Aberfeldy Village, London

Masterplan, Below Ground Drainage Strategy

Stage 2+ Planning Issue

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Prepared For:

EcoWorld AND Poplar HARCA

Meinhardt

ABERFELDY VILLAGE, LONDON

BELOW GROUND DRAINAGE STRATEGY

ISSUED FOR PLANNING

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
DRAFT	18/12/2020	Mrs. M. Burca	Mr. C. Ryan	Mr. C. Ryan	Draft Issue
P01	17/09/2021	Mr. L. Hornblow	Mr. L. Boustead	Mr. C. Marchant	Draft Stage 2+ Planning Issue
P02	06/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft Stage 2+ Planning Issue
P03	12/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P04	22/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P05	26/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Updated to address ES comments.
P06	08/03/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft revised planning issue
P07	01/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue
P08	06/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue
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P10	24/10/22	Mr. L. Boustead	Mr. G. Bansal	Mr. G. Bansal	Updated Appendix C drawing

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Executive Summary

Meinhardt UK Ltd has been appointed by Ecoworld International to undertake the foul and surface water below ground drainage design for the proposed construction of Aberfeldy Village. The scheme consists of approximately 1500 units proposed across multiple Phases. The proposals comprise of a number of blocks including podiums and some towers up to 29 stories in height. The Site is located within the London Borough of Tower Hamlets in an area known as Poplar Riverside, Aberfeldy Village, E14, London.

The proposed surface water drainage strategy for each phase has been developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network in the local area. A scheme has been developed that utilises blue, green and podium deck attenuation roof structures along with below ground cellular attenuation tanks designed for the 1:100 year plus 40% climate change storm event.

The developments QBAR greenfield runoff rate has been calculated to be 22.4/s. It is proposed that the entire site will discharge at this rate as agreed with the London Borough of Tower Hamlets. Each building and associated hardstanding being proposed to discharge at a proportion of this flow rate, this has been split between 13 separate connections across the site receiving the total 22.4/s. Each buildings associated storm water drainage is conveyed by a traditional gravity run system to the nearest Thames Water Asset, with all connection discharging into the Thames Water combined water Sewer network.

As the development must ensure that private and public drainage areas remain separate, due to ownership and future maintenance as well as adoption requirements the total site area considered for the drainage strategy is based on the private areas, and not the entire site area of 9.1ha. The site area is circa 5.92ha, which excludes council adopted roads and green areas, as such the total hardstanding (impermeable area) is circa 3.2ha.

The option of infiltrating has been dismissed due to the requirement to ensure an exclusion zone of 5m is provided from each soakaway structure to either buildings or public highway, as such no space is available to allow for an full infiltration strategy, additionally although it is feasible to drain into the River Terrace Deposits (gravels) it would not be recommended as it can cause flooding of existing basements given the impermeable London Clay cap below.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the buildings and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

A pre planning enquiry has been submitted to Thames Water stating the proposed foul and surface water discharge rates from the new development. Thames Water had responded giving approval for both however, new plans have been submitted since and flow rate applied from the scheme has reduced from that agreed in the pre planning, it is therefore assumed this is still accepted.

The Thames Water asset records for the site highlighted potential foul and surface water connection points however further CCTV survey works will need to be undergone before any detailed design.

Refer to drainage drawings 2812-MHT-CV-BG-DR-100 and 2812-MHT-CV-RF-DR-101 within the appendix for proposed drainage layout.

1 Introduction

This Drainage Strategy Report has been prepared by a Meinhardt and is submitted in support of a hybrid planning application for the Aberfeldy Village Masterplan. The hybrid planning application is made in relation to the north of East India Dock Road (A13), east of the Blackwall Tunnel Northern Approach Road (A12) and to the southwest of Abbot Road (the “Site”) on behalf of The Aberfeldy New Village LLP’ (“The Applicant”). The hybrid planning application is formed of detailed development proposals in respect of Phase A for which no matters are reserved ("Detailed Proposals"), and outline development proposals for the remainder of the Site, with all matters reserved ("Outline Proposals"). The Detailed Proposals and Outline Proposals together are referred to as the “Proposed Development”.

This report is an update to the version of the Drainage Strategy Report dated April 2022 that was submitted as part of a resubmission to an earlier hybrid planning application submitted to the London Borough of Tower Hamlets (LBTH) in October 2021 (LPA Ref: PA/21/02377/A1). This updated version has been prepared in response to a reduction in the quantum of proposed residential floorspace and residential units proposed, through the removal of Block A3 from the proposed parameter plans. The proposals also seek to provide an increase in the number of affordable units being delivered as part of the development. Further information is set out within the accompanying Covering Letter (as prepared by DP9 Ltd, dated October 2022) and the updated Planning Statement (as prepared by DP9 Ltd, dated October 2022).
The sections of this report that are different from those contained in the resubmission version submitted in April 2022 are:
Section 2.1.3
Section 2.1.4
Section 2.2.3
Appendix C - 2812-MHT-CV-BG-DR-100, 2812-MHT-CV-RF-DR-101, Block A1 A2 Calculation, Block B1 B2 Calculation.

The Proposed Development comprises the comprehensive redevelopment of the Site. The Proposed Development will provide new retail and workspace floorspace along with residential dwellings and the pedestrianisation of the A12 Abbott Road vehicular underpass to create a new east to west route. The Development will also provide significant, high quality public realm, including a new Town Square, a new High Street and a public park.

The purpose of the Drainage Strategy Report is to assist our client and the Local Planning Authority to make an informed decision regarding the drainage strategy for the proposed development in addition to assist the BREEAM assessor with the rewarding of credits under Pol 03.

2 Existing Drainage

1.1 Existing Site

The existing site is located in an area known as Poplar Riverside, Aberfeldy Village, E14, London, within the London Borough of Tower Hamlets.

The existing site is a mixed-use development consisting of residential housing and non-residential floor space, including shops, professional services, food and drink, residential institution, storage, community and cultural uses.

The Site is located in Poplar, within the administrative boundary of the London Borough of Tower Hamlets. The Site is 9.1 hectares (approx. 22 acres) in total and comprises:

- Abbott Road;
- Aberfeldy Street;
- Balmore Close;
- Blairgowrie Court;
- Heather House;
- Jura House;
- Tartan House;
- Thistle House;
- Kilbrennan House;
- Nos. 33-35 Findhorn Street;
- 2a Ettrick Street;
- 384 Abbott Road;
- Lochnagar Street;
- Aberfeldy Neighbourhood Centre;
- Nairn Street Estate; and
- Leven Road Open Space and Braithwaite Park are included for their enhancement.
- Jolly's Green

The total site area is 9.1Ha, and the total drained site area totals circa 5.92ha which excludes council adopted roads and green areas. The total hardstanding (impermeable area) is circa 3.2ha. 3.2ha has been used in the drainage calculations.

The River Lee is located to the east of the site and flows in a generally southerly direction to its confluence with the River Thames. The entire site is noted on the Gov.uk website's Flood map for planning to be wholly within flood zone 3 however benefits from the presence of flood defences.

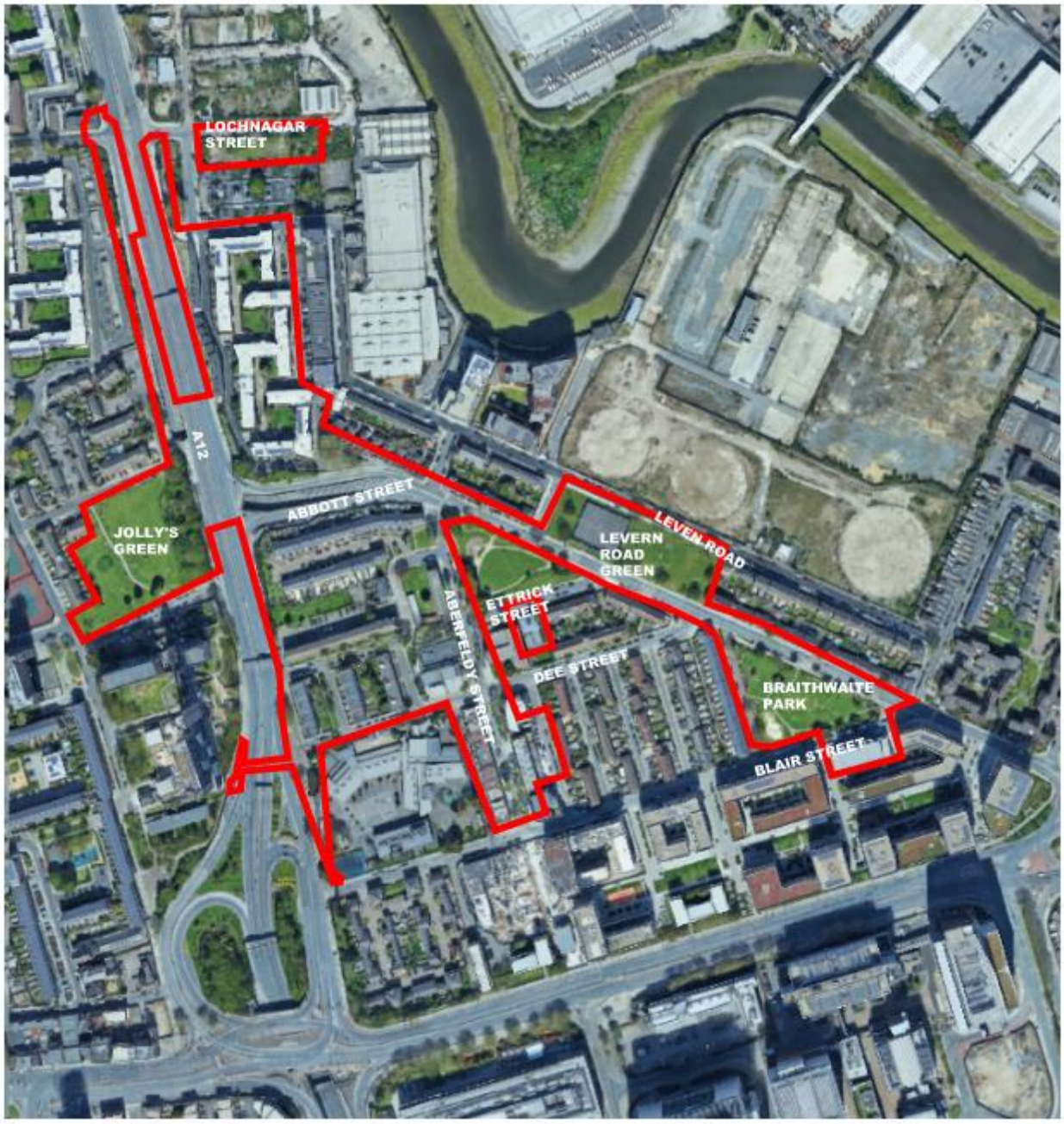


Figure 1: Site Location

1.2 Existing Drainage

1.2.1 Private Onsite Drainage

A topographical survey of the site has been completed by Aworth Survey in December 2009 and a utility survey was carried out for the site by Sumo Services Survey in August 2020.

Based on these surveys the existing private drainage network consists of surface water, foul water and combined water pipes and manholes. All of the existing private drainage has been shown to be draining to the closest Thames Water public sewer via multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Figure 2: Topographical Survey

A CCTV survey will be undertaken to confirm the exact line, level, and condition of the connections to the surrounding public sewer network.

A copy of the topographical and utility surveys can be found in the appendices.

1.2.2 Public Sewers

Asset records obtained in November 2020 from Thames Water have revealed public surface and combined water sewers crossing through the proposed Aberfeldy Village site. The arrangement of the network is summarised below:

Thames Water Surface Water Sewers

The surface water sewers crossing the proposed site are located within:

- Abbott Road (B125) within the proposed site boundary (From MH Ref: 3406 – 3403 to 3402). The diameter of the surface water sewer is 225mm;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 2420 – 3403 to 3402). The diameter of the surface water sewer is 225mm. It is assumed to be a Thames Water pumping station for the road fly under. A CCTV survey will be required to establish what it serves.

These two sewers are assumed to be picking up Abbott Roads highway drainage and will therefore be abandoned along with the road itself as dictated by the scheme.

Thames Water Combined Water Sewers

The combined water sewers crossing the proposed site are located within:

- Lochnagar Street to the north of the site (the public combined water sewer is running west within Lochnagar Street to MH Ref: 2704). The diameter of the combined water sewer is 305mm and changes to 381mm just before connecting into Thames Water manhole 2704;
- Bromley Hall Road to the north west of the site (From MH Ref: 2630 to 2705). The diameter of the combined water sewer is 225mm and changes to 305mm just before connects to Thames Water manhole 2705;
- Leven Road to the east of the site (the public combined water sewer is running south within Leven Road: from MH Ref: 3605 to 5403). The diameter of the combined water sewer starts at 225mm and increases in size to 300mm sewer. The combined water sewer then changes into a 600mm before entering the proposed site and connecting into Thames Water combined manhole 5403;
- Leven Road to the east of the site (the public combined water sewer is running north within Leven Road: from MH Ref: 7403 to 5405). The diameter of the combined water sewer starts at 305mm, changes in size to 300mm sewer and then to 225 before connecting into Thames Water combined manhole 5405;
- Darnaway Place to the east of the site (the public combined water sewer is running south within Darnaway Place: from MH Ref: 4511 to 4407). The diameter of the combined water sewer is 229mm;
- Blair Street to the south of the site and running north through the proposed site boundary (From MH Ref: 7303 to 6302). The diameter of the combined water sewer is 305mm and changes to 457mm after the junction with Thames Water combined sewer which is running north to the combined Thames Water manhole 6302;
- Blair Street to the south of the site (the public combined water sewer is running east within Blair Street from: MH Ref: unknown-4203 to 5205). The diameter of the combined water sewer is 305mm and changes to 457 before connecting into Thames Water combined manhole 5205;
- Aberfeldy Street within the proposed site boundary (the public combined water sewer entering through the south of the site and is running north within Aberfeldy Street: from MH Ref: 5205 to 4407). The diameter of the combined water sewer starts at 457mm and changes to 533mm before connecting into Thames Water combined water manhole 4301A. The combined water sewer exiting Thames Water manhole 4301A is 610mm and changes to 686mm after Thames Water combined manhole 4420, before connecting into Thames Water combined manhole 4407;

- Dee Street within the proposed site boundary (the public combined water sewer is running east within Dee Street from MH Ref: 3222 to 4312). The diameter of the combined water sewer is 305mm;
- Ettrick Street within the proposed site boundary (the public combined water sewer is running east from MH Ref: 3316 to 4301A). The diameter of the combined water sewer is 300mm and changes to 305 before connecting into Thames Water combined manhole 4301A;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 8301 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 914mm and changes to 991mm just before connects to the combined trunk in Joshua Street;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 4407 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 991mm.
- Jolly's Green; there is a 1524 x 1227mm combined sewer running underneath Jolly's Green. This large trunk sewer has connecting sewers that run under the roads adjacent to the green space prior to discharging to the trunk, these roads being Andrew Street and Joshua Street.

There is a combined water trunk sewer located to the west of the site within the proposed site boundary running north. The diameter of the combined water sewer is 2250mm.

Refer to the Appendix B for the complete Thames Water Asset Records.

Meinhardt has overlaid the existing sewer information from the Thames Water Asset Records and the proposed architectural masterplan on a sketch to determine whether there are any areas where proposed structure will sit over the existing Thames Water assets. The sketch has highlighted a number of the proposed buildings are located directly above the existing Thames Water sewers and manholes. Where this occurs either a build over agreement or a sewer diversion will be required with Thames Water to proceed with the current site layout.

Based on the Thames Water Assets Records all of the existing private drainage has been shown to be draining to the north of the site where there are multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Refer to the sketch 2812-MHT-CV-BG-DR-050 in the appendices for details of the existing Thames Water sewers crossing the site.

2 Drainage Strategy

2.1 Surface Water Drainage

2.1.1 Drainage Design Parameters

The industry standards along with the Environment Agency and Sewers for Adoption 7th Edition dictate for below ground surface water drainage that:

- There will be no surcharging of the drainage system for a 1 in 2-year storm;
- The drainage can be surcharged with no flooding for a 1 in 30-year storm; and
- The drainage can flood on-site for a 1 in a 100-year storm with a 40% climate change allowance provided the flood water remains on site and does not flood habitable areas or affect safe ingress and egress to the site for occupiers.

All surface water drainage options outlined in this report adhere to these principles.

Hydraulic calculations have been carried out using the Micro Drainage hydraulic modelling software unless otherwise specified. Refer to Appendix C for calculations.

2.1.2 Initial Consultations

2.1.2.1 Local Authority/Planning Authority – Tower Hamlets Council

Tower Hamlets Council were contacted on 01/09/21 to discuss the proposed drainage strategy prior to planning submissions, however, no response has been received at the time of writing.

2.1.2.2 Thames Water

A predevelopment enquiry has been submitted to Thames Water to confirm if there is sufficient capacity within the Thames Water public sewer network to accommodate the proposed development. Thames Water have confirmed there is sufficient capacity in the surrounding public sewers to accept the flows from the proposed development.

2.1.3 Proposed Surface Water Drainage Strategy

The proposed site will discharge at the equivalent QBAR greenfield rate of 22.4/s. Hydraulic calculations indicate that the attenuation volume required for the development to discharge at the proposed discharge rate of 22.4/s for a 1 in 100 year + 40% climate change storm event is approximately 3662m^3, to be confirmed during detail design. This strategy should also include measures to improve run-off quality whilst maximising bio-diversity, amenity and other multifunctional benefits to provide a sustainable drainage system as noted in PPG.

Table 2-1: Discharge Opportunities

London Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	There are limited opportunities for rainwater harvesting on this project due to the proposed usage of the building and limited external space that requires irrigation. It has therefore been discounted.

Use infiltration techniques, such as porous surfaces in non-clay areas	Due to the underlying geology of the site being London Clay and poor infiltration rates, infiltration devices are not used on this site. Furthermore, there are limited locations that comply with the requirement of Building Regulations to be more than 5m from a highway or structure. The use of infiltration techniques has therefore been discounted including infiltration basins/ponds.
Attenuate rainwater in ponds or open water features for gradual release	Due to the constrained nature of the site, there is little opportunity for above ground storage structures like ponds. Although green spaces are provided in the proposals, the areas are not suitable to be used for controlled flooding due to the proposed nature of the areas i.e. ponds. Furthermore, the existing levels across the site do not offer any suitable locations where controlled flooding may occur.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Excess surface water flows during high intensity rainfall events are proposed to be stored using a combination of podium/blue roofs, green roofs bio-retention/SuDS planters and below ground geo-cellular storage crates.
Discharge rainwater direct to a water course	Not possible because there are no watercourses in area surrounding site
Discharge rainwater to a surface water sewer/drain	Not possible because there are no surface water drains in area surrounding site, nearby public sewers are combined.
Discharge rainwater to a combined sewer	Discharge to a combined system at the restricted rate equivalent to QBAR greenfield rates.

The proposed surface water strategy for the site will be developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding. Due to the limited areas of landscaping available on the site there are constraints to which SuDS can be incorporated into the development. SuDS with large land take such as detention basins or ponds are not suitable for an urban development therefore not applicable for development. It is also found that the use of infiltration SuDS will not be feasible for the site due to the existing ground conditions. The proposed drainage strategy for the development has therefore been made sustainable through the use of blue roofs, high level podiums attenuation and below ground attenuation tanks.

Due to the segregation of parcels, due to ensuring private drainage is separate to public highway drainage its not possible to integrate or provide a holistic surface water design whereby one parcel is potentially using an area in another parcel for attenuation, including any open green space that is proposed aspart of the wider strategy, as this would require a new public TW sewer network to be placed within an existing built environment which is unviable given the context of the scheme.

It is proposed that each phase will have a separate drainage network.

Phase A Strategy – Detailed Planning Application

Based on the above, the only feasible surface water discharge location is the public sewers surrounding the site. Phase A is divided into 3 different locations therefore it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water sewer. Therefore the strategy is outlined below.

Block I1:

The proposed surface water drainage strategy for Building I1 has been made sustainable through the use of a blue roof and a below ground attenuation tank. The approximate volume of attenuation for this building is 69m^3. Of which 34.2m^3 attenuation is provided by cellular attenuation crates and 35m^3 is provided by the blue/green roof.

The surface water drainage network will drain via gravity to the northwest of Building I1 into a demarcation chamber restricting the discharge rate to 1l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water sewer network. It is proposed that controls will be used on the blue roof to ensure that all attenuation is fully utilised. It is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303). The Thames Water sewer asset records have no cover level or Invert level information for the manhole THMH7303 therefore a survey is required for the existing combined water sewer running along Blair Street.

Block J1:

The proposed surface water drainage strategy for Building J1 has been made sustainable through the use of a below ground attenuation tank. It is proposed to discharge surface water from Building J1 via gravity into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection. Surface water discharge from the building is to be restricted to 1.25l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate required storage for building J1 is 346m^3 this is to be provided through the proposed cellular attenuation crates.

Block F1:

To attenuate surface water at source and reduce the risk of downstream flooding it is proposed that Building F1 will use of blue roofs, high level podium attenuation and a below ground attenuation tank. The approximate volume of attenuation is 185m^3. It is proposed that controls will be used on the blue roofs and high level podium to ensure that all attenuation is fully utilised. The surface water drainage network will drain via gravity to the northeast of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. It is proposed that a new connection will be made to the southeast corner of the building, branching into the Thames Water combined water sewer in Aberfeldy Street between manholes TWMH4313 & TWMH4312.

Block H1/H2 & H3:

The proposed surface water drainage strategy for the buildings H1&H2 and H3 has been made sustainable through the use of two below ground attenuation tanks (one attenuation tank serving buildings H1&H2 and one attenuation tank serving building H3) and blue/green roof areas to attenuate surface water at source and reduce the risk of downstream flooding.

The proposed surface water drainage network for buildings H1&H2 will drain via gravity to the east of the buildings into a demarcation chamber restricting the discharge rate to 1.5l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for buildings H1&H2 is 161m^3, of which 49m^3 is provided through the blue roof and 112m^3 is provided through the below ground cellular attenuation crates.

The same strategy is applied to Building H3 which will discharge surface water via gravity to the west of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for building H3 is 135m^3, of which 24m^3 is provided through the blue roof and 111.2m^3 is provided through the below ground cellular attenuation crates.

Buildings H1&H2 and H3 will discharge surface water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 6.25l/s it is required to attenuate an approximate volume of 896m^3.

Phase B Strategy – Outline Planning Application

The proposed surface water strategy for the phase B has been developed to utilise sustainable drainage systems (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network. The scheme that has been developed to utilise a combination of blue roofs, high level podium attenuation and attenuation tanks.

The proposed strategy includes a total of three new connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving the adjacent Block A1/A2 receiving a restricted discharge rate of 2.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving B1/B2 & B4 receiving a total restricted discharge rate of 3.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving Blocks B3 and B5 receiving a total restricted discharge rate of 2.3l/s.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 7.3l/s it is required to attenuate an approximate volume of 862m^3

The Jolly's Green area will be delivered as part of Phase B. The area is proposed to be public realm and is proposed to discharge surface water at a restricted rate equivalent to the QBAR greenfield for all storms up to and including the 1 in 100 year +40% climate change storm. This rate has been calculated to be 3.9l/s and approximately 100m^3 of surface water attenuation will be required to facilitate this. This will be provided through the use of permeable paving.

Phase C Strategy – Outline Planning Application

The proposed drainage strategy for Phase C is similar to that of Phase B. It is proposed that surface water will be attenuated through the use of SuDS to minimise the likelihood of downstream flooding. It is proposed that the primary source of attenuation for Phase C will be below ground attenuation tanks with further attenuation to be provided via blue roofs and high levels podium attenuation.

It is proposed that surface water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303), will be made. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Each block shall attenuate and restrict flows separately before connecting into TWMH4303, the below summaries the proposed discharge rates and required attenuation for each block within phase C;

- Block C1/C2/C3/C4 shall restrict discharge rate to 1.5l/s requiring a total 651m^3 attenuation of which 425m^3 is to be provided through below ground cellular attenuation crates and 238m^3 provided via blue roofs and high levels podium attenuation.

- Block C5 & C6 have been designed to have a shared flow control structure limiting discharge to 1l/s with attenuation however split both buildings to receive 10m^3 attenuation provided through below ground cellular attenuation crates. Flows from Blocks C5 and C6 are to be conveyed into a combined running along Ettrick Street to the east before discharging into TWMH4303.

- Block E1/E2/E3 is to restrict discharge rate to 1.5l/s requiring a total 563m^3 attenuation of which 400.4m^3 is to be provided via below ground cellular attenuation crates and 162m^3 provided via blue roofs and high levels podium attenuation.

The Phase C development shall therefore discharge at a maximum 4.0l/s for the 1:100 year plus 40% climate change event, this flow is all conveyed into the Thames Water Manhole TWMH4303 in Ettrick Street. The total amount of attenuation to be provided for this phase is 1233m^3.

Phase D Strategy – Outline Planning Application

The proposed surface water drainage strategy for the building Phase D has been made sustainable through the use of a below ground attenuation tank and blue roofs and high levels podium attenuation

The proposed surface water strategy for the building Phase D is to discharge surface water via gravity to the southeast of Phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Surface water discharge from the site is to be restricted to 1.5l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate volume of attenuation for Phase D is 576m^3, of which 490m^3 is to be provided via below ground attenuation crates and 87m^3 provided via and blue roof attenuation.

For full drainage strategy drawings refer to the Appendix C, including exceedance flow routes. Summary of the drainage strategy can be found in the Tower Hamlets SUDS proforma in Appendix D.

2.1.4 Proposed Discharge Rates Summary

The table below shows the volume of surface water attenuation required to suit a 1 in 100-year storm event + 40% climate change. A breakdown of the proposed discharge rates and required attenuation volumes is shown in Table 1.

	Storm Event	Proposed Discharge Rate	Required Surface Water Attenuation
Phase A Blocks I1, J1, F1, H1&H2 and H3	1 in 100 year + 40% CC	6.0 l/s	896m³
Phase B	1 in 100 year + 40% CC	10.9 l/s	898m³
Phase C	1 in 100 year + 40% CC	4.0 l/s	1231m³
Phase D	1 in 100 year + 40% CC	1.5 l/s	576m³
Total	1 in 100 year + 40% CC	22.4 l/s	3601m³

Table2-2: Proposed Surface Water Discharge Rates

2.1.5 Water Quality

The proposed drainage strategy manages pollution risk for the site based on a simple qualitative method as defined in the CIRIA SuDS Manual C753, consisting of an assessment of likely pollution hazard levels for the site and SuDS performance capacities:

Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 2-3: Extract from CIRIA C753: Pollution Hazard Indicines

The site is predominantly roof areas and pedestrian walkways and as such, the site has a Low Pollution hazard level. Surface water run-off will be managed using a range of SuDS detailed previously that will offer water quality benefits.

The car parking a ground level is covered and therefore will be discharged to the foul network.

SuDS bio-retention planters and green roofs will provide pollution control as they assit with removing heavy metals and hydrocarbons from surface water run-off.

2.1.6 Amenity, Bio-diversity and Multi-functional benefits

The proposed drainage strategy offers a number of multifaceted benefits across amenity, biodiversity and other areas. Blue/green roofs provide a positive impact on amenity for the site and green roofs and SuDS bio-retention areas help to improve and increase bio-diversity. As discussed in the section above, the SuDS bio-retention planters and green roofs in particular in addition to other SuDS features help to improve water quality from the site.

2.2 Foul Water Drainage

2.2.1 Drainage Design Parameters

The below-ground foul drainage system will be designed to Sewers for Adoption 8th Edition, BS EN 752 Parts 3 and 4, and the Building Regulations Document H where appropriate.

2.2.2 Proposed Foul Water Drainage Strategy

Due to size and phasing of the development, it is proposed that foul drainage from the site will be split into 10 individual outfalls into the Thames Water combined network. Splitting the foul discharge from the site is important due to the potential increase in flow, reducing the impact on the existing Thames Water combined drainage network.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the building and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

The proposed strategy includes various connections to the existing Thames Water combined sewer network. These are outlined below.

As phase A is divided into 3 different locations it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water combined water sewer network. Therefore five connections to the Thames Water combined water sewer network are proposed for phase A:

- For the building I1 it is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303);
- It is proposed that building J1 to discharge foul water into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection;
- It is proposed that a new connection will be made to the southeast corner of the building F1 into the Thames Water combined water sewer in Aberfeldy Street (TWMH4313-TWMH4312); and
- Buildings H1&H2 and H3 will discharge foul water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed strategy for phase B includes a total of three connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving building A1/A2;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving buildings B1/B2 and B4;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving building B3/B5.

