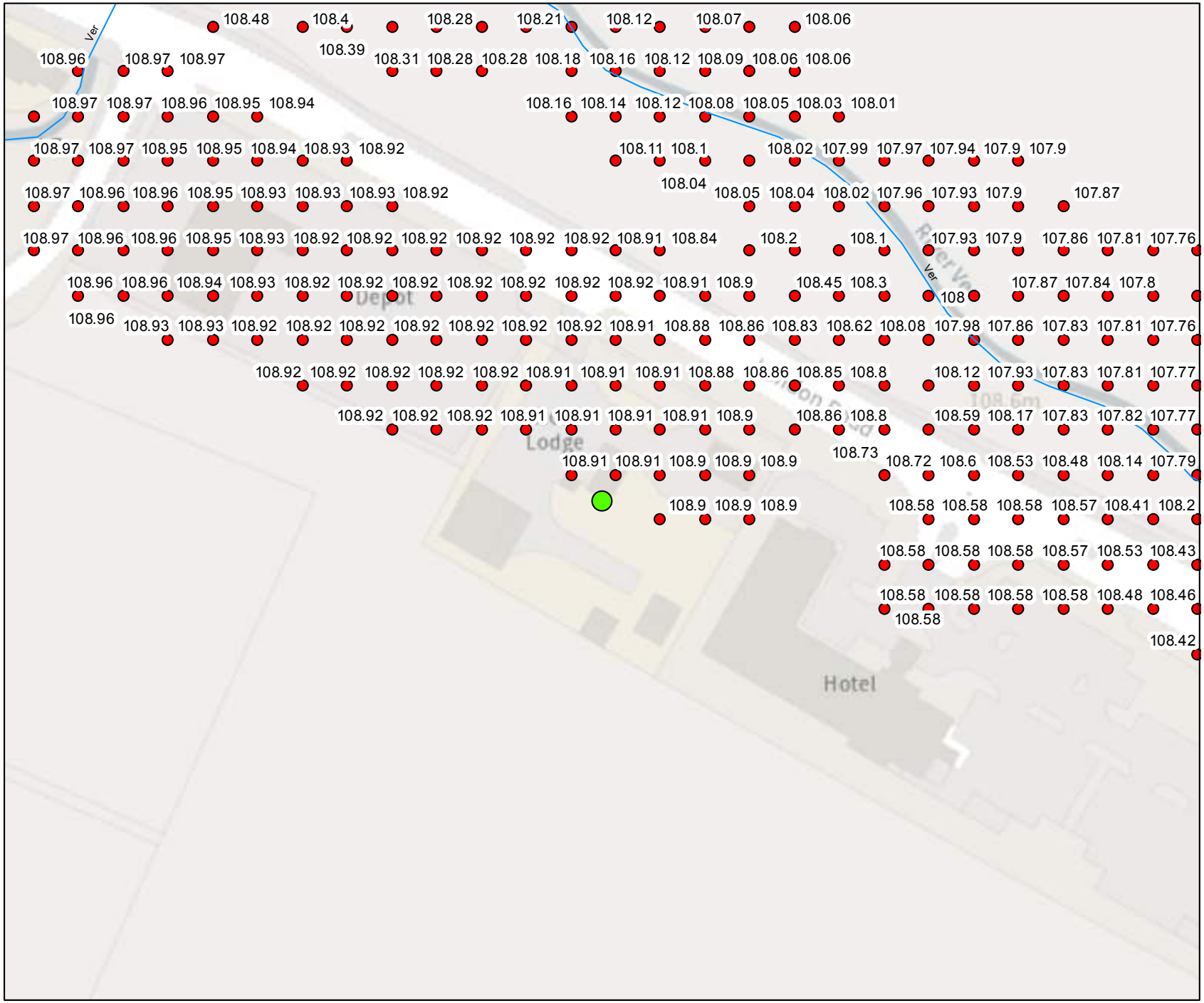

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

- Main Rivers
- Site location

2D Node Results: Heights

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

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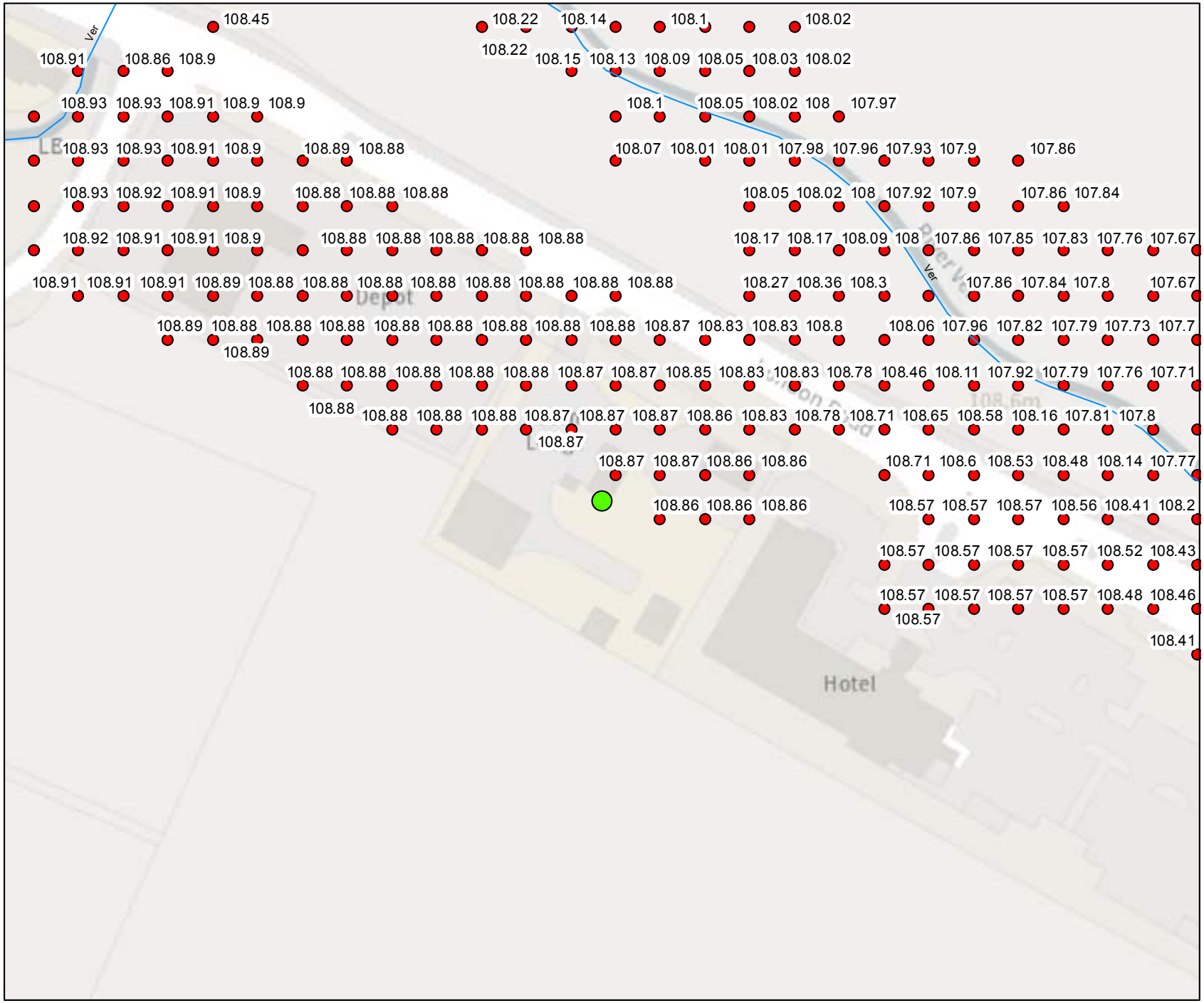

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60

Metres

Legend

Main Rivers

Site location

2D Node Results: Heights

1 in 200 (0.5%) Defended

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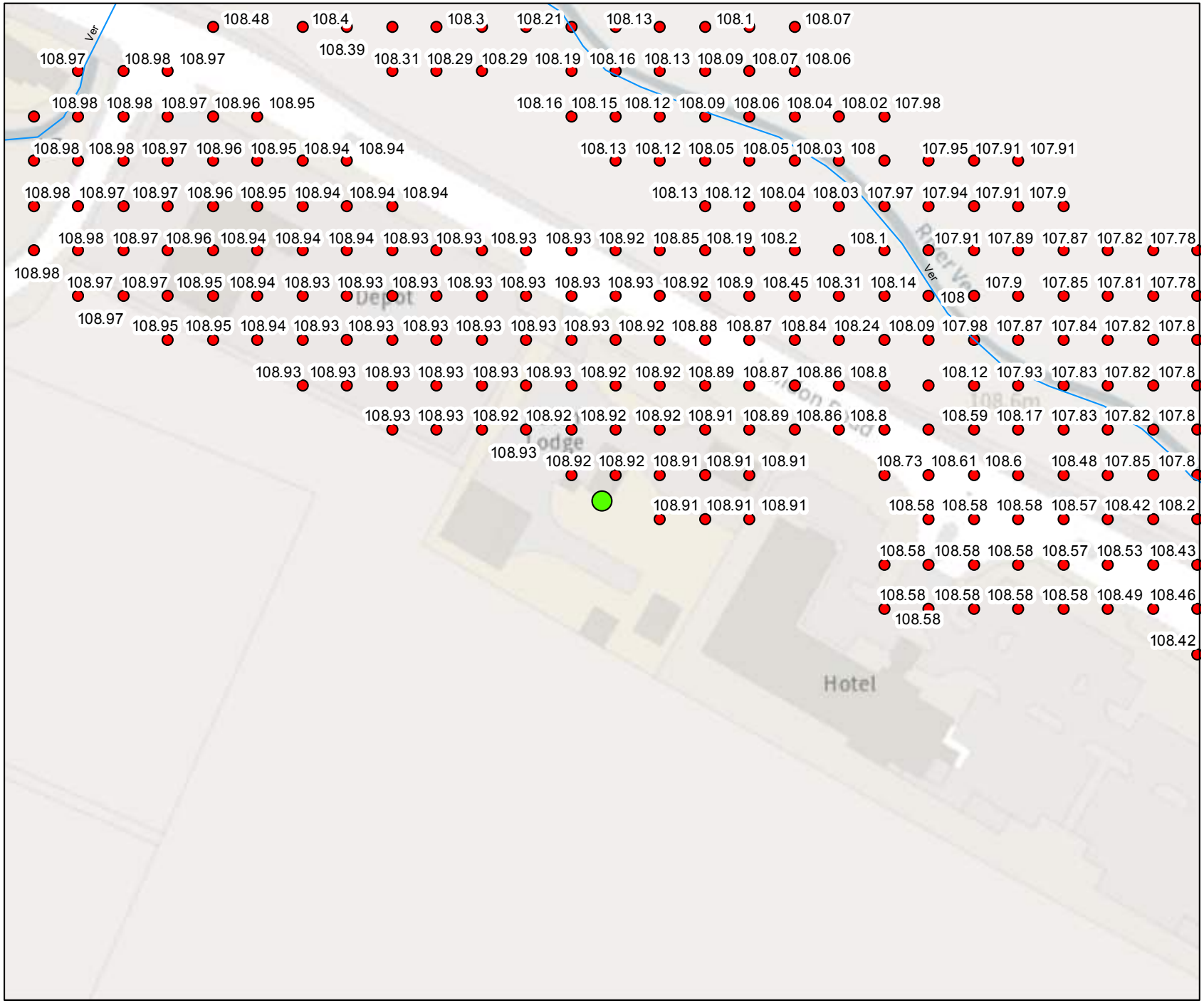

