Middle Aston Limited

The Hatchery

Flood Risk Assessment

HMA-LE-GEN-XX-RP-CE-FRA01-C-Flood Risk Assessment

March 2021

linkeng.co.uk

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Flood Risk Assessment

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Rev A	29/11/2019	CH	Planning Issue
Rev B	07/04/2020	CH	Revised Masterplan
Rev C	23/03/2021	CH	Planning Issue

CONTENTS

1 INTRODUCTION

1.1 Background

1.1.1 Link was commissioned by Middle Aston Limited to prepare this report in support of a full planning application for business development at Middle Aston Limited's former poultry farm premises (the site) at "The Hatchery" in Middle Aston, Oxfordshire. The site already is in B1/B8 business use.

1.1.2 Redevelopment principally comprises rebuilding existing warehouse units and erecting some entirely new buildings to create a new development layout. Extra car parking will be added and drainage improved. A plan of the proposed development is included at Appendix A.

1.1.3 National Planning Policy Framework (NPPF) classifies the development as "major" because the red line site area exceeds one hectare. This classification and the proposal to include surface water drainage causes the Lead Local Flood Authority (LLFA), Oxfordshire County Council, to be a statutory consultee to the Local Planning Authority (LPA), Cherwell District Council, about the determination of the planning application.

1.1.4 In accordance with the planning application registration requirements of the LPA, and drainage requirements of the LLFA, this report has been prepared to provide a statement of Flood Risk, a Sustainable Drainage (SuDS) Strategy and a Drainage Management Plan in support of the development proposal.

1.2 Site Location

1.2.1 The postal address of the site is The Hatchery, Hatch End Business Park, Fir Lane, Middle Aston, Bicester, OX25 5QL. Its National Grid Coordinates, taken at the highway access, are 447590, 226510. The planning application includes a site location plan.

1.3 Topography

1.3.1 A recent detailed topographical survey of the site, which has an area of about 2.2 hectares, is included at Appendix B of this report. The survey was made to Ordnance Survey grid and level datum. Sloping quite steeply from west to east, site levels are in the range 115.5 metres above Ordnance Survey Datum (m AOD) at its highway access to 123.5 m AOD on the western boundary. To the west of the site the land continues to rise at a shallow gradient over a distance of more than 500 metres. To the east, the land falls steeply, typically at about 1 in 10, towards a valley line located approximately 150 metres from the site.

1.4 Ground Conditions

1.4.1 At the time of writing no detailed ground Investigation has been completed. A desktop search of available information has been undertaken to provide an initial assessment of ground conditions. British Geological Survey 1:50,000 mapping shows that the site is located at the boundary between

sandstone bedrock of the Horsehay Sand Member outcropping to the west, and sandstone, limestone and ironstone bedrock of the Northampton Sand Formation outcropping to the east. No superficial deposits are indicated to be present at the site.

1.4.2 A record of a three metre deep borehole sunk in 1972 on the verge of Fir Lane next to the site describes that beneath 100 mm thick topsoil an 800 mm thick layer of fine brown clayey sand overlays fine yellow/brown clayey stony sand.

1.4.3 Furthermore, soakaway testing has been completed in accordance with BRE365 which have confirmed the granular and pervious nature of the underlying ground. Infiltration rates in the western part of the site range from 0.12mm/hr to 0.063mmhr and 0.017 mm/hr in the eastern section.

1.5 Watercourses

1.5.1 There is no watercourse present on the site. The natural drainage of the site is to a watercourse located on the eastern edge of a copse on the eastern side of the Fir Lane. A pipe culvert links the low point in the watercourse to a stream located in the valley line.

1.6 Public Sewerage

1.6.1 Thames Water sewer records, Appendix C, confirm that a foul sewer is located under Fir Lane next to the site, with a manhole located close to the highway access to the site, seen during the site visit. All indications are that the site foul drainage system is connected to this manhole. However the manhole cover has not been lifted to confirm this.

1.6.2 Surface water sewerage is not available locally.

1.7 Site Drainage

1.7.1 Existing development on the site benefits from a separate piped foul and surface water drainage system. Foul drainage is connected to the Thames Water foul sewer. It is understood that the surface water drainage is connected via a 150 mm diameter pipe to watercourse to the east of the site. The topographical survey plan shows locations of most drainage chambers, but not all were lifted during the site visit. Approximate routes of existing drainage pipes are shown on the drainage strategy plan, appended.

2 PLANNING POLICY AND REGULATIONS APPLICABLE TO FLOOD RISK AND DRAINAGE

2.1 National Planning Policy

2.1.1 NPPF, the most recent of edition of which was published by the Department of Communities and Local Government (DCLG) on 24th July 2018, sets out current United Kingdom government planning policy for England.

2.1.2 The requirement for conducting a FRA as part of a planning application is set out in Footnote 50 on page 47 of the NPPF, which states:

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

2.1.3 Flood Map for Planning is prepared by the Environment Agency in support of NPPF. It shows the approximate extents of land subject to flooding by rivers and tidal waters, classifying land as Flood Zone 1 (negligible flood frequency in today's climatic conditions), Flood Zone 2 (low frequency of flooding today) and Flood Zone 3 (significant frequency of flooding today). Flood Map for Planning does not take into account the benefit of flood defences or the impact of future climate change or the influence of waves at coastal locations or the result of blockages. The quality of the mapping varies from place to place. Where no assessment of watercourse flooding has been done the default Flood Zone is Flood Zone 1. Classification as Flood Zone 1 neither guarantees no flooding today and certainly does not guarantee no flooding in the future as a result of climate change. Nevertheless NPPF states that Flood Zone 1 is the preferred location of all development.

2.1.4 Guidance about application of the NPPF is set out in the on line "living document" Planning Practice Guidance (PPG).

2.1.5 PPG gives guidance about how a flood risk assessment should be researched and written. There is different guidance depending in which of the three Flood Zones subject development is located.

2.1.6 PPG divides Flood Zone 3 into Flood Zone 3B, also known as functional flood plain, and Flood Zone 3A, which describes land that is not functional flood plain but is expected to flood with an annual exceedance probability (AEP) of at least 1% for rivers or 0.5% for tidal flooding. PPG advises that LPAs should supply maps of Flood Zone 3B via Strategic Flood Risk Assessments (SFRAs)

2.1.7 For all developments proposed in Flood Zones 2 and 3, NPPF describes how the Local Planning Authority (LPA) should check that the site proposed has the lowest frequency of flooding of those

available for the development. This check is called the “Sequential Test”, which the LPA should have undertaken for all developments included in its Local Plan Development Framework by means of its Level II SFRA. When the Sequential Test is not already passed, the FRA should include enough information on alternative sites for the LPA to decide if the Sequential Test is satisfied.

2.1.8 NPPF also requires that the LPA undertakes an “Exception Test” for flood sensitive development proposed in areas with high frequency of flooding. An Exception Test is done only if the Sequential Test has been passed. Its purpose is to demonstrate that flood risk can be safely managed for the lifetime of the development. Accordingly the FRA for such development should give evidence that the Exception Test is passed.

2.1.9 As PPG advises that only water compatible development is suited for locating in confirmed Flood Zone 3B, any other type of development proposed in Flood Zone 3B could not be granted planning consent, in which case carrying out a flood risk assessment for it would be superfluous.

2.1.10 Climate change allowances are a mandatory part of NPPF and are set out in PPG, covering peak rainfall, increased river flow, and increased tide level. The allowances used depend upon the design lifetime of a development and its location, and in general more conservative allowances are applied with increasing vulnerability of the development. Nevertheless NPPF does not require development proposed in today's Flood Zone 1 to make allowances for flooding by either fluvial or tidal waters, only from increased peak rainfall.

2.1.11 PPG sets out a rainwater disposal hierarchy of i) to groundwater, ii) to watercourse, iii) to surface water sewer and iv) to combined drain, in that order.

2.1.12 Building Regulations and Environment Agency permitting control disposal of sewage. Sewage should be delivered to a public foul sewer when that is practicable. If local sewage treatment is required, disposal of final effluent to surface water or ground water might be subject to Environment Agency permit.

2.1.13 Building Regulations controls many aspects of development drainage, setting out acceptable standards in Approved Document H. Compliance with relevant codes of practice also meets Building Regulations.

2.1.14 "Non-Statutory Technical Standards for Sustainable Drainage Systems" are national standards published by the Department for Environment, Food and Rural Affairs in March 2015 setting out UK Government expectations for surface water drainage systems serving major developments in England to restrict discharges to green field rates. An exception is given when a discharge is made to tidal waters, when unrestricted flows are permitted. The standards do not address the quality of surface water discharges. They state circumstances when the discharge rate can be higher than green field, up to the existing flow in the case of redevelopment of brown field sites.

2.1.15 National recommendations for ensuring high quality of rainwater discharged to receiving waters are set out in CIRIA 753 "The SuDS Manual. CIRIA 753 also gives very detailed guidance on design, construction and maintenance of surface water drainage systems generally.

2.1.16 The quality of rainwater discharges to receiving surface waters and groundwater are subject to regulation by the Environment Agency. Permitting can be required when discharges risk causing significant deterioration of quality of receiving waters.

2.2 Local Planning Policy

2.2.1 Policy ESD 6 of the Cherwell Local Plan 2011-2031 sets out local policies on flood risk and drainage of proposed developments in the District of Cherwell.

Policy ESD 6: Sustainable Flood Risk Management

The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.

In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.

Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.

Site specific flood risk assessments will be required to accompany development proposals in the following situations:

- **All development proposals located in flood zones 2 or 3**
- **Development proposals of 1 hectare or more located in flood zone 1**
- **Development sites located in an area known to have experienced flooding problems**
- **Development sites located within 9m of any watercourses.**

Flood risk assessments should assess all sources of flood risk and demonstrate that:

- **There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)**
- **Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.**

Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.

3 FLOOD RISK

3.1 Fluvial Flooding

3.1.1 Figure 1 below shows an extract of Flood Map for Planning covering the area around the site, identified by the yellow marker.

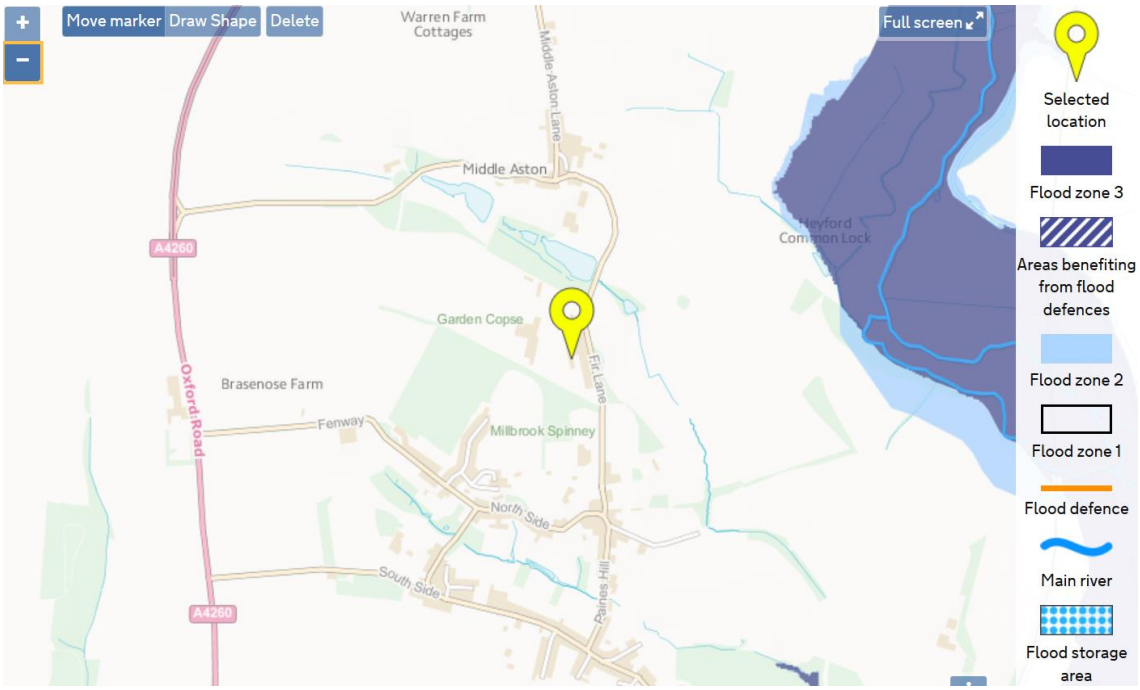


Figure 1: Flooding from Rivers and Watercourse

3.1.2 This plan advises that the entire site is located within Flood Zone 1.

3.1.3 Site inspection confirms that the development indeed is not subject to fluvial flood risk either today or in the future as a result of climate change or blockages.

3.2 Flooding from the Sea

3.2.1 This risk is not applicable to an inland location such as the site.

3.3 Flooding from Land

3.3.1 Updated Flood Map for Surface Water Flooding, reproduced at Figure 2 overleaf, indicates no surface water flood risk to the site.

