Flood Risk Assessment &
Drainage Strategy

Land East of Warwick Road,

Banbury, Oxfordshire

Jubb

PREPARED BY:	FOR:	DATE:	REFERENCE:
Jubb Consulting Engineers Ltd.	Vistry Homes Ltd	January 2023	17279-FRA&DS-01 v4

Contents

1 Project Information

1.1 Project Information

Client	Vistry Homes Ltd

1.2 Project Details

Project Name	Land East of Warwick Road
Location	Banbury, Oxfordshire
Jubb Project Number	17279

1.3 Report Details

Version	Four
Status	Planning Submission
Date	19th January 2023

1.4 Project Authorisation

ISSUE HISTORY: AUTHORISATION:

Version	Date	Detail	Prepared By	Approved By
V1	17.06.22	First Draft	RJ	LE
V2	01.07.22	Second Draft – Soakaway Testing Update	LE	LE
V3	21.07.22	Planning Submission	LE	LE
V4	19.01.23	For Submission – Updated Masterplan	LE	LE

2 Introduction

2.1 Commission

2.1.1 This Flood Risk Assessment and Drainage Strategy has been commissioned on behalf of Vistry Homes Ltd to support a planning application for the proposed development of land to the east of Warwick Road in Banbury, Oxfordshire.

2.1.2 This report may not be relied upon or reproduced by any third party for any use without the written agreement of Jubb Consulting Engineering Ltd.

2.2 Brief

2.2.1 This flood risk assessment is prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) published by the Ministry of Housing, Communities and Local Government. Section 14 of the NPPF and the associated Planning Practice Guidance (PPG) sets out the framework for planning decisions made by the local, regional and national government and the Environment Agency (EA). In order for planning authorities to make informed decisions on the development of sites in areas at risk of flood, NPPF requires the developer to carry out an assessment of flood risk.

2.2.2 This report addresses the requirements given in Section 14 of the NPPF and other issues, which are deemed relevant to flood risk. These requirements include the following:

- Assessment of the magnitude and severity of flood risk to the site
- Assess suitability of the site and development through the use of the Sequential Test & Exception Test (if required)
- Consider flood risk due to overtopping of existing flood defences
- Assess the impact of the proposed development on flood risk to adjacent developments
- Determine the ability of existing and proposed drainage to accommodate development flows with respect to surface flooding
- Demonstrate the appropriate mitigation measure have been taken to prevent flooding
- Demonstrate the appropriate emergency situations have been considered e.g. overland flow paths and evacuation routes

2.2.3 This report also considers the disposal of wastewater generated by the proposed development. Existing infrastructure will be reviewed to identify potential options for the disposal of foul and surface water run-off. A strategy will be presented for the preferred option

3 Site Description

3.1 Site Location

3.1.1 The proposed site is located to the east of Warwick Road on the north-western periphery of the town of Banbury, Oxfordshire. The site is approximately 12.63Ha in area and has a National Grid Reference (NGR) of 443331E, 243133N.

3.1.2 The site boundaries are formed by Warwick Road to the west and a tree lined hedgerow and adjacent agricultural land to the north and east. To the south, a narrow strip of dense woodland separates the site from a recent housing development.

3.1.3 Beyond the site boundaries, the site is predominantly surrounded by agricultural land and small sporadic villages to the north, east and west. With the existing residential and commercial areas of Banbury located immediately to the south and south-east.

A site location plan is included in Appendix A.

3.2 Existing Site Use

3.2.1 The existing site currently consists of two large open fields separated by existing hedgerows. Both fields are currently used for agricultural purposes.

3.3 Site Topography

3.3.1 A detailed topographical survey has been undertaken on the proposed site.

3.3.2 In the western field, the survey shows that the levels fall steadily from the western, northern and eastern field boundaries towards a low point on the southern site boundary.

3.3.3 The high point of the site is located on the northern boundary and in the north-west corner of the site with a level of approximately 146.5mAOD. With the low point of the site located centrally on the southern site boundary at a level of approximately 143mAOD.

3.3.4 Warwick Road which bounds the site along the western boundary is approximately 1-2m higher than the existing levels along the western boundary of the site.

3.3.5 In the eastern field, levels fall quite steeply in an easterly direction. Existing levels fall from a high point of approximately 145.5mAOD located on the western field boundary, reaching a low point of approximately 140.0mAOD on the eastern boundary.

A copy of the topographical survey is included in Appendix B.

3.4 Site Geology

Geology

3.4.1 The British Geological Survey (BGS) maps indicated that the site is underlain with ferruginous limestone and ironstone of the Marlstone Rock Formation.

3.4.2 No superficial deposits have been identified beneath the site.

Hydrogeology

3.4.3 The BGS hydrogeology maps indicated the site is underlain with the strata of the Lias Group, which are characterised as rocks with essentially no groundwater.

3.4.4 The Environment Agency's online indicative aquifer mapping identifies Marlstone Rock Formation as a Secondary A aquifer.

3.4.5 Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

3.4.6 The Environment Agency groundwater source protection zones show that the proposed site is not located within a groundwater protection zone.

Hydrology

3.4.7 No significant watercourses have been identified within the proposed site boundaries.

3.4.8 The nearest Environment Agency (EA) designated 'main river' to the site is the Sor Brook and Hanwell Brook, which are located approximately 800m to the west and 1.3km to the east of the site respectively.

3.4.9 The Sor Brook flows from the north in a southerly direction towards the village of Broughton. From this point the brook flows in a south easterly direction to its confluence with the River Cherwell near Adderbury.

3.4.10 The Hanwell Brook flows from the north in a south-easterly direction, before converging with the River Cherwell on the north-eastern outskirts of Banbury. Approximately 560m to the north-east of the site an unnamed tributary of the Hanwell Brook is also present. This tributary flows in an easterly direction before converging with the Hanwell Brook to the east of the site.

3.5 Existing Drainage

3.5.1 The existing local public foul and surface water sewer networks currently serving the local area are owned and operated by Thames Water. A copy of Thames Water asset plan is included in Appendix C.

3.5.2 Thames Water asset plans show there is no existing public drainage infrastructure located within the site boundaries. However, it is evident that public sewer assets are located throughout the surrounding areas of Banbury.

3.5.3 Due to the nature of the existing site, it is not expected that any positive drainage is currently present within the proposed site boundaries. This assumption was further supported by the topographical survey which did not identify any existing drainage infrastructure within the site.

3.5.4 The nearest public foul sewer is located approximately 375m to the south of the site within Warwick Road. An existing sewer is shown running in a southerly direction within Warwick Road until it reaches the roundabout with the Highlands and continues in a south-easterly direction. This existing sewer accommodates flows from the existing residential areas to the south of the site.

3.5.5 An existing foul sewer network is also shown running throughout the village of Hanwell to the north of the site.

3.5.6 The nearest existing public surface water sewers are located within the existing residential areas to the south of Dukes Meadow Drive, which is a considerable distance to the south of the site. These sewers collect flows from the existing residential areas, with flows conveyed to the south via Warwick Road.

3.5.7 It is anticipated that a network of foul and surface water sewers are present within the recent residential development located immediately to the south of the site. These sewers may be subject to an adoption agreement with Thames Water but are not currently shown on the Thames Water asset plans.

4 Flood Risk to the Existing Site

This section explores the primary sources of flooding to the site.

4.1 Tidal & Fluvial

4.1.1 The proposed site is identified as lying outside of the fluvial and tidal flood risk zone according to the Environment Agency's published floodplain map (refer to Figure 1). This estimate of the extent of flooding is based on the absence or failure of all existing flood defences currently protecting the site.

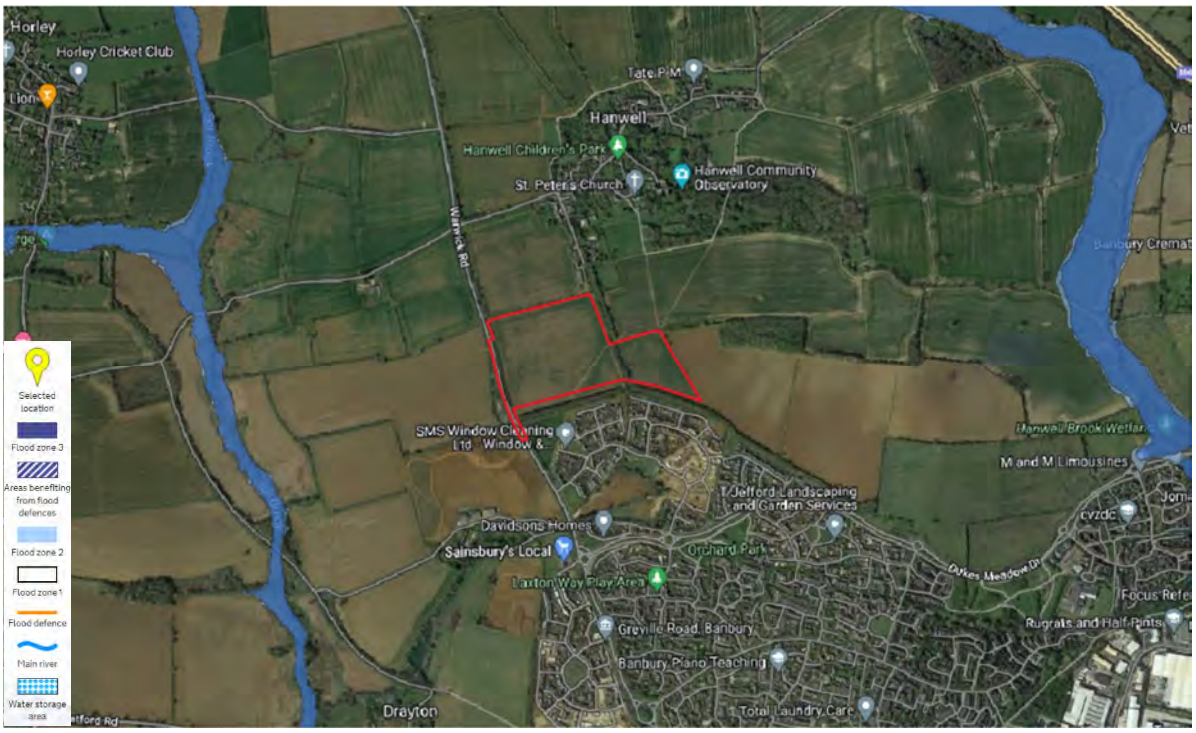

Figure 1 – Extract from Environment Agency Flood Map for Planning

4.1.2 The EA floodplain map indicates that the site lies within Flood Zone 1 – Low Probability in Table 1 of the NPPF Planning Practice Guidance.

4.1.3 This zone has less than a 1 in 1000-year annual probability of flooding.

4.1.4 The NPPF Planning Practice Guidance states that all types of development are suitable for this flood zone.

4.2 Overland & Surface Water Flooding

4.2.1 As shown on the Environment Agency risk of flooding from surface water map (refer to Figure 2), the site is identified as an area of very low risk of surface water flooding.

Figure 2 – Extract from Environment Agency Flood Risk from Surface Water Map

4.2.2 The majority of the site is shown at very low risk of flooding due to the topography of the site and the surrounding area. However, there is a very small section of the site on the southern boundary which is shown at low risk of surface water flooding.

4.2.3 It is anticipated that the development proposals will further alleviate this isolated risk of flooding with the proposed drainage strategy including the collection and discharge of surface water run-off from the site in a controlled manner and preventing these flows from ponding within the site.

4.2.4 Due to the topography of the adjacent field to the north of the site, there is the potential for overland flows to be directed towards the subject site. However, due to the small catchment, characteristics of the underlying strata and the greenfield nature of the surrounding land it is considered that the risk posed to the development is low.

4.2.5 It is considered that flooding from overland and surface water flows does not pose a significant risk to the development, with additional mitigation measures suggested in section 9 to further manage the risk to the site.

4.3 Flooding from Sewers

4.3.1 There is a very low risk of flooding from the existing public sewerage infrastructure impacting the proposed site due to the location of the existing apparatus and the topography of the surrounding area.

4.3.2 Thames Water asset plans confirm there is no existing sewers located within the proposed site, with the nearest sewers located to the south of the site.

4.3.3 In the event of a sewer incapacity of blockages occurring to the existing sewer network, flows would be conveyed away from the site due to the topography of the surrounding area and would therefore not impact the site.

4.3.4 The Cherwell Level 1 Strategic Flood Risk Assessment Update (SFRA), includes a map of recorded sewer flooding incidents across the district. The map shows that no incidents of sewer flooding have occurred within the site or in the surrounding area.

4.3.5 Consequently, it is not considered that flooding from sewers poses a significant risk of flooding to the proposed development.

4.4 Flooding from Groundwater

4.4.1 The underlying bedrock beneath the subject site is predominantly Limestone and Ironstone of the Marlstone Rock Formation

4.4.2 The Cherwell SFRA includes a map of areas susceptible to groundwater flooding. This map indicates that there is a very low risk of groundwater flooding occurring at the site.

