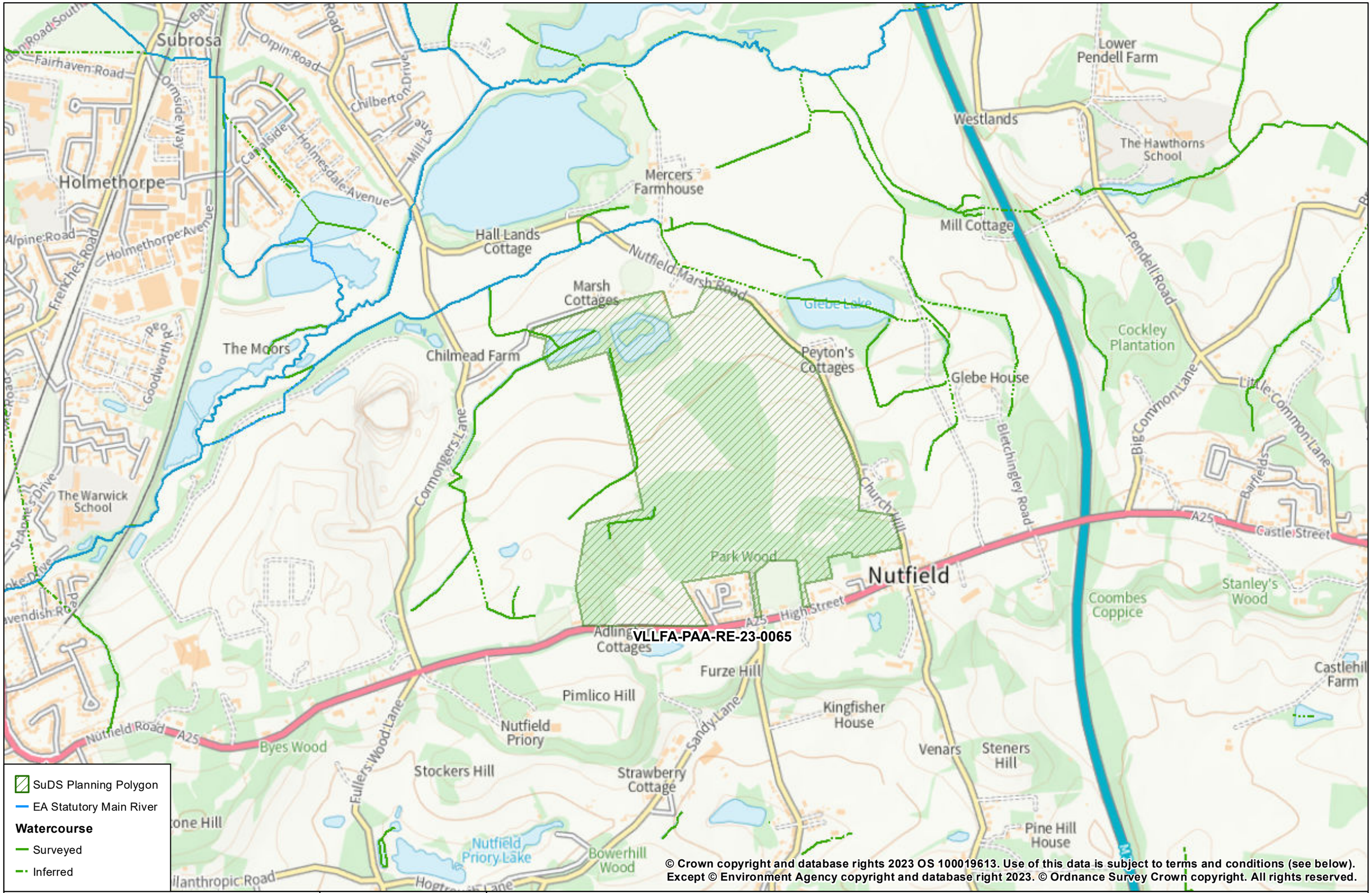


SuDS Planning Polygon

EA Statutory Main River

Watercourse

Surveyed

Inferred

N

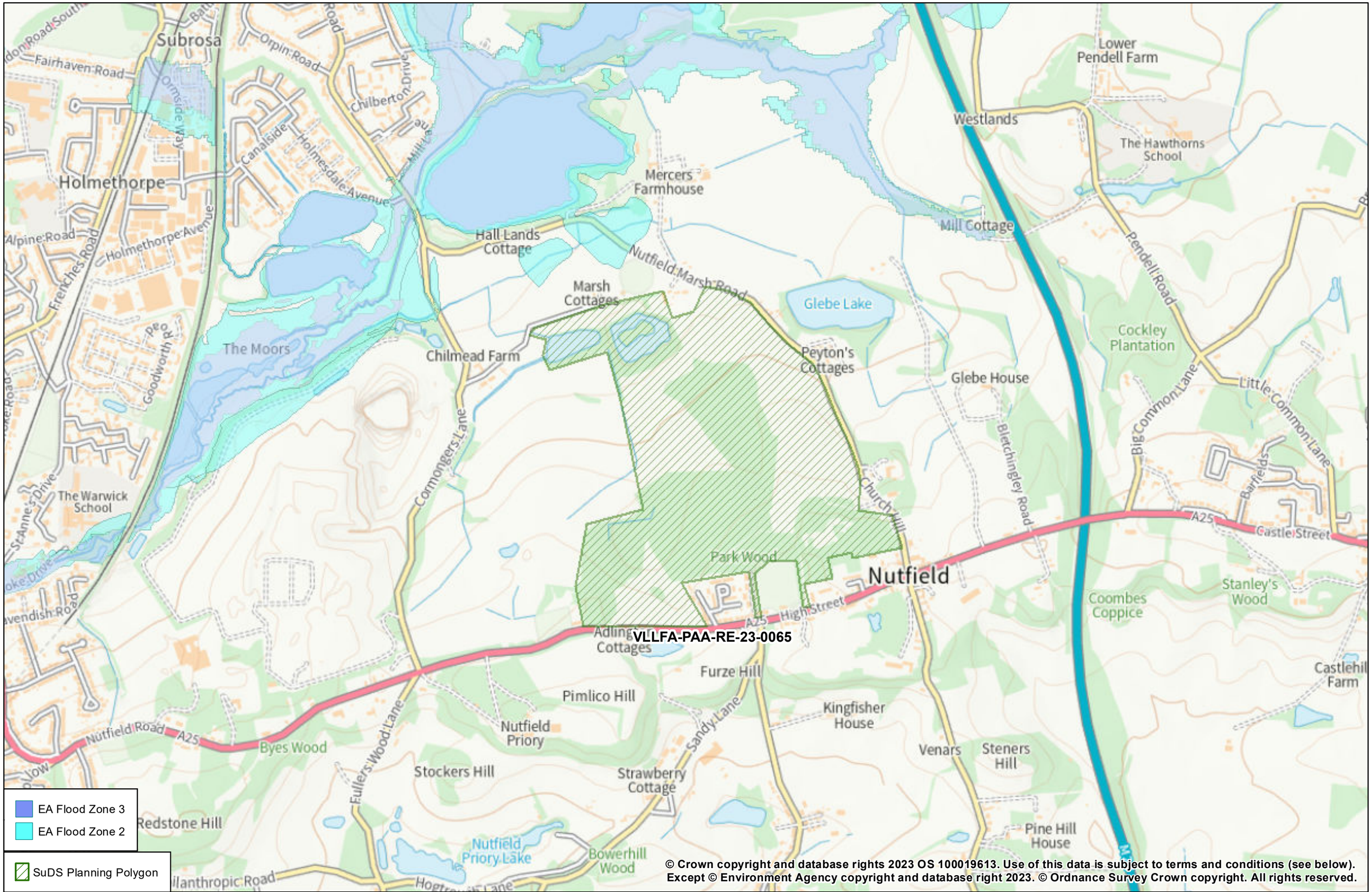
Created by: LM
Department: Flood & Climate Resilience
Printed on: 02/08/2023

Original Size A3

0 150 300 Metres

FLOOD RISK REPORT- VLLFA-PAA-RE-23-0065 - Site off A25, Nutfiled, Redhill, RH14HE
EA Statutory Main River and Watercourse
For use in reference to the Flood Risk Report only.