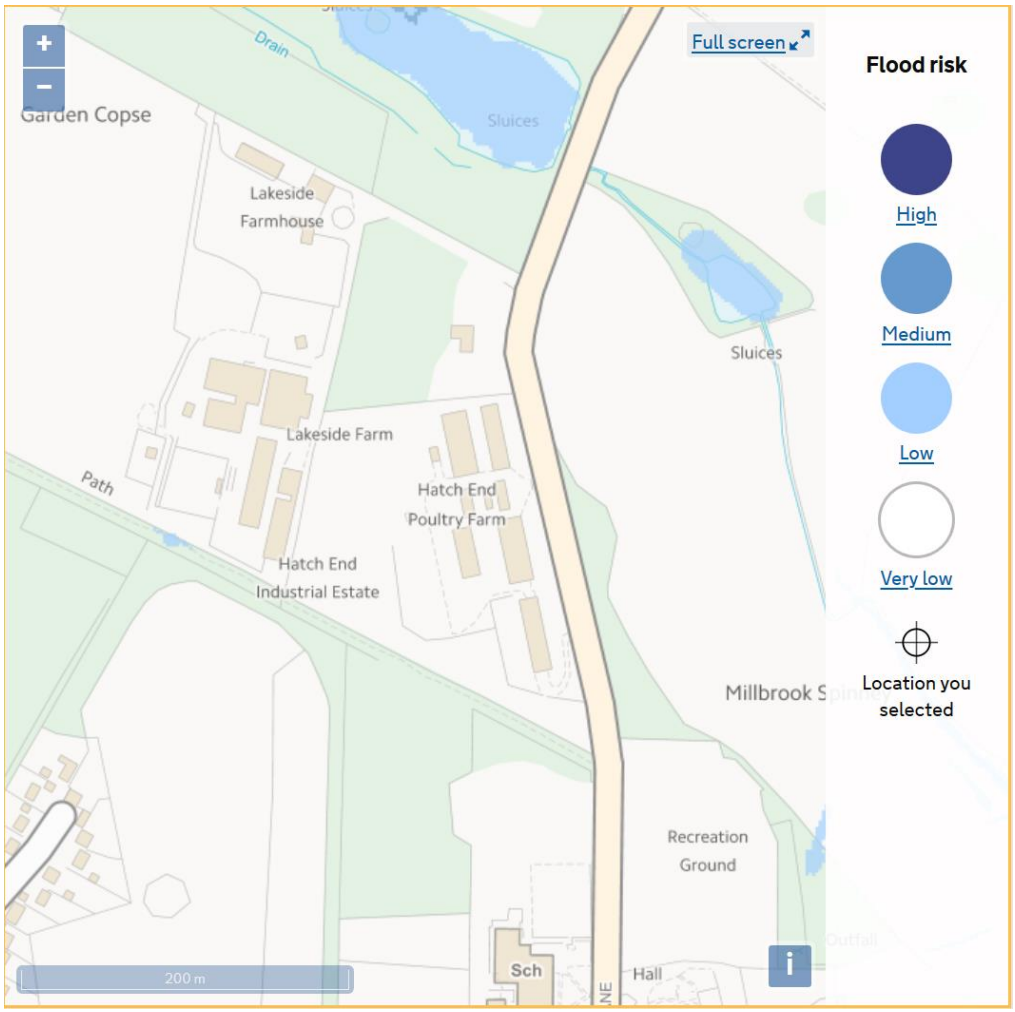


Figure 2: Flooding from Surface Water

3.3.2 Site inspection suggests that limited run off of surface water across the site boundary from higher land to its west will occur occasionally. Topography means that overland run off is less likely to affect the southern part of the site than the northern part. In practice overland run off can be dealt with satisfactorily by site drainage systems, by continuing to facilitate overland flow across the site and by ensuring that ground floors of buildings are suitably raised above finished external ground levels.

3.4 Flooding from Groundwater

3.4.1 Permeability of bedrock and water table levels together make it very unlikely that groundwater flooding could occur at the site. The SFRA confirms this negligible risk.

3.5 Flooding from Sewers

3.5.1 No public sewers are located such that they could flood the site.

3.6 Flooding from Reservoirs, Canals and Other Artificial Sources

3.6.1 The reservoir flood map shown in Figure 3 below shows the extent of flooding should water body subject to Reservoirs Act 1975 suffer a breach of a containing embankment or dam occur. This map confirms that the site is not subject to such flood risk.

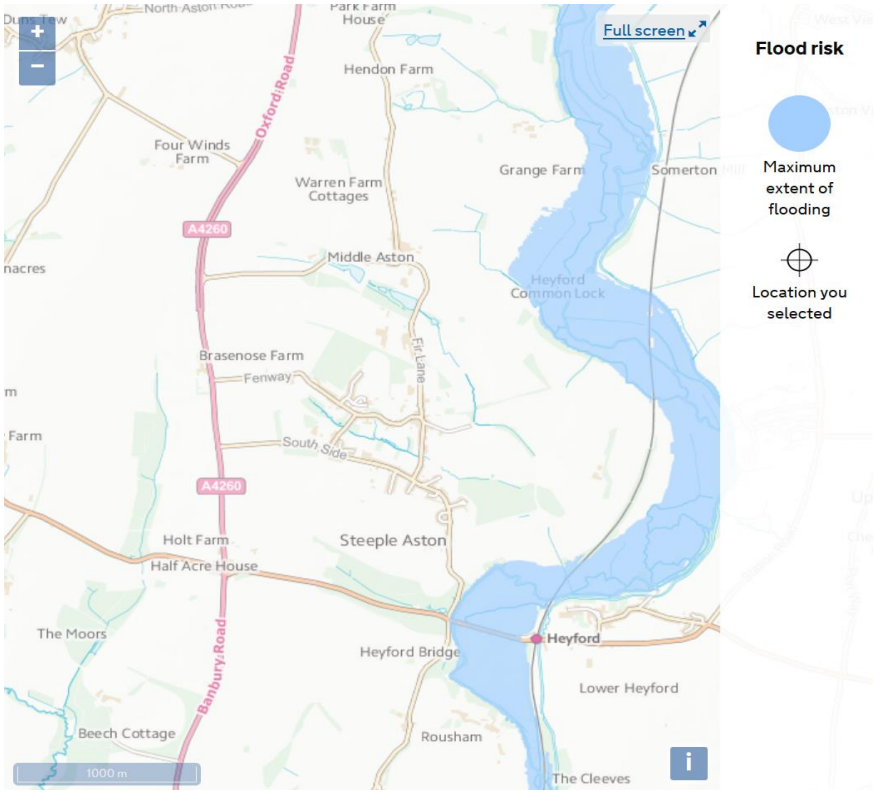


Figure 3: Flooding from Reservoirs

3.7 Pluvial Flood Risk

3.7.1 Currently the site's rainwater drainage system has blockages to down pipes and drainage gratings, leading to elevated pluvial flood risk within the site. However this risk is limited by the steepness of the site which prevents deep surface water accumulating on the surface of the ground.

3.7.2 Several buildings lack rainwater drainage, leading to over the edge run off from pitched roofs. There are no flat roof present, so accumulation of water on roofs is not an issue.

4 APPLICABILITY OF PERTINENT POLICIES

4.1 Mitigation of Existing Flood Risk

4.1.1 Two existing flood risks require mitigation as part of the development. These are from defective existing surface water drainage systems and overland flow from higher land to the west of the site.

4.2 Sequential and Exception Tests

4.2.1 The entire site is located in Flood Zone 1. Therefore Sequential and Exception Tests are not required.

4.3 Climate Change

4.3.1 PPG advises that the flood risk vulnerability of the development is "less vulnerable". Therefore there is no requirement to explore the impact of climate change on fluvial flooding.

4.3.2 Given the anticipated lifetime of similar B2/B8 developments, the flood risk assessment should assess the flood risk associated with both 10% and 20% increase in peak rainfall intensity as a result of climate change. As a further sensitivity assessment, 40% climate change should be reviewed.

4.4 Rainwater Disposal Hierarchy

4.4.1 Ground conditions are suitable for infiltration drainage, so this method has been developed as a means to beneficially reduce rainwater run off from the proposed development compared to existing flow. This is subject to space constraints, especially with regards to the large, mature trees to the eastern side of the site.

4.5 Control of Rainfall Run Off

4.5.1 The entire site is brown field. Whereas the aim would be to reduce the peak rate of run off from the development to surface water to an amount similar to that estimated to have occurred when the site was in its original green field condition, it would be permissible to retain existing rainfall run off rates.

4.6 Ensuring Quality of Development Rainwater Run Off

4.6.1 Recommendations of the SuDS Manual apply.

4.7 Sewage Disposal

4.7.1 All domestic sewage should be disposed of to the foul sewer, as existing.

4.7.2 If any trade effluent is generated by the development, the producers will have to make their own arrangements for its disposal. Thames Water is not obliged to receive it into its foul sewer. The probability is that treatment and disposal of trade effluent on site is unlikely to be approved.

4.7.3 Trade effluent is a matter that can be dealt with if and when it arises, for instance by storage and disposal by road tanker, as the developer proposes that only domestic sewage will be produced by the development.

5 PROPOSED DRAINAGE STRATEGY

5.1 Sewage Drainage Strategy

5.1.1 Sewage will be collected by an underground piped drainage system and discharge to the Thames Water foul sewer in Fir Lane, similar to existing. The system will be designed and built compliant with Building Regulations following the grant of planning consent and an assessment of which, if any, parts of the existing foul drainage system are suitable for reuse either as is or refurbished. A drainage strategy is included as Appendix D.

5.2 Rainwater and Surface Water Drainage Strategy

5.2.1 Following infiltration testing, it has been confirmed that infiltration will be used to reduce rainwater run off from the development compared to the current brown field situation, such that discharge to off site watercourse, although it will continue, will be significantly less than existing. The new drainage system will be designed with the principal objectives of i) controlling local flooding on the surface of the site to applicable standards, ii) intercepting overland flow from higher ground, iii) limiting overland flow from the site to land downstream, including to Fir Lane, iv) meeting the objective of reducing overall discharge rates to off site land drainage, and v) ensuring that discharges to surface waters and ground water are of appropriate quality.

5.2.2 Unless further testing demonstrates that infiltration drainage cannot achieve these objectives or it is not achievable at reasonable cost, alternative forms limiting discharge to off site surface waters, principally entailing storage on site and physically controlling the rate of discharge, will not be considered any further.

5.2.3 Water butts are shown indicatively on the drainage layout and have been considered as part of this assessment to improve water consumption. Should they be feasible, they should implemented to the development.

5.2.4 It should be noted that the lowest part of the site in the eastern boundary along Fir Lane, is lined with mature trees. Drainage infrastructure and infiltration trenches have been located away from these areas to protect the trees and roots. This provides no option for utilising infiltration techniques for disposing of storm water from the lowest lying part of the site, which shall reuse the existing outfall to the drain within Fir Lane.

5.2.5 Whereas green roofs could be used to control rainwater run off and improve the quality of water discharged from site, they are not being considered because the proposed buildings are not strong enough to support the great weight of such roofs.

5.3 Water Quality

5.3.1 New/refurbished parking areas will drain to groundwater via permeable surface and porous sub base. The bedding layer for the permeable external roads and car park will achieve satisfactory removal of most pollutants generated by the parking areas.

5.3.2 Proposed roofs will drain to both trench soakaways and via the existing outfall pipe to off site watercourse. The proposal is to include large catchpits to act as sediment traps on the drainage pipework between roofs and soakaways and the outfall pipe where required.

5.3.3 Existing road drainage will be retained unaltered, with suitable maintenance for improved performance.

5.4 Details of Surface Water Drainage Strategy

5.4.1 Appended LE19055-HMA-LE-GEN-XX-500-S5 - Proposed Drainage Layout and LE19055-HMA-LE-GEN-XX-501-S5 - Existing Impermeable Catchment describe the proposed surface water drainage system and are included in Appendix C. The drainage system proposed comprises permeable surfacing and trench soakaways serving 6,142 square metres of roofs, parking area and roadways. 1,850 square metres of proposed drained area will continue to drain to the existing surface water outfall leading to a local watercourse. Currently 4.650 square metres of drained area discharges to the existing outfall unrestricted. The development proposals secure a minimum 60% reduction in drained area compared to the existing situation and the same reduction on discharge rate and volume for up to the 100 year storm event plus climate change allowance.

5.4.2 Surface water drainage as proposed is demonstrated by Appendix C, Supporting Microdrainage Calculations, completed for each catchment at the 10 year and 100 year storm event plus 40% climate change allowance.

5.5 Exceedance Flows

5.5.1 Drainage exceedance flows, ie those that may occur due to rainfall exceeding drainage capacity, will be over ground to Fir Lane very similar to existing. Location and direction of exceedance flows are indicated by green arrows on the Proposed Drainage Layout. Surface water on Fir Lane drains over the edge eastwards to existing watercourses. No third party is affected.

6 Drainage Management Plan

6.1 Responsibility

6.1.1 The occupier of the proposed development shall be responsible for the maintenance and operation of the drainage system, including any attenuation and flow control devices.

6.2 Maintenance of Pipe Networks

6.2.1 Maintenance and management of main storm sewers and chambers inclusive of pipework from paved areas and buildings (but excluding internal building drainage) should be visually inspected and jetted/cleaned as required. As a minimum, this should be carried out every 5 years. Methods of inspection to give indications of blockages etc. may include:

- Pulling a mandrel through the pipe to identify physical faults (e.g. disjointed pipes).
- Flushing/jetting.
- CCTV.
- Measurement of water depths in pipe entries, catchpits or interceptors along a drain run may identify potentially blocked pipes.

6.2.2 Gully gratings, manhole gratings and channel gratings shall be visually inspected at least once every year and replaced or re-set if damaged or dislodged. Gullies should be inspected at least once every year, ideally during spring time as the Autumn and Winter seasons produce the most detritus build up in the form of leaves, litter and silt. This material should be removed from the channels and disposed of at a licensed tip. This material should not be tipped in other areas of the development as it may pose a pollution threat to the surrounding drainage system.

6.2.3 Sediment released by drain jetting should be sucked out by a vacuum road tanker as it is freed, to avoid the sediment adversely affecting the downstream drainage system.

6.3 Maintenance of SuDS Features

6.3.1 The regular and correct maintenance of the SuDS feature is essential to the continued performance. The SuDS Manual C753 provides advice on the management of the system. The recommended maintenance regimes for the soakaways and porous paving, detailed within Tables 1 and 2 shown on the following two pages, shall form the basis of the strategy for the provided development.

TABLE 13.1 Operation and maintenance requirements for soakaways

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

Table 1 – Table 13.1 of CIRIA 753

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2 – Table 20.15 of CIRIA 753

6.3.2 It should be noted that maintenance regimes detailed above are an initial recommendations and the actual maintenance work undertaken should be adapted by the maintenance provider to suit the actual performance and needs of the drainage system.

7 SUMMARY

7.1.1 This site specific Flood Risk Assessment and Drainage Strategy has been prepared in accordance with NPPF national guidance and local policy in support of the redevelopment of an existing B1/B8 development at a former poultry farm.

7.1.2 Flood Map for Planning shows the site is located within Flood Zone 1. Updated Flood Map for Surface Water shows no surface water flooding on or close to the site.

7.1.3 Site inspection confirmed that there is negligible risk to the site from fluvial flooding, but there is a likelihood of occasional overland flooding occurring from higher ground to the west.

7.1.4 Sediment has accumulated in parts of the existing surface water drainage system seriously affecting its efficiency, and some parts of the existing development do not benefit from surface water drainage.

7.1.5 It is proposed to reuse the existing piped outfall to an off site watercourse to serve approximately 23% of the development, which is a significantly smaller area than the piped outfall currently serves. The remaining catchment of the development will be drained by a combination of permeable external areas and trench soakaways.

7.1.6 All sewage will discharge to the Thames Water foul sewer in Fir Lane, similar to existing.

7.1.7 Such arrangements comply with national and local planning policies and drainage standards.

8 CONCLUSION

8.1.1 Drainage does not constrain the grant of consent to the development as proposed. Details of surface water drainage can be controlled by an appropriate planning condition. Details of foul drainage can be controlled by Building Regulations.