It is proposed that foul water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303) will be made. This will be serving the buildings C1/C2/C3/C4, C5, C6 & E1/E2/E3.

The proposed foul water strategy for the building Phase D is to discharge foul water via gravity to the southeast of the phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

The discharge locations and foul water strategy will be confirmed during detailed design and a Section 106 drainage connection application for each connection will be submitted at the construction stage to Thames Water for formal approval of the proposed connections arrangement.

2.2.3 Proposed Foul Water Discharge Rates

Based on the most recent accommodation schedule (as at 17.09.21), the peak foul water discharge rate from the site will be in the region of 75l/s. This proposed discharge rate has been calculated in accordance with BS EN 12056-2, however, this will be confirmed by Meinhardt's MEP engineer during detailed design.

Thames Water have been contacted and have confirmed they have sufficient capacity in their network to accept the proposed flows from the development (surface water and foul water).

2.3 Proposed Combined Water Flow Rates

The proposed combined water discharge rates for the site are outlined in Table 1.

Contributing Area (ha) – Hardstanding areas	Proposed Surface Water Discharge Rate [1 in 100 year storm + 40% CC] (l/s)	Proposed Peak Foul Water Discharge Rate (l/s)	Proposed Combined Peak Discharge Rate (l/s)	Reduction compared to Existing Combined Discharge Rate
3.2	22.4	75.58	97.98	67%

Table 1: Proposed Combined Water Discharge Rates

The proposed discharge rates will be confirmed during detailed design.

2.4 Site Wide Foul Water Drainage Coordination

The proposed foul water drainage strategy for the site involve coordination with Meinhardts MEP engineer's to coordination the superstructure drainage up until it enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings before discharging via gravity into the Thames Water combined sewer located in the surrounding roads.

Any ground floor or basement level foul water drainage that can't be drained by gravity will be routed to private basement foul water pump chambers which will lift foul water from the basements into the internal drainage network before draining via gravity into the external below ground drainage network.

2.5 Operations and Maintenance

2.5.1 Pipes (Including Oversized)

2.5.1.1 Location and Description

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacturer's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the Meinhardt drainage specification.

2.5.1.2 Operation

They are intended to be dry except for during rainfall events. These have been designed to be self-cleansing for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.

2.5.1.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

2.5.2 Green/Blue Roofs, Location and Description

A green/blue roof specialist will be required at later design stages.

2.5.2.1 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify and sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie. Year one), replace dead plans as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly and annually or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly and annually or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required - clippings should be removed and not allowed to accumulate	Six monthly and annually or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

2.5.3 Bioretention Systems

2.5.3.1 Location and Description

Bio-retention systems (including rain gardens) are shallow landscaped depressions can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide:

- Attractive landscape features that are self-irrigating and fertilizing
- Habitat and biodiversity
- Cooling of the local microclimate due to evapotranspiration.

Bio-retention systems have been specified to be used in various privately managed public spaces throughout the site.

2.5.3.2 Operation

It has been concluded in literature (Dalrymple, 2013) that bio-retention systems will typically require approximately 2.5 times more maintenance than typical landscaped designs.

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

2.5.4 Geocellular units

2.5.4.1 Location and Description

Geocellular units are proprietary products and therefore manufacturer's specific recommendations should also be taken into consideration above what has been prepared in this document. Additionally, different manufacturers may have different connection types and arrangements which will need to be taken in to consideration.

2.5.4.2 Operation

The geocellular units, along with permeable paving, are intended to attenuate the discharge from the site up to and including the 1 in 100 year plus 40% climate change event.

Access for maintenance has been provided through inspection chambers.

2.5.4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of geocellular units as designed. As the feature is buried a regularly inspection regime is very important to ensure the correct functionality of the surface water drainage network. Maintenance responsibility for the geocellular units and their surrounding areas should be placed with Ecoworld.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check penstocks and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.

2.5.5 Permeable Pavements

2.5.5.1 Location and Description

The permeable pavement is located at the Jolly's Green area of the development.

The permeable pavement has been designed in accordance with CIRIA C753.

Permeable pavements contain proprietary products and as such, the manufacturer's recommendations should be followed where used.

2.5.5.2 Operation

Permeable pavements are an efficient mean of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium.

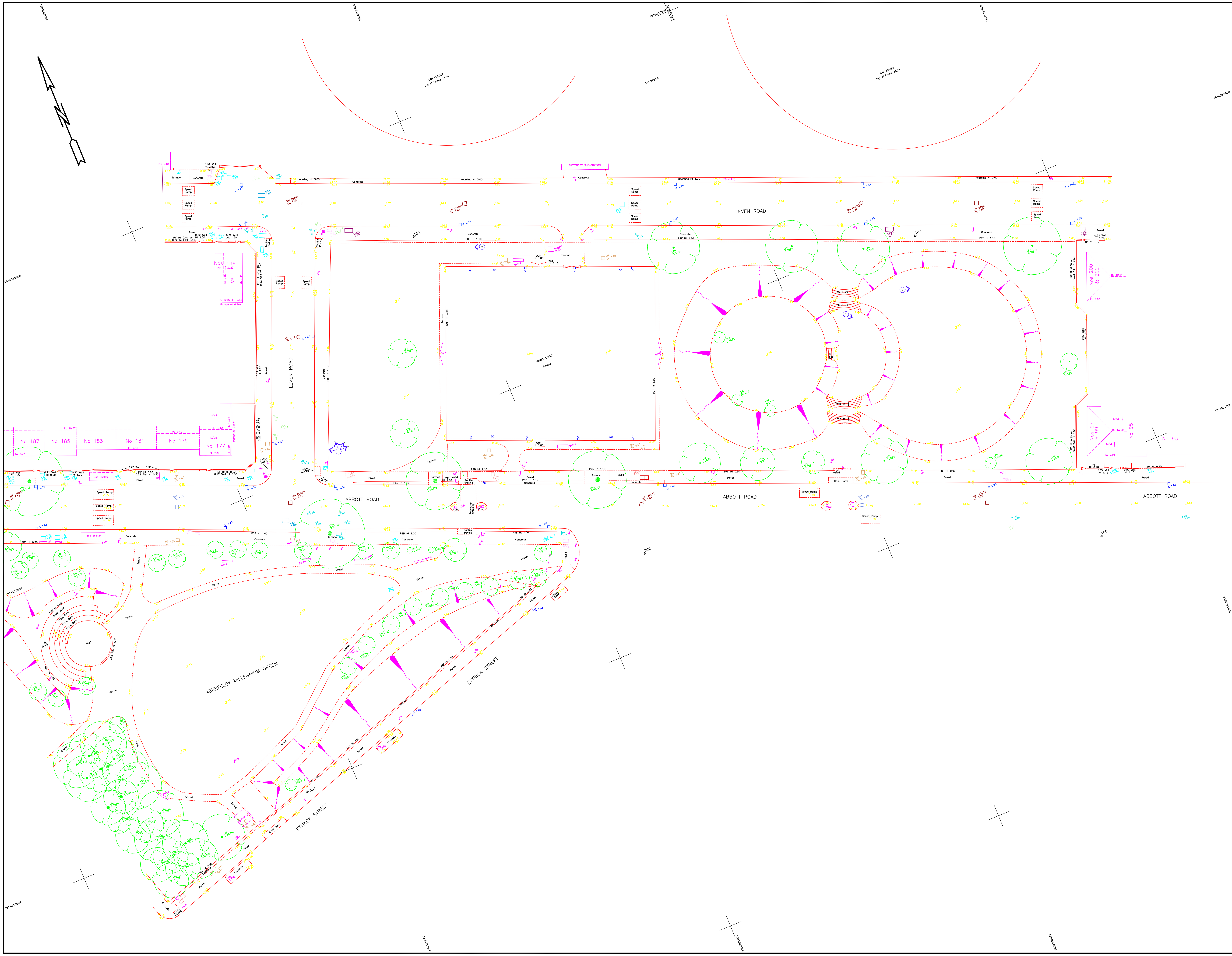
The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone which makes up the sub-base.

2.5.5.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the pervious pavement. Maintenance responsibility for the pavement and its surrounding area should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Appendix A – Topographical & Utility Surveys



LEGEND

AIR CONDITIONING UNIT	ACU	
ADVERTISING BOARD	AB	
AIR VALVE	AV	
BOLLARD	B	
BELISHA BEACON	BB	
BOREHOLE	BH	
BASEMENT LIGHT	BLT	
BOUNDARY POST/PEG	BP	
BUS STOP	BS	
CABLE TELEVISION PIT	CATV	
COAL HOLE	CH	
CONTROL BOX	CB	
DOG WASTE BIN	DWB	
DOWN PIPE	DP	
EARTHING ROD	ER	
ELECTRICITY CABLE PIT	ELCP	
ELECTRICITY CONTROL BOX	CBE	
ELECTRICITY INSPECTION COVER	ELIC	
ELECTRICITY POLE	EP	
ELECTRICITY PYLON	EL PYLON	
FIRE HYDRANT	FH	
FLAG STAFF	FS	
FLOODLIGHT	FLT	
FLOWER BED	FB	
FOOTPATH	FP	
GAS VALVE	GV	
GUIDE POST	GP	
GULLY	G	
INSPECTION COVER	IC	
INSPECTION COVER (UNKNOWN)	ICU	
KERB OUTLET	KO	
LAMP HOLE	LH	
LAMP POST	LP	
LIGHTED BOLLARD	LTB	
LITTER BIN	LB	
MANHOLE	MH	
MILESTONE	MS	
NAME PLATE	NP	
NOTICE BOARD	NB	
PARKING METER	PM	
POST	P	
POST BOX	PB	
RAIN WATER PIPE	RWP	
REFLECTOR POST	RP	
ROAD SIGN	RS	
RODDING EYE	RE	
SERVICE MARKER POST	SMP	
SIGN POST	SP	
SLUICE VALVE	SV	
SOIL & VENT PIPE	SVP	
SPOTLIGHT (GROUND)	SPLG	
SPOTLIGHT (TOWER)	SPLT	
STOP COCK	SC	
TELECOM CONTROL BOX	CBT	
TELECOM INSPECTION CHAMBER	TIC	
TELECOM MANHOLE	TMH	
TELECOM PILLAR	TLP	
TELEGRAPH POLE	TP	
TELEPHONE CALL BOX	TCB	
TICKET MACHINE	TM	
TL CABLE INSPECTION COVER	TLIC	
TRAFFIC LIGHT	TL	
TRAFFIC LIGHT CONTROL BOX	CBTL	
TRAFFIC LIGHT CONTROL POST	CPTL	
VENT PIPE	VP	
WATER METER	WM	
WASH OUT	WO	
WATER CONTROL PILLAR	WCP	
WATER TAP	Tap	
WATER TROUGH	WT	

LEVELS

SPOT LEVEL(+Indicates pos.)	+ 127.13
BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
EAVES LEVEL	EL
FLOOR LEVEL	FL
INVERT LEVEL	IL
ROOF LEVEL	RFL
RIDGE LEVEL	RL
SOFFIT LEVEL	SFL
SPRING LEVEL	SPL
THRESHOLD LEVEL	THL
TOP OF WALL LEVEL	ToW
WATER LEVEL	WL

FENCE DESCRIPTIONS

BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CHESTNUT PALING FENCE	CPF
CLOSE BOARD FENCE	CBF
CONCRETE SLAB FENCE	CSF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CBR
IRON RAILINGS	IRF
INTERWOVEN FENCE	IWF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	Misc F
OPEN BOARD FENCE	OBF
PALING FENCE	PLF
PALISADE FENCE	PAL
PEDESTRIAN SAFETY BARRIER	PSB
POST AND CHAIN FENCE	PCF
POST AND MESH FENCE	PMF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
TRELLIS	TLS
WIRE MESH FENCE	WMF
AVERAGE	Ave
HEIGHT	Ht

DRAINAGE

SURFACE WATER PIPE	0.15 SW
FOUL WATER PIPE	0.15 FW
NO VISIBLE CONNECTION	NVC
UNABLE TO LIFT	UTL
UNABLE TO SURVEY	UTS
TAKEN FROM RECORDS	TFR
DRAINAGE CHANNEL (OPEN)	DC
DRAINAGE CHANNEL (COVERED)	DC
OVERHEAD WIRE	O/H W
BANKING	
EXTENT OF VEGETATION	
HEDGES	
MARSH	
GATE	SINGLE DOUBLE
RETAINING WALL	RTW
SLOPING MASONRY	
STILE	
WALL (Width drawn to scale)	
BUILDING	
OPEN SIDED/ BUILDING OVERHEAD	
CANOPY	
GLASS ROOFED	
ARCHWAY	
CONTOURS	25.50
ORDNANCE SURVEY BENCH MARK	OSBM Value 12.47
TEMPORARY BENCH MARK	TBM Value 50.00
SURVEY STATION	

TREE LEGEND

ALDER	ALD	MAPLE	MPL
ASH	ASH	OAK	OAK
ASPEN	ASP	PINE	PNE
BEECH	BCH	POPLAR	POP
CEDAR	CED	PRUNUS	PRU
CHERRY	CHY	RHODODENDRONS	RDN
CONIFEROUS	CON	ROWAN	RWN
CYPRESS	CYP	SALLOW	SLW
DECIDUOUS	DEC	SAPLING	SAP
DEAD	DED	SWEET CHESTNUT	SCH
ELDERBERRY	ELD	SILVER BIRCH	SIB
ELM	ELM	SPRUCE	SPR
EUCALYPTUS	EUC	SPECIES UNKNOWN	SPU
FIR	FIR	SYCAMORE	SYC
FRUIT	FRT	TREE OF HEAVEN	TOH
HAWTHORN	HAW	WELLINGTONIA	WEL
HAZEL	HZL	WHITEBEAM	WBM
HORNBEAM	HBM	WILLOW	WLW
HORSE CHESTNUT	HCH	WALNUT	WNT
HOLLY	HLY	YEW	YEW
INDIAN BEAN TREE	IBT		
LARCH	LAR	MULTI-TRUNK	MT
LABURNUM	LBM		
LOCUST	LCS	0.2 / 6 / 3T	
LIME	LIM		
LONDON PLANE	LPN	Dia of Bole / Tree Height / No of Trunks	
MAGNOLIA	MAG		

SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
100	PN	538634.795	181387.889	1.889
101	PKN	538514.670	181447.628	1.737
102	PKN	538544.730	181480.753	1.873
103	PKN	538624.766	181447.996	1.674
300	??	538463.462	181378.864	1.771
301	PN	538491.308	181399.170	1.700
302	PKN	538560.752	181415.049	1.811
622	PN	538459.194	181440.085	3.221
C1	PN	538663.947	181376.651	1.940
C2	PN	538687.952	181279.286	1.783
C3	PKN	538506.884	181219.790	1.829
C4	PN	538429.831	181475.704	1.957

HN – Hilti® Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PN)

SHEET LAYOUT

2 1

NOTE:

PHOTO POSITIONS SHOWN THUS: <-(1)

FOR PHOTO'S REFER TO DRAWING 3553–7 SHEET 3.

NOTES

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO–ORDINATES 538663.947E, 181376.651N.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

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Drawing No	Sheet	Revision	Surveyed	NW/CS
3553–7	1		Drawn	TP
	Scale 1:200	@ A0	Checked	PE
			Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 7

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF

LEGEND

UTILITY LINETYPES

Service	Linetype	Service	Linetype
British Telecom	BT	Gas	G
Cable Television	CATV	Heating PiP/Es	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown found by GPR	GPR — U
Electric	E	Unknown	U
Fire Hydrant Main	FH	Unknown Cable	UC
Fibre Optic	FO	Unknown PiP/Eline	UPL
Fuel	FUEL	Water	W

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) — ASR — XXX — ASR — XXX

UTILITY SURVEY INFORMATION

Area of Concern	AOC	Unable to Survey	UTS
Contracted Survey Area	SVY AREA	Unable to Lift (cover)	UTL
Previous Survey Area	PREVIOUS	Unable to Trace	U
Extent of (Post processed) GPR	GPR Survey	Unable to Trace (due to blockage)	B
Depth to Top of Service (metres)	(O.60d)	Unable to Trace Further	F
		End of Trace	E

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)		PiP/E into Ground (symbol)	
Belisha Beacon (symbol)	BB	Post (symbol)	PO
Bollard (symbol)	B	Rain Water PiP/E (symbol)	RWP
Borehole (symbol)		Road Sign (symbol)	RS
British Telecoms IC (sized)	BTIC	Rodding Eye (symbol)	RE
Building (incomplete detail)		Sapling (symbol)	S
Cable into Ground (symbol)		Sign Post (symbol)	SP
Cable TV Box (symbol)	CTV	Spot Light (symbol)	SL
CCTV Camera (symbol)		Spot Height	50.00 +
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet (sized)	EC	Traffic Bollard (symbol)	B
Electric Pole (symbol)	EP	Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Height: Spread: SP/Ecies:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Electric Sign (symbol)	ES		
Embankment			
Feeder Pillar (sized)	FP	Traffic Light (symbol)	TL
Fire Hydrant (sized)	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent PiP/E (symbol)	VP
Flat Roof Level in metres	FRL 50.00	Wall	
Flood Light (symbol)	FL	Waste PiP/E (symbol)	WP
Gas Valve (symbol)	GV	Water Meter (symbol)	WM
	Single / Double	Water Valve (symbol)	WV
Ground Level in metres	GL 50.00	Building Canopy	
Gulley (sized)	GU	Crash Barrier	
InsP/Ection Cover (sized)	IC	Drainage Channel	Drainage Channel
Invert Level in metres	IL 50.00	Drop Kerb (level in metres)	50.00
Junction Box - BT (sized)	JB BT	Edge Detail (level in metres)	50.00
Junction Box - Comms (sized)	JB COM	Footpath (level in metres)	50.00
Junction Box - Elec (sized)	JB	Fence	
Lamp Post (symbol)	LP	Heras Fence	
Light Bollard (symbol)	LB	Kerb channel (level in metres)	50.00
Light in ground (symbol)	LIG	Kerb top (level in metres)	50.00Tk
Manhole (sized)	MH	Overhead Service Line	OHS
Manhole CapP/Ed Port		P/Edestrian Railing	
ParaP/Et Level in metres	PL 50.00		
PiP/E Diameter in millimetres	Ø100		

GENERAL NOTES

IrresP/Ective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and piP/Es/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly deP/Ending on ground, weather and traffic conditions. No warranty is given in resP/Ect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the P/Erformance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth P/Enetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Sheet 01
Sheet 02
Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

Previous Sumo Survey "SOR016539.dwg" has been inserted into this model for reference.

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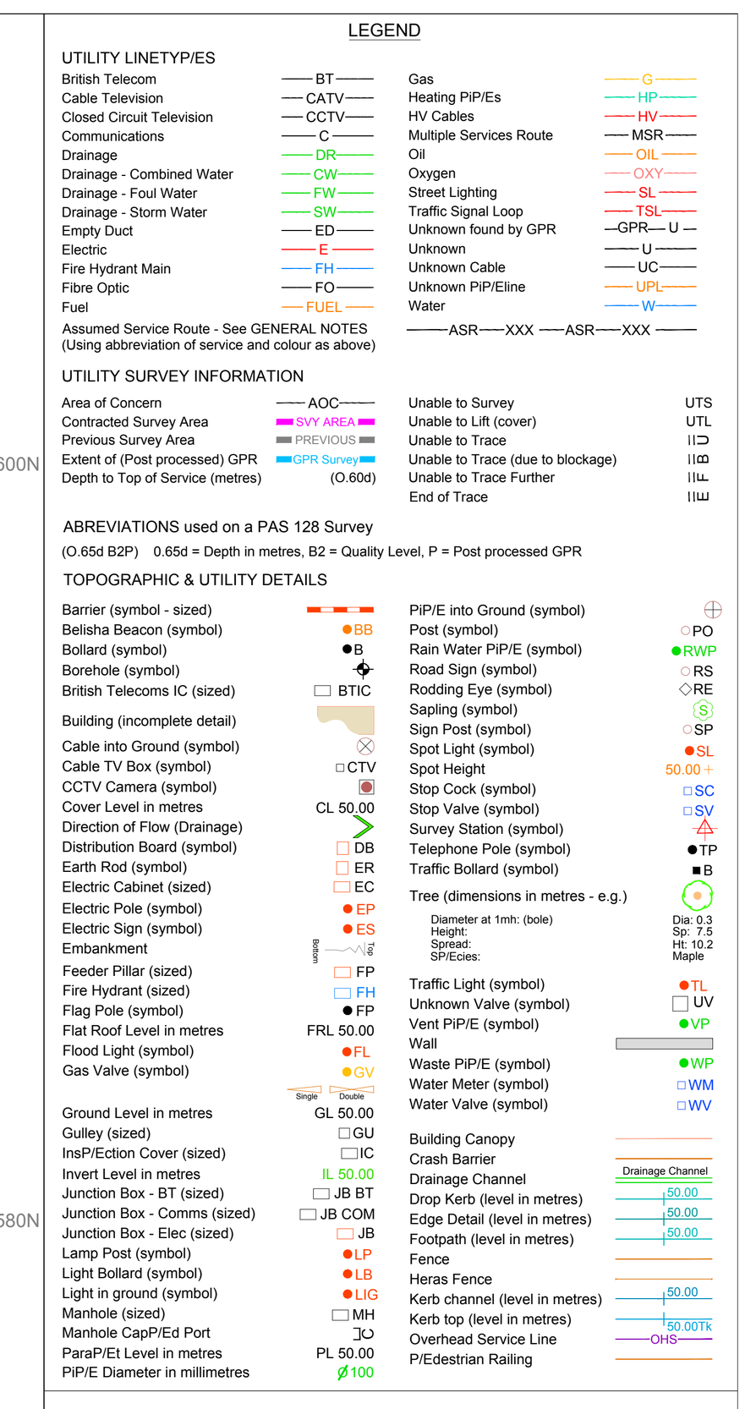
Title: Utility Mapping

Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

Date Completed:	15/08/2020	Post Code:	E14 0ND
Surveyed:	DW, JHG, CE	Scale:	1/200 (A0 Sheet)
Drawn:	DM		
Checked:	DW, JHG, CE		
Job No: SOR017679		Dwg No: 01	Rev:



GENERAL NOTES

IrresP/Ective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

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Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and piP/Es/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly deP/Ending on ground, weather and traffic conditions. No warranty is given in resP/Ect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the P/Erformance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth P/Enetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Sheet 01

Sheet 02

Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

Previous Sumo Survey "SOR016539.dwg" has been inserted into this model for reference.

SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HAVANT
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
www.sumoservices.com

Title: Utility Mapping

Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

Date Completed:	15/08/2020	Post Code:	E14 0ND
Surveyed:	DW, JHG, MW, CE	Scale:	1/200 (A0 Sheet)
Drawn:	DM		
Checked:	DW, JHG, MW, CE		
Job No:	SOR017679	Dwg No: 02	Rev:

LEGEND

UTILITY LINETYP/ES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating PiP/Es	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown found by GPR	GPR — U
Electric	E	Unknown	U
Fire Hydrant Main	FH	Unknown Cable	UC
Fibre Optic	FO	Unknown PiP/Eline	UPL
Fuel	FUEL	Water	W

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) — ASR — XXX — ASR — XXX —

UTILITY SURVEY INFORMATION

Area of Concern	AOC	Unable to Survey	UTS
Contracted Survey Area	SVY AREA	Unable to Lift (cover)	UTL
Previous Survey Area	PREVIOUS	Unable to Trace	U
Extent of (Post processed) GPR	GPR Survey	Unable to Trace (due to blockage)	B
Depth to Top of Service (metres)	(O.60d)	Unable to Trace Further	F
		End of Trace	E

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)		PiP/E into Ground (symbol)	
Belisha Beacon (symbol)	BB	Post (symbol)	PO
Bollard (symbol)	B	Rain Water PiP/E (symbol)	RWP
Borehole (symbol)		Road Sign (symbol)	RS
British Telecoms IC (sized)	BTIC	Rodding Eye (symbol)	RE
Building (incomplete detail)		Sapling (symbol)	S
Cable into Ground (symbol)		Sign Post (symbol)	SP
Cable TV Box (symbol)	CTV	Spot Light (symbol)	SL
CCTV Camera (symbol)		Spot Height	50.00
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet (sized)	EC	Traffic Bollard (symbol)	B
Electric Pole (symbol)	EP	Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Height: Spread: SP/Ecies:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Electric Sign (symbol)	ES		
Embankment	Bottom / Top		
Feeder Pillar (sized)	FP	Traffic Light (symbol)	TL
Fire Hydrant (sized)	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent PiP/E (symbol)	VP
Flat Roof Level in metres	FRL 50.00	Wall	
Flood Light (symbol)	FL	Waste PiP/E (symbol)	WP
Gas Valve (symbol)	GV	Water Meter (symbol)	WM
	Single / Double	Water Valve (symbol)	WV
Ground Level in metres	GL 50.00		
Gulley (sized)	GU	Building Canopy	
InsP/Ection Cover (sized)	IC	Crash Barrier	
Invert Level in metres	IL 50.00	Drainage Channel	Drainage Channel
Junction Box - BT (sized)	JB BT	Drop Kerb (level in metres)	50.00
Junction Box - Comms (sized)	JB COM	Edge Detail (level in metres)	50.00
Junction Box - Elec (sized)	JB	Footpath (level in metres)	50.00
Lamp Post (symbol)	LP	Fence	
Light Bollard (symbol)	LB	Heras Fence	
Light in ground (symbol)	LIG	Kerb channel (level in metres)	50.00
Manhole (sized)	MH	Kerb top (level in metres)	50.00Tk
Manhole CapP/Ed Port		Overhead Service Line	OHS
ParaP/Et Level in metres	PL 50.00	P/Edestrian Railing	
PiP/E Diameter in millimetres	Ø100		

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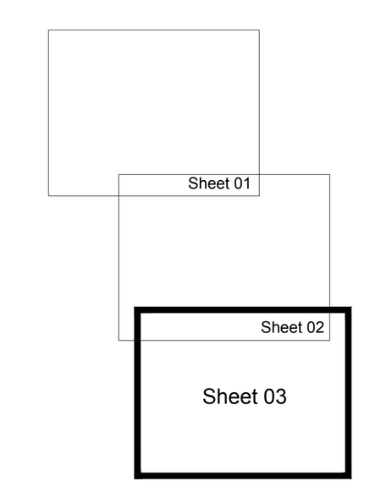
SHEET LAYOUT



Rev	Notes	Drawn	Date

Notes:

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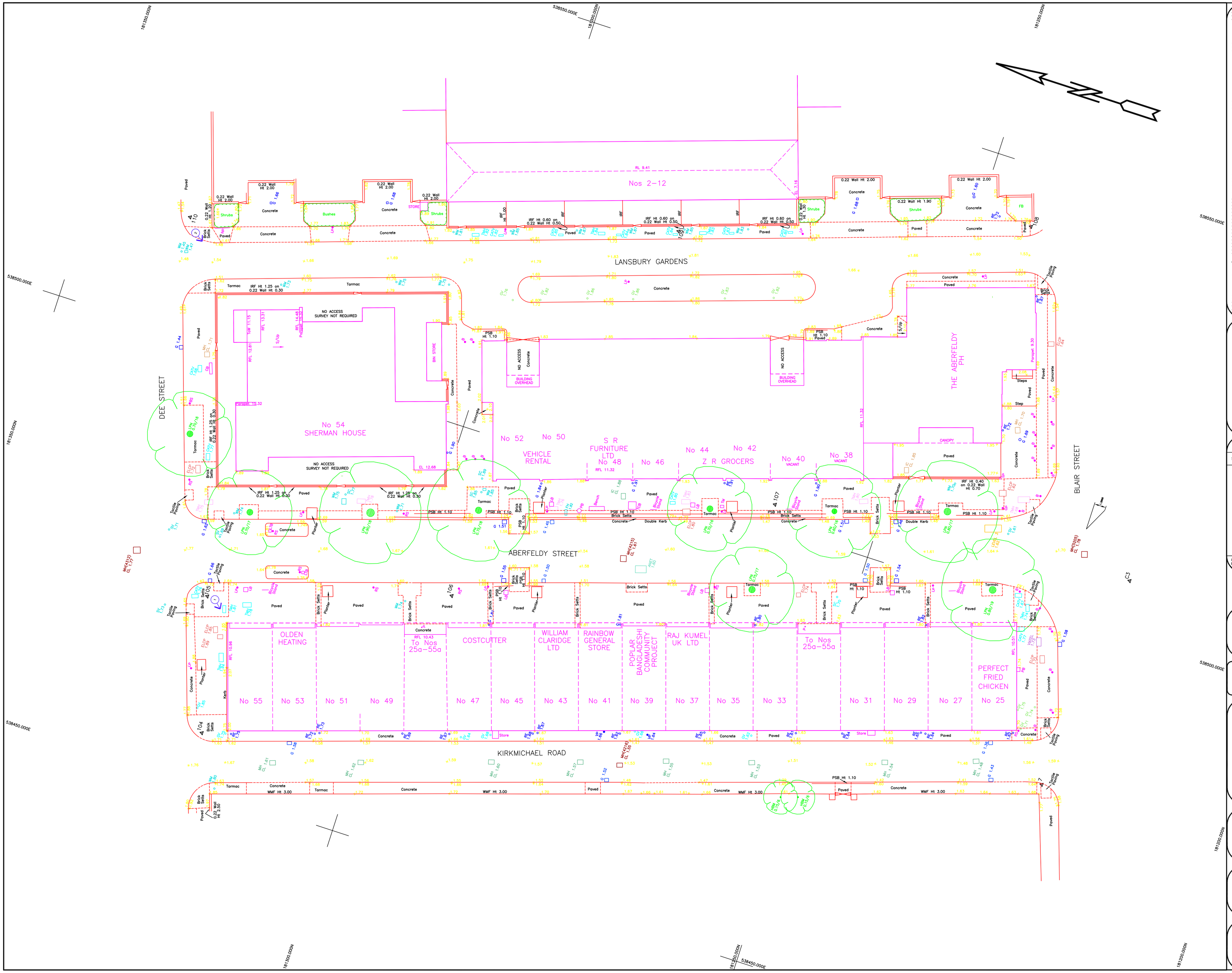
Drawn:	DM		
Checked:	DW, JHG, MW, CE		
Job No:	SOR017679	Dwg No: 03	Rev:



LEGEND

AIR CONDITIONING UNIT	ACU		**FENCE DESCRIPTIONS**		
ADVERTISING BOARD	AB	•	BARBED WIRE FENCE	BWF	
AIR VALVE	AV	○	CHAIN LINK FENCE	CLF	
BOLLARD	B	•	CHESTNUT PALING FENCE	CPF	
BELISHA BEACON	BB	•	CLOSE BOARD FENCE	CBF	
BOREHOLE	BH	⊕	CONCRETE SLAB FENCE	CSF	
BOLLARD/SIGN LIGHT	BL	⊡	DECORATIVE IRON FENCE	DIF	
BENCHMARK POST/PEG	BP	•	CRASH BARRIER	CBR	
BUS STOP	BS	•	IRON RAILINGS	IRF	
CABLE TELEVISION PIT	CATV	□	INTERWOVEN FENCE	IWF	
COAL HOLE	CH	○	LARCH LAP FENCE	LLF	
CONTROL BOX	CB	□	MISCELLANEOUS FENCE	Misc F	
DOG WASTE BIN	DWB	•	OPEN BOARD FENCE	OBF	
DOWN PIPE	DP	○	PALING FENCE	PAL	
EARTHING ROD	ER	•	PALISADE FENCE	PLF	
ELECTRICITY CABLE PIT	ELCP	□	PEDESTRIAN SAFETY BARRIER	PSB	
ELECTRICITY CONTROL BOX	CBE	□	POST AND CHAIN FENCE	PCF	
ELECTRICITY INSPECTION COVER	ELC	□	POST AND MESH FENCE	PMF	
ELECTRICITY POLE	EP	•	POST AND RAIL FENCE	PRF	
ELECTRICITY PYLON	EL PYLON	⊠	POST AND WIRE FENCE	PWF	
FIRE HYDRANT	FH	□	TRELLIS	TLS	
FLAG POLE	FP	•	WIRE MESH FENCE	WMF	
FLOODLIGHT	FLT	⬚			
FLOWER BED	FB	⬚	AVERAGE	Ave	
FOOTPATH	FP		HEIGHT	Ht	
GAS VALVE	GV	○	**DRAINAGE**		
GUIDE POST	GP	•	SURFACE WATER PIPE	0.15 SW	
GULLY	G	○	FOUL WATER PIPE	0.15 FW	
INSPECTION COVER	IC	○	NO VISIBLE CONNECTION	NVC	
INSPECTION COVER (UNKNOWN)	ICU	○	UNABLE TO LIFT	UTL	
KERB OUTLET	KO	○	UNABLE TO SURVEY	UTS	
LAMP HOLE	LH	○	TAKEN FROM RECORDS	TFR	
LAMP POST	LP	•	DRAINAGE CHANNEL (OPEN)	DC	
LIGHTED BOLLARD	LTB	•			
LITTER BIN	LB	⊙	DRAINAGE CHANNEL (COVERED)	DC	
MANHOLE	MH	○			
MILESTONE	MS	•	OVERHEAD WIRE	O/H W	
NAME PLATE	NP	—			
NOTICE BOARD	NB	▭	BANKING		
PARKING METER	PM	•			
POST	P	•	EXTENT OF VEGETATION		
POST BOX	PB	○			
RAIN WATER PIPE	RWP	○	HEDGES		
REFLECTION POST	RP	•			
ROAD SIGN	RS	•	MARSH		
ROODING EYE	RE	○			
SERVICE MARKER POST	SMP	•	GATE	SINGLE DOUBLE	
SIGN POST	SP	•			
SLUICE VALVE	SV	○	RETAINING WALL	RTW	
SOIL & VENT PIPE	SVP	○			
SPOTLIGHT (GROUND)	SPLG	•	SLOPING MASONRY		
SPOTLIGHT (TOWER)	SPLT	•			
STOP COCK	SC	○	STILE		
TELECOM CONTROL BOX	TBT	□			
TELECOM INSPECTION CHAMBER	TIC	□	WALL (Width drawn to scale)		
TELECOM MANHOLE	TMH	□			
TELECOM PILLAR	TLP	□	BUILDING		
TELEGRAPH POLE	TP	•			
TELEPHONE CALL BOX	TCB	□	OPEN SIDED/ BUILDING OVERHEAD		
TICKET MACHINE	TM	□			
TL CABLE INSPECTION COVER	TLIC	□	CANOPY		
TRAFFIC LIGHT	TL	•			
TRAFFIC LIGHT CONTROL BOX	CBTL	□	GLASS ROOFED		
TRAFFIC LIGHT CONTROL POST	TLP	•			
VENT PIPE	VP	○	ARCHWAY		
WATER METER	WM	○			
WASH OUT	WO	○	CONTOURS	25.50	
WATER CONTROL PILLAR	WCP	○			
WATER TAP	TAP	•	ORDNANCE SURVEY	OSBM	
WATER TROUGH	WT	□	BENCH MARK	Value 12.47	
LEVELS			TEMPORARY	TBM	
SPOT LEVEL(+indicates pos.)	+ 127.13		BENCH MARK	Value 50.00	
BASEMENT LEVEL	BFL		SURVEY STATION		
BED LEVEL	BL				
COVER LEVEL	CL				
EAVES LEVEL	EL				
FLOOR LEVEL	FL				
INVERT LEVEL	IL				
ROOF LEVEL	RFL				
KERB LEVEL	KL				
SOFFIT LEVEL	SFL				
SPRING LEVEL	SPL				
THRESHOLD LEVEL	THL				
TOP OF WALL LEVEL	ToW				
WATER LEVEL	WL				

TREE LEGEND

ALDER	ALD	MAPLE	MPL
ASH	ASH	OAK	OAK
ASPEN	ASP	PINE	PNE
BEECH	BCH	POPLAR	POP
CEDAR	CED	PRUNUS	PRU
CHERRY	CHY	RHODODENDRONS	RDN
CONIFEROUS	CON	ROWAN	RWN
CYPRESS	CYP	SALLOW	SLW
DECIDUOUS	DEC	SAPLING	SAP
DEAD	DED	SWEET CHESTNUT	SCH
ELDERBERRY	ELD	SILVER BIRCH	SBR
ELM	ELM	SPRUCE	SPR
EUCALYPTUS	EUC	SYCAMORE	SYC
FIR	FIR	SPECIES UNKNOWN	UNS
FRUIT	FRT	TREE OF HEAVEN	TOH
HAWTHORN	HAW	WELLINGTONIA	WEL
HAZEL	HZL	WHITEBEAM	WBM
HORNBEAM	HBM	WILLOW	WLW
HORSE CHESTNUT	HCH	WALNUT	WNT
HOLLY	HLY	YEW	YEW
INDIAN BEAN TREE	IBT	MULTI-TRUNK	MT
LARCH	LAR		
LABURNUM	LBM	0.2 / 6 / 3T	
LOCUST	LCS	Dia of Tree / No of	
LIME	LIM	Bole / Height / Trunks	
LONDON PLANE	LPN		
MAGNOLIA	MAG		

SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
7	PN	538480.864	181222.252	1.571
100	–	538634.795	181387.889	1.889
104	PNW	538456.201	181318.168	1.791
105	PNW	538471.710	181322.503	1.767
106	PKN	538480.626	181295.154	1.724
107	PNW	538502.572	181262.266	1.788
108	PN	538542.985	181243.685	1.646
109	PKN	538529.685	181282.973	1.849
110	PKN	538513.558	181338.185	1.587
C2	PN	538687.952	181279.286	1.783
C3	PKN	538506.884	181219.790	1.829

HN – HBBI Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PM)

NOTE:
PHOTO POSITIONS SHOWN THUS: ← 1

FOR PHOTO'S REFER TO DRAWING 3553–2 SHEET 2.

NOTES

GRID — THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO–ORDINATES 538663.947E, 181376.651N.

LEVELLING — THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

Aworth SURVEY CONSULTANTS
LRQA Certificated Office
Norfolk House, Norfolk Way, Uckfield, TN22 1EP
Tel:– 01825 768319 Fax:– 01825 768310
www.aworth.co.uk als@aworth.co.uk
The Lansdowne Building, 2 Lansdowne Road
Croydon, CR9 2ER
Tel:– 020 8263 6046 Fax:– 020 8263 6146

Drawing No	Sheet	Revision
3553–2	1	
Scale 1:200 @ A1		

Surveyed	NW
Drawn	DRF/TP
Checked	PDE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 2

Client

POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF

LEGEND

AIR CONDITIONING UNIT	ACU		
ADVERTISING BOARD	AB	●	SIGN
AIR VALVE	AV	+	
BELL PUSH	BP	+	
BILLBOARD BEACON	BB	●	
BOLLARD	BOL	●	
BOUNDARY LIGHT	BL	+	
BOUNDARY POST/PEG	BP	+	
BUS STOP	BS	+	
CABLE TELEVISION PIT	CATV	□	
COAL HOLE	CH	□	
CONTROL BOX	CB	□	
CROSS WALL PIN	CWP	+	
DOWN PIPE	DP	+	
ELECTRIC POLE	EP	+	
ELECTRICITY CABLE PIT	ELCP	□	
ELECTRICITY CONTROL BOX	ECB	□	
ELECTRICITY INSPECTION COVER	EIC	□	
ELECTRICITY PILLAR	EP	□	
ELECTRICITY PYLON	EL PYLON	⊠	
FLAG	FG	+	
FLAG STAFF	FS	+	
FLOODLIGHT	FL	⊡	
FLOODLIGHT MAST	FLT	⊡	
FOOTPATH	FP	---	
GAS VALVE	GV	+	
GAS POST	GP	+	
GULLY	G	○	
INSPECTION COVER	IC	□	
INSPECTION COVER (UNKNOWN)	ICU	□	
KERB OUTLET	KO	+	
LAMP POST	LP	+	
LEAD POST	LP	+	
LIGHTED BOLLARD	LTB	+	
MANHOLE	MH	○	
MARKER PIN	MP	+	
MILESTONE	MS	+	
MINOR POST	MP	+	
NOTICE BOARD	NB	▭	
PARKING METER	PM	+	
PIPE	P	+	
POST BOX	PB	+	
RAIN WATER PIPE	RWP	+	
ROAD SIGN POST	RSP	+	
SIGN POST	SP	+	
SOCKET	SK	+	
SOUNDING EYE	SE	+	
STANDARD MARKER POST	SMP	+	
SIGN POST	SP	+	
SLUICE VALVE	SV	○□	
SOIL VENT PIPE	SVP	+	
SPOTLIGHT (GROUND)	SPLG	+	
SPOTLIGHT (TOWER)	SPLT	+	
STOP COCK	SC	+	
TELEGRAPH BOX	TGB	□	
TELEGRAPH MANHOLE CHAMBER	TMH	□	
TELECOM MANHOLE	TMH	□	
TELECOM POLE	TP	+	
TELEMANN TOILE	TT	+	
TELEPHONE CALL BOX	TCB	□	
TELEPHONE POLE	TP	+	
TV CABLE INSPECTION COVER	TVC	□	
TRAFFIC LIGHT	TL	+	
TRAFFIC LIGHT CONTROL BOX	TLCB	□	
TRAFFIC LIGHT CONTROL POST	TLCP	+	
TREE	T	+	
WATER METER	WM	+	
WATER POST	WP	+	
WATER CONTROL PILLAR	WCP	+	
WATER TAP	WT	+	
WATER TROUGH	WT	+	
LEVELS			
SPOT LEVEL(Indicates pos.)	+	127.13	
BASEMENT LEVEL		BL	
BED LEVEL		BL	
CILL LEVEL		CL	
EAVES LEVEL		EL	
FLOOR LEVEL		FL	
GROUND LEVEL		GL	
ROOF LEVEL		RL	
RIDGE LEVEL		RDL	
SILL LEVEL		SIL	
SPRING LEVEL		SPL	
THRESHOLD LEVEL		THL	
WATER LEVEL		WL	

FENCE DESCRIPTIONS	
BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CLOSE BOARD FENCE	CBF
CLOSE BOARD FENCE	CBF
CONCRETE SLAB FENCE	CSF
CONCRETE POST FENCE	CPF
CRASH BARRIER	CBR
IRON RAILING	IRF
LARCH LAP FENCE	LLF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	Misc F
PALISADE FENCE	PALF
PALING FENCE	PLF
PALISADE FENCE	PAL
POST AND CHAIN SAFETY BARRIER	PCSB
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
RAILINGS	RAIL
WIRE MESH FENCE	WMF
AVENUE	Ave
HEIGHT	Ht

DRAINAGE	
SURFACE WATER PIPE	SLTN / SW
FOUL WATER PIPE	SLTN / FW
NO VISIBLE CONNECTION	NVC
UNABLE TO LIFT	UTL
NOT FOUND DURING SURVEY	NF
TAKEN FROM RECORDS	TFR
DRAINAGE CHANNEL (OPEN)	
DRAINAGE CHANNEL (COVERED)	DC
OVERHEAD WIRE	O/HLW
BANKING	
EXTENT OF VEGETATION	
HEDGES	
MARSH	
GATE	SINGLE DOUBLE
RETAINING WALL	RTW
SLOPING MASONRY	
STILE	
WALL (Width drawn to scale)	
BUILDING	
ENTRY SIDED/ BUILDING OVERHEAD	
CANOPY	
GLASS ROOFED	
ARCHWAY	
CONTOURS	
ORDNANCE SURVEY BENCH MARK	OSBM Value 12.47
TEMPORARY BENCH MARK	TBM Value 50.00
SURVEY STATION	

TREE LEGEND

ALDER	ALD	MAPLE	MPL
ASH	ASH	OAK	OAK
ASPEN	ASP	PINE	PINE
BEECH	BEEH	POPLAR	POP
CEDAR	CED	RHODODENDRON	RDN
CHERRY	CHY	RHODODENDRONS	RDN
CONIFEROUS	CON	ROWAN	SWN
CYPRESS	CYP	SILVER BIRCH	SBH
DECIDUOUS	DEC	SPRUCE	SPR
DEAD	DED	SWEET CHESTNUT	SCH
ELDER/BERRY	ELD	SYCAMORE	SYC
ELM	ELM	YEW	YEW
EUCALYPTUS	EUC	SPECIES UNKNOWN	SPU
FIR	FIR	TREE GROUP	TGP
FRUIT	FRT	TREE OF HEAVEN	TOH
HAWTHORN	HAW	WILLIAM/SALIX	WIL
HAZEL	HAZ	WILLOW	WLW
HORNBEAM	HBM	WALNUT	WNT
HORSE CHESTNUT	HCH	YEW	YEW
HOLLY	HOL		
INDIAN BEAN TREE	IBT	MULTI-TRUNK	MT
LARCH	LAR		
LAURENUM	LAU	Dia of Tree Bole / Height / No of Trunks	0.2 / 4 / 3T
LOQUAT	LOQ		
LIME	LIM		
LONDON PLANE	LPL		
MAGNOLIA	MAG		

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Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
50	PN	538723.408	181302.555	1.783
51	PN	538743.187	181255.806	1.653
52	PNW	538752.765	181230.150	1.729
53	PN	538777.386	181218.539	1.788
54	PN	538768.285	181195.695	4.223
55	PN	538823.444	181216.378	4.266
56	PN	538862.514	181229.780	4.289
57	PN	538889.518	181250.146	4.314
58	PN	538898.100	181276.217	3.382
59	PKN	538863.352	181285.090	2.634
60		538801.399	181318.471	1.922
61	PKN	538771.406	181319.327	1.852
62	PN	538777.714	181288.671	1.808
63	PKN	538848.013	181273.050	1.636
65	PNW	538783.642	181236.459	1.944
66	PEG	538811.387	181291.715	1.744
C1	PN	538663.947	181376.651	1.940
C2	PN	538697.952	181279.256	1.783

W = With Nail PKN = Parker Kalon® Nail FGW = Permanent Ground Marker
NW = Punch Mark PN = Pipe Nail W = Washer Used with PKN and PKC

NOTE:
PHOTO POSITIONS SHOWN THUS: ← 1

FOR PHOTO'S REFER TO DRAWING 3553-5 SHEET 2.

NOTES

GRID: THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID SURVEY CONTROL. THE LOCAL GRID ORIGIN IS 25N E1 E538663.947, N181376.651.

LEVELLING: THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

LLOYDS REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

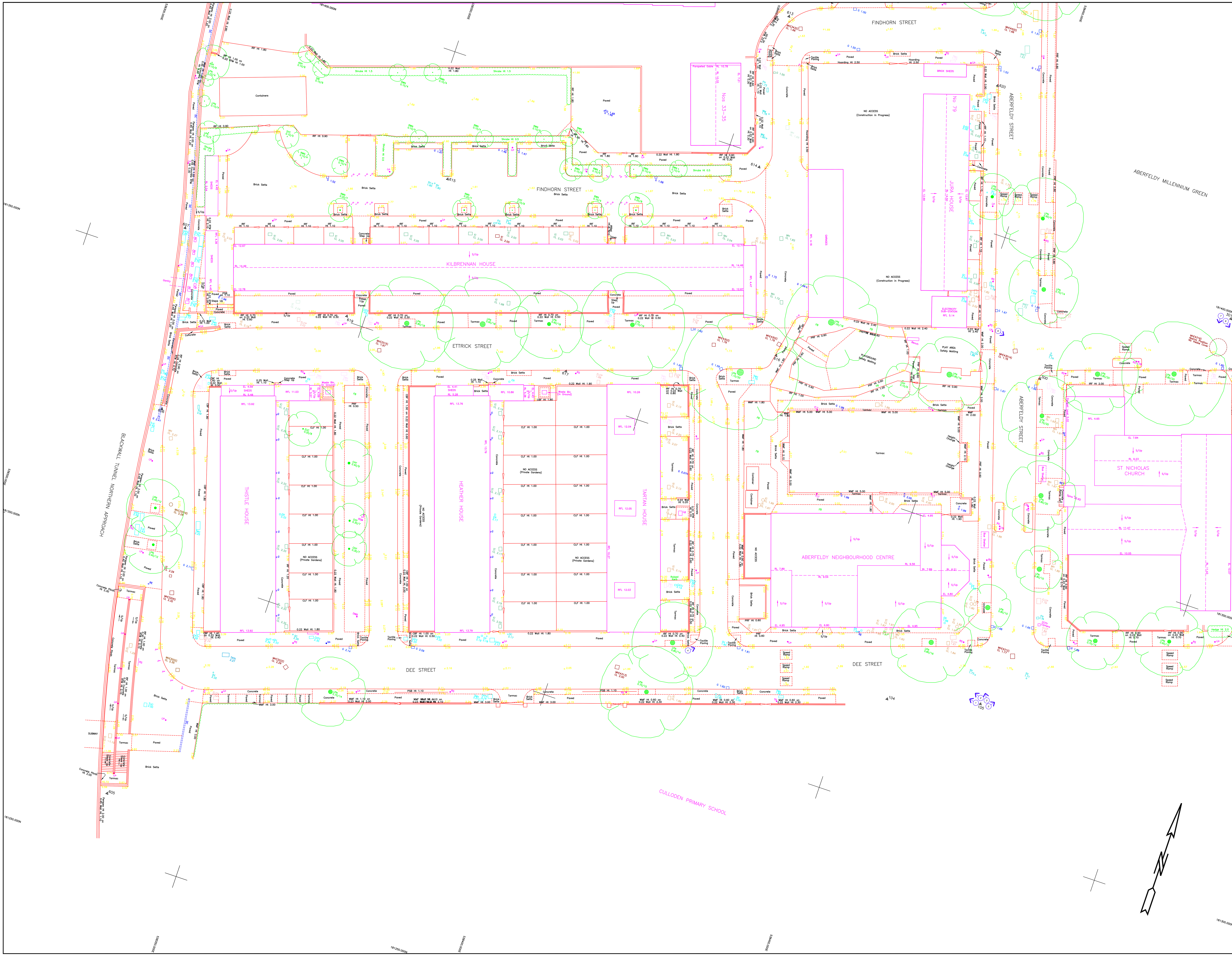
THE SURVEY ASSOCIATION

Aworth SURVEY CONSULTANTS
LRQA Certificated Office
Norfolk House, Norfolk Way, Uckfield, TN22 1EP
Tel:- 01825 768319 Fax:- 01825 768310
www.aworth.co.uk als@aworth.co.uk
The Lansdowne Building, 2 Lansdowne Road
Croydon, CR9 2ER
Tel:- 020 8263 6046 Fax:- 020 8263 6146

Drawing No	Sheet	Revision	Surveyed	CS
3553-5	1		Drawn	JBW
	Scale 1:200 @ A0		Checked	PDC
			Date	18/12/09

Project
ABERFELDY VILLAGE
POPLAR
PHASE 5

Client
POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF



SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

0.2 / 6 / 3T — Dia of Bole / Tree Height / No of Trunks

MULTI-TRUNK MT

Coordinate Table

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
100	PN	538634.795	181387.889	1.889
101	PKN	538514.670	181447.628	1.737
105	PNW	538471.710	181322.503	1.767
110	PKN	538513.558	181338.185	1.587
300	PKN	538463.462	181378.864	1.771
301	PN	538491.308	181399.170	1.700
302	PKN	538560.752	181415.049	1.811
303	PKN	538584.861	181360.978	1.582
600	PKN	538427.513	181308.490	1.990
601	PN	538391.334	181297.567	2.139
602	PN	538373.212	181302.329	2.239
603	PKN	538353.673	181294.721	2.329
604	HN	538339.098	181280.636	2.476
605	PN	538334.163	181259.767	2.593
606	HN	538321.900	181325.555	2.415
607	PN	538315.708	181356.368	2.973
608	PKN	538307.935	181397.113	3.182
609	PN	538297.372	181442.215	3.063
610	PN	538340.316	181458.161	2.433
611	PN	538387.155	181468.694	1.590
612	PN	538429.773	181450.741	1.801
613	PN	538402.553	181424.181	1.756
614	PN	538405.993	181397.949	1.873
615	PN	538355.834	181378.805	1.592
616	PN	538419.161	181368.113	1.830
617	PN	538385.738	181353.977	1.855
618	PKN	538378.350	181338.972	2.196
619	PKN	538346.946	181350.869	1.948
620	PN	538440.400	181424.358	1.632
C4	PNW	538429.831	181475.704	1.957

HN – Hilti® Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PN)

SHEET LAYOUT

NOTE:
PHOTO POSITIONS SHOWN THUS: (1)

FOR PHOTO'S REFER TO DRAWING 3553-6 SHEET 4.

NOTES

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO-ORDINATES 538663.947E, 181376.651N.

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

Aworth
SURVEY CONSULTANTS
LRQA Certificated Office
Norfolk House, Norfolk Way, Uckfield, TN22 1EP
Tel:– 01825 768319 Fax:– 01825 768310
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Croydon, CR9 2ER
Tel:– 020 8263 6046 Fax:– 020 8263 6146

Drawing No	Sheet	Revision
3553-6	2	
	Scale 1:200	@ A0

Surveyed	DR/CS
Drawn	TP
Checked	PDE
Date	18/12/09

Project
ABERFELDY VILLAGE
POPLAR
PHASE 6

Client
POPLAR HARCA
UNIT 3, QUEBEC WHARF
14 THOMAS ROAD
LONDON E14 7AF

Appendix B – Thames Water Asset Records and Pre Development Enquiry Response

Mrs Maria Magdalena Burca
Ecoworld and Poplar Harca C/O Meinhardt (UK) Ltd
10 Aldersgate Street
London
EC1A 4HJ

Wastewater pre-planning
Our ref DS6080631

24 March 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mrs Burca,

Thank you for providing information on your development:

Aberfeldy Village, Area known as Poplar Riverside, London, E14 0HT.

Existing: 297 dwellings, primary school and commercial space (2,217sqm).

Proposed: Demolition of existing site. Phase A – 250 residential units. Foul water discharging by gravity. 50 units to MH7303, 23 units to MH3605, 75 units to MH4301A, 102 units to MH4215. Surface water discharging by gravity attenuated to 8.59l/s to manholes 7303, 3605, 4301A and 4215.

Phase B – 573 residential units, 920.3sqm of workspace, 1,894.9sqm of residential hub, 344,8sqm of estate management space and 443.3sqm of retail space. Foul water discharging by gravity. 79 units to MH3605, 222 units to MH3517 and MH2536, 160 units to MH3516. Surface water discharging by gravity attenuated to 8l/s to manholes 3605, 3517, 2536 and 3516.

Phase C – 622 residential units and 4,816.7sqm workspace. Foul water discharging by gravity to manhole 4303. Surface water discharging by gravity attenuated to 6l/s to manhole 4303.

Phase D – Primary school. Foul water discharging by gravity to manhole 4302. Surface water discharging by gravity attenuated to 3l/s to manhole 4302.

Phase E – 427 residential units and 2,808.3sqm of workspace. Foul water discharging by gravity. 220 units to the manhole upstream of MH4203 in Blair Street, 151 units to MH4202 and 78 units to MH4216.

Overall surface water discharge rates for the development will be restricted to 33.59l/s.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would we consider a restricted discharge into the public combined sewer network.

If the peak surface water run-off discharge is then restricted to Greenfield run-off rates/a maximum of 33.59l/s as your drainage strategy indicates, then we would have no objections to the proposals.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.

In considering your surface water needs, we support the use of sustainable drainage on development sites. You'll need to show the local authority and/or lead local flood authority how you've taken into account the surface water hierarchy that we've included.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0203 577 9811.

Yours sincerely

Siva Rajaratnam - Adoptions Engineer

Thames Water

Asset location search

Property Searches

Meinhardt (UK) Ltd
10

LONDON
EC1A 4HJ

Search address supplied	Aberfeldy Village Aberfeldy Street London London UK
Your reference	Aberfeldy Street Aberfeldy Village E14 0NU
Our reference	ALS/ALS Standard/2020_4292429
Search date	5 November 2020

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

0845 070 9148

Search address supplied: Aberfeldy Village, Aberfeldy Street, London, London, UK,

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 searchprovides 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 0845 070 9148, 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.

The following quartiles have been printed as they fall within Thames' sewerage area:

TQ3881NE
TQ3881SW
TQ3881NW
TQ3881SE

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.