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 15 30 60
Metres

Legend

- Main Rivers
- Site location

2D Node Results: Heights

- 1 in 1000 (0.1%) Defended

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Produced by:
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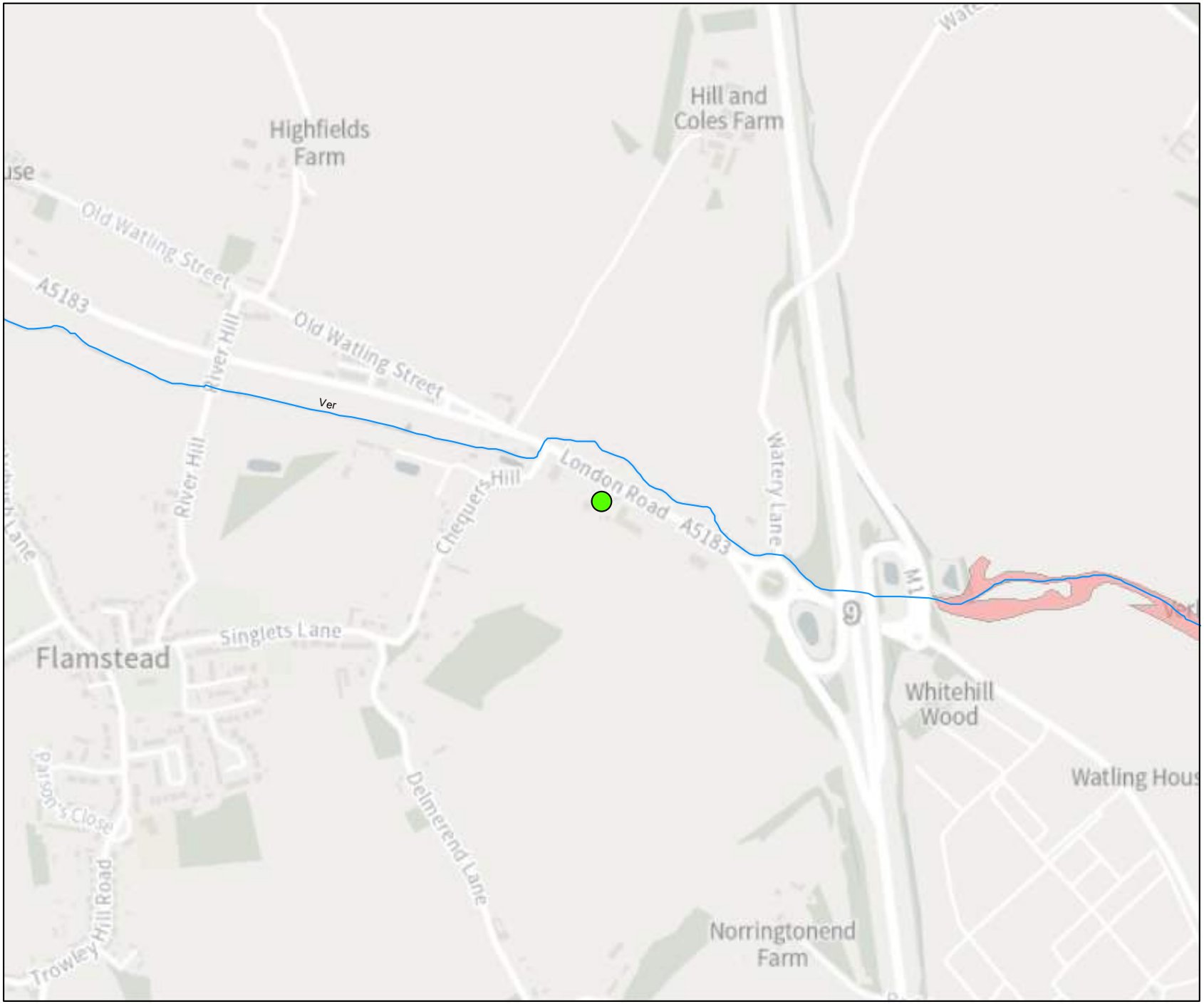
Hertfordshire & North London

Historic Flood Map centred on: Acorn Lodge, London Road, Flamstead, AL3 8HB - 03/03/2022 - HNL 252943 BC



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

N

0 150 300 600

Metres

Legend

- Main Rivers
- Site location

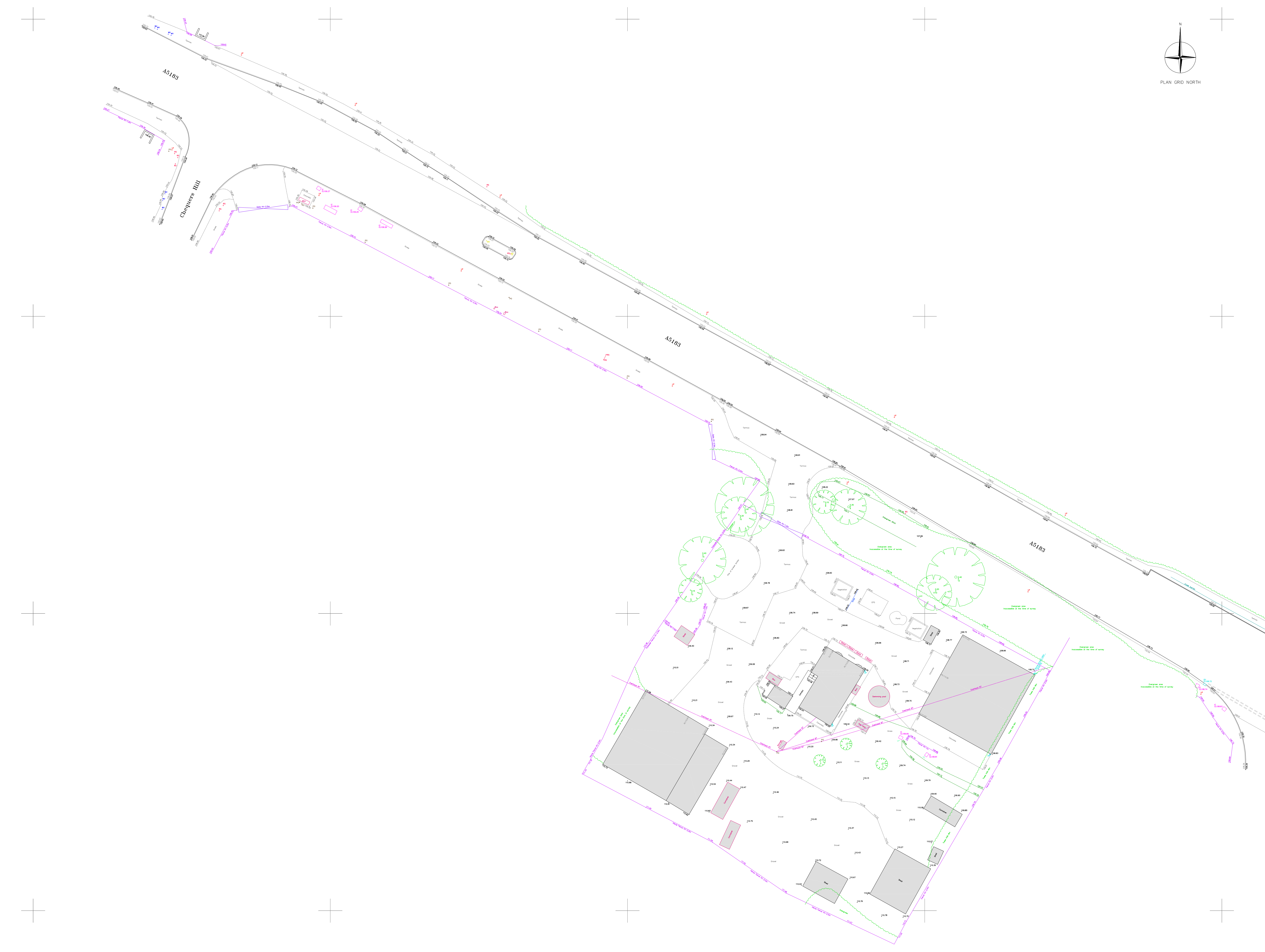
Flood Event Outlines

- 1993

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.

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

Appendix: D – Topographical Survey



TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

Abbreviations and symbols

AH	Arch Head Height	MP	Marker Post
AR	Assumed Route	NB	Name Board
AV	Air Valve	OHL	Overhead Line (approx)
BB	Belisha Beacon	Pan	Panel Fence
BH	Bore Hole	PB	Post Box
BL	Bed Level	PM	Parking Meter
BO	Bollard	PO	Post
BrP	Brace Post	P/R	Post & Rail Fence
BS	Bus Stop	P/W	Post & Wire Fence
BU	Bush	P/Wall	Partition Wall
B/W	Barbed Wire Fence	RE	Rodding Eye
BX	Box (Utilities)	RL	Ridge Level
C/B	Close Board Fence	RP	Reflector Post
CH	Cill Height	RS	Road Sign
CL	Cover Level	RSD	Roller Shutter Door
C/L	Chain Link Fence	RSJ	Rolled Steel Joist
C-Lev	Ceiling Level	SI	Sign Post
Col	Column	SP	Arch Spring Point Height
C/P	Chestnut Paling Fence	SV	Stop Valve
CR	Cable Riser	SW	Surface Water
DC	Drainage Channel	SY	Stay
DH	Door Head Height	Tac	Tactile Paving
DP	Down Pipe	TC	Telecom Cover
DR	Drain	TH	Trial Pit
EL	Eaves Level	THL	Threshold Level
EP	Electric Pole	TL	Traffic Light
ER	Earth Rod	ToW	Top of Wall
ET	EP+Transformer	TP	Telegraph Pole
FB	Flower Bed	TV	Cable TV Cover
FBD	Floor Board Direction	UB	Universal Beam
FH	Fire Hydrant	UC	Unknown Cover
FBD	Floor Board Direction	UK	Unknown Tree
FH	Fire Hydrant	USB	Under Side Beam
FL	Floor Level	UTL	Unable To Lift
FP	Flag Pole	VP	Vent Pipe
FW	Foul Water	WB	Waste Bin
GU	Gully	WL	Water Level
GV	Gas Valve	WM	Water Meter
HH	Head Height	WO	Wash Out
IC	Inspection Cover	WV	Water Valve
IL	Invert Level	(X.XX)	Floor to Ceiling Height
I/R	Iron Railings		
KO	Kerb Outlet	(X.XX)F/C	Floor to False Ceiling Ht
LP	Lamp Post		
MH	Manhole	△	Survey Control Station

General note:

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

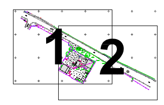
Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Stamford Topographical immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in meters unless otherwise stated.