APPENDICES

APPENDIX A – Proposed Site Plan

PLANNING

1:250

5m 0 5m 10m 15m 20m 25m

N

Planning Application area

Area within site ownership

REV MARK	REVISION DESCRIPTION	REVISION DATE
A	Planning Application Area Updated.	18.03.21

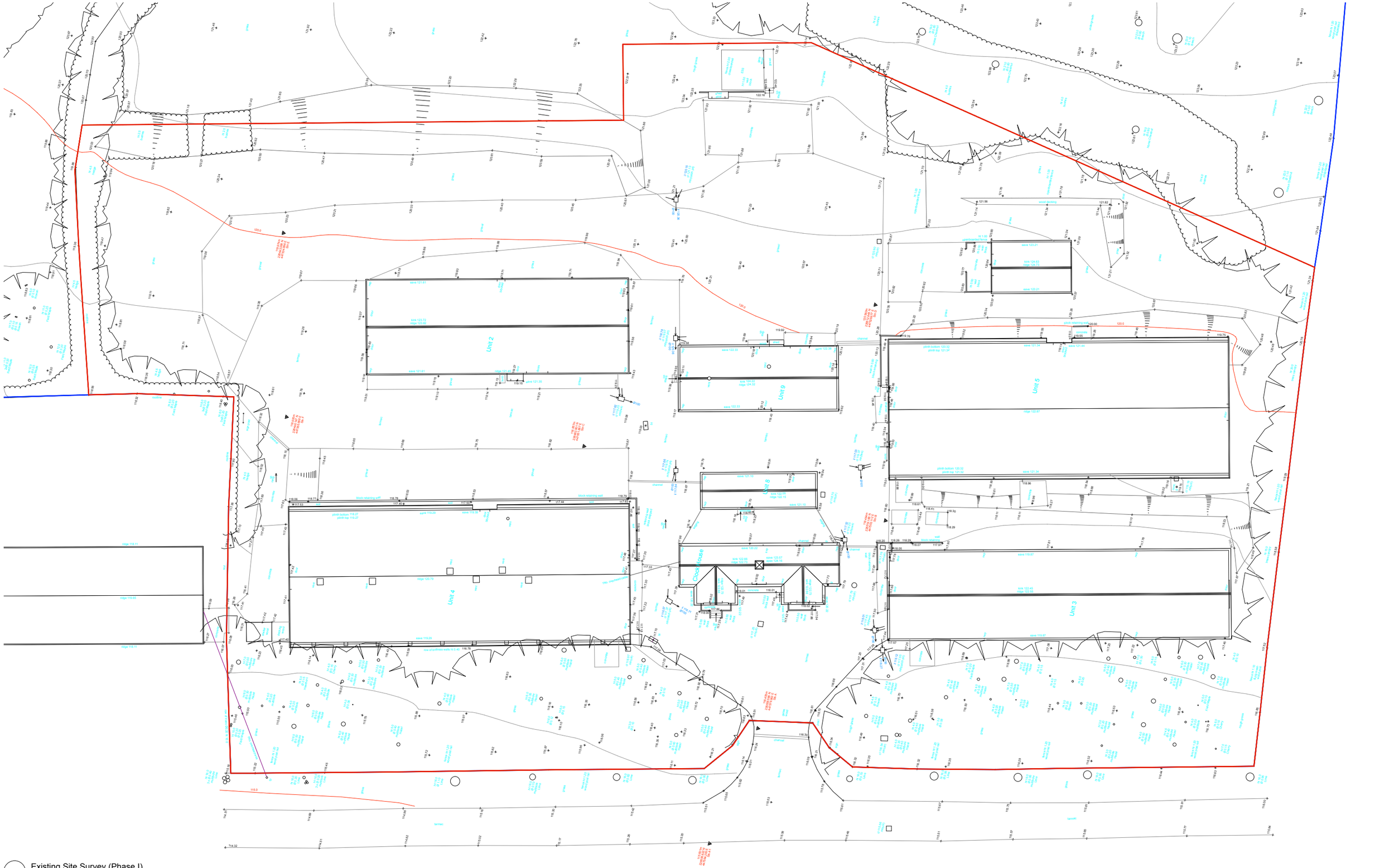
- The Hatchery

- Middle Aston

HAWKINS PROJECTS LTD
Unit 9a Thorpe Way
Banbury Oxfordshire
OX16 4SP
t 01295 252 363
f 01295 251 008
e info@hawkins-group.co.uk
www.hawkins-group.co.uk

DRAWING TITLE	- Proposed Site Plan		
CONTRACT	- The Hatchery		
MODELLED BY	- HS	ISSUE DATE	-
CONTRACT NO	- JOB139990	SCALE	- 1:250 @A1
DRAWING No	- 139990_P101	REVISION No.	A

APPENDIX B – Topographical Survey



1 Existing Site Survey (Phase I)
Scale: 1:200

Rev	Date	Dwn	Chckd	Description	Rev	Date	Dwn	Chckd	Description

DRAFT PLANNING ISSUE

6 King Street Bristol BS1 4EQ
T 0117 929 9293 E info@fm-architects.co.uk
F 0117 929 9295 W fm-architects.co.uk

0 10m

North

ferguson mann architects

Job Title: Hatch End, Middle Aston				Drawing Title: Existing Site & Topo Survey		
Client: Middle Aston Limited						
Scale: 1:200 @ A1 1:400 @ A3	Date: 15.05.19	Dwn: RG	Chckd: AK	Job No: 10949	Drawing No: PL-002 (SK)	Rev

APPENDIX C – Thames Water Sewer Records

Asset location search

Property Searches

Jones-Parry Associates Limited
HOOK
RG27 8DB

Search address supplied

Middle Aston Limited
Hatch End Old Poultry Farm
Middle Aston
Bicester
OX25 5QL

Your reference The Hatchery Middle Aston

Our reference ALS/ALS Standard/2019_4108117

Search date 26 November 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

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

searchcode

Asset location search

Property Searches

Search address supplied: Middle Aston Limited, Hatch End Old Poultry Farm, Middle Aston, Bicester, OX25 5QL

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:

SP4726SW
SP4726NE
SP4726NW
SP4726SE

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:

SP4726SW
SP4726NE
SP4726NW
SP4726SE

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

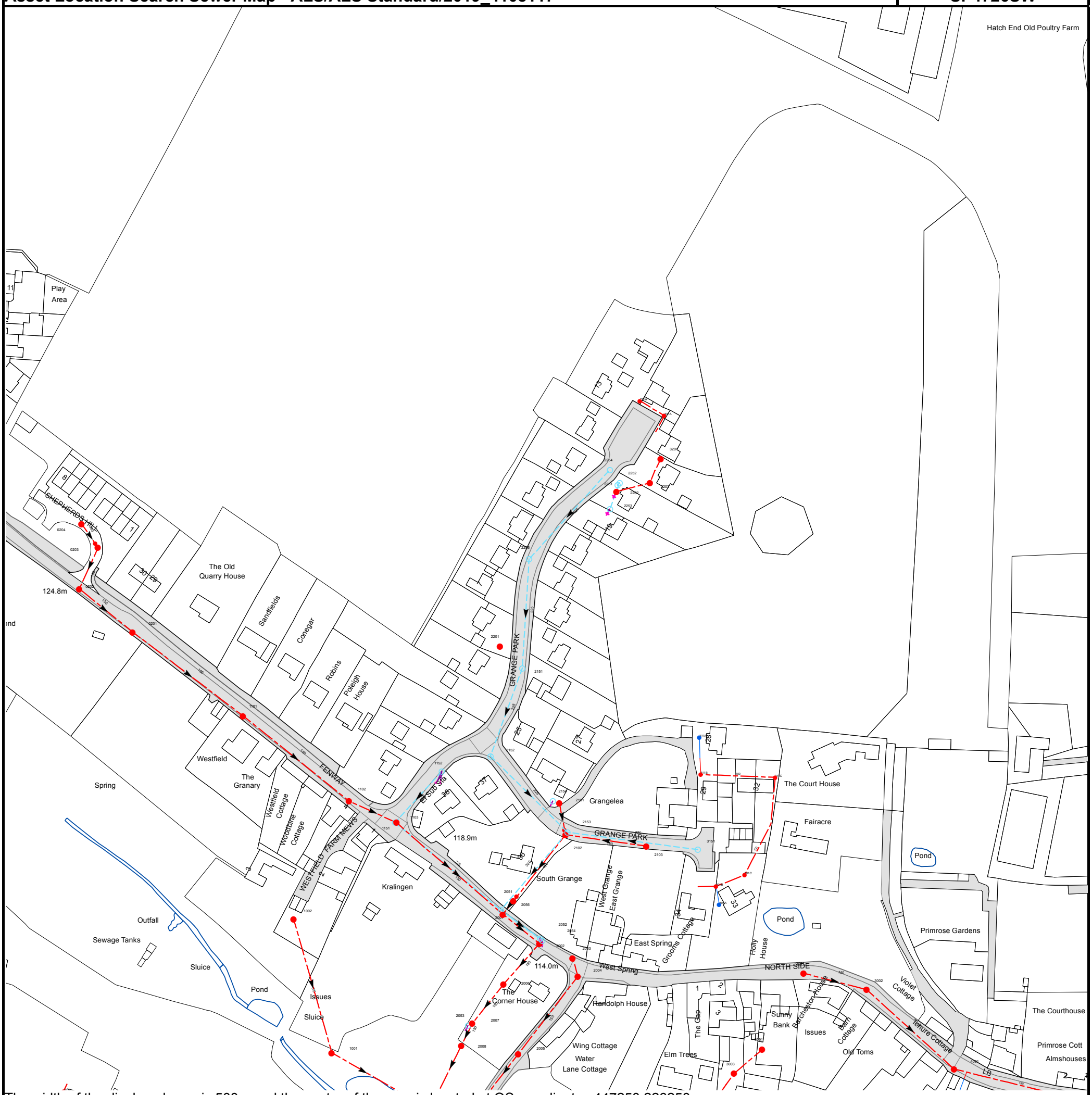
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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/2019_4108117

SP4726SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 447250,226250

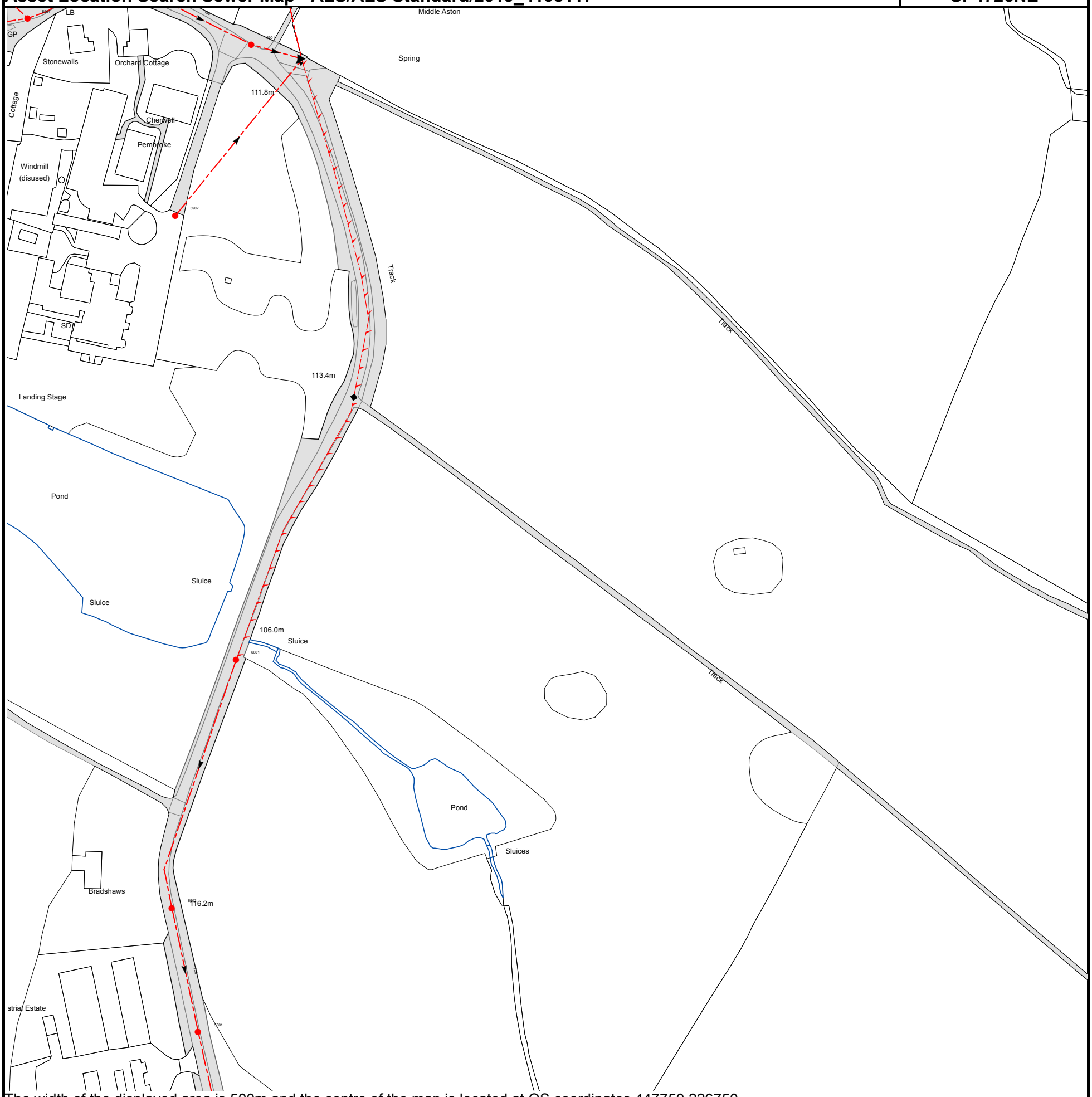
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual 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
3151	120.75	119.01
2103	120.93	118.77
2102	121.25	118.09
2153	121.28	117.77
1103	119.05	117.06
1151	119.03	117.45
2101	122.15	119.84
1102	119.34	117.81
2154	121.99	120.08
311C	n/a	n/a
311B	n/a	n/a
1152	121.41	119.25
2152	122.67	121.75
311A	n/a	n/a
1101	121.69	119.69
2151	125.16	124
2201	126.67	124.18
2255	127.44	126.22
2253	128.66	126.1
2202	128.84	126.59
2251	128.69	127.08
2252	128.9	126.91
2203	128.65	126.93
2254	128.89	127.24
3201	128.79	127.27
331A	n/a	n/a
231A	n/a	n/a
3003	114.87	113.63
2005	108.86	107.59
1001	108.45	107.02
3091	n/a	n/a
2008	109.98	109.34
2053	110.69	109.09
2007	110.77	109.62
3002	113.67	112.32
2006	113.97	110.89
2004	113.82	112.29
3001	113.96	112.49
2003	114.05	113.33
2002	115.03	113.13
2054	115.11	113.79
2052	115.11	113.79
1002	112.94	111.58
2001	116.1	114
2051	116.23	114.67
301A	n/a	n/a
2056	n/a	n/a
301B	n/a	n/a
301C	n/a	n/a
4001	113.64	111.88
001A	n/a	n/a
0202	124.7	123.36
0204	127.35	125.56
0203	126.25	124.36
0201	123.36	121.79