The following quartiles have been printed as they fall within Thames' water area:

TQ3881NE
TQ3881SW

TQ3881NW
TQ3881SE

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

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

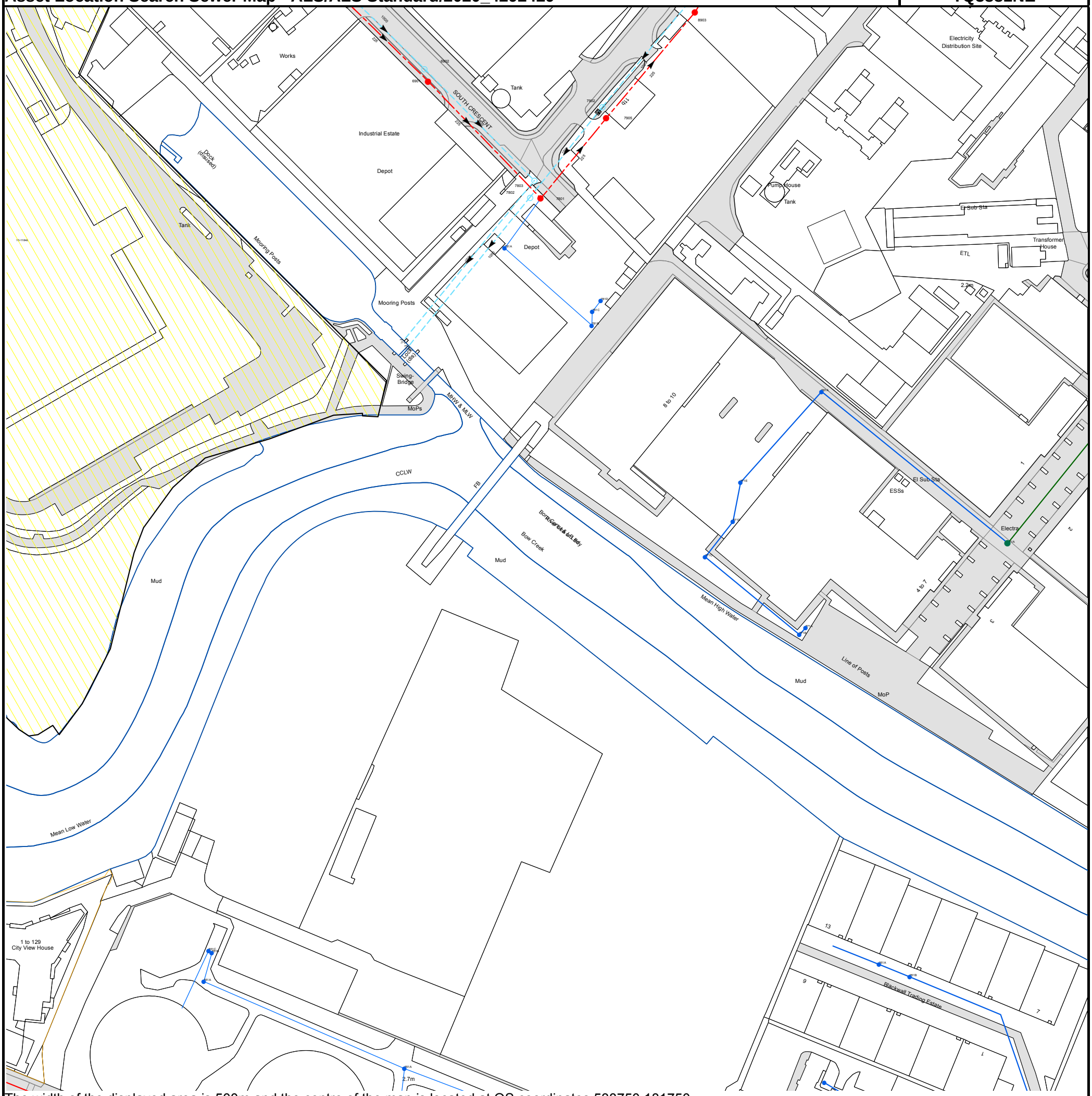
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429

TQ3881NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181750

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.

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
85AB	n/a	n/a
85AC	n/a	n/a
951A	n/a	n/a
951B	n/a	n/a
8904	n/a	n/a
8903	n/a	n/a
781A	n/a	n/a
7802	n/a	n/a
7803	n/a	n/a
7801	n/a	n/a
781B	n/a	n/a
781C	n/a	n/a
781D	n/a	n/a
871C	n/a	n/a
871D	n/a	n/a
871E	n/a	n/a
871B	n/a	n/a
871A	n/a	n/a
881A	n/a	n/a
971A	n/a	n/a
651A	n/a	n/a
6902	n/a	n/a
6901	n/a	n/a
7902	n/a	n/a
7905	n/a	n/a
551A	n/a	n/a
551C	n/a	n/a
551B	n/a	n/a

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429

TQ3881SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181250

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.

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
3407	2.25	.86
3402	1.92	-3.79
3403	1.94	-.54
2417	3	1.5
141A	n/a	n/a
2424	2.32	n/a
141G	n/a	n/a
411H	n/a	n/a
4203	1.7	-.48
4204	1.79	-.7
4202	1.71	-.9
4201	1.7	-.94
42DH	n/a	n/a
42DI	n/a	n/a
42DJ	n/a	n/a
42EA	n/a	n/a
4216	1.57	-1.33
42EE	n/a	n/a
4215	1.61	-2.24
42EG	n/a	n/a
42ED	n/a	n/a
43DB	n/a	n/a
33CH	n/a	n/a
4301A	1.77	-2.82
43DE	n/a	n/a
431E	n/a	n/a
43DD	n/a	n/a
43DF	n/a	n/a
4319	1.76	-1.28
43DG	n/a	n/a
44DB	n/a	n/a
44DA	n/a	n/a
44CI	n/a	n/a
44DC	n/a	n/a
44DD	n/a	n/a
44CH	n/a	n/a
44CJ	n/a	n/a
3432	1.68	-1.72
4420	1.59	-3.16
4419	1.7	-3.27
4408	1.75	-3.45
3405	1.72	.13
4407	1.97	-3.55
4401	1.76	-.05
3404	1.67	-.33
3222	2.36	.55
32CG	n/a	n/a
42EC	n/a	n/a
33EE	n/a	n/a
4313	2.04	-1.04
43DI	n/a	n/a
33ED	n/a	n/a
33EC	n/a	n/a
33EB	n/a	n/a
4312	1.73	-2.54
33EA	n/a	n/a
33DJ	n/a	n/a
431D	n/a	n/a
431C	n/a	n/a
33CE	n/a	n/a
4303	n/a	n/a
4302	n/a	n/a
431B	n/a	n/a
33DB	n/a	n/a
33DC	n/a	n/a
431A	n/a	n/a
33DD	n/a	n/a
3016	4.41	-1.42
3015	4.08	-1.55
3014	3.45	-1.74
3010	n/a	n/a
3023	4.25	1.24
3005	n/a	n/a
3009	3.98	1.27
3008	4.06	2.68
3007	4.16	-1.23
3006	6.19	2.89
2422	2.26	-4.27
2406	2.7	1.83
2409	2.99	2.3
2408	n/a	n/a
2304	2.49	1.07
2420	3.36	1.54
2303	2.35	.8
2305	2.66	1.02
2301	2.38	.73
3306	2.49	1.72
3310	2.57	.74
3406	2.76	1.11
3401	3.04	-8.94

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3302	2.7	.54
3301B	2.29	-1.11
33CI	n/a	n/a
3205	2.35	-4.07
33CD	n/a	n/a
3202	n/a	n/a
33CJ	n/a	n/a
33DE	n/a	n/a
33DF	n/a	n/a
33DG	n/a	n/a
33DH	n/a	n/a
33DA	n/a	n/a
33DI	n/a	n/a
3316	n/a	n/a
2102	4.37	1.67
2012	4.38	1.37
2112	4.66	-8.47
3112	n/a	n/a
3101	n/a	n/a
3102	n/a	n/a
3103	n/a	n/a
3106	n/a	n/a
311C	n/a	n/a
311B	n/a	n/a
311A	n/a	n/a
4104	1.72	-.02
411E	n/a	n/a
411A	n/a	n/a
411J	n/a	n/a
411F	n/a	n/a
411B	n/a	n/a
411I	n/a	n/a
411G	n/a	n/a
411C	n/a	n/a
4103	1.85	-.11
411D	n/a	n/a
4011	4.17	1.55
4102	1.93	-.22
4101	1.93	-.49
12BD	n/a	n/a
12BE	n/a	n/a
2208	5.19	2.74
22CE	n/a	n/a
22CD	n/a	n/a
12BF	n/a	n/a
22BH	n/a	n/a
22BI	n/a	n/a
22BJ	n/a	n/a
22CA	n/a	n/a
22CB	n/a	n/a
22CC	n/a	n/a
2207	5.18	2.47
21CE	n/a	n/a
21CD	n/a	n/a
2203	5.2	2.35
21CC	n/a	n/a
2202	3.7	1.85
2204	3.93	2.12
2201	2.97	.77
2212	2.64	1.93
3218	2.85	1.21
3217	2.94	.53
3219	2.74	1.64
3201	2.44	-8.63
3204	2.34	-.83
3203	2.47	-1.25
12EB	n/a	n/a
12EA	n/a	n/a
121I	n/a	n/a
121F	5.7	4.88
121K	5.65	4.88
121T	5.98	3.89
121J	n/a	n/a
121G	5.7	4.55
12DJ	n/a	n/a
121E	n/a	n/a
121H	n/a	n/a
121D	5.7	3.04
121O	6.31	4.9
12DI	n/a	n/a
121C	5.99	3.08
121R	6.17	4.07
12DH	n/a	n/a
12FH	n/a	n/a
12FI	n/a	n/a
12BJ	n/a	n/a
12CA	n/a	n/a
12CB	n/a	n/a
12AI	n/a	n/a
12AJ	n/a	n/a
12BA	n/a	n/a
12BB	n/a	n/a
12BC	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
11ED	n/a	n/a
11EC	n/a	n/a
11EB	n/a	n/a
21BE	n/a	n/a
11CG	n/a	n/a
11EA	n/a	n/a
21CH	n/a	n/a
21BF	n/a	n/a
11CH	n/a	n/a
11DJ	n/a	n/a
11CI	n/a	n/a
11CJ	n/a	n/a
21BG	n/a	n/a
11DA	n/a	n/a
11DB	n/a	n/a
11DI	n/a	n/a
21BH	n/a	n/a
11DC	n/a	n/a
11DH	n/a	n/a
21BI	n/a	n/a
11DF	n/a	n/a
11DG	n/a	n/a
21BJ	n/a	n/a
2110	5.27	3.03
21CA	n/a	n/a
21CB	n/a	n/a
2109	4.66	2.72
10DF	n/a	n/a
20DC	n/a	n/a
101A	n/a	n/a
20CD	n/a	n/a
10CC	n/a	n/a
10CI	n/a	n/a
20CI	n/a	n/a
1017	5.67	2.64
10CD	n/a	n/a
1016	5.23	2.03
10FD	n/a	n/a
20CJ	n/a	n/a
2019	4.77	1.79
10FE	n/a	n/a
11EI	n/a	n/a
11EJ	n/a	n/a
11FA	n/a	n/a
11FB	n/a	n/a
11FC	n/a	n/a
11FE	n/a	n/a
11FH	n/a	n/a
1102B	5.81	2.58
11EG	n/a	n/a
11EF	n/a	n/a
1101A	5.8	2.17
11EE	n/a	n/a
2103	4.5	2.19
02CH	n/a	n/a
12GD	n/a	n/a
12DG	n/a	n/a
12BI	n/a	n/a
12DF	n/a	n/a
12DD	n/a	n/a
12DC	n/a	n/a
12BH	n/a	n/a
12DB	n/a	n/a
12DA	n/a	n/a
12CJ	n/a	n/a
12GF	n/a	n/a
1205	n/a	n/a
12CI	n/a	n/a
12BG	n/a	n/a
12CH	n/a	n/a
12CC	n/a	n/a
13DH	n/a	n/a
13DE	n/a	n/a
13DG	n/a	n/a
13DF	n/a	n/a
13DD	n/a	n/a
13DI	n/a	n/a
13DC	n/a	n/a
13DB	n/a	n/a
1303	n/a	n/a
1301	5.33	3.16
1004	n/a	n/a
1009	n/a	n/a
1003	n/a	n/a
1001A	n/a	n/a
1010	5.03	1.14
2004	5.3	2.58
1013	5.52	1.82
2005	4.86	3.56
2006	4.74	3.75
1011	5.33	1.55
001D	n/a	n/a
10DH	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2011	4.53	1.22
10FA	n/a	n/a
10EJ	n/a	n/a
10DG	n/a	n/a
10DE	n/a	n/a
10DB	n/a	n/a
101B	n/a	n/a
10DD	n/a	n/a
20DB	n/a	n/a
01FD	n/a	n/a
0102A	6.44	3.38
01FG	n/a	n/a
01FH	n/a	n/a
01FI	n/a	n/a
01FJ	n/a	n/a
01FF	n/a	n/a
01GA	n/a	n/a
01GB	n/a	n/a
01GC	n/a	n/a
01BE	n/a	n/a
01BF	n/a	n/a
0003	6.02	2.89
11CB	n/a	n/a
11GI	n/a	n/a
11GA	n/a	n/a
11CC	n/a	n/a
11GB	n/a	n/a
11GC	n/a	n/a
11GD	n/a	n/a
11GE	n/a	n/a
11GF	n/a	n/a
11GG	n/a	n/a
10FC	n/a	n/a
11HC	n/a	n/a
11HA	n/a	n/a
11HD	n/a	n/a
0302	5.99	3.98
0312	n/a	2.95
0402	5.17	2.45
0301	5.75	3.69
0311	5.81	2.78
1410	5.02	1.25
141E	n/a	n/a
1411	5.23	1.47
141D	n/a	n/a
1404	5.25	1.53
141C	n/a	n/a
1312	5.55	3.33
1405	5.47	2.46
1415	n/a	n/a
1311	5.43	2.97
1403	4.55	1.3
1414	n/a	n/a
1310	5.38	3.07
1302	n/a	n/a
141H	n/a	n/a
131A	n/a	n/a
1402	4.17	1.17
141B	n/a	n/a
1401	3.58	1.08
2315	4.46	1.69
2314	3.26	1.25
2403	2.27	-5.19
2407	2.81	2.25
0212	n/a	n/a
0201B	6.49	3.67
02CI	n/a	n/a
0202	6.24	3.38
12FD	n/a	n/a
1103B	5.94	3.13
12FC	n/a	n/a
11CD	n/a	n/a
121S	6.11	5.25
12FB	n/a	n/a
12FA	n/a	n/a
12EJ	n/a	n/a
12EI	n/a	n/a
12EH	n/a	n/a
12EG	n/a	n/a
121L	5.71	4.55
12EF	n/a	n/a
121M	5.73	4.28
121A	5.6	3.17
12EE	n/a	n/a

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429

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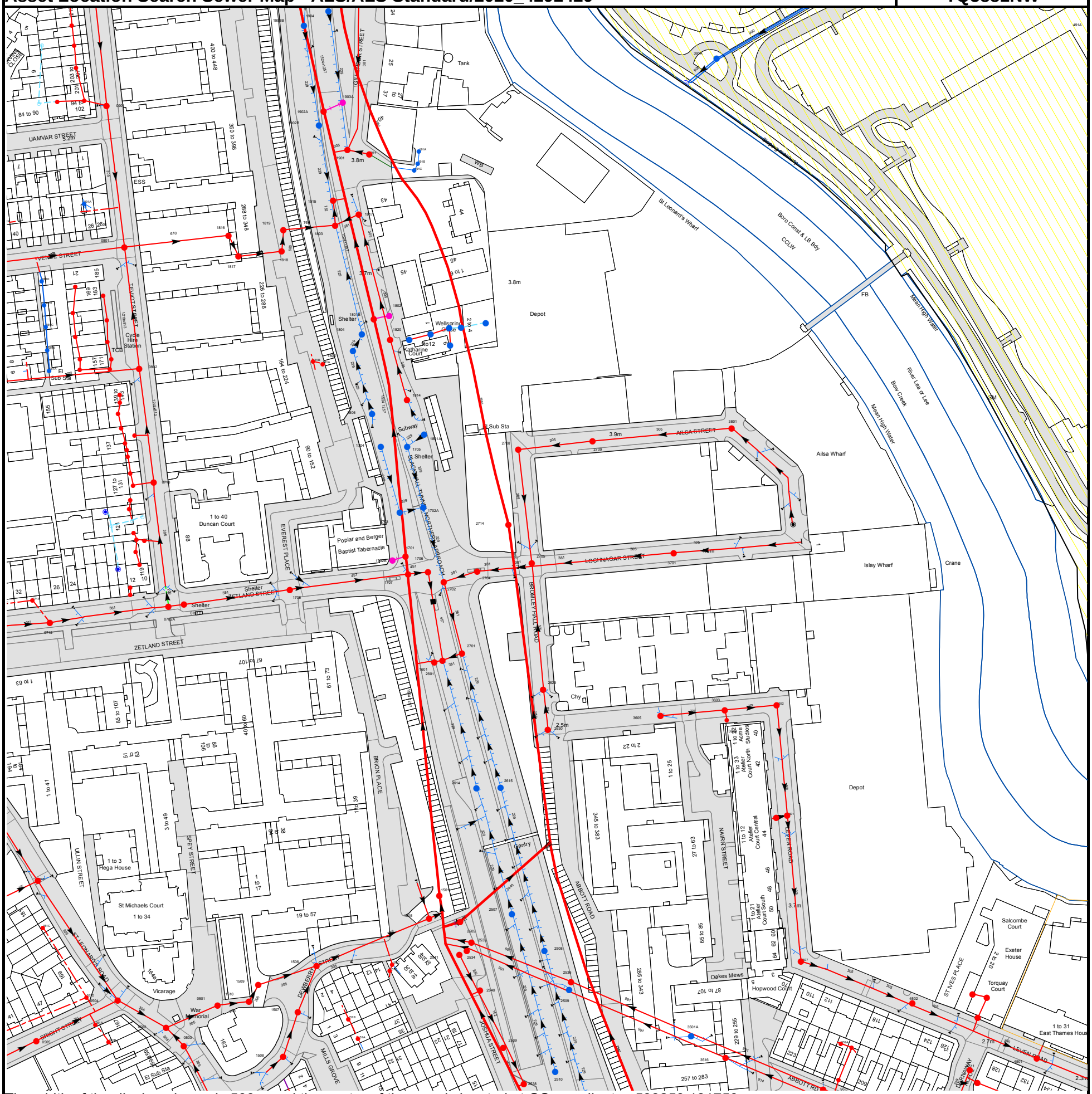

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181750

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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
3701	n/a	n/a
3501A	n/a	n/a
3603	3.19	1.1
3516	n/a	n/a
3604	3.24	n/a
361A	3.5	.4
3602	3.75	.78
3601	3.55	.29
3507	3.39	n/a
3517	n/a	n/a
35CH	n/a	n/a
351A	n/a	n/a
35CG	n/a	n/a
4502	n/a	n/a
4511	n/a	n/a
45BF	n/a	n/a
45CB	n/a	n/a
45BH	n/a	n/a
45BG	n/a	n/a
4501	n/a	n/a
1705	n/a	n/a
2709	n/a	n/a
1801A	n/a	n/a
3801	n/a	n/a
1806	n/a	n/a
1814	n/a	n/a
181A	n/a	n/a
181B	n/a	n/a
1805	n/a	n/a
28AB	n/a	n/a
18CI	n/a	n/a
1820	n/a	n/a
18CH	n/a	n/a
1804	n/a	n/a
28AC	n/a	n/a
28AE	n/a	n/a
28AD	n/a	n/a
1801B	n/a	n/a
1802	n/a	n/a
1817	n/a	n/a
1818	n/a	n/a
1816	n/a	n/a
1819	n/a	n/a
1803	n/a	n/a
1917	n/a	n/a
1915	n/a	n/a
191C	n/a	n/a
191B	n/a	n/a
1914	n/a	n/a
191A	n/a	n/a
1901	n/a	n/a
1902B	n/a	n/a
1902A	n/a	n/a
1903A	n/a	n/a
391A	n/a	n/a
1903B	n/a	n/a
491A	n/a	n/a
1904	n/a	n/a
391B	n/a	n/a
2538	n/a	n/a
2510	n/a	n/a
1508	n/a	n/a
2539	n/a	n/a
0503	n/a	n/a
151A	n/a	n/a
0502	n/a	n/a
151B	n/a	n/a
1507	n/a	n/a
0501	n/a	n/a
1510	n/a	n/a
2540	n/a	n/a
2509	n/a	n/a
1509	n/a	n/a
2536	n/a	n/a
151D	n/a	n/a
1506	n/a	n/a
151C	n/a	n/a
2541	n/a	n/a
2534	n/a	n/a
2508	n/a	n/a
2535	n/a	n/a
2505	2.25	-8.8
1505	n/a	n/a
2507	n/a	n/a
1501	2.32	-5.24
2614	n/a	n/a
2615	n/a	n/a
2630	n/a	n/a
3605	n/a	n/a
2629	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1601	n/a	n/a
2601	n/a	n/a
2701	n/a	n/a
0702A	n/a	n/a
0701B	n/a	n/a
1708	n/a	n/a
2702	n/a	n/a
1707	n/a	n/a
1706	n/a	n/a
2704	n/a	n/a
2705	n/a	n/a
1702B	n/a	n/a
1701	n/a	n/a
2714	3.24	-9.46
1703	n/a	n/a
1702A	n/a	n/a
0713	n/a	n/a
2708	n/a	n/a
1704	n/a	n/a
07CH	n/a	n/a
07DB	n/a	n/a
07DD	n/a	n/a
07DE	n/a	n/a
07DJ	n/a	n/a
07EA	n/a	n/a
07EB	n/a	n/a
07DI	n/a	n/a
07DH	n/a	n/a
08BJ	n/a	n/a
08CA	n/a	n/a
08CB	n/a	n/a
08CC	n/a	n/a
08AH	n/a	n/a
081A	n/a	n/a
08EE	n/a	n/a
08DI	n/a	n/a
0802	n/a	n/a
08DH	n/a	n/a
08ED	n/a	n/a
081B	n/a	n/a
08DG	n/a	n/a
08EC	n/a	n/a
081C	n/a	n/a
08DF	n/a	n/a
08EB	n/a	n/a
081D	n/a	n/a
08DE	n/a	n/a
08EA	n/a	n/a
081E	n/a	n/a
0801	n/a	n/a
091A	n/a	n/a
0901	n/a	n/a
09BD	n/a	n/a
09BE	n/a	n/a
09BF	n/a	n/a
09CA	n/a	n/a
09BJ	n/a	n/a
09BC	n/a	n/a
09BI	n/a	n/a
09BH	n/a	n/a
071A	n/a	n/a
0506	n/a	n/a
051C	n/a	n/a
0712	n/a	n/a
051D	n/a	n/a
07CI	n/a	n/a
0504	n/a	n/a
07AH	n/a	n/a
07BJ	n/a	n/a
07CE	n/a	n/a
07CF	n/a	n/a
07CD	n/a	n/a
07CG	n/a	n/a
07CC	n/a	n/a
051B	n/a	n/a
0505	n/a	n/a
051A	n/a	n/a

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Asset Location Search Sewer Map - ALS/ALS Standard/2020_4292429

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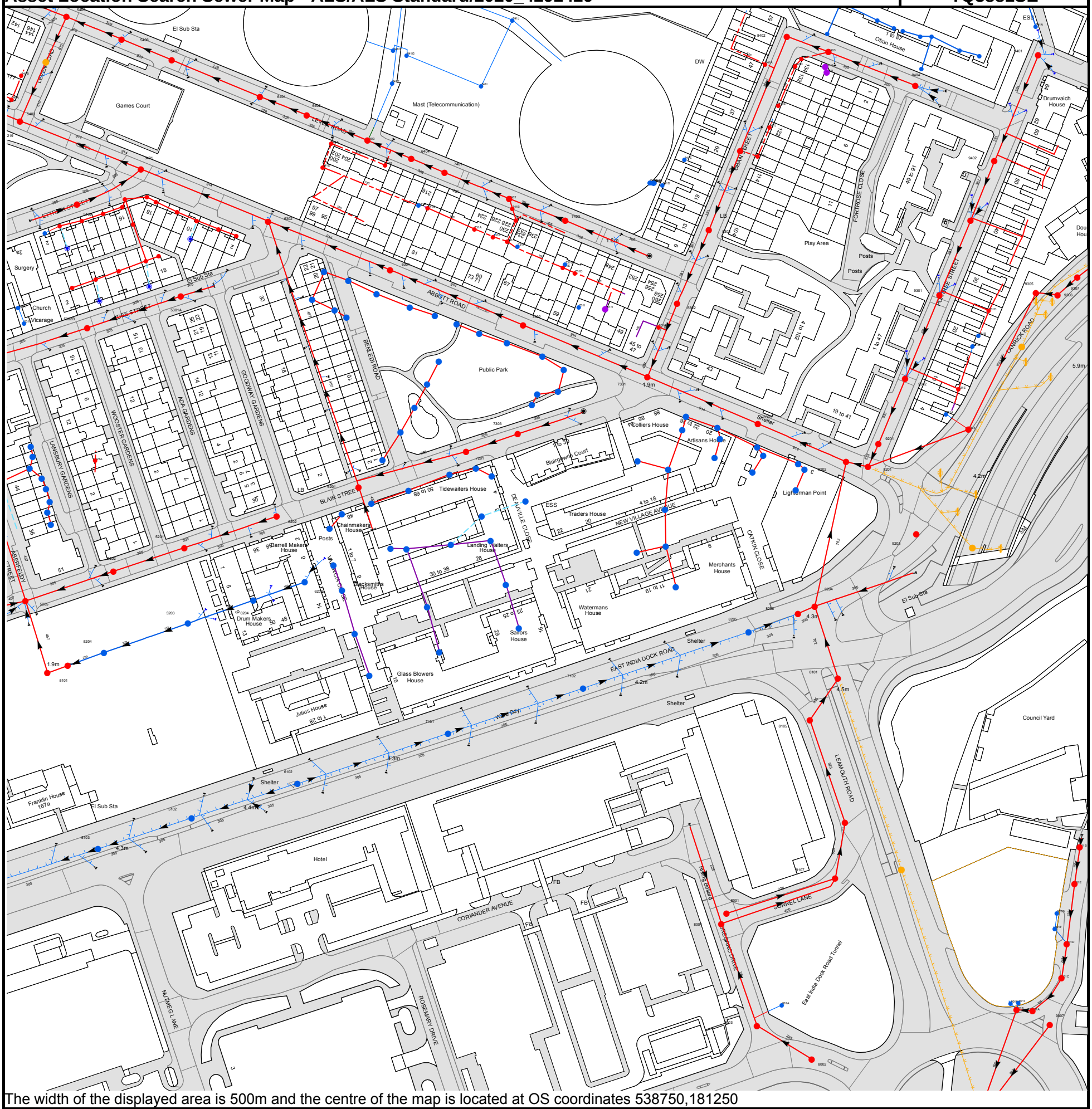