Sheet layout:



The coordinate system and level datum established for this survey is related to Ordnance Survey (OS) national grid using GPS.

DRAWING TITLE: Topographical survey

5 Hughes Drive, Rugby, CV23 1AF, Warwickshire,
Tel: 07939 462 806

www.StamfordTopographical.co.uk

CLIENT: Founthill Ltd

PROJECT: Land at Acorn Lodge, London Road, Flamstead, St Albans, AL3 8HB

PROJECT No:	REV:	SURVEY DATE:	SCALE @ A0:
ST0114		03/08/2022	1:200

Appendix E – BRE 365 Infiltration Tests

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

Engineer:

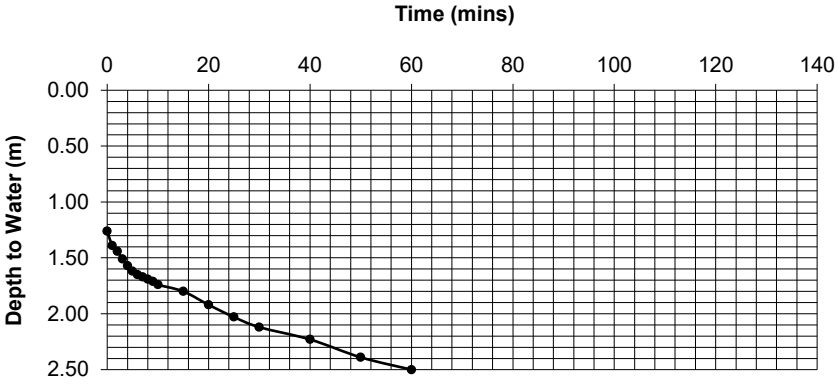
Job Number: SE1754

Sheet: 1 / 3

SOAKAWAY TEST

Position: SP1

Test Number: 1
Date: 11/08/23



Time (min)	Depth (m)
0	1.26
1	1.39
2	1.44
3	1.51
4	1.57
5	1.62
6	1.65
7	1.67
8	1.69
9	1.71
10	1.74
15	1.80
20	1.92
25	2.03
30	2.12
40	2.23
50	2.39
60	2.50

Length of pit:	L =	1.50	m
Width of pit:	W =	0.50	m
Depth of pit	D =	2.50	m
Base area of pit:	A =	0.75	m^2
100% effective depth	D100 =	1.26	m
75% effective depth	D75 =	1.57	m
50% effective depth	D50 =	1.88	m
25% effective depth	D25 =	2.19	m
time to D75	T75 =	240	sec
time to D25	T25 =	2182	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	1942	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.47	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	3.23	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 7.41E-05 m/sec

Test Strata: See SP1 Log.

Remarks:

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

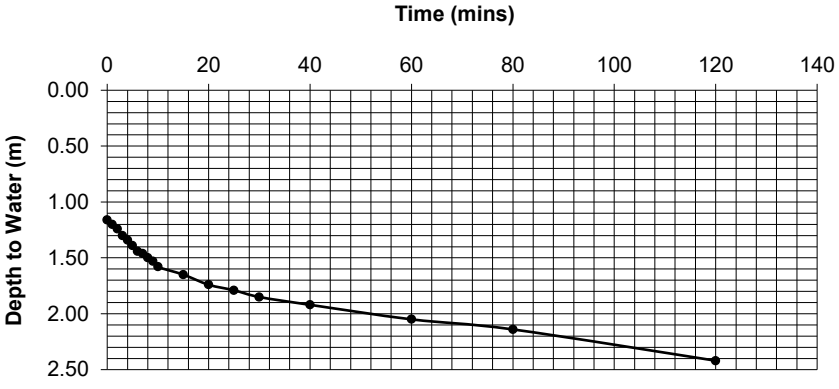
Engineer:

Job Number: SE1754

SOAKAWAY TEST

Position: SP1

Test Number: 2
Date: 11/08/23



Time (min)	Depth (m)
0	1.16
1	1.20
2	1.24
3	1.30
4	1.34
5	1.39
6	1.44
7	1.46
8	1.50
9	1.53
10	1.58
15	1.65
20	1.74
25	1.79
30	1.85
40	1.92
60	2.05
80	2.14
120	2.42

Length of pit:	L =	1.50	m
Width of pit:	W =	0.50	m
Depth of pit	D =	2.50	m
Base area of pit:	A =	0.75	m^2
100% effective depth	D100 =	1.16	m
75% effective depth	D75 =	1.50	m
50% effective depth	D50 =	1.83	m
25% effective depth	D25 =	2.17	m
time to D75	T75 =	480	sec
time to D25	T25 =	5057	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	4577	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.50	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	3.43	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 3.20E-05 m/sec

Test Strata: See SP1 Log.

Remarks:

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

Engineer:

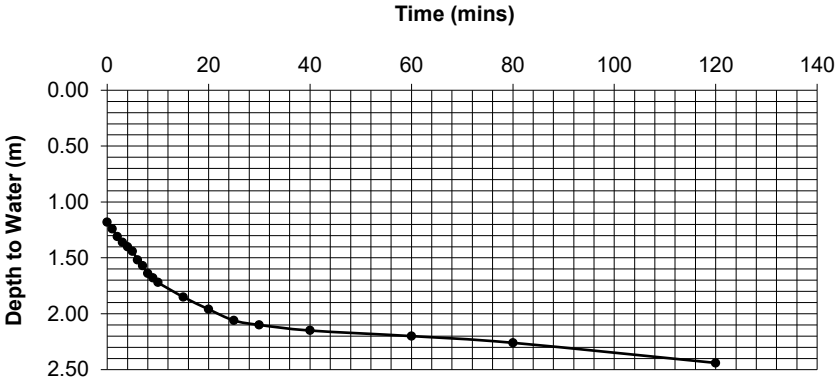
Job Number: SE1754

Sheet: 3 / 3

SOAKAWAY TEST

Position: SP1

Test Number: 3
Date: 11/08/23



Time (min)	Depth (m)
0	1.18
1	1.24
2	1.31
3	1.36
4	1.40
5	1.44
6	1.52
7	1.57
8	1.64
9	1.68
10	1.72
15	1.85
20	1.96
25	2.06
30	2.10
40	2.15
60	2.20
80	2.26
120	2.44

Length of pit:	L =	1.50	m
Width of pit:	W =	0.50	m
Depth of pit	D =	2.50	m
Base area of pit:	A =	0.75	m^2
100% effective depth	D100 =	1.18	m
75% effective depth	D75 =	1.51	m
50% effective depth	D50 =	1.84	m
25% effective depth	D25 =	2.17	m
time to D75	T75 =	353	sec
time to D25	T25 =	2880	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	2528	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.50	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	3.39	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 5.78E-05 m/sec

Test Strata: See SP1 Log.

Remarks:

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

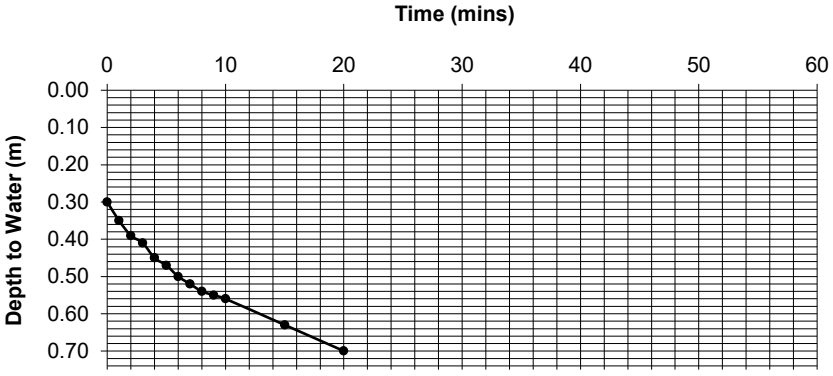
Engineer:

Job Number: SE1754

SOAKAWAY TEST

Position: SP2

Test Number: 1
Date: 11/08/23



Time (min)	Depth (m)
0	0.30
1	0.35
2	0.39
3	0.41
4	0.45
5	0.47
6	0.50
7	0.52
8	0.54
9	0.55
10	0.56
15	0.63
20	0.70

Length of pit:	L =	1.30	m
Width of pit:	W =	0.50	m
Depth of pit	D =	0.75	m
Base area of pit:	A =	0.65	m^2
100% effective depth	D100 =	0.30	m
75% effective depth	D75 =	0.41	m
50% effective depth	D50 =	0.53	m
25% effective depth	D25 =	0.64	m
time to D75	T75 =	180	sec
time to D25	T25 =	943	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	763	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.15	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	1.46	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 1.31E-04 m/sec

Test Strata: See SP2 Log.

Remarks:

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

Engineer:

Job Number: SE1754

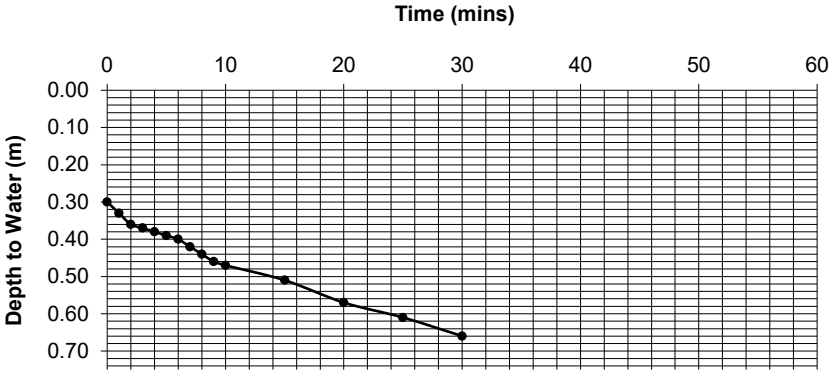
Sheet: 2 / 3

SOAKAWAY TEST

Position: SP2

Test Number: 2

Date: 11/08/23



Time (min)	Depth (m)
0	0.30
1	0.33
2	0.36
3	0.37
4	0.38
5	0.39
6	0.40
7	0.42
8	0.44
9	0.46
10	0.47
15	0.51
20	0.57
25	0.61
30	0.66

Length of pit:	L =	1.30	m
Width of pit:	W =	0.50	m
Depth of pit	D =	0.75	m
Base area of pit:	A =	0.65	m^2
100% effective depth	D100 =	0.30	m
75% effective depth	D75 =	0.41	m
50% effective depth	D50 =	0.53	m
25% effective depth	D25 =	0.64	m
time to D75	T75 =	390	sec
time to D25	T25 =	1680	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	1290	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.15	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	1.46	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 7.77E-05 m/sec

Test Strata: See SP2 Log.

