



Flood risk, water and environment

Flood Risk Assessment and Surface Water Drainage Strategy

AEG0383_UB4_Hillingdon_01

Site Address: 65 Delamere Road
Hayes
Hillingdon
London
UB4 0NN

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



Flood risk, water and environment

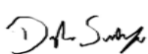
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Project: Flood Risk Assessment

Prepared for: Arora & Co

Reference: AEG0383_UB4_Hillingdon_01

Site Location: 65 Delamere Road, Hayes, Hillingdon, London, UB4 0NN

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Summary

Development Description	Existing	Proposed
Development Type	Ground floor offices with dwelling above	Construction of a single storey rear extension and internal reconfiguration to provide greater space to the existing office units
EA Vulnerability Classification	Less Vulnerable (offices) and More Vulnerable (residential) although dwelling remains unaffected by application	No change. Development is extension of existing offices
Ground Floor Level	Approximately 29.56m AOD to 30.94m AOD based on EA 1m LiDAR	No change. FFLs of proposed extension should be set no lower than existing FFLs in line with EA Standing Advice for Minor Developments.
Level of Sleeping Accommodation	First Floor	No change
Impermeable Surface Area	Whole site (approximately 300m ²) considered impermeable	No change
Surface Water Drainage	N/A ²	Outline SWDS in this report shows runoff from entire site to be attenuated in below ground crate system in east of site prior to discharge at 1 l/s to Thames Water surface water sewer.
Site Size	Approximately 300m ²	No change
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zones 1 and 2	Mostly Flood Zone 1
Flood Source	Fluvial	Yeading Brook
SFRA Available	Yes – West London Strategic Flood Risk Assessment (2018)	
Management Measures	Summary	Comment

Ground floor level above extreme flood levels	Yes	Site outside 1:100 year +CC (20%) EA modelled flood extent
Safe Access/Egress Route	Yes	South entrance on Uxbridge Road in Flood Zone 1 and outside 1:100 year +CC (20%) and 1:1000 year EA modelled flood extents. Also, dry route away from site possible in 1:1000 year pluvial event
Flood Resilient Design	Yes	Extension should be constructed in flood resilient manner in accordance with CLG Report <i>Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)</i> . See section 6 of this report.
Site Drainage Plan	Yes	Outline SWDS in this report shows runoff from entire site to be attenuated in below ground crate system in east of site prior to discharge at 1 l/s to Thames Water surface water sewer.
Flood Warning & Evacuation Plan	N/A ¹	Site owners and tenants should sign up to EA Flood Warning Service - Yeading Brook at Hillingdon
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	Site outside 1:100 year +CC (20%) EA modelled fluvial flood extent and 1:1000 year pluvial extent.
Increase in surface run-off generation	Negligible	Runoff from entire site to be attenuated in below ground crate system in east of site prior to discharge at 1 l/s (as close to greenfield as practical) to Thames Water surface water sewer
Impact on hydraulic performance of channels	None	Development approximately 40m from nearest watercourse.

¹ not required for this assessment

² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Arora & Co to undertake a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

- 1.3. The site of the proposed development is 65 Delamere Road, Hayes, Hillingdon, London, UB4 0NN (Figure 1).
- 1.4. The site is currently occupied by a part single, part two storey building. The first floor element, at the west of the site, is used for residential purposes. The entirety of the ground floor is used as offices, with one large office space at the east of the site below the residential use, and six smaller office spaces in the single storey element of the building.
- 1.5. It is understood that the proposed development is for the construction of a single storey rear extension and internal reconfiguration to provide greater space to the existing office units. Post-development there will be six office units. Existing and proposed plans can be found in Appendix A of this report.

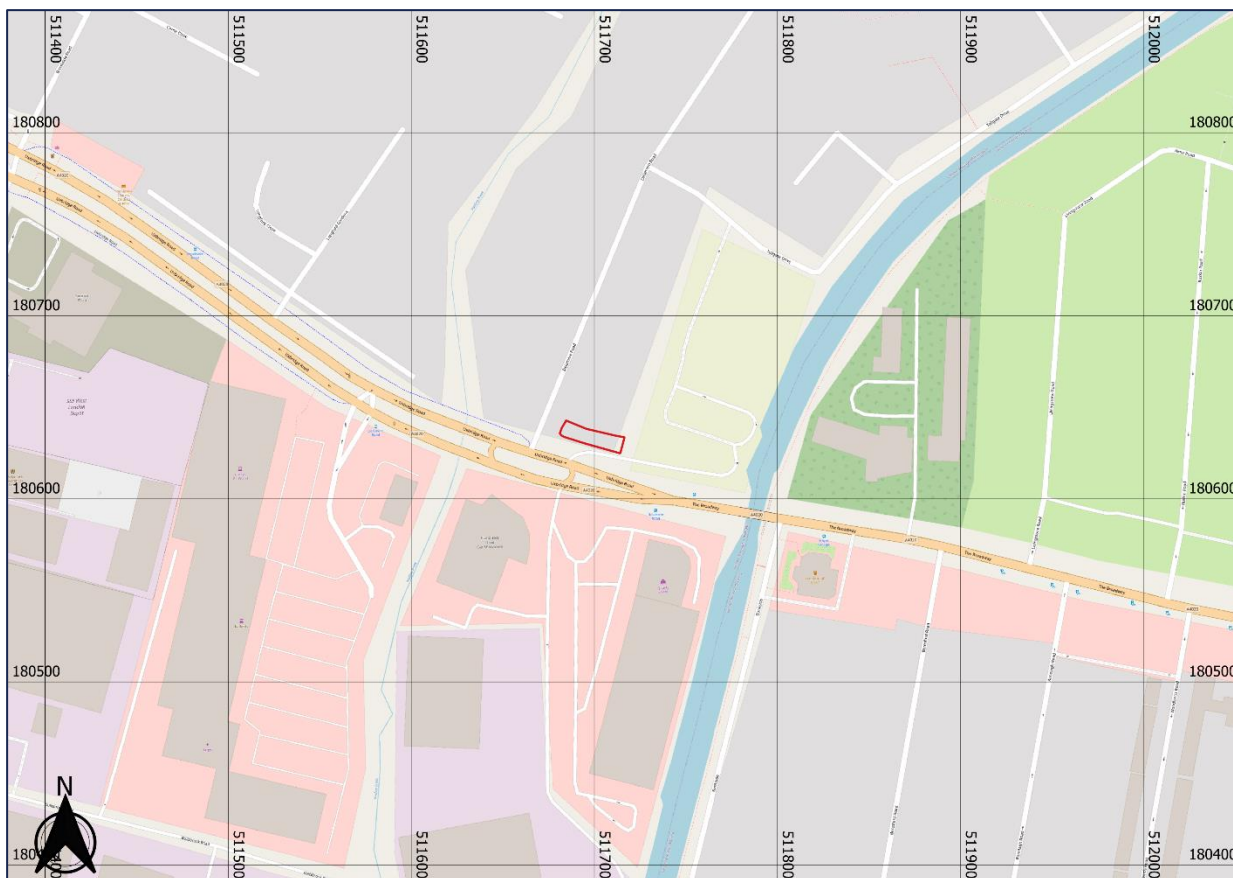


Figure 1: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.6. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been utilised to review the topography of the site (Figure 2). Ground levels on site vary between approximately 29.56m Above Ordnance Datum (AOD) and 30.94m AOD based on EA 1m LiDAR.

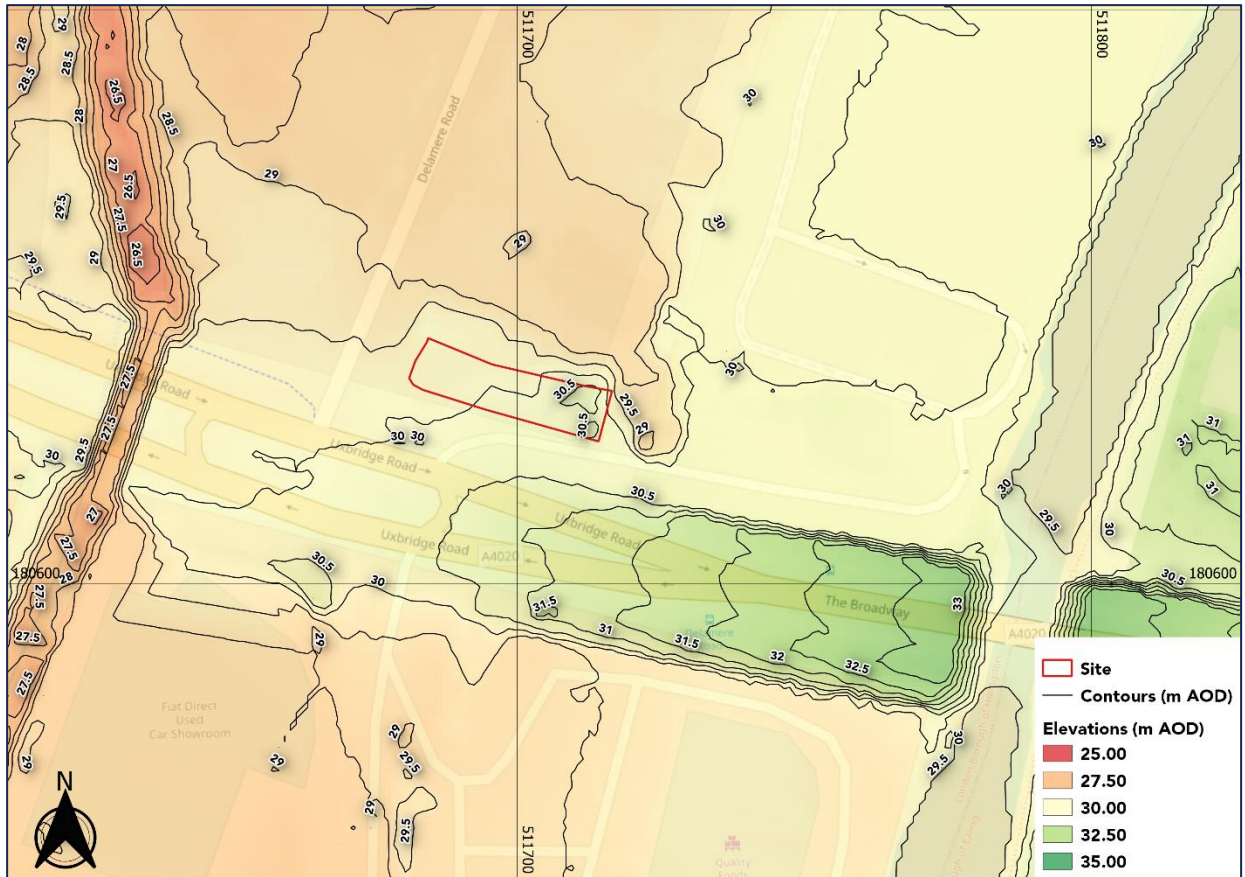


Figure 2: Topography based on EA 1m LiDAR. (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

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

Planning Policy and Guidance

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

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

1.9. The site is located partially within Flood Zone 2 and therefore an FRA is required in accordance with the NPPF.

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

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

1.11. A planning application for the proposed development was previously refused (Hillingdon Ref 51424/APP/2019/3021) based on the following reason for refusal:

1. The submitted Flood Risk Assessment fails to robustly address the issues relating to flood risk and the proposal is therefore contrary to Policy EM6 of the Hillingdon Local Plan: Part One - Strategic Policies (November 2012), Policies OE7 and OE8 of the Hillingdon Local Plan: Part Two - Saved UDP Policies (November 2012), Policy

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

DMEI 9 of the emerging Hillingdon Local Plan: Part Two – Development Management Policies with Modifications (March 2019), Policy 5.12 of the London Plan (2016) and the NPPF.

- 1.12. Furthermore, the planning appeal was dismissed (Appeal Ref APP/R5510/W/19/3226512), with the planning inspector stating:

3. The appeal development would result in an increase in the amount of building coverage at the site when compared to the existing development. The appellant has submitted a document titled 'flood report' with the appeal submission which indicates that the appeal site is located within Flood Zone 2 (as defined by the Environment Agency) which means that the site has a medium probability of flooding.

4. The National Planning Policy Framework (the Framework) outlines that a site-specific flood risk assessment is required for proposals located within Flood Zone 2. Whilst the flood report provides some detail on how the appeal development would be protected from flooding, it does not provide sufficient details to enable me to conclude that the occupiers of the development would not be subjected to an unacceptable flood risk. Furthermore, it does not provide any information on whether the development would unacceptably increase flood risk elsewhere.

5. In the absence of such information I am therefore unable to conclude that the development would not have an adverse impact on flood risk, either for the occupiers of the development or in relation to increased flood risk elsewhere.

6. For the above reasons the proposals has failed to provide sufficient information to demonstrate that the proposal would not cause an unacceptable flood risk contrary to the aims of objectives of the Framework and National Planning Practice Guidance and Policy EM6 of the Hillingdon Local Plan : Part One Strategic Policies (2012) (HLP), saved Policies OE7 and OE8 of the London Borough of Hillingdon Unitary Development Plan (1998) (HUDP) and Policy 5.12 of the London Plan (2016) which amongst other matters seek to manage flood risk including increased flood risk elsewhere and the provision of flood protection measures.

- 1.13. As such, Aegaea have been instructed to produce this FRA and SWDS to accompany a new planning application which addresses the above reasons for refusal and inspector comments.

Climate Change

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

Table 1: London Management Catchment Climate Change Allowances

Epoch	Central	Higher	Upper
2020s	1%	14%	26%
2050s	7%	14%	30%
2080s	17%	27%	54%

- 1.16. The proposed development is for the construction of extensions to the existing offices on site. Therefore, the Central allowance of 17% should be applied.

2. National Planning Policy Framework

- 2.1. The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. The following section summarises the key policies and guidance relevant to the proposed development.
- 2.2. The National Planning Policy Framework² (NPPF) (DCLG, 2021) includes Government policy on development and flood risk stating that:

"159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*

² <https://www.gov.uk/guidance/national-planning-policy-framework>, last updated July 2021

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

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

2.3. Paragraph 046 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

Minor development means:

- *minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metres.*
- *alterations: development that does not increase the size of buildings eg alterations to external appearance.*
- *householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of houses into flats.*

2.4. The proposal seeks to increase footprint on site by approximately 70m², and will provide greater space to the existing office units, an extension of the existing use. No new units are proposed. Therefore, the proposal could be considered a Minor Development in accordance with Paragraph 046 of the PPG.

2.5. Footnote 55 of the NPPF states:

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

2.6. Flood Zones in England are defined in Table 2³ as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zone 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in her Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2: Flood Zone Definitions

- 2.7. An FRA should be appropriate to the scale, nature and location of the development and should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.8. An assessment of any hydrological impacts should be assessed including an assessment of impacts on surface water runoff and impacts to the drainage network to demonstrate how flood risk to others will be managed following development and taking climate change into account.

³ <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

London Plan

2.9. Policy SI13 of the 2021 London Plan⁴ states:

Policy SI 13 Sustainable drainage

- *A Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.*
- *B Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
 - 1) *rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*
 - 2) *rainwater infiltration to ground at or close to source*
 - 3) *rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
 - 4) *rainwater discharge direct to a watercourse (unless not appropriate)*
 - 5) *controlled rainwater discharge to a surface water sewer or drain*
 - 6) *controlled rainwater discharge to a combined sewer.*
- *C Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*

⁴ https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

- *D Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.*

Local Plan

2.10. Policy EM6 of the Hillingdon Local Plan Part 1⁵ (2012) states:

Policy EM6: Flood Risk Management

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

The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated.

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

2.11. Policy DME1 of the emerging Hillingdon Local Plan: Part Two – Development Management Policies⁶ (2020) states:

⁵ https://www.hillingdon.gov.uk/media/3080/Local-Plan-Part-1---Strategic-Policies/pdf/Local_Plan_Part_1_Strategic_Policies_15_feb_2013_a_1_1.pdf?m=1598370401647

⁶ https://www.hillingdon.gov.uk/media/3084/Hillingdon-Local-Plan-Part-2-Development-Management-Policies/pdf/LPP2_Development_Management_Policies_-_ADOPTED_VERSION_JAN_2020_1.pdf?m=1598370641570

POLICY DMEI 9: Management of Flood Risk

A) Development proposals in Flood Zones 2 and 3a will be required to demonstrate that there are no suitable sites available in areas of lower flood risk. Where no appropriate sites are available, development should be located on the areas of lowest flood risk within the site. Flood defences should provide protection for the lifetime of the development. Finished floor levels should reflect the Environment Agency's latest guidance on climate change.

B) Development proposals in these areas will be required to submit an appropriate level Flood Risk Assessment (FRA) to demonstrate that the development is resilient to all sources of flooding.

C) Development in Flood Zone 3b will be refused in principle unless identified as an appropriate development in Flood Risk Planning Policy Guidance. Development for appropriate uses in Flood Zone 3b will only be approved if accompanied by an appropriate FRA that demonstrates the development will be resistant and resilient to flooding and suitable warning and evacuation methods are in place.

D) Developments may be required to make contributions (through legal agreements) to previously identified flood improvement works that will benefit the development site.

E) Proposals that fail to make appropriate provision for flood risk mitigation, or which would increase the risk or consequences of flooding, will be refused.

Sequential and Exception Tests

- 2.12. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.
- 2.13. Under the NPPF all new planning applications should undergo a Sequential Test unless a minor household development or a change of use application in accordance with paragraph 168 and footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the flood plain.

2.14. Paragraph 168 of the 2021 NPPF states that:

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

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

Summary

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

3. Consultation and Review

Sources of Information

Consultation

- 3.1. A Product 4 dataset has been provided by the EA and has been used to inform this FRA. The Product 4 can be found in full in Appendix B of this report.

Documents

- 3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.
- 3.3. The following sources of information have been reviewed for this assessment:
- The Interactive Flood Risk Mapping available on the Environment Agency (EA) website⁷.
 - The National Planning Policy Framework (NPPF) technical guide (Communities and Local Government, 2019).
 - British Geological Survey - Geology of Britain Viewer (British Geological Society, 2017).
 - London Plan (2021).
 - West London Strategic Flood Risk Assessment⁸ (SFRA) (2018).
 - Hillingdon Local Plan Part 1 (2012)
 - Hillingdon Local Plan: Part Two – Development Management Policies (2020)

⁷ Environment Agency, Flood Map for Planning, <https://flood-map-for-planning.service.gov.uk/>, 2017

⁸ <https://westlondonsfra.london/>

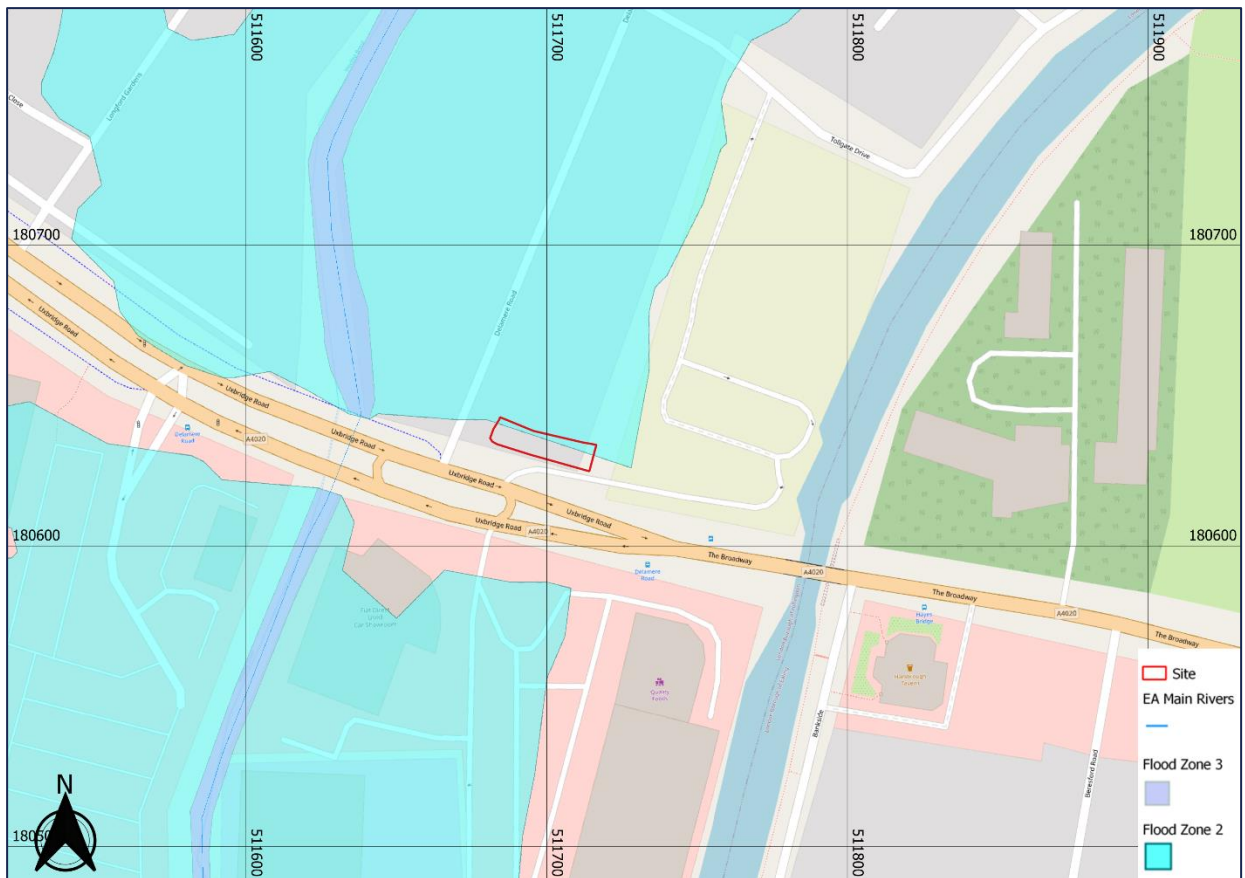


Figure 4: EA Flood Zones (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Main Rivers

- 4.3. The nearest Main River to the site is the Yeading Brook which flows north to south approximately 40m west of the site.