4.4.3 Data recorded from a nearby BGS borehole, located approximately 80m west of the site, showed that groundwater was not encountered until a significant depth of approximately 10.4m below ground level.

4.4.4 There are no historic records of groundwater flooding events occurring within the site.

4.4.5 No detailed on-site geotechnical investigation works has been undertaken on the proposed site. However, initial onsite soakaway testing was undertaken which included the excavation of four trail pits across the site to a depth of 2.85m below ground level. No groundwater was encountered in any of the trial pits.

4.4.6 Based on the information discussed above, it is considered that flooding from groundwater does not pose a significant risk to the site.

4.4.7 Further onsite testing should be undertaken across the subject site to obtain further details on the underlying ground conditions and the groundwater regime.

4.5 Flooding from Artificial Sources

4.5.1 There are no artificial bodies of water located within or near the proposed site. As a result, it is not considered that flooding from artificial sources poses a risk of flooding to the site.

5 Proposed Development

5.1 Development Description

5.1.1 The development proposals include an outline application for up to 170 dwellings (Use Class C3) with associated open space and vehicular access off Warwick Road, Banbury. With all matters reserved except for access.

A proposed development layout is included in Appendix D.

5.1.2 The development will consist of a mix of house types, with areas of landscaping and public open space.

5.1.3 Vehicular access to the development will be provided via a new access junction off Warwick Road on the western boundary of the site.

5.2 Development Suitability

5.2.1 The NPPF aims to direct developments to suitable areas with low probability of flooding. The table below illustrates the acceptable classification of development within each flood zone.

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1 **(<1 in 1000)**	✓	✓	✓	✓	✓
Flood Zone 2 **(up to 1 in 1000)**	✓	✓	Exception Test	✓	✓
Flood Zone 3a **(1 in 100 fluvial)** **(1 in 200 tidal)**	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b **(functional floodplain)**	Exception Test	✓	X	X	X

5.2.2 The proposed development type is considered to be classifies as a 'more vulnerable' development under Table 2 of the NPPF planning practice guidance.

5.2.3 As the site is in Flood Zone 1, all vulnerability classes are suitable and thus the proposed scheme is deemed acceptable.

5.2.4 The site will not need to be subjected to a sequential test by the Local Planning Authority (LPA) in respect of the appropriateness for the proposed development in this location, as the site is located wholly within Flood Zone 1.

6 Development Drainage

6.1 Foul Drainage

6.1.1 A new foul water drainage network will be required to service the proposed development. The new network will collect and convey foul water discharge from the development to a new connection point on the existing public Thames Water foul sewer network.

6.1.2 It is proposed to discharge flows to the existing 900mm diameter public sewer located to the south of the site within Warwick Road. The existing site is not positively drained, consequently the proposed development will increase flows to the public sewerage system.

6.1.3 On the basis that the proposed development will consist of up to 170 new dwellings, Sewerage Sector Guidance Appendix C – Design & Construction Guidance recommends a peak flow rate of 4000 l/day/unit dwelling for residential uses. This would produce an anticipated peak flow rate of 7.9 l/s, with a dry weather flow of 1.31 l/s based on a peaking factor of 6.

6.1.4 The new foul sewerage network will be designed to accommodate the anticipated peak development flows without flooding.

6.1.5 Thames Water have been instructed to undertake an initial assessment of the existing public foul sewer network, to confirm if sufficient capacity is available to accommodate the additional flows from the development proposals.

6.1.6 Thames Water have confirmed that the existing sewer network which runs within Warwick Road has sufficient capacity to accommodate the development and a point of connection at MH 361A is feasible. A copy of the pre-development enquiry is included in Appendix E.

6.1.7 The proposed point of connection is located approximately 325m to the south of the site within Warwick Road. Due to the existing levels of the network, Warwick Road and the site it is anticipated that a gravity connection from the development to the point of connection will not be practical. It is therefore proposed to pump flows from the site to Warwick Road, where a gravity connection along Warwick Road to the point of connection should be achievable.

6.2 Surface Water Drainage

6.2.1 Current legislation and guidance require developers to manage surface water run-off from new developments to mitigate flood risk to the site and the surrounding area and provide a sustainable means of disposing of run-off from impermeable areas.

6.2.2 Off-site surface water discharge must be managed to ensure that it does not exceed the predevelopment flow rate. Sustainable drainage systems (SuDS) should be utilised to attenuate flows and ensure that run-off from the new hardstanding areas receives the appropriate level of treatment to improve water quality.

6.2.3 The proposals aim to provide a new sustainable surface water drainage network to dispose of surface water run-off in an effective manner. In accordance with the drainage hierarchy, the possible drainage options considered for the proposed site include:

- Infiltration via the use of soakaways or infiltration basins
- Attenuation and discharge to a local watercourse
- Attenuation and discharge to a public sewer network

6.2.4 Initial BGS survey information identified that the site is underlain with limestone and ironstone of the Marlstone Rock Formation.

6.2.5 Preliminary onsite soakaway testing in accordance with BRE365 was undertaken at four locations across the site to assess the viability of an infiltration solution. A copy of the soakaway testing results is included in Appendix F.

6.2.6 The infiltration rates obtained from the testing show that infiltration is feasible across the full extents of the site. Three tests were undertaken in the western field, with results largely varying between $3x10^{-4}$ m/s and $1x10^{-4}$ m/s with a couple of tests at location SW3 providing rates of $9x10^{-5}$ m/s and $7.4x10^{-5}$ m/s. In the eastern field one test was undertaken in the area of the proposed basin which obtained results ranging from $9.8x10^{-5}$ m/s to $7x10^{-5}$ m/s.

6.2.7 The proposed development will create areas prevented by impervious surfacing from draining to the ground by natural processes. Surface water run-off will be directed to an appropriately designed positive drainage system, which will control the offsite discharge and prevent flooding to the site and downstream areas.

6.2.8 It is proposed to utilise a range of SuDS features throughout the development to discharge flows in a co-ordinated and effective manner. Methods such as permeable paving, individual plot soakaways, raingardens, water butts, swales and infiltration basin are proposed to be incorporated throughout the development proposals.

A plan of the proposed drainage strategy is included in Appendix G.

6.2.9 The proposed SuDS features which will be incorporated within the development parcel in the western field have been designed based on the worst rate of infiltration obtained from the three tests undertaken in this field. This is a conservative rate; at the detailed design stage the proposed SuDS features should be based on rates obtained from specific testing undertaken in the location of the SuDS feature. The proposed infiltration basin has been designed based on the worst rate of infiltration obtained from the testing undertaken at location four.

6.2.10 Each SuDS feature should be designed to accommodate flows for the 1 in 100-year plus 40% climate change event, with a half drain time of less than 24 hours and including an appropriate factor of safety.

6.2.11 In accordance with local guidance, a 10% increase in impermeable area to account for urban creep has also been included as part of the proposed drainage strategy and calculations.

6.2.12 Permeable paving is proposed for driveways and parking/ courtyard areas. Where possible, minor secondary roads could also be considered for permeable paving. Priority shall be given to the use of permeable paving, however, this is subject to Oxfordshire County Council requirements in order to meet their adoptability criteria. Example permeable paving calculations are included in Appendix G.

6.2.13 The primary access roads through the development are proposed to drain via the use of 'over the edge drainage', with raingardens positioned adjacent to the highway and run-off from the carriageway and footway catchments conveyed directly to these features. The raingardens will be designed to allow for attenuation/storage as flows are discharged via infiltration though the substrate, with an overflow provided to convey excess flows to an infiltration basin.

6.2.14 It is proposed that each residential property will discharge to infiltration SuDS within the curtilage, which could consist of soakaways and permeable driveways. The design of the individual plot SuDS features will vary depending on the size and type of the property. Example indicative plot soakaways are shown on the proposed drainage drawing, with example sizing calculations for a semi-detached and detached properties included in Appendix G.

6.2.15 Excess flows or where a section of highway or a property cannot utilise these SuDS features will be conveyed to an alternative SuDS feature or the infiltration basin located in the eastern field.

6.2.16 Swales could also be incorporated within the proposals and could be utilised for conveyance, discharge and to accommodate any exceedance flows.

6.2.17 The residential properties could also include water butts located in the rear gardens, which will provide an element of rainwater harvesting.

6.2.18 To accommodate the drainage proposals and the existing site levels, an element of localised adjustment of existing ground levels may be required.

6.2.19 For exceedance events, it is proposed that excess runoff will be retained within the development site with flows directed away from buildings to the swales and infiltration basin. An exceedance flow route plan is included in Appendix H.

7 Sustainable Drainage Systems & Water Quality

7.1.1 The surface water management should incorporate sustainable drainage techniques to restrict surface water discharge from the site and improve the water quality of the run-off. There are a wide range of techniques that can be applied including source control, online systems and outlet controls. Ciria have published a SuDS manual, which details a number of systems along with guidance on their application and design.

7.1.2 SuDS systems typically rely on either infiltration or attenuation to reduce peak flows and volume discharge and filtration systems to remove pollutants or solids from the effluent.

7.1.3 The existing ground conditions are suitable for the use of infiltration methods for the discharge of surface water flows from the proposed development.

7.1.4 As a means of analysing whether the SuDS measures utilised for the site will provide adequate water treatment to the surface water runoff the Ciria SuDS manual specifies a simple index approach. This approach gives different land uses certain pollution hazard indices (Table 26.2 Ciria Manual), while SuDS features are given mitigation indices (Table 26.3 Ciria Manual). If the SuDS indices are greater or equal than the pollution hazard indices the water treatment within the system is deemed adequate.

7.1.5 The impermeable hardstanding areas of the site can be split into three distinct areas:

- Building Roof areas
- Carparking/Driveways
- Roadways/Footways

7.1.6 The building roof areas collect rainfall from the structure and runoff is predominantly clean. Individual property driveways and low traffic roads also have low hazard indices. The hazard and mitigation indices for each impermeable area type is summarised below (Refer to Table 1).

Impermeable Region	Hazard Indices			Treatment	Mitigation Indices		
	TSS	Metals	Hydro		TSS	Metals	Hydro
Car Parking /Driveways	0.5	0.4	0.4	Infiltration Basin	0.5	0.5	0.6
Building Roof	0.2	0.2	0.05	Permeable Paving	0.7	0.6	0.7
Roadways /Footways	0.5	0.4	0.4	Swale	0.5	0.6	0.6

Table 1 – Ciria Simple Index Approach Analysis

7.1.7 As shown in Table 1 the inclusion of a range of SuDS features is deemed adequate to meet water quality requirements for the residential site.

7.1.8 It is proposed to incorporate a variety of sustainable drainage techniques as part of the drainage strategy. This will include an infiltration basin, raingardens, plot soakaways, water butts and permeable paving throughout the site such as to supplement the overall drainage strategy for the site.

7.1.9 These sustainable drainage features will provide ecological benefits as well as additional water quality benefits through the dilution, infiltration, filtration and settlement of solid particles.

7.1.10 During the construction phase of the development the contractor will need to ensure that appropriate provisions are put in place to ensure that the water quality of the surface water discharge from the site is being maintained. This will involve measures to prevent silts and other construction waste being conveyed offsite through surface water runoff.

8 SuDS Management & Maintenance

8.1.1 To ensure that any proposed SuDS features operate effectively for its lifetime a detailed management plan for the operation and maintenance of the SuDS will be produced, prior to construction, based on Chapter 32 of Ciria C753.

8.1.2 It is anticipated that proposed surface water and foul drainage networks will be offered to Thames Water for adoption. Where Thames Water will not accept certain sections of pipework, these will be the responsibility of a site management company.

8.1.3 Drainage for buildings, access roads, car parks, landscaping, etc in private ownership will be managed and maintained privately.

8.1.4 Proposed SuDS features such as permeable paving driveways will remain private and will be maintained by the homeowner or the site management company.

8.1.5 Proposed SuDS features located in public spaces such as the infiltration basin will be offered to the local authority or Thames Water for adoption.

8.1.6 SuDS features in public spaces that remain under private ownership, will be maintained by a site management company. The management company will be responsible for the regular inspection and maintenance of SuDS features, with a contractor on standby for emergency reactive maintenance.

8.1.7 As the scheme is progressed management and maintenance practices for maintaining SuDS/drainage infrastructure will be constantly reviewed and updated with a final confirmed plan to be agreed with the Local Authority prior to construction.

9 Development Flood Risk & Mitigation

9.1 Tidal & Fluvial Flooding

9.1.1 The proposed site is not at risk of tidal or fluvial flooding and lies within Flood Zone 1 on the EA flood maps. The development proposals do not increase the flood risk to either site or the surrounding area from tidal or fluvial sources.

9.1.2 The proposed use of the site is defined as 'more vulnerable' under the NPPF, however, this is still acceptable for a low risk flood site.

9.1.3 The proposed development includes a site wide drainage strategy which will collect and discharge flows in a suitable manner. It is proposed to discharge flows via infiltration methods and will not increase the risk of flooding to the site or surrounding area.