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4108117

SP4726NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 447750,226750

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
5901	117.12	115.76
6901	112.11	110.91
5501	115.72	113.75
5502	116.07	114.63
6601	n/a	n/a
5902	n/a	n/a

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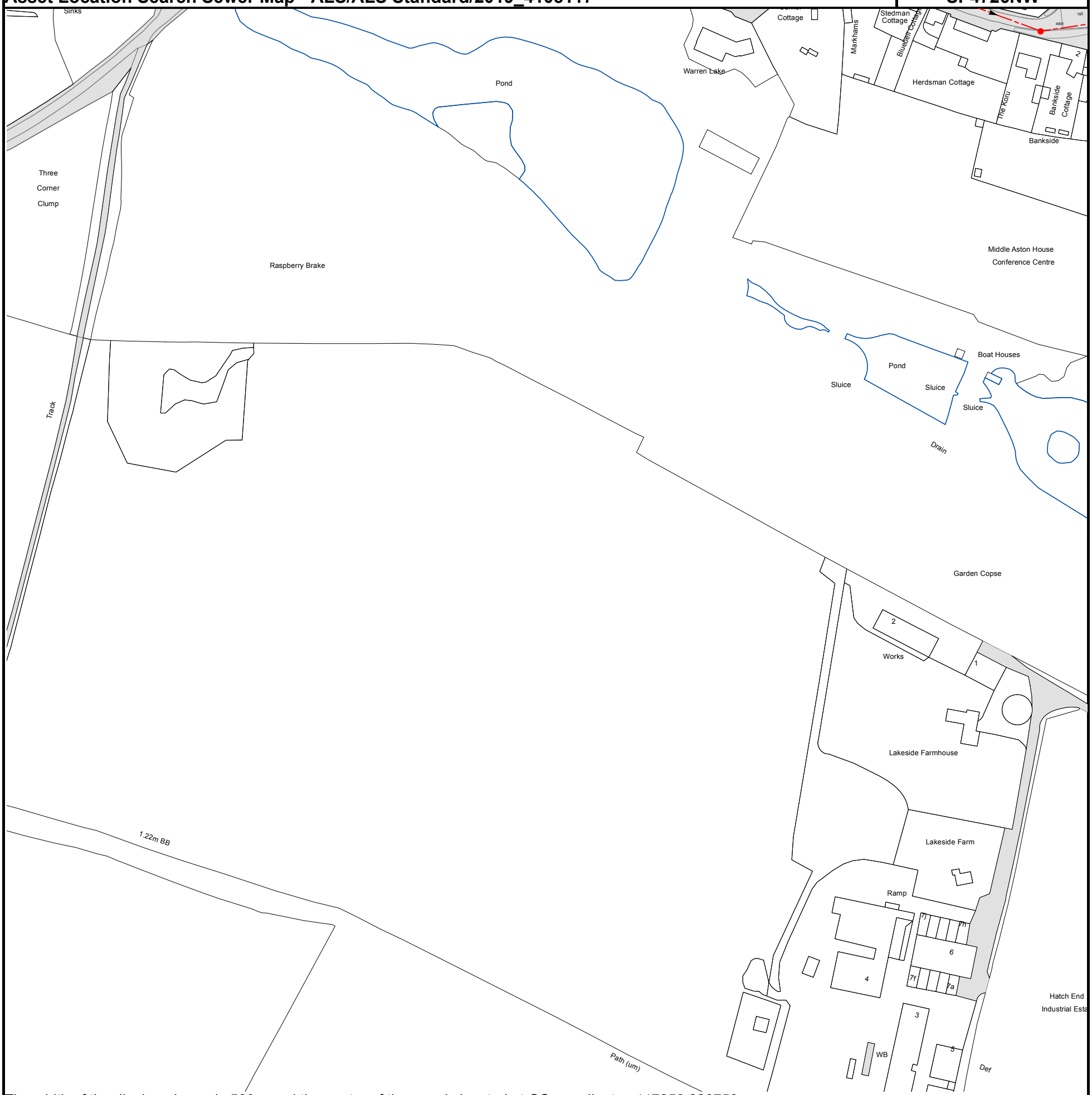
Asset Location Search Sewer Map - ALS/ALS Standard/2019_4108117

SP4726NW



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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
4901	119.45	117.98

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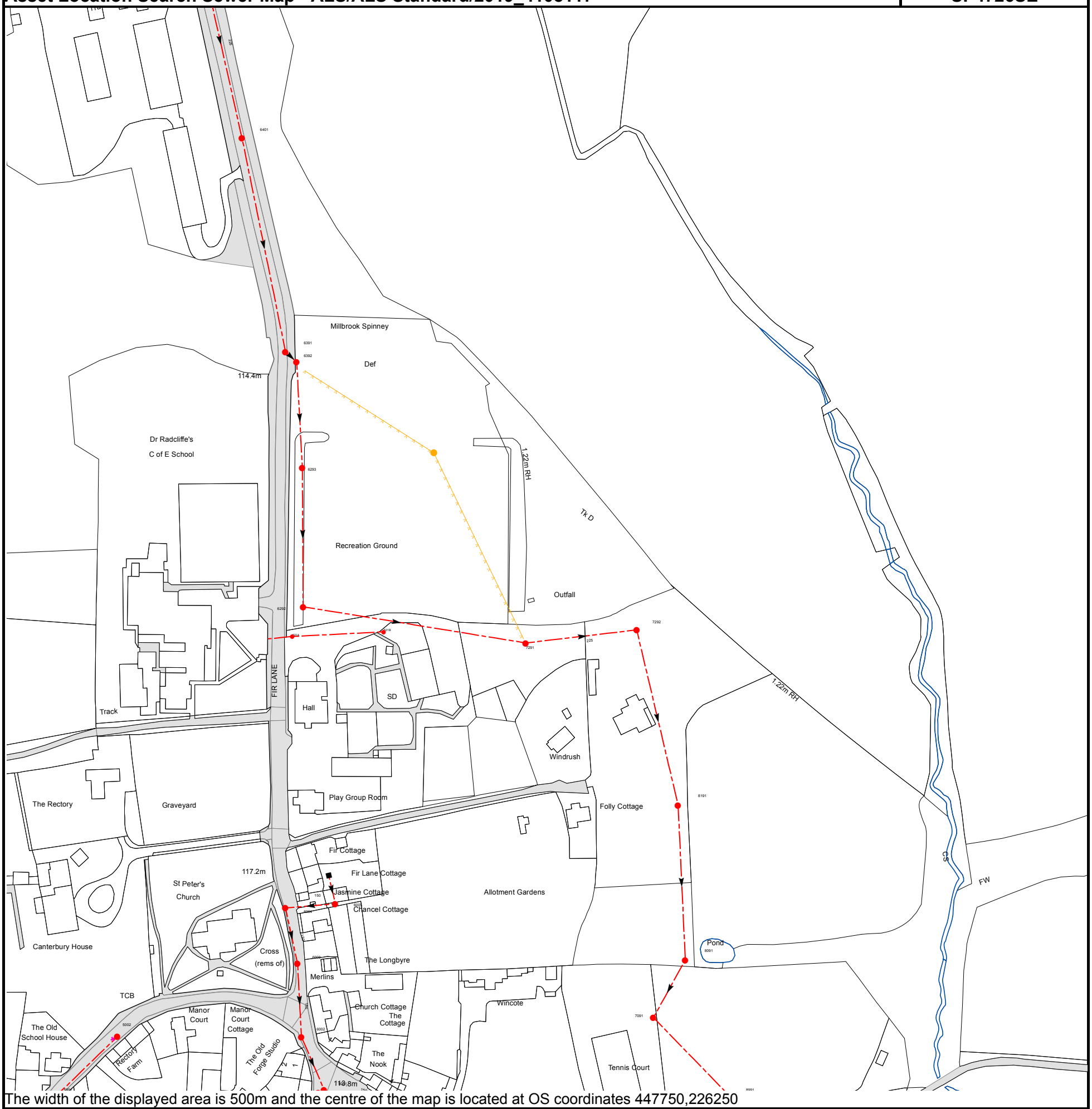
Asset Location Search Sewer Map - ALS/ALS Standard/2019_4108117

SP4726SE



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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
6002	114.51	113.07
5002	114.84	113.31
6003	115.62	113.87
6004	116.36	114.57
621A	n/a	n/a
6292	111.2	108.7
6293	111.22	109.22
6392	111.4	110.2
6391	114.33	111.98
6401	114.29	112.6
6001	113.27	112.49
6005	116.22	114.87
621B	n/a	n/a
7291	110.39	107.39
7292	n/a	n/a
7091	n/a	n/a
8191	n/a	n/a
8091	n/a	n/a

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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