SURREY COUNTY COUNCIL



VLLFA-PAA-RE-23-0065

EA Flood Zone 3

EA Flood Zone 2

SuDS Planning Polygon

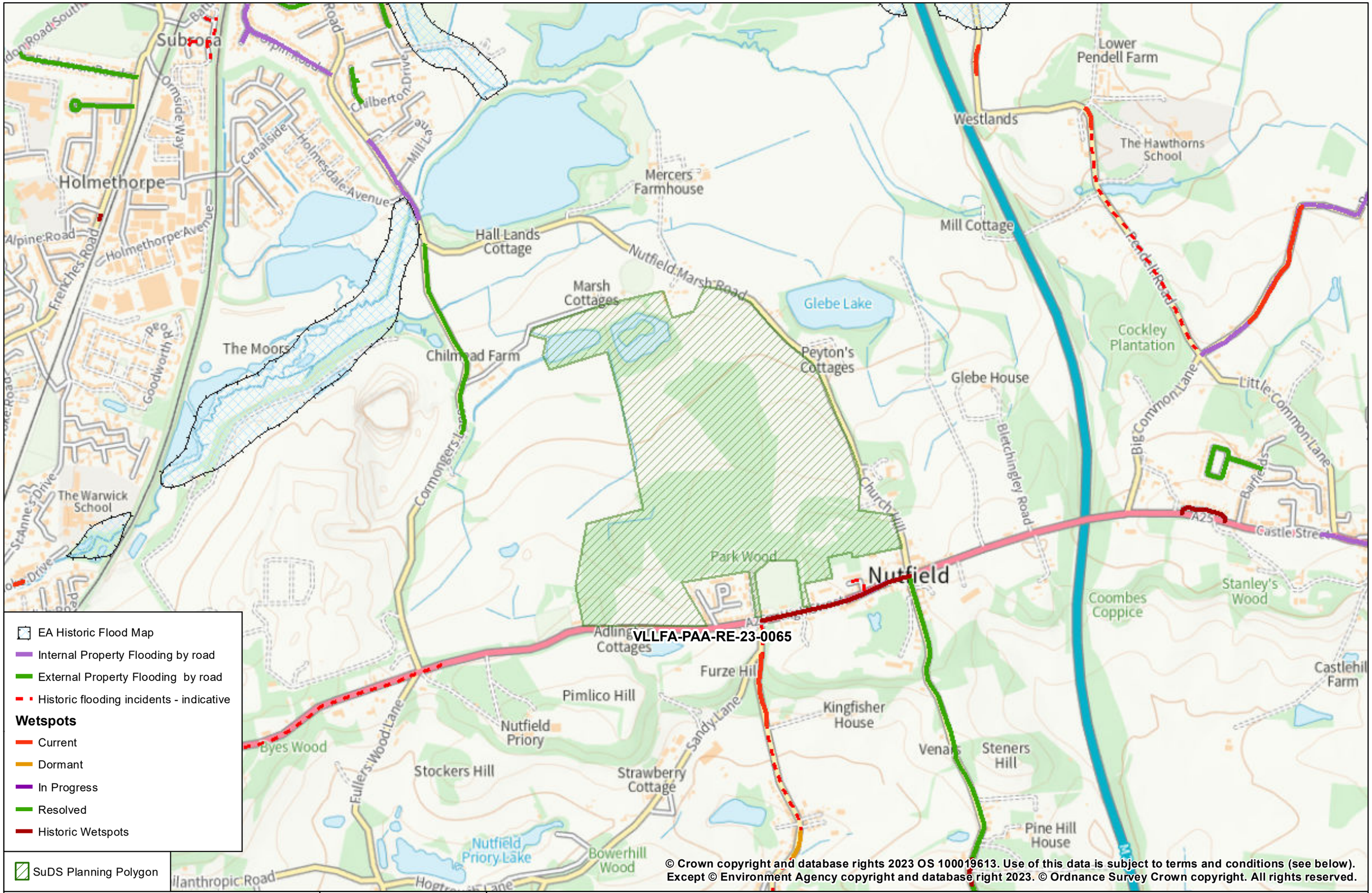
N

Created by: LM
Department: Flood & Climate Resilience
Printed on: 02/08/2023

Original Size A3
0 150 300 Metres

FLOOD RISK REPORT- VLLFA-PAA-RE-23-0065 - Site off A25, Nutfiled, Redhill, RH14HE
Fluvial Flood Risk
For use in reference to the Flood Risk Report only.