9.2 Overland / Surface Water Flooding

9.2.1 As discussed in section 4.2 the proposed site is at low risk of flooding from overland and surface water flows.

9.2.2 Although the risk to the site is not considered significant, it is suggested that the following flood risk management measures are considered to further manage any potential risk.

- Finished floor levels should be set at a minimum of 150mm above existing levels
- Where possible, the existing ground profile should be designed to convey any potential flows away from buildings or vulnerable areas

9.2.3 The development proposals will include a site wide drainage strategy which will be designed to accommodate all surface water flows from the new hardstanding areas of the development. This network will be designed to accommodate the 1 in 30-year event without flooding, with flow routes considered to prevent flooding onsite or downstream during extremely wet weather.

9.2.4 Consequently, the proposed development will not have a significant impact on flood risk to the site or the surrounding area.

9.3 Flooding from Sewers

9.3.1 As discussed in section 4.3 there is very low risk to the site from the failure of existing drainage infrastructure in the region.

9.3.2 A new surface water drainage network will be constructed to service the proposed development. However, the new sewer network will not pose a risk of flooding to the site or the surrounding area, as the network will be designed to accommodate flows without flooding in the 1 in 30-year event, with flow routes considered to prevent flooding onsite or downstream during extremely wet weather.

9.3.3 A new foul drainage network will also be constructed to service the site. This network will be designed to accommodate the anticipated peak flows with no flooding.

9.3.4 Based on the information discussed above, it is considered that the proposed development does not increase the risk of flooding from sewers to the site or surrounding.

9.4 Groundwater Flooding

9.4.1 The subject site is considered to be at low risk of groundwater flooding and there are no historic records of groundwater flooding on the site.

9.4.2 It is proposed to discharge surface water flows via an infiltration solution. The proposals are not expected to affect the groundwater table and consequently will not increase the risk of flooding from groundwater sources.

9.5 Flooding from Artificial Sources

9.5.1 As discussed in section 4.5 there is no flood risk to the site from artificial sources. The development proposals do not impact the risk posed to the site or the surrounding area.

10 Conclusions & Recommendations

It is considered that this assessment represents a comprehensive and robust analysis of the flood impact of the development upon other adjacent properties and of existing flood mechanisms on the development itself. It demonstrates that the proposed development is sustainable in terms of flood risk and can be summarised as follows.

Subject	Conclusions
Tidal and Fluvial Flood Risk	The development is located in Flood Zone 1 – low probability for tidal and fluvial flooding on the Environment Agency flood maps.
Flood Risk from Other Sources	No significant risk of flooding to the site from surface water or overland flows, sewers, groundwater or artificial water bodies was identified.
Development Suitability	The development use is considered suitable for the site, which lies within Flood Zone 1 – Low Probability, under Table 3 of the NPPF Planning Practice Guidance.
Existing Drainage	The existing local public foul and surface water networks are owned and operated by Thames Water. The nearest public foul sewer networks are located to the south of the site within Warwick Road. No existing sewer infrastructure has been identified within the site, which is expected due to the nature of the site.
Proposed Drainage	New surface and foul water sewer networks will be constructed to service the proposed development. Surface water flows will be discharged via a sustainable drainage solution. It is proposed to discharge flows via an infiltration method with SuDS features incorporated throughout the site. It is proposed to discharge foul flows to the existing public foul sewer located within the nearby vicinity of the site.
Surface Water Management	It is proposed to discharge surface water run-off from the development via the use of infiltration methods. To accommodate the site constraints including the existing site topography, proposed catchments and ground conditions the proposed drainage strategy will include a range of SuDS features. An infiltration basin located in the eastern field will be supplemented by individual plot soakaways, raingardens and permeable paving. The proposed SuDS features will be sized to accommodate flows for a range of storm events including the 1 in 100-year plus 40% climate change scenario. The proposed strategy will discharge flows in a sustainable manner, with drainage features providing additional ecological and water quality benefits.
Foul Water Disposal	It is proposed to discharge foul flows to a new point of connection on the existing public Thames Water foul drainage network within Warwick Road.

	Due to the levels of the site and surrounding area along with the location of the point of connection, foul flows will require pumping from the site before a gravity connection can be achieved to the public sewer. The development will increase foul loadings from the site, increasing the peak discharge rate to approximately 7.9 l/s. Thames Water have confirmed that the existing sewer network currently has sufficient capacity to accommodate the additional flows from the development proposals. With an anticipated point of connection to the existing sewer network located to the south of the site in Warwick Road.

Based on the findings of this report, it is considered that there are no grounds for objecting to the proposed development in terms of flood risk.

Appendix A: Site Location Plan

Site Boundary 12.63ha

client
Vistry Group

project title
Land East of Warwick Road, Banbury

drawing title
Site Location Boundary

date	**10 MAY 2022**	drawn by	**RA**
drawing number	**edp3253_d007e**	checked	**PW**
scale	**1:5,000 @ A3**	QA	

the environmental dimension partnership
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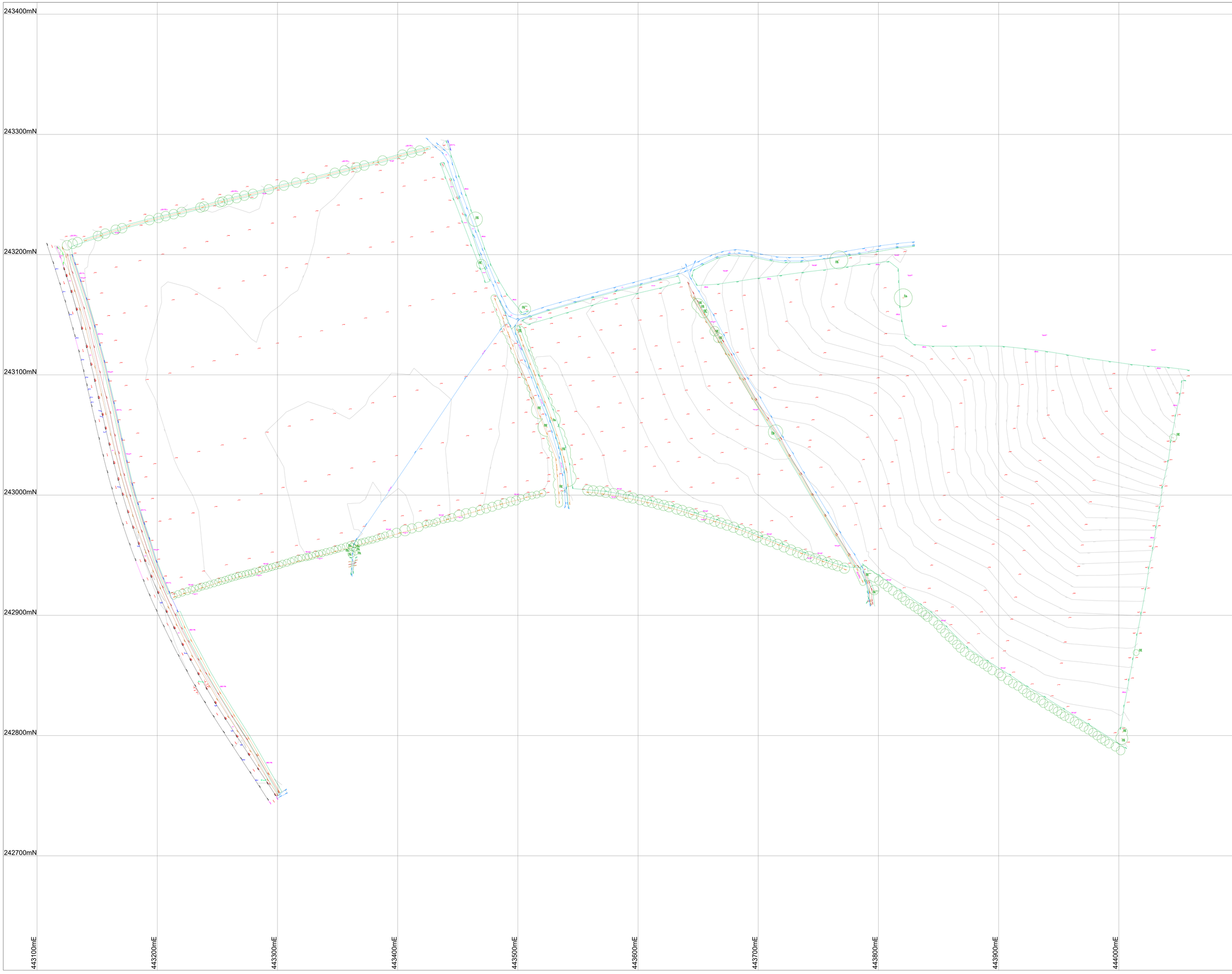
Appendix B: Topographical Survey



LEGEND

CATV	CABLE TELEVISION COVER	BD	BACK DROP
EIC	ELECTRIC INSPECTION COVER	BL	BASE/BED LEVEL
EJB	ELECTRIC JUNCTION BOX	CL	COVER LEVEL
EP	ELECTRICITY POLE	CP	CATCH PIT
ER	EARTHING ROD	DC	DRAINAGE CHANNEL
FH	FIRE HYDRANT	DP	DOWN PIPE
GJB	GAS JUNCTION BOX	G	GULLY
GV	GAS VENT	IC	INSPECTION COVER
JB	JUNCTION BOX	IL	INVERT LEVEL
MK(E)	SERVICE MARKER (ELECTRIC)	MH(C)	MANHOLE (COMBINED)
MK(G)	SERVICE MARKER (GAS)	MH(F)	MANHOLE (FOUL)
MK(W)	SERVICE MARKER (WATER)	MH(S)	MANHOLE (SURFACE WATER)
OHW	OVERHEAD WIRE	RE	RODDING EYE
SC(G)	STOP COCK (GAS)	RWP	RAIN WATER PIPE
SC(W)	STOP COCK (W)	SEG	SIDE ENTRY GULLY
STAY	SUPPORT FOR TELEPHONE POLE	SVP	SOIL VENT PIPE
SV	STOP VALVE	UTL	UNABLE TO LIFT
BT	TELEPHONE INSPECTION COVER	VP	VENT PIPE
TJB	TELEPHONE JUNCTION BOX	WO	WASH OUT
TP	TELEPHONE POLE	B	BOLLARD
WIC	WATER INSPECTION COVER	BH	BORE HOLE
WM	WATER METER	BP	BRICK PILLAR
DPC	DAMP PROOF COURSE	BS	BUS STOP
THL	THRESHOLD LEVEL	CPS	CONCRETE PAVING SLABS
T.O.W	TOP OF WALL	FB	FLOWER BED
WL	WATER LEVEL	LB	LITTER BIN
CLG	CEILING LEVEL	LC	LIGHTING COLUMN
DHL	DOOR HEAD LEVEL	P	POST
FL	FLOOR LEVEL	PB	POST BOX
SCLG	SUSPENDED CEILING LEVEL	RNP	ROAD NAME PLATE
US	UNDERSIDE	RS	ROAD SIGN
USB	UNDERSIDE OF BEAM	RW	RETAINING WALL
WCL	WINDOW CILL LEVEL	SP	SIGN POST
WHL	WINDOW HEAD LEVEL	SU	STEP(S) UP
		TCB	TELEPHONE CALL BOX
		TS	TREE STUMP

OSBM	ORDNANCE SURVEY BENCH MARK
STN	SURVEY STATION
TBM	TEMPORARY BENCH MARK

TREE — Species / Trunk / Canopy / Height

SURVEY STATION

GATE - GATES

FENCE — TOP OF BANK

BUILDING — BOTTOM OF BANK

OVER HEAD BUILDING LINE — KERB

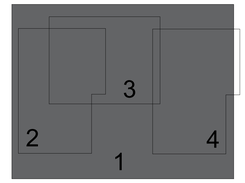
FACE OF WALL — DROP KERB

CHANGE OF SURFACE — CONTOUR WITH VALUE

EDGE OF UNDERGROWTH — OVER HEAD CABLE

TREE LINE/HEDGE ROOT LINE — FOOTPATH LINE

SHEET LAYOUT



ALL LEVELS AND CO-ORDINATES ARE RELATED TO THE ORDNANCE SURVEY NATIONAL GRID OSTN15, UNLESS OTHERWISE NOTED.

CONTOUR INTERVALS SET AT 1.0M.

TREE SPECIALS AND DETAILS ARE QUOTED AS A MEAN SIZE AND SHOWN TO SCALE, HOWEVER NO RESPONSIBILITY CAN BE TAKEN FOR WRONG SPECIES IDENTIFICATIONS.

IT IS RECOMMENDED THAT FOR ANY WORKS INVOLVING DRAINAGE, THAT ADDITIONAL CHECKS ARE CARRIED OUT BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION COMMENCING.

AT THE TIME OF SURVEY THE FIELDS WERE HEAVILY CROPPED, AS SUCH IT IS RECOMMENDED THAT ONCE CROPS HAVE BEEN REMOVED, A SITE RE-LEVEL IS CARRIED OUT PRIOR TO ANY DESIGN WORK COMMENCES.