The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181250

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181250

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
8401	n/a	n/a
841G	n/a	n/a
841A	n/a	n/a
841J	n/a	n/a
841B	n/a	n/a
8402	n/a	n/a
841C	n/a	n/a
841F	n/a	n/a
841H	n/a	n/a
841I	n/a	n/a
84DH	n/a	n/a
8403	n/a	n/a
94CI	n/a	n/a
94CH	n/a	n/a
94CJ	n/a	n/a
9404	n/a	n/a
94DA	n/a	n/a
94DC	n/a	n/a
94DB	n/a	n/a
9402	n/a	n/a
9401	n/a	n/a
7403	n/a	n/a
741A	n/a	n/a
741B	n/a	n/a
641C	n/a	n/a
641E	n/a	n/a
7402	n/a	n/a
841D	n/a	n/a
741E	n/a	n/a
741D	n/a	n/a
741H	n/a	n/a
741C	n/a	n/a
741G	n/a	n/a
741F	n/a	n/a
7401	n/a	n/a
641D	n/a	n/a
641B	n/a	n/a
841E	n/a	n/a
6404	n/a	n/a
641A	n/a	n/a
6403	n/a	n/a
6402	n/a	n/a
741I	n/a	n/a
641F	n/a	n/a
641G	n/a	n/a
641H	n/a	n/a
741J	n/a	n/a
5405	n/a	n/a
9203	n/a	n/a
82CD	n/a	n/a
82CH	n/a	n/a
82CE	n/a	n/a
8201	n/a	n/a
82CF	n/a	n/a
8202	n/a	n/a
82CJ	n/a	n/a
82CI	n/a	n/a
82CG	n/a	n/a
9201	n/a	n/a
83CF	n/a	n/a
9304	n/a	n/a
83CE	n/a	n/a
8301	n/a	n/a
931A	n/a	n/a
931E	n/a	n/a
9302	n/a	n/a
931C	n/a	n/a
931B	n/a	n/a
931D	n/a	n/a
9301	n/a	n/a
9306	n/a	n/a
9305	n/a	n/a
9307	n/a	n/a
9403	n/a	n/a
72AI	n/a	n/a
731B	n/a	n/a
73CI	n/a	n/a
731C	n/a	n/a
731F	n/a	n/a
7303	n/a	n/a
7302	n/a	n/a
72CD	n/a	n/a
73DD	n/a	n/a
73DB	n/a	n/a
73CG	n/a	n/a
73DA	n/a	n/a
731E	n/a	n/a
73CJ	n/a	n/a
731G	n/a	n/a
731D	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
731I	n/a	n/a
731H	n/a	n/a
72AH	n/a	n/a
7301	n/a	n/a
831A	n/a	n/a
82CB	n/a	n/a
82CC	n/a	n/a
8302	n/a	n/a
83CB	n/a	n/a
83CC	n/a	n/a
8303	n/a	n/a
8004	n/a	n/a
8003	n/a	n/a
801A	6.29	5.79
8002	n/a	n/a
9007	n/a	n/a
8001	n/a	n/a
8107	n/a	n/a
8106	n/a	n/a
6102	n/a	n/a
7101	n/a	n/a
8105	n/a	n/a
7102	n/a	n/a
8101	n/a	n/a
61BC	n/a	n/a
62DF	n/a	n/a
62CJ	n/a	n/a
8205	n/a	n/a
72CB	n/a	n/a
8206	n/a	n/a
62DE	n/a	n/a
8204	n/a	n/a
62DA	n/a	n/a
82BJ	n/a	n/a
72CA	n/a	n/a
6203	n/a	n/a
62DB	n/a	n/a
72AG	n/a	n/a
62DD	n/a	n/a
62DC	n/a	n/a
82CA	n/a	n/a
72BJ	n/a	n/a
72BI	n/a	n/a
6202	n/a	n/a
63DI	n/a	n/a
63DJ	n/a	n/a
62CA	n/a	n/a
63EI	n/a	n/a
62CB	n/a	n/a
63FA	n/a	n/a
63EA	n/a	n/a
6201	n/a	n/a
62CE	n/a	n/a
63ED	n/a	n/a
62EF	n/a	n/a
6301	n/a	n/a
63EG	n/a	n/a
62CD	n/a	n/a
63EC	n/a	n/a
63EF	n/a	n/a
63EH	n/a	n/a
63EB	n/a	n/a
63EE	n/a	n/a
72BA	n/a	n/a
73CF	n/a	n/a
7201	n/a	n/a
731A	n/a	n/a
72AJ	n/a	n/a
73CH	n/a	n/a
72CC	n/a	n/a
53AE	n/a	n/a
53BG	n/a	n/a
53BH	n/a	n/a
5402	n/a	n/a
54DI	n/a	n/a
5302B	n/a	n/a
521A	n/a	n/a
53BI	n/a	n/a
54BH	n/a	n/a
53BJ	n/a	n/a
5406	n/a	n/a
54DH	n/a	n/a
54DJ	n/a	n/a
53CC	n/a	n/a
5401	n/a	n/a
53CA	n/a	n/a
54EA	n/a	n/a
54EB	n/a	n/a
53CB	n/a	n/a
5407	n/a	n/a
54EC	n/a	n/a
5301A	n/a	n/a
54ED	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
53CD	n/a	n/a
63CF	n/a	n/a
6401	n/a	n/a
6302	n/a	n/a
5101	n/a	n/a
511B	n/a	n/a
5204	n/a	n/a
5203	n/a	n/a
5205	n/a	n/a
6204	n/a	n/a
5202	n/a	n/a
5201	n/a	n/a
52CH	n/a	n/a
52CI	n/a	n/a
52CJ	n/a	n/a
52DA	n/a	n/a
52DB	n/a	n/a
5403	n/a	n/a
541A	n/a	n/a
541B	n/a	n/a
52DC	n/a	n/a
52DE	n/a	n/a
52DD	n/a	n/a
531B	n/a	n/a
531A	n/a	n/a
5103	n/a	n/a
5102	n/a	n/a
901H	5.1	4.21
901B	5.1	2.1
901I	5.1	4.39
901A	4.91	2.2
901F	5.59	4.52
901G	5.59	2.97
901C	4.96	2.37
901D	4.82	2.43
901E	4.68	2.58
911B	4.6	3.15
94DF	n/a	n/a
94DE	n/a	n/a
941A	n/a	n/a

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

- Trunk Surface Water
- Trunk Foul
- Storm Relief
- Trunk Combined
- Vent Pipe
- Bio-solids (Sludge)
- Proposed Thames Surface Water Sewer
- Proposed Thames Water Foul Sewer
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Proposed Thames Water Rising Main
- Vacuum

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
- Dam Chase
- Fitting
- Meter
- Vent Column

Operational Controls

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

- Control Valve
- Drop Pipe
- Ancillary
- 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.

- Outfall
- Undefined End
- Inlet

Other Symbols

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

- Public/Private Pumping Station
- Change of characteristic indicator (C.O.C.I.)
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Operational Site
- Chamber
- Tunnel
- Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

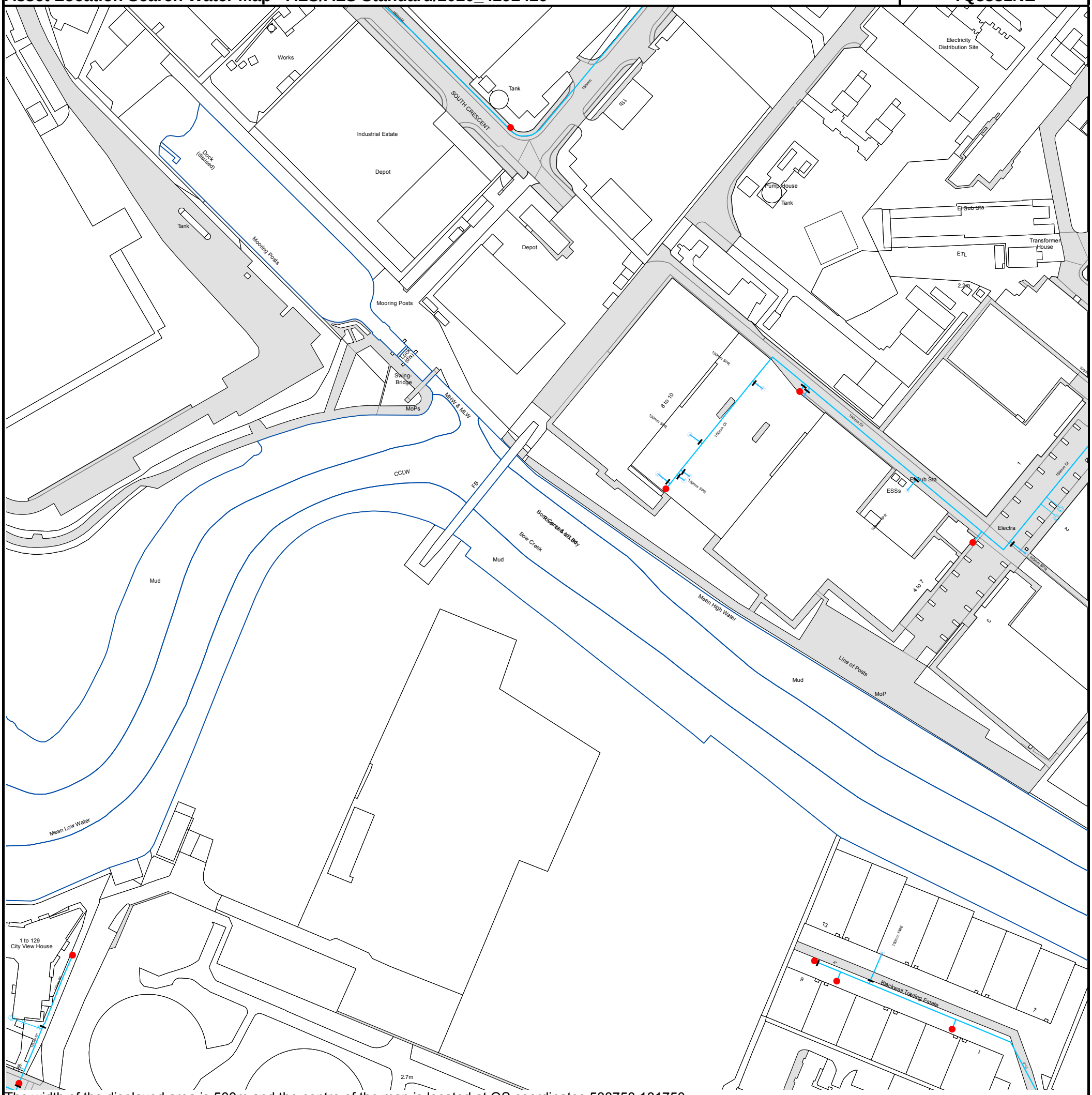
- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Gulley
- Culverted Watercourse
- Proposed
- Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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 present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2020_4292429

TQ3881NE



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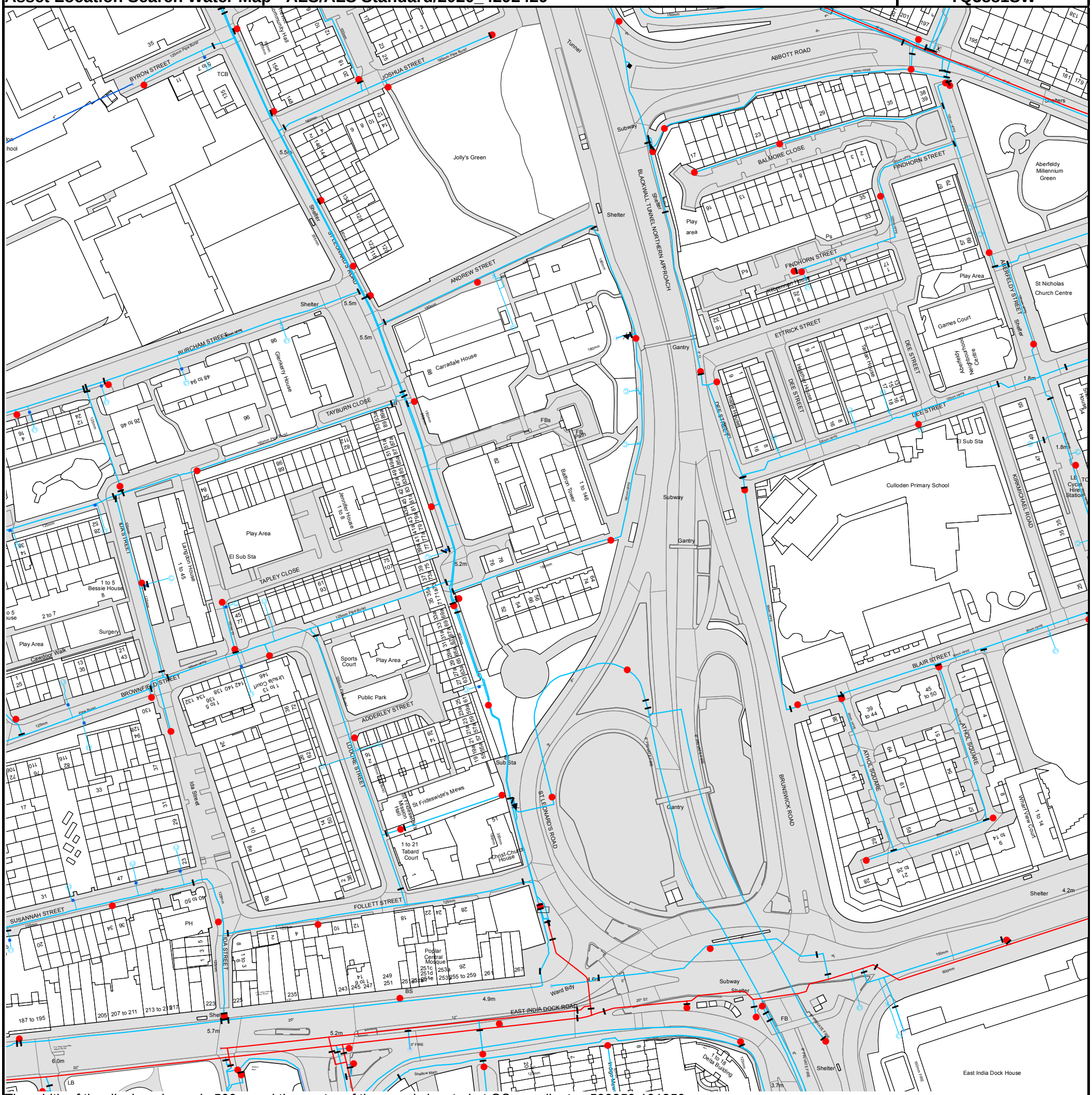
Asset Location Search Water Map - ALS/ALS Standard/2020_4292429

TQ3881SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181250

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.

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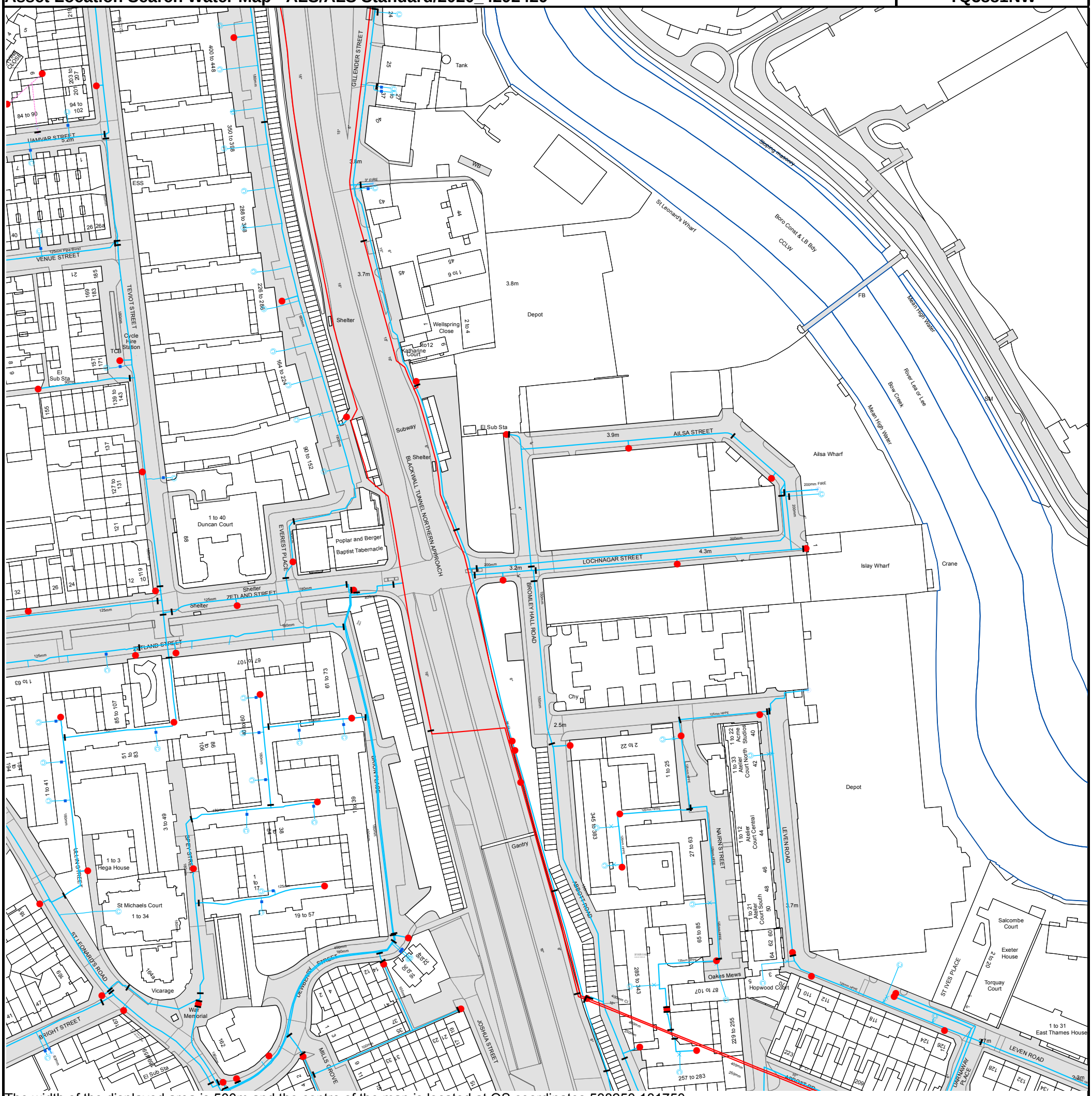
Asset Location Search Water Map - ALS/ALS Standard/2020_4292429

TQ3881NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538250,181750

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.

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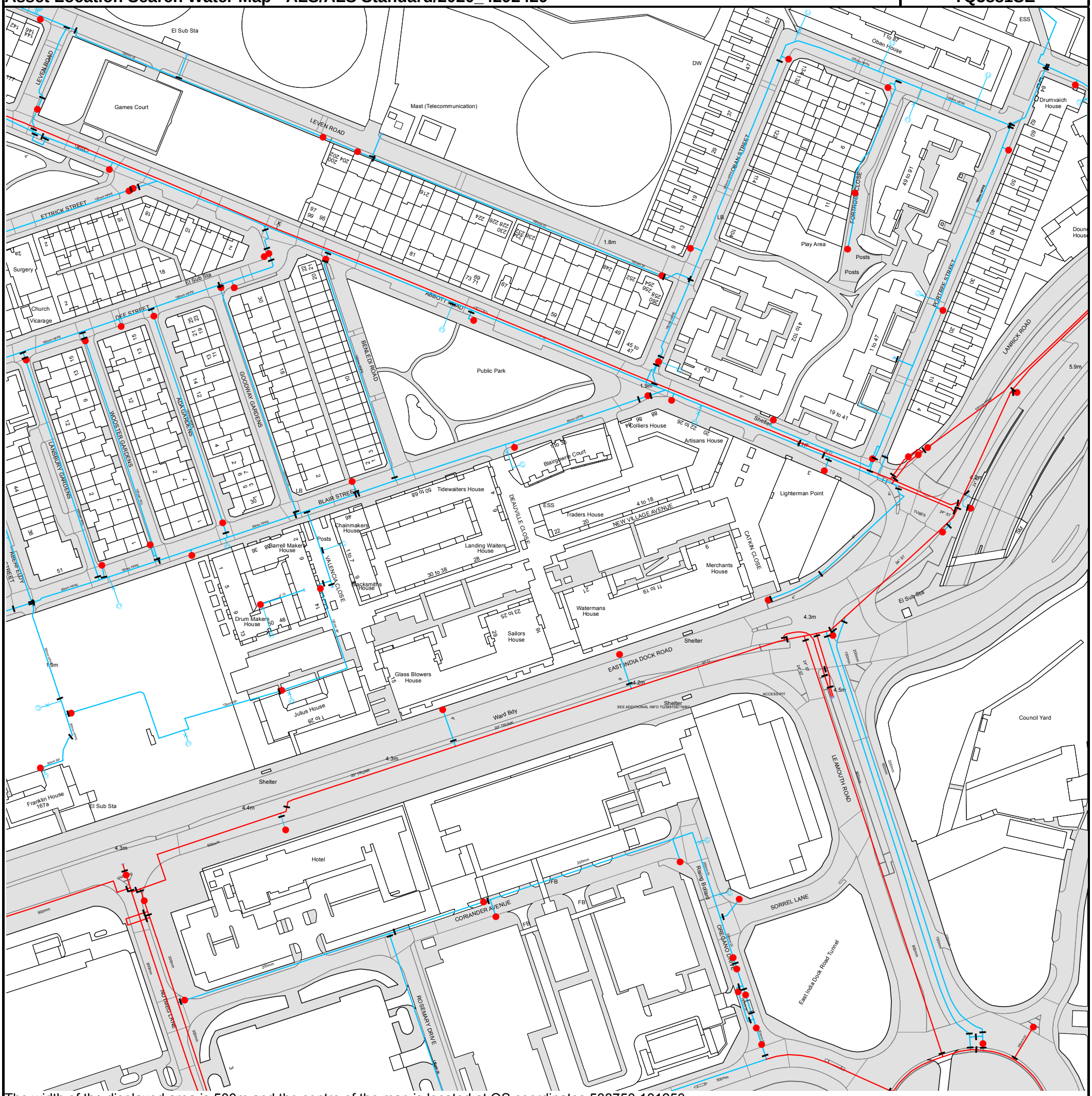
Asset Location Search Water Map - ALS/ALS Standard/2020_4292429

TQ3881SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 538750,181250

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.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

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 **0845 070 9148** 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 C – Drainage Strategy Drawings and Calculations

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.221	0.221	1.4	154.5	O K
30 min Summer	9.289	0.289	1.4	202.3	O K
60 min Summer	9.359	0.359	1.4	251.6	O K
120 min Summer	9.430	0.430	1.4	301.0	O K
180 min Summer	9.470	0.470	1.4	328.8	O K
240 min Summer	9.496	0.496	1.4	347.2	O K
360 min Summer	9.533	0.533	1.4	372.8	O K
480 min Summer	9.558	0.558	1.4	390.5	O K
600 min Summer	9.576	0.576	1.4	403.2	O K
720 min Summer	9.590	0.590	1.4	412.7	O K
960 min Summer	9.608	0.608	1.4	425.4	O K
1440 min Summer	9.624	0.624	1.4	436.5	O K
2160 min Summer	9.623	0.623	1.4	436.0	O K
2880 min Summer	9.609	0.609	1.4	426.0	O K
4320 min Summer	9.578	0.578	1.4	404.3	O K
5760 min Summer	9.546	0.546	1.4	382.5	O K
7200 min Summer	9.515	0.515	1.4	360.2	O K
8640 min Summer	9.481	0.481	1.4	336.5	O K
10080 min Summer	9.450	0.450	1.4	314.8	O K
15 min Winter	9.247	0.247	1.4	173.1	O K
30 min Winter	9.324	0.324	1.4	226.7	O K
60 min Winter	9.403	0.403	1.4	282.1	O K
120 min Winter	9.483	0.483	1.4	338.0	O K
180 min Winter	9.528	0.528	1.4	369.7	O K
240 min Winter	9.558	0.558	1.4	390.7	O K
360 min Winter	9.600	0.600	1.4	419.8	O K
480 min Winter	9.629	0.629	1.4	440.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	108.0	19
30 min Summer	90.705	0.0	114.9	34
60 min Summer	56.713	0.0	218.1	64
120 min Summer	34.246	0.0	227.4	124
180 min Summer	25.149	0.0	225.6	184
240 min Summer	20.078	0.0	222.1	244
360 min Summer	14.585	0.0	213.9	364
480 min Summer	11.622	0.0	207.7	484
600 min Summer	9.738	0.0	203.0	602
720 min Summer	8.424	0.0	199.3	722
960 min Summer	6.697	0.0	193.6	962
1440 min Summer	4.839	0.0	186.3	1442
2160 min Summer	3.490	0.0	400.6	2160
2880 min Summer	2.766	0.0	385.5	2736
4320 min Summer	1.989	0.0	355.3	3416
5760 min Summer	1.573	0.0	669.5	4160
7200 min Summer	1.311	0.0	692.6	4976
8640 min Summer	1.129	0.0	706.6	5712
10080 min Summer	0.994	0.0	700.1	6464
15 min Winter	138.153	0.0	112.0	19
30 min Winter	90.705	0.0	116.1	34
60 min Winter	56.713	0.0	226.7	64
120 min Winter	34.246	0.0	226.1	122
180 min Winter	25.149	0.0	219.0	182
240 min Winter	20.078	0.0	213.5	242
360 min Winter	14.585	0.0	206.5	360
480 min Winter	11.622	0.0	202.2	478

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.650	0.650	1.4	454.7	O K
720 min Winter	9.666	0.666	1.4	465.9	O K
960 min Winter	9.688	0.688	1.4	481.3	O K
1440 min Winter	9.709	0.709	1.4	496.5	Flood Risk
2160 min Winter	9.714	0.714	1.4	500.0	Flood Risk
2880 min Winter	9.704	0.704	1.4	492.7	Flood Risk
4320 min Winter	9.664	0.664	1.4	464.8	O K
5760 min Winter	9.627	0.627	1.4	438.8	O K
7200 min Winter	9.587	0.587	1.4	411.0	O K
8640 min Winter	9.546	0.546	1.4	381.9	O K
10080 min Winter	9.498	0.498	1.4	348.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	199.3	596
720 min Winter	8.424	0.0	197.4	714
960 min Winter	6.697	0.0	195.6	946
1440 min Winter	4.839	0.0	195.1	1412
2160 min Winter	3.490	0.0	401.6	2096
2880 min Winter	2.766	0.0	389.5	2740
4320 min Winter	1.989	0.0	368.8	3592
5760 min Winter	1.573	0.0	743.8	4440
7200 min Winter	1.311	0.0	753.6	5400
8640 min Winter	1.129	0.0	733.8	6312
10080 min Winter	0.994	0.0	719.2	7168

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.600

Time (mins) From:	To:	Area (ha)
0	4	0.600

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.0	1.000	700.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.471	0.471	0.6	4.7	O K
30 min Summer	9.586	0.586	0.6	5.9	O K
60 min Summer	9.659	0.659	0.7	6.6	O K
120 min Summer	9.664	0.664	0.7	6.6	O K
180 min Summer	9.640	0.640	0.7	6.4	O K
240 min Summer	9.609	0.609	0.6	6.1	O K
360 min Summer	9.549	0.549	0.6	5.5	O K
480 min Summer	9.492	0.492	0.6	4.9	O K
600 min Summer	9.438	0.438	0.6	4.4	O K
720 min Summer	9.383	0.383	0.6	3.8	O K
960 min Summer	9.267	0.267	0.6	2.7	O K
1440 min Summer	9.141	0.141	0.6	1.4	O K
2160 min Summer	9.071	0.071	0.5	0.7	O K
2880 min Summer	9.053	0.053	0.4	0.5	O K
4320 min Summer	9.038	0.038	0.3	0.4	O K
5760 min Summer	9.032	0.032	0.3	0.3	O K
7200 min Summer	9.028	0.028	0.2	0.3	O K
8640 min Summer	9.026	0.026	0.2	0.3	O K
10080 min Summer	9.024	0.024	0.2	0.2	O K
15 min Winter	9.531	0.531	0.6	5.3	O K
30 min Winter	9.666	0.666	0.7	6.7	O K
60 min Winter	9.758	0.758	0.7	7.6	Flood Risk
120 min Winter	9.767	0.767	0.7	7.7	Flood Risk
180 min Winter	9.737	0.737	0.7	7.4	Flood Risk
240 min Winter	9.693	0.693	0.7	6.9	O K
360 min Winter	9.604	0.604	0.6	6.0	O K
480 min Winter	9.520	0.520	0.6	5.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	5.2	18
30 min Summer	90.705	0.0	6.8	32
60 min Summer	56.713	0.0	8.5	60
120 min Summer	34.246	0.0	10.3	98
180 min Summer	25.149	0.0	11.3	130
240 min Summer	20.078	0.0	12.0	164
360 min Summer	14.585	0.0	13.1	234
480 min Summer	11.622	0.0	13.9	302
600 min Summer	9.738	0.0	14.6	370
720 min Summer	8.424	0.0	15.2	440
960 min Summer	6.697	0.0	16.1	550
1440 min Summer	4.839	0.0	17.4	768
2160 min Summer	3.490	0.0	18.8	1104
2880 min Summer	2.766	0.0	19.9	1468
4320 min Summer	1.989	0.0	21.5	2192
5760 min Summer	1.573	0.0	22.6	2904
7200 min Summer	1.311	0.0	23.6	3664
8640 min Summer	1.129	0.0	24.4	4392
10080 min Summer	0.994	0.0	25.0	5144
15 min Winter	138.153	0.0	5.8	18
30 min Winter	90.705	0.0	7.6	32
60 min Winter	56.713	0.0	9.5	60
120 min Winter	34.246	0.0	11.5	108
180 min Winter	25.149	0.0	12.7	138
240 min Winter	20.078	0.0	13.5	178
360 min Winter	14.585	0.0	14.7	254
480 min Winter	11.622	0.0	15.6	326