SURREY COUNTY COUNCIL



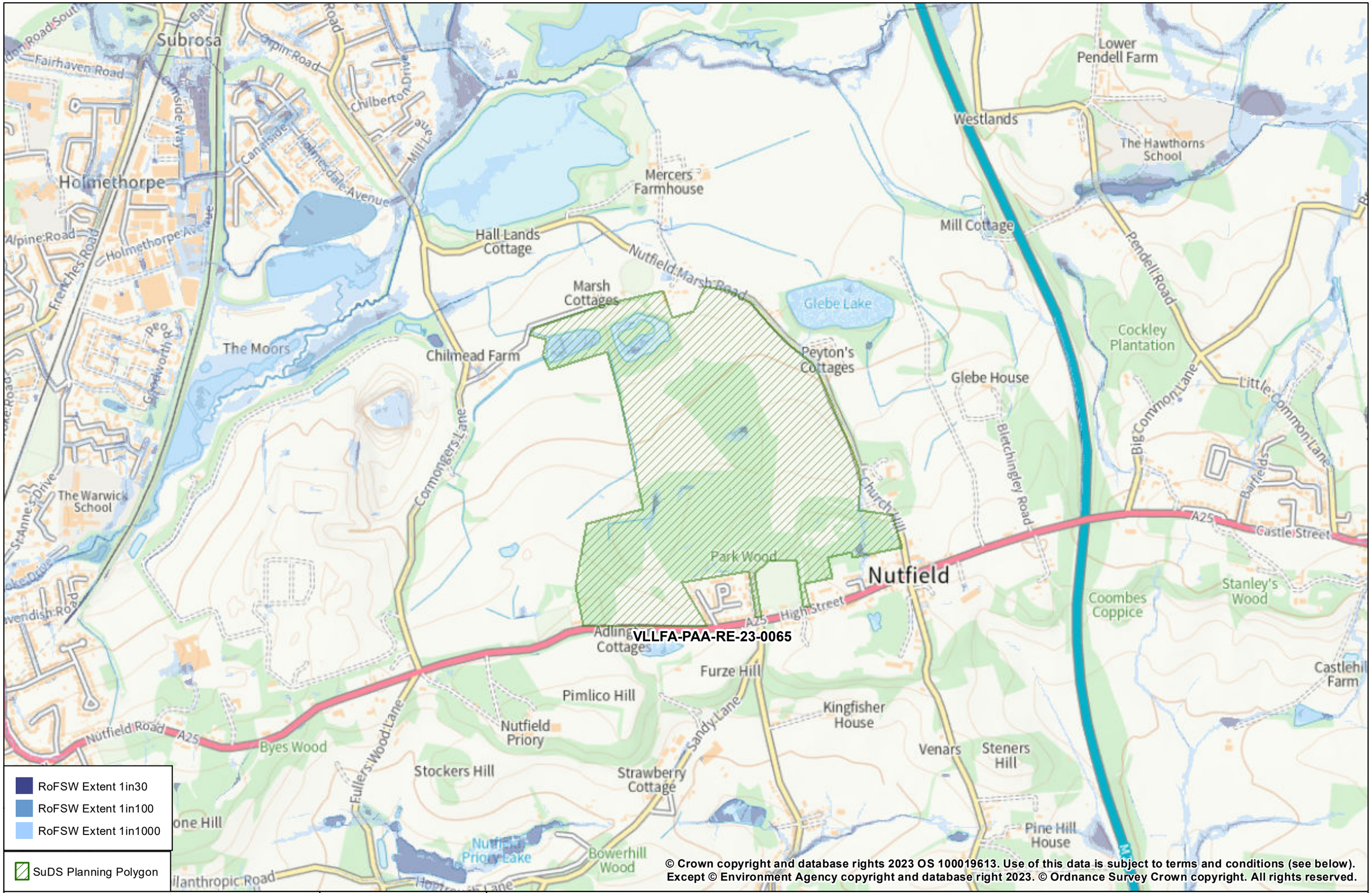
N

Created by: LM
Department: Flood & Climate Resilience
Printed on: 02/08/2023

Original Size A3
0 150 300 Metres

FLOOD RISK REPORT- VLLFA-PAA-RE-23-0065 - Site off A25, Nutfiled, Redhill, RH14HE
Historic Flood Evidence
For use in reference to the Flood Risk Report only.

SURREY COUNTY COUNCIL



N

Created by: LM
Department: Flood & Climate Resilience
Printed on: 02/08/2023

Original Size A3
0 150 300 Metres

FLOOD RISK REPORT- VLLFA-PAA-RE-23-0065 - Site off A25, Nutfiled, Redhill, RH14HE
Surface Water Flood Risk
For use in reference to the Flood Risk Report only.

SURREY COUNTY COUNCIL

Detailed Flood Risk Report Site off A25, Nutfield, Redhill RH1 4HE

08 August 2023

SURREY

Detailed Flood Risk Report

Purpose of Report

This document has been prepared for the purpose of providing flood risk information for a specific site; either to aid in the development of a planning application or for flood risk management. The information provided is that which is available to Surrey County Council at the time and may include specific guidance for Planners and Developers about Sustainable Drainage. Surrey County Council gives no guarantee that any flood risk information provided is100% accurate, or exhaustive; it is solely the information we currently hold.

The applicant is advised that there will need to be additional discussions with the County Council as Highway Authority in respect of any drainage proposals for proposed highway works under Section 278 or proposed adoption of new roads under Section 38 of the 1980 Highway Act. Consenting for the discharge of surface water to Ordinary Watercourses should also be directed to the County Council under the Land Drainage Act (1991).

Document History

This report relates to the following enquiry/pre-application request/planning application as:

SCC Application ID	Version	Originator	Date	Reviewer	Date
VLLFA-PAA-RE-23-0065	1.0	LM	02/08/2023	AD	03/08/2023

Glossary

The table below defines some of the frequently used terminology for your general information.

Acronym/Term	Definition
Annual Probability	Flood events are defined according to their likelihood of occurrence. The term 'annual probability of flooding' is used, meaning the chance of a particular flood occurring in any one year. This can be expressed as a percentage. For example, a flood with an annual probability of 1 in 100 can also be referred to as a flood with a 1% annual probability. This means that every year there is a 1% chance that this magnitude flood could occur.
Flood Zone 1	Area with a low probability of flooding from rivers (< 1 in 1,000 annual chance of flooding).
Flood Zone 2	Area with a medium probability of flooding from rivers (1 in 100 – 1 in 1,000 annual chance of flooding).
Flood Zone 3	Area with a high probability of flooding from rivers (> 1 in 100 annual chance of flooding).
Fluvial flooding	Exceedance of the flow capacity of river channels (whether this is a Main River or an Ordinary Watercourse), leading to overtopping of the river banks and inundation of the surrounding land. Climate change is expected to increase the risk of fluvial flooding in the future.
Infiltration SuDS	These are sustainable drainage systems which facilitate the infiltration of surface water into the ground. Once in the ground, the water percolates through the subsurface to the groundwater.
Groundwater flooding	Emergence of groundwater at the surface (and subsequent overland flows) or into subsurface voids as a result of abnormally high groundwater flows, the introduction of an obstruction to groundwater flow and / or the rebound of previously depressed groundwater levels.