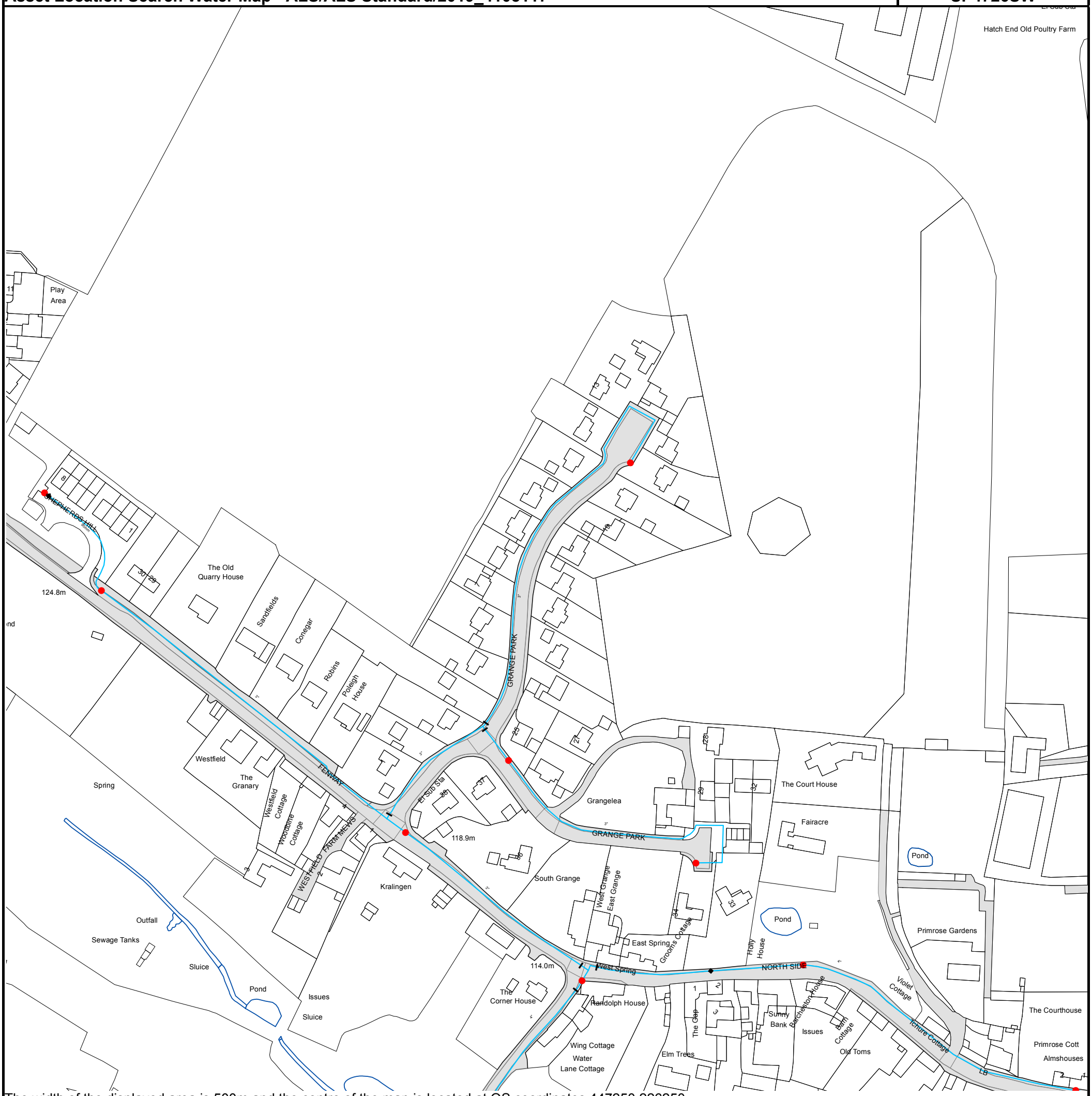
Abandoned Sewer

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/2019_4108117

SP4726SW



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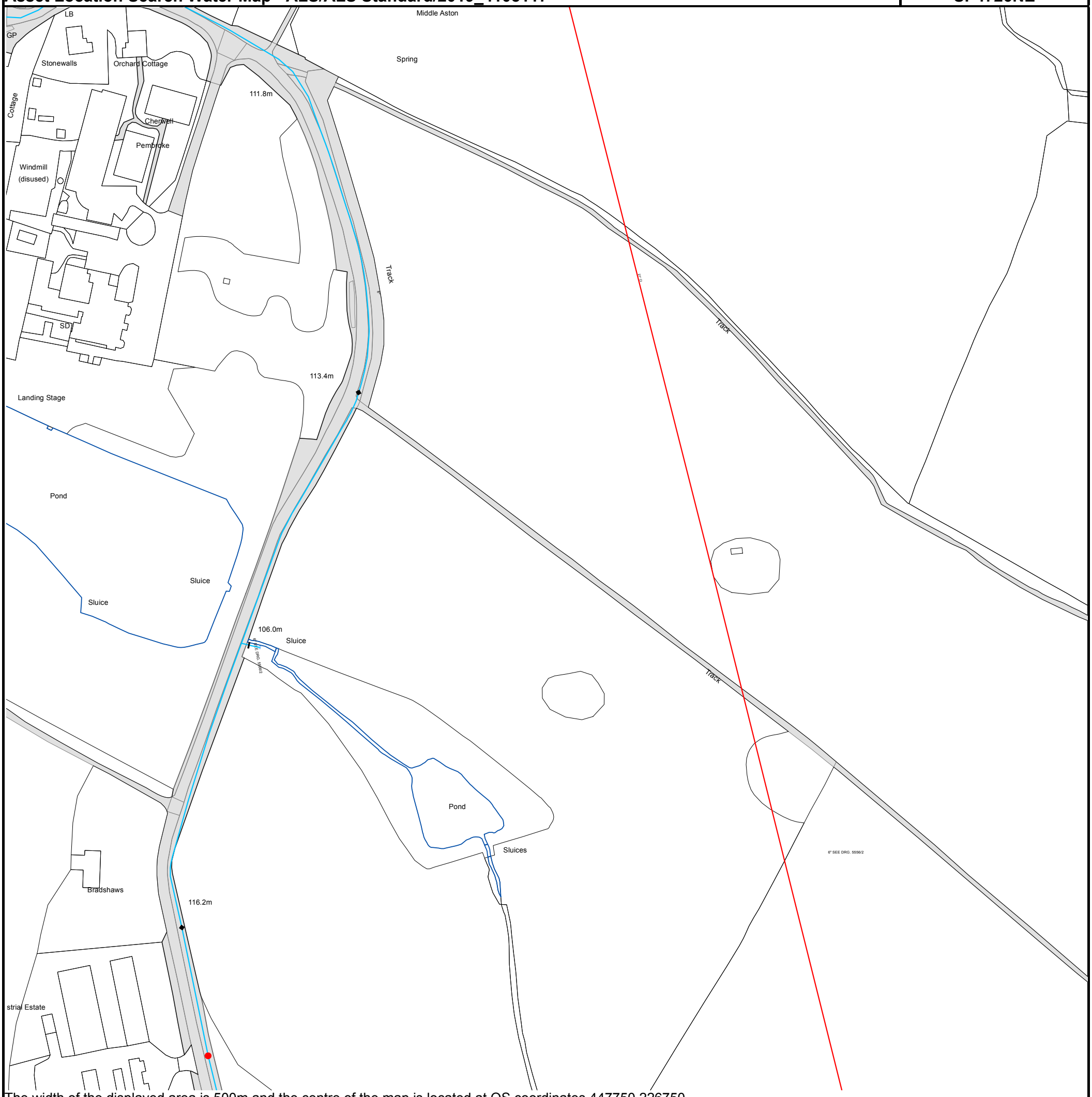
Asset Location Search Water Map - ALS/ALS Standard/2019_4108117

SP4726NE



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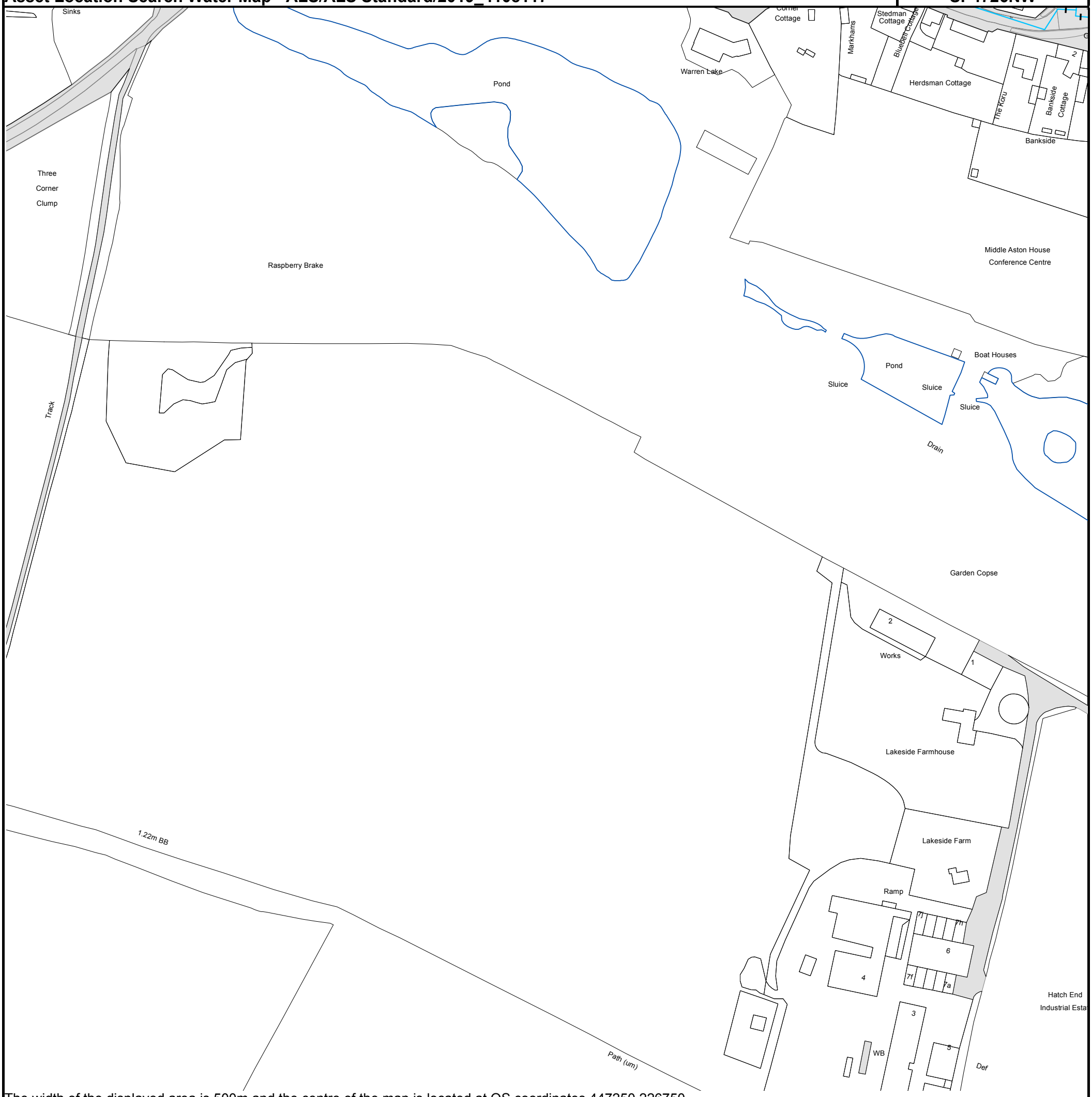
Asset Location Search Water Map - ALS/ALS Standard/2019_4108117

SP4726NW



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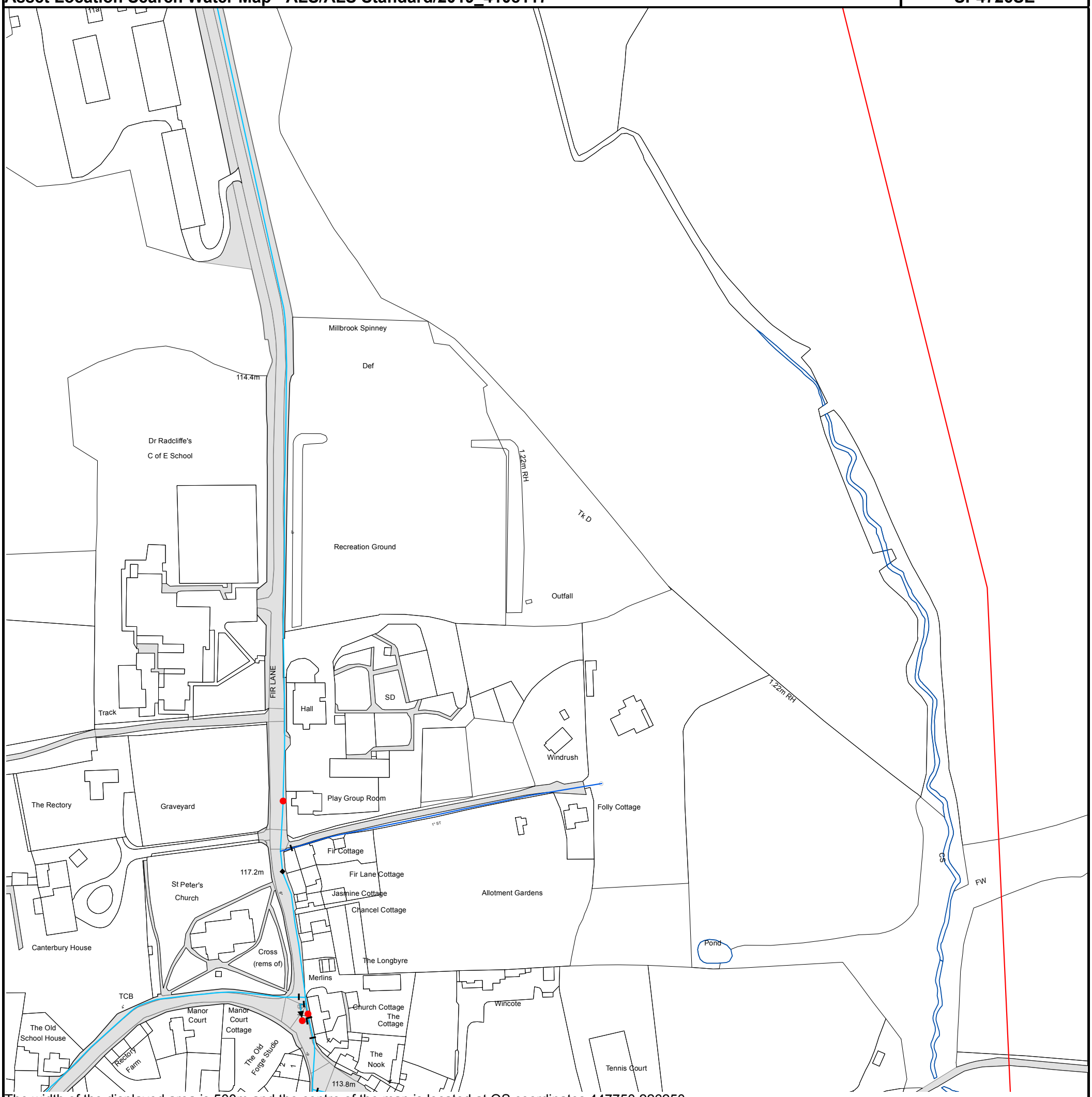
Asset Location Search Water Map - ALS/ALS Standard/2019_4108117	SP4726SE



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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.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

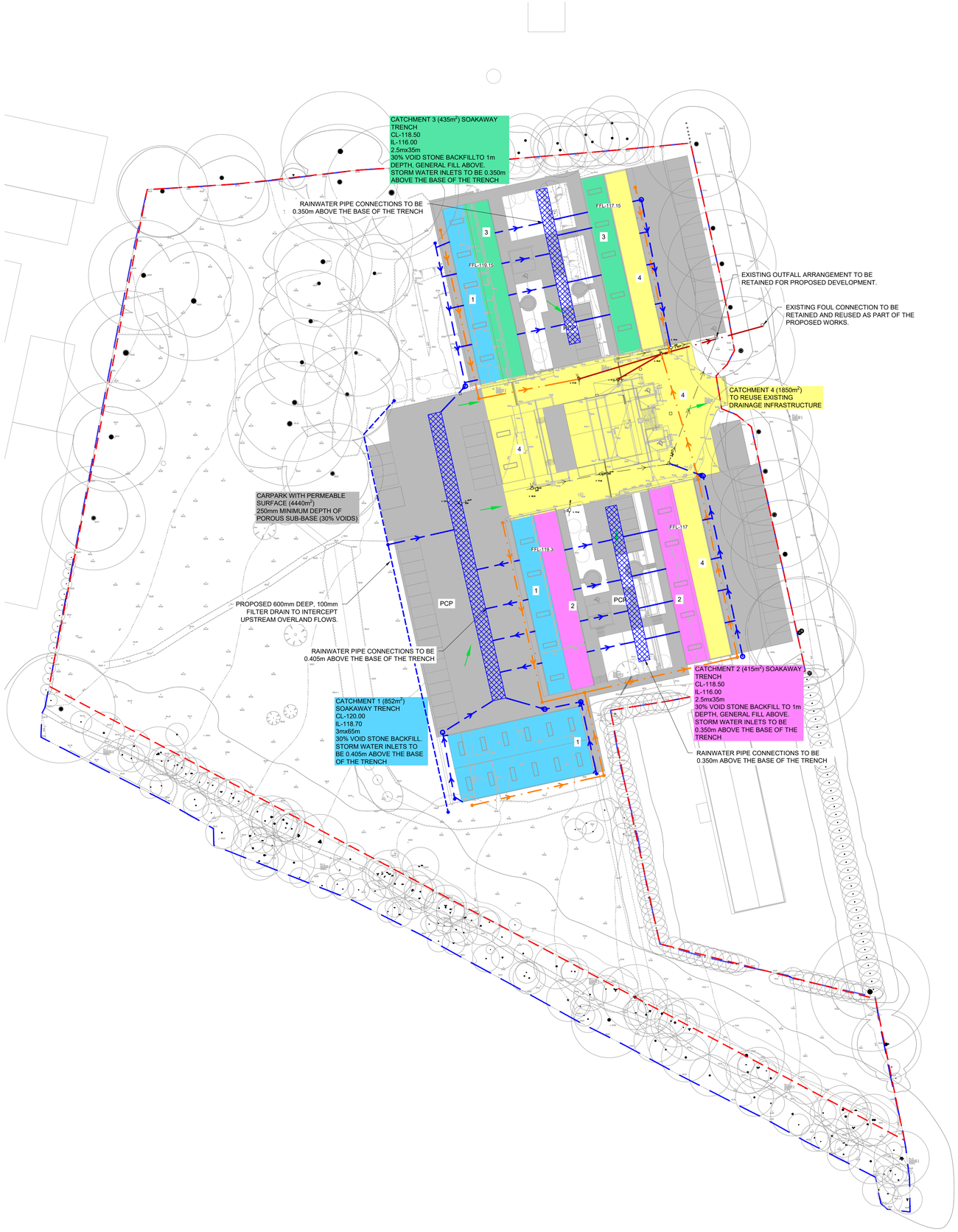
You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

APPENDIX D – Drainage Strategy Drawing No. HMA-LE-GEN-XX-RD-500-S5-A1,

Existing Impermeable Catchment Drawing No. HMA-LE-GEN-XX-RD-501-S5-A1

Supporting MicroDrainage Calculations



DRAINAGE KEY

- INDICATIVE PROPOSED UNDERGROUND STORM DRAINAGE. EXACT LOCATIONS TO BE COORDINATED WITH EXISTING DRAINS TO BE RETAINED.
- INDICATIVE PROPOSED UNDERGROUND FOUL DRAINAGE. EXACT LOCATIONS TO BE COORDINATED WITH EXISTING DRAINS TO BE RETAINED.
- PROPOSED TRENCH SOAKAWAY TO SERVE EXTERNAL AREAS AND ROOF DRAINS. REFER TO CALCULATIONS AND INDIVIDUAL CATCHMENTS FOR SIZES AND REQUIREMENTS.
- EXISTING STORM DRAINS BASED ON TOPOGRAPHICAL SURVEY. RUNS TO BE CONFIRMED PRIOR TO CONSTRUCTION.
- EXISTING FOUL DRAINS BASED ON TOPOGRAPHICAL SURVEY. RUNS TO BE CONFIRMED PRIOR TO CONSTRUCTION.
- PROPOSED STORM RODDING EYE
- PROPOSED FILTER DRAIN AT TOE OF EXCAVATION
- EXCEEDANCE OVERLAND FLOW ROUTE
- PROPOSED WATER BUTT. LOCATION SHOWN INDICATIVELY.