Remarks:

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB

Client: FOUNTHILL LAND, PLANNING AND DEVELOPMENT

Engineer:

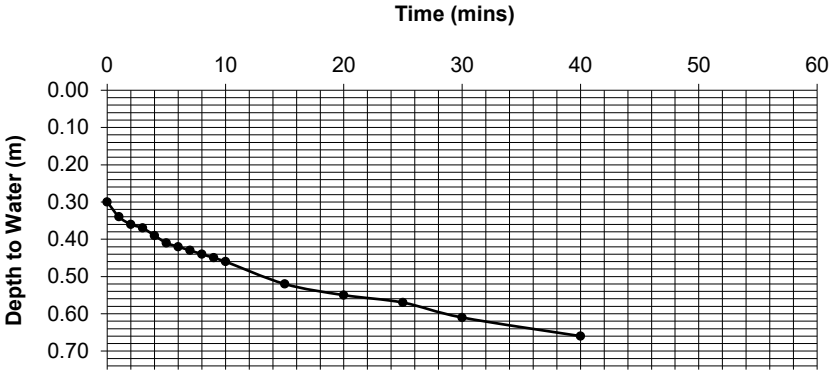
Job Number: SE1754

Sheet: 3 / 3

SOAKAWAY TEST

Position: SP2

Test Number: 3
Date: 11/08/23



Time (min)	Depth (m)
0	0.30
1	0.34
2	0.36
3	0.37
4	0.39
5	0.41
6	0.42
7	0.43
8	0.44
9	0.45
10	0.46
15	0.52
20	0.55
25	0.57
30	0.61
40	0.66

Length of pit:	L =	1.30	m
Width of pit:	W =	0.50	m
Depth of pit	D =	0.75	m
Base area of pit:	A =	0.65	m^2
100% effective depth	D100 =	0.30	m
75% effective depth	D75 =	0.41	m
50% effective depth	D50 =	0.53	m
25% effective depth	D25 =	0.64	m
time to D75	T75 =	300	sec
time to D25	T25 =	2160	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	1860	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.15	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	1.46	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 5.39E-05 m/sec

Test Strata: See SP2 Log.

Remarks:

SUB SURFACE

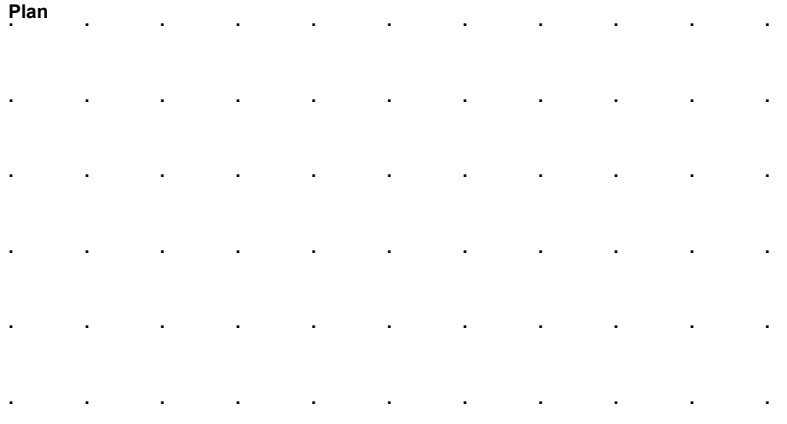
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Trial Pit Number
ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB	SP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	1.50m x 0.50m x 2.50m		FOUNTHILL LAND, PLANNING AND DEVELOPMENT	SE1754
	Location AS PLAN	**Dates** 11/08/2023	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: dark orangish brown clayey silty sandy gravel sized fragments of quartz, brick, concrete and chalk with roots and cobble sized fragments of quartz.		
					0.40	Orangish brown gravelly slightly sandy sitly CLAY with low quartz cobble content. Gravel is chalk.		
					(1.30)			
					1.70	Structureless off-white CHALK with occasional clasts between 50mm and 100mm diameter.		
					(0.80)			
			11/08/2023:DRY		2.50	Complete at 2.50m		

Plan



Remarks

Pit sides remained vertical and stable.
No groundwater encountered.
On completion backfilled with arisngs.

Scale (approx)	Logged By	Figure No.
1:25	SS/VW	SE1754.SP1

SUB SURFACE

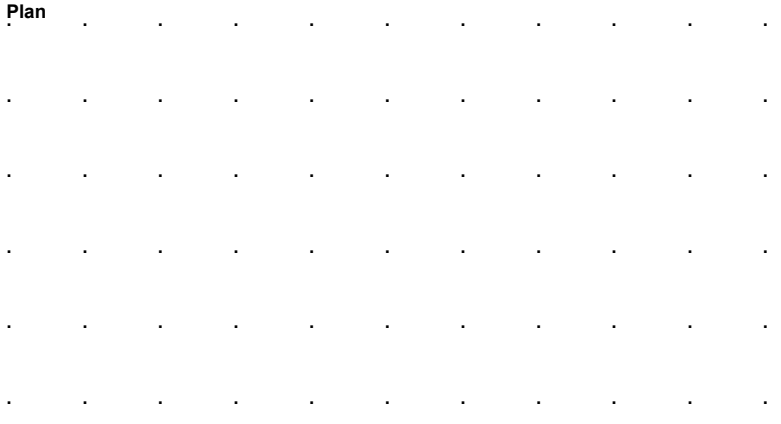
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Trial Pit Number
ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB	SP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANCIAL EXCAVATOR	1.30m x 0.50m x 0.75m		FOUNTHILL LAND, PLANNING AND DEVELOPMENT	SE1754
	Location AS PLAN	**Dates** 11/08/2023	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			11/08/2023:DRY		(0.75)	MADE GROUND: dark orangish brown clayey silty sandy gravel sized fragments of quartz, brick, concrete and chalk with roots and cobble sized fragments of quartz.		
					0.75	Complete at 0.75m		

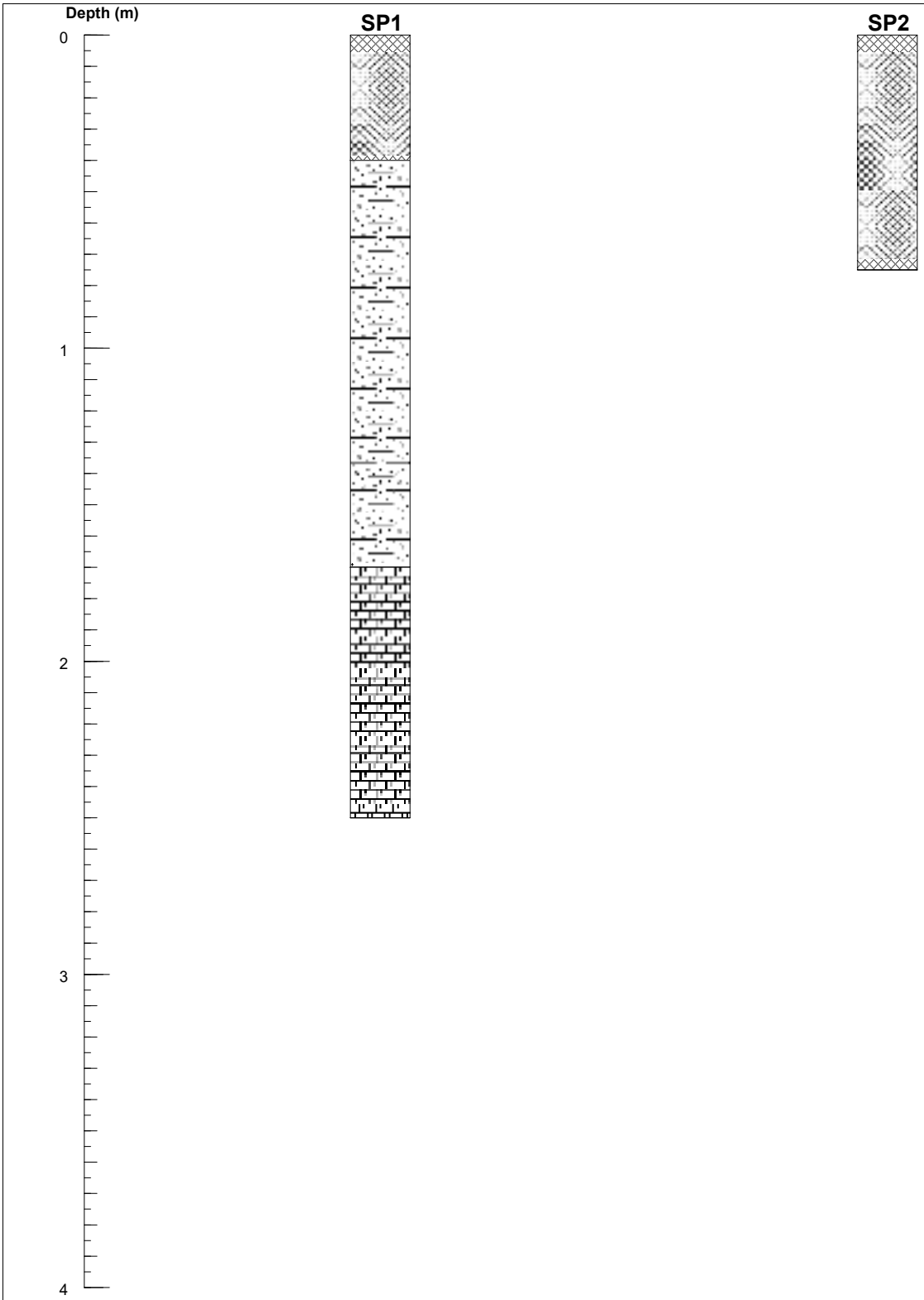
Plan



Remarks

Pit sides remained vertical and stable.
No groundwater encountered.
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	SS/VW	SE1754.SP2