THIS SURVEY PROVIDES POSITION AND DESCRIPTION OF FEATURE IN RELATION TO SURVEY CONTROL STATION AND IN NO WAY IMPLIES LEGAL TITLE OR BOUNDARY OWNERSHIP.

DO NOT SCALE FROM A PDF.

DRAWING IS CORRECT AT TIME OF SURVEY.

N

OAK SURVEYS LTD

OAK SURVEYS LIMITED
27 Foreland Avenue
Folkestone
Kent, CT19 6DU
Tel: 07792572772

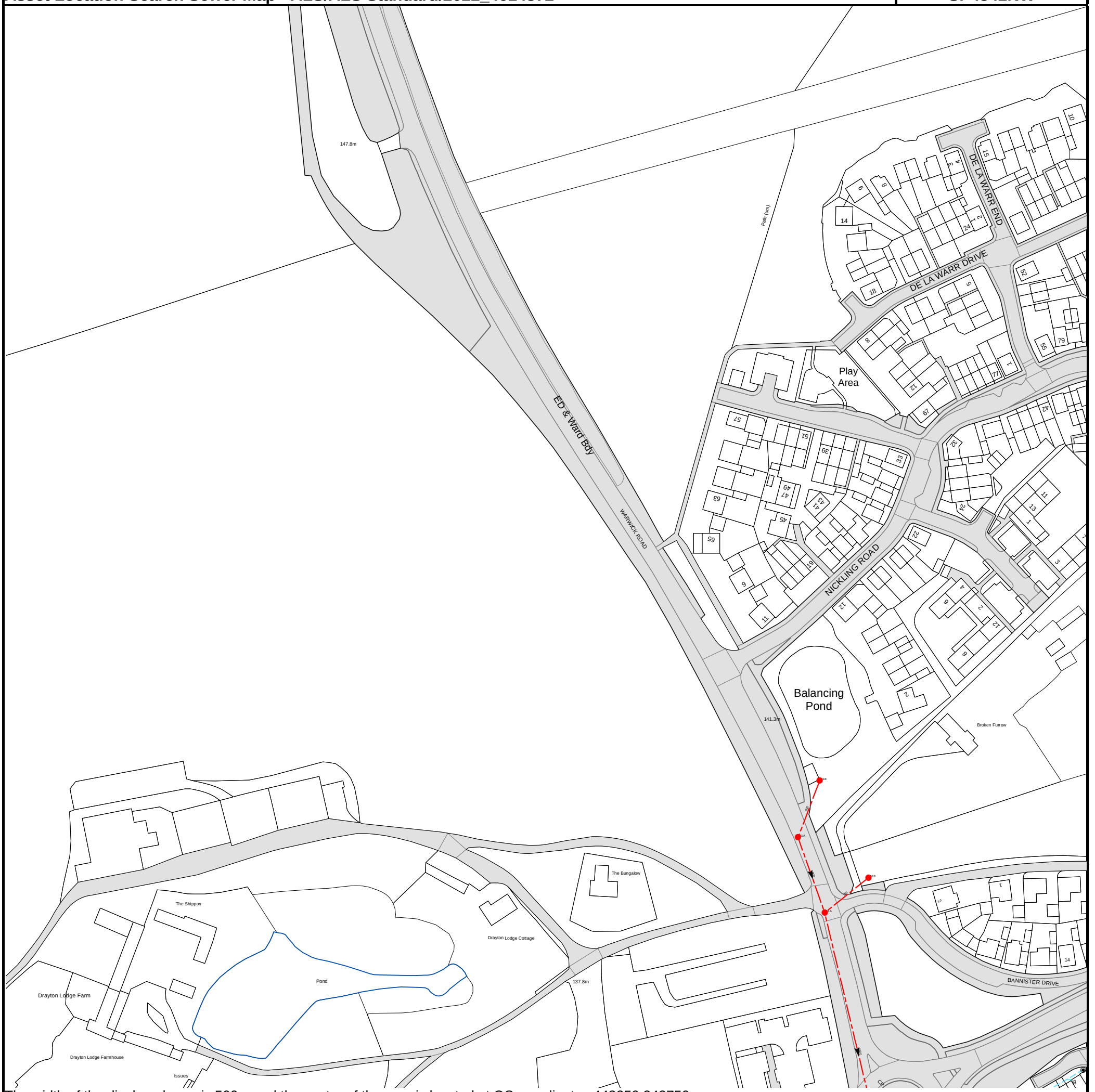
Site
LAND OFF WARWICK ROAD
BANBURY

Drawing
TOPOGRAPHICAL SURVEY
SHEET 1 of 4

Drawn by C.H.	Date 28/07/18	Drawing No. Oak_18-154
Scale 1/1000 @ A0	Revision	

Appendix C: Thames Water Asset Plans

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4614872	SP4342NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443250,242750

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.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0800 009 4540 **E** searches@thameswater.co.uk **I** www.thameswater-propertysearches.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4614872

SP4342NE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443750,242750

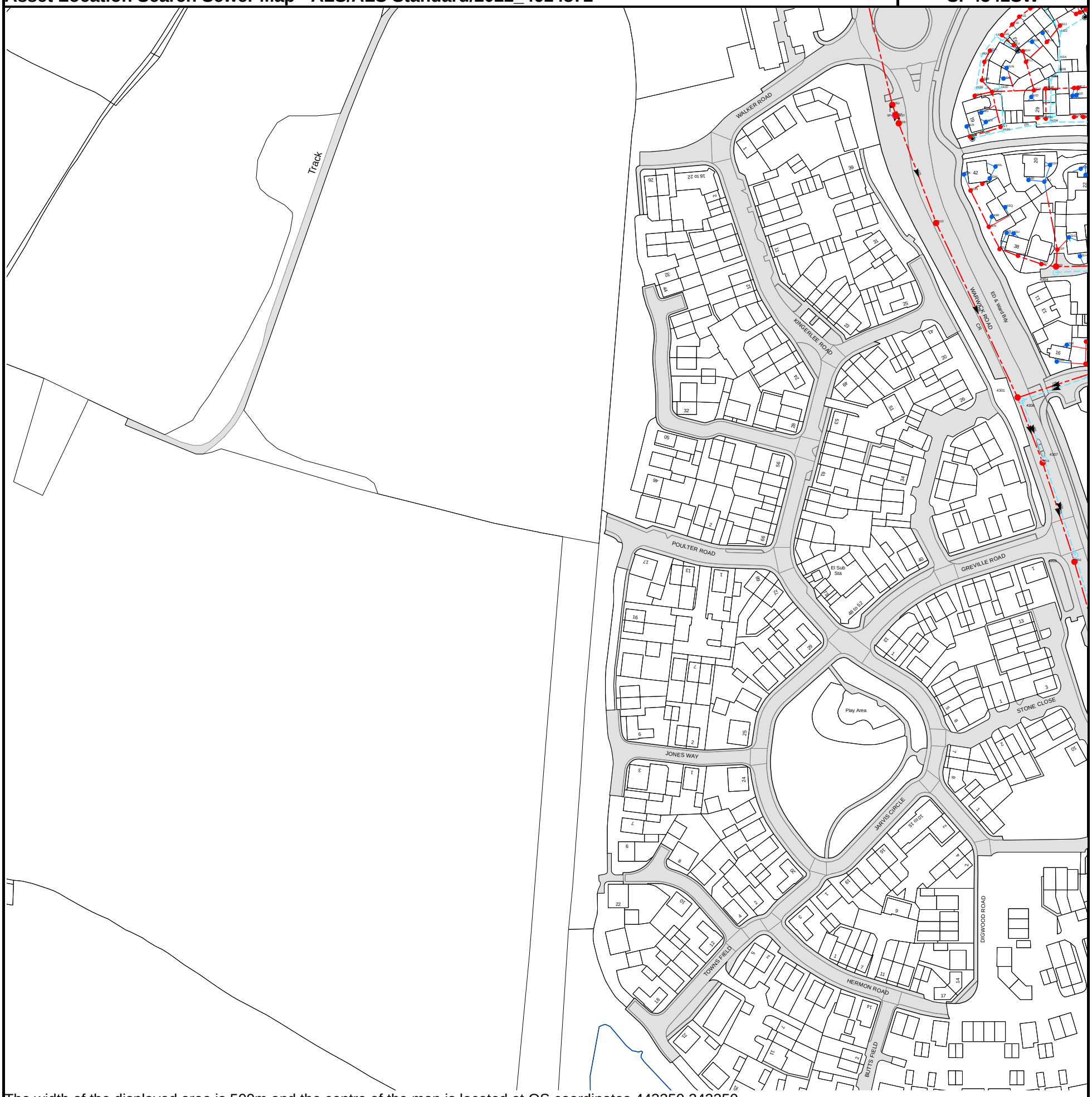
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443750,242750

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.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0800 009 4540 **E** searches@thameswater.co.uk **I** www.thameswater-propertysearches.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4614872

SP4342SW

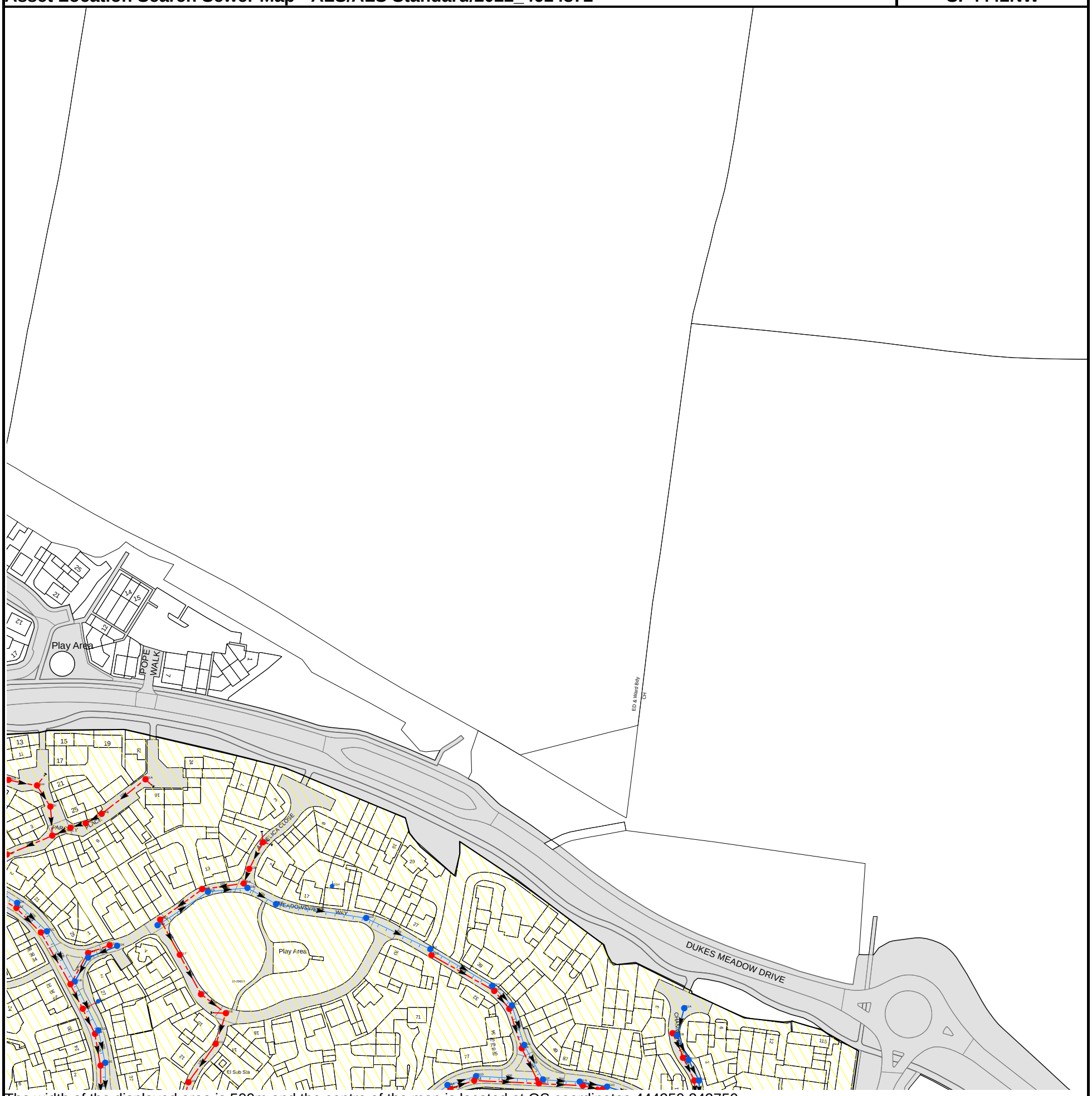


The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443250,242250

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.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0800 009 4540 **E** searches@thameswater.co.uk **I** www.thameswater-propertysearches.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4614872	SP4442NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 444250,242750

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.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0800 009 4540 **E** searches@thameswater.co.uk **I** www.thameswater-propertysearches.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4614872