Other Watercourses

- 4.4. The Grand Union Canal (Uxbridge to Hanwell Locks, Slough Arm, Paddington Arm) is located approximately 65m east of the site.

Fluvial Flood Data

- 4.5. A Product 4 dataset has been provided by the EA and has been used to inform this FRA. The Product 4 can be found in full in Appendix B of this report.

- 4.6. Under the July 2021 climate change guidance, the proposed development would need to consider a 17% allowance for climate change on the 1:100 year event. The Product 4 provided by the EA includes 20%, 25%, 30% and 70% allowances on the 1:100 year event. The 1:100 year +CC (20%) event is considered a conservative estimate of the 1:100 year +CC (17%) event.
- 4.7. The Product 4 provided indicates that the site would remain unaffected in all modelled events up to and including the 1:100 year +CC (70%) event, but could be partially affected in the 1:1000 year event (Figure 5), hence being partially in Flood Zone 2.

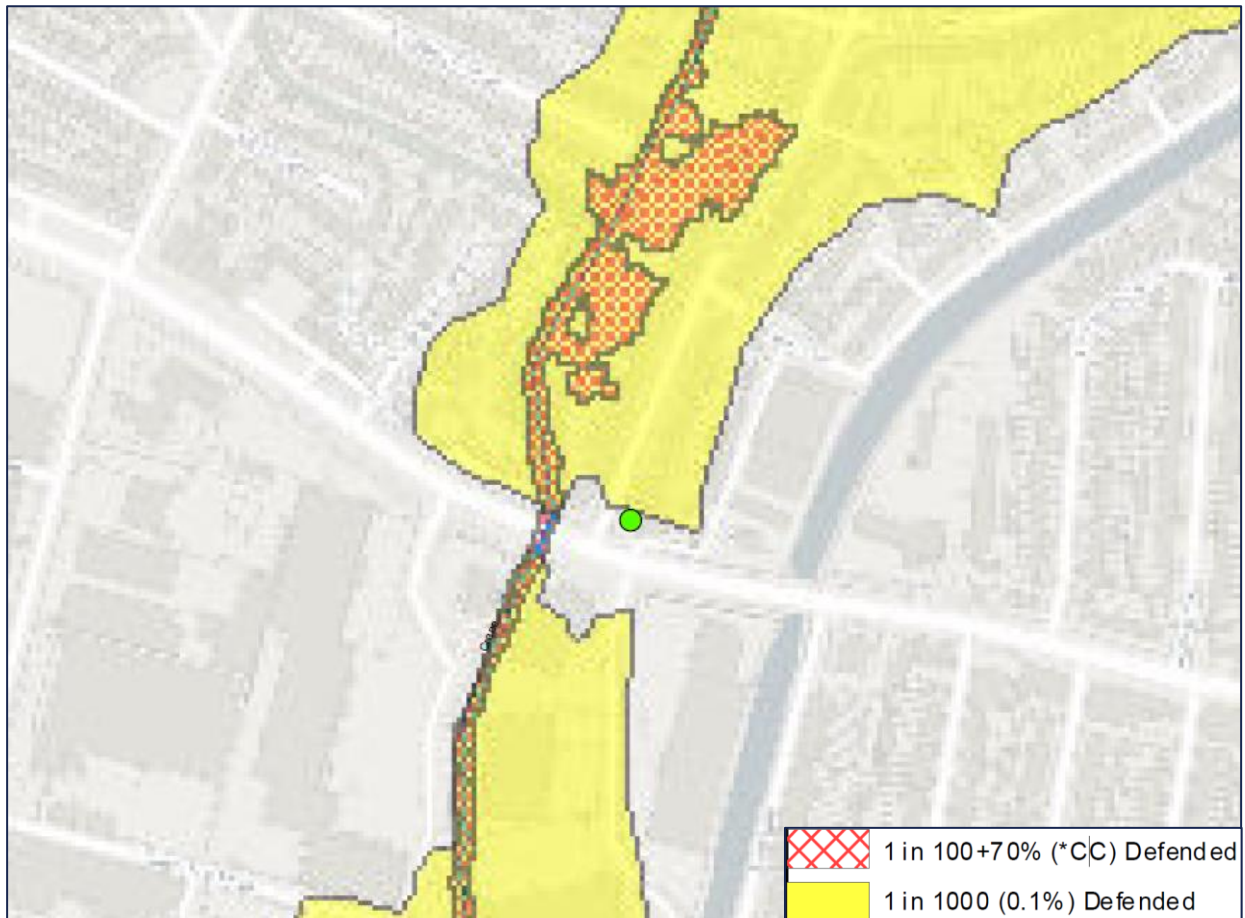


Figure 5: EA Modelled Flood Extents (Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198)

- 4.8. The EA have not provided 2D floodplain flood levels for the 1:1000 year event. However, they have provided 1D in-channel modelled flood levels at several nodes along the route of the Yeading Brook as it flows past the site. The node locations are shown in Figure 6. Node Y730u is the closest node to the site, although Node Y731 is further upstream.

- 4.9. Based on the EA model, the 1:1000 year flood levels at Nodes Y730u and Y731 are 29.19m AOD and 29.26m AOD, respectively.
- 4.10. Ground levels on site vary between approximately 29.56m Above Ordnance Datum (AOD) and 30.94m AOD based on EA 1m LiDAR. As such, based on a comparison between in-channel flood levels and site levels, the site actually appears to be on land higher than the 1:1000 year flood levels by a minimum of 300mm. It is acknowledged that land north of the site is lower than the 1:1000 year flood level of 29.26m AOD (Figure 7).
- 4.11. Nevertheless, this analysis suggests that the site could remain unaffected during the 1:1000 year event also.
- 4.12. As such, and given that the site is also outside the modelled flood extent for the 1:100 year +CC (20%) event, the risk of flooding from fluvial sources is considered low.

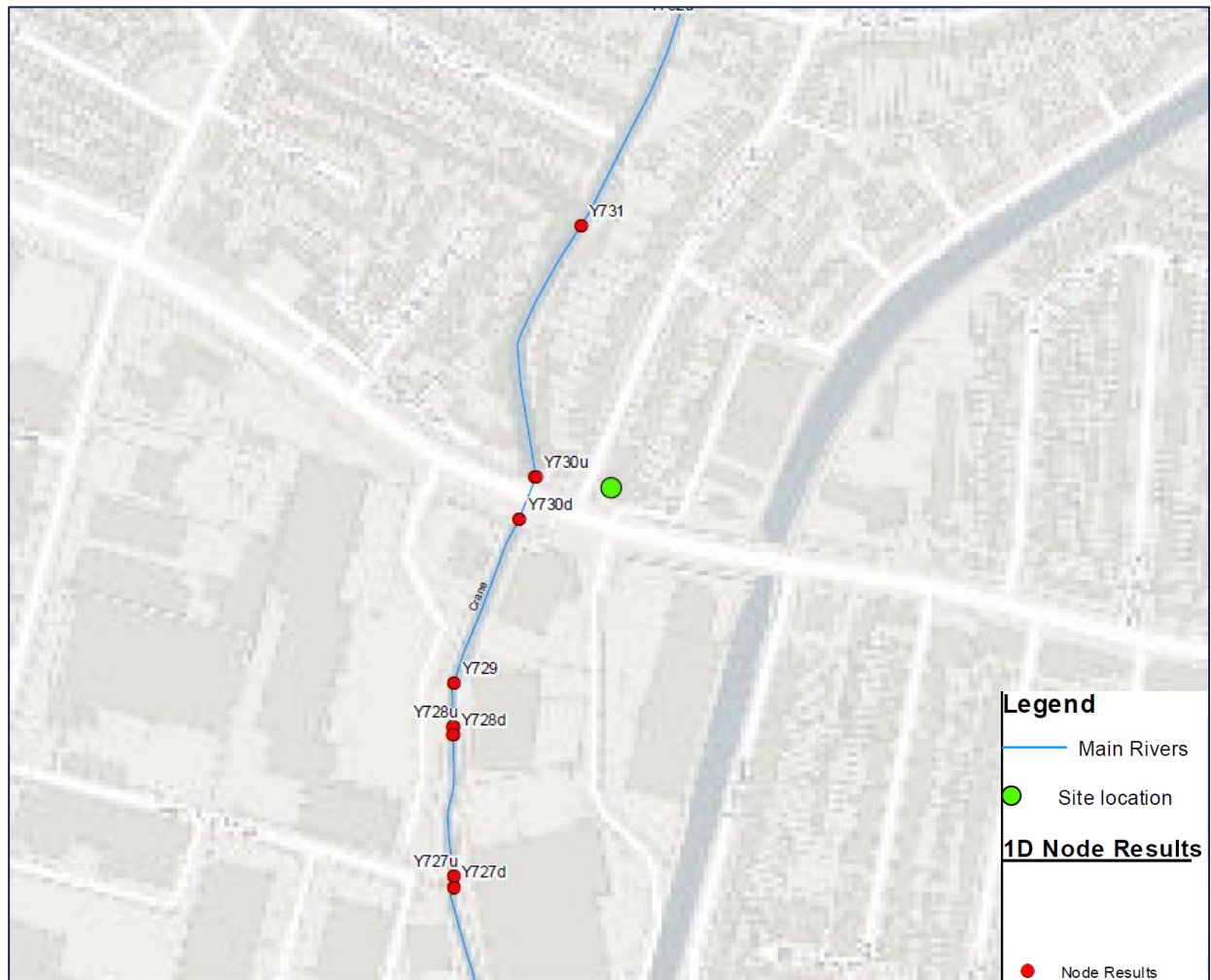


Figure 6: EA Modelled In-Channel Nodes (Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198)



Figure 7: Topography based on EA 1m LiDAR. (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Historic Flooding

- 4.13. The Environment Agency's Recorded Flood Outlines dataset indicates that the site is approximately 180m south of a historic flood incident in August 1977, caused by issues with local drainage/surface water (Figure 8).

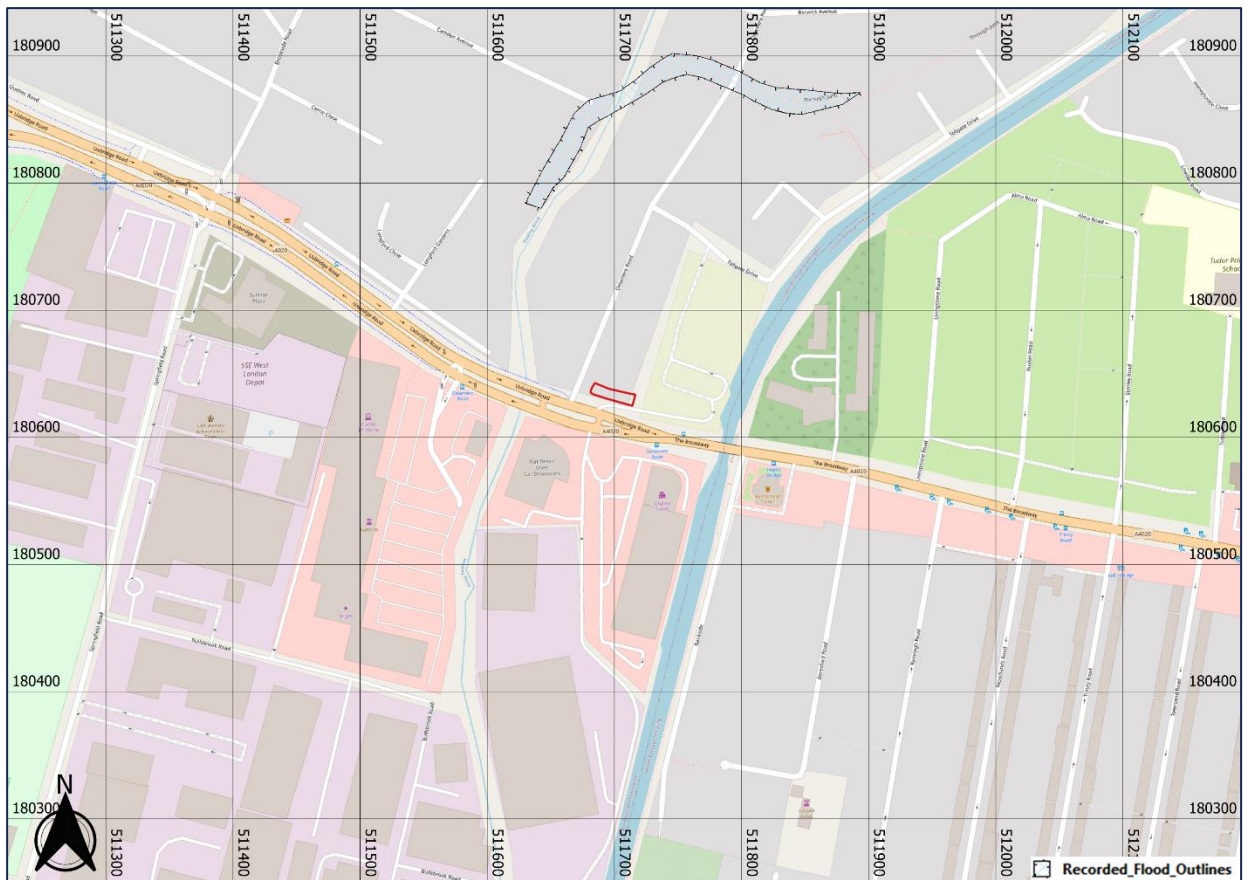


Figure 8: EA Recorded Flood Outlines (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA).
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Coastal Flooding

- 4.14. The site is not at risk of coastal flooding.

Canals

- 4.15. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders and boreholes and manages water levels by transferring it within the canal system.
- 4.16. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become

obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.

- 4.17. Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 4.18. The Grand Union Canal (Uxbridge to Hanwell Locks, Slough Arm, Paddington Arm) is located approximately 65m east of the site.
- 4.19. A review of EA 1m LiDAR indicates that the ground levels are fairly flat from the western bank of the Canal to the site (Figure 9) apart from higher ground at the east of the site. However it does not appear that the canal is in a raised embankment at this location.

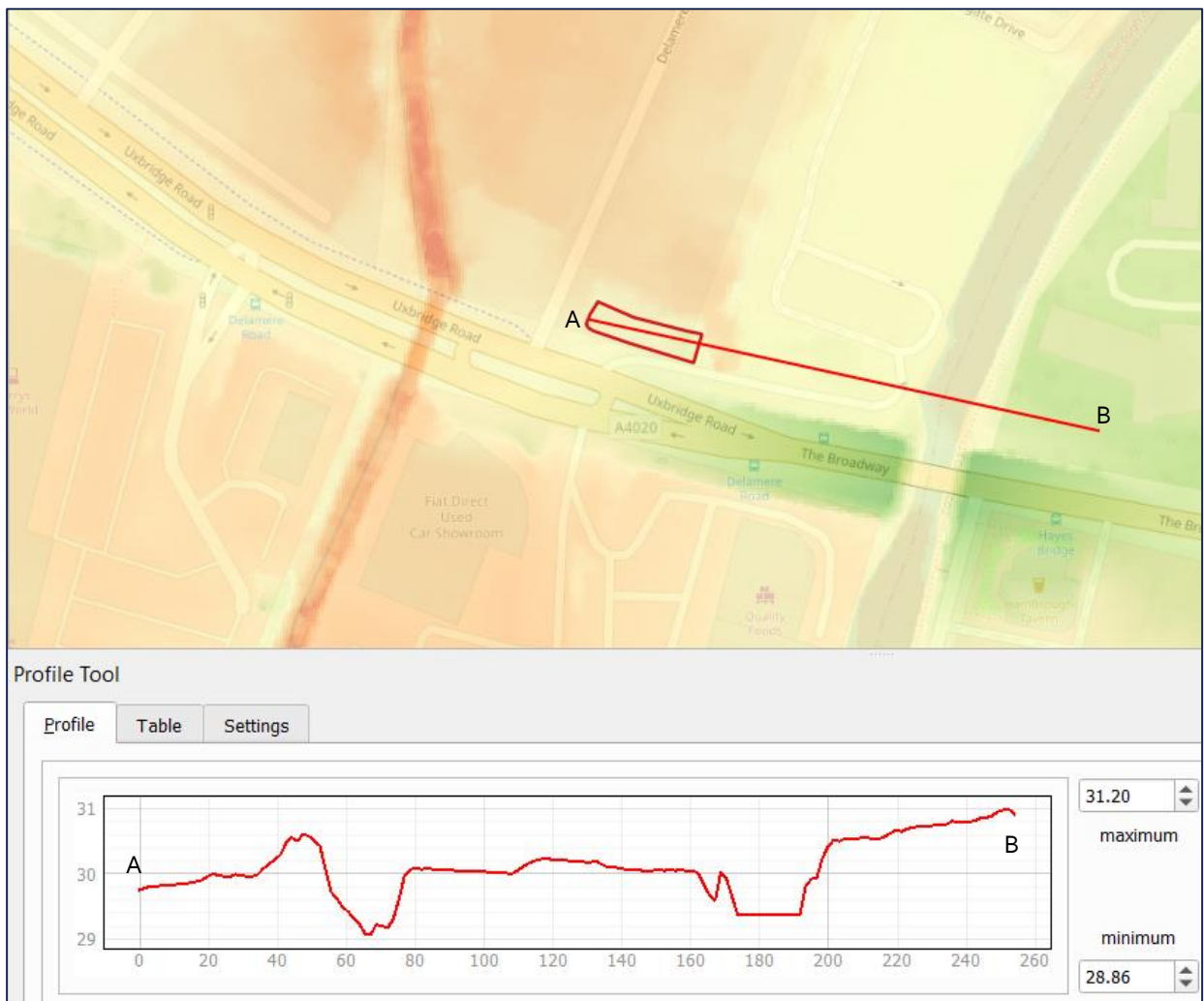


Figure 9: Topography based on EA 1m LiDAR. (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.20. Information regarding the water levels in the Grand Union Canal at this location could not be found at the time of writing. However, as canal water levels are generally maintained and as the canal is not in a raised embankment, the risk of flooding from this source is considered low.

Pluvial Flood Risk

- 4.21. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.22. A review of the EA Risk of Flooding from Surface Water (RoFSW) dataset indicates that the site would remain unaffected in the modelled 1:1000 year event (Figure 10).

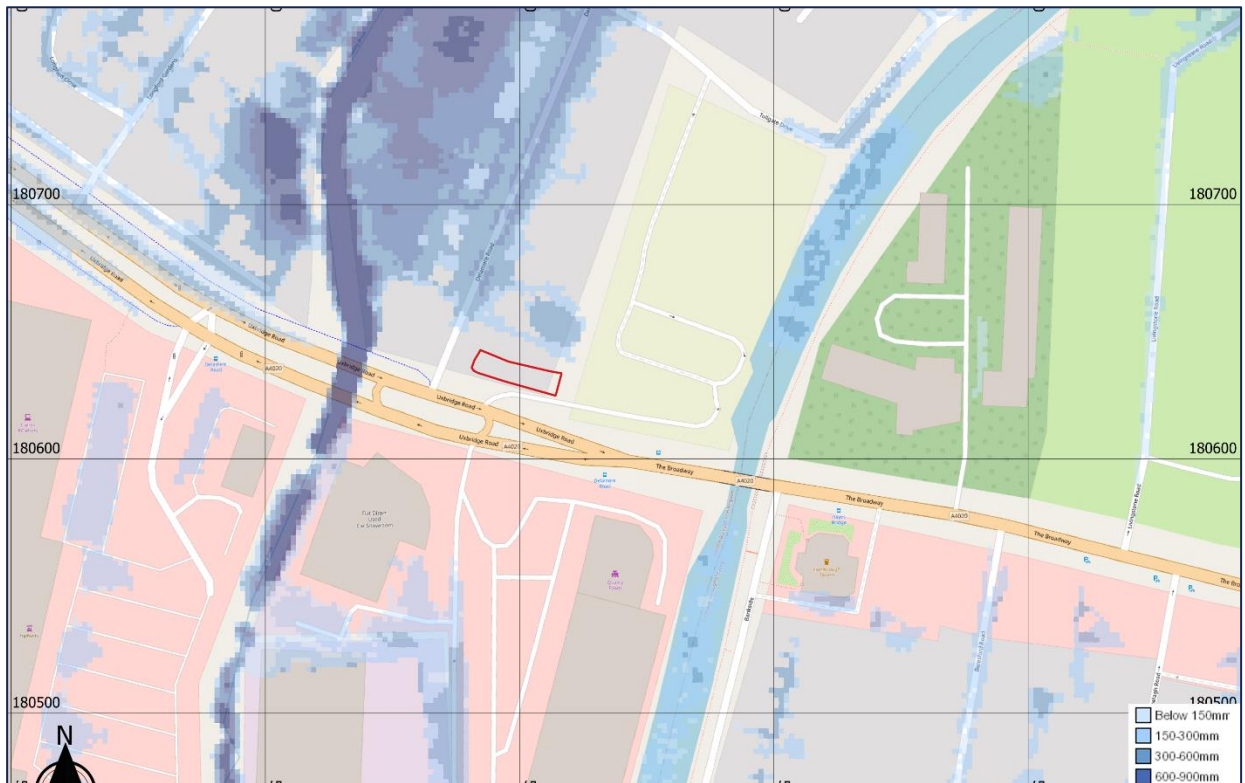


Figure 10 1:1000 year (0.1%) pluvial flood depths (Sources: EA RoFSW, © Environment Agency copyright and/or database right 2015. All rights reserved. Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors.)