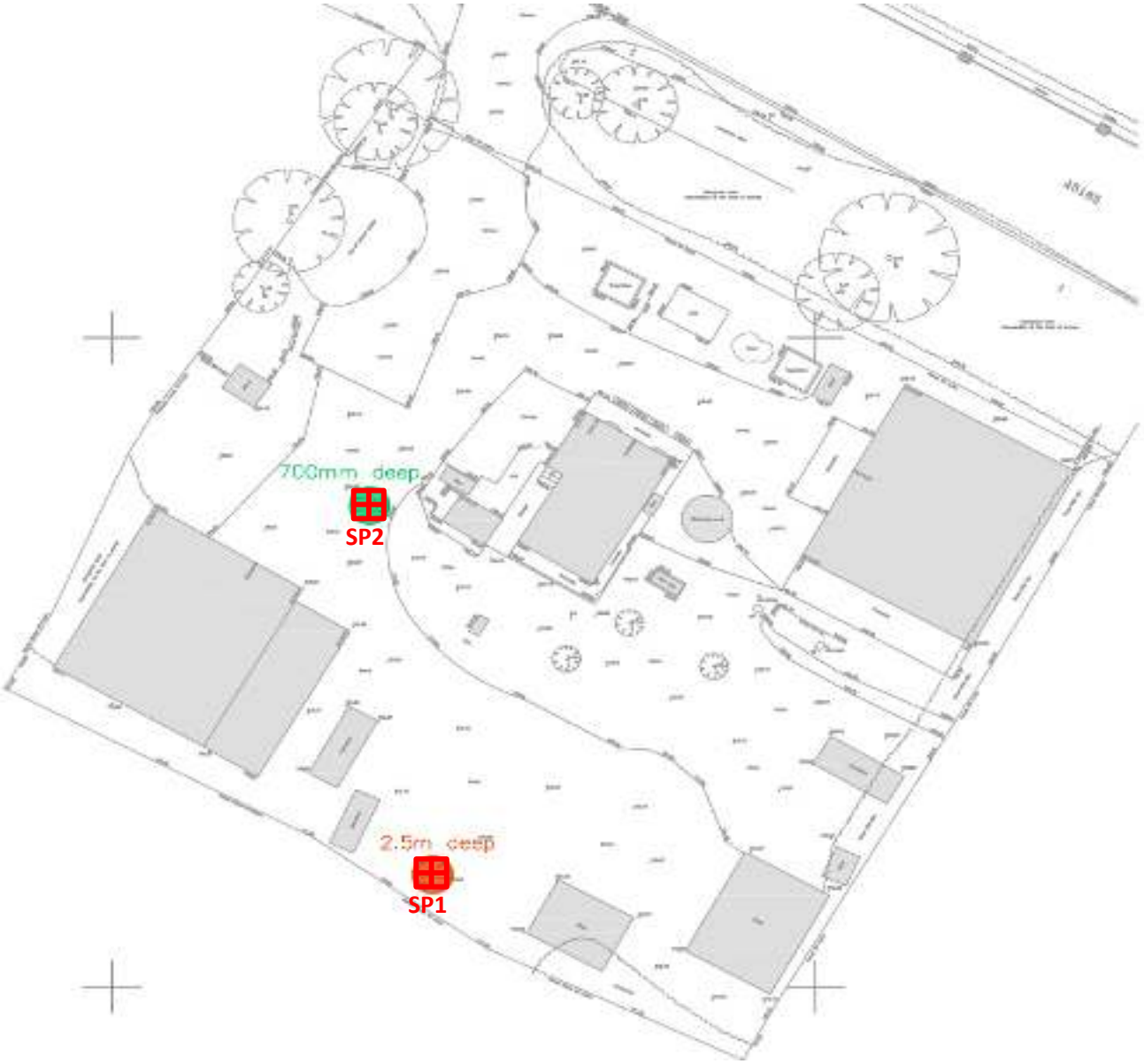
Key

- Groundwater Strike
- Strike Rise Level
- MADE GROUND
- Silty sandy gravelly CLAY
- CHALK

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Nominal Section

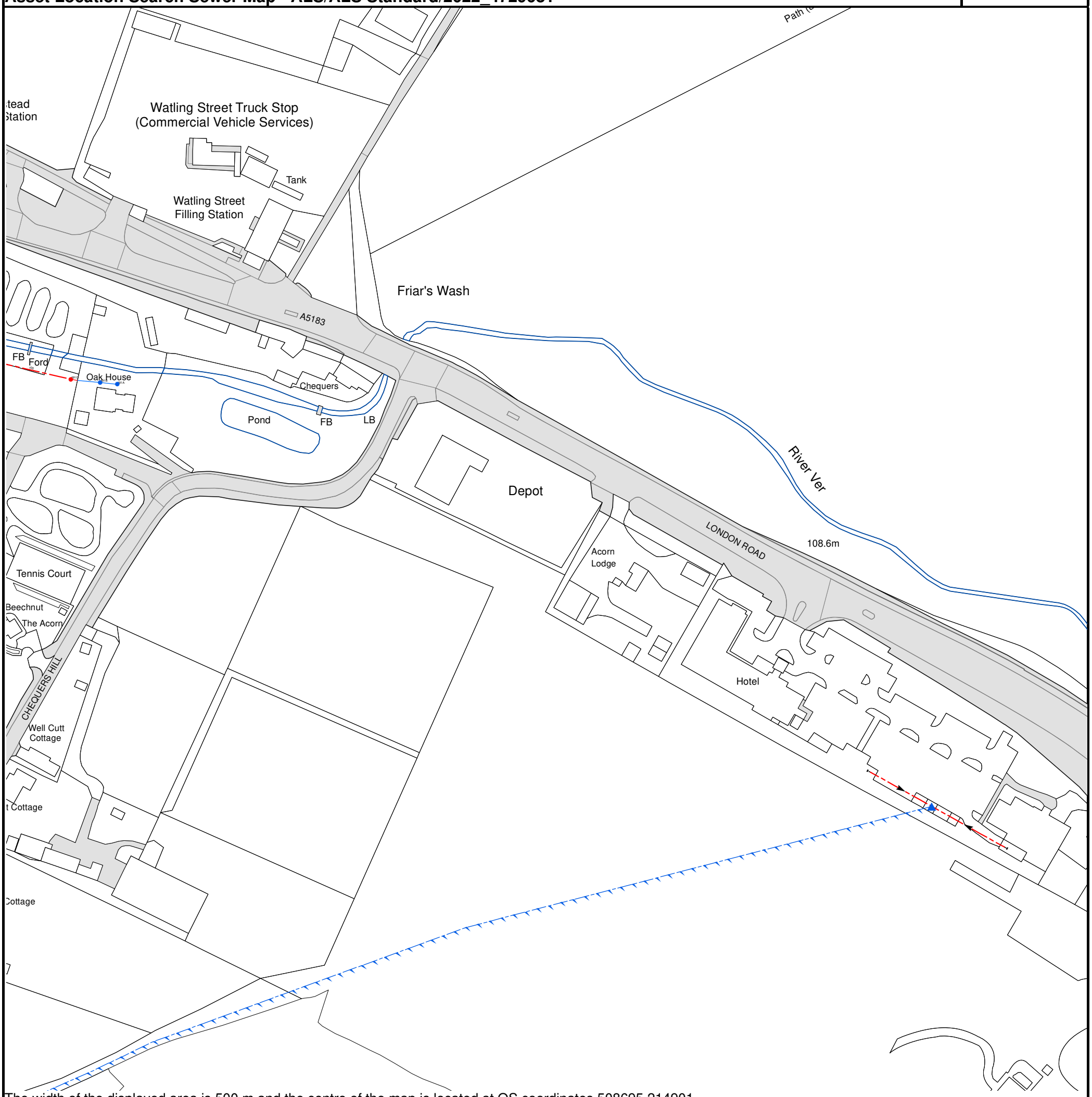
Site	Date Drawn	Date Checked	Sheet	Job Number
ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB	30/08/2023		1/1	SE1754
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
FOUNTHILL LAND, PLANNING AND DEVELOPMENT			1:20[V]	SE1754.1



SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Soakaway Location Plan			
Site ACORN LODGE, LONDON ROAD, FLAMSTEAD, AL3 8HB	Date Drawn 25/08/2023	Date Checked	Orientation N	Job No. SE1754
Client FOUNTHILL LAND, PLANNING AND DEVELOPMENT	Drawn By Shaylen	Checked By	Scale	Figure No. 1

Appendix F - Thames Water Sewer Mapping

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4729681



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 508695,214901

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

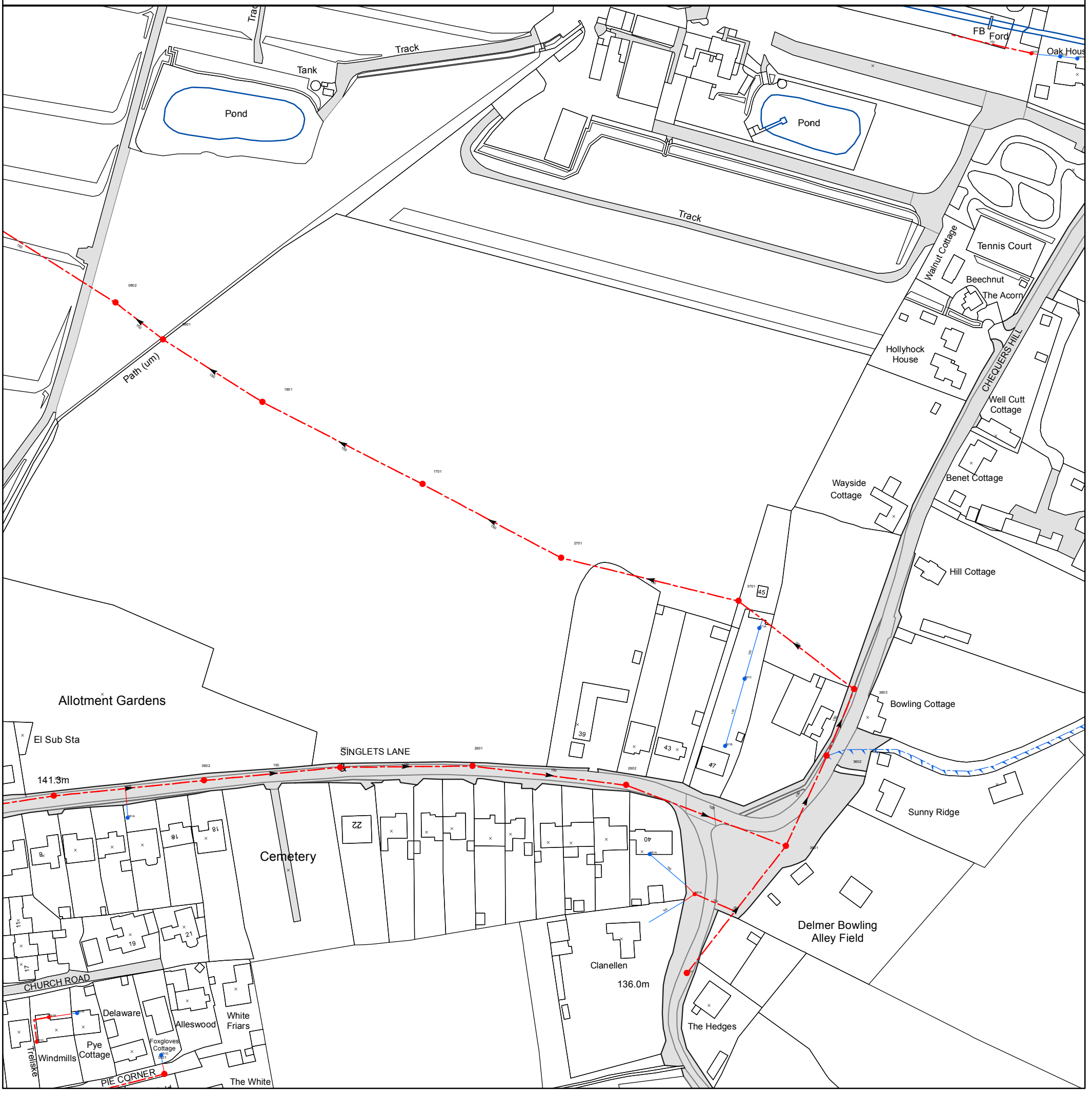
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
491A	n/a	n/a
491B	n/a	n/a
491C	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4729681