SP4342SE

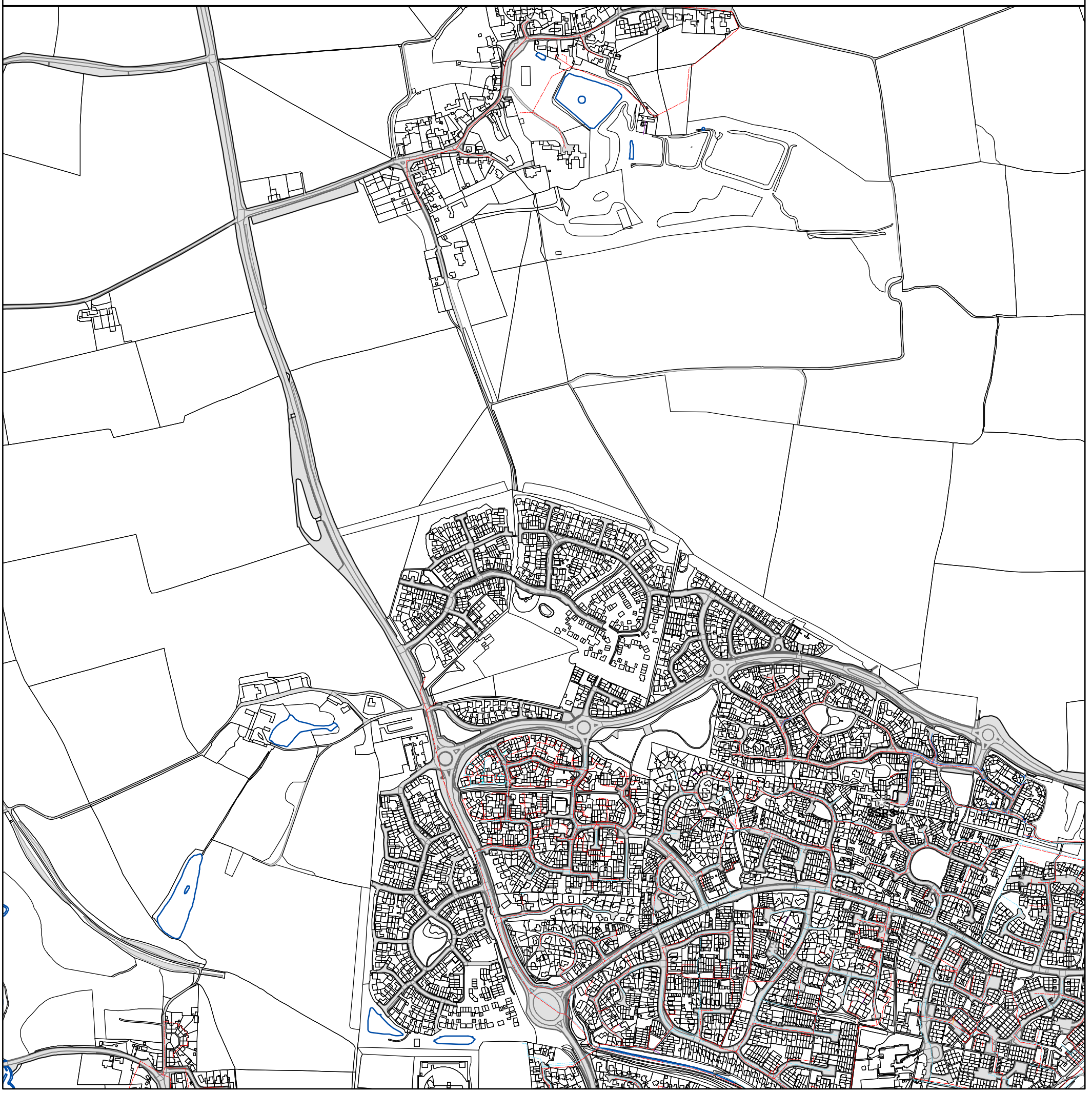
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 443750,242250

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.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0800 009 4540 **E** searches@thameswater.co.uk **I** www.thameswater-propertysearches.co.uk

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

ALS/ALS Standard/2022_4614872



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	G1KANAGA
Print Date:	29/03/2022
Map Centre:	443593,242882
Grid Reference:	SP4342NE

Comments:

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

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

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

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

Notes:

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

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

Appendix D: Illustrative Masterplan

- Site Boundary (12.63ha)
- 1 Arrival Square
- 2 Attenuation Pond
- 3 Wildflower Meadow and Oak Parkland
- 4 Woodland Planting
- 5 Public Right of Way Integrated within Green Corridor
- 6 Vehicular Access Point
- 7 Main Street With Green Verge, Including Rain Gardens
- 8 Neighbourhood Green with Swale
- 9 Natural Play Space
- 10 Informal Kick-about Space
- 11 Mown Grass Trails

client
Vistry Homes Ltd

project title
Land to the East of Warwick Road, Banbury

drawing title
Concept Masterplan

date	06 OCTOBER 2022	drawn by	NBo
drawing number	edp3253_d038d	checked	RAl
scale	1:5,000 @ A3	QA	RBa

the environmental dimension partnership
Registered office: 01285 740427 - www.edp-uk.co.uk - info@edp-uk.co.uk

Appendix E: Thames Water Pre-Development Enquiry Response

Wastewater pre-planning

Our ref DS6095240

18 May 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site: Land east of Warwick Road, Banbury, OX16 1JN

Thank you for providing information on your development.

Existing site: greenfield
Proposed site: general housing (170 units)
Proposed foul water to discharge by gravity to MH 361A

We have completed the assessment of the foul water flows 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 foul water 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

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water 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. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

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 have any further questions, please contact me on 0800 009 3921.

Kind Regards,

Leigh Khan
Developer Services – Adoptions Engineer
Tel: 0800 009 3921
developer.services@thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

Appendix F: Soakaway Testing Results

N
INDICATIVE NORTH

SA(X) Proposed soakaway test to BRE Digest 365

SW3
Soakaway test undertaken
@ 1.5m bgl

SW1A
Soakaway test undertaken
@ 1.5m bgl

SW2
Soakaway test undertaken
@1.5m bgl

SW4
Soakaway test undertaken
@ 2.0m bgl

Rev	Date	Description	By	Apvd
P2	30.05.22	Amended locations to limit damage to crop	LE	LE
P1	22.04.22	Preliminary issue	LE	LE

PROJECT:
LAND TO THE EAST OF
WARWICK ROAD, BANBURY

TITLE:
SOAKAWAY TESTING LOCATION PLAN

CLIENT:
VISTRY GROUP

SCALE@A1:
1:1000

PROJECT REF:
17279

DRAWING No: SK06

REV: P2

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

Bristol, Cardiff, Plymouth, Winchester
St James Court, St James Parade, Bristol BS1 3LH
jubb.uk.com
+44(0)117 922 6266

Geotechnical Engineering Limited

TRIAL PIT LOG

SW1A

CLIENT VISTRY HOMES LIMTED

SITE LAND EAST OF WARWICK ROAD, BANBURY

Sheet 1 of 1

Start Date 15 June 2022

Scale 1:25

End Date 15 June 2022

Depth 2.40 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Crop over reddish brown gravelly fine and medium SAND. Gravel is angular and subangular fine and medium ferruginous sandstone and sandstone. 0.00 - 0.15m: Rare rootlets.			
1B 2D	1.40 - 1.60 1.40 - 1.60							
3B 4D	1.90 - 2.10 1.90 - 2.10				Reddish brown angular ferruginous sandstone COBBLES with much reddish brown very gravelly fine to coarse sand and rare pockets (up to 50mm diam) of soft light brown silty clay. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	2.00		
					Trial pit Completed at 2.40m	2.40		

Equipment: Pit excavated by JCB 3CX

Pit width x length: 0.80m x 2.00m

Sidewall stability: Sidewalls spalling 1.00-2.40m

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 2.40m.

Remarks: Soakaway test referenced SW1A undertaken at 1.50m, results presented separately. Trial pit terminated at 2.40m upon encountering hard strata (possible bedrock).

AGS

CONTRACT	CHECKED
37121	

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

SW2

CLIENT VISTRY HOMES LIMTED

SITE LAND EAST OF WARWICK ROAD, BANBURY

Sheet 1 of 1

Start Date 17 June 2022

Scale 1:25

End Date 17 June 2022

Depth 1.80 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 2D	0.40 - 0.60 0.40 - 0.60			Crop over reddish brown gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse ferruginous sandstone. 0.00 - 0.05m: Rare rootlets.			
				Reddish brown gravelly fine to coarse SAND with a high angular ferruginous sandstone cobble content and rare pockets (up to 100x50mm) of soft light brown silty clay. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	0.60		
3B 4D	1.40 - 1.60 1.40 - 1.60			Reddish brown angular ferruginous sandstone COBBLES with much reddish brown very gravelly fine to coarse sand and rare pockets (up to 50mm diam) of soft light brown silty clay. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	1.50		
				Trial pit Completed at 1.80m	1.80		

Equipment: Pit excavated by JCB 3CX

Pit width x length: 0.80m x 2.10m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.80m.

Remarks: Soakaway test referenced SW2 undertaken at 1.50m, results presented separately. Trial pit terminated at 1.80m upon encountering hard strata (possible bedrock).

AGS

CONTRACT	CHECKED
37121	

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

SW3

CLIENT VISTRY HOMES LIMTED

SITE LAND EAST OF WARWICK ROAD, BANBURY

Sheet 1 of 1

Start Date 14 June 2022

Scale 1:25

End Date 14 June 2022

Depth 2.85 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
				Crop over reddish brown gravelly fine to coarse SAND. Gravel is angular and subangular fine and medium ferruginous sandstone and sandstone. 0.00 - 0.10m: Rare rootlets.			
1B 2D	0.40 - 0.60 0.40 - 0.60			Reddish brown gravelly silty fine to coarse SAND with a medium angular ferruginous sandstone cobble content and rare pockets (up to 20mm diam) of soft light brown clayey silt. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	0.40		
3B 4D	0.90 - 1.10 0.90 - 1.10						
5B 6D	1.40 - 1.60 1.40 - 1.60						
7B 8D	1.90 - 2.10 1.90 - 2.10						
				Reddish brown gravelly silty fine to coarse SAND with a high angular ferruginous sandstone cobble content and rare pockets (up to 40mm diam) of soft light brown clayey silt. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	2.10		
9B 10D	2.50 - 2.60 2.50 - 2.60						
				Trial pit Completed at 2.85m	2.85		

Equipment: Pit excavated by JCB 3CX

Pit width x length: 0.80m x 1.80m

Sidewall stability: Sidewalls spalling 1.30-2.85m

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 2.85m.

Remarks: Soakaway test referenced SW3 undertaken at 1.50m, results presented separately. Trial pit terminated at 2.85m upon encountering hard strata (possible bedrock).

CONTRACT	CHECKED
37121	

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

SW4

CLIENT VISTRY HOMES LIMTED

SITE LAND EAST OF WARWICK ROAD, BANBURY

Sheet 1 of 1

Start Date 16 June 2022

Scale 1:25

End Date 16 June 2022

Depth 2.50 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Crop over reddish brown gravelly silty fine to coarse SAND. Gravel is angular and subangular fine and medium ferruginous sandstone and sandstone. 0.00 - 0.15m: Rare rootlets.			
1B 2D	0.40 - 0.60 0.40 - 0.60							
					Reddish brown gravelly silty fine to coarse SAND with a high angular ferruginous sandstone cobble content and frequent pockets (up to 200x100mm) of soft light brown silty clay. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	0.70		
3B 4D	1.40 - 1.60 1.40 - 1.60							
					Reddish brown angular ferruginous sandstone COBBLES with much reddish brown very gravelly fine to coarse sand and rare pockets (up to 50mm diam) of soft light brown silty clay. Gravel is angular and subangular fine to coarse ferruginous sandstone and sandstone.	2.25		
5B 6D	2.40 - 2.50 2.40 - 2.50					2.50		
					Trial pit Completed at 2.50m			

Equipment: Pit excavated by JCB 3CX

Pit width x length: 0.80m x 2.00m

Sidewall stability: Stable and vertical

Groundwater: Not encountered

Backfill: Arisings 0.00 - 2.50m.

Remarks: Soakaway test referenced SW4 undertaken at 2.00m, results presented separately. Trial pit terminated at 2.50m upon encountering hard strata (possible bedrock).