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.437	0.437	0.6	4.4	O K
720 min Winter	9.337	0.337	0.6	3.4	O K
960 min Winter	9.190	0.190	0.6	1.9	O K
1440 min Winter	9.076	0.076	0.5	0.8	O K
2160 min Winter	9.048	0.048	0.4	0.5	O K
2880 min Winter	9.038	0.038	0.3	0.4	O K
4320 min Winter	9.030	0.030	0.2	0.3	O K
5760 min Winter	9.026	0.026	0.2	0.3	O K
7200 min Winter	9.023	0.023	0.2	0.2	O K
8640 min Winter	9.021	0.021	0.1	0.2	O K
10080 min Winter	9.020	0.020	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	16.4	400
720 min Winter	8.424	0.0	17.0	464
960 min Winter	6.697	0.0	18.0	562
1440 min Winter	4.839	0.0	19.5	764
2160 min Winter	3.490	0.0	21.1	1104
2880 min Winter	2.766	0.0	22.3	1460
4320 min Winter	1.989	0.0	24.1	2140
5760 min Winter	1.573	0.0	25.4	2856
7200 min Winter	1.311	0.0	26.4	3592
8640 min Winter	1.129	0.0	27.3	4392
10080 min Winter	0.994	0.0	28.1	4960

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.020

Time (mins) From:	To:	Area (ha)
0	4	0.020

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	1.000	10.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0041-8000-1000-8000
Design Head (m)	1.000
Design Flow (l/s)	0.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	41
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.8	Kick-Flo®	0.369	0.5
Flush-Flo™	0.184	0.6	Mean Flow over Head Range	-	0.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.7	2.000	1.1	4.000	1.5	7.000	1.9
0.200	0.6	1.000	0.8	2.200	1.1	4.500	1.6	7.500	2.0
0.300	0.6	1.200	0.9	2.400	1.2	5.000	1.6	8.000	2.0
0.400	0.5	1.400	0.9	2.600	1.2	5.500	1.7	8.500	2.1
0.500	0.6	1.600	1.0	3.000	1.3	6.000	1.8	9.000	2.2
0.600	0.6	1.800	1.0	3.500	1.4	6.500	1.9	9.500	2.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.378	0.378	0.1	3.8	O K
30 min Summer	9.489	0.489	0.1	4.9	O K
60 min Summer	9.594	0.594	0.2	5.9	O K
120 min Summer	9.679	0.679	0.2	6.8	O K
180 min Summer	9.710	0.710	0.2	7.1	Flood Risk
240 min Summer	9.718	0.718	0.2	7.2	Flood Risk
360 min Summer	9.709	0.709	0.2	7.1	Flood Risk
480 min Summer	9.696	0.696	0.2	7.0	O K
600 min Summer	9.681	0.681	0.2	6.8	O K
720 min Summer	9.665	0.665	0.2	6.7	O K
960 min Summer	9.634	0.634	0.2	6.3	O K
1440 min Summer	9.576	0.576	0.2	5.8	O K
2160 min Summer	9.500	0.500	0.1	5.0	O K
2880 min Summer	9.434	0.434	0.1	4.3	O K
4320 min Summer	9.328	0.328	0.1	3.3	O K
5760 min Summer	9.245	0.245	0.1	2.5	O K
7200 min Summer	9.166	0.166	0.1	1.7	O K
8640 min Summer	9.101	0.101	0.1	1.0	O K
10080 min Summer	9.066	0.066	0.1	0.7	O K
15 min Winter	9.424	0.424	0.1	4.2	O K
30 min Winter	9.550	0.550	0.2	5.5	O K
60 min Winter	9.670	0.670	0.2	6.7	O K
120 min Winter	9.771	0.771	0.2	7.7	Flood Risk
180 min Winter	9.810	0.810	0.2	8.1	Flood Risk
240 min Winter	9.824	0.824	0.2	8.2	Flood Risk
360 min Winter	9.822	0.822	0.2	8.2	Flood Risk
480 min Winter	9.803	0.803	0.2	8.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	3.9	19
30 min Summer	90.705	0.0	5.1	33
60 min Summer	56.713	0.0	6.4	62
120 min Summer	34.246	0.0	7.7	122
180 min Summer	25.149	0.0	8.5	182
240 min Summer	20.078	0.0	9.0	240
360 min Summer	14.585	0.0	9.8	322
480 min Summer	11.622	0.0	10.5	382
600 min Summer	9.738	0.0	11.0	444
720 min Summer	8.424	0.0	11.4	510
960 min Summer	6.697	0.0	12.0	648
1440 min Summer	4.839	0.0	13.1	924
2160 min Summer	3.490	0.0	14.1	1324
2880 min Summer	2.766	0.0	14.9	1728
4320 min Summer	1.989	0.0	16.1	2504
5760 min Summer	1.573	0.0	17.0	3280
7200 min Summer	1.311	0.0	17.7	4032
8640 min Summer	1.129	0.0	18.3	4584
10080 min Summer	0.994	0.0	18.8	5240
15 min Winter	138.153	0.0	4.3	19
30 min Winter	90.705	0.0	5.7	33
60 min Winter	56.713	0.0	7.1	62
120 min Winter	34.246	0.0	8.6	120
180 min Winter	25.149	0.0	9.5	178
240 min Winter	20.078	0.0	10.1	234
360 min Winter	14.585	0.0	11.0	342
480 min Winter	11.622	0.0	11.7	406

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.787	0.787	0.2	7.9	Flood Risk
720 min Winter	9.767	0.767	0.2	7.7	Flood Risk
960 min Winter	9.724	0.724	0.2	7.2	Flood Risk
1440 min Winter	9.640	0.640	0.2	6.4	O K
2160 min Winter	9.530	0.530	0.2	5.3	O K
2880 min Winter	9.437	0.437	0.1	4.4	O K
4320 min Winter	9.293	0.293	0.1	2.9	O K
5760 min Winter	9.162	0.162	0.1	1.6	O K
7200 min Winter	9.066	0.066	0.1	0.7	O K
8640 min Winter	9.042	0.042	0.1	0.4	O K
10080 min Winter	9.035	0.035	0.1	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	12.3	470
720 min Winter	8.424	0.0	12.7	546
960 min Winter	6.697	0.0	13.5	702
1440 min Winter	4.839	0.0	14.6	996
2160 min Winter	3.490	0.0	15.8	1428
2880 min Winter	2.766	0.0	16.7	1844
4320 min Winter	1.989	0.0	18.0	2636
5760 min Winter	1.573	0.0	19.0	3408
7200 min Winter	1.311	0.0	19.8	3888
8640 min Winter	1.129	0.0	20.5	4408
10080 min Winter	0.994	0.0	21.0	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins) From:	To:	Area (ha)
0	4	0.015

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	1.000	10.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0020-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	0.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	20
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.2	Kick-Flo®	0.175	0.1
Flush-Flo™	0.084	0.1	Mean Flow over Head Range	-	0.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.800	0.2	2.000	0.3	4.000	0.4	7.000	0.5
0.200	0.1	1.000	0.2	2.200	0.3	4.500	0.4	7.500	0.5
0.300	0.1	1.200	0.2	2.400	0.3	5.000	0.4	8.000	0.5
0.400	0.1	1.400	0.2	2.600	0.3	5.500	0.4	8.500	0.5
0.500	0.1	1.600	0.2	3.000	0.3	6.000	0.4	9.000	0.5
0.600	0.2	1.800	0.3	3.500	0.3	6.500	0.4	9.500	0.5

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.228	0.228	1.4	136.6	O K
30 min Summer	9.298	0.298	1.4	178.8	O K
60 min Summer	9.370	0.370	1.4	222.3	O K
120 min Summer	9.443	0.443	1.4	265.6	O K
180 min Summer	9.483	0.483	1.4	289.8	O K
240 min Summer	9.510	0.510	1.4	305.7	O K
360 min Summer	9.546	0.546	1.4	327.6	O K
480 min Summer	9.570	0.570	1.4	342.3	O K
600 min Summer	9.588	0.588	1.4	352.6	O K
720 min Summer	9.600	0.600	1.4	360.1	O K
960 min Summer	9.616	0.616	1.4	369.6	O K
1440 min Summer	9.627	0.627	1.4	376.2	O K
2160 min Summer	9.618	0.618	1.4	371.1	O K
2880 min Summer	9.600	0.600	1.4	360.2	O K
4320 min Summer	9.565	0.565	1.4	338.7	O K
5760 min Summer	9.529	0.529	1.4	317.3	O K
7200 min Summer	9.490	0.490	1.4	293.8	O K
8640 min Summer	9.453	0.453	1.4	271.9	O K
10080 min Summer	9.420	0.420	1.4	252.0	O K
15 min Winter	9.255	0.255	1.4	153.1	O K
30 min Winter	9.334	0.334	1.4	200.4	O K
60 min Winter	9.415	0.415	1.4	249.3	O K
120 min Winter	9.497	0.497	1.4	298.3	O K
180 min Winter	9.543	0.543	1.4	326.0	O K
240 min Winter	9.574	0.574	1.4	344.1	O K
360 min Winter	9.615	0.615	1.4	368.9	O K
480 min Winter	9.643	0.643	1.4	385.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	104.8	19
30 min Summer	90.705	0.0	114.2	34
60 min Summer	56.713	0.0	205.0	64
120 min Summer	34.246	0.0	224.4	124
180 min Summer	25.149	0.0	224.3	184
240 min Summer	20.078	0.0	221.2	244
360 min Summer	14.585	0.0	214.2	364
480 min Summer	11.622	0.0	208.7	482
600 min Summer	9.738	0.0	204.5	602
720 min Summer	8.424	0.0	201.0	722
960 min Summer	6.697	0.0	195.4	962
1440 min Summer	4.839	0.0	187.3	1442
2160 min Summer	3.490	0.0	403.6	2160
2880 min Summer	2.766	0.0	388.8	2504
4320 min Summer	1.989	0.0	356.0	3244
5760 min Summer	1.573	0.0	596.4	4040
7200 min Summer	1.311	0.0	620.0	4824
8640 min Summer	1.129	0.0	638.5	5544
10080 min Summer	0.994	0.0	651.2	6352
15 min Winter	138.153	0.0	110.4	19
30 min Winter	90.705	0.0	115.7	34
60 min Winter	56.713	0.0	220.1	64
120 min Winter	34.246	0.0	224.7	122
180 min Winter	25.149	0.0	218.8	182
240 min Winter	20.078	0.0	214.3	240
360 min Winter	14.585	0.0	208.2	358
480 min Winter	11.622	0.0	204.2	478

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.663	0.663	1.4	398.1	O K
720 min Winter	9.678	0.678	1.4	407.1	O K
960 min Winter	9.698	0.698	1.4	419.0	O K
1440 min Winter	9.715	0.715	1.4	429.0	Flood Risk
2160 min Winter	9.712	0.712	1.4	427.5	Flood Risk
2880 min Winter	9.695	0.695	1.4	416.9	O K
4320 min Winter	9.649	0.649	1.4	389.3	O K
5760 min Winter	9.604	0.604	1.4	362.4	O K
7200 min Winter	9.557	0.557	1.4	334.0	O K
8640 min Winter	9.503	0.503	1.4	301.9	O K
10080 min Winter	9.448	0.448	1.4	269.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	201.3	596
720 min Winter	8.424	0.0	199.2	712
960 min Winter	6.697	0.0	196.5	944
1440 min Winter	4.839	0.0	194.9	1400
2160 min Winter	3.490	0.0	405.7	2076
2880 min Winter	2.766	0.0	392.5	2712
4320 min Winter	1.989	0.0	366.5	3416
5760 min Winter	1.573	0.0	666.7	4328
7200 min Winter	1.311	0.0	690.8	5264
8640 min Winter	1.129	0.0	708.4	6144
10080 min Winter	0.994	0.0	715.2	6952

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.531

Time (mins) From:	To:	Area (ha)
0	4	0.531

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	1.000	600.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.222	0.222	1.4	133.5	O K
30 min Summer	9.291	0.291	1.4	174.7	O K
60 min Summer	9.362	0.362	1.4	217.2	O K
120 min Summer	9.432	0.432	1.4	259.4	O K
180 min Summer	9.472	0.472	1.4	283.0	O K
240 min Summer	9.497	0.497	1.4	298.5	O K
360 min Summer	9.533	0.533	1.4	319.7	O K
480 min Summer	9.557	0.557	1.4	334.0	O K
600 min Summer	9.573	0.573	1.4	344.1	O K
720 min Summer	9.586	0.586	1.4	351.3	O K
960 min Summer	9.601	0.601	1.4	360.4	O K
1440 min Summer	9.611	0.611	1.4	366.5	O K
2160 min Summer	9.602	0.602	1.4	360.9	O K
2880 min Summer	9.583	0.583	1.4	350.1	O K
4320 min Summer	9.547	0.547	1.4	328.5	O K
5760 min Summer	9.510	0.510	1.4	305.9	O K
7200 min Summer	9.471	0.471	1.4	282.6	O K
8640 min Summer	9.436	0.436	1.4	261.6	O K
10080 min Summer	9.403	0.403	1.4	242.1	O K
15 min Winter	9.249	0.249	1.4	149.6	O K
30 min Winter	9.326	0.326	1.4	195.8	O K
60 min Winter	9.406	0.406	1.4	243.6	O K
120 min Winter	9.486	0.486	1.4	291.4	O K
180 min Winter	9.531	0.531	1.4	318.4	O K
240 min Winter	9.560	0.560	1.4	336.1	O K
360 min Winter	9.600	0.600	1.4	360.2	O K
480 min Winter	9.628	0.628	1.4	376.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	103.4	19
30 min Summer	90.705	0.0	113.8	34
60 min Summer	56.713	0.0	201.4	64
120 min Summer	34.246	0.0	223.4	124
180 min Summer	25.149	0.0	224.5	184
240 min Summer	20.078	0.0	222.3	244
360 min Summer	14.585	0.0	215.7	364
480 min Summer	11.622	0.0	210.1	482
600 min Summer	9.738	0.0	205.7	602
720 min Summer	8.424	0.0	202.0	722
960 min Summer	6.697	0.0	195.9	962
1440 min Summer	4.839	0.0	186.9	1442
2160 min Summer	3.490	0.0	403.4	2160
2880 min Summer	2.766	0.0	388.8	2480
4320 min Summer	1.989	0.0	355.7	3240
5760 min Summer	1.573	0.0	583.2	4032
7200 min Summer	1.311	0.0	606.4	4760
8640 min Summer	1.129	0.0	624.7	5536
10080 min Summer	0.994	0.0	638.0	6352
15 min Winter	138.153	0.0	109.5	19
30 min Winter	90.705	0.0	115.5	34
60 min Winter	56.713	0.0	217.6	64
120 min Winter	34.246	0.0	225.3	122
180 min Winter	25.149	0.0	220.2	182
240 min Winter	20.078	0.0	215.6	240
360 min Winter	14.585	0.0	209.2	358
480 min Winter	11.622	0.0	204.9	476

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.647	0.647	1.4	388.5	O K
720 min Winter	9.662	0.662	1.4	397.2	O K
960 min Winter	9.681	0.681	1.4	408.6	O K
1440 min Winter	9.697	0.697	1.4	418.0	O K
2160 min Winter	9.693	0.693	1.4	416.0	O K
2880 min Winter	9.675	0.675	1.4	405.1	O K
4320 min Winter	9.629	0.629	1.4	377.5	O K
5760 min Winter	9.584	0.584	1.4	350.4	O K
7200 min Winter	9.535	0.535	1.4	321.3	O K
8640 min Winter	9.479	0.479	1.4	287.5	O K
10080 min Winter	9.427	0.427	1.4	256.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	201.7	596
720 min Winter	8.424	0.0	199.3	712
960 min Winter	6.697	0.0	195.8	944
1440 min Winter	4.839	0.0	192.9	1400
2160 min Winter	3.490	0.0	405.4	2076
2880 min Winter	2.766	0.0	391.8	2708
4320 min Winter	1.989	0.0	364.7	3412
5760 min Winter	1.573	0.0	652.0	4328
7200 min Winter	1.311	0.0	676.4	5264
8640 min Winter	1.129	0.0	695.7	6128
10080 min Winter	0.994	0.0	706.0	6864

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.519

Time (mins) From:	To:	Area (ha)
0	4	0.519

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	1.000	600.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.274	0.274	1.1	54.9	O K
30 min Summer	9.358	0.358	1.1	71.5	O K
60 min Summer	9.442	0.442	1.1	88.4	O K
120 min Summer	9.523	0.523	1.1	104.5	O K
180 min Summer	9.563	0.563	1.1	112.7	O K
240 min Summer	9.587	0.587	1.1	117.4	O K
360 min Summer	9.614	0.614	1.1	122.8	O K
480 min Summer	9.626	0.626	1.1	125.3	O K
600 min Summer	9.630	0.630	1.1	126.1	O K
720 min Summer	9.629	0.629	1.1	125.9	O K
960 min Summer	9.618	0.618	1.1	123.6	O K
1440 min Summer	9.591	0.591	1.1	118.2	O K
2160 min Summer	9.550	0.550	1.1	110.1	O K
2880 min Summer	9.510	0.510	1.1	102.0	O K
4320 min Summer	9.424	0.424	1.1	84.8	O K
5760 min Summer	9.350	0.350	1.1	70.0	O K
7200 min Summer	9.289	0.289	1.1	57.7	O K
8640 min Summer	9.238	0.238	1.1	47.5	O K
10080 min Summer	9.197	0.197	1.1	39.4	O K
15 min Winter	9.308	0.308	1.1	61.5	O K
30 min Winter	9.402	0.402	1.1	80.3	O K
60 min Winter	9.497	0.497	1.1	99.4	O K
120 min Winter	9.588	0.588	1.1	117.6	O K
180 min Winter	9.635	0.635	1.1	127.0	O K
240 min Winter	9.663	0.663	1.1	132.6	O K
360 min Winter	9.696	0.696	1.1	139.1	O K
480 min Winter	9.713	0.713	1.1	142.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	53.6	19
30 min Summer	90.705	0.0	70.1	34
60 min Summer	56.713	0.0	90.5	64
120 min Summer	34.246	0.0	109.2	124
180 min Summer	25.149	0.0	120.2	182
240 min Summer	20.078	0.0	127.9	242
360 min Summer	14.585	0.0	139.0	362
480 min Summer	11.622	0.0	147.4	482
600 min Summer	9.738	0.0	153.8	600
720 min Summer	8.424	0.0	159.0	720
960 min Summer	6.697	0.0	165.7	912
1440 min Summer	4.839	0.0	164.3	1138
2160 min Summer	3.490	0.0	201.9	1532
2880 min Summer	2.766	0.0	213.2	1956
4320 min Summer	1.989	0.0	229.7	2724
5760 min Summer	1.573	0.0	243.3	3464
7200 min Summer	1.311	0.0	253.3	4184
8640 min Summer	1.129	0.0	261.5	4920
10080 min Summer	0.994	0.0	268.4	5552
15 min Winter	138.153	0.0	60.0	19
30 min Winter	90.705	0.0	77.9	33
60 min Winter	56.713	0.0	101.3	64
120 min Winter	34.246	0.0	122.2	122
180 min Winter	25.149	0.0	134.4	180
240 min Winter	20.078	0.0	142.9	238
360 min Winter	14.585	0.0	155.1	356
480 min Winter	11.622	0.0	163.8	472

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.720	0.720	1.1	144.1	Flood Risk
720 min Winter	9.722	0.722	1.1	144.4	Flood Risk
960 min Winter	9.715	0.715	1.1	142.9	Flood Risk
1440 min Winter	9.680	0.680	1.1	136.0	O K
2160 min Winter	9.629	0.629	1.1	125.8	O K
2880 min Winter	9.574	0.574	1.1	114.9	O K
4320 min Winter	9.452	0.452	1.1	90.4	O K
5760 min Winter	9.336	0.336	1.1	67.2	O K
7200 min Winter	9.248	0.248	1.1	49.6	O K
8640 min Winter	9.183	0.183	1.1	36.7	O K
10080 min Winter	9.138	0.138	1.1	27.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	169.9	584
720 min Winter	8.424	0.0	173.5	698
960 min Winter	6.697	0.0	174.0	916
1440 min Winter	4.839	0.0	167.6	1198
2160 min Winter	3.490	0.0	226.1	1640
2880 min Winter	2.766	0.0	238.7	2104
4320 min Winter	1.989	0.0	257.0	2984
5760 min Winter	1.573	0.0	272.5	3696
7200 min Winter	1.311	0.0	283.7	4400
8640 min Winter	1.129	0.0	293.0	5024
10080 min Winter	0.994	0.0	300.8	5656

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.215

Time (mins) From:	To:	Area (ha)
0	4	0.215

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.258	0.258	1.4	51.6	O K
30 min Summer	9.336	0.336	1.4	67.2	O K
60 min Summer	9.413	0.413	1.4	82.7	O K
120 min Summer	9.486	0.486	1.4	97.1	O K
180 min Summer	9.522	0.522	1.4	104.3	O K
240 min Summer	9.542	0.542	1.4	108.3	O K
360 min Summer	9.561	0.561	1.4	112.3	O K
480 min Summer	9.568	0.568	1.4	113.6	O K
600 min Summer	9.567	0.567	1.4	113.3	O K
720 min Summer	9.560	0.560	1.4	112.1	O K
960 min Summer	9.544	0.544	1.4	108.9	O K
1440 min Summer	9.509	0.509	1.4	101.8	O K
2160 min Summer	9.455	0.455	1.4	91.0	O K
2880 min Summer	9.406	0.406	1.4	81.2	O K
4320 min Summer	9.322	0.322	1.4	64.3	O K
5760 min Summer	9.253	0.253	1.4	50.6	O K
7200 min Summer	9.201	0.201	1.4	40.1	O K
8640 min Summer	9.161	0.161	1.3	32.3	O K
10080 min Summer	9.132	0.132	1.3	26.5	O K
15 min Winter	9.289	0.289	1.4	57.9	O K
30 min Winter	9.377	0.377	1.4	75.5	O K
60 min Winter	9.465	0.465	1.4	93.0	O K
120 min Winter	9.549	0.549	1.4	109.7	O K
180 min Winter	9.590	0.590	1.4	118.0	O K
240 min Winter	9.614	0.614	1.4	122.7	O K
360 min Winter	9.638	0.638	1.4	127.7	O K
480 min Winter	9.649	0.649	1.4	129.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	50.9	19
30 min Summer	90.705	0.0	66.9	34
60 min Summer	56.713	0.0	85.5	64
120 min Summer	34.246	0.0	103.4	122
180 min Summer	25.149	0.0	113.8	182
240 min Summer	20.078	0.0	121.2	242
360 min Summer	14.585	0.0	132.0	362
480 min Summer	11.622	0.0	140.1	482
600 min Summer	9.738	0.0	146.7	600
720 min Summer	8.424	0.0	152.1	716
960 min Summer	6.697	0.0	160.9	818
1440 min Summer	4.839	0.0	173.2	1066
2160 min Summer	3.490	0.0	190.8	1432
2880 min Summer	2.766	0.0	201.5	1820
4320 min Summer	1.989	0.0	217.1	2596
5760 min Summer	1.573	0.0	229.7	3336
7200 min Summer	1.311	0.0	239.1	4032
8640 min Summer	1.129	0.0	246.9	4680
10080 min Summer	0.994	0.0	253.4	5352
15 min Winter	138.153	0.0	57.1	19
30 min Winter	90.705	0.0	74.9	33
60 min Winter	56.713	0.0	95.8	62
120 min Winter	34.246	0.0	115.8	122
180 min Winter	25.149	0.0	127.5	180
240 min Winter	20.078	0.0	135.7	238
360 min Winter	14.585	0.0	147.7	354
480 min Winter	11.622	0.0	156.8	468

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.650	0.650	1.4	130.1	O K
720 min Winter	9.647	0.647	1.4	129.3	O K
960 min Winter	9.630	0.630	1.4	126.0	O K
1440 min Winter	9.588	0.588	1.4	117.5	O K
2160 min Winter	9.519	0.519	1.4	103.8	O K
2880 min Winter	9.439	0.439	1.4	87.9	O K
4320 min Winter	9.310	0.310	1.4	61.9	O K
5760 min Winter	9.214	0.214	1.4	42.8	O K
7200 min Winter	9.150	0.150	1.3	30.0	O K
8640 min Winter	9.110	0.110	1.2	22.0	O K
10080 min Winter	9.086	0.086	1.1	17.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	164.0	582
720 min Winter	8.424	0.0	170.0	692
960 min Winter	6.697	0.0	179.5	904
1440 min Winter	4.839	0.0	190.6	1126
2160 min Winter	3.490	0.0	213.7	1600
2880 min Winter	2.766	0.0	225.7	1992
4320 min Winter	1.989	0.0	243.3	2768
5760 min Winter	1.573	0.0	257.3	3464
7200 min Winter	1.311	0.0	267.9	4112
8640 min Winter	1.129	0.0	276.6	4752
10080 min Winter	0.994	0.0	284.0	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.203

Time (mins) From:	To:	Area (ha)
0	4	0.203

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.216	0.216	1.1	43.2	O K
30 min Summer	9.282	0.282	1.1	56.3	O K
60 min Summer	9.346	0.346	1.1	69.3	O K
120 min Summer	9.407	0.407	1.1	81.3	O K
180 min Summer	9.436	0.436	1.1	87.3	O K
240 min Summer	9.453	0.453	1.1	90.6	O K
360 min Summer	9.470	0.470	1.1	94.0	O K
480 min Summer	9.476	0.476	1.1	95.3	O K
600 min Summer	9.476	0.476	1.1	95.2	O K
720 min Summer	9.471	0.471	1.1	94.1	O K
960 min Summer	9.456	0.456	1.1	91.2	O K
1440 min Summer	9.427	0.427	1.1	85.5	O K
2160 min Summer	9.385	0.385	1.1	77.1	O K
2880 min Summer	9.346	0.346	1.1	69.2	O K
4320 min Summer	9.277	0.277	1.1	55.4	O K
5760 min Summer	9.221	0.221	1.1	44.1	O K
7200 min Summer	9.177	0.177	1.1	35.4	O K
8640 min Summer	9.144	0.144	1.1	28.8	O K
10080 min Summer	9.119	0.119	1.1	23.9	O K
15 min Winter	9.242	0.242	1.1	48.5	O K
30 min Winter	9.316	0.316	1.1	63.2	O K
60 min Winter	9.390	0.390	1.1	77.9	O K
120 min Winter	9.459	0.459	1.1	91.9	O K
180 min Winter	9.495	0.495	1.1	99.0	O K
240 min Winter	9.515	0.515	1.1	103.0	O K
360 min Winter	9.537	0.537	1.1	107.4	O K
480 min Winter	9.547	0.547	1.1	109.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	42.3	19
30 min Summer	90.705	0.0	55.7	34
60 min Summer	56.713	0.0	71.5	64
120 min Summer	34.246	0.0	86.4	122
180 min Summer	25.149	0.0	95.1	182
240 min Summer	20.078	0.0	101.3	242
360 min Summer	14.585	0.0	110.3	362
480 min Summer	11.622	0.0	117.1	482
600 min Summer	9.738	0.0	122.5	600
720 min Summer	8.424	0.0	127.1	720
960 min Summer	6.697	0.0	134.4	808
1440 min Summer	4.839	0.0	144.7	1038
2160 min Summer	3.490	0.0	159.7	1428
2880 min Summer	2.766	0.0	168.6	1820
4320 min Summer	1.989	0.0	181.7	2596
5760 min Summer	1.573	0.0	192.3	3344
7200 min Summer	1.311	0.0	200.2	4032
8640 min Summer	1.129	0.0	206.7	4752
10080 min Summer	0.994	0.0	212.1	5440
15 min Winter	138.153	0.0	47.5	19
30 min Winter	90.705	0.0	62.3	33
60 min Winter	56.713	0.0	80.1	62
120 min Winter	34.246	0.0	96.7	122
180 min Winter	25.149	0.0	106.5	180
240 min Winter	20.078	0.0	113.4	238
360 min Winter	14.585	0.0	123.4	354
480 min Winter	11.622	0.0	130.9	470