The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale:	1:1791
Width:	500m
Printed By:	Skrishna1
Print Date:	05/10/2022
Map Centre:	508250,214750
Grid Reference:	TL0814NW

Comments:

ALS/ALS Standard/2022_4729681

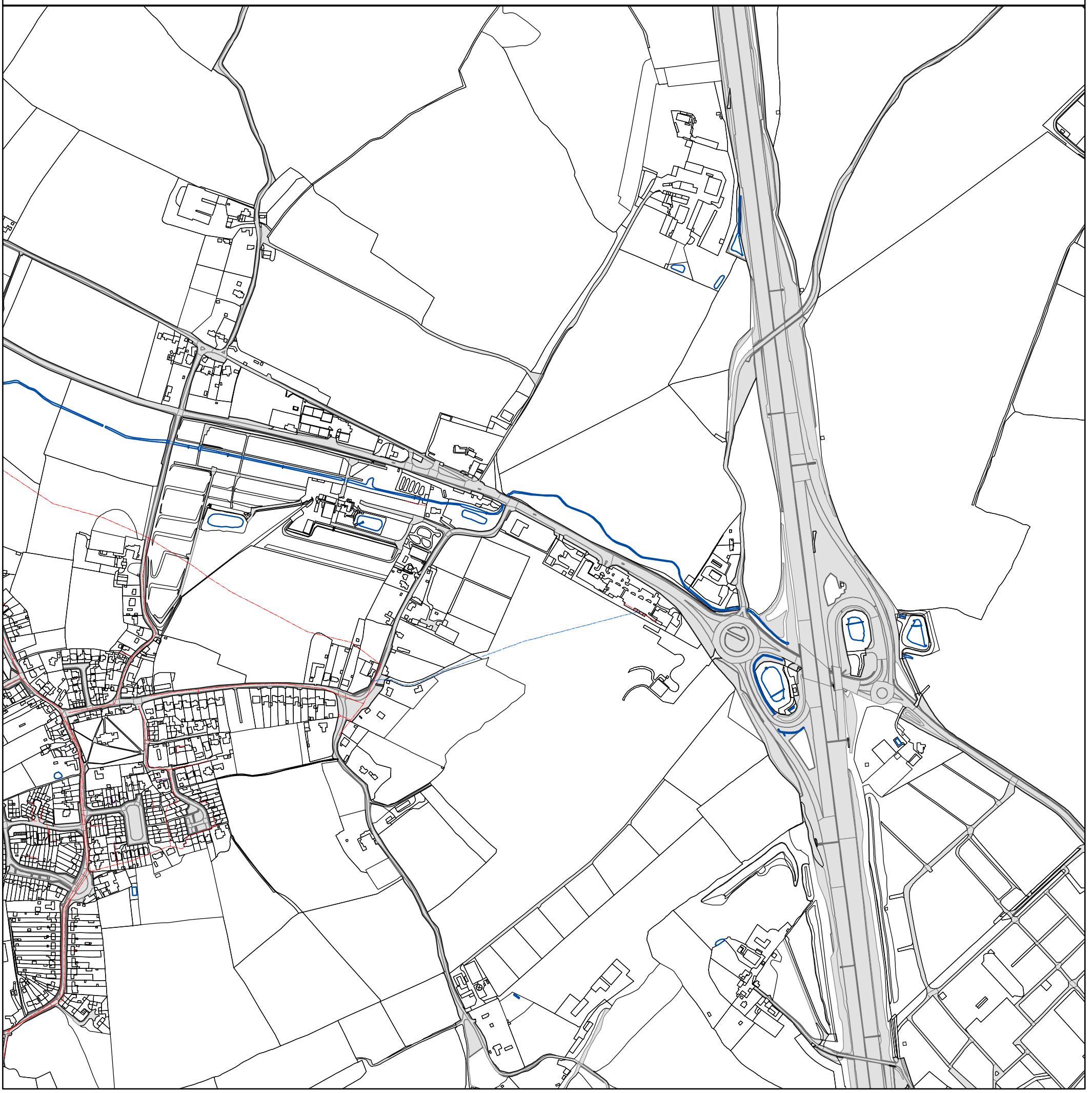
NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
0501	141.7	140.09
0801	130.17	128.27
3701		
3602	135.47	133.56
1701	131.87	
1801	130.65	128.99
0602	141.03	139.34
2701	233.8	231.16
051C		
051B		
361A		
371A		
061A		
491B		
051D		

REFERENCE	COVER LEVEL	INVERT LEVEL
0802	129.07	127.5
2602	137.55	
3601		
3603	134.43	132.42
2601	138.82	137.09
1601	139.77	
0601	142.44	140.77
351A		
051A		
3501	136.29	134.76
361B		
361C		
491A		
491C		

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4729681



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	Skrishna1
Print Date:	05/10/2022
Map Centre:	508695,214901
Grid Reference:	TL0814NE

Comments:

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Appendix G – Flood Velocity Assessment

REPRESENTS A VELOCITY OF 0.25 m/s TO 0.5 m/s. AS SUCH A CONSERVATIVE VELOCITY OF 0.5 m/s HAS BEEN USED TO INFORM THE HAZARD RATING ASSESSMENT

SMALL POCKET OF 0.5m/s TO 1.0m/s IGNORED AS THESE LOOK TO BE AN ANOMALY AND COULD BE ATTRIBUTED TO LOCALISED LOW-SPOTS.

THE MAJORITY OF THE EXTENT OF FLOODING LOOKS TO HAVE A VELOCITY OF 0.0 m/s TO 0.25 m/s.

PROPOSED PRIVATE PATH

PROPOSED PRIVATE PATH

Acorn Lodge

PLOT 1

PLOT 2

PLOT 3

PLOT 4

VP

VP

P

SURFACE WATER FLOOD VELOCITIES FOR 1:1000YR EVENT (WORST CASE) DOWNLOADED FROM DEFRA DATA SERVICES PLATFORM AND PROCESSED ON QGIS AND AUTOCAD.

REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS:

Unit 23, The Maltings, Stanstead Abbotts, Hertfordshire, SG12 8HG
Tel: 01920 871777

www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:

ACORN LODGE

TITLE:

1:1000YR SURFACE WATER
FLOOD VELOCITIES
FOR HAZARD RATING ASSESSMENT

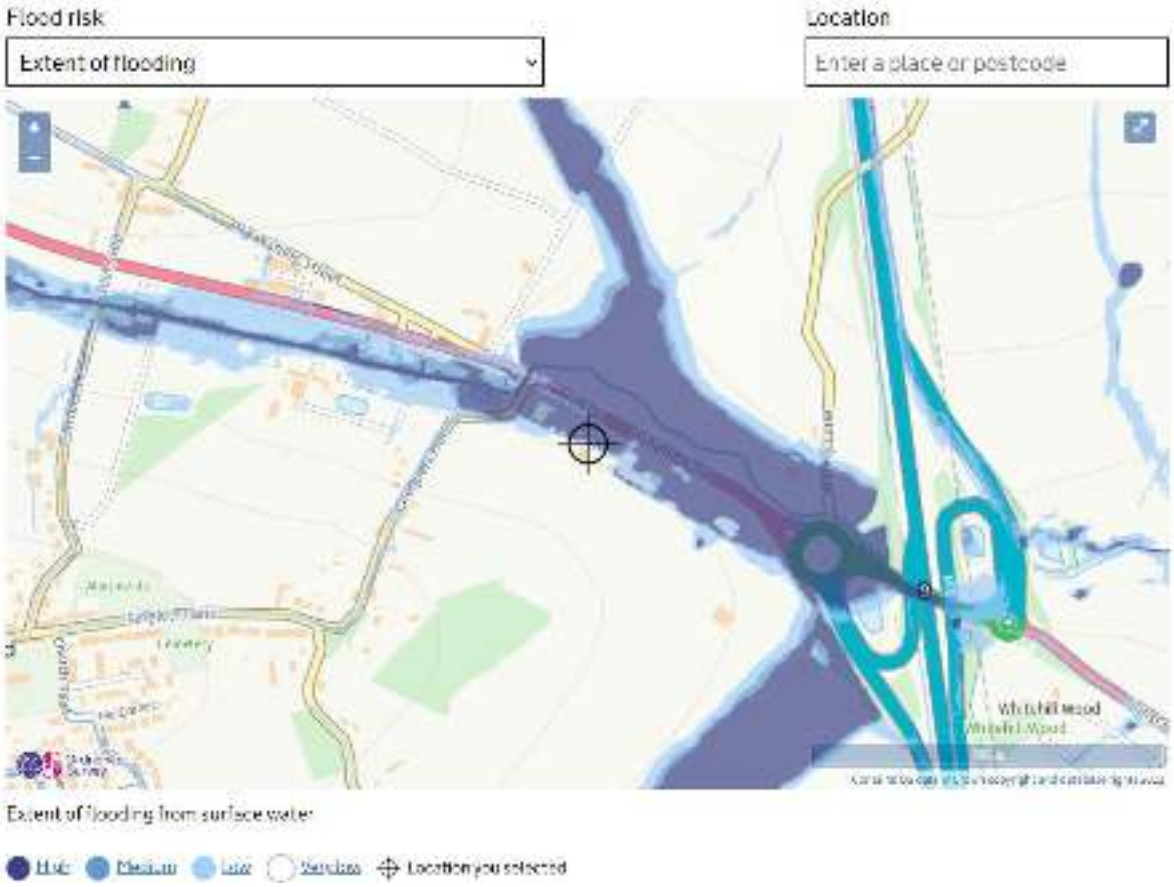
SCALE @ A3:	DESIGN-DRAWN:	DATE:
1:500	MC	21.03.2024