- 4.23. The West London SFRA (2018) states:

Where developments are proposed within Flood Zone 3a (surface water), floodplain compensation must account for predicted flood depths for the 1 in 30yr and 1 in 100yr RoFSW mapping or depths predicted by site specific modelling

- 4.24. As such, as the site is outside the modelled 1:1000 year event, there would be no requirement for pluvial Compensatory Flood Storage (CFS) and would not increase flood risk elsewhere through displacement of pluvial flood water.
- 4.25. The site is not within a Critical Drainage Area (CDA) as defined in the West London SFRA (2018).
- 4.26. As such, the risk of flooding from pluvial sources is considered low.

Reservoirs

- 4.27. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 4.28. According to EA flood risk from reservoirs mapping the site is just outside the maximum modelled flood extent following reservoir flooding both in isolation and when combined with river flooding (Figure 11). Lower land to the west, north and east of the site could be affected following reservoir flooding.
- 4.29. As reservoirs are highly managed, the maximum flood extent provided in the EA Risk of Flooding from Reservoirs mapping is considered a worst case scenario. Therefore, given these criteria the site is deemed to be at a low risk of flooding from this source.

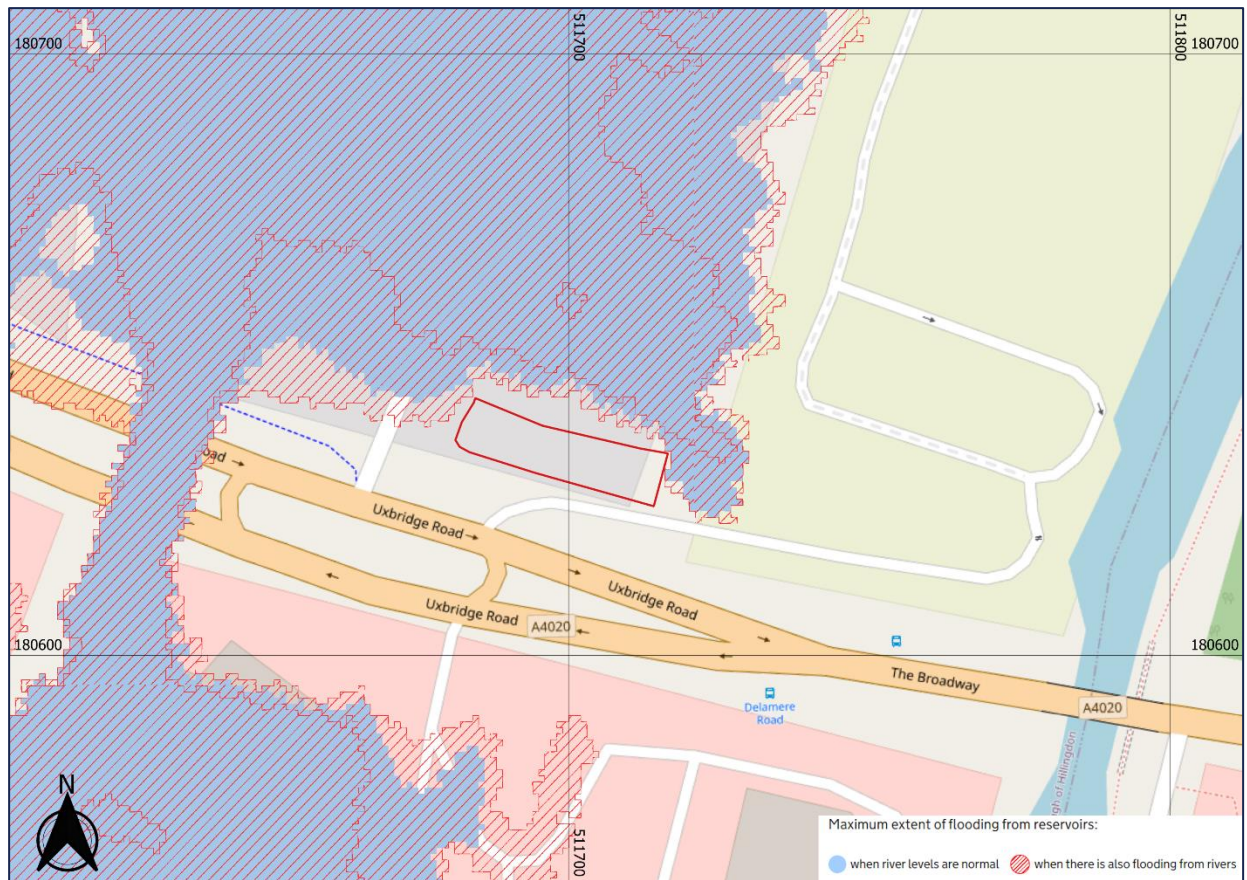


Figure 11 1: EA Flood Risk from Reservoirs (Contains public sector information licensed under the Open Government Licence v3.0. Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors.)

Groundwater

- 4.30. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.31. The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is London Clay comprising clay, silt and sand. The BGS Geology of Britain Viewer also indicates that the superficial deposits underlying the site are the Langley Silt Member comprising clay and silt.
- 4.32. There are three BGS borehole records approximately 50m to 150m east and northeast of the site (BGS refs TQ18SW152, TQ18SW153 and TQ18SW154). In all three records, groundwater strikes were not observed.

- 4.33. The West London SFRA web mapping (2018) indicates that the site is within a 1km grid square of which less than 25% is considered susceptible to groundwater flooding. Furthermore, the SFRA mapping suggests that the site is not within an area considered to have increased potential for elevated groundwater.
- 4.34. As such, the risk of flooding from groundwater is considered low.

Sewer Flooding

- 4.35. Surface water sewers can be a cause of flooding where the drainage network has become overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.36. The West London SFRA web mapping (2018) indicates that the site is not located within a postcode area known to have flooded from sewers previously based on Thames Water records.
- 4.37. The development is therefore considered to be at low risk of flooding from sewers.
- 4.38. A Thames Water Asset Plan has been acquired (Appendix C of this report). An extract is provided in Figure 12 below.

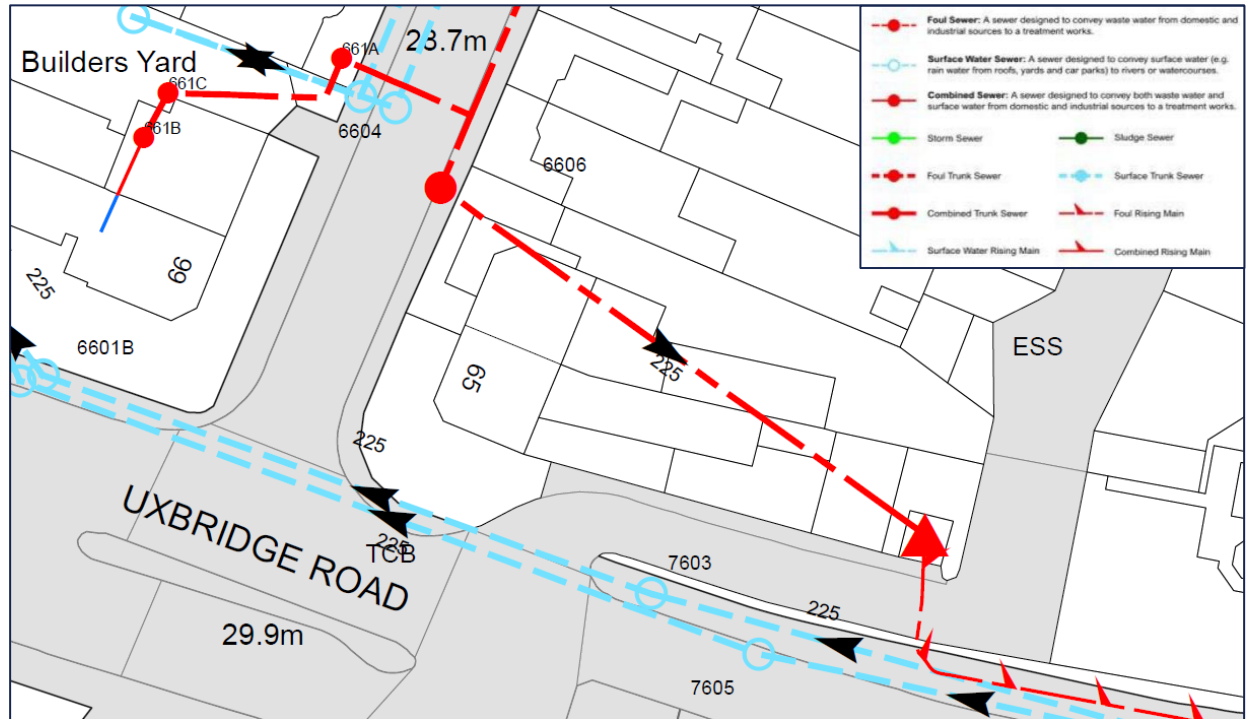


Figure 12: Thames Water Asset Plan Excerpt (Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved)

4.39. It can be seen from Figure 12 above that there is a 225mm diameter foul sewer flowing northwest to southeast through the northeast corner of the site. Based on plans provided by the client and the asset plan, the existing footprint may be located atop the existing sewer in the east of the site. Proposed plans indicate that an extension is proposed on the south side of the existing single storey element of the site and thus beyond 3m of the mapped location of the Thames Water sewer. Should any works be proposed within 3m of this sewer, Thames Water approval would be required.

5. Offsite Impacts

- 5.1. The West London SFRA states that an FRA for planning should include:

Evidence demonstrating that there will be no net loss of floodplain storage for all proposed developments in Flood Zone 3b and Flood Zone 3a.

- 5.2. This applies to both fluvial and pluvial Flood Zones 3a and 3b, as the SFRA continues:

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

- 5.3. Analysis within this report has indicated that the site would remain unaffected in the modelled 1:100 year +CC (20%) fluvial and 1:1000 pluvial events.
- 5.4. As such, there would be no requirement for Compensatory Flood Storage (CFS) and the proposal would not increase flood risk elsewhere through displacement of flood water.

6. Flood Risk Mitigation

Fluvial

- 6.1. Analysis within this report has indicated that the site would remain unaffected in the modelled 1:100 year +CC (20%) fluvial event. While the site is within the 1:1000 year fluvial modelled flood extent, the site is on land above the modelled flood level and thus the site may also remain unaffected in this event. As such, the risk of flooding from fluvial sources is considered low.
- 6.2. Nevertheless, as the site is partially in Flood Zone 2, a conservative approach should be adopted and the extension should be constructed in a flood resilient manner in accordance with the CLG Report, *Improving the Flood Performance of New Buildings - Flood Resilient Construction (2007)* including measures such as the below:
- Solid (i.e. concrete floors) with waterproof screed.
 - Raised wiring and power outlets at ground level.
 - Units to be raised on legs above plinth.
 - Waterproof plasterboard used at ground floor.
 - Air brick covers to be installed.
 - Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.
 - Patio doors may be susceptible to ingress of flood water. Any PVC window/door sills should be adequately sealed. Double glazing should be used to provide resistance against external flood water pressure. Of concern would be excessive water pressure on the glazing of patio doors.
 - Site owners, management and tenants to sign up to the EA Flood Warning Service (Yeading Brook at Hillingdon) if not done so already.

Pluvial

- 6.3. The site is outside the modelled 1:1000 year pluvial extent and the risk of pluvial flooding to the proposed development is considered low. The flood resilience measures recommended to mitigate the risk of fluvial flooding should provide sufficient mitigation against pluvial flooding.

Reservoirs, Groundwater and Sewers

- 6.4. Flood risk from other sources is deemed to be low, therefore no specific mitigation is recommended.

7. Surface Water Drainage Strategy

Surrounding Water Environment & Existing Drainage

- 7.1. A Thames Water Asset Plan has been obtained and is provided in Appendix C of this report. An extract is provided in Figure 12.
- 7.2. It can be seen from Figure 12 that there is a 225mm diameter foul sewer flowing northwest to southeast through the northeast corner of the site. Based on plans provided by the client and the asset plan, the existing footprint may be located atop the existing sewer in the east of the site. Proposed plans indicate that an extension is proposed on the south side of the existing single storey element of the site.
- 7.3. Figure 12 also indicates two 225mm diameter public surface water sewers flowing east to west below Uxbridge Road to the south of the site. These eventually discharge into the Yeading Brook west of the site. The Thames Water Asset Plan indicates that Manhole 7603 has a cover level of 30.69m AOD and an invert level of 28.51m AOD – suggesting that the sewer is approximately 2m deep.
- 7.4. No details regarding existing site drainage have been provided at the time of writing. Given that the site is brownfield, it is presumed that the site is positively drained. A review of Google Streetview indicates a downpipe on the southern side of the existing building (Figure 13). Thames Water Manhole 7603 is also highlighted red in Figure 13. As such, it is presumed that runoff is discharged into the Thames Water sewer below Uxbridge Road. However, a CCTV drainage survey should be carried out prior to detailed design to confirm how runoff is drained from the site – it may be possible to reuse an existing outfall from the site.



Figure 13: Google Streetview of Site (© 2002 Google)

Pre-Development / Greenfield Runoff Rates

- 7.5. The total area of the site is approximately 300m² (0.03 hectares).
- 7.6. Based on aerial imagery, it is understood that the whole site is impermeable as existing. Proposed plans suggest that impermeable area will remain the same post-development and there will be no increase in hardstanding surfaces.
- 7.7. The greenfield runoff rate for the site's total proposed hardstanding area of 300m² has been calculated using the IH-124 method (via the ICP SuDS variation) within InfoDrainage Software v2021.5.
- 7.8. The IH-124 method was developed as part of the original Flood Studies Report (FSR) in 1975 and was devised to calculate runoff from small catchments by estimating the mean annual flood flow (Q_{bar}) using the following equation:

$$Q_{bar}_{rural} = 0.00108(0.1 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17} m^3/s$$

Where:

Q_{bar}_{rural} is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the hardstanding surfaces in ha.

SAAR is the Standard Average Annual Rainfall for the period 1941 to 1970 in mm

SPR is Standard Percentage Runoff coefficient for the SOIL category. The SOIL category is extracted from UK Winter Rainfall Acceptance Potential (WRAP) map.

- 7.9. The ICP SuDS variation is a scaled-down version of the IH-124 runoff method for estimating peak flow rates from both undeveloped and partly urbanised catchments that are smaller than 50 ha in size, which is appropriate in this instance.
- 7.10. The parameters used for estimating the greenfield runoff rates for the site are presented in Table 3.

Table 3 IH-124 Input Parameters

Greenfield runoff rates from the site – simulation criteria	
Rainfall Data	FSR
Area	0.03 Ha
SAAR	641.0
SOIL	0.30
Region	Region 6
Urban %	0

7.11. Table 4 displays the estimated greenfield runoff rates for the impermeable area of 0.03 Ha.

Table 4 Greenfield Runoff Rates

Return Period	Greenfield Runoff Rate
1 in 1 Year	0.0 l/s
1 in 2 Year (Q_{BAR})	0.0 l/s
1 in 30 Year	0.1 l/s
1 in 100 Year	0.2 l/s

7.12. Policy SI13 of the 2021 London Plan states:

...Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible...

7.13. As such, runoff rates from the proposed development should be restricted to greenfield rates where possible. As greenfield rates are less than 1 l/s, restricting to these rates could result in an increased risk of blockage within the system. It is generally considered acceptable to restrict flows to 1 l/s when Q_{BAR} rates are below this. A peak discharge rate of 1.0l/s will be incorporated into the surface water drainage design limited via a Hydrobrake control manhole.

Surface Water Drainage Strategy

- 7.14. In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.
- 7.15. The management of surface water has been considered in respect to the SuDS hierarchy below, as detailed in the CIRIA 753 "The SuDS Manual" (section 3.2.3).

Table 5 SuDS Drainage Hierarchy

SUDS DRAINAGE HIERARCHY				
			Suitability	Comment
	1.	Store rainwater for later use	✓	Rainwater harvesting for the proposed extension should be considered by a specialist at the detailed design stage.
	2.	Use infiltration techniques, such as porous surfaces in non-clay areas	x	Online mapping suggests a bedrock of London Clay overlain by superficial clay and silt. Furthermore, online soil mapping indicates loamy soils with naturally high groundwater. Based on site plans and the presence of the Thames Water foul sewer and its 3m buffer zone, there may also be inadequate space on site for infiltration SuDS such as soakaways. As such, infiltration has been discounted at this stage.
	3.	Attenuate rainwater in ponds or open water features for gradual release	x	Space on site is limited for above ground SuDS.
	4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	Attenuation can be provided in the form of a below ground geocellular crate system.
	5.	Discharge rainwater direct to a watercourse	x	No watercourses in feasible vicinity of site. Site is approximately 40m east of the Yeading Brook and creating a new outfall would not be feasible. Furthermore, the Thames Water asset plan suggests that the public sewers discharge into the Yeading Brook 40m west of the site anyway, hence proposing to discharge into the sewer which then flows into watercourse.
	6.	Discharge rainwater to a surface water sewer/drain	✓	Thames Water Asset Plan indicates two surface water sewers below Uxbridge Road. Outline strategy proposes a new connection to Manhole 7603, however a CCTV survey is recommended to determine if there is an existing outfall from the site, and if there is, this should be reused where possible (following attenuation on site).

	7.	Discharge rainwater to Combined Sewer	x	No combined sewers in vicinity of site. Following SuDS hierarchy, surface water sewer should be used rather than the foul sewer.
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7.16. On review of the SuDS drainage hierarchy, and with reference to both national and local policy, surface water generated from the proposed development could be managed via **on site** attenuation in the form of a below ground geocellular tank, with surface water discharging at a restricted rate of 1.0l/s to the nearby Thames Water surface water sewer south of the site subject to Thames Water approval. This outline strategy proposes a new connection to Manhole 7603, however a CCTV survey is recommended to determine if there is an existing outfall from the site, and if there is, this should be reused where possible (following attenuation on site).

InfoDrainage Modelling

7.17. A simplified surface water drainage model was built in InfoDrainage software (v 2021.7) which comprised of:

- 1 contributing catchment area across the proposed development area representing the total site roof area and hardstanding surface (0.03 hectares).
- 1 attenuation tank unit.
- 1 Hydrobrake flow control, limited to 1.0 l/s.

Table 6 Simulation Criteria

Total Catchment Area Simulation Parameters	
Rainfall Data	FSR
Area	0.03 Ha
M5-60	20.2mm
Ratio R	0.409
Return Periods	1, 30, 100, 100 +40% for Climate Change. Summer and Winter
Storm Durations	15, 30, 60, 120, 240, 360, 480, 960, 1140, 5760, 10080 minute
Volumetric Runoff Coefficient	0.90 (both summer and winter)
Percentage Impervious	100%
Time of Concentration	5 minutes

8. InfoDrainage Modelling Results

- 8.1. A simplified InfoDrainage model has been produced whereby the hardstanding area is applied as an inflow an upstream manhole the site, which flows into a below ground geocellular crate system (sized at 5x3x1.6m and 95% porosity), and then into a single Hydrobrake manhole which has a flow restriction of 1.0 l/s. Runoff would then be discharged into the adjacent Thames Water manhole ref 7603 at 1.0 l/s.
- 8.2. All pipes are modelled as 225mm diameter.
- 8.3. The full calculation outputs can be found in Appendix D of this report although the below sections summarise these outputs.

1 in 1 Year Storm Event

- 8.4. The results of the InfoDrainage simulations for the network show that during the 1 in 1 year storm event, the maximum predicted depth within the 1.6m deep tank is expected to reach 0.188m during the critical event period (240 minute - summer). The peak runoff rate discharging from the site through the Hydrobrake Manhole is modelled to be 0.7 l/s in this event. No flooding is observed in this event based on the InfoDrainage model.

1 in 30 Year Storm Event

- 8.5. The results of the InfoDrainage simulations for the network show that during the 1 in 30 year storm event, the maximum predicted depth within the 1.6m deep tank is expected to reach 0.420m during the critical event period (240 minute - summer). The peak runoff rate discharging from the site through the Hydrobrake Manhole is modelled to be 0.7 l/s in this event. No flooding is observed in this event based on the InfoDrainage model.

1 in 100 Year Storm Event

- 8.6. The results of the InfoDrainage simulations for the network show that during the 1 in 100 year storm event, the maximum predicted depth within the 1.6m deep tank is expected to reach 0.557m during the critical event period (240 minute - summer). The peak runoff rate discharging from the site through the Hydrobrake Manhole is modelled to be 0.8 l/s in this event. No flooding is observed in this event based on the InfoDrainage model.