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.549	0.549	1.1	109.8	O K
720 min Winter	9.546	0.546	1.1	109.3	O K
960 min Winter	9.534	0.534	1.1	106.7	O K
1440 min Winter	9.497	0.497	1.1	99.4	O K
2160 min Winter	9.435	0.435	1.1	86.9	O K
2880 min Winter	9.373	0.373	1.1	74.7	O K
4320 min Winter	9.268	0.268	1.1	53.7	O K
5760 min Winter	9.190	0.190	1.1	37.9	O K
7200 min Winter	9.136	0.136	1.1	27.2	O K
8640 min Winter	9.101	0.101	1.0	20.3	O K
10080 min Winter	9.080	0.080	1.0	16.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	137.0	582
720 min Winter	8.424	0.0	141.9	694
960 min Winter	6.697	0.0	149.7	906
1440 min Winter	4.839	0.0	158.6	1140
2160 min Winter	3.490	0.0	178.8	1576
2880 min Winter	2.766	0.0	188.9	1988
4320 min Winter	1.989	0.0	203.6	2768
5760 min Winter	1.573	0.0	215.4	3464
7200 min Winter	1.311	0.0	224.2	4112
8640 min Winter	1.129	0.0	231.6	4760
10080 min Winter	0.994	0.0	237.7	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.170

Time (mins) From:	To:	Area (ha)
0	4	0.170

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.000	200.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.230	0.230	0.8	23.0	O K
30 min Summer	9.298	0.298	0.8	29.8	O K
60 min Summer	9.365	0.365	0.8	36.5	O K
120 min Summer	9.425	0.425	0.8	42.5	O K
180 min Summer	9.452	0.452	0.8	45.2	O K
240 min Summer	9.463	0.463	0.8	46.3	O K
360 min Summer	9.470	0.470	0.8	47.0	O K
480 min Summer	9.465	0.465	0.8	46.5	O K
600 min Summer	9.456	0.456	0.8	45.6	O K
720 min Summer	9.447	0.447	0.8	44.7	O K
960 min Summer	9.428	0.428	0.8	42.8	O K
1440 min Summer	9.385	0.385	0.8	38.5	O K
2160 min Summer	9.327	0.327	0.8	32.7	O K
2880 min Summer	9.277	0.277	0.8	27.7	O K
4320 min Summer	9.196	0.196	0.8	19.6	O K
5760 min Summer	9.142	0.142	0.8	14.2	O K
7200 min Summer	9.106	0.106	0.8	10.6	O K
8640 min Summer	9.084	0.084	0.7	8.4	O K
10080 min Summer	9.070	0.070	0.7	7.0	O K
15 min Winter	9.258	0.258	0.8	25.8	O K
30 min Winter	9.335	0.335	0.8	33.5	O K
60 min Winter	9.412	0.412	0.8	41.2	O K
120 min Winter	9.481	0.481	0.8	48.1	O K
180 min Winter	9.512	0.512	0.8	51.2	O K
240 min Winter	9.527	0.527	0.8	52.7	O K
360 min Winter	9.538	0.538	0.8	53.8	O K
480 min Winter	9.536	0.536	0.8	53.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	23.2	19
30 min Summer	90.705	0.0	30.5	33
60 min Summer	56.713	0.0	38.5	64
120 min Summer	34.246	0.0	46.5	122
180 min Summer	25.149	0.0	51.3	182
240 min Summer	20.078	0.0	54.6	242
360 min Summer	14.585	0.0	59.5	360
480 min Summer	11.622	0.0	63.2	478
600 min Summer	9.738	0.0	66.2	526
720 min Summer	8.424	0.0	68.7	590
960 min Summer	6.697	0.0	72.8	714
1440 min Summer	4.839	0.0	78.8	968
2160 min Summer	3.490	0.0	85.6	1360
2880 min Summer	2.766	0.0	90.5	1732
4320 min Summer	1.989	0.0	97.5	2464
5760 min Summer	1.573	0.0	103.0	3168
7200 min Summer	1.311	0.0	107.2	3824
8640 min Summer	1.129	0.0	110.8	4496
10080 min Summer	0.994	0.0	113.8	5152
15 min Winter	138.153	0.0	26.0	19
30 min Winter	90.705	0.0	34.1	33
60 min Winter	56.713	0.0	43.1	62
120 min Winter	34.246	0.0	52.1	120
180 min Winter	25.149	0.0	57.4	180
240 min Winter	20.078	0.0	61.1	236
360 min Winter	14.585	0.0	66.6	350
480 min Winter	11.622	0.0	70.8	462

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.528	0.528	0.8	52.8	O K
720 min Winter	9.516	0.516	0.8	51.6	O K
960 min Winter	9.492	0.492	0.8	49.2	O K
1440 min Winter	9.440	0.440	0.8	44.0	O K
2160 min Winter	9.348	0.348	0.8	34.8	O K
2880 min Winter	9.270	0.270	0.8	27.0	O K
4320 min Winter	9.159	0.159	0.8	15.9	O K
5760 min Winter	9.098	0.098	0.8	9.8	O K
7200 min Winter	9.070	0.070	0.7	7.0	O K
8640 min Winter	9.059	0.059	0.6	5.9	O K
10080 min Winter	9.051	0.051	0.5	5.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	74.1	568
720 min Winter	8.424	0.0	76.9	666
960 min Winter	6.697	0.0	81.5	752
1440 min Winter	4.839	0.0	88.2	1068
2160 min Winter	3.490	0.0	95.9	1472
2880 min Winter	2.766	0.0	101.3	1872
4320 min Winter	1.989	0.0	109.2	2552
5760 min Winter	1.573	0.0	115.4	3176
7200 min Winter	1.311	0.0	120.1	3752
8640 min Winter	1.129	0.0	124.1	4496
10080 min Winter	0.994	0.0	127.4	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.091

Time (mins) From:	To:	Area (ha)
0	4	0.091

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.246	0.246	1.1	88.5	O K
30 min Summer	9.322	0.322	1.1	115.8	O K
60 min Summer	9.399	0.399	1.1	143.7	O K
120 min Summer	9.476	0.476	1.1	171.3	O K
180 min Summer	9.518	0.518	1.1	186.4	O K
240 min Summer	9.544	0.544	1.1	196.0	O K
360 min Summer	9.579	0.579	1.1	208.5	O K
480 min Summer	9.601	0.601	1.1	216.4	O K
600 min Summer	9.615	0.615	1.1	221.4	O K
720 min Summer	9.624	0.624	1.1	224.7	O K
960 min Summer	9.633	0.633	1.1	227.8	O K
1440 min Summer	9.628	0.628	1.1	226.2	O K
2160 min Summer	9.604	0.604	1.1	217.6	O K
2880 min Summer	9.580	0.580	1.1	209.0	O K
4320 min Summer	9.534	0.534	1.1	192.2	O K
5760 min Summer	9.487	0.487	1.1	175.4	O K
7200 min Summer	9.436	0.436	1.1	157.1	O K
8640 min Summer	9.391	0.391	1.1	140.9	O K
10080 min Summer	9.351	0.351	1.1	126.5	O K
15 min Winter	9.276	0.276	1.1	99.2	O K
30 min Winter	9.361	0.361	1.1	129.8	O K
60 min Winter	9.448	0.448	1.1	161.3	O K
120 min Winter	9.535	0.535	1.1	192.5	O K
180 min Winter	9.582	0.582	1.1	209.6	O K
240 min Winter	9.613	0.613	1.1	220.6	O K
360 min Winter	9.653	0.653	1.1	235.1	O K
480 min Winter	9.679	0.679	1.1	244.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	78.8	19
30 min Summer	90.705	0.0	93.3	34
60 min Summer	56.713	0.0	141.5	64
120 min Summer	34.246	0.0	167.6	124
180 min Summer	25.149	0.0	177.6	184
240 min Summer	20.078	0.0	179.6	244
360 min Summer	14.585	0.0	178.2	362
480 min Summer	11.622	0.0	176.0	482
600 min Summer	9.738	0.0	173.7	602
720 min Summer	8.424	0.0	171.6	722
960 min Summer	6.697	0.0	167.7	962
1440 min Summer	4.839	0.0	160.9	1440
2160 min Summer	3.490	0.0	316.8	1820
2880 min Summer	2.766	0.0	324.2	2192
4320 min Summer	1.989	0.0	300.0	2984
5760 min Summer	1.573	0.0	389.6	3856
7200 min Summer	1.311	0.0	405.5	4608
8640 min Summer	1.129	0.0	418.7	5360
10080 min Summer	0.994	0.0	429.4	6056
15 min Winter	138.153	0.0	86.1	19
30 min Winter	90.705	0.0	95.3	34
60 min Winter	56.713	0.0	157.3	64
120 min Winter	34.246	0.0	179.1	122
180 min Winter	25.149	0.0	180.7	182
240 min Winter	20.078	0.0	179.7	240
360 min Winter	14.585	0.0	177.3	358
480 min Winter	11.622	0.0	175.2	476

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.696	0.696	1.1	250.7	O K
720 min Winter	9.708	0.708	1.1	255.0	Flood Risk
960 min Winter	9.721	0.721	1.1	259.6	Flood Risk
1440 min Winter	9.723	0.723	1.1	260.3	Flood Risk
2160 min Winter	9.699	0.699	1.1	251.6	O K
2880 min Winter	9.668	0.668	1.1	240.3	O K
4320 min Winter	9.607	0.607	1.1	218.7	O K
5760 min Winter	9.544	0.544	1.1	195.9	O K
7200 min Winter	9.475	0.475	1.1	171.2	O K
8640 min Winter	9.401	0.401	1.1	144.5	O K
10080 min Winter	9.340	0.340	1.1	122.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	173.5	592
720 min Winter	8.424	0.0	172.0	708
960 min Winter	6.697	0.0	169.5	936
1440 min Winter	4.839	0.0	166.4	1386
2160 min Winter	3.490	0.0	342.8	2016
2880 min Winter	2.766	0.0	335.7	2304
4320 min Winter	1.989	0.0	309.4	3240
5760 min Winter	1.573	0.0	436.3	4152
7200 min Winter	1.311	0.0	454.1	5048
8640 min Winter	1.129	0.0	469.0	5792
10080 min Winter	0.994	0.0	481.3	6464

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.345

Time (mins) From:	To:	Area (ha)
0	4	0.345

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	360.0	1.000	360.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.230	0.230	2.5	114.9	O K
30 min Summer	9.300	0.300	2.5	149.9	O K
60 min Summer	9.370	0.370	2.5	185.1	O K
120 min Summer	9.437	0.437	2.5	218.4	O K
180 min Summer	9.471	0.471	2.5	235.4	O K
240 min Summer	9.491	0.491	2.5	245.4	O K
360 min Summer	9.513	0.513	2.5	256.7	O K
480 min Summer	9.524	0.524	2.5	262.2	O K
600 min Summer	9.528	0.528	2.5	264.1	O K
720 min Summer	9.527	0.527	2.5	263.6	O K
960 min Summer	9.518	0.518	2.5	259.1	O K
1440 min Summer	9.497	0.497	2.5	248.5	O K
2160 min Summer	9.463	0.463	2.5	231.4	O K
2880 min Summer	9.428	0.428	2.5	213.9	O K
4320 min Summer	9.363	0.363	2.5	181.4	O K
5760 min Summer	9.306	0.306	2.5	153.2	O K
7200 min Summer	9.259	0.259	2.5	129.5	O K
8640 min Summer	9.220	0.220	2.4	109.9	O K
10080 min Summer	9.188	0.188	2.4	94.2	O K
15 min Winter	9.258	0.258	2.5	128.8	O K
30 min Winter	9.336	0.336	2.5	168.2	O K
60 min Winter	9.416	0.416	2.5	207.8	O K
120 min Winter	9.492	0.492	2.5	245.9	O K
180 min Winter	9.532	0.532	2.5	265.8	O K
240 min Winter	9.555	0.555	2.5	277.7	O K
360 min Winter	9.584	0.584	2.5	292.2	O K
480 min Winter	9.601	0.601	2.5	300.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	107.5	19
30 min Summer	90.705	0.0	141.1	34
60 min Summer	56.713	0.0	186.8	64
120 min Summer	34.246	0.0	225.7	124
180 min Summer	25.149	0.0	248.5	182
240 min Summer	20.078	0.0	264.3	242
360 min Summer	14.585	0.0	287.4	362
480 min Summer	11.622	0.0	304.5	482
600 min Summer	9.738	0.0	317.9	600
720 min Summer	8.424	0.0	328.8	720
960 min Summer	6.697	0.0	344.8	858
1440 min Summer	4.839	0.0	357.9	1084
2160 min Summer	3.490	0.0	420.8	1472
2880 min Summer	2.766	0.0	444.2	1876
4320 min Summer	1.989	0.0	477.6	2680
5760 min Summer	1.573	0.0	508.3	3456
7200 min Summer	1.311	0.0	529.0	4176
8640 min Summer	1.129	0.0	546.0	4848
10080 min Summer	0.994	0.0	559.5	5552
15 min Winter	138.153	0.0	120.6	19
30 min Winter	90.705	0.0	157.2	33
60 min Winter	56.713	0.0	209.4	62
120 min Winter	34.246	0.0	252.7	122
180 min Winter	25.149	0.0	278.0	180
240 min Winter	20.078	0.0	295.4	238
360 min Winter	14.585	0.0	320.5	356
480 min Winter	11.622	0.0	338.5	472

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.609	0.609	2.5	304.4	O K
720 min Winter	9.612	0.612	2.5	305.9	O K
960 min Winter	9.608	0.608	2.5	303.8	O K
1440 min Winter	9.576	0.576	2.5	288.0	O K
2160 min Winter	9.527	0.527	2.5	263.6	O K
2880 min Winter	9.476	0.476	2.5	237.8	O K
4320 min Winter	9.377	0.377	2.5	188.4	O K
5760 min Winter	9.293	0.293	2.5	146.6	O K
7200 min Winter	9.227	0.227	2.5	113.6	O K
8640 min Winter	9.178	0.178	2.4	89.0	O K
10080 min Winter	9.142	0.142	2.3	70.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	351.9	588
720 min Winter	8.424	0.0	361.6	700
960 min Winter	6.697	0.0	371.3	924
1440 min Winter	4.839	0.0	365.9	1312
2160 min Winter	3.490	0.0	471.3	1620
2880 min Winter	2.766	0.0	497.4	2048
4320 min Winter	1.989	0.0	534.7	2892
5760 min Winter	1.573	0.0	569.5	3640
7200 min Winter	1.311	0.0	592.7	4328
8640 min Winter	1.129	0.0	611.9	5016
10080 min Winter	0.994	0.0	627.4	5656

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.450

Time (mins) From:	To:	Area (ha)
0	4	0.450

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	1.000	500.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.5	Kick-Flo®	0.627	2.0
Flush-Flo™	0.307	2.5	Mean Flow over Head Range	-	2.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	0.800	2.3	2.000	3.4	4.000	4.7	7.000	6.2
0.200	2.4	1.000	2.5	2.200	3.6	4.500	5.0	7.500	6.4
0.300	2.5	1.200	2.7	2.400	3.7	5.000	5.3	8.000	6.6
0.400	2.5	1.400	2.9	2.600	3.9	5.500	5.5	8.500	6.8
0.500	2.4	1.600	3.1	3.000	4.1	6.000	5.7	9.000	7.0
0.600	2.1	1.800	3.3	3.500	4.5	6.500	6.0	9.500	7.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.327	0.327	1.4	81.9	O K
30 min Summer	9.428	0.428	1.4	106.9	O K
60 min Summer	9.530	0.530	1.4	132.5	O K
120 min Summer	9.628	0.628	1.4	157.1	O K
180 min Summer	9.680	0.680	1.4	169.9	O K
240 min Summer	9.711	0.711	1.4	177.7	Flood Risk
360 min Summer	9.748	0.748	1.4	187.1	Flood Risk
480 min Summer	9.769	0.769	1.4	192.2	Flood Risk
600 min Summer	9.779	0.779	1.4	194.8	Flood Risk
720 min Summer	9.783	0.783	1.4	195.8	Flood Risk
960 min Summer	9.779	0.779	1.4	194.7	Flood Risk
1440 min Summer	9.752	0.752	1.4	188.1	Flood Risk
2160 min Summer	9.712	0.712	1.4	177.9	Flood Risk
2880 min Summer	9.673	0.673	1.4	168.2	O K
4320 min Summer	9.599	0.599	1.4	149.7	O K
5760 min Summer	9.525	0.525	1.4	131.3	O K
7200 min Summer	9.444	0.444	1.4	111.1	O K
8640 min Summer	9.378	0.378	1.4	94.5	O K
10080 min Summer	9.322	0.322	1.4	80.4	O K
15 min Winter	9.367	0.367	1.4	91.8	O K
30 min Winter	9.480	0.480	1.4	120.0	O K
60 min Winter	9.595	0.595	1.4	148.7	O K
120 min Winter	9.706	0.706	1.4	176.6	Flood Risk
180 min Winter	9.765	0.765	1.4	191.4	Flood Risk
240 min Winter	9.802	0.802	1.4	200.4	Flood Risk
360 min Winter	9.847	0.847	1.4	211.7	Flood Risk
480 min Winter	9.873	0.873	1.4	218.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	79.0	19
30 min Summer	90.705	0.0	101.3	34
60 min Summer	56.713	0.0	134.3	64
120 min Summer	34.246	0.0	161.7	124
180 min Summer	25.149	0.0	177.6	184
240 min Summer	20.078	0.0	188.3	242
360 min Summer	14.585	0.0	202.6	362
480 min Summer	11.622	0.0	210.3	482
600 min Summer	9.738	0.0	212.2	602
720 min Summer	8.424	0.0	211.6	722
960 min Summer	6.697	0.0	208.3	960
1440 min Summer	4.839	0.0	199.7	1224
2160 min Summer	3.490	0.0	300.1	1600
2880 min Summer	2.766	0.0	316.6	2016
4320 min Summer	1.989	0.0	338.1	2852
5760 min Summer	1.573	0.0	362.0	3688
7200 min Summer	1.311	0.0	376.9	4392
8640 min Summer	1.129	0.0	389.3	5104
10080 min Summer	0.994	0.0	399.5	5848
15 min Winter	138.153	0.0	88.0	19
30 min Winter	90.705	0.0	109.0	33
60 min Winter	56.713	0.0	150.2	64
120 min Winter	34.246	0.0	180.5	122
180 min Winter	25.149	0.0	197.3	180
240 min Winter	20.078	0.0	207.6	240
360 min Winter	14.585	0.0	216.2	356
480 min Winter	11.622	0.0	216.8	472

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.888	0.888	1.4	221.9	Flood Risk
720 min Winter	9.895	0.895	1.4	223.8	Flood Risk
960 min Winter	9.897	0.897	1.4	224.2	Flood Risk
1440 min Winter	9.871	0.871	1.4	217.8	Flood Risk
2160 min Winter	9.819	0.819	1.4	204.9	Flood Risk
2880 min Winter	9.768	0.768	1.4	192.0	Flood Risk
4320 min Winter	9.663	0.663	1.4	165.8	O K
5760 min Winter	9.558	0.558	1.4	139.4	O K
7200 min Winter	9.433	0.433	1.4	108.2	O K
8640 min Winter	9.336	0.336	1.4	83.9	O K
10080 min Winter	9.259	0.259	1.4	64.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	216.0	588
720 min Winter	8.424	0.0	214.6	702
960 min Winter	6.697	0.0	211.5	924
1440 min Winter	4.839	0.0	205.1	1354
2160 min Winter	3.490	0.0	335.8	1688
2880 min Winter	2.766	0.0	353.9	2160
4320 min Winter	1.989	0.0	369.0	3072
5760 min Winter	1.573	0.0	405.5	3984
7200 min Winter	1.311	0.0	422.2	4688
8640 min Winter	1.129	0.0	436.1	5368
10080 min Winter	0.994	0.0	447.7	6048

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.320

Time (mins) From:	To:	Area (ha)
0	4	0.320

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	1.000	250.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0058-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.5	Kick-Flo®	0.515	1.1
Flush-Flo™	0.253	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.4	2.000	2.0	4.000	2.8	7.000	3.7
0.200	1.4	1.000	1.5	2.200	2.1	4.500	3.0	7.500	3.8
0.300	1.4	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.9
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.3	8.500	4.0
0.500	1.2	1.600	1.9	3.000	2.5	6.000	3.4	9.000	4.1
0.600	1.2	1.800	2.0	3.500	2.7	6.500	3.5	9.500	4.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.298	0.298	1.1	38.8	O K
30 min Summer	9.388	0.388	1.1	50.4	O K
60 min Summer	9.477	0.477	1.1	62.1	O K
120 min Summer	9.558	0.558	1.1	72.6	O K
180 min Summer	9.596	0.596	1.1	77.5	O K
240 min Summer	9.615	0.615	1.1	79.9	O K
360 min Summer	9.630	0.630	1.1	81.9	O K
480 min Summer	9.630	0.630	1.1	81.9	O K
600 min Summer	9.622	0.622	1.1	80.9	O K
720 min Summer	9.612	0.612	1.1	79.6	O K
960 min Summer	9.593	0.593	1.1	77.0	O K
1440 min Summer	9.552	0.552	1.1	71.8	O K
2160 min Summer	9.492	0.492	1.1	63.9	O K
2880 min Summer	9.426	0.426	1.1	55.3	O K
4320 min Summer	9.319	0.319	1.1	41.4	O K
5760 min Summer	9.237	0.237	1.1	30.9	O K
7200 min Summer	9.180	0.180	1.1	23.4	O K
8640 min Summer	9.139	0.139	1.1	18.1	O K
10080 min Summer	9.111	0.111	1.0	14.5	O K
15 min Winter	9.335	0.335	1.1	43.5	O K
30 min Winter	9.436	0.436	1.1	56.7	O K
60 min Winter	9.537	0.537	1.1	69.9	O K
120 min Winter	9.630	0.630	1.1	81.8	O K
180 min Winter	9.674	0.674	1.1	87.6	O K
240 min Winter	9.697	0.697	1.1	90.6	O K
360 min Winter	9.718	0.718	1.1	93.4	Flood Risk
480 min Winter	9.723	0.723	1.1	94.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	38.9	19
30 min Summer	90.705	0.0	51.1	34
60 min Summer	56.713	0.0	64.7	64
120 min Summer	34.246	0.0	78.2	122
180 min Summer	25.149	0.0	86.1	182
240 min Summer	20.078	0.0	91.7	242
360 min Summer	14.585	0.0	99.9	362
480 min Summer	11.622	0.0	106.1	480
600 min Summer	9.738	0.0	111.1	582
720 min Summer	8.424	0.0	115.3	628
960 min Summer	6.697	0.0	122.2	752
1440 min Summer	4.839	0.0	132.1	1012
2160 min Summer	3.490	0.0	144.0	1432
2880 min Summer	2.766	0.0	152.1	1816
4320 min Summer	1.989	0.0	163.9	2552
5760 min Summer	1.573	0.0	173.2	3280
7200 min Summer	1.311	0.0	180.3	3960
8640 min Summer	1.129	0.0	186.3	4592
10080 min Summer	0.994	0.0	191.3	5336
15 min Winter	138.153	0.0	43.6	19
30 min Winter	90.705	0.0	57.3	33
60 min Winter	56.713	0.0	72.5	62
120 min Winter	34.246	0.0	87.6	122
180 min Winter	25.149	0.0	96.5	180
240 min Winter	20.078	0.0	102.7	238
360 min Winter	14.585	0.0	111.9	352
480 min Winter	11.622	0.0	118.8	466

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.719	0.719	1.1	93.5	Flood Risk
720 min Winter	9.709	0.709	1.1	92.2	Flood Risk
960 min Winter	9.682	0.682	1.1	88.6	O K
1440 min Winter	9.631	0.631	1.1	82.0	O K
2160 min Winter	9.548	0.548	1.1	71.2	O K
2880 min Winter	9.452	0.452	1.1	58.8	O K
4320 min Winter	9.288	0.288	1.1	37.4	O K
5760 min Winter	9.182	0.182	1.1	23.6	O K
7200 min Winter	9.120	0.120	1.1	15.6	O K
8640 min Winter	9.086	0.086	1.0	11.2	O K
10080 min Winter	9.071	0.071	0.9	9.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	124.4	576
720 min Winter	8.424	0.0	129.1	680
960 min Winter	6.697	0.0	136.7	788
1440 min Winter	4.839	0.0	147.5	1084
2160 min Winter	3.490	0.0	161.3	1556
2880 min Winter	2.766	0.0	170.4	1988
4320 min Winter	1.989	0.0	183.7	2684
5760 min Winter	1.573	0.0	194.0	3352
7200 min Winter	1.311	0.0	202.0	3968
8640 min Winter	1.129	0.0	208.7	4584
10080 min Winter	0.994	0.0	214.3	5240

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.153

Time (mins) From:	To:	Area (ha)
0	4	0.153

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	130.0	1.000	130.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0053-1300-1000-1300
Design Head (m)	1.000
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.3	Kick-Flo®	0.477	0.9
Flush-Flo™	0.236	1.1	Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.9	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	1.0	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.6
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.1	9.500	3.6

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.320	0.320	0.8	32.0	O K
30 min Summer	9.417	0.417	0.8	41.7	O K
60 min Summer	9.513	0.513	0.8	51.3	O K
120 min Summer	9.601	0.601	0.8	60.1	O K
180 min Summer	9.642	0.642	0.8	64.2	O K
240 min Summer	9.663	0.663	0.8	66.3	O K
360 min Summer	9.682	0.682	0.8	68.2	O K
480 min Summer	9.684	0.684	0.8	68.4	O K
600 min Summer	9.677	0.677	0.8	67.7	O K
720 min Summer	9.668	0.668	0.8	66.8	O K
960 min Summer	9.649	0.649	0.8	64.9	O K
1440 min Summer	9.611	0.611	0.8	61.1	O K
2160 min Summer	9.556	0.556	0.8	55.6	O K
2880 min Summer	9.504	0.504	0.8	50.4	O K
4320 min Summer	9.396	0.396	0.8	39.6	O K
5760 min Summer	9.298	0.298	0.8	29.8	O K
7200 min Summer	9.225	0.225	0.8	22.5	O K
8640 min Summer	9.172	0.172	0.8	17.2	O K
10080 min Summer	9.135	0.135	0.8	13.5	O K
15 min Winter	9.359	0.359	0.8	35.9	O K
30 min Winter	9.469	0.469	0.8	46.9	O K
60 min Winter	9.577	0.577	0.8	57.7	O K
120 min Winter	9.677	0.677	0.8	67.7	O K
180 min Winter	9.726	0.726	0.9	72.6	Flood Risk
240 min Winter	9.752	0.752	0.9	75.2	Flood Risk
360 min Winter	9.778	0.778	0.9	77.8	Flood Risk
480 min Winter	9.786	0.786	0.9	78.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	32.1	19
30 min Summer	90.705	0.0	42.2	34
60 min Summer	56.713	0.0	53.4	64
120 min Summer	34.246	0.0	64.4	122
180 min Summer	25.149	0.0	71.0	182
240 min Summer	20.078	0.0	75.6	242
360 min Summer	14.585	0.0	82.3	362
480 min Summer	11.622	0.0	87.4	480
600 min Summer	9.738	0.0	91.6	594
720 min Summer	8.424	0.0	95.0	642
960 min Summer	6.697	0.0	100.6	760
1440 min Summer	4.839	0.0	108.6	1024
2160 min Summer	3.490	0.0	118.6	1444
2880 min Summer	2.766	0.0	125.3	1848
4320 min Summer	1.989	0.0	135.1	2640
5760 min Summer	1.573	0.0	142.7	3344
7200 min Summer	1.311	0.0	148.5	4040
8640 min Summer	1.129	0.0	153.4	4680
10080 min Summer	0.994	0.0	157.6	5352
15 min Winter	138.153	0.0	36.0	19
30 min Winter	90.705	0.0	47.1	33
60 min Winter	56.713	0.0	59.8	62
120 min Winter	34.246	0.0	72.2	122
180 min Winter	25.149	0.0	79.5	180
240 min Winter	20.078	0.0	84.6	238
360 min Winter	14.585	0.0	92.2	352
480 min Winter	11.622	0.0	97.9	466