PROJECT No:	DRAWING No:
3824	SK10 REV A

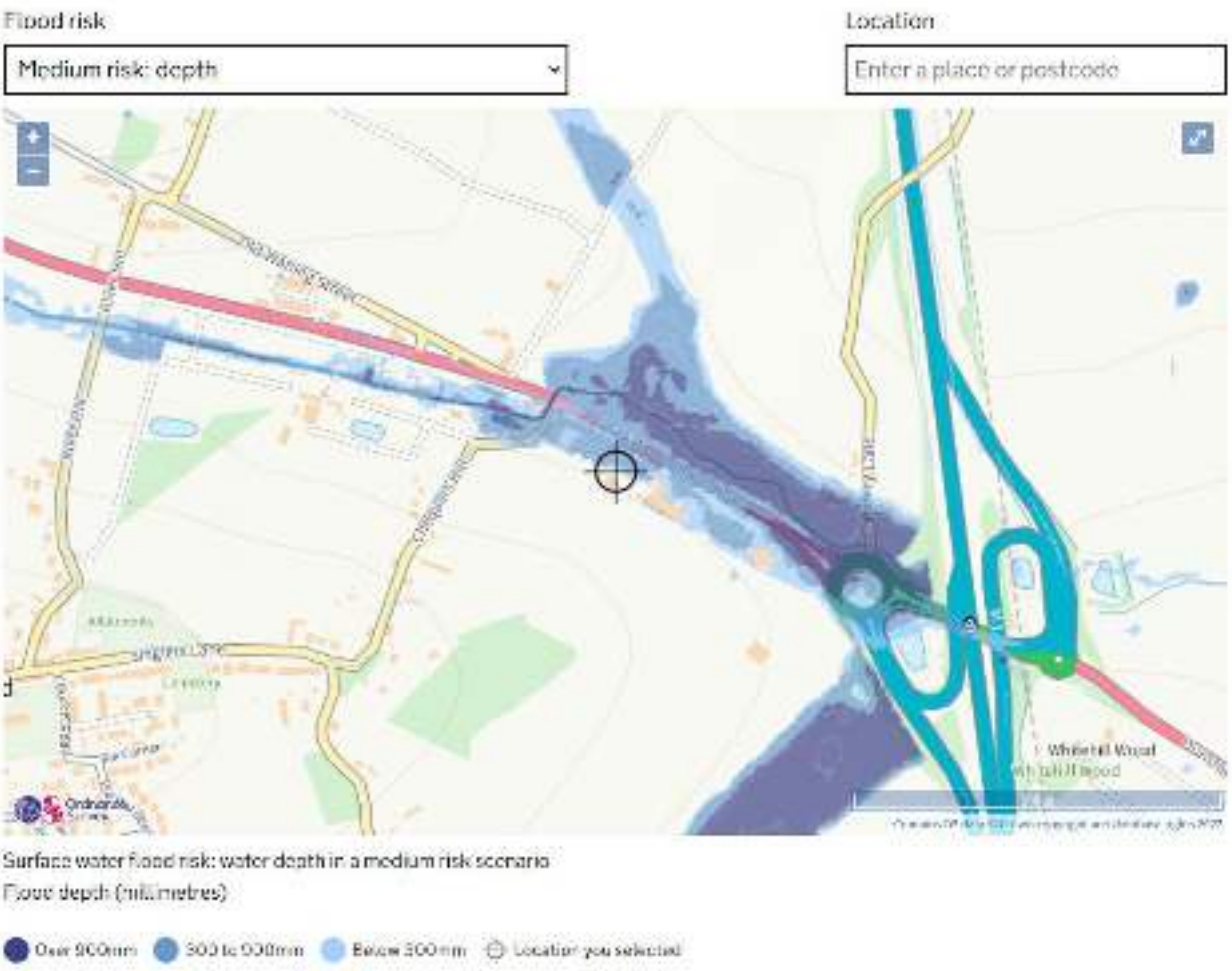
Appendix H – Surface Water Flood Maps

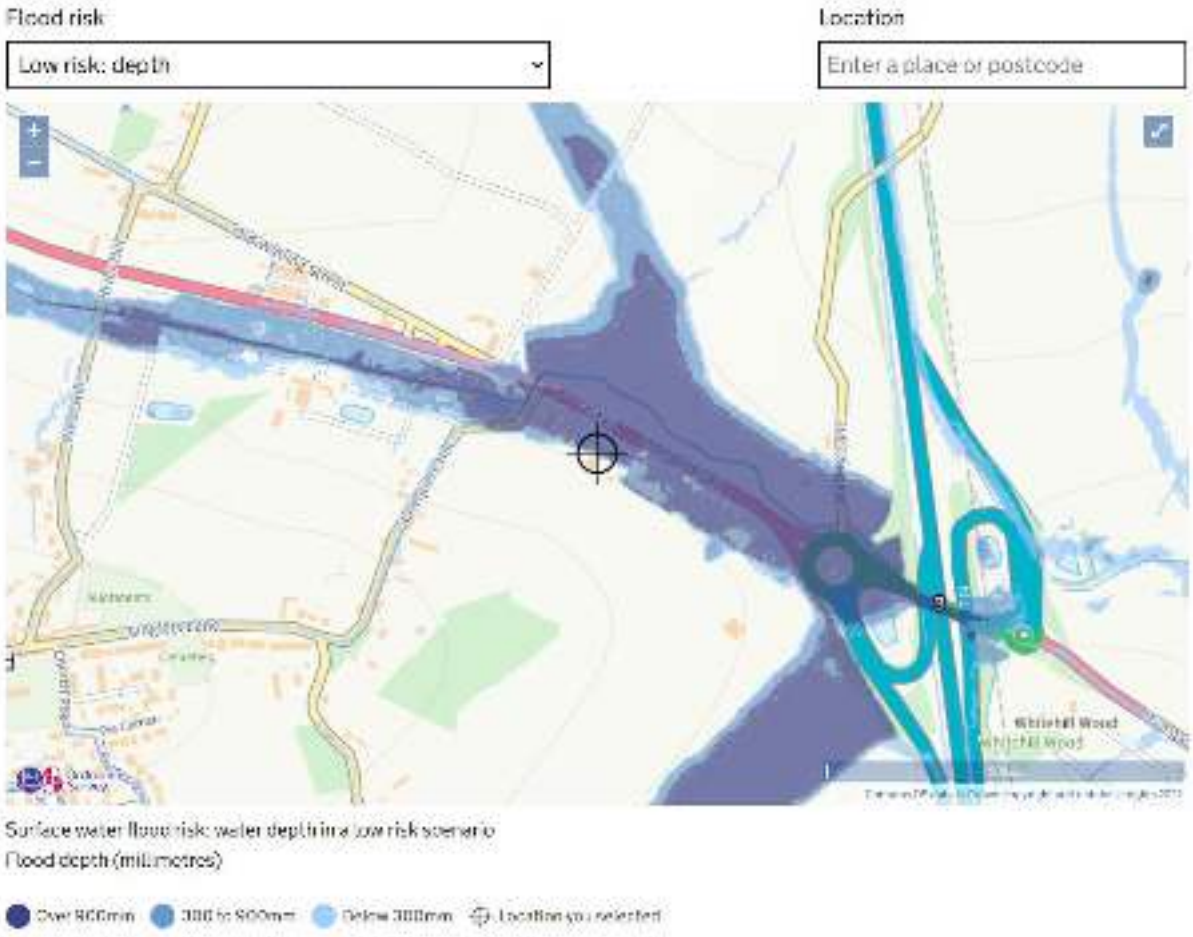
1000YR Surface Water Flood Depths (m)

Extracted from DEFRA Data Services Platform and processed on QGIS

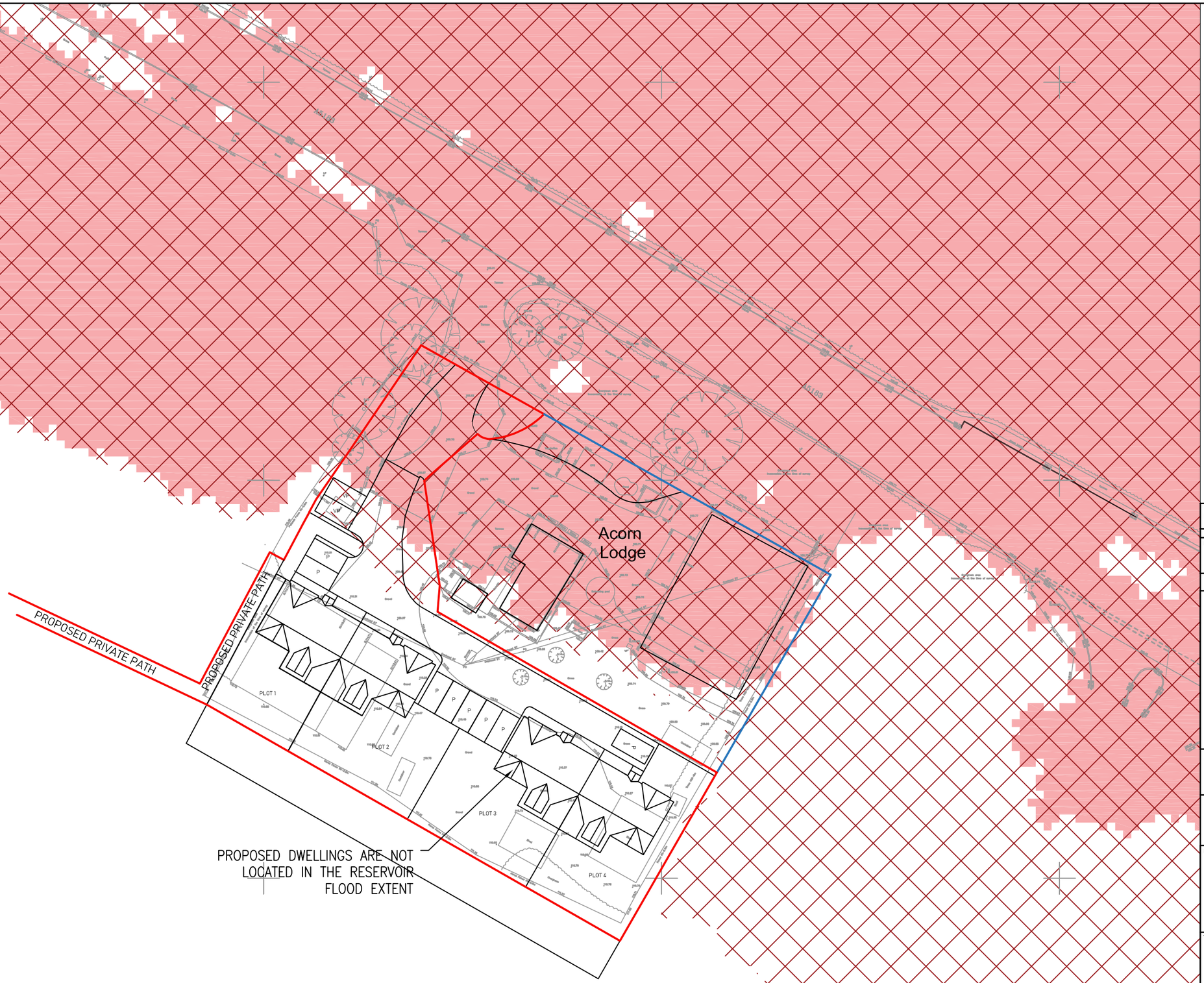


https://check-long-term-flood-risk.service.gov.uk/map?easting=508714&northing=214889&map=SurfaceWater