1 in 100 Year Storm Event (plus 40% CC)

- 8.7. The results of the InfoDrainage simulations for the network show that during the 1 in 100 year +CC (40%) storm event, the maximum predicted depth within the 1.6m deep tank is expected to reach 0.811m during the critical event period (240 minute - summer). The peak runoff rate discharging from the site through the Hydrobrake Manhole is modelled to be 0.9 l/s in this event. No flooding is observed in this event based on the InfoDrainage model.
- 8.8. As such, these results indicate that the runoff from the proposed development could be accommodated within a drainage system of the approximate size modelled. As depths in the tank would not exceed 1.2m, the tank depth could be reduced at the detailed design stage in light of additional CCTV survey information regarding existing outfalls. The purpose of these calculations is to demonstrate that the proposed development can be accommodated while accounting for local SuDS policy. The calculations undertaken are therefore conservative. Full InfoDrainage results for all return periods and durations can be found in Appendix D.

Maintenance

8.10. Table 7 presents details regarding the maintenance requirements for the proposed SuDS included as part of the development, taken from the CIRIA C753 SuDS manual. Each manufacturer will have bespoke requirements however the below should be used as a guide:

Table 7 Maintenance Requirements for Attenuation Tanks

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any area that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/ rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/ check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Surface Water Drainage Arrangement

8.11. The proposed outline surface water drainage layout can be found in Appendix E of this report.

Designing for Exceedance

- 8.12. Periods of exceedance occur when the rate of surface water runoff exceeds the drainage system capacity. Conveyance beneath ground cannot, generally, be economically or sustainably constructed to the scale required for the most extreme rainfall events. This may result, on occasion, in the surface water runoff exceeding the capacity of the drainage network, with excess water (exceedance flow) being conveyed above ground.
- 8.13. For situations where extreme rainfall intensity exceeds inlet capacities, or for extreme storm events exceeding the design flood event considered for drainage design, the proposed site levels should direct surface water to the open area in the east of the site, which should be below the floor levels of the offices.

Water Quality

- 8.14. In order to protect the downstream receiving water body, a key element of SuDS is that they have the potential to improve the quality of surface water discharged from a site. In order to assess this, the "Pollution hazard indices for different land use classifications", provided in the CIRIA SuDS Manual (C753) as table 26.2, has been reviewed. The indices use four different methods of assessing pollution potential based on the hazard level, total suspended solids (TSS), Metals, and Hydrocarbons.
- 8.15. The Pollution Hazard Indices are summarised in Table 8 below (with reference to table 26.3 in the CIRIA SuDS manual).

Table 8 Pollutant Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other roofs (commercial)	Low	0.3	0.2	0.05
Standard to be achieved	Low	0.3	0.2	0.05

- 8.16. Runoff from commercial (office) roofs is generally considered low contamination risk and does not usually warrant any significant treatment. All downpipes should be fitted with silt traps to negate debris build up in the below ground network.
- 8.17. The external area will not be trafficked so should also be low contamination risk. To negate the potential risk of pollutants from the adjacent highway entering the drainage system, oil interceptors should be installed upstream of the geocellular tank where possible.

9. Conclusions

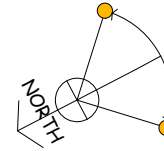
- 9.1. This FRA and SWDS has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 65 Delamere Road, Hayes, Hillingdon, London, UB4 0NN. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 9.2. The FRA and SWDS supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.

Source of Flooding	Flood Risk Summary
Fluvial (and Canals)	Analysis within this report has indicated that the site would remain unaffected in the modelled 1:100 year +CC (20%) fluvial event. While the site is within the 1:1000 year fluvial modelled flood extent, the site is on land above the modelled flood level and thus the site may also remain unaffected in this event. As such, the risk of flooding from fluvial sources is considered low.
Pluvial	The site is outside the modelled 1:1000 year pluvial extent and the risk of pluvial flooding to the proposed development is considered low.
Reservoirs Groundwater Sewers	The site is considered to be at low risk from other sources.

- 9.3. On review of the SuDS drainage hierarchy, and with reference to both national and local policy, surface water generated from the proposed development could be managed via on site attenuation in the form of a below ground geocellular tank, with surface water discharging at a restricted rate of 1.0l/s to the nearby Thames Water surface water sewer south of the site subject to Thames Water approval. This outline strategy proposes a new connection to Manhole 7603, however a CCTV survey is recommended to determine if there is an existing outfall from the site, and if there is, this should be reused where possible (following attenuation on site).

- 9.4. This Flood Risk Assessment and Surface Water Drainage Strategy should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals



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65 DELAMERE ROAD, HAYES. UB4 0NN
EXISTING SITE LOCATION PLAN - 65DELAMERE/PL01A

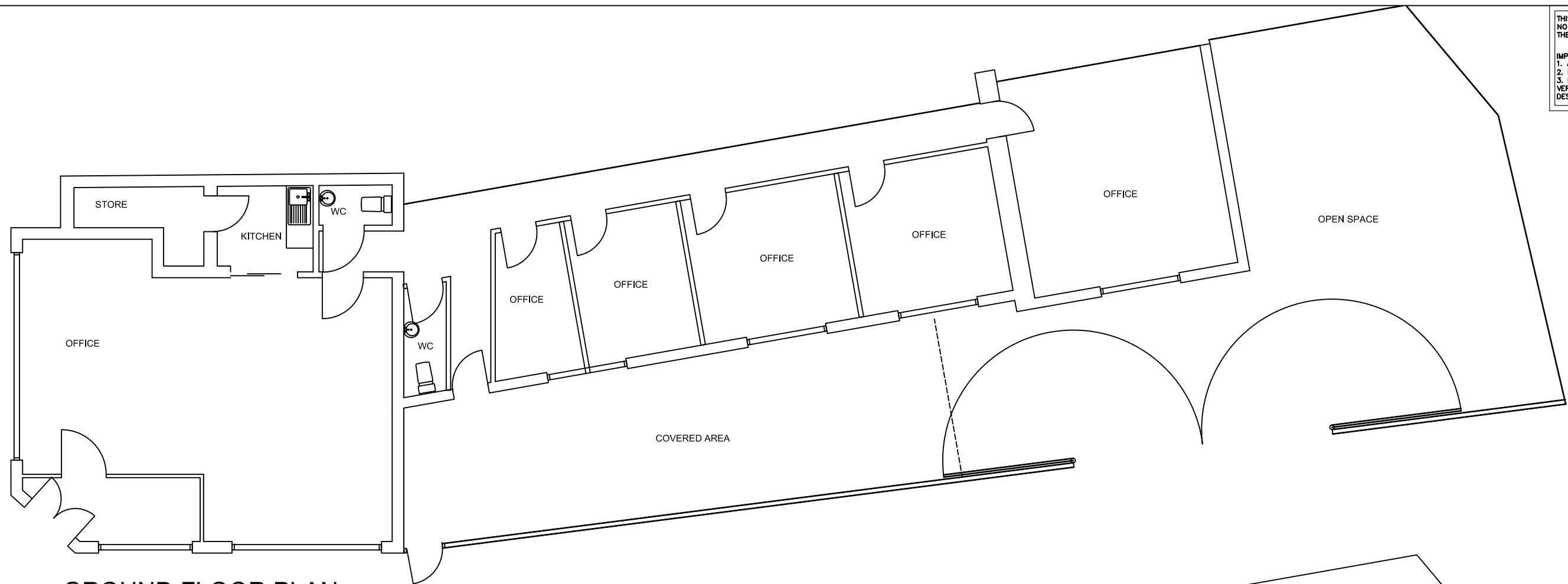


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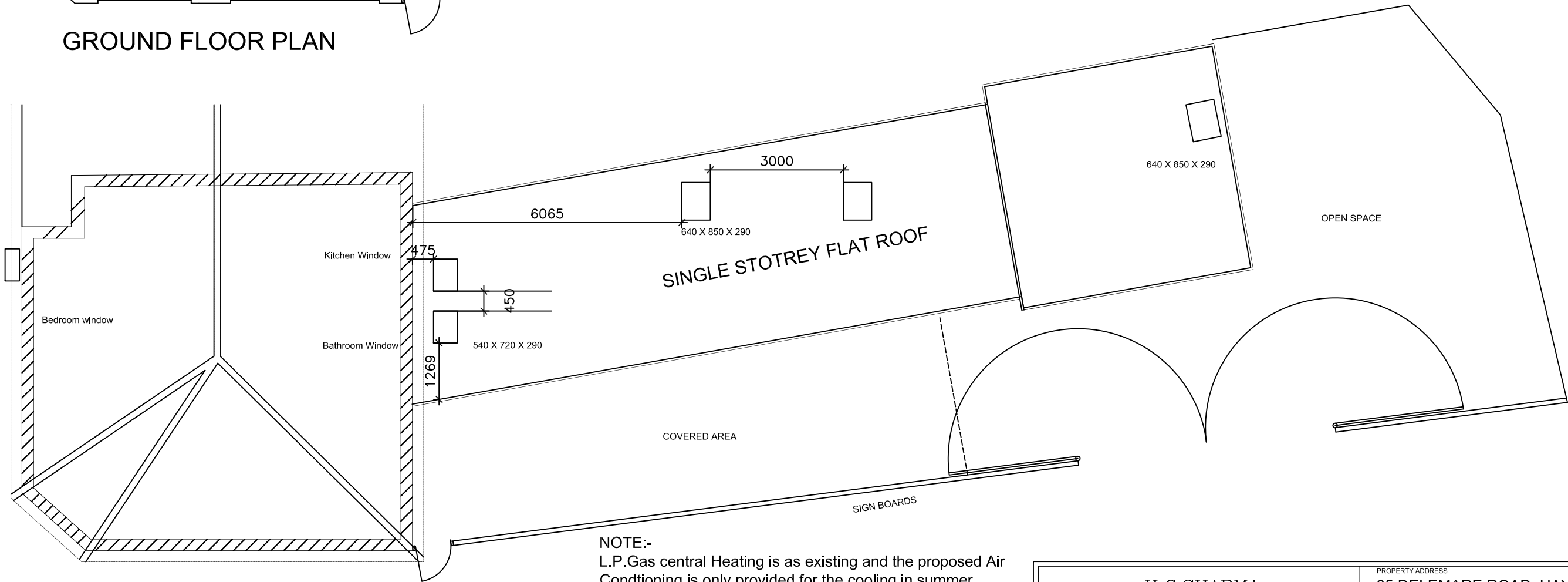
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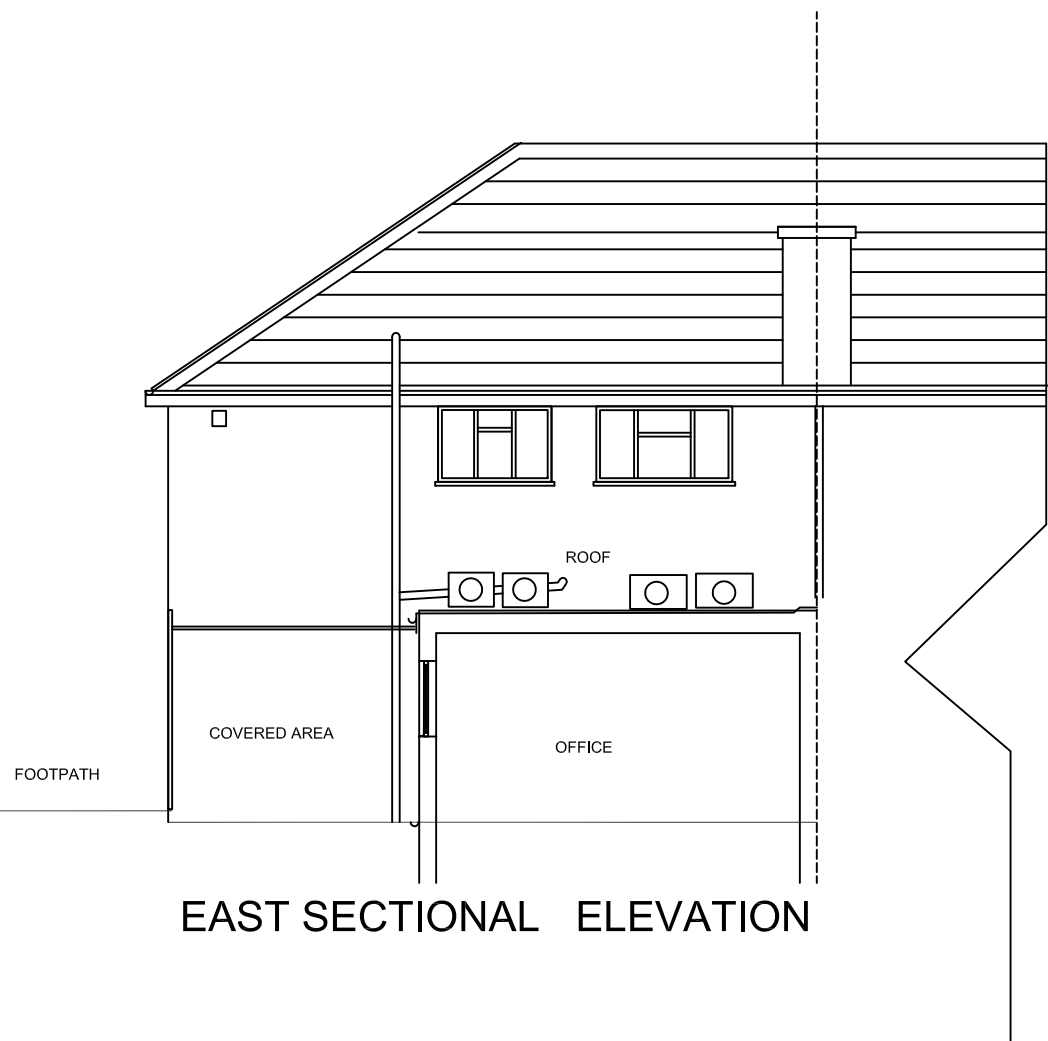
GROUND FLOOR PLAN



ROOF PLAN

NOTE:-
L.P.Gas central Heating is as existing and the proposed Air
Conditioning is only provided for the cooling in summer.
This is only operational in Office hours.

PROPERTY ADDRESS			
65 DELEMARE ROAD, HAYES, UB4 0NN			
TITLE			
OFFICE BUILDING AIR CONDITIONING		PLAN AS EXISTING	
DATE	SCALE	DRAWING No.	REV.
May-2008	1:100	DA-2008-01	—

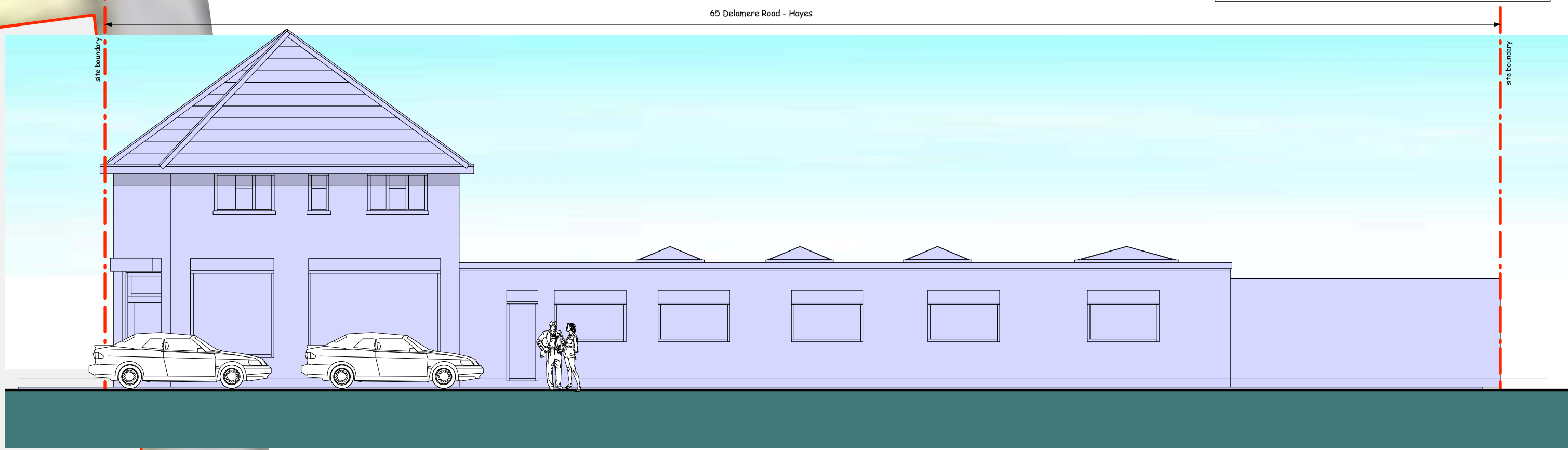


EAST SECTIONAL ELEVATION

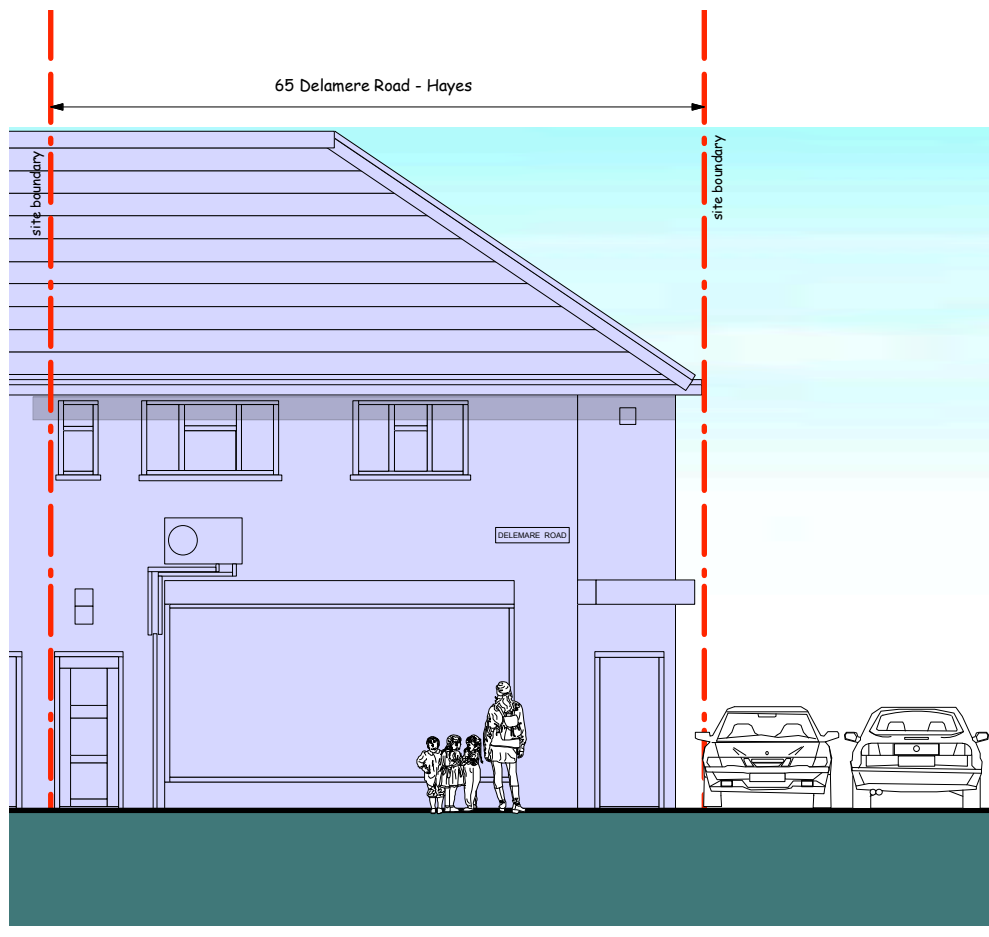


WEST ELEVATION

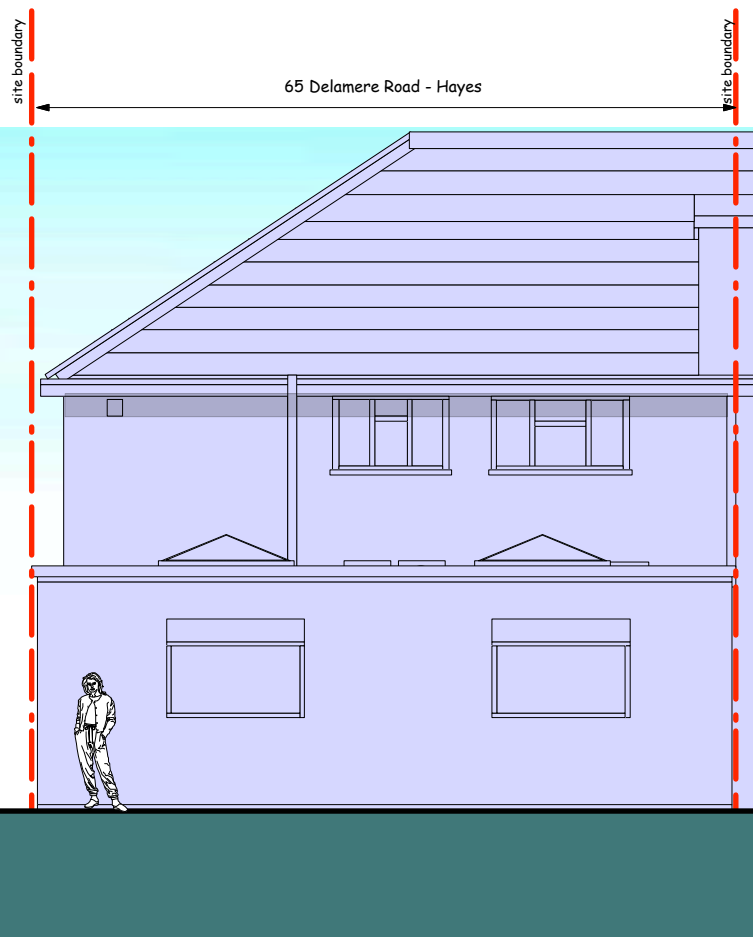
H.C.SHARMA Chartered Architect 15 MORLAND GARDENS, SOUTHALL, MIDDX UB1 3DY Tel: 0790 999 5765 Fax: 020 8571 3550		PROPERTY ADDRESS 65 DELEMARE ROAD, HAYES, UB4 0NN	
		TITLE OFFICE BUILDING AIR CONDITIONING	PLAN AS EXISTING- WEST & EAST
DATE May-2008	SCALE 1:100	DRAWING No. DA-2008-02	REV. —