AGS

CONTRACT	CHECKED
37121	

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

SOAKAWAY TEST

CLIENT VISTRY HOMES LIMTED

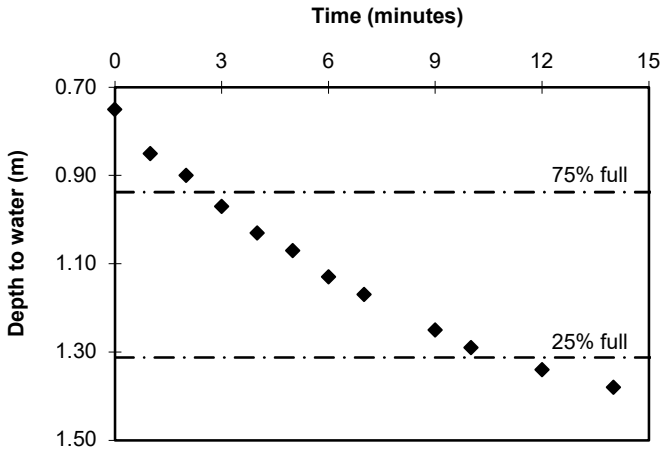
SITE LAND EAST OF WARWICK ROAD, BANBURY TRIAL PIT **SW1A**

DATE 15/06/2022

TEST 1

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.75	m
v_{p75-25}	0.600	m^3
a_{p50}	3.700	m^2
t_{p75-25}	9	min

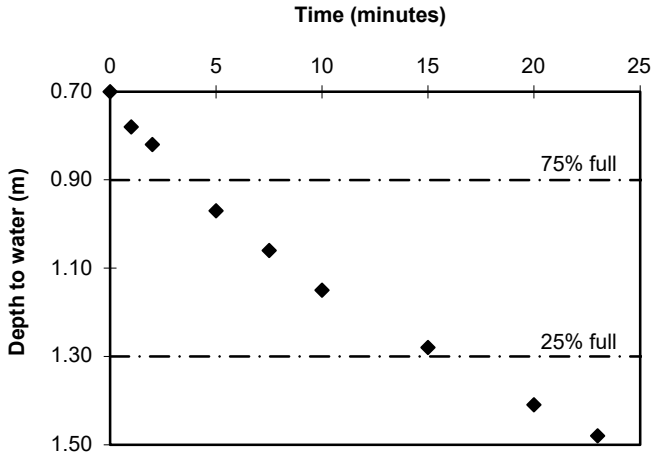
soil infiltration rate, *f* **3.1×10^{-4} ms^{-1}**



TEST 2

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.70	m
v_{p75-25}	0.640	m^3
a_{p50}	3.840	m^2
t_{p75-25}	13	min

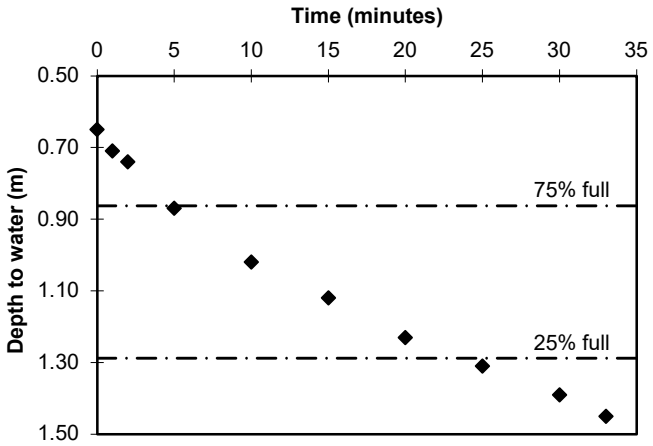
soil infiltration rate, *f* **2.1×10^{-4} ms^{-1}**



TEST 3

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.65	m
v_{p75-25}	0.680	m^3
a_{p50}	3.980	m^2
t_{p75-25}	18	min

soil infiltration rate, *f* **1.6×10^{-4} ms^{-1}**



Remarks Test carried out in accordance with BRE DG 365 (2016).

CONTRACT	CHECKED
37121	**EC**

GC / AT

Geotechnical Engineering Limited

SOAKAWAY TEST

CLIENT VISTRY HOMES LIMTED

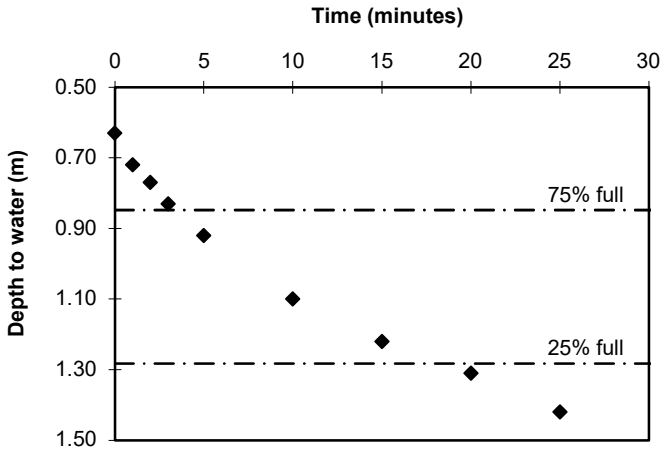
SITE LAND EAST OF WARWICK ROAD, BANBURY TRIAL PIT **SW2**

DATE 17/06/2022

TEST 1

LENGTH	2.10	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.63	m
v_{p75-25}	0.731	m^3
a_{p50}	4.203	m^2
t_{p75-25}	15	min

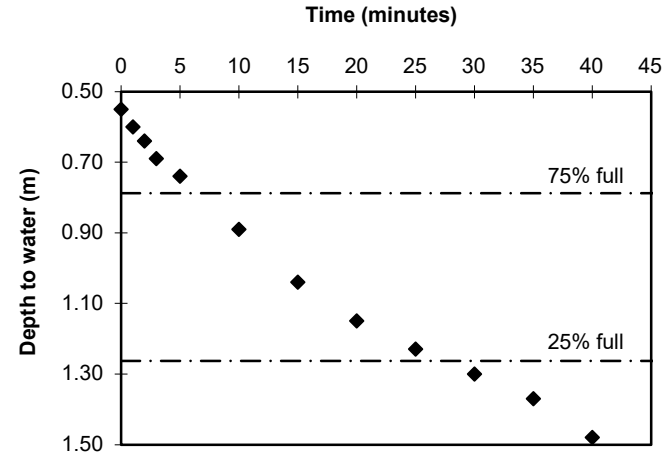
soil infiltration rate, *f* **1.9×10^{-4} ms^{-1}**



TEST 2

LENGTH	2.10	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.55	m
v_{p75-25}	0.798	m^3
a_{p50}	4.435	m^2
t_{p75-25}	20	min

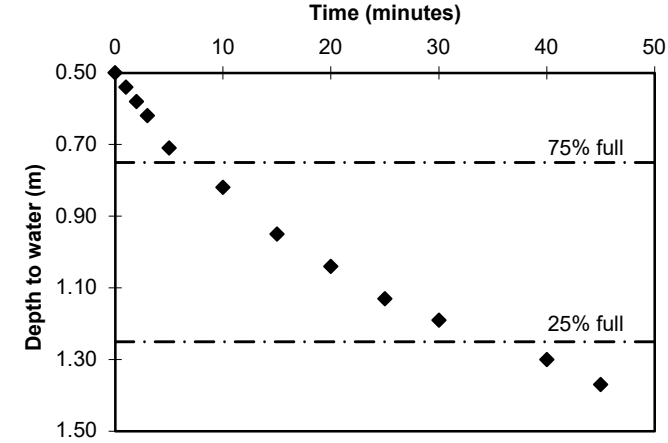
soil infiltration rate, *f* **1.5×10^{-4} ms^{-1}**



TEST 3

LENGTH	2.10	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.50	m
v_{p75-25}	0.840	m^3
a_{p50}	4.580	m^2
t_{p75-25}	29	min

soil infiltration rate, *f* **1.1×10^{-4} ms^{-1}**



Remarks Test carried out in accordance with BRE DG 365 (2016).

CONTRACT	CHECKED
37121	**EC**

GC / AT

Geotechnical Engineering Limited

SOAKAWAY TEST

CLIENT VISTRY HOMES LIMTED

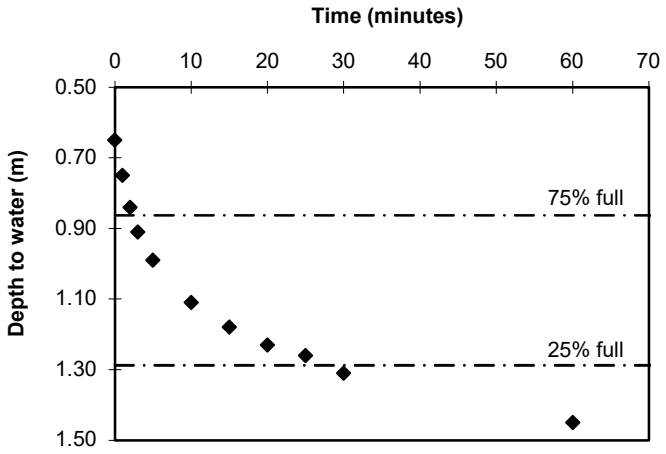
SITE LAND EAST OF WARWICK ROAD, BANBURY TRIAL PIT **SW3**

DATE 14/06/2022

TEST 1

LENGTH	1.80	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.65	m
v_{p75-25}	0.612	m^3
a_{p50}	3.650	m^2
t_{p75-25}	25	min

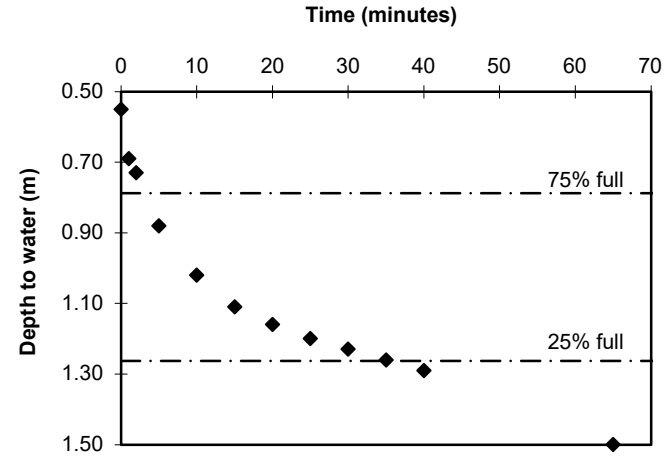
soil infiltration rate, *f* **1.1×10^{-4} ms^{-1}**



TEST 2

LENGTH	1.80	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.55	m
v_{p75-25}	0.684	m^3
a_{p50}	3.910	m^2
t_{p75-25}	32	min

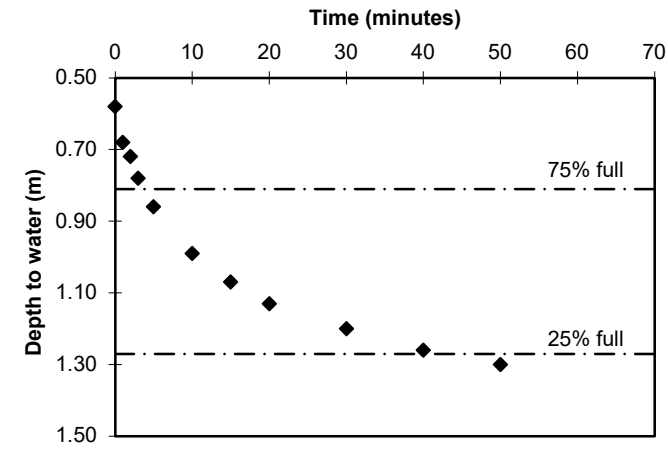
soil infiltration rate, *f* **9.0×10^{-5} ms^{-1}**



TEST 3

LENGTH	1.80	m
BREADTH	0.80	m
DEPTH	1.50	m
WATER LEVEL	Dry	
FILL LEVEL	0.58	m
v_{p75-25}	0.662	m^3
a_{p50}	3.832	m^2
t_{p75-25}	39	min

soil infiltration rate, *f* **7.4×10^{-5} ms^{-1}**



Remarks Test carried out in accordance with BRE DG 365 (2016).