Flood risk
Medium risk: depth
Location
Enter a place or postcode
Surface water flood risk: water depth in a medium risk scenario
Flood depth (millimetres)
Over 900mm
300 to 900mm
Below 300 mm
Location you selected


Flood risk
Low risk: depth
Location
Enter a place or postcode
Surface water flood risk: water depth in a low risk scenario
Flood depth (millimetres)
Over 900mm
300 to 900mm
Below 300mm
Location you selected

Appendix I – Reservoir Flood Extent



KEY

RESERVOIR FLOODING EXTENT WHEN RIVER LEVELS ARE NORMAL

RESERVOIR FLOODING EXTENT WHEN THERE IS ALSO FLOODING FROM RIVERS

REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS:
PLANNING

1st Floor Millers House, Roydon Road,
Stanstead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777

www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:
ACORN LODGE
LONDON ROAD, FLAMSTEAD

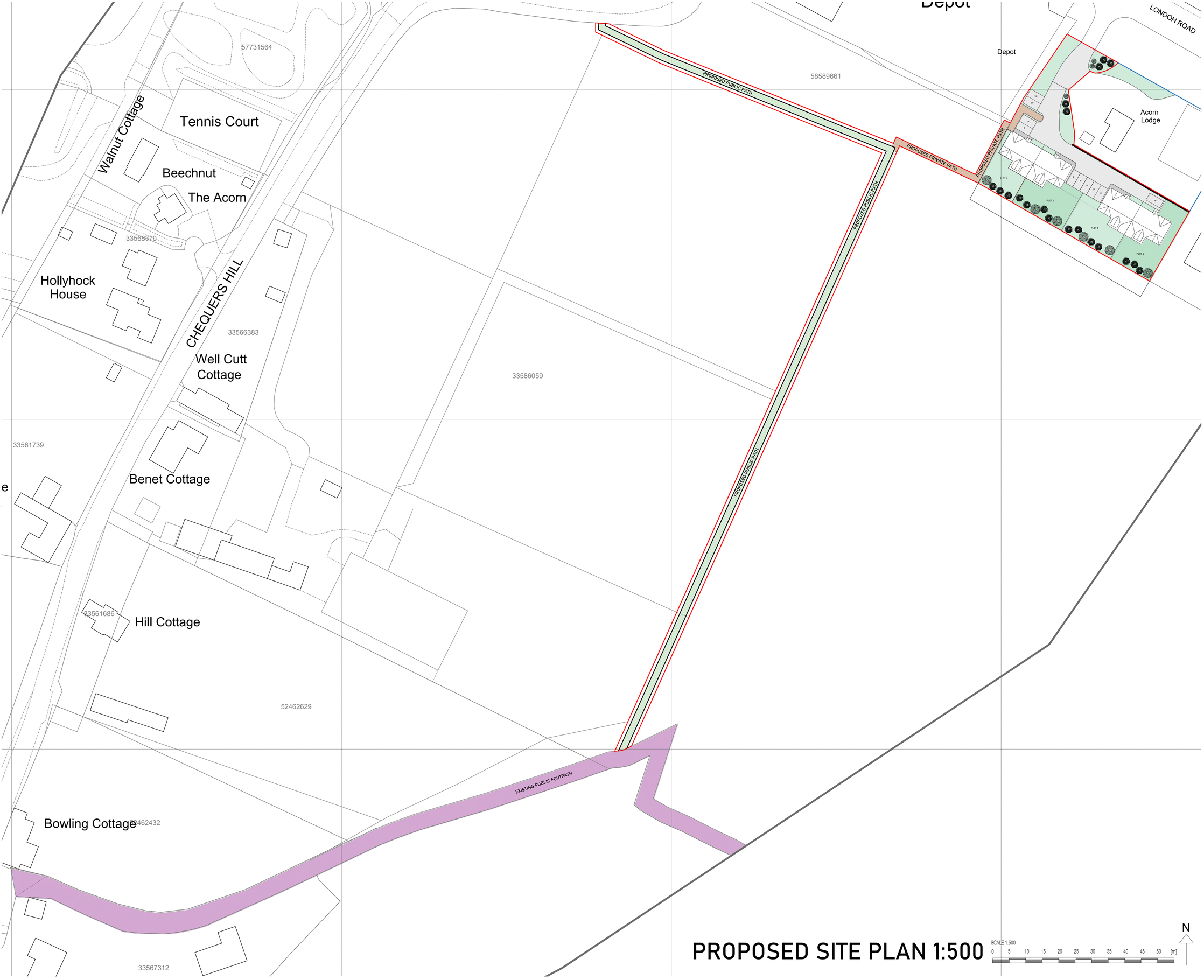
TITLE:
RESERVOIR
FLOOD EXTENT

SCALE @ A3:	DESIGN–DRAWN:	DATE:
1:500	MC	21.03.2024

PROJECT No:	DRAWING No:
3824	SK11 REV A

RESERVOIR FLOOD EXTENT DOWNLOADED FROM DEFRA DATA SERVICES PLATFORM AND PROCESSED ON QGIS AND AUTOCAD.

Appendix J – Emergency Pedstrian Access and Proposed PRoW



REVISION NOTES

REV	DESCRIPTION	DATE

STAGE

- [ ] PRE APPLICATION
- [ ] LAWFUL DEVELOPMENT
- [x] PLANNING APPLICATION
- [ ] CONDITIONS
- [ ] BUILDING CONTROL
- [ ] AS-BUILT

PROJECT

4NO NEW BUILD DWELLINGS
CREATION OF NEW FOOTPATH

DRAWING NUMBER	OAKPL-04
DATE	20/03/2024
SCALE	1:200 @ A1
SHEET NUMBER	1 of 1
DRAWN BY	HD
REVISION	

ADDRESS

ACORN LODGE
LONDON ROAD
FLAMSTEAD

DRAWING TITLE

PROPOSED SITE PLAN 1:500

PROPOSED SITE PLAN 1:500

SCALE 1:500
0 5 10 15 20 25 30 35 40 45 50 [m]

N

OAKWOOD PLANNING & DESIGN LTD
CRN: 14467585
TEL: 07947 497352
MAIL: PLANNING@OAKWOODPLANS.CO.UK

Appendix K – Proposed SuDS Layout

REV	DATE	BY	DESCRIPTION	CHK	APD
B	13.09.2023	MD	UPDATE FOLLOWING LLFA COMMENTS	MD	MD
A	02.05.2023	AW	REVISED SITE LAYOUT	RC	RC

DRAWING STATUS: FOR PLANNING PURPOSES ONLY

Unit 23, The Maltings, Stanstead Abbotts, Hertfordshire, SG12 8HG
Tel: 01920 871777
www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT: ACORN LODGE, FLAMSTEAD

TITLE: PROPOSED SUDS LAYOUT

SCALE @ A1:	DESIGN-DRAWN:	DATE:
1:200	MC	21.03.2024
PROJECT No: 3824	DRAWING No: SK03 REV C	

Appendix L - Causeway Flow Hydraulic Outputs

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Roof Soakaway	0.011	110.150	24.870	83.051	2.500

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Node Roof Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.11520	Safety Factor	3.0	Invert Level (m)	107.650
Side Inf Coefficient (m/hr)	0.11520	Porosity	0.95	Time to half empty (mins)	634

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7.7	7.7	1.670	7.7	26.4	1.671	0.0	26.4

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	Roof Soakaway	304	107.866	0.216	0.4	1.6015	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
480 minute summer	Roof Soakaway	Infiltration	0.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Roof Soakaway	228	108.193	0.543	0.9	4.0194	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Roof Soakaway	Infiltration	0.1

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Roof Soakaway	232	108.439	0.789	1.3	5.8380	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Roof Soakaway	Infiltration	0.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Roof Soakaway	176	108.333	0.683	1.4	5.0595	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
180 minute winter	Roof Soakaway	Infiltration	0.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Roof Soakaway	232	108.669	1.018	1.6	7.5399	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Roof Soakaway	Infiltration	0.2

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Road Soakaway	0.022	109.500	24.870	83.051	2.500

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Node Road Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.11520	Safety Factor	3.0	Invert Level (m)	107.000
Side Inf Coefficient (m/hr)	0.11520	Porosity	0.95	Time to half empty (mins)	694

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	11.5	11.5	1.670	11.5	35.5	1.671	0.0	35.5

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Road Soakaway	220	107.318	0.317	0.9	3.5248	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Road Soakaway	Infiltration	0.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	Road Soakaway	240	107.768	0.768	2.9	8.5258	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute summer	Road Soakaway	Infiltration	0.2

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Road Soakaway	236	108.129	1.129	2.7	12.5396	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Road Soakaway	Infiltration	0.3

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	Road Soakaway	240	107.966	0.966	3.5	10.7270	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute summer	Road Soakaway	Infiltration	0.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Road Soakaway	236	108.405	1.405	3.3	15.6019	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Road Soakaway	Infiltration	0.3

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
PP1	0.034	110.150	24.870	83.051	0.450

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.27900	Invert Level (m)	109.700	Slope (1:X)	2000.0
Side Inf Coefficient (m/hr)	0.27900	Time to half empty (mins)	16	Depth (m)	
Safety Factor	3.0	Width (m)	18.400	Inf Depth (m)	
Porosity	0.33	Length (m)	18.300		

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PP1	13	109.715	0.015	5.7	1.1934	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	PP1	Infiltration	2.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	21	109.739	0.039	13.7	3.7937	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
30 minute summer	PP1	Infiltration	6.8

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	22	109.754	0.054	19.2	5.4878	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
30 minute summer	PP1	Infiltration	8.8

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	21	109.749	0.048	17.3	4.8821	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
30 minute summer	PP1	Infiltration	8.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	22	109.772	0.072	24.3	7.5392	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
30 minute summer	PP1	Infiltration	8.8

Appendix M – Exceedance Routes

IN AN EXCEEDANCE EVENT, SURFACE WATERS WOULD CROSS THE SITE AND FOLLOW EXISTING SURFACE WATER FLOW PATH ROUTES HEADING IN AN EASTERLY DIRECTION ALONG LONDON ROAD

A5183

Acorn Lodge

PROPOSED PRIVATE PATH

PROPOSED PRIVATE PATH

PLOT 1

PLOT 2

PLOT 3

PLOT 4

KEY

SURFACE WATER FLOW EXCEEDANCE ROUTE

REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS:

PLANNING

1st Floor Millers House, Roydon Road,
Stanstead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777

www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:

ACORN LODGE

LONDON ROAD, FLAMSTEAD

TITLE:

SURFACE WATER
FLOW PATH AND
EXCEEDANCE ROUTE

SCALE @ A3:	DESIGN–DRAWN:	DATE:
1:500	MC	21.03.2024

PROJECT No:	DRAWING No:
3824	SK12 REV A