CATCHMENT KEY

PCP — PROPOSED CAR PARK WITH PERMEABLE SURFACE - TOTAL AREA 4440m²
CAR PARKS TO DRAIN DIRECTLY THROUGH POROUS SUB-BASE AND INFILTRATE TO THE GROUND. MINIMUM POROUS SUB-BASE DEPTH (30% VOIDS) TO BE 300mm, REFER TO MICRODRAINAGE CALCULATIONS PROVIDED.

1 — PROPOSED BUILDING ROOF - 852m² - CATCHMENT 1
TO BE DRAIN THROUGH UNDERGROUND DRAINS TO SOAKAWAY TRENCH. REFER TO MICRODRAINAGE CALCULATIONS PROVIDED.
RAIN WATER PIPE CONNECTIONS TO BE LAID AT LEAST 0.405m ABOVE THE BASE, WHICH WILL BE ABOVE THE 10yr WATER LEVEL.

2 — PROPOSED BUILDING ROOF - 415m² - CATCHMENT 2
TO BE DRAIN THROUGH TO SOAKAWAY TRENCH. REFER TO MICRODRAINAGE CALCULATIONS PROVIDED.
RAIN WATER PIPE CONNECTIONS TO BE LAID AT LEAST 0.350m ABOVE THE BASE, WHICH WILL BE ABOVE THE 10yr WATER LEVEL.

3 — PROPOSED BUILDING ROOF - 435m² - CATCHMENT 3
TO BE DRAIN THROUGH TO SOAKAWAY TRENCH. REFER TO MICRODRAINAGE CALCULATIONS PROVIDED.
RAIN WATER PIPE CONNECTIONS TO BE LAID AT LEAST 0.350m ABOVE THE BASE, WHICH WILL BE ABOVE THE 10yr WATER LEVEL.

4 — PROPOSED BUILDING ROOF AND EXISTING EXTERNAL YARD - 1850m² - CATCHMENT 4
TO BE DRAINED THROUGH THE EXISTING DRAINAGE INFRASTRUCTURE WITHIN THE SITE. TOTAL AREA DISCHARGING UNRESTRICTED REDUCED BY 60% FROM 4650m². REFER TO DRAWING HMA-LE-GEN-XX-DR-501 - EXISTING IMPERMEABLE CATCHMENT DRAWING.

DRAINAGE NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE FLOOD RISK ASSESSMENT REPORT, HMA-LE-GEN-XX-RP-FRA01.
2. SITE PERMEABILITY BASED ON INFILTRATION TESTING COMPLETED AT 0.063m/hr AND 0.017mm/hr. 0.017mm/hr USED FOR DESIGN PURPOSES AS A CONSERVATIVE APPROACH.
3. DRAINAGE INFILTRATION CALCULATIONS COMPLETED FOR EACH CATCHMENT TO SIZE THE SOAKAWAY TRENCH.
4. TRENCHES AND PERMEABLE CAR PARKS TO BE FILLED WITH STONE OF 30% MINIMUM POROSITY.
5. THE REDUCTION IN IMPERMEABLE CATCHMENT DRAINING TO THE OUTFALL PROVIDES SIGNIFICANT BETTERMENT TO OFFSITE FLOODING AND SATISFIES NATIONAL AND LOCAL PLANNING REQUIREMENTS.

GENERAL NOTES

1. THIS DRAWING SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF LINK ENGINEERING.
2. DO NOT SCALE FROM THIS DRAWING. UNITS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
3. THE CONTRACTOR IS TO CHECK ALL INFORMATION PROVIDED PRIOR TO COMMENCING WORKS AND SEEK CLARIFICATION FROM THE ENGINEER IN RESPECT TO ANY AMBIGUITIES FOUND.
4. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER SCHEME SPECIFIC DRAWINGS.
5. PAVEMENT SURFACING AND FOUNDATIONS SHALL BE DESIGNED IN ACCORDANCE WITH THE DEPARTMENT FOR TRANSPORT'S DESIGN MANUAL FOR ROADS AND BRIDGES AND SHALL COMPLY WITH THE ADOPTING LOCAL HIGHWAY AUTHORITY'S DESIGN GUIDANCES WHERE APPLICABLE, FOLLOWING A FULL SITE INVESTIGATION TO ESTABLISH GROUND CONDITIONS.
6. ALL TRAFFIC SIGNS AND ROAD MARKINGS SHALL BE PROVIDED IN ACCORDANCE WITH THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016 (INCLUDING SUBSEQUENT AMENDMENTS 1 & 2) AND THE CORRESPONDING TRAFFIC SIGNS MANUALS
7. ALL ADOPTABLE STREETLIGHTING SHALL BE DESIGNED IN ACCORDANCE WITH THE ADOPTING LOCAL HIGHWAY AUTHORITY'S DESIGN GUIDANCES WHERE APPLICABLE. LIGHTING SHALL BE DESIGNED TO BS 5489 (2013) AND BS EN 13201 (2015) FOR THE APPROPRIATE ROUTE CLASSIFICATION.
8. ALL ADOPTABLE HIGHWAY WORKS SHALL BE ADOPTED VIA THE HIGHWAY AUTHORITY ACT 1980.
9. FOUL AND SURFACE WATER DRAINAGE STRATEGIES SHALL BE DESIGNED IN STRICT ACCORDANCE WITH THE SITE SPECIFIC FLOOD RISK ASSESSMENT RECOMMENDATIONS.
10. ALL ADOPTABLE DRAINAGE WORKS SHALL BE DESIGNED IN ACCORDANCE WITH "SEWERS FOR ADOPTION", THE "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY" 6th EDITION AND ANY SUBSEQUENT AMENDMENTS TO THESE DOCUMENTS AS ADVISED.
11. ALL ADOPTABLE DRAINAGE WORKS SHALL BE ADOPTED VIA THE WATER INDUSTRY ACT 1991.
12. ALL PRIVATE WORKS SHALL BE DESIGNED TO THEIR RESPECTIVE PARTS OF BUILDING REGULATIONS.
13. FOR FINAL DEVELOPMENT LAYOUT AND LANDSCAPING PROPOSALS, SEE ARCHITECTS' PLANS.
14. PLANTING OR ANY OBSTRUCTIONS OF ANY KIND (OTHER THAN ESSENTIAL STREET FURNITURE) ARE NOT PERMITTED WITHIN THE CARRIAGEWAY VISIBILITY SPLAYS.
15. ALL EARTHWORK SLOPES TO BE NO STEEPER THAN 1 IN 3 UNLESS ADVISED OTHERWISE WITHIN SPECIFIC SITE INVESTIGATION DESIGN REPORT TO BE PROVIDED.

Rev.	Amendments	Date	By
D	ISSUED FOR PLANNING	23.03.21	CH
C	UPDATED LAYOUT AND CATCHMENTS	17.03.21	CH
B	UPDATED LAYOUT AND CATCHMENTS	07.04.20	CH
A	ISSUED FOR PLANNING	29.11.19	CH
-	INITIAL ISSUE.	21.11.19	CH

Revisions

Client
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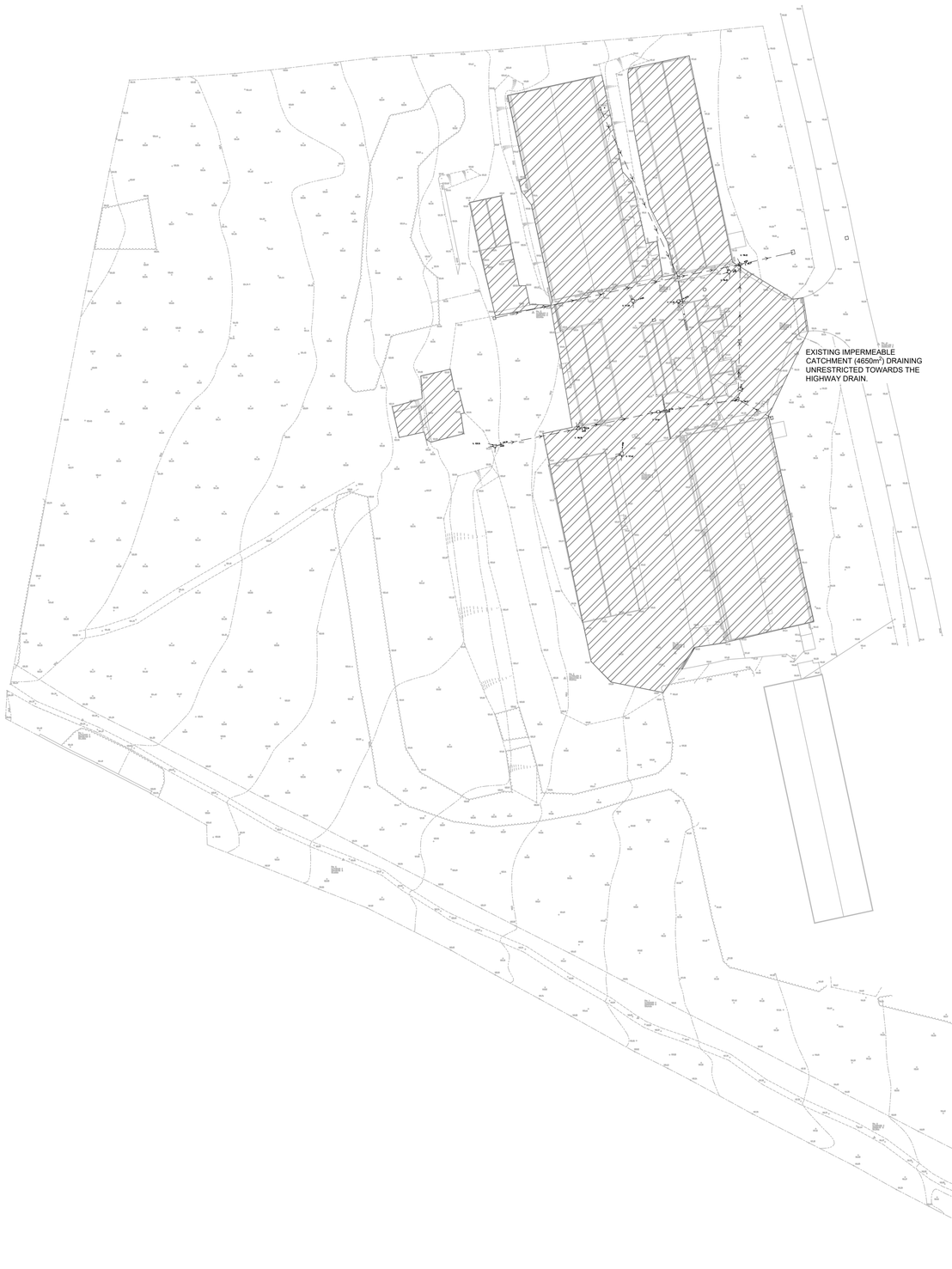
Project
LE19055
THE HATCHERY
MIDDLE ASTON

Drawing
PROPOSED DRAINAGE STRATEGY

Scale @ A1	Drawn	Checked	Rev
1:500	CH	NHM	D

Drawing No. HMA-LE-GEN-XX-DR-CE-500
Status PLANNING (S5)



GENERAL NOTES

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10. ALL ADOPTABLE DRAINAGE WORKS SHALL BE DESIGNED IN ACCORDANCE WITH "SEWERS FOR ADOPTION", THE "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY" 6th EDITION AND ANY SUBSEQUENT AMENDMENTS TO THESE DOCUMENTS AS ADVISED.
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Rev.	Amendments	Date	By
A	UPDATED PLANNING ISSUE	23.03.21	CH
-	INITIAL ISSUE.	07.04.20	CH

Revisions

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Drawing
EXISTING IMPERMEABLE CATCHMENT

Scale @ A1	Drawn	Checked	Rev
1:500	CH	NHM	A

Drawing No
HMA-LE-GEN-XX-DR-CE-501

Status
PLANNING (S5)

Summary of Results for 10 year Return Period

Half Drain Time : 238 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	119.004	0.304	0.7	11.4	O K
30 min Summer	119.056	0.356	0.7	14.5	O K
60 min Summer	119.103	0.403	0.7	17.2	O K
120 min Summer	119.138	0.438	0.8	19.3	O K
180 min Summer	119.146	0.446	0.8	19.8	O K
240 min Summer	119.146	0.446	0.8	19.7	O K
360 min Summer	119.140	0.440	0.8	19.4	O K
480 min Summer	119.132	0.432	0.8	18.9	O K
600 min Summer	119.122	0.422	0.7	18.4	O K
720 min Summer	119.112	0.412	0.7	17.8	O K
960 min Summer	119.090	0.390	0.7	16.5	O K
1440 min Summer	119.050	0.350	0.7	14.2	O K
2160 min Summer	118.999	0.299	0.7	11.2	O K
2880 min Summer	118.959	0.259	0.7	8.8	O K
4320 min Summer	118.910	0.210	0.6	5.9	O K
5760 min Summer	118.882	0.182	0.5	4.5	O K
7200 min Summer	118.862	0.162	0.5	3.5	O K
8640 min Summer	118.846	0.146	0.4	2.9	O K
10080 min Summer	118.833	0.133	0.4	2.4	O K
15 min Winter	119.004	0.304	0.7	11.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	60.278	0.0	25
30 min Summer	38.832	0.0	39
60 min Summer	24.003	0.0	68
120 min Summer	14.465	0.0	124
180 min Summer	10.672	0.0	180
240 min Summer	8.577	0.0	212
360 min Summer	6.291	0.0	276
480 min Summer	5.045	0.0	342
600 min Summer	4.250	0.0	410
720 min Summer	3.693	0.0	478
960 min Summer	2.957	0.0	616
1440 min Summer	2.161	0.0	882
2160 min Summer	1.578	0.0	1260
2880 min Summer	1.262	0.0	1620
4320 min Summer	0.921	0.0	2296
5760 min Summer	0.736	0.0	3008
7200 min Summer	0.619	0.0	3744
8640 min Summer	0.537	0.0	4424
10080 min Summer	0.476	0.0	5152
15 min Winter	60.278	0.0	25