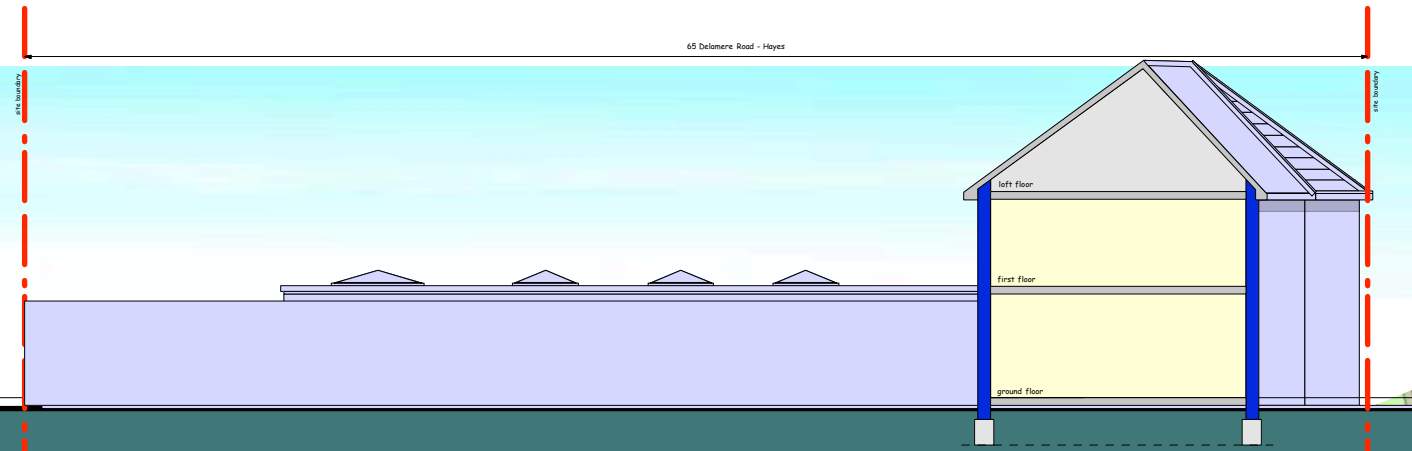
PROPOSED SIDE ELEVATION B
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PROPOSED FRONT ELEVATION A
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PROPOSED REAR ELEVATION C
scale:- 1:100@A1



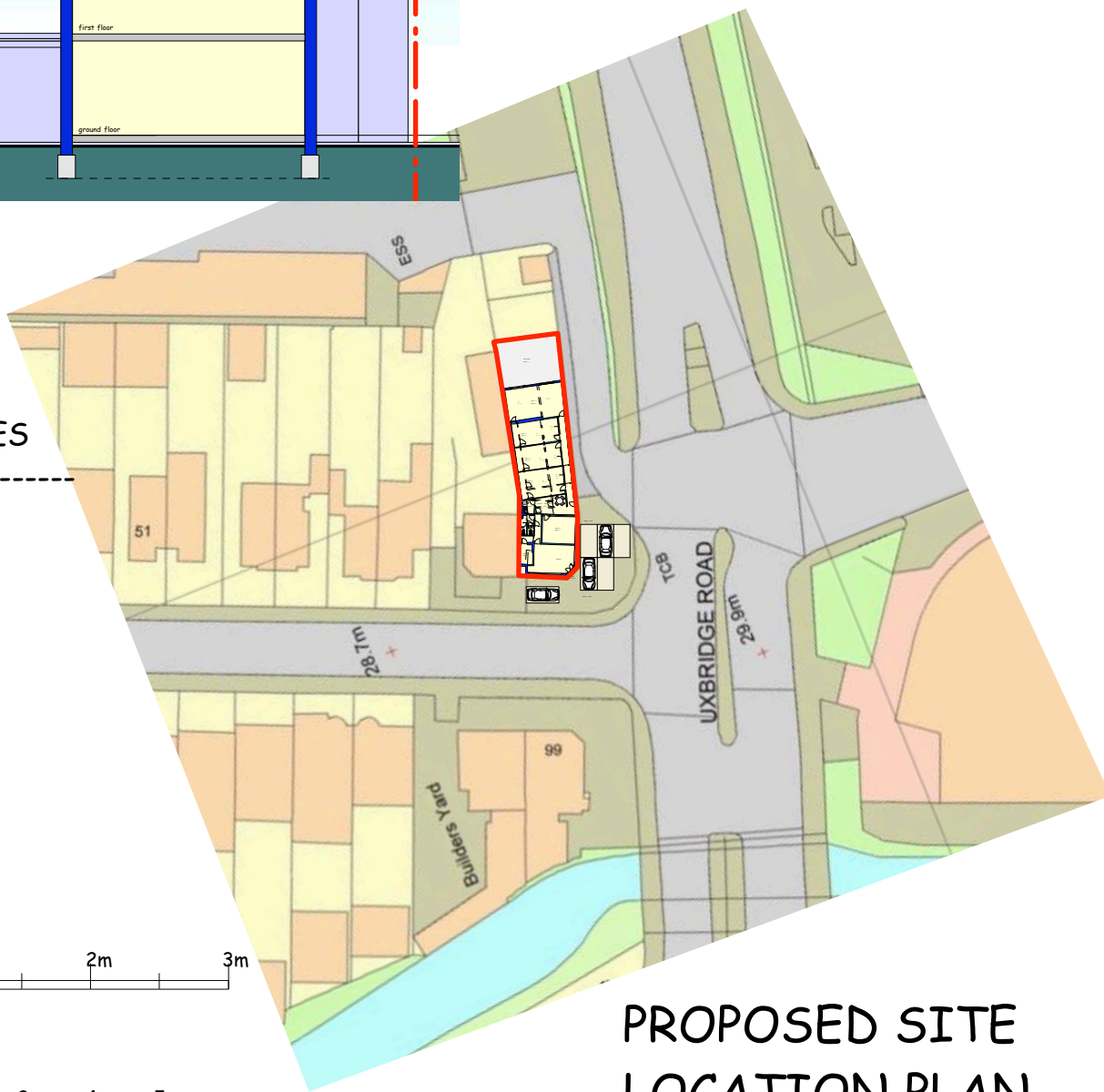
PROPOSED SIDE / SECTION
ELEVATION D
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Site Area:- (approx) - 300sq.m/3,229sq.ft 0.074 ACRES

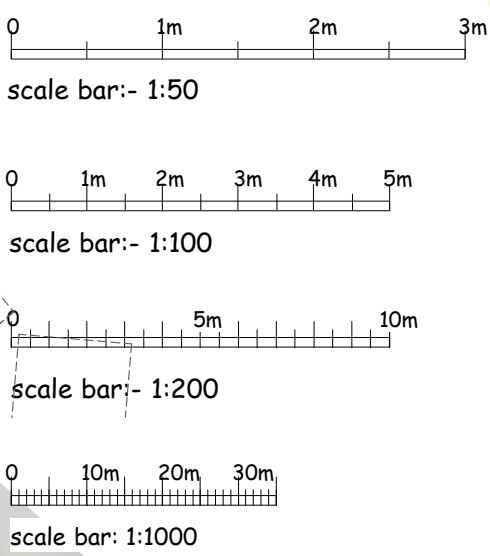
ACCOMMODATION TO SITE:-

loft floor:- 00sq.m
first floor:- 00sq.m
ground floor:- 214sq.m
TOTAL:- 214sq.m/2,303sq.ft

Parking onsite: 6 bay
amenity/yard space:- 62sq.m

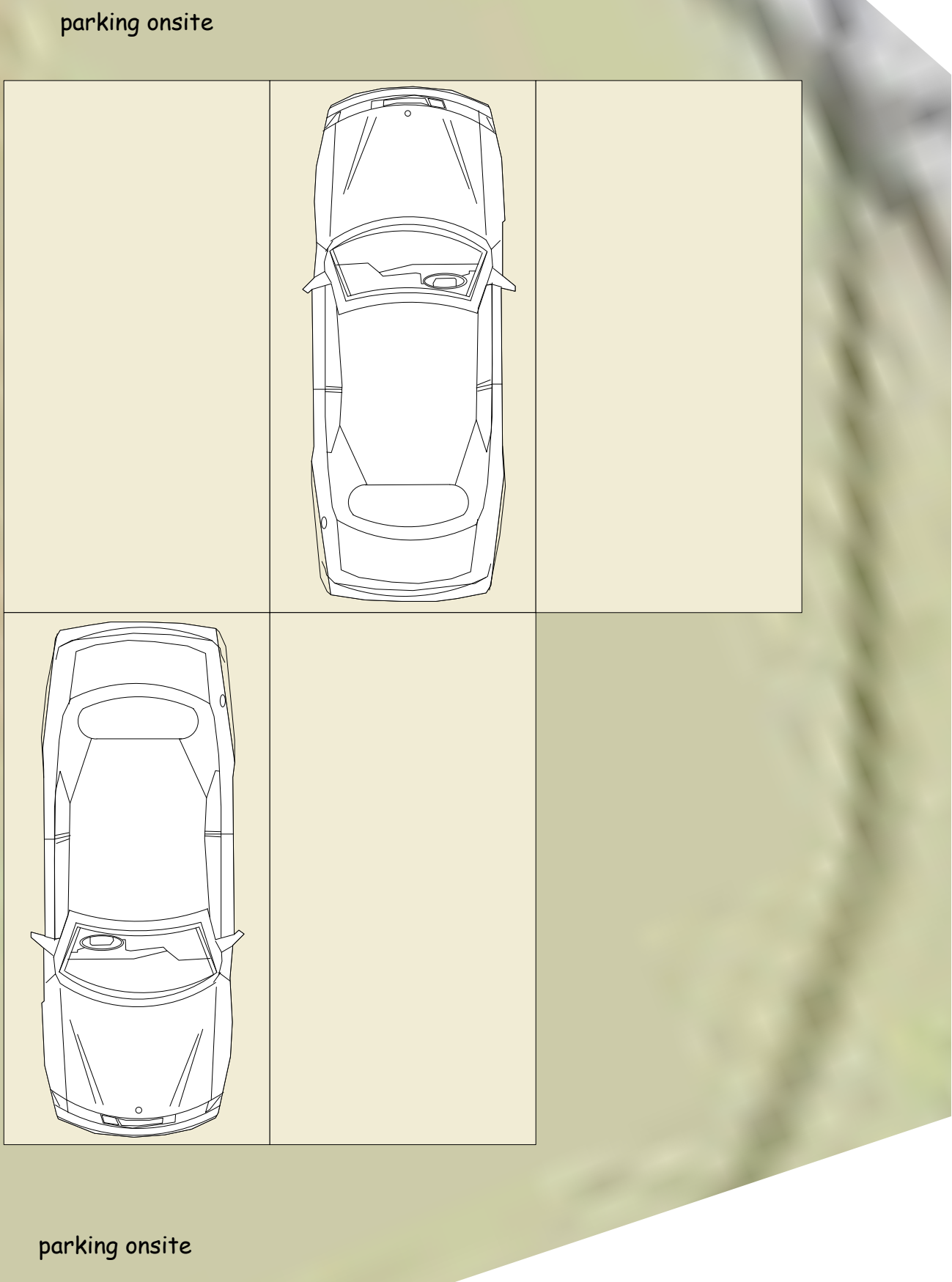


PROPOSED SITE
LOCATION PLAN
scale:- 1:1000@A1



proposed side/
section
elevation B

proposed side
elevation B



PROPOSED SITE / GROUND PLAN
scale:- 1:500@A1

65 DELAMERE ROAD, HAYES. UB4 0NN
PROPOSED INFORMATION

WALL CONSTRUCTION

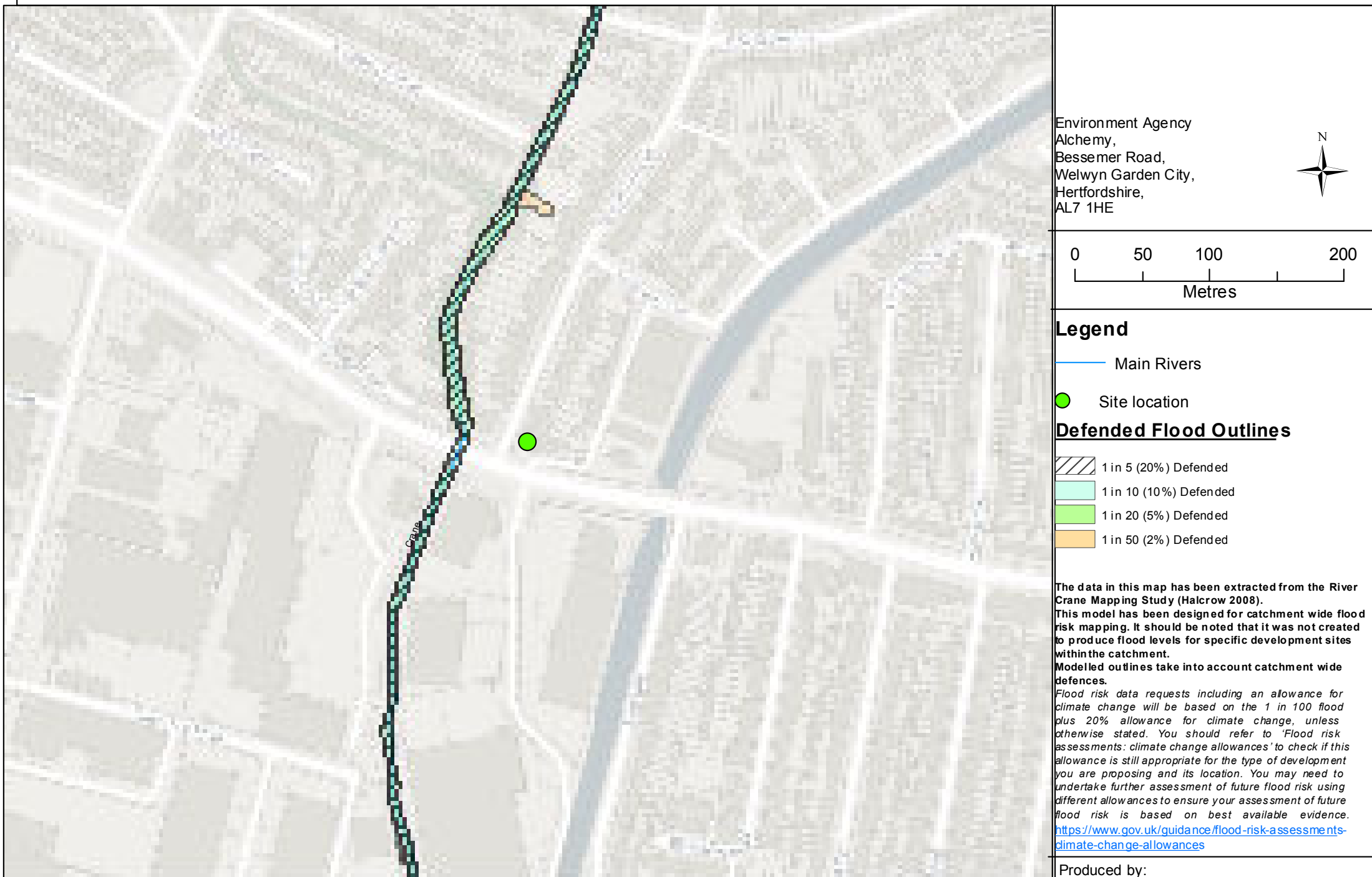
- existing wall
- proposed wall

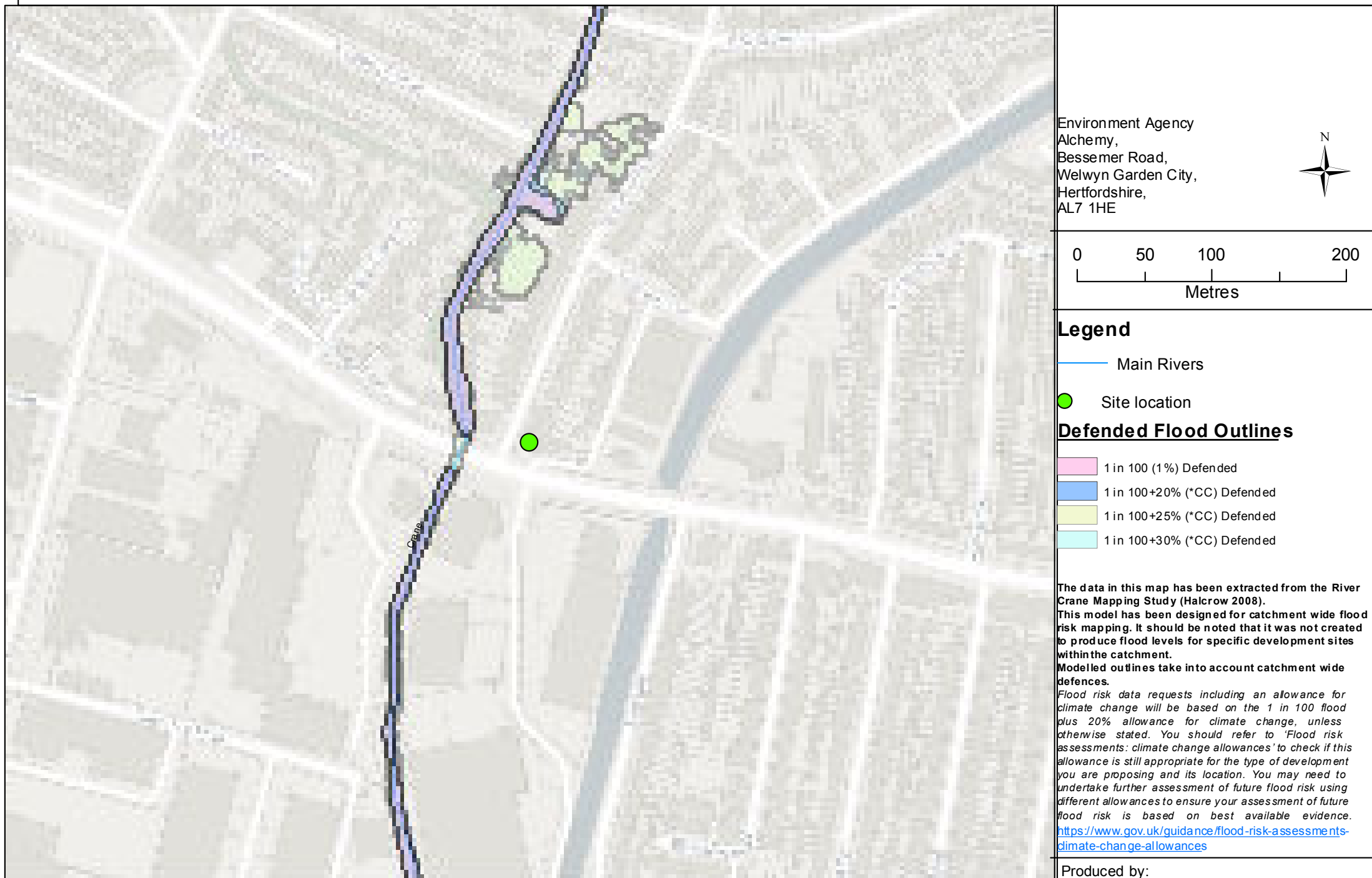
REV.	DATE	DESCRIPTION
------	------	-------------