Main River	Main rivers are usually larger streams and rivers, but some of them are smaller watercourses of local significance. Main Rivers indicate those watercourses for which the Environment Agency is the relevant risk management authority.
Ordinary Watercourse	Ordinary Watercourses are displayed in the mapping as the detailed river network. An ordinary watercourse is any watercourse (excluding public sewers) that is not a Main River, and the Lead Local Flood Authority or Internal Drainage Board are the relevant risk management authority.
Other sources of flood risk	Flooding from canals, reservoirs (breach or overtopping) and failure of flood defences.
Sewer flooding	Flooding from sewers is caused by exceedance of sewer capacity and / or a blockage in the sewer network. In areas with a combined sewer network system there is a risk that land and infrastructure could be flooded with contaminated water. In cases where a separate sewer network is in place, sites are not sensitive to flooding from the foul sewer system.
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan
SuDS	Sustainable Drainage Systems
Surface water flooding	Intense rainfall exceeds the available infiltration capacity and / or the drainage capacity leading to overland flows and surface water flooding. Climate change is expected to increase the risk of surface water flooding in the future. This source is also referred to as pluvial flooding.
Tidal flooding	Propagation of high tides and storm surges up tidal river channels, leading to overtopping of the river banks and inundation of the surrounding land.
RoFSW	Risk of Flooding from Surface Water. The data shows areas at risk of flooding from surface water, for three flooding return periods (1 in 30, 1 in 100 and 1 in 1000), and the depth, velocity, hazard and flow direction associated with that flooding. It also includes; data on the models used to develop the maps and information that describes the suitable uses of the data.

Data Sources

The following sources of data have been used in preparing this report and its associated mapping:

- Geology- Bedrock and Superficial Deposits (British Geological Survey- 50,000 scale digital)
- Soilscapes (Cranfield University- http://www.landis.org.uk/soilscapes/)
- SuDS Suitability (British Geological Survey) https://www.bgs.ac.uk/datasets/infiltration-suds-map/
- Surface Water Flood Risk
    - Risk of Flooding from Surface Water (RoFSW) (Environment Agency) https://environment.data.gov.uk/dataset/90d2ff8f-d465-11e4-8cb5-f0def148f590
- Flood Map for Planning (Environment Agency)
    - Floodzones 2 & 3 https://environment.data.gov.uk/dataset/87446770-d465-11e4-b97a-f0def148f590
- Groundwater
    - Susceptibility to Groundwater Flooding (British Geological Survey) https://www.bgs.ac.uk/datasets/groundwater-flooding/
- Historic Flood Evidence
    - Historic Flood Map (Environment Agency)
    - Wetspots (Surrey County Council) https://www.surreycc.gov.uk/land-planning-and-development/interactive-map
    - Property Flooding Database (Surrey County Council)
    - Historic Flooding Incidents Database (Surrey County Council)
    - Highway flooding incidents and flood enquiries (Surrey County Council)

Site Flood Risk Information

Groundwater

Risk & Evidence

The majority of the site is located within an area which is classed as having a limited potential for groundwater flooding to occur.

The northwest boundary of the site is located within an area which is classed as having a potential for groundwater flooding to occur where there is property situated below ground level e.g. basements.