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	119.056	0.356	0.7	14.5	O K
60 min Winter	119.104	0.404	0.7	17.3	O K
120 min Winter	119.139	0.439	0.8	19.3	O K
180 min Winter	119.148	0.448	0.8	19.9	O K
240 min Winter	119.147	0.447	0.8	19.8	O K
360 min Winter	119.138	0.438	0.8	19.3	O K
480 min Winter	119.126	0.426	0.7	18.6	O K
600 min Winter	119.111	0.411	0.7	17.7	O K
720 min Winter	119.096	0.396	0.7	16.8	O K
960 min Winter	119.065	0.365	0.7	15.0	O K
1440 min Winter	119.008	0.308	0.7	11.7	O K
2160 min Winter	118.942	0.242	0.7	7.8	O K
2880 min Winter	118.905	0.205	0.6	5.7	O K
4320 min Winter	118.863	0.163	0.5	3.6	O K
5760 min Winter	118.836	0.136	0.4	2.5	O K
7200 min Winter	118.816	0.116	0.3	1.8	O K
8640 min Winter	118.802	0.102	0.3	1.4	O K
10080 min Winter	118.791	0.091	0.3	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	38.832	0.0	39
60 min Winter	24.003	0.0	66
120 min Winter	14.465	0.0	122
180 min Winter	10.672	0.0	178
240 min Winter	8.577	0.0	230
360 min Winter	6.291	0.0	286
480 min Winter	5.045	0.0	362
600 min Winter	4.250	0.0	438
720 min Winter	3.693	0.0	512
960 min Winter	2.957	0.0	656
1440 min Winter	2.161	0.0	926
2160 min Winter	1.578	0.0	1284
2880 min Winter	1.262	0.0	1620
4320 min Winter	0.921	0.0	2336
5760 min Winter	0.736	0.0	3048
7200 min Winter	0.619	0.0	3752
8640 min Winter	0.537	0.0	4424
10080 min Winter	0.476	0.0	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.085

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.028	4	8	0.028	8	12	0.028

Model Details

Storage is Online Cover Level (m) 120.000

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.01700	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.01700	Trench Length (m)	65.0
Safety Factor	1.5	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	118.700	Cap Infiltration Depth (m)	0.000

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

Half Drain Time : 506 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	119.272	0.572	0.8	27.2	O K
30 min Summer	119.410	0.710	0.9	35.2	O K
60 min Summer	119.543	0.843	0.9	43.0	O K
120 min Summer	119.657	0.957	1.0	49.7	O K
180 min Summer	119.705	1.005	1.0	52.4	Flood Risk
240 min Summer	119.724	1.024	1.0	53.6	Flood Risk
360 min Summer	119.728	1.028	1.0	53.8	Flood Risk
480 min Summer	119.716	1.016	1.0	53.1	Flood Risk
600 min Summer	119.702	1.002	1.0	52.3	Flood Risk
720 min Summer	119.686	0.986	1.0	51.4	O K
960 min Summer	119.654	0.954	1.0	49.5	O K
1440 min Summer	119.588	0.888	0.9	45.6	O K
2160 min Summer	119.498	0.798	0.9	40.3	O K
2880 min Summer	119.417	0.717	0.9	35.6	O K
4320 min Summer	119.282	0.582	0.8	27.7	O K
5760 min Summer	119.175	0.475	0.8	21.4	O K
7200 min Summer	119.089	0.389	0.7	16.4	O K
8640 min Summer	119.022	0.322	0.7	12.5	O K
10080 min Summer	118.971	0.271	0.7	9.5	O K
15 min Winter	119.273	0.573	0.8	27.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.993	0.0	26
30 min Summer	90.986	0.0	40
60 min Summer	56.713	0.0	70
120 min Summer	34.148	0.0	128
180 min Summer	25.042	0.0	186
240 min Summer	19.977	0.0	244
360 min Summer	14.486	0.0	360
480 min Summer	11.532	0.0	422
600 min Summer	9.655	0.0	484
720 min Summer	8.347	0.0	546
960 min Summer	6.629	0.0	680
1440 min Summer	4.783	0.0	954
2160 min Summer	3.446	0.0	1364
2880 min Summer	2.728	0.0	1764
4320 min Summer	1.960	0.0	2548
5760 min Summer	1.549	0.0	3288
7200 min Summer	1.289	0.0	3976
8640 min Summer	1.110	0.0	4672
10080 min Summer	0.977	0.0	5352
15 min Winter	138.993	0.0	26

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	119.411	0.711	0.9	35.3	O K
60 min Winter	119.544	0.844	0.9	43.1	O K
120 min Winter	119.660	0.960	1.0	49.8	O K
180 min Winter	119.709	1.009	1.0	52.7	Flood Risk
240 min Winter	119.730	1.030	1.0	53.9	Flood Risk
360 min Winter	119.737	1.037	1.0	54.3	Flood Risk
480 min Winter	119.724	1.024	1.0	53.6	Flood Risk
600 min Winter	119.704	1.004	1.0	52.4	Flood Risk
720 min Winter	119.686	0.986	1.0	51.4	O K
960 min Winter	119.645	0.945	1.0	49.0	O K
1440 min Winter	119.557	0.857	0.9	43.8	O K
2160 min Winter	119.433	0.733	0.9	36.5	O K
2880 min Winter	119.324	0.624	0.8	30.2	O K
4320 min Winter	119.149	0.449	0.8	19.9	O K
5760 min Winter	119.020	0.320	0.7	12.4	O K
7200 min Winter	118.935	0.235	0.7	7.4	O K
8640 min Winter	118.901	0.201	0.6	5.4	O K
10080 min Winter	118.880	0.180	0.5	4.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.986	0.0	40
60 min Winter	56.713	0.0	68
120 min Winter	34.148	0.0	124
180 min Winter	25.042	0.0	182
240 min Winter	19.977	0.0	238
360 min Winter	14.486	0.0	350
480 min Winter	11.532	0.0	456
600 min Winter	9.655	0.0	496
720 min Winter	8.347	0.0	566
960 min Winter	6.629	0.0	720
1440 min Winter	4.783	0.0	1024
2160 min Winter	3.446	0.0	1456
2880 min Winter	2.728	0.0	1876
4320 min Winter	1.960	0.0	2640
5760 min Winter	1.549	0.0	3344
7200 min Winter	1.289	0.0	3960
8640 min Winter	1.110	0.0	4576
10080 min Winter	0.977	0.0	5248

Summary of Results for 10 year Return Period

Half Drain Time : 214 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.078	0.178	0.4	5.6	O K
30 min Summer	116.126	0.226	0.4	7.1	O K
60 min Summer	116.168	0.268	0.4	8.4	O K
120 min Summer	116.196	0.296	0.4	9.3	O K
180 min Summer	116.201	0.301	0.4	9.5	O K
240 min Summer	116.199	0.299	0.4	9.4	O K
360 min Summer	116.192	0.292	0.4	9.2	O K
480 min Summer	116.182	0.282	0.4	8.9	O K
600 min Summer	116.171	0.271	0.4	8.5	O K
720 min Summer	116.160	0.260	0.4	8.2	O K
960 min Summer	116.138	0.238	0.4	7.5	O K
1440 min Summer	116.098	0.198	0.4	6.2	O K
2160 min Summer	116.046	0.146	0.4	4.6	O K
2880 min Summer	116.007	0.107	0.4	3.4	O K
4320 min Summer	115.959	0.059	0.3	1.9	O K
5760 min Summer	115.945	0.045	0.3	1.4	O K
7200 min Summer	115.938	0.038	0.3	1.2	O K
8640 min Summer	115.934	0.034	0.2	1.1	O K
10080 min Summer	115.930	0.030	0.2	0.9	O K
15 min Winter	116.079	0.179	0.4	5.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	60.278	0.0	25
30 min Summer	38.832	0.0	39
60 min Summer	24.003	0.0	66
120 min Summer	14.465	0.0	124
180 min Summer	10.672	0.0	178
240 min Summer	8.577	0.0	206
360 min Summer	6.291	0.0	268
480 min Summer	5.045	0.0	336
600 min Summer	4.250	0.0	406
720 min Summer	3.693	0.0	474
960 min Summer	2.957	0.0	610
1440 min Summer	2.161	0.0	872
2160 min Summer	1.578	0.0	1244
2880 min Summer	1.262	0.0	1592
4320 min Summer	0.921	0.0	2256
5760 min Summer	0.736	0.0	2944
7200 min Summer	0.619	0.0	3672
8640 min Summer	0.537	0.0	4408
10080 min Summer	0.476	0.0	5144
15 min Winter	60.278	0.0	25

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.126	0.226	0.4	7.1	O K
60 min Winter	116.168	0.268	0.4	8.4	O K
120 min Winter	116.197	0.297	0.4	9.4	O K
180 min Winter	116.203	0.303	0.4	9.5	O K
240 min Winter	116.200	0.300	0.4	9.4	O K
360 min Winter	116.189	0.289	0.4	9.1	O K
480 min Winter	116.175	0.275	0.4	8.7	O K
600 min Winter	116.159	0.259	0.4	8.1	O K
720 min Winter	116.142	0.242	0.4	7.6	O K
960 min Winter	116.110	0.210	0.4	6.6	O K
1440 min Winter	116.052	0.152	0.4	4.8	O K
2160 min Winter	115.986	0.086	0.4	2.7	O K
2880 min Winter	115.950	0.050	0.3	1.6	O K
4320 min Winter	115.937	0.037	0.3	1.2	O K
5760 min Winter	115.930	0.030	0.2	0.9	O K
7200 min Winter	115.925	0.025	0.2	0.8	O K
8640 min Winter	115.922	0.022	0.1	0.7	O K
10080 min Winter	115.920	0.020	0.1	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	38.832	0.0	39
60 min Winter	24.003	0.0	66
120 min Winter	14.465	0.0	122
180 min Winter	10.672	0.0	176
240 min Winter	8.577	0.0	226
360 min Winter	6.291	0.0	282
480 min Winter	5.045	0.0	358
600 min Winter	4.250	0.0	434
720 min Winter	3.693	0.0	506
960 min Winter	2.957	0.0	648
1440 min Winter	2.161	0.0	914
2160 min Winter	1.578	0.0	1260
2880 min Winter	1.262	0.0	1512
4320 min Winter	0.921	0.0	2212
5760 min Winter	0.736	0.0	2952
7200 min Winter	0.619	0.0	3672
8640 min Winter	0.537	0.0	4416
10080 min Winter	0.476	0.0	5120

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.042

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.014	4	8	0.014	8	12	0.014

Model Details

Storage is Online Cover Level (m) 118.500

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.01700	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.01700	Trench Length (m)	35.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	115.900	Cap Infiltration Depth (m)	1.000

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

Half Drain Time : 465 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.325	0.425	0.4	13.4	O K
30 min Summer	116.451	0.551	0.5	17.3	O K
60 min Summer	116.570	0.670	0.5	21.1	O K
120 min Summer	116.671	0.771	0.5	24.3	O K
180 min Summer	116.711	0.811	0.5	25.5	O K
240 min Summer	116.725	0.825	0.5	26.0	O K
360 min Summer	116.722	0.822	0.5	25.9	O K
480 min Summer	116.707	0.807	0.5	25.4	O K
600 min Summer	116.690	0.790	0.5	24.9	O K
720 min Summer	116.673	0.773	0.5	24.3	O K
960 min Summer	116.638	0.738	0.5	23.2	O K
1440 min Summer	116.573	0.673	0.5	21.2	O K
2160 min Summer	116.487	0.587	0.5	18.5	O K
2880 min Summer	116.411	0.511	0.5	16.1	O K
4320 min Summer	116.282	0.382	0.4	12.0	O K
5760 min Summer	116.180	0.280	0.4	8.8	O K
7200 min Summer	116.101	0.201	0.4	6.3	O K
8640 min Summer	116.040	0.140	0.4	4.4	O K
10080 min Summer	115.995	0.095	0.4	3.0	O K
15 min Winter	116.325	0.425	0.4	13.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.993	0.0	26
30 min Summer	90.986	0.0	40
60 min Summer	56.713	0.0	70
120 min Summer	34.148	0.0	128
180 min Summer	25.042	0.0	186
240 min Summer	19.977	0.0	244
360 min Summer	14.486	0.0	360
480 min Summer	11.532	0.0	412
600 min Summer	9.655	0.0	474
720 min Summer	8.347	0.0	536
960 min Summer	6.629	0.0	672
1440 min Summer	4.783	0.0	946
2160 min Summer	3.446	0.0	1352
2880 min Summer	2.728	0.0	1760
4320 min Summer	1.960	0.0	2512
5760 min Summer	1.549	0.0	3240
7200 min Summer	1.289	0.0	3968
8640 min Summer	1.110	0.0	4664
10080 min Summer	0.977	0.0	5336
15 min Winter	138.993	0.0	26