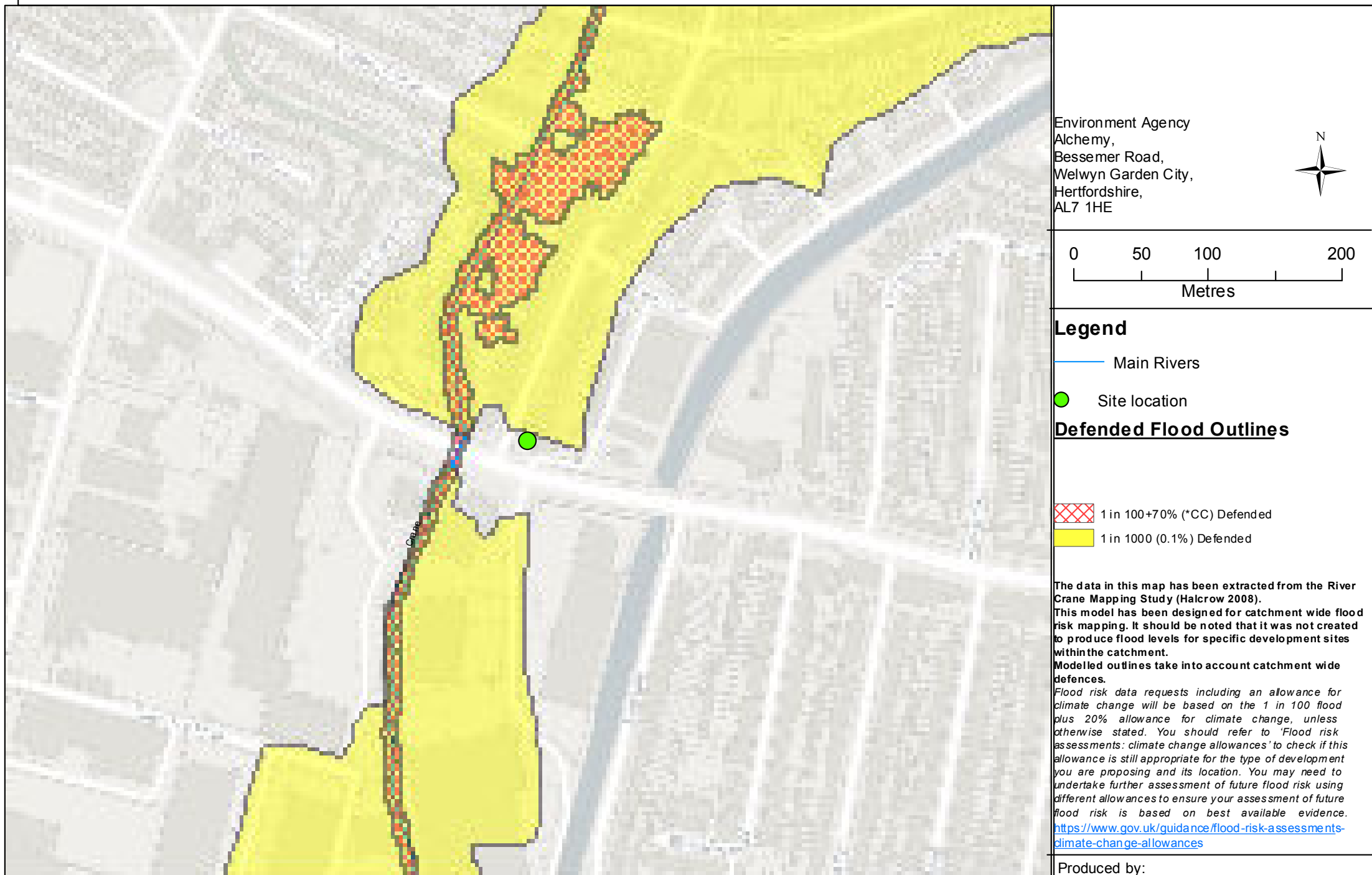


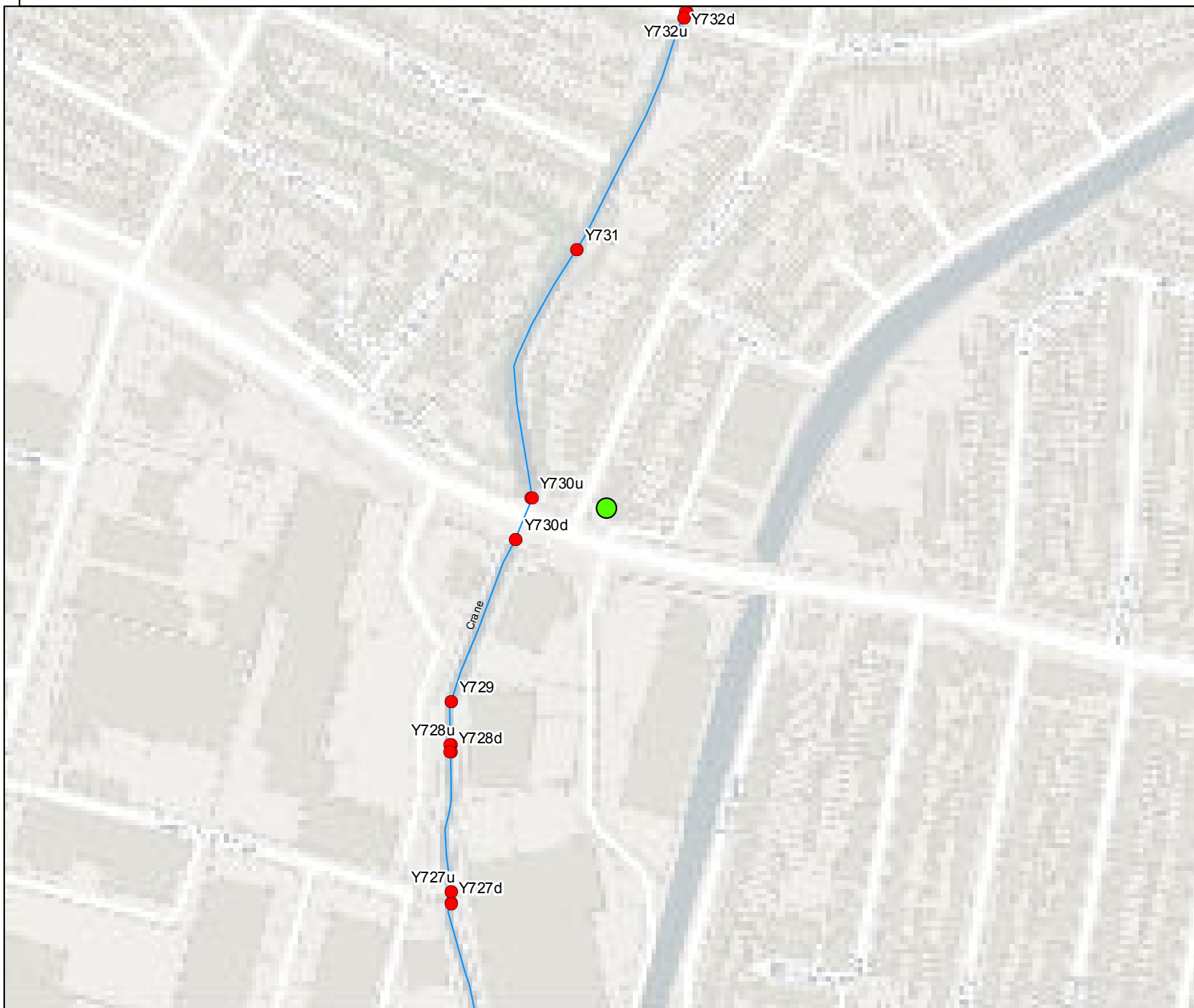
PROJECT	65 DELAMERE ROAD, HAYES. UB4 0NN
DRAWING	PROPOSED INFORMATION
CLIENT	
SCALE	1:50/1:100/1:200/1:1000 @ A1
DATE	MARCH/2018
DRAWING No	65DELAMERE/PL03A
© copyright retained	

Appendix B – EA Data

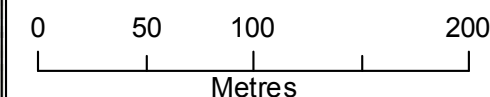








Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE



Legend

— Main Rivers

● Site location

1D Node Results

● Node Results

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008). This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment.

Modelled outlines take into account catchment wide defences.

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

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

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

Environment Agency ref: HNL252413BC

The following information has been extracted from the River Crane Mapping Study (Halcrow 2008)

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

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

Caution:

The modelled flood levels and extents are appropriate for catchment wide strategic flood risk mapping. However, for more detailed flood risk assessment it is recommended that each of the underlying flood mapping, hydraulic modelling and hydrological assumptions are re-evaluated to determine the appropriateness in a more detailed analysis.

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

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

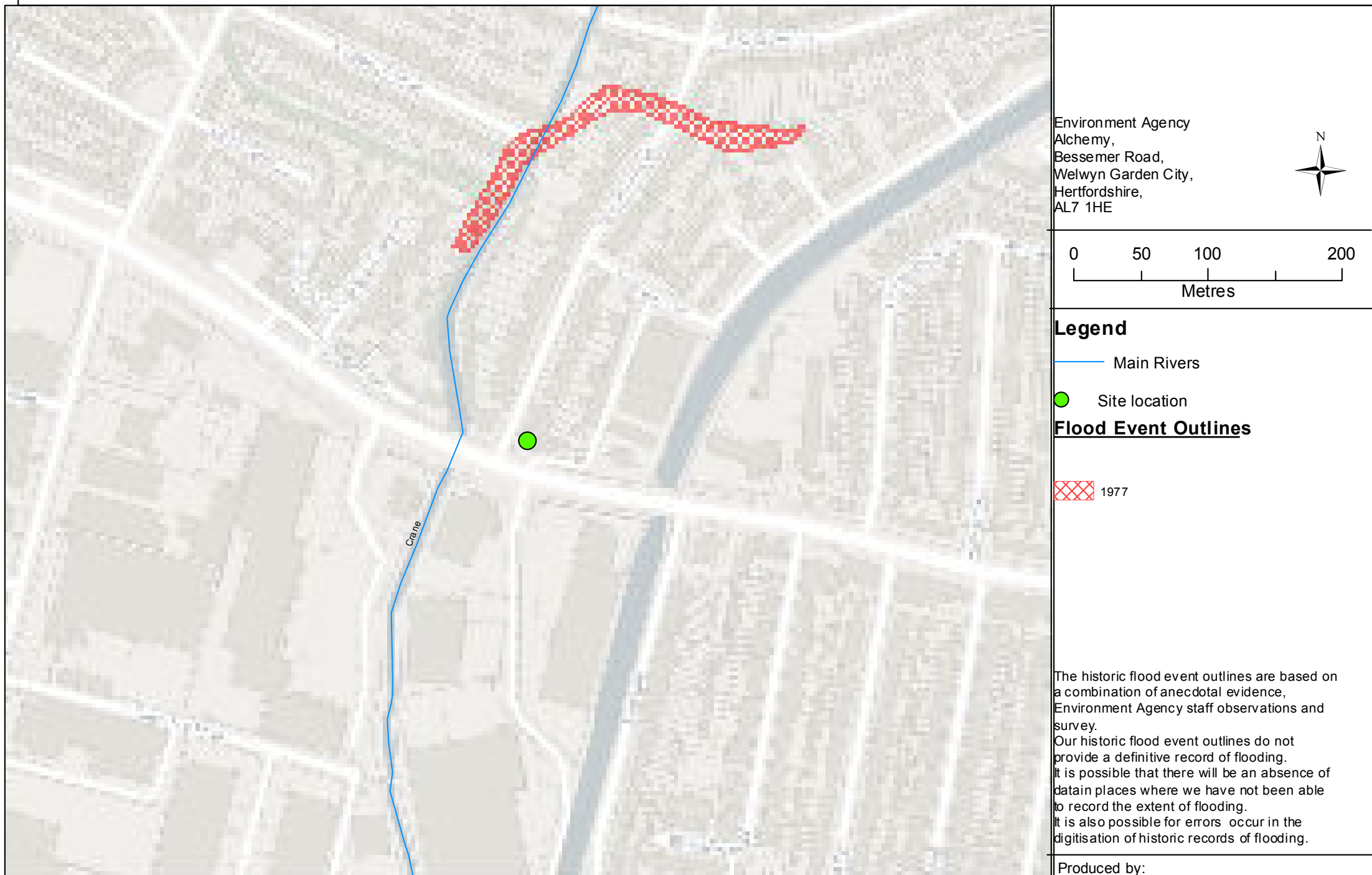
MODELLED FLOOD LEVEL

			Return Period									
Node Label	Easting	Northing	5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
Y732u	511735	180957	27.90	27.93	27.97	28.05	28.10	28.19	28.21	28.25	28.36	29.38
Y732d	511734	180955	27.88	27.91	27.95	28.03	28.08	28.16	28.18	28.22	28.33	29.27
Y731	511669	180803	27.74	27.78	27.82	27.90	27.96	28.06	28.08	28.12	28.25	29.26
Y730u	511638	180644	27.61	27.65	27.70	27.79	27.85	27.95	27.97	28.01	28.15	29.19
Y730d	511629	180617	27.58	27.62	27.67	27.76	27.82	27.92	27.94	27.98	28.12	29.11
Y729	511601	180509	27.45	27.49	27.54	27.63	27.70	27.79	27.82	27.86	28.03	29.13
Y728u	511587	180483	27.47	27.51	27.56	27.65	27.72	27.81	27.84	27.88	28.05	29.13
Y728d	511587	180482	27.46	27.51	27.56	27.65	27.71	27.81	27.83	27.87	28.04	29.12
Y727u	511587	180388	27.40	27.44	27.49	27.58	27.64	27.74	27.76	27.81	27.99	29.11
Y727d	511586	180384	27.37	27.42	27.46	27.55	27.61	27.70	27.73	27.77	27.95	29.11

MODELLED FLOWS

			Return Period									
Node Label	Easting	Northing	5 yr	10 yr	20 yr	50 yr	100 yr	100yr + 20%	100yr + 25%	100yr + 35%	100yr + 70%	1000yr
Y732u	511735	180957	7.64	7.91	8.22	8.76	9.16	9.80	9.96	10.24	11.11	24.70
Y732d	511734	180955	7.64	7.91	8.22	8.76	9.16	9.80	9.96	10.24	11.11	24.70
Y731	511669	180803	7.64	7.92	8.23	8.76	9.16	9.78	9.92	10.18	10.97	24.46
Y730u	511638	180644	7.76	8.06	8.40	9.01	9.46	10.17	10.33	10.62	11.51	24.37
Y730d	511629	180617	7.76	8.06	8.40	9.01	9.46	10.17	10.33	10.62	11.51	24.37
Y729	511601	180509	7.97	8.32	8.70	9.43	9.98	10.83	11.03	11.39	12.50	24.31
Y728u	511587	180483	7.97	8.32	8.70	9.43	9.97	10.83	11.03	11.39	12.49	24.27
Y728d	511587	180482	7.97	8.32	8.70	9.43	9.97	10.83	11.03	11.39	12.49	24.27
Y727u	511587	180388	7.97	8.32	8.70	9.43	9.97	10.82	11.01	11.37	12.46	24.13
Y727d	511586	180384	7.97	8.32	8.70	9.43	9.97	10.82	11.01	11.37	12.46	24.13

Historic Flood Map centred on: 65 Delamere Road, Hayes, Hillingdon, London, UB4 0NN -01/03/2022 - HNL252413BC



Appendix C – Thames Water Information

Asset location search



Property Searches

Aegaea
66 Swaledale Road
WARMINSTER
BA12 8FJ

Search address supplied Arora & Co
65
Delamere Road
Hayes
UB4 0NN

Your reference 383

Our reference ALS/ALS Standard/2022_4600323

Search date 4 March 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



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



0800 009 4540

Search address supplied: Arora & Co, 65, Delamere Road, Hayes, UB4 0NN

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

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

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ
Tel: 0345 3572401



For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

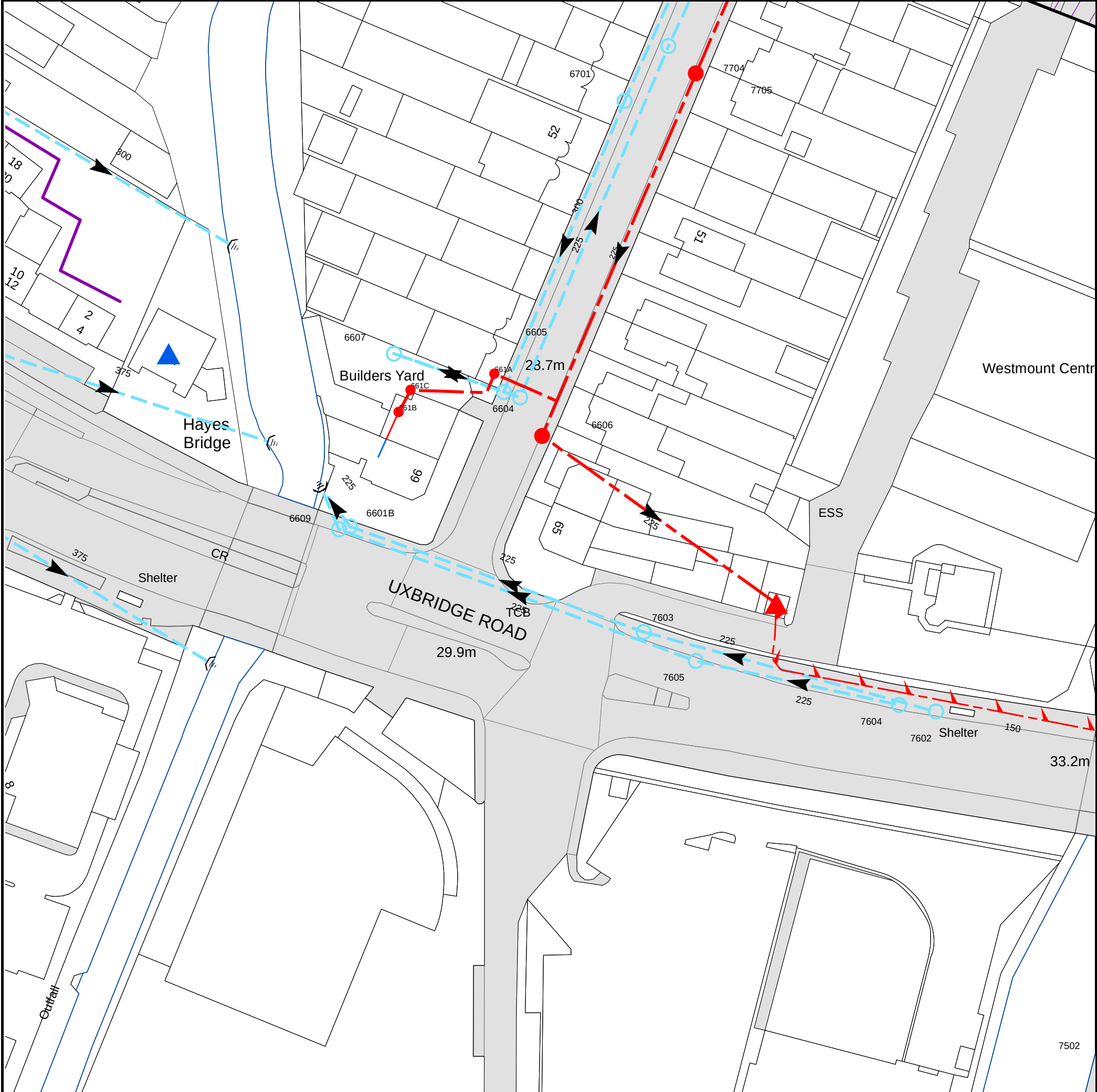
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



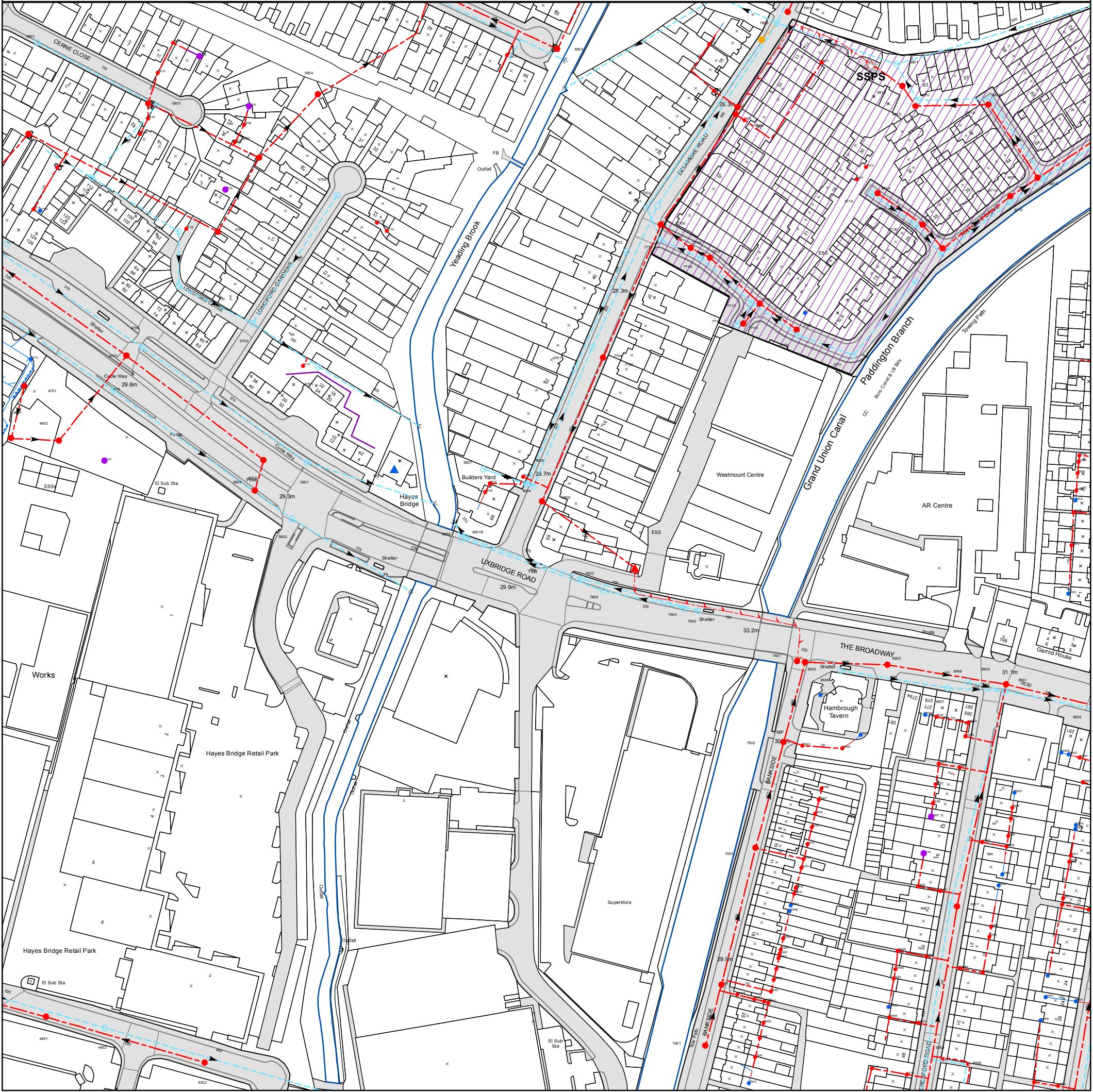
The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 511684,180635

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
6609	n/a	n/a
6601B	29.77	27.93
6607	n/a	n/a
661B	n/a	n/a
661C	n/a	n/a
661A	n/a	n/a
6605	n/a	n/a
6604	n/a	n/a
6606	n/a	n/a
6701	n/a	n/a
7603	30.69	28.51
7704	n/a	n/a
7605	n/a	n/a
7705	n/a	n/a
7602	32.5	29.82
7604	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.		