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.783	0.783	0.9	78.3	Flood Risk
720 min Winter	9.775	0.775	0.9	77.5	Flood Risk
960 min Winter	9.749	0.749	0.9	74.9	Flood Risk
1440 min Winter	9.701	0.701	0.9	70.1	Flood Risk
2160 min Winter	9.624	0.624	0.8	62.4	O K
2880 min Winter	9.548	0.548	0.8	54.8	O K
4320 min Winter	9.384	0.384	0.8	38.4	O K
5760 min Winter	9.244	0.244	0.8	24.4	O K
7200 min Winter	9.156	0.156	0.8	15.6	O K
8640 min Winter	9.106	0.106	0.8	10.6	O K
10080 min Winter	9.078	0.078	0.7	7.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	102.5	576
720 min Winter	8.424	0.0	106.3	684
960 min Winter	6.697	0.0	112.5	810
1440 min Winter	4.839	0.0	120.6	1094
2160 min Winter	3.490	0.0	132.8	1556
2880 min Winter	2.766	0.0	140.3	2016
4320 min Winter	1.989	0.0	151.3	2852
5760 min Winter	1.573	0.0	159.8	3512
7200 min Winter	1.311	0.0	166.4	4112
8640 min Winter	1.129	0.0	171.9	4752
10080 min Winter	0.994	0.0	176.5	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.126

Time (mins) From:	To:	Area (ha)
0	4	0.126

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.384	0.384	0.8	7.7	O K
30 min Summer	9.488	0.488	0.8	9.8	O K
60 min Summer	9.566	0.566	0.8	11.3	O K
120 min Summer	9.592	0.592	0.8	11.8	O K
180 min Summer	9.579	0.579	0.8	11.6	O K
240 min Summer	9.559	0.559	0.8	11.2	O K
360 min Summer	9.517	0.517	0.8	10.3	O K
480 min Summer	9.476	0.476	0.8	9.5	O K
600 min Summer	9.434	0.434	0.8	8.7	O K
720 min Summer	9.387	0.387	0.8	7.7	O K
960 min Summer	9.306	0.306	0.8	6.1	O K
1440 min Summer	9.192	0.192	0.8	3.8	O K
2160 min Summer	9.105	0.105	0.8	2.1	O K
2880 min Summer	9.071	0.071	0.7	1.4	O K
4320 min Summer	9.050	0.050	0.5	1.0	O K
5760 min Summer	9.040	0.040	0.4	0.8	O K
7200 min Summer	9.035	0.035	0.3	0.7	O K
8640 min Summer	9.032	0.032	0.3	0.6	O K
10080 min Summer	9.030	0.030	0.3	0.6	O K
15 min Winter	9.434	0.434	0.8	8.7	O K
30 min Winter	9.552	0.552	0.8	11.0	O K
60 min Winter	9.644	0.644	0.8	12.9	O K
120 min Winter	9.684	0.684	0.8	13.7	O K
180 min Winter	9.667	0.667	0.8	13.3	O K
240 min Winter	9.642	0.642	0.8	12.8	O K
360 min Winter	9.584	0.584	0.8	11.7	O K
480 min Winter	9.525	0.525	0.8	10.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	8.3	18
30 min Summer	90.705	0.0	10.9	33
60 min Summer	56.713	0.0	13.6	62
120 min Summer	34.246	0.0	16.4	116
180 min Summer	25.149	0.0	18.1	144
240 min Summer	20.078	0.0	19.3	176
360 min Summer	14.585	0.0	21.0	246
480 min Summer	11.622	0.0	22.3	316
600 min Summer	9.738	0.0	23.4	386
720 min Summer	8.424	0.0	24.3	448
960 min Summer	6.697	0.0	25.7	568
1440 min Summer	4.839	0.0	27.9	796
2160 min Summer	3.490	0.0	30.1	1128
2880 min Summer	2.766	0.0	31.9	1472
4320 min Summer	1.989	0.0	34.4	2200
5760 min Summer	1.573	0.0	36.2	2936
7200 min Summer	1.311	0.0	37.7	3584
8640 min Summer	1.129	0.0	39.0	4368
10080 min Summer	0.994	0.0	40.1	5048
15 min Winter	138.153	0.0	9.3	18
30 min Winter	90.705	0.0	12.2	32
60 min Winter	56.713	0.0	15.2	60
120 min Winter	34.246	0.0	18.4	116
180 min Winter	25.149	0.0	20.3	162
240 min Winter	20.078	0.0	21.6	188
360 min Winter	14.585	0.0	23.5	266
480 min Winter	11.622	0.0	25.0	342

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	9.463	0.463	0.8	9.3	O K
720 min Winter	9.391	0.391	0.8	7.8	O K
960 min Winter	9.268	0.268	0.8	5.4	O K
1440 min Winter	9.129	0.129	0.8	2.6	O K
2160 min Winter	9.066	0.066	0.7	1.3	O K
2880 min Winter	9.050	0.050	0.5	1.0	O K
4320 min Winter	9.038	0.038	0.4	0.8	O K
5760 min Winter	9.032	0.032	0.3	0.6	O K
7200 min Winter	9.029	0.029	0.3	0.6	O K
8640 min Winter	9.026	0.026	0.2	0.5	O K
10080 min Winter	9.024	0.024	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	9.738	0.0	26.2	416
720 min Winter	8.424	0.0	27.2	484
960 min Winter	6.697	0.0	28.8	598
1440 min Winter	4.839	0.0	31.2	808
2160 min Winter	3.490	0.0	33.8	1120
2880 min Winter	2.766	0.0	35.7	1472
4320 min Winter	1.989	0.0	38.5	2164
5760 min Winter	1.573	0.0	40.6	2936
7200 min Winter	1.311	0.0	42.3	3640
8640 min Winter	1.129	0.0	43.7	4392
10080 min Winter	0.994	0.0	44.9	5016

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.032

Time (mins) From:	To:	Area (ha)
0	4	0.032

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	20.0	1.000	20.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

ISO A1 841mm x 594mm

PHASE B - BLOCK A1/A2
POSITIVELY DRAINED AREA =4500m²
STORM WATER DISCHARGE RATE = 2.5l/s
REQUIRED ATTENUATION VOLUME = 343m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =130m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 148m³
BLUE/GREEN ROOF ATTENUATION:
VOLUME = 116m³
98m²
PERMEABLE PAVING:
AREA =475m²
DEPTH 0.3m (30% VOID RATIO)
VOLUME =43m³

TOTAL ATTENUATION PROVIDED = 308m³

PHASE B - BLOCK B1/B2
POSITIVELY DRAINED AREA =3000m²
STORM WATER DISCHARGE RATE = 1.5l/s
ATTENUATION VOLUME = 183m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =150m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 171m³
BLUE/GREEN ROOF:
VOLUME = 55m³

TOTAL ATTENUATION = 226m³

PHASE B - BLOCK B3
POSITIVELY DRAINED AREA =1525m²
STORM WATER DISCHARGE RATE = 1.3l/s
REQUIRED ATTENUATION VOLUME = 129m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =35m²
DEPTH = 2.4m (95% VOID RATIO)
VOLUME = 79.8m³
BLUE/GREEN ROOF:
VOLUME = 52m³

TOTAL ATTENUATION PROVIDED = 131.8m³

PHASE B - BLOCK B5
POSITIVELY DRAINED AREA =321m²
STORM WATER DISCHARGE RATE = 1l/s
REQUIRED ATTENUATION VOLUME = 13m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =13.2m²
DEPTH =1.2 m (95% VOID RATIO)
VOLUME = 15m³

PHASE B - JOLLY'S GREEN
POSITIVELY DRAINED AREA =10,000m²
STORM WATER DISCHARGE RATE = 3.9l/s
REQUIRED ATTENUATION VOLUME = 98m³
PERMEABLE PAVING:
AREA =1380m²
DEPTH 0.3m (30% VOID RATIO)
VOLUME =120m³

TOTAL ATTENUATION PROVIDED = 120m³

PHASE C - BLOCK C1/C2/C3/C4
POSITIVELY DRAINED AREA =6005m²
STORM WATER DISCHARGE RATE = 1.5l/s
REQUIRED ATTENUATION VOLUME = 651m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =364m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 426m³
BLUE/GREEN ROOF:
VOLUME = 238m³

TOTAL ATTENUATION PROVIDED = 653m³

PHASE C - BLOCK C6
POSITIVELY DRAINED AREA =148m²
STORM WATER DISCHARGE RATE = 0.25l/s
(SHARED FLOW CONTROL STRUCTURE WITH BOLCK C5 LIMITING FLOW TO TOTAL 1l/s)
REQUIRED ATTENUATION VOLUME = 10m³
BELOW GROUND CELLULAR ATTENUATION CRATE:
AREA=17.6m²
DEPTH =0.6 m (95% VOID RATIO)
VOLUME = 10.03m³

PHASE C - BLOCK C5
POSITIVELY DRAINED AREA =210m²
STORM WATER DISCHARGE RATE = 0.75l/s
(SHARED FLOW CONTROL STRUCTURE WITH BOLCK C6 LIMITING FLOW TO TOTAL 1l/s)
REQUIRED ATTENUATION VOLUME = 10m³
BELOW GROUND CELLULAR ATTENUATION CRATE:
AREA=17.6m²
DEPTH =0.6 m (95% VOID RATIO)
VOLUME = 10.03m³

PHASE C - BLOCK E1/E2/E3
POSITIVELY DRAINED AREA =5185m²
STORM WATER DISCHARGE RATE = 1.5l/s
REQUIRED ATTENUATION VOLUME = 562m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =351.36m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 400.5m³
BLUE/GREEN ROOF:
VOLUME = 162m³

TOTAL ATTENUATION PROVIDED = 562.5m³

THAMES WATER SWS REF:3605
CL=n/a
IL=n/a
(SURVEY REQUIRED)

THAMES WATER SWS REF:3602
CL=3.75
IL=0.78

PHASE A - BLOCK J1
POSITIVELY DRAINED AREA = 2624m²
STORM WATER DISCHARGE RATE = 1.0l/s
REQUIRED ATTENUATION VOLUME = 260m³
CELLULAR ATTENUATION CRATES:
AREA = 228m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 260m³

THAMES WATER CWS REF:2536
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:3501A
CL=N/A
IL=N/A
(SURVEY REQUIRED)

PHASE B - BLOCK B4
POSITIVELY DRAINED AREA = 1255m²
STORM WATER DISCHARGE RATE = 1l/s
REQUIRED ATTENUATION VOLUME = 97m³
CELLULAR ATTENUATION CRATES:
AREA = 68.8m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 78.4m³
BLUE/GREEN ROOF:
VOLUME = 19m³

TOTAL ATTENUATION PROVIDED = 97.4m³

THAMES WATER CWS REF:3516
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:4407
CL=1.66
IL=-3.55

PHASE D - BLOCK D1/D2/D3/D4
POSITIVELY DRAINED AREA = 5310m²
STORM WATER DISCHARGE RATE = 1.5l/s
REQUIRED ATTENUATION VOLUME = 576m³
CELLULAR ATTENUATION CRATES:
AREA = 430m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 490.2m³
BLUE/GREEN ROOF:
VOLUME = 87m³

TOTAL PROVIDED ATTENUATION = 577.2m³

THAMES WATER CWS REF:4301A
CL=1.77
IL=-2.82

PHASE A - BLOCK F1
POSITIVELY DRAINED AREA = 2145m²
STORM WATER DISCHARGE RATE = 1.25l/s
REQUIRED ATTENUATION VOLUME = 185m³
CELLULAR ATTENUATION CRATES:
AREA = 114m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 130m³
BLUE/GREEN ROOF:
VOLUME = 56m³

TOTAL ATTENUATION PROVIDED = 185m³

THAMES WATER CWS REF:4302
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:4303
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:4312
CL=1.77
IL=-2.54

THAMES WATER CWS REF:4313
CL=2.00
IL=-1.04

PHASE A - BLOCK H3
POSITIVELY DRAINED AREA = 1700m²
STORM WATER DISCHARGE RATE = 1.25l/s
REQUIRED ATTENUATION VOLUME = 135m³
CELLULAR ATTENUATION CRATES:
AREA = 97.52m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 111.2m³
BLUE/GREEN ROOF:
VOLUME = 24m³

TOTAL ATTENUATION PROVIDED = 135.2m³

PHASE A - BLOCK H1/H2
POSITIVELY DRAINED AREA =2025m²
STORM WATER DISCHARGE RATE = 1.5l/s
REQUIRED ATTENUATION VOLUME = 161m³
BELOW GROUND CELLULAR ATTENUATION CRATES:
AREA =98.4m²
DEPTH = 1.2m (95% VOID RATIO)
VOLUME = 112m³
BLUE/GREEN ROOF:
VOLUME = 49m³

TOTAL ATTENUATION VOLUME PROVIDED = 161m³

THAMES WATER CWS REF:4215
CL=1.61
IL=-2.24

THAMES WATER CWS REF:2705
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:2704
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:3701
CL=N/A
IL=N/A
(SURVEY REQUIRED)

THAMES WATER CWS REF:7303
CL=N/A
IL=N/A
(SURVEY REQUIRED)

PHASE A - BLOCK I1
POSITIVELY DRAINED AREA = 905m²
STORM WATER DISCHARGE RATE = 1l/s
REQUIRED ATTENUATION VOLUME = 69m³
CELLULAR ATTENUATION CRATES:
AREA = 24m²
DEPTH = 1.5m (95% VOID RATIO)
VOLUME = 34.2m³
BLUE/GREEN ROOF:
VOLUME = 35m³

TOTAL ATTENUATION PROVIDED = 69.2m³

ISSUED FOR INFORMATION

REV	DESCRIPTION	BY	DATE
P01	STAGE 2 ISSUE	LH	20/08/21
P02	SUSTAINABILITY PRESENTATION	LB	25/08/21
P03	DRAFT STAGE 2+ ISSUED FOR PLANNING	LH	17/09/21
P04	ISSUED FOR PLANNING	LB	14/10/21
P05	REVISED PLANNING ISSUE	LB	07/03/22
P06	REVISED PLANNING ISSUE	LB	20/10/22

NOTES:

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5. PERMEABLE PAVING TO BE UTILIZED IN PRIVATELY MANAGED PUBLIC SPACE WHERE FEASIBLE.
6. THIS DRAWING IS BASED ON:
   - THAMES WATER ASSET RECORDS DATED NOVEMBER 2020
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN3663 - LB - ZZ - 00 - DR - 000201 - Illustrative Scheme - Lower Ground Floor Plan - 1 AND - LB - ZZ - 28 - DR - 000206 - Illustrative Scheme - Roof Plan - 1 RECEIVED OCTOBER 2022
   - TOPOGRAPHICAL & UTILITIES COMBINED SURVEY FULL SITE V2

TOTAL DISCHARGE RATE FROM SITE IS EQUAL TO THE GREENFEILD RUNOFF RATE OF 22.4 L/S.

KEY:

- ASSUMED PROPERTY BOUNDARY
- PROPOSED SURFACE WATER SEWER
- EXISTING SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- EXISTING COMBINED WATER SEWER
- PROPOSED COMBINED WATER SEWER
- ABANDONED SEWER
- PROPOSED SURFACE WATER MANHOLE
- EXISTING FOUL WATER MANHOLE
- PROPOSED FOUL WATER MANHOLE
- EXISTING COMBINED WATER SEWER
- PROPOSED COMBINED WATER MANHOLE
- PROPOSED BELOW GROUND SURFACE WATER ATTENUATION TANK
- SUDS PLANTER (BIO-RETENTION)
- ASSUMED POSITIVELY DRAINED BLOCK AREA
- PERMEABLE PAVING

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

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PROJECT
ABERFELDY VILLAGE MASTERPLAN

CLIENT
ECOWORLD

TITLE
BELOW GROUND DRAINAGE MASTERPLAN

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
LH	LH	LB	LB
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-100			P06

DATE: 20/10/2022
FILE LOCATION: \MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\DRAWINGS\2812-MHT-CV-BG-DR-100.DWG

ISO A1 841mm x 594mm

BLOCK A1/A2

ROOF AREA = 2110m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1386 x 0.5 = 693m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 65m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 543m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 51m³

TOTAL ATTENUATION VOLUME PROVIDED = 116m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B1/B2

ROOF AREA = 1289m²

ASSUMED ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1175 x 0.5 = 587.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 55m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B4

ROOF AREA = 300m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 211m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 19m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK B3

ROOF AREA = 1095m²

ROOF AREA USED BY MEP PLANT/FIXED FURNITURE = 85m²
<50% TOTAL BLUE/GREEN ROOF AREA THEREFORE ASSUMPTION OKAY.

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1095 x 0.5 = 547.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 52m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK C1/C2/C3/C4

ROOF AREA = 4349m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 2598 x 0,5 = 1299m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 123.4m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 1210m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 114.95m³

TOTAL ATTENUATION VOLUME PROVIDED = 238m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK D1/D2/D3/D4

ROOF AREA = 2320m²

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1833 x 0.5 = 916.5m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 87m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK E1/E2/E3

ROOF AREA = 3062m²

BLUE/GREEN ROOF ATTENUATION:
ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 1948 x 0.5 = 974m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 92m³

PODIUM BLUE ROOF:
PODIUM BLUE ROOF AREA = 746m²

ATTENUATION VOLUME PROVIDED BY PODIUM BLUE ROOF AT 0.1m DEPTH & 0.95 VOID RATIO = 70m³

TOTAL ATTENUATION VOLUME PROVIDED = 162m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK F1

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 843m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.115m DEPTH & 0.95 VOID RATIO = 120m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK H1/H2

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 581m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.115m DEPTH & 0.95 VOID RATIO = 63m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK H3

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 321m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.115m DEPTH & 0.95 VOID RATIO = 35m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

BLOCK I1

ROOF AREA AVAILABLE FOR BLUE/GREEN ROOF = 510m²

ATTENUATION VOLUME PROVIDED BY BLUE/GREEN ROOF AT 0.115m DEPTH & 0.95 VOID RATIO = 57m³

BLUE/GREEN ROOF DISCHARGE RATE DESIGNED BY SPECIALIST AT LATER DESIGN STAGE.

NOTE:

A 50% REDUCTION IN BLUE/GREEN ROOF PLAN AREA IS APPLIED WHERE ROOF PLANT AREAS ARE UNKNOWN. THIS REDUCTION IS EXCLUDING PODIUM BLUE ROOF AREAS.

ISSUED FOR INFORMATION

REV	DESCRIPTION	BY	DATE
P01	STAGE 2 ISSUE	LH	20/08/21
P02	DRAFT STAGE 2+ FOR PLANNING	LH	17/09/21
P03	ISSUED FOR PLANNING	LB	14/10/21
P04	REVISED ISSUE	LB	22/10/22

NOTES:

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3. THIS DRAWING IS FOR PLANNING PURPOSES.
4. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND CONSULTANTS DRAWINGS AND SPECIFICATIONS.
5. THIS DRAWING IS BASED ON:
   - 3663 - LB - ZZ - 00 - DR - 000201 - Illustrative Scheme - Lower Ground Floor Plan - 1 AND - LB - ZZ - 28 - DR - 000206 - Illustrative Scheme - Roof Plan - 1 RECEIVED OCTOBER 2022

KEY:

- PROPOSED PODIUM DECK BLUE ROOF AREA
- PROPOSED BLUE OR GREEN ROOF AREA
- PROPOSED BLUE ROOF AREA

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

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PROJECT
ABERFELDY VILLAGE MASTERPLAN

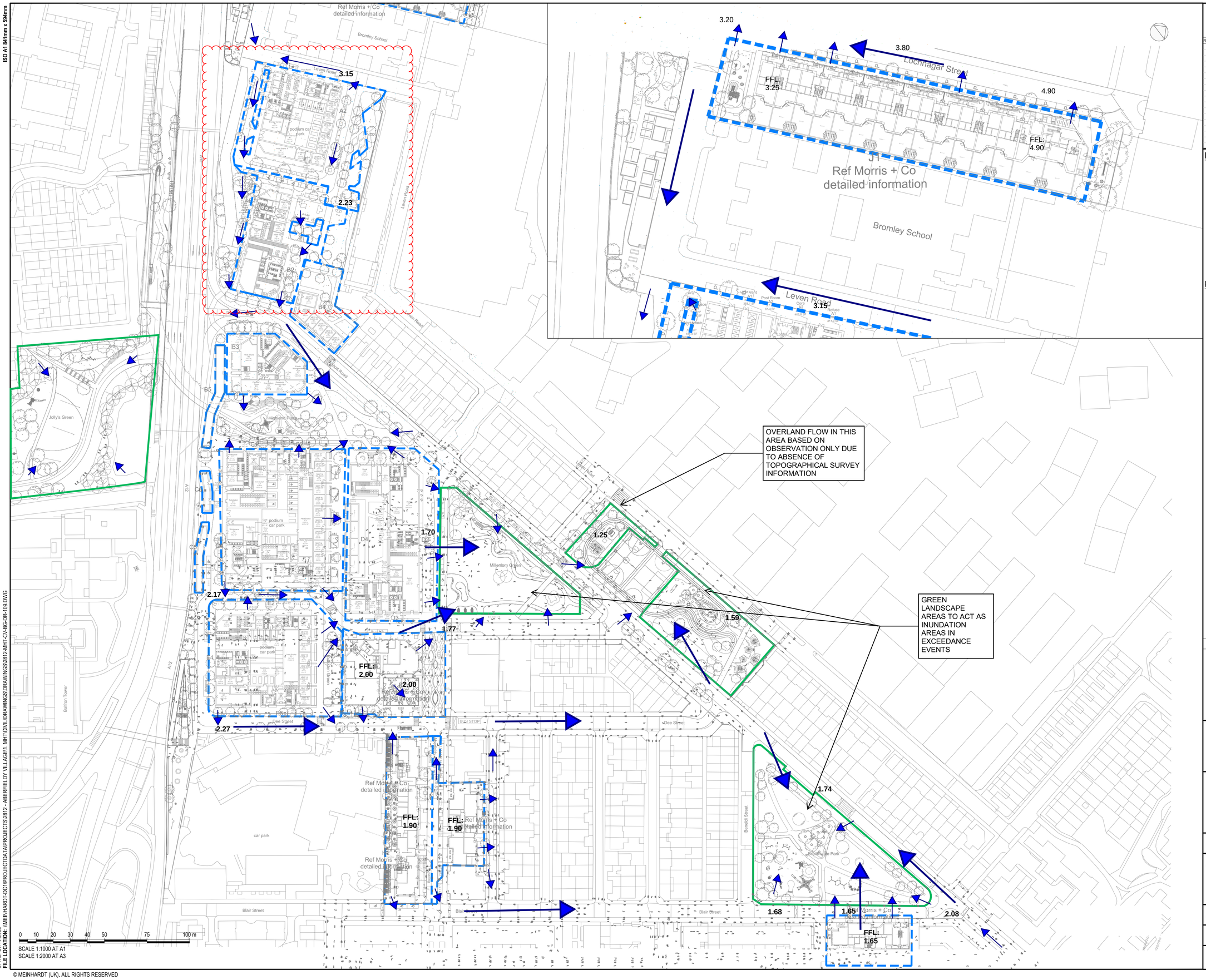
CLIENT
ECOWORLD

TITLE
ROOF MASTERPLAN

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
LH	LH	LB	CM
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-101			P04

DATE: 20/10/2022
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\DRAWINGS\2812-MHT-CV-RF-DR-101.DWG

ISO A1 841mm x 594mm



FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE
P01	FOR INFORMATION ONLY	SA	14.02.22
P02	REVISED ISSUE	LB	01.04.22
P03	REVISED ISSUE	LB	01.06.22
P04	REVISED ISSUE	LB	31.08.22
P05	REVISED ISSUE	LB	10.10.22
P06	REVISED ISSUE	LB	20.10.22
P07	REVISED ISSUE	LB	24.10.22

NOTES:

1. DO NOT SCALE FROM THIS DRAWING
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS FOR INFORMATION ONLY.
4. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND CONSULTANTS DRAWINGS AND SPECIFICATIONS.
5. PERMEABLE PAVING TO BE UTILIZED IN PRIVATELY MANAGED PUBLIC SPACE WHERE FEASIBLE.
6. THIS DRAWING IS BASED ON:
   - LEVITT BERNSTEIN ARCHITECTURAL MASTERPLAN 3663 - 100A - Proposed LGF Plan - Scenario A - P11, DATED: 20/10/22
   - TOPOGRAPHICAL & UTILITIES COMBINED SURVEY FULL SITE V2

KEY:

- PROPOSED BLOCK BOUNDARY
- PROPOSED GREEN SPACE BOUNDARY
- OVERLAND FLOW ROUTE

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

MEINHARDT
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www.meinhardt.co.uk

PROJECT
ABERFELDY VILLAGE

CLIENT
ECOWORLD

TITLE
OVERLAND FLOW ROUTES

DISCIPLINE			SCALE
CIVIL			1:1000
DRAWN	DESIGNED	CHECKED	APPROVED
SA	LB	LB	GB
DRAWING No			ISSUE
2812-MHT-CV-BG-DR-109			P07

DATE: 20/10/2022
FILE LOCATION: \\MEINHARDT-DC1\PROJECTDATA\PROJECTS\2812 - ABERFIELDY VILLAGE\1. MHT\CIVIL\DRAWINGS\DRAWINGS\2812-MHT-CV-BG-DR-109.DWG

Appendix D – Tower Hamlets SUDS Proforma

TOWER HAMLETS

GREATER**LONDON**AUTHORITY

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1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Aberfeldy Village
Address & post code	Poplar Riverside, Aberfeldy Village, E14, London
OS Grid ref. (Easting, Northing)	E 538365
	N 181398
LPA reference (if applicable)	
Brief description of proposed work	The Aberfeldy Village Masterplan aims to deliver, up to 1628 new homes, new workspace, a new high street, new and improved open space and the pedestrianisation of the A12 Abbott Road
Total site Area	91000 m^2
Total existing impervious area	37000 m^2
Total proposed impervious area	32000 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	no
Existing drainage connection type and location	Traditional piped system, multiple connection points
Designer Name	Luke Boustead
Designer Position	Senior Engineer
Designer Company	Meinhardt

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Alluviam - Clay, Silt, S
Bedrock geology classification	London Clay Formation
Site infiltration rate	1.12x10 -4 and 2.55x10 m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	locations to Thames Water public combine
Has the owner/regulator of the discharge location been consulted?	o Thames Water. Response received confirr

TOWER HAMLETS

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3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	22.4			
1 in 1				22.4
1 in 30				23.4
1 in 100				24.4
1 in 100 + CC				25.4
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Vortex Flow control (Hydro-Brake or similar)		

3c. Proposed SuDS Measures	*Catchment area (m^2)*	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	7000	3500	335
Blue roofs	11000	6500	620
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	3500	730	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds			0
Attenuation tanks	48334		2715
Total	**69834**	**10730**	**3670**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 2.1.3
Drainage hierarchy (2b)	Section 2.1.3
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix B
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix C
Proposed SuDS measures & specifications (3b)	Throughout report
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	Appendix B
Detailed landscaping plans	Appendix E
Maintenance strategy	Section 2.5
Demonstration of how the proposed SuDS measures improve:	Section 2
a) water quality of the runoff?	Section 2.1.5
b) biodiversity?	Section 2.1.6
c) amenity?	Section 2.1.6

Waltham Forest

GREATER**LONDON**AUTHORITY

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1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Uplands Business Park (outline site)
Address & post code	Blackhorse Ln, London E17 5QN
OS Grid ref. (Easting, Northing)	E 535695
	N 189846
LPA reference (if applicable)	
Brief description of proposed work	Redevelopment of Uplands buisness park into light industry and residential flats
Total site Area	39000 m^2
Total existing impervious area	39000 m^2
Total proposed impervious area	39000 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Pumped/gravity connection to sewer under Goldsmith Street
Designer Name	Luke Boustead
Designer Position	Senior Engineer
Designer Company	Meinhardt

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Alluviam - Clay, Silt, S
Bedrock geology classification	London Clay
Site infiltration rate	1.12x10 m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	Y	Y
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.		

2c. Proposed Discharge Details

Proposed discharge location	blic surface water sewer under Goldmith Str
Has the owner/regulator of the discharge location been consulted?	Yes

Waltham Forest

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3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	6.5			
1 in 1				6.5
1 in 30				6.5
1 in 100				6.5
1 in 100 + CC				6.5
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Vortex flow control		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	1998
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		3162
Total	**0**	**0**	**5160**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Detailed in section 8.2
Drainage hierarchy (2b)	Detailed in section 8.2
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Detailed in section 8.2
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Detailed in section 8.2 and Appendix
Proposed SuDS measures & specifications (3b)	Detailed in section 8.2
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Detailed in Appendix
Detailed drainage design drawings, including exceedance flow routes	Detailed in Appendix
Detailed landscaping plans	Detailed in Appendix
Maintenance strategy	Detailed in Section 9
Demonstration of how the proposed SuDS measures improve:	Detailed in section 8.2
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

Appendix E – Architects Plans

ILLUSTRATIVE PLAN LOCATION

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