This is based on a conceptual understanding of the regional geology and hydrogeology and is therefore only an indication of where geological conditions could enable groundwater flooding to occur. It does not indicate hazard or risk and it does not provide any information on the depth to which groundwater flooding may occur or the likelihood of the occurrence of an event of a particular magnitude. This information should not be used on its own to make planning decisions at any scale, particularly site scale, or to indicate the risk of groundwater flooding.

Implications/Considerations for Planning

It is considered that there are no significant implications for surface water management on the site, relating to the site's susceptibility to groundwater flooding. However, this dataset is based on a conceptual understanding at a regional level. It is suggested that appropriate scale site based investigations are conducted to understand the groundwater regime on site.

Surface Water

Risk & Evidence

The area of interest is shown to be at risk of surface water flooding in the following return period events; 1 in 30, 1 in 100 and 1 in 1000 year. The surface water flood extents are not appropriate to be used in assessing flood risk at an individual property level. In addition, the methods used to derive the flood extents are based on modelled design rainfall (i.e. not observed patterns of rainfall) and consequently this information cannot definitively show that an area of land or property is, or is not, at risk of flooding.

The RoFSW have been created from the Environment Agency's nationally produced surface water flood mapping, and appropriate locally produced mapping from Lead Local Flood Authorities such as Surrey County Council. This means that in different areas, the flood extents have varying levels of suitability scales for viewing or assessing. This area's information is only suitable for assessing flood risk at a 'town to street' scale. This scale is suitable for identifying which parts of towns or streets are at risk, or which towns or streets have the most risk. It is likely to be reliable for a local area, but not individual properties.

Implications/Considerations for Planning

In areas at risk of surface water flooding, the following sections outline considerations for the appropriate management of surface water, based on the information provided to Surrey County Council.

Historical Flooding

Risk & Evidence

The Historic Flood Map shows that there is no record of this area being previously flooded by rivers, groundwater or a combination of these sources. However this does not necessarily mean that flooding has not occurred, just that it has not been reported and/or recorded within the Historical Flood Map dataset.

Wetspots indicate the approximate location of known previous flooding on the highway. There is a wetspot near to the area of interest and this highlights that there has been historic flooding in the vicinity.

According to Surrey County Council's Property Flooding Database, there have been previous instances of property flooding nearby, either internally or externally. The instances of property flooding occurred Winter 2013/2014 and Summer 2020. Property flooding is sensitive information and this is why more specific details on the location of flooding cannot be provided. Whilst this dataset is the most comprehensive record of property flooding in Surrey, there may be instances of property flooding which were not reported and therefore are not recorded in this dataset.

Surrey County Council's Historic Flooding Incident Database highlights all reported, non point location specific, flooding incidents e.g. example road was flooded. The data indicates that there is a nearby location which has previously reported flooding.

Implications/Considerations for Planning

In areas which have been previously affected by flooding, the following should be considered:
• Is there a safe access/egress route demonstrated?
• Is there an evacuation plan in place?
• Have resilience/resistance measures been considered in the design?

SuDS Suitability

The selection of SuDS should be considered in the early stages of design. The selection criteria, as set out by The SuDS manual (CIRIA C753 - 2015), provides a good framework for doing this. Surrey County Council has its own guidance which can be access at:

Sustainable Drainage System Design Guidance - Surrey County Council (surreycc.gov.uk)

https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-drainage/drainage-guidance

Potential for Infiltration Drainage

Surrey County Council is licensed to use the Infiltration SuDS Data produced by the British Geological Survey. This data was produced after the Pitt Review (2007) and aims to encourage the appropriate use of SuDS. By utilising SuDS, the reliance on traditional piped systems is reduced, and the sustainable management of surface water is encouraged.
The Infiltration SuDS data is used to make a preliminary assessment of the suitability of the subsurface for infiltration drainage. This data is not a replacement for a soakaway test or site investigation which must be completed to support a planning application.

The suitability of utilising infiltration techniques has been summarised for the application site below.

Source Protection Zones

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Constraints to Infiltration

There are no