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: 1:1790
Width: 500m
Printed By: Rveldhur
Print Date: 04/03/2022
Map Centre: 511684,180634
Grid Reference: TQ1180NE

Comments:

ALS/ALS Standard/2022_4600323

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

REFERENCE	COVER LEVEL	INVERT LEVEL
781B		
4703	29.72	25.42
5601		
4810		
5703	29.47	28.25
5705		
5604		
5803	30.31	29.34
4601		
5602		
4706	29.97	27.73
7703		
6609		
7701		
6701		
7702		
601B	29.77	27.93
5701		
7602	32.5	29.82
7605		
6605		
7704		
7806		
84WD		
84WK		
84WZ		
581A		
6803		
85WE		
85XF		
471C		
871B		
881D		
771D		
981C		
871C		
871J		
771A		
881B		
771B		
771G		
771C		
771H		
871G		
461A		
571A		
581E		
5802	30.36	28.71
681C		
671A		
581D		
881F		
841B		
881H		
74WS		
74WL		
74WH		
74WM		
84HC		
96WJ		
96WH		
96WC		
96WB		
85WZ		
85WA		
85HE		
74WU		
74WW		
74WD		
74WI		
74WP		
74WN		
73WC		
7401	29.88	28.44
7403	29.94	28.15
84HL		
84WI		
84WQ		
84WY		
85XE		
95WS		

REFERENCE	COVER LEVEL	INVERT LEVEL
781A	28.32	26.97
4803	30.92	29.93
5603		
4602		
5704		
5702	29.37	27.97
5801		
5302		
4401	39.78	36.81
4801		
6607		
7801	28.34	26.67
7803	28.6	
6606		
7603	30.69	28.51
7604		
5706	29.68	28.75
5804		
7706		
7705		
6604		
8801	28.63	26.4
681A		
84WL		
84WE		
581C		
581B		
85WD		
85WG		
4701		
871A		
871D		
881E		
981F		
871H		
7710		
871F		
881A		
7707		
771E		
871I		
881C		
771F		
871E		
571B		
4402	29.31	27.51
581F		
581G		
471M		
671B		
481B		
881G		
841C		
4702	29.74	27.73
74WQ		
74WG		
73HF		
84WT		
96WG		
96WI		
96WE		
96WD		
85WB		
85WN		
85WF		
85HD		
74WX		
84WV		
74WE		
74WK		
74WO		
74WR		
7502		
7402	29.87	28.29
84WJ		
84HK		
84WH		
84WB		
85WI		
85ZF		
95WW		

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

ALS/ALS Standard/2022_4600323

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

REFERENCE	COVER LEVEL	INVERT LEVEL
94XV		
94WT		
94W3		
94W6		
93W4		
85AB		
95WE		
95WF		
8505	31.15	28.49
8507	31.325	29.705
8401	31.07	28.19
8305		
8506	31.11	
7501	33.18	31.12
85WC		
83WX		
94WW		
871K		
831S		
661B		
661A		
471A		
781E		
84WC		
471O		

REFERENCE	COVER LEVEL	INVERT LEVEL
94WU		
94WO		
94W1		
93W5		
83WZ		
85AA		
95WG		
95WA		
8501	31.18	27.85
8403	31.087	28.597
8503	33.06	29.01
8508	32.66	31.35
8306		
8502	31.77	28.92
841A		
571C		
94WM		
851V		
831T		
661C		
481C		
84WA		
83WY		
781F		



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

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.

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	

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.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0800 009 4540 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix D – InfoDrainage Calculations

UK and Ireland Rural Runoff Calculator

ICP SUDS / IH 124 ADAS 345 FEH ReFH2 Greenfield Volume

Method: ☒ ICP SUDS ☐ IH 124

Area (ha):

SAAR (mm):

Soil:

Region:

Additional Options

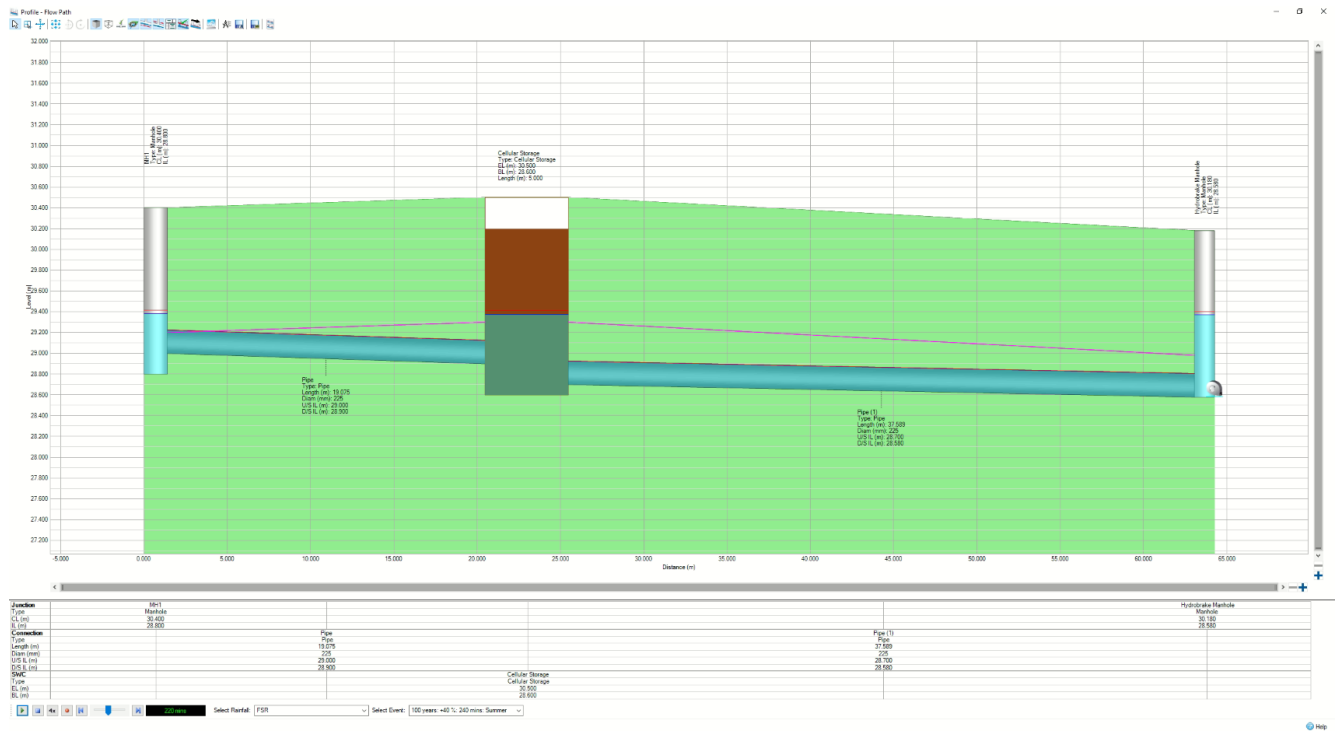
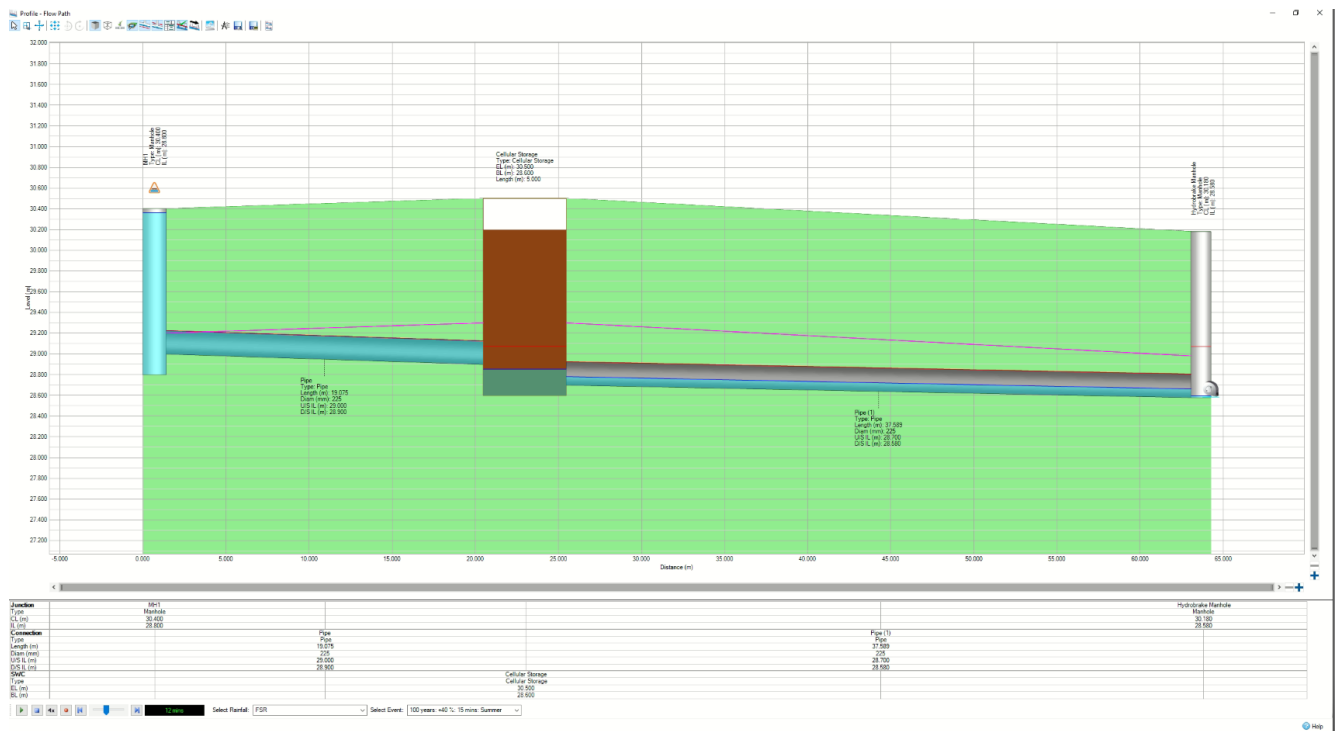
Urban:

Return Period (years):

Growth Curve:

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 100 (years) (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 6	0.0	0.0	0.2	0.0	0.1	0.2



Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Inflows Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
Company Address:				



Catchment Area

Type : Catchment Area

Area (ha)	0.03
-----------	------

Preliminary Sizing

Volumetric Runoff Coefficient	0.900
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Junctions Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			

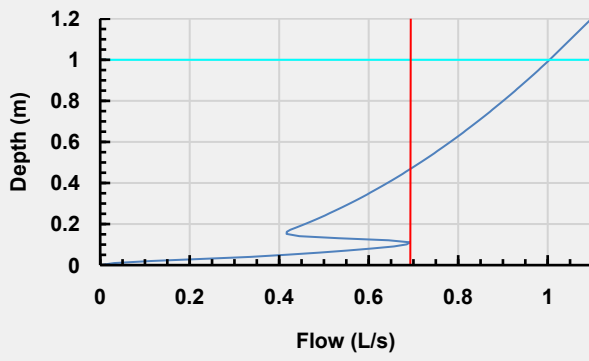
Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)
Hydrobrake Manhole	Manhole	208576.304	601477.148	30.180	1.600
MH1	Manhole	208571.599	601533.613	30.400	1.600

Name	Invert Level (m)	Chamber Shape	Diameter (m)	Manhole Locked
Hydrobrake Manhole	28.580	Circular	1.200	☐
MH1	28.800	Circular	1.400	☐

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
Hydrobrake Manhole	Inlet	Pipe (1)	(None)	No Restriction
MH1	Inlet	Catchment Area	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Hydrobrake Manhole	Outlet	(None)	Hydro-Brake®
	Invert Level (m)	28.580	
	Design Depth (m)	1.000	
	Design Flow (L/s)	1.0	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0045-1000-1000-1000	
			
MH1	Outlet	Pipe	Free Discharge

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
	Company Address:			



Cellular Storage

Type : Cellular Storage

Dimensions

Exceedence Level (m)	30.500
Depth (m)	1.600
Base Level (m)	28.600
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	5
Crate Width (m)	3
Crate Height (m)	1.6
Total Volume (m³)	23.100

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Free Discharge

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Inflow Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	MH1		Time of Concentration	0.03	100	0	100	0.03
TOTAL		0.0		0.03				0.03

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Title: UK and Ireland Rural Runoff Calculator	Designed by: NDD		Checked by:	Approved By:
Company Address:				

ICP SUDS / IH 124

Details

Method	ICP SUDS
Area (ha)	0.03
SAAR (mm)	641.0
Soil	0.3
Region	Region 6
Urban	0
Return Period (years)	100

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 100 (years) (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 6	0.0	0.0	0.2	0.0	0.1	0.2

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Inflows Summary Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
	Company Address:			



FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	FSR: 1 years: +0 %: 15 mins: Summer	0.03	4.9	2.129

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Inflows Summary Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
	Company Address:			



FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	FSR: 30 years: +0 %: 15 mins: Summer	0.03	12.1	5.226

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Inflows Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	FSR: 100 years: +0 %: 15 mins: Summer	0.03	15.7	6.787

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Inflows Summary Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
	Company Address:			



FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	FSR: 100 years: +40 %: 15 mins: Summer	0.03	21.9	9.500

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Junctions Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Hydrobrake Manhole	FSR: 1 years: +0 %: 240 mins: Summer	30.18 0	28.58 0	28.688	0.108	1.0	0.122	0.000	0.7	3.342	OK
MH1	FSR: 1 years: +0 %: 30 mins: Summer	30.40 0	28.80 0	29.183	0.383	4.4	0.590	0.000	3.3	2.377	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Junctions Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Hydrobrake Manhole	FSR: 30 years: +0 %: 240 mins: Summer	30.18 0	28.58 0	29.015	0.435	2.2	0.492	0.000	0.7	9.694	OK
MH1	FSR: 30 years: +0 %: 15 mins: Summer	30.40 0	28.80 0	29.449	0.649	12.1	0.998	0.000	9.4	4.700	Surcharged

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022			
Report Details: Type: Junctions Summary Storm Phase: Phase	Designed by: NDD	Checked by:	Approved By:	
Company Address:				



FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Hydrobrake Manhole	FSR: 100 years: +0 %: 240 mins: Summer	30.18 0	28.58 0	29.150	0.570	2.1	0.645	0.000	0.8	13.139	OK
MH1	FSR: 100 years: +0 %: 15 mins: Summer	30.40 0	28.80 0	29.762	0.962	15.7	1.480	0.000	11.8	6.234	Surcharged

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Junctions Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Hydrobrake Manhole	FSR: 100 years: +40 %: 240 mins: Summer	30.18 0	28.58 0	29.403	0.823	1.9	0.930	0.000	0.9	17.264	OK
MH1	FSR: 100 years: +40 %: 15 mins: Summer	30.40 0	28.80 0	30.366	1.566	21.9	2.410	0.000	16.0	8.434	Flood Risk

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: NDD	Checked by:	Approved By:	
		Company Address:			



FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Cellular Storage	FSR: 1 years: +0 %: 240 mins: Summer	28.788	28.788	0.188	0.188	1.3	2.677	0.000	0.000	1.0	3.369	47	88	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: NDD	Checked by:	Approved By:	
		Company Address:			



FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Cellular Storage	FSR: 30 years: +0 %: 240 mins: Summer	29.020	29.020	0.420	0.420	3.1	5.984	0.000	0.000	2.2	9.722	28	74	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: NDD	Checked by:	Approved By:	
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Cellular Storage	FSR: 100 years: +0 %: 240 mins: Summer	29.157	29.157	0.557	0.557	4.1	7.931	0.000	0.000	2.1	13.184	44	66	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)	Status
Cellular Storage	FSR: 100 years: +40 %: 240 mins: Summer	29.411	29.411	0.811	0.811	5.7	11.562	0.000	0.000	1.9	18.258	67	50	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Connections Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 1 years: +0 %: 30 mins: Summer	Pipe	MH1	Cellular Storage	30.4	29.183	0.115	2.377	0.2	0.79	3.3	OK
Pipe (1)	FSR: 1 years: +0 %: 240 mins: Summer	Pipe	Cellular Storage	Hydrobrake Manhole	30.5	28.788	0.090	3.369	0.1	0.3	1.0	OK

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Connections Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	MH1	Cellular Storage	30.4	29.449	0.225	4.700	0.2	2.22	9.4	Surcharged
Pipe (1)	FSR: 30 years: +0 %: 60 mins: Summer	Pipe	Cellular Storage	Hydrobrake Manhole	30.5	28.978	0.225	4.151	0.1	1.14	3.8	Surcharged

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Connections Summary Storm Phase: Phase		Designed by: NDD	Checked by:	Approved By:	
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +0 %: 15 mins: Summer	Pipe	MH1	Cellular Storage	30.4	29.762	0.225	6.234	0.3	2.8	11.8	Surcharged
Pipe (1)	FSR: 100 years: +0 %: 30 mins: Summer	Pipe	Cellular Storage	Hydrobrake Manhole	30.5	29.032	0.225	2.749	0.1	1.44	4.7	Surcharged

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN		Date: 29/03/2022			
Report Details: Type: Connections Summary Storm Phase: Phase		Designed by: NDD	Checked by:		Approved By:
		Company Address:			



FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	MH1	Cellular Storage	30.4	30.366	0.225	8.434	0.4	3.78	16.0	Flood Risk
Pipe (1)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	Cellular Storage	Hydrobrake Manhole	30.5	29.074	0.225	1.927	0.1	1.61	5.3	Surcharged

Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022		
	Designed by: NDD	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



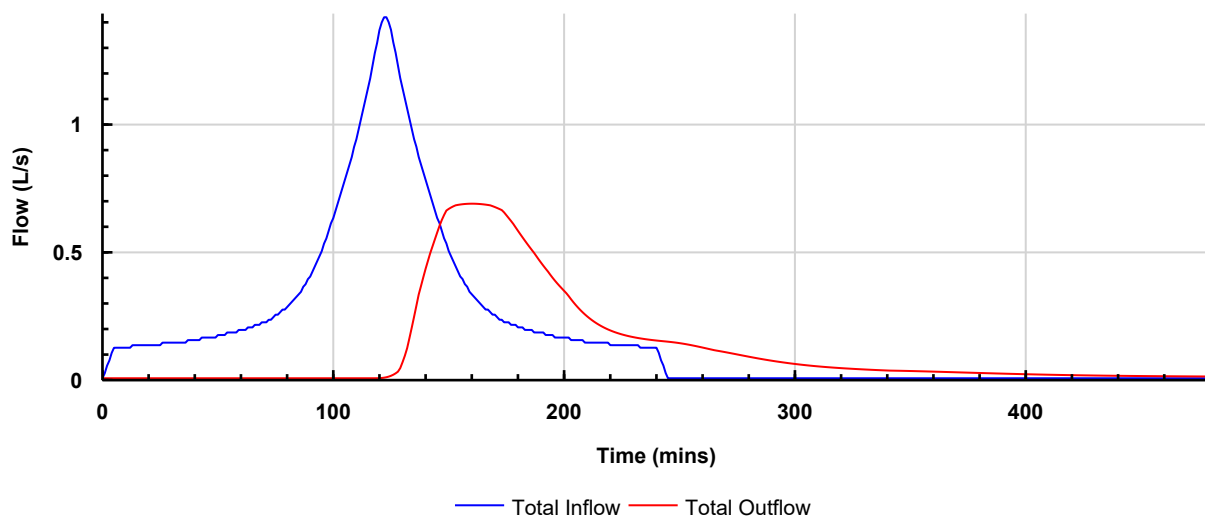
Phase
FSR: 1 years: Increase Rainfall (%): +0: 240 mins: Summer