CONTRACT	CHECKED
37121	**EC**

GC / AT

Geotechnical Engineering Limited

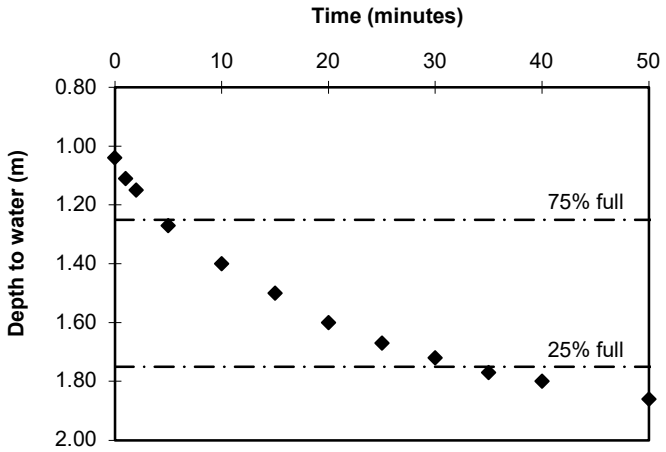
SOAKAWAY TEST

CLIENT VISTRY HOMES LIMTED
SITE LAND EAST OF WARWICK ROAD, BANBURY TRIAL PIT **SW4**
DATE 16/04/2022

TEST 1

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	2.00	m
WATER LEVEL	Dry	
FILL LEVEL	1.04	m
v_{p75-25}	0.768	m^3
a_{p50}	4.288	m^2
t_{p75-25}	31	min

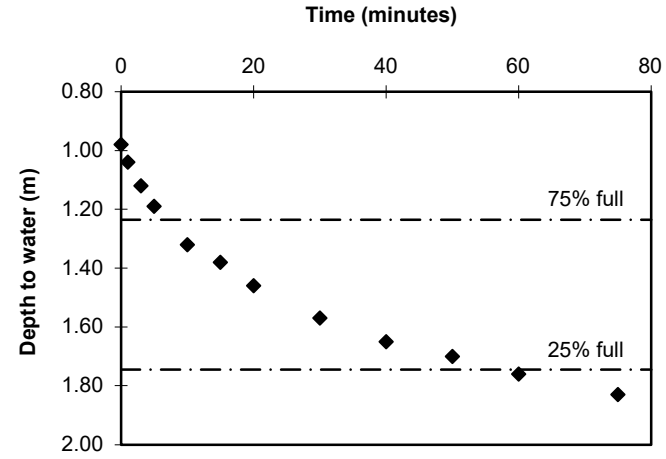
soil infiltration rate, *f* **9.8×10^{-5} ms^{-1}**



TEST 2

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	2.00	m
WATER LEVEL	Dry	
FILL LEVEL	0.98	m
v_{p75-25}	0.816	m^3
a_{p50}	4.456	m^2
t_{p75-25}	51	min

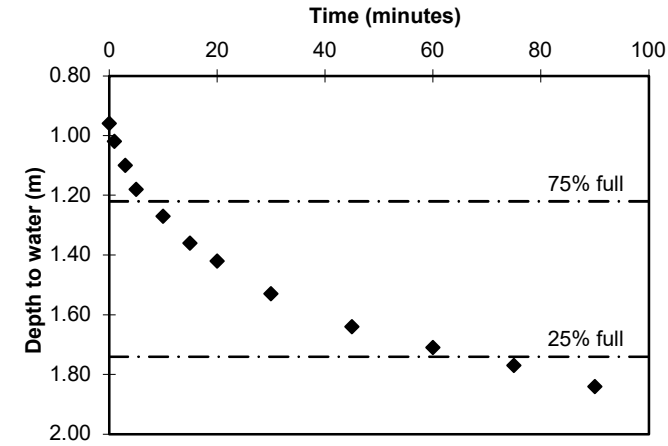
soil infiltration rate, *f* **6.0×10^{-5} ms^{-1}**



TEST 3

LENGTH	2.00	m
BREADTH	0.80	m
DEPTH	2.00	m
WATER LEVEL	Dry	
FILL LEVEL	0.96	m
v_{p75-25}	0.832	m^3
a_{p50}	4.512	m^2
t_{p75-25}	60	min

soil infiltration rate, *f* **5.1×10^{-5} ms^{-1}**



Remarks Test carried out in accordance with BRE DG 365 (2016).

CONTRACT	CHECKED
37121	**EC**

GC / AT

Appendix G: Proposed Drainage Plan & Calculations

Legend

- Proposed Infiltration Basin
- Proposed Foul Pump Station
- Proposed Foul Water Rising Main
- Proposed Permeable Paving
- Proposed Swale
- Raingardens Catchment
- Proposed Permeable Paving or Alternative SuDS Catchment

Notes

1. Do not scale from this drawing.
2. No detailed GI works have been undertaken on the subject site.
3. It has been assumed that discharging surface water flows via infiltration techniques will be viable.
4. Initial onsite infiltration testing in accordance with BRE365 guidance has been undertaken across the site, this confirmed that infiltration is a viable option. The results obtained from this testing have been used to inform the drainage proposals.
5. Infiltration basins shown to accommodate the 1 in 100 year including 40% climate change allowance rainfall event.
6. Proposed basins shown indicatively and are based on available information and design assumptions. The size, shape and position is subject to detail design.
7. The proposed strategy is based on existing levels. The proposals are subject to change following confirmation of finished levels
8. The proposed strategy is based on the draft concept masterplan and is subject to change as the masterplan is progressed.
9. It is anticipated that foul flows from the development will be conveyed to a suitable point of connection on the existing public sewer network located within close proximity to the site. Due to existing site levels it is anticipated that foul flows will require pumping to the proposed POC. This is subject to liason with Thames Water.
10. Indicative pump station layout and location shown, number of pump stations and requirements to be confirmed at detailed design.

Rev	Date	Description	By	Apvd
P5	19:01:23	Updated Masterplan	LE	LE
P4	06:10:22	Updated Masterplan	LE	LE
P3	21:07:22	Planning Submission	LE	LE
P2	01:17:22	Drainage updated to reflect onsite infiltration testing results	LE	LE
P1	17.06.22	Preliminary issue	LE	LE

PROJECT:
LAND EAST OF WARWICK ROAD, BANBURY

TITLE:
PRELIMINARY DRAINAGE PLAN - STRATEGY OVERVIEW

CLIENT:
VISTRY HOMES LTD

SCALE@A1:
1:1000

PROJECT REF:
17279

DRAWING No: SK_C_007

REV: P5

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

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

Half Drain Time : 177 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.766	0.766	45.6	725.8	O K
30 min Summer	0.849	0.849	47.7	816.3	O K
60 min Summer	0.916	0.916	49.4	891.6	O K
120 min Summer	0.942	0.942	50.0	921.0	O K
180 min Summer	0.928	0.928	49.7	905.2	O K
240 min Summer	0.911	0.911	49.2	885.1	O K
360 min Summer	0.871	0.871	48.2	841.2	O K
480 min Summer	0.833	0.833	47.3	798.6	O K
600 min Summer	0.797	0.797	46.4	759.3	O K
720 min Summer	0.763	0.763	45.6	722.3	O K
960 min Summer	0.699	0.699	44.0	654.8	O K
1440 min Summer	0.584	0.584	41.3	536.1	O K
2160 min Summer	0.439	0.439	37.9	392.6	O K
2880 min Summer	0.323	0.323	35.2	282.5	O K
4320 min Summer	0.132	0.132	31.0	111.8	O K
5760 min Summer	0.050	0.050	29.2	41.9	O K
7200 min Summer	0.041	0.041	24.0	34.2	O K
8640 min Summer	0.035	0.035	20.5	29.1	O K
10080 min Summer	0.031	0.031	17.8	25.4	O K
15 min Winter	0.767	0.767	45.7	726.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	193.659	0.0	18
30 min Summer	112.484	0.0	33
60 min Summer	65.334	0.0	62
120 min Summer	37.948	0.0	120
180 min Summer	27.617	0.0	154
240 min Summer	22.042	0.0	184
360 min Summer	16.041	0.0	252
480 min Summer	12.803	0.0	320
600 min Summer	10.748	0.0	390
720 min Summer	9.317	0.0	458
960 min Summer	7.451	0.0	594
1440 min Summer	5.438	0.0	854
2160 min Summer	3.969	0.0	1232
2880 min Summer	3.174	0.0	1588
4320 min Summer	2.209	0.0	2288
5760 min Summer	1.708	0.0	2936
7200 min Summer	1.399	0.0	3656
8640 min Summer	1.189	0.0	4384
10080 min Summer	1.036	0.0	5056
15 min Winter	193.659	0.0	18

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.851	0.851	47.7	818.2	O K
60 min Winter	0.920	0.920	49.5	895.1	O K
120 min Winter	0.950	0.950	50.2	930.0	O K
180 min Winter	0.935	0.935	49.8	912.9	O K
240 min Winter	0.913	0.913	49.3	887.7	O K
360 min Winter	0.864	0.864	48.1	832.4	O K
480 min Winter	0.811	0.811	46.8	774.7	O K
600 min Winter	0.760	0.760	45.5	719.3	O K
720 min Winter	0.710	0.710	44.3	666.4	O K
960 min Winter	0.618	0.618	42.1	570.8	O K
1440 min Winter	0.457	0.457	38.3	409.7	O K
2160 min Winter	0.266	0.266	33.9	230.4	O K
2880 min Winter	0.129	0.129	30.9	108.9	O K
4320 min Winter	0.042	0.042	24.6	34.9	O K
5760 min Winter	0.033	0.033	19.0	27.0	O K
7200 min Winter	0.027	0.027	15.5	22.0	O K
8640 min Winter	0.023	0.023	13.2	18.7	O K
10080 min Winter	0.020	0.020	11.7	16.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	112.484	0.0	32
60 min Winter	65.334	0.0	60
120 min Winter	37.948	0.0	116
180 min Winter	27.617	0.0	168
240 min Winter	22.042	0.0	190
360 min Winter	16.041	0.0	268
480 min Winter	12.803	0.0	344
600 min Winter	10.748	0.0	418
720 min Winter	9.317	0.0	490
960 min Winter	7.451	0.0	632
1440 min Winter	5.438	0.0	896
2160 min Winter	3.969	0.0	1276
2880 min Winter	3.174	0.0	1612
4320 min Winter	2.209	0.0	2204
5760 min Winter	1.708	0.0	2864
7200 min Winter	1.399	0.0	3744
8640 min Winter	1.189	0.0	4400
10080 min Winter	1.036	0.0	5064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 442950 242300 SP 42950 42300
C (1km)	-0.023
D1 (1km)	0.322
D2 (1km)	0.329
D3 (1km)	0.212
E (1km)	0.300
F (1km)	2.463
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.900
Cv (Winter)	0.900
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.750

Time (mins) From:	To:	Area (ha)
0	4	1.750

Model Details

Storage is Online Cover Level (m) 3.000

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 1.5
Infiltration Coefficient Base (m/hr) 0.18400 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.18400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	825.0	0.400	951.7	0.800	1087.5	1.001	0.0
0.200	887.2	0.600	1018.5	1.000	1158.7		

17279
Warwick Road, Banbury

Surface Water Calculations
Permeable Paving
Driveway EG
30yr + 40% Climate Change

SOAKAWAY DESIGN **LOCATION** r = 0.35 SA1 I (m/s) = 7.40E-05
CELLULAR PIT TO CIRIA FoS = 2 CLIMATE CHANGE % 40%
PIT LENGTH 2.40 PIT WIDTH 4.80 AREA 12.70 f 1.33E-01 EFF DEPTH 0.40 VOID RATIO 0.35 RETURN PERIOD M30
m m Sq m m/hr

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M30-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.53	15.606	21.848	0.277	14.4	0.320	**-0.042**	**1.61**	-0.01	0.00
15	0.62	12.4	1.53	18.972	26.561	0.337	14.4	0.480	**-0.142**	**1.61**	-0.04	-0.01
30	0.79	15.8	1.57	24.806	34.728	0.441	14.4	0.959	**-0.518**	**1.61**	-0.14	-0.04
60	1.00	20.0	1.59	31.800	44.520	0.565	14.4	1.918	**-1.353**	**1.61**	-0.35	-0.12
120	1.22	24.4	1.59	38.796	54.314	0.690	14.4	3.836	**-3.146**	**1.61**	-0.82	-0.27
240	1.48	29.6	1.58	46.768	65.475	0.832	14.4	7.672	**-6.841**	**1.61**	-1.78	-0.59
360	1.67	33.4	1.56	52.104	72.946	0.926	14.4	11.508	**-10.582**	**1.61**	-2.76	-0.92
600	1.90	38.0	1.56	59.280	82.992	1.054	14.4	19.181	**-18.127**	**1.61**	-4.73	-1.57
900	2.10	42.0	1.51	63.420	88.788	1.128	14.4	28.771	**-27.644**	**1.61**	-7.21	-2.40
1440	2.44	48.8	1.51	73.688	103.163	1.310	14.4	46.034	**-44.724**	**1.61**	-11.66	-3.88

17279
Warwick Road, Banbury

Surface Water Calculations
Permeable Paving
Driveway EG
100yr + 40% Climate Change

SOAKAWAY DESIGN **LOCATION** r = 0.35 SA1 I (m/s) = 7.40E-05
CELLULAR PIT TO CIRIA FoS = 2 CLIMATE CHANGE % 40%
PIT LENGTH 2.40 m PIT WIDTH 4.80 m AREA 12.70 Sq m f 1.33E-01 m/hr EFF DEPTH 0.40 m VOID RATIO 0.35 RETURN PERIOD M100