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	116.451	0.551	0.5	17.4	O K
60 min Winter	116.572	0.672	0.5	21.2	O K
120 min Winter	116.674	0.774	0.5	24.4	O K
180 min Winter	116.715	0.815	0.5	25.7	O K
240 min Winter	116.731	0.831	0.5	26.2	O K
360 min Winter	116.731	0.831	0.5	26.2	O K
480 min Winter	116.713	0.813	0.5	25.6	O K
600 min Winter	116.692	0.792	0.5	25.0	O K
720 min Winter	116.672	0.772	0.5	24.3	O K
960 min Winter	116.629	0.729	0.5	23.0	O K
1440 min Winter	116.541	0.641	0.5	20.2	O K
2160 min Winter	116.421	0.521	0.5	16.4	O K
2880 min Winter	116.317	0.417	0.4	13.1	O K
4320 min Winter	116.150	0.250	0.4	7.9	O K
5760 min Winter	116.032	0.132	0.4	4.2	O K
7200 min Winter	115.959	0.059	0.3	1.9	O K
8640 min Winter	115.945	0.045	0.3	1.4	O K
10080 min Winter	115.940	0.040	0.3	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.986	0.0	40
60 min Winter	56.713	0.0	68
120 min Winter	34.148	0.0	124
180 min Winter	25.042	0.0	182
240 min Winter	19.977	0.0	238
360 min Winter	14.486	0.0	348
480 min Winter	11.532	0.0	450
600 min Winter	9.655	0.0	484
720 min Winter	8.347	0.0	558
960 min Winter	6.629	0.0	714
1440 min Winter	4.783	0.0	1014
2160 min Winter	3.446	0.0	1448
2880 min Winter	2.728	0.0	1852
4320 min Winter	1.960	0.0	2600
5760 min Winter	1.549	0.0	3288
7200 min Winter	1.289	0.0	3824
8640 min Winter	1.110	0.0	4408
10080 min Winter	0.977	0.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.042

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.014	4	8	0.014	8	12	0.014

Model Details

Storage is Online Cover Level (m) 118.500

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.01700	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.01700	Trench Length (m)	35.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	115.900	Cap Infiltration Depth (m)	1.000

Summary of Results for 10 year Return Period

Half Drain Time : 220 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.083	0.183	0.4	5.8	O K
30 min Summer	116.132	0.232	0.4	7.3	O K
60 min Summer	116.175	0.275	0.4	8.6	O K
120 min Summer	116.204	0.304	0.4	9.6	O K
180 min Summer	116.210	0.310	0.4	9.8	O K
240 min Summer	116.208	0.308	0.4	9.7	O K
360 min Summer	116.201	0.301	0.4	9.5	O K
480 min Summer	116.191	0.291	0.4	9.2	O K
600 min Summer	116.180	0.280	0.4	8.8	O K
720 min Summer	116.169	0.269	0.4	8.5	O K
960 min Summer	116.147	0.247	0.4	7.8	O K
1440 min Summer	116.106	0.206	0.4	6.5	O K
2160 min Summer	116.054	0.154	0.4	4.8	O K
2880 min Summer	116.013	0.113	0.4	3.6	O K
4320 min Summer	115.962	0.062	0.3	2.0	O K
5760 min Summer	115.946	0.046	0.3	1.5	O K
7200 min Summer	115.939	0.039	0.3	1.2	O K
8640 min Summer	115.934	0.034	0.2	1.1	O K
10080 min Summer	115.931	0.031	0.2	1.0	O K
15 min Winter	116.083	0.183	0.4	5.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	60.278	0.0	25
30 min Summer	38.832	0.0	39
60 min Summer	24.003	0.0	66
120 min Summer	14.465	0.0	124
180 min Summer	10.672	0.0	180
240 min Summer	8.577	0.0	208
360 min Summer	6.291	0.0	270
480 min Summer	5.045	0.0	338
600 min Summer	4.250	0.0	406
720 min Summer	3.693	0.0	474
960 min Summer	2.957	0.0	612
1440 min Summer	2.161	0.0	874
2160 min Summer	1.578	0.0	1256
2880 min Summer	1.262	0.0	1612
4320 min Summer	0.921	0.0	2260
5760 min Summer	0.736	0.0	2944
7200 min Summer	0.619	0.0	3672
8640 min Summer	0.537	0.0	4408
10080 min Summer	0.476	0.0	5136
15 min Winter	60.278	0.0	25

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.132	0.232	0.4	7.3	O K
60 min Winter	116.175	0.275	0.4	8.7	O K
120 min Winter	116.206	0.306	0.4	9.6	O K
180 min Winter	116.212	0.312	0.4	9.8	O K
240 min Winter	116.209	0.309	0.4	9.7	O K
360 min Winter	116.198	0.298	0.4	9.4	O K
480 min Winter	116.184	0.284	0.4	8.9	O K
600 min Winter	116.168	0.268	0.4	8.4	O K
720 min Winter	116.151	0.251	0.4	7.9	O K
960 min Winter	116.119	0.219	0.4	6.9	O K
1440 min Winter	116.060	0.160	0.4	5.0	O K
2160 min Winter	115.992	0.092	0.4	2.9	O K
2880 min Winter	115.953	0.053	0.3	1.7	O K
4320 min Winter	115.938	0.038	0.3	1.2	O K
5760 min Winter	115.931	0.031	0.2	1.0	O K
7200 min Winter	115.926	0.026	0.2	0.8	O K
8640 min Winter	115.923	0.023	0.2	0.7	O K
10080 min Winter	115.920	0.020	0.1	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	38.832	0.0	39
60 min Winter	24.003	0.0	66
120 min Winter	14.465	0.0	122
180 min Winter	10.672	0.0	176
240 min Winter	8.577	0.0	226
360 min Winter	6.291	0.0	282
480 min Winter	5.045	0.0	360
600 min Winter	4.250	0.0	434
720 min Winter	3.693	0.0	508
960 min Winter	2.957	0.0	652
1440 min Winter	2.161	0.0	916
2160 min Winter	1.578	0.0	1272
2880 min Winter	1.262	0.0	1536
4320 min Winter	0.921	0.0	2212
5760 min Winter	0.736	0.0	2936
7200 min Winter	0.619	0.0	3680
8640 min Winter	0.537	0.0	4400
10080 min Winter	0.476	0.0	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.043

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.014	4	8	0.014	8	12	0.014

Model Details

Storage is Online Cover Level (m) 118.500

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.01700	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.01700	Trench Length (m)	35.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	115.900	Cap Infiltration Depth (m)	0.000

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

Half Drain Time : 475 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.335	0.435	0.4	13.7	O K
30 min Summer	116.464	0.564	0.5	17.8	O K
60 min Summer	116.587	0.687	0.5	21.6	O K
120 min Summer	116.691	0.791	0.5	24.9	O K
180 min Summer	116.732	0.832	0.5	26.2	O K
240 min Summer	116.748	0.848	0.5	26.7	O K
360 min Summer	116.745	0.845	0.5	26.6	O K
480 min Summer	116.730	0.830	0.5	26.2	O K
600 min Summer	116.714	0.814	0.5	25.6	O K
720 min Summer	116.696	0.796	0.5	25.1	O K
960 min Summer	116.661	0.761	0.5	24.0	O K
1440 min Summer	116.595	0.695	0.5	21.9	O K
2160 min Summer	116.508	0.608	0.5	19.2	O K
2880 min Summer	116.431	0.531	0.5	16.7	O K
4320 min Summer	116.300	0.400	0.4	12.6	O K
5760 min Summer	116.196	0.296	0.4	9.3	O K
7200 min Summer	116.115	0.215	0.4	6.8	O K
8640 min Summer	116.052	0.152	0.4	4.8	O K
10080 min Summer	116.005	0.105	0.4	3.3	O K
15 min Winter	116.335	0.435	0.4	13.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.993	0.0	26
30 min Summer	90.986	0.0	40
60 min Summer	56.713	0.0	70
120 min Summer	34.148	0.0	128
180 min Summer	25.042	0.0	186
240 min Summer	19.977	0.0	244
360 min Summer	14.486	0.0	360
480 min Summer	11.532	0.0	414
600 min Summer	9.655	0.0	476
720 min Summer	8.347	0.0	538
960 min Summer	6.629	0.0	672
1440 min Summer	4.783	0.0	948
2160 min Summer	3.446	0.0	1360
2880 min Summer	2.728	0.0	1760
4320 min Summer	1.960	0.0	2516
5760 min Summer	1.549	0.0	3248
7200 min Summer	1.289	0.0	3968
8640 min Summer	1.110	0.0	4672
10080 min Summer	0.977	0.0	5344
15 min Winter	138.993	0.0	26

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	116.465	0.565	0.5	17.8	O K
60 min Winter	116.588	0.688	0.5	21.7	O K
120 min Winter	116.694	0.794	0.5	25.0	O K
180 min Winter	116.737	0.837	0.5	26.4	O K
240 min Winter	116.753	0.853	0.5	26.9	O K
360 min Winter	116.755	0.855	0.5	26.9	O K
480 min Winter	116.738	0.838	0.5	26.4	O K
600 min Winter	116.716	0.816	0.5	25.7	O K
720 min Winter	116.696	0.796	0.5	25.1	O K
960 min Winter	116.653	0.753	0.5	23.7	O K
1440 min Winter	116.564	0.664	0.5	20.9	O K
2160 min Winter	116.443	0.543	0.5	17.1	O K
2880 min Winter	116.337	0.437	0.4	13.8	O K
4320 min Winter	116.168	0.268	0.4	8.4	O K
5760 min Winter	116.045	0.145	0.4	4.6	O K
7200 min Winter	115.967	0.067	0.3	2.1	O K
8640 min Winter	115.946	0.046	0.3	1.5	O K
10080 min Winter	115.941	0.041	0.3	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.986	0.0	40
60 min Winter	56.713	0.0	68
120 min Winter	34.148	0.0	124
180 min Winter	25.042	0.0	182
240 min Winter	19.977	0.0	238
360 min Winter	14.486	0.0	350
480 min Winter	11.532	0.0	452
600 min Winter	9.655	0.0	486
720 min Winter	8.347	0.0	560
960 min Winter	6.629	0.0	714
1440 min Winter	4.783	0.0	1016
2160 min Winter	3.446	0.0	1452
2880 min Winter	2.728	0.0	1852
4320 min Winter	1.960	0.0	2636
5760 min Winter	1.549	0.0	3296
7200 min Winter	1.289	0.0	3888
8640 min Winter	1.110	0.0	4408
10080 min Winter	0.977	0.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.043

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.014	4	8	0.014	8	12	0.014

Model Details

Storage is Online Cover Level (m) 118.500

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.01700	Trench Width (m)	3.0
Infiltration Coefficient Side (m/hr)	0.01700	Trench Length (m)	35.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	115.900	Cap Infiltration Depth (m)	0.000

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

Half Drain Time : 162 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	118.933	0.233	2.2	24.5	Flood Risk
30 min Summer	118.970	0.270	2.5	32.7	Flood Risk
60 min Summer	118.997	0.297	2.8	39.8	Flood Risk
120 min Summer	119.012	0.312	2.9	43.8	Flood Risk
180 min Summer	119.015	0.315	3.0	44.5	Flood Risk
240 min Summer	119.014	0.314	3.0	44.4	Flood Risk
360 min Summer	119.010	0.310	2.9	43.2	Flood Risk
480 min Summer	119.004	0.304	2.9	41.6	Flood Risk
600 min Summer	118.997	0.297	2.8	39.8	Flood Risk
720 min Summer	118.990	0.290	2.7	37.9	Flood Risk
960 min Summer	118.976	0.276	2.6	34.4	Flood Risk
1440 min Summer	118.951	0.251	2.4	28.4	Flood Risk
2160 min Summer	118.921	0.221	2.1	21.9	Flood Risk
2880 min Summer	118.897	0.197	1.9	17.4	O K
4320 min Summer	118.862	0.162	1.5	11.8	O K
5760 min Summer	118.837	0.137	1.3	8.5	O K
7200 min Summer	118.819	0.119	1.1	6.3	O K
8640 min Summer	118.805	0.105	1.0	5.0	O K
10080 min Summer	118.794	0.094	0.9	4.0	O K
15 min Winter	118.933	0.233	2.2	24.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.993	0.0	25
30 min Summer	90.986	0.0	38
60 min Summer	56.713	0.0	66
120 min Summer	34.148	0.0	118
180 min Summer	25.042	0.0	148
240 min Summer	19.977	0.0	178
360 min Summer	14.486	0.0	246
480 min Summer	11.532	0.0	316
600 min Summer	9.655	0.0	384
720 min Summer	8.347	0.0	450
960 min Summer	6.629	0.0	582
1440 min Summer	4.783	0.0	840
2160 min Summer	3.446	0.0	1212
2880 min Summer	2.728	0.0	1564
4320 min Summer	1.960	0.0	2292
5760 min Summer	1.549	0.0	3000
7200 min Summer	1.289	0.0	3688
8640 min Summer	1.110	0.0	4416
10080 min Summer	0.977	0.0	5144
15 min Winter	138.993	0.0	25

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	118.970	0.270	2.5	32.7	Flood Risk
60 min Winter	118.998	0.298	2.8	39.9	Flood Risk
120 min Winter	119.013	0.313	3.0	44.1	Flood Risk
180 min Winter	119.014	0.314	3.0	44.4	Flood Risk
240 min Winter	119.013	0.313	3.0	44.0	Flood Risk
360 min Winter	119.006	0.306	2.9	42.0	Flood Risk
480 min Winter	118.997	0.297	2.8	39.6	Flood Risk
600 min Winter	118.987	0.287	2.7	37.0	Flood Risk
720 min Winter	118.977	0.277	2.6	34.5	Flood Risk
960 min Winter	118.958	0.258	2.4	29.9	Flood Risk
1440 min Winter	118.925	0.225	2.1	22.7	Flood Risk
2160 min Winter	118.887	0.187	1.8	15.7	O K
2880 min Winter	118.859	0.159	1.5	11.3	O K
4320 min Winter	118.821	0.121	1.1	6.6	O K
5760 min Winter	118.797	0.097	0.9	4.3	O K
7200 min Winter	118.782	0.082	0.8	3.0	O K
8640 min Winter	118.770	0.070	0.7	2.2	O K
10080 min Winter	118.762	0.062	0.6	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.986	0.0	38
60 min Winter	56.713	0.0	64
120 min Winter	34.148	0.0	118
180 min Winter	25.042	0.0	152
240 min Winter	19.977	0.0	188
360 min Winter	14.486	0.0	264
480 min Winter	11.532	0.0	338
600 min Winter	9.655	0.0	410
720 min Winter	8.347	0.0	480
960 min Winter	6.629	0.0	616
1440 min Winter	4.783	0.0	874
2160 min Winter	3.446	0.0	1240
2880 min Winter	2.728	0.0	1596
4320 min Winter	1.960	0.0	2296
5760 min Winter	1.549	0.0	3008
7200 min Winter	1.289	0.0	3720
8640 min Winter	1.110	0.0	4408
10080 min Winter	0.977	0.0	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.900
Region	England and Wales	Cv (Winter)	0.900
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.407	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.100

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.033	4	8	0.033	8	12	0.033

Model Details

Storage is Online Cover Level (m) 119.200

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01700	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	277.8	Slope (1:X)	300.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	118.700	Membrane Depth (m)	0

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