Tables

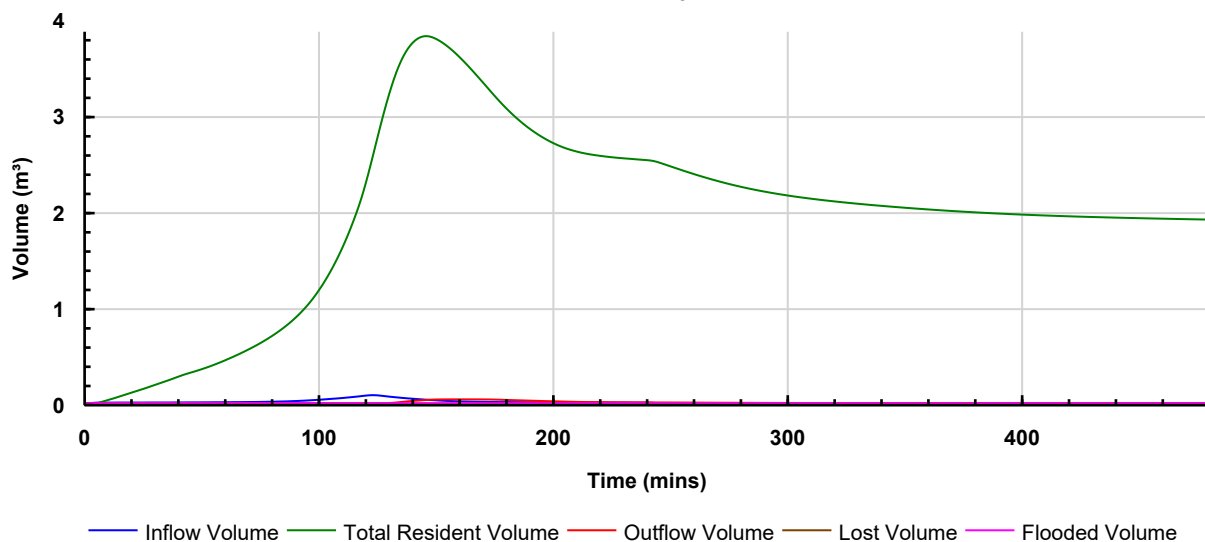
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Hydrobrake Manhole			0.7	3.342
TOTAL	1.4	5.285	0.7	3.342

Graphs

Flow Graph



Volume Graph



Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022		
	Designed by: NDD	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



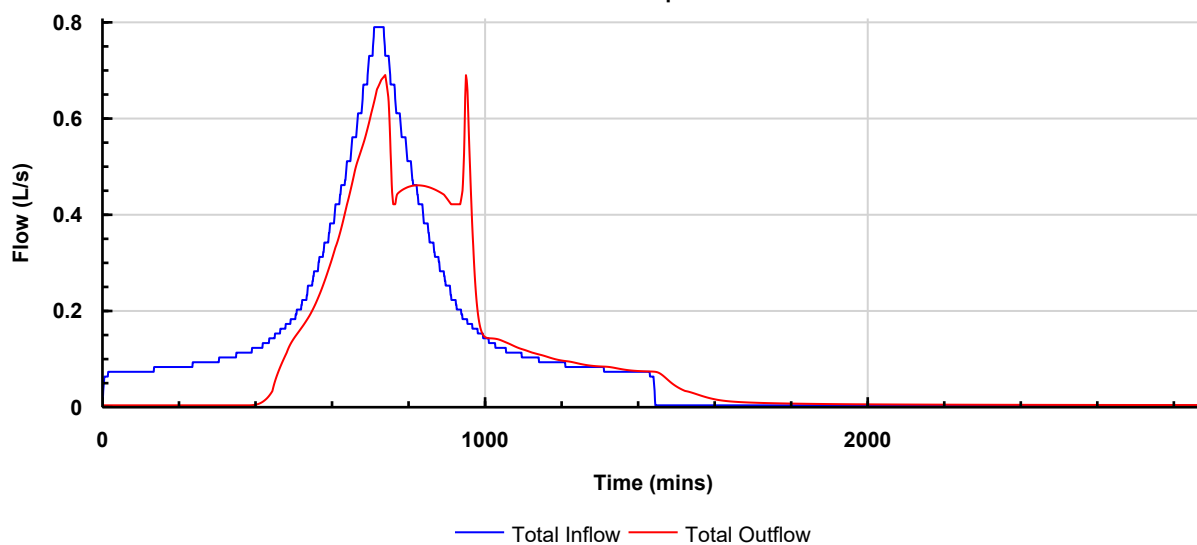
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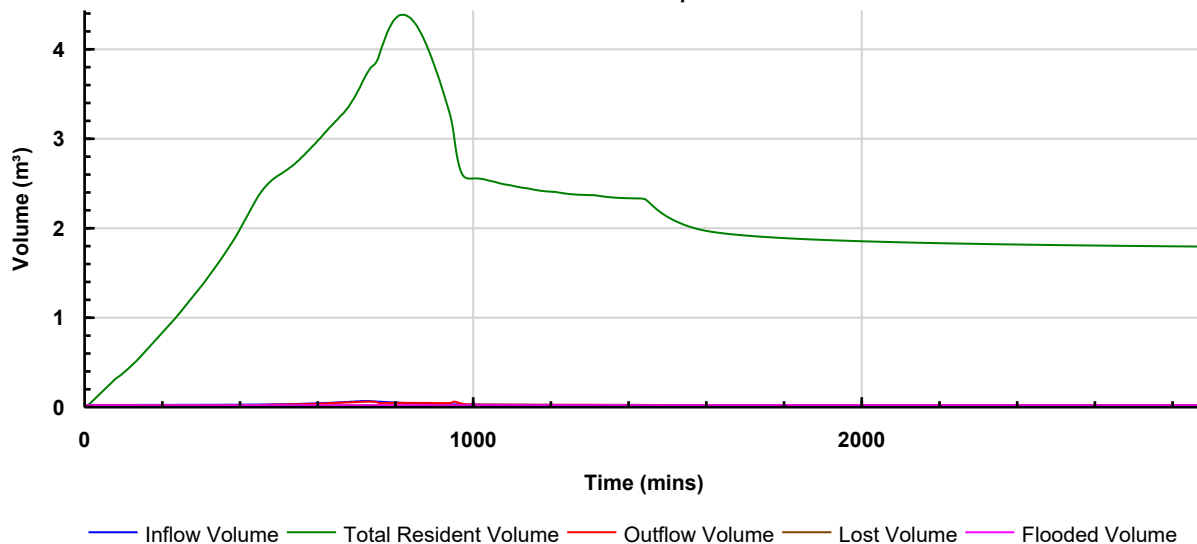
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Hydrobrake Manhole			0.7	15.734
TOTAL	0.8	17.544	0.7	15.734

Graphs

Flow Graph



Volume Graph



Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022		
	Designed by: NDD	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



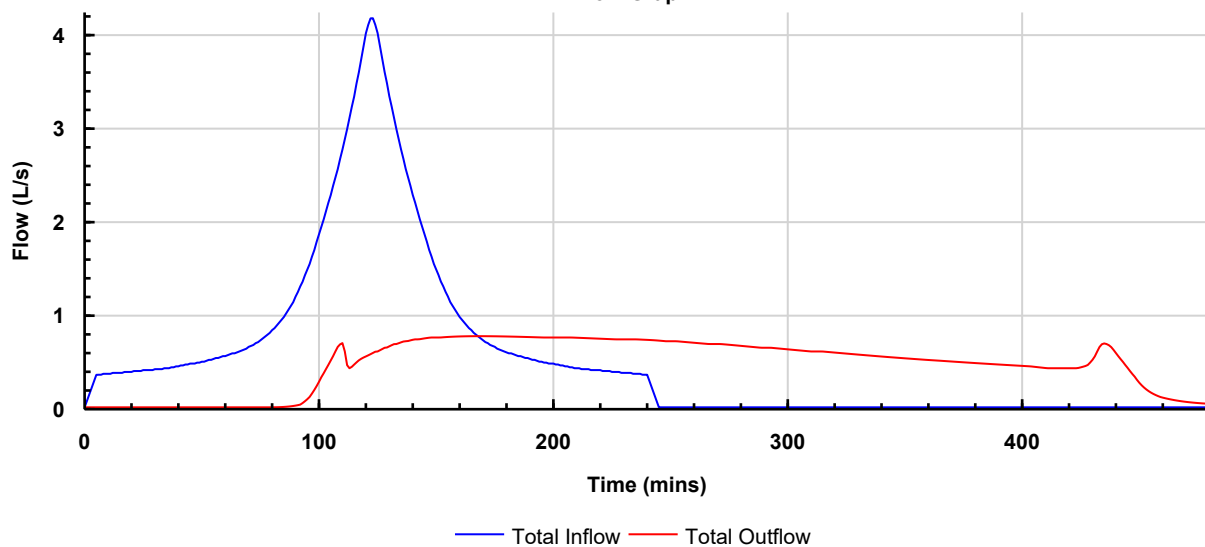
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Tables

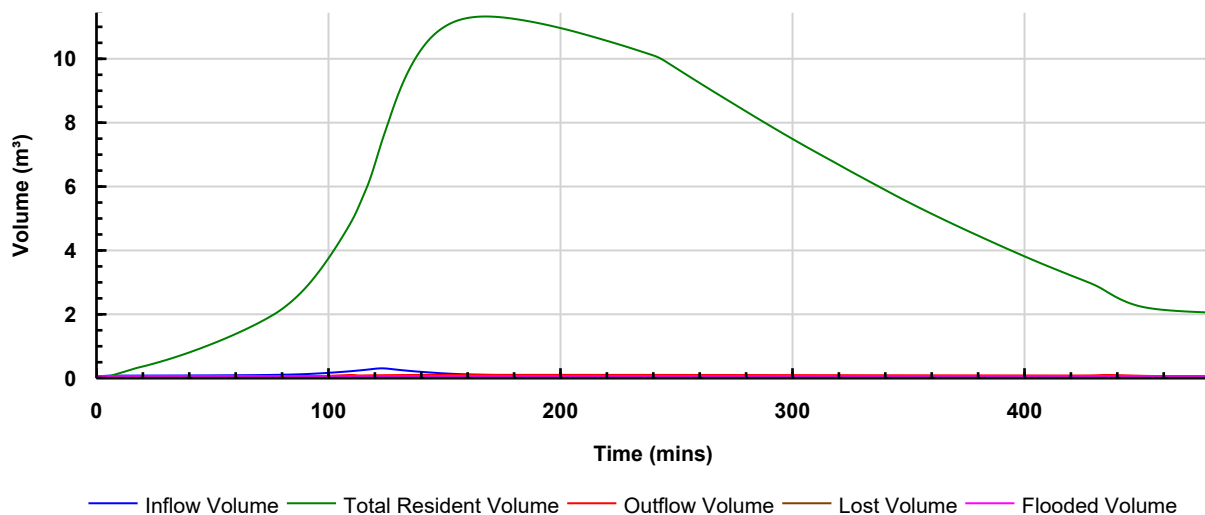
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Hydrobrake Manhole			0.8	13.139
TOTAL	4.2	15.512	0.8	13.139

Graphs

Flow Graph



Volume Graph



Project 383: 65 Delamere Road Hillingdon Road UB4 0NN	Date: 29/03/2022		
	Designed by: NDD	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



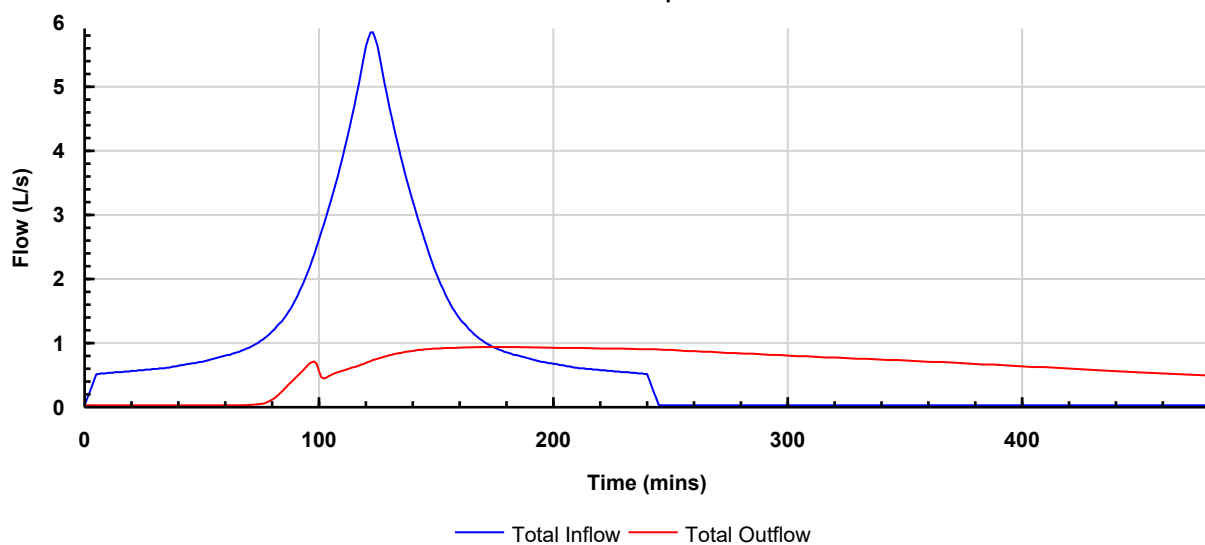
Phase
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Tables

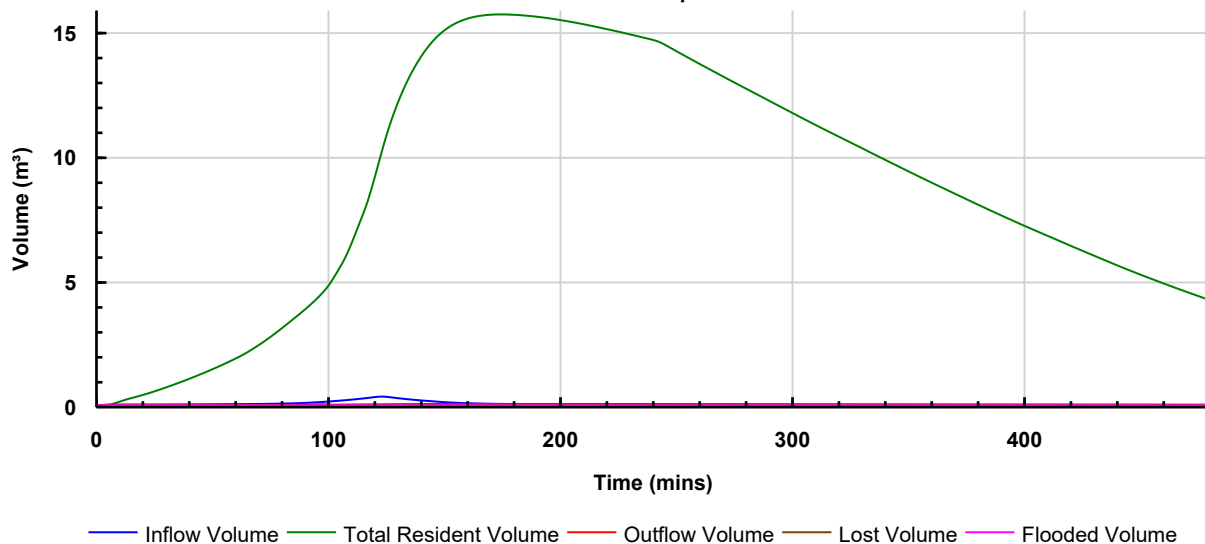
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Hydrobrake Manhole			0.9	17.264
TOTAL	5.8	21.724	0.9	17.264

Graphs

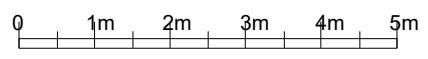
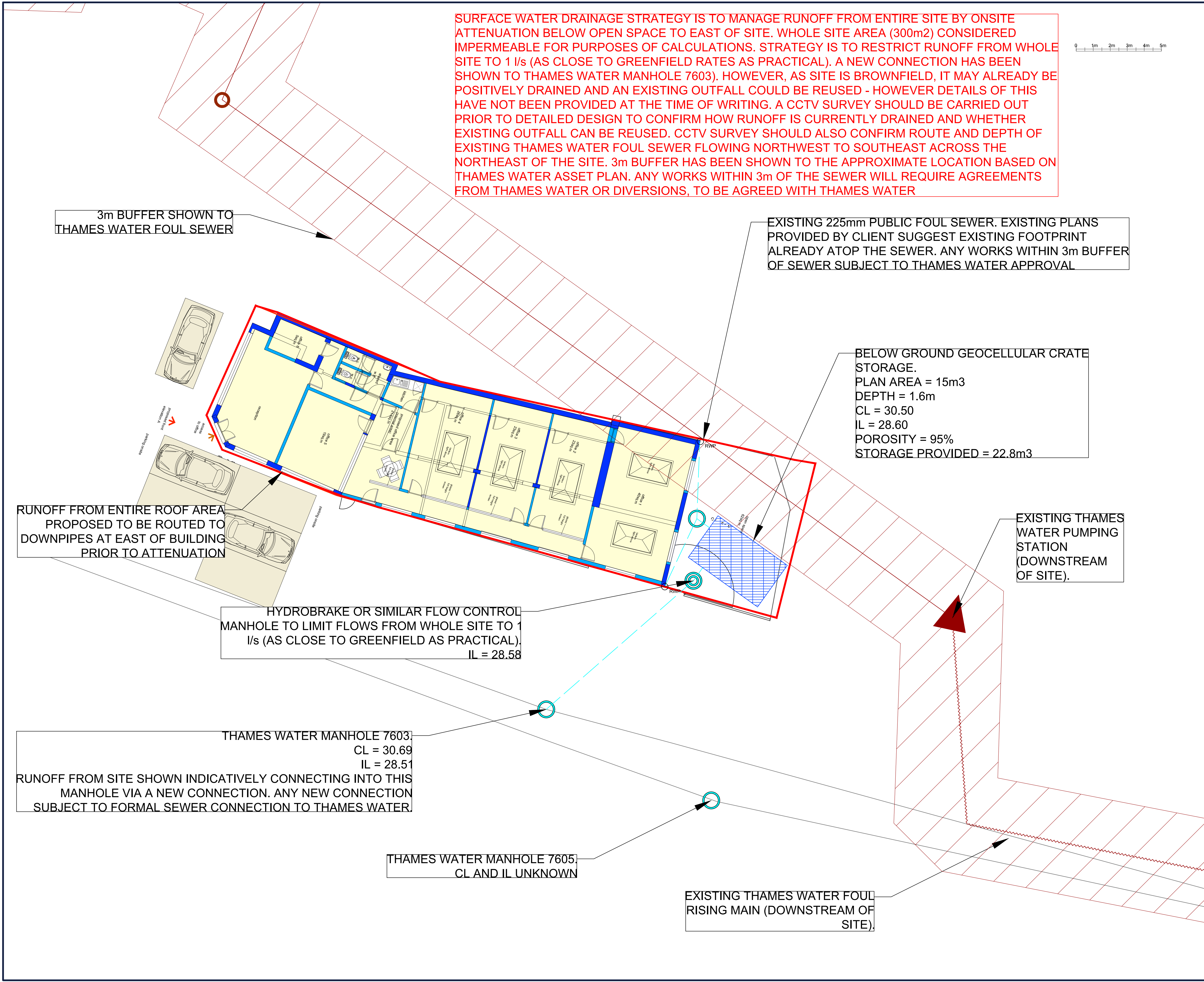
Flow Graph



Volume Graph



Appendix E – Surface Water Drainage Layout



- NOTES:**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT REPORTS, PLANS AND ARCHITECTURAL DRAWINGS
 2. THIS DRAWING SHOULD NOT BE SCALED. THERE SHOULD BE NO RELIANCE ON THIS DRAWING WITH REGARDS TO DIMENSIONS. ALL DIMENSIONS SHOULD BE CONFIRMED ON SITE.
 3. ANY DISCREPANCY ON THIS DRAWING SHOULD BE REPORTED TO AEGAEA IMMEDIATELY FOR CLARIFICATION.
 4. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORKS AND FOR THE STABILITY, INSTALLATION AND HEALTH AND SAFETY OF THE WORKS.
 5. AEGAEA HAVE PRODUCED THIS DRAWING BASED ON THE DRAWINGS AND INFORMATION PROVIDED BY THE CLIENT AVAILABLE AT THE TIME OF PRODUCTION. WE CANNOT ACCEPT RESPONSIBILITY FOR DISCREPANCIES RESULTING FROM NEW PLANS/ INFORMATION BEING ISSUED POST-ISSUE OF THIS DRAWING. THE CONTRACTOR SHOULD REVIEW THIS DRAWING IN LIGHT OF WIDER SITE INFORMATION SUCH AS CONTAMINATION, UTILITIES SURVEYS AND SITE INVESTIGATIONS
 6. IT IS THE RESPONSIBILITY OF THE PRINCIPLE CONTRACTOR TO MAKE THE DESIGNER AND CLIENT AWARE OF SITE-SPECIFIC RISKS AND HAZARDS THAT MAY AFFECT THE DRAWING AND SPECIFICATION

LEGEND	
	PUBLIC SURFACE WATER SEWER
	PUBLIC FOUL WATER SEWER
	PROPOSED SURFACE WATER DRAIN
	HYDROBRAKE MANHOLE
	SURFACE WATER MANHOLE
	FOUL WATER MANHOLE
	ATTENUATION
	FOUL PUMPING STATION
	RAINWATER PIPE

CLIENT: ARORA & CO

SITE: 65 DELAMERE ROAD, HILLINGDON LONDON, UB4 0NN

DRAWING: OUTLINE SURFACE WATER DRAINAGE STRATEGY

DRAWING NUMBER: 383-DR01

DATE: 29/03/2022	REV: -
------------------	--------

DRAWN BY: NDD

DRAWING SCALE: SEE DRAWING FOR SCALE BAR

PRELIMINARY DRAWING FOR PLANNING ONLY - NOT FOR CONSTRUCTION

Flood risk, water and environment