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M100-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.91	19.482	27.275	0.346	14.4	0.320	**0.027**	**1.61**	0.01	0.00
15	0.62	12.4	1.91	23.684	33.158	0.421	14.4	0.480	**-0.058**	**1.61**	-0.02	-0.01
30	0.79	15.8	1.99	31.442	44.019	0.559	14.4	0.959	**-0.400**	**1.61**	-0.10	-0.03
60	1.00	20.0	2.03	40.600	56.840	0.722	14.4	1.918	**-1.196**	**1.61**	-0.31	-0.10
120	1.22	24.4	2.03	49.532	69.345	0.881	14.4	3.836	**-2.955**	**1.61**	-0.77	-0.26
240	1.48	29.6	2.01	59.496	83.294	1.058	14.4	7.672	**-6.614**	**1.61**	-1.72	-0.57
360	1.67	33.4	1.97	65.798	92.117	1.170	14.4	11.508	**-10.339**	**1.61**	-2.70	-0.90
600	1.90	38.0	1.97	74.860	104.804	1.331	14.4	19.181	**-17.850**	**1.61**	-4.65	-1.55
900	2.10	42.0	1.89	79.380	111.132	1.411	14.4	28.771	**-27.360**	**1.61**	-7.13	-2.37
1440	2.44	48.8	1.89	92.232	129.125	1.640	14.4	46.034	**-44.394**	**1.61**	-11.57	-3.85

17279
Warwick Road, Banbury

Surface Water Calculations
Permeable Paving
Courtyard EG
30yr + 40% Climate Change

SOAKAWAY DESIGN				**LOCATION**		r =	0.35		SA1	I (m/s) =	7.40E-05	
CELLULAR PIT TO CIRIA										FoS =	3	CLIMATE CHANGE % 40%
PIT LENGTH	50.00	PIT WIDTH	9.00	AREA	842.00	f	8.88E-02	EFF DEPTH	0.40	VOID RATIO	0.35	RETURN PERIOD M30
m		m		Sq m		m/hr						

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M30-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.53	15.606	21.848	18.396	473.6	7.009	**11.387**	**63.00**	0.14	0.03
15	0.62	12.4	1.53	18.972	26.561	22.364	473.6	10.514	**11.850**	**63.00**	0.14	0.03
30	0.79	15.8	1.57	24.806	34.728	29.241	473.6	21.028	**8.213**	**63.00**	0.10	0.02
60	1.00	20.0	1.59	31.800	44.520	37.486	473.6	42.056	**-4.570**	**63.00**	-0.05	-0.01
120	1.22	24.4	1.59	38.796	54.314	45.733	473.6	84.111	**-38.379**	**63.00**	-0.46	-0.09
240	1.48	29.6	1.58	46.768	65.475	55.130	473.6	168.223	**-113.093**	**63.00**	-1.34	-0.25
360	1.67	33.4	1.56	52.104	72.946	61.420	473.6	252.334	**-190.914**	**63.00**	-2.27	-0.42
600	1.90	38.0	1.56	59.280	82.992	69.879	473.6	420.557	**-350.678**	**63.00**	-4.17	-0.78
900	2.10	42.0	1.51	63.420	88.788	74.759	473.6	630.835	**-556.076**	**63.00**	-6.61	-1.24
1440	2.44	48.8	1.51	73.688	103.163	86.863	473.6	1009.336	**-922.473**	**63.00**	-10.97	-2.05

17279
Warwick Road, Banbury

Surface Water Calculations
Permeable Paving
Courtyard EG
100yr + 40% Climate Change

SOAKAWAY DESIGN **LOCATION** r = 0.35 SA1 I (m/s) = 7.40E-05
CELLULAR PIT TO CIRIA FoS = 3 CLIMATE CHANGE % 40%
PIT LENGTH 50.00 m PIT WIDTH 9.00 m AREA 842.00 Sq m f 8.88E-02 m/hr EFF DEPTH 0.40 m VOID RATIO 0.35 RETURN PERIOD M100

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M100-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.91	19.482	27.275	22.965	473.6	7.009	**15.956**	**63.00**	0.19	0.04
15	0.62	12.4	1.91	23.684	33.158	27.919	473.6	10.514	**17.405**	**63.00**	0.21	0.04
30	0.79	15.8	1.99	31.442	44.019	37.064	473.6	21.028	**16.036**	**63.00**	0.19	0.04
60	1.00	20.0	2.03	40.600	56.840	47.859	473.6	42.056	**5.804**	**63.00**	0.07	0.01
120	1.22	24.4	2.03	49.532	69.345	58.388	473.6	84.111	**-25.723**	**63.00**	-0.31	-0.06
240	1.48	29.6	2.01	59.496	83.294	70.134	473.6	168.223	**-98.089**	**63.00**	-1.17	-0.22
360	1.67	33.4	1.97	65.798	92.117	77.563	473.6	252.334	**-174.771**	**63.00**	-2.08	-0.39
600	1.90	38.0	1.97	74.860	104.804	88.245	473.6	420.557	**-332.312**	**63.00**	-3.95	-0.74
900	2.10	42.0	1.89	79.380	111.132	93.573	473.6	630.835	**-537.262**	**63.00**	-6.39	-1.19
1440	2.44	48.8	1.89	92.232	129.125	108.723	473.6	1009.336	**-900.613**	**63.00**	-10.71	-2.00

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Warwick Road, Banbury

Surface Water Calculations
Cellular Soakaway
Large House Plot Soakaway EG
30yr + 40% Climate Change

SOAKAWAY DESIGN				**LOCATION**		r =	0.35		SA1	I (m/s) =	7.40E-05	
CELLULAR PIT TO CIRIA										FoS =	3	CLIMATE CHANGE % 40%
PIT LENGTH	3.00	PIT WIDTH	3.00	AREA	141.00	f	8.88E-02	EFF DEPTH	1.00	VOID RATIO	0.95	RETURN PERIOD M30
m		m		Sq m		m/hr						

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M30-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.53	15.606	21.848	3.081	15	0.222	**2.859**	**8.55**	1.07	0.32
15	0.62	12.4	1.53	18.972	26.561	3.745	15	0.333	**3.412**	**8.55**	1.28	0.38
30	0.79	15.8	1.57	24.806	34.728	4.897	15	0.666	**4.231**	**8.55**	1.59	0.47
60	1.00	20.0	1.59	31.800	44.520	6.277	15	1.332	**4.945**	**8.55**	1.86	0.55
120	1.22	24.4	1.59	38.796	54.314	7.658	15	2.664	**4.994**	**8.55**	1.87	0.55
240	1.48	29.6	1.58	46.768	65.475	9.232	15	5.328	**3.904**	**8.55**	1.47	0.43
360	1.67	33.4	1.56	52.104	72.946	10.285	15	7.992	**2.293**	**8.55**	0.86	0.25
600	1.90	38.0	1.56	59.280	82.992	11.702	15	13.320	**-1.618**	**8.55**	-0.61	-0.18
900	2.10	42.0	1.51	63.420	88.788	12.519	15	19.980	**-7.461**	**8.55**	-2.80	-0.83
1440	2.44	48.8	1.51	73.688	103.163	14.546	15	31.968	**-17.422**	**8.55**	-6.54	-1.94

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Warwick Road, Banbury

Surface Water Calculations
Cellular Soakaway
Large House Plot Soakaway EG
100yr + 40% Climate Change

SOAKAWAY DESIGN **LOCATION** r = 0.35 SA1 I (m/s) = 7.40E-05
CELLULAR PIT TO CIRIA FoS = 3 CLIMATE CHANGE % 40%
PIT LENGTH 3.00 m PIT WIDTH 3.00 m AREA 141.00 Sq m f 8.88E-02 m/hr EFF DEPTH 1.00 m VOID RATIO 0.95 RETURN PERIOD M100

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M100-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.91	19.482	27.275	3.846	15	0.222	**3.624**	**8.55**	1.36	0.40
15	0.62	12.4	1.91	23.684	33.158	4.675	15	0.333	**4.342**	**8.55**	1.63	0.48
30	0.79	15.8	1.99	31.442	44.019	6.207	15	0.666	**5.541**	**8.55**	2.08	0.62
60	1.00	20.0	2.03	40.600	56.840	8.014	15	1.332	**6.682**	**8.55**	2.51	0.74
120	1.22	24.4	2.03	49.532	69.345	9.778	15	2.664	**7.114**	**8.55**	2.67	0.79
240	1.48	29.6	2.01	59.496	83.294	11.745	15	5.328	**6.417**	**8.55**	2.41	0.71
360	1.67	33.4	1.97	65.798	92.117	12.989	15	7.992	**4.997**	**8.55**	1.88	0.56
600	1.90	38.0	1.97	74.860	104.804	14.777	15	13.320	**1.457**	**8.55**	0.55	0.16
900	2.10	42.0	1.89	79.380	111.132	15.670	15	19.980	**-4.310**	**8.55**	-1.62	-0.48
1440	2.44	48.8	1.89	92.232	129.125	18.207	15	31.968	**-13.761**	**8.55**	-5.17	-1.53

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Surface Water Calculations
Cellular Soakaway
Small House Plot Soakaway EG
30yr + 40% Climate Change

SOAKAWAY DESIGN				**LOCATION**		r =	0.35		SA1	I (m/s) =	7.40E-05	
CELLULAR PIT TO CIRIA										FoS =	3	CLIMATE CHANGE % 40%
PIT LENGTH	2.00	PIT WIDTH	2.50	AREA	77.00	f	8.88E-02	EFF DEPTH	1.00	VOID RATIO	0.95	RETURN PERIOD M30
m		m		Sq m		m/hr						

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M30-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.53	15.606	21.848	1.682	9.5	0.141	**1.542**	**4.75**	0.91	0.31
15	0.62	12.4	1.53	18.972	26.561	2.045	9.5	0.211	**1.834**	**4.75**	1.09	0.37
30	0.79	15.8	1.57	24.806	34.728	2.674	9.5	0.422	**2.252**	**4.75**	1.33	0.45
60	1.00	20.0	1.59	31.800	44.520	3.428	9.5	0.844	**2.584**	**4.75**	1.53	0.52
120	1.22	24.4	1.59	38.796	54.314	4.182	9.5	1.687	**2.495**	**4.75**	1.48	0.50
240	1.48	29.6	1.58	46.768	65.475	5.042	9.5	3.374	**1.667**	**4.75**	0.99	0.33
360	1.67	33.4	1.56	52.104	72.946	5.617	9.5	5.062	**0.555**	**4.75**	0.33	0.11
600	1.90	38.0	1.56	59.280	82.992	6.390	9.5	8.436	**-2.046**	**4.75**	-1.21	-0.41
900	2.10	42.0	1.51	63.420	88.788	6.837	9.5	12.654	**-5.817**	**4.75**	-3.45	-1.16
1440	2.44	48.8	1.51	73.688	103.163	7.944	9.5	20.246	**-12.303**	**4.75**	-7.29	-2.46

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SOAKAWAY DESIGN **LOCATION** r = 0.35 SA1 I (m/s) = 7.40E-05
CELLULAR PIT TO CIRIA FoS = 3 CLIMATE CHANGE % 40%
PIT LENGTH 2.00 m PIT WIDTH 2.50 m AREA 77.00 Sq m f 8.88E-02 m/hr EFF DEPTH 1.00 m VOID RATIO 0.95 RETURN PERIOD M100

Storm Duration min	Z1	M5-Dmin Rmm	Z2	M100-Dmin Rmm	Total Rainfall +CC mm	Inlet Cu m	As50 Sq m	Outlet Cu m	**Net storage required Cu m**	**Soakaway pit storage Cu m**	**Time of Half Emptying Hrs**	Max Depth m
10	0.51	10.2	1.91	19.482	27.275	2.100	9.5	0.141	**1.960**	**4.75**	1.16	0.39
15	0.62	12.4	1.91	23.684	33.158	2.553	9.5	0.211	**2.342**	**4.75**	1.39	0.47
30	0.79	15.8	1.99	31.442	44.019	3.389	9.5	0.422	**2.968**	**4.75**	1.76	0.59
60	1.00	20.0	2.03	40.600	56.840	4.377	9.5	0.844	**3.533**	**4.75**	2.09	0.71
120	1.22	24.4	2.03	49.532	69.345	5.340	9.5	1.687	**3.652**	**4.75**	2.16	0.73
240	1.48	29.6	2.01	59.496	83.294	6.414	9.5	3.374	**3.039**	**4.75**	1.80	0.61
360	1.67	33.4	1.97	65.798	92.117	7.093	9.5	5.062	**2.031**	**4.75**	1.20	0.41
600	1.90	38.0	1.97	74.860	104.804	8.070	9.5	8.436	**-0.366**	**4.75**	-0.22	-0.07
900	2.10	42.0	1.89	79.380	111.132	8.557	9.5	12.654	**-4.097**	**4.75**	-2.43	-0.82
1440	2.44	48.8	1.89	92.232	129.125	9.943	9.5	20.246	**-10.304**	**4.75**	-6.11	-2.06

Appendix H: Flood Exceedance Route Plan

Rev	Date	Description	By	Apvd
P3	19.01.23	Updated Masterplan	LE	LE
p2	21.07.22	Planning Submission	LE	LE
P1	16.06.22	Preliminary issue	LE	LE

PROJECT:
LAND EAST OF WARWICK ROAD, BANBURY

TITLE:
EXCEEDANCE FLOW ROUTE PLAN

CLIENT:
VISTRY HOMES LTD

SCALE@A1:
1:1000

PROJECT REF:
17279

DRAWING No: SK_C_008

REV: P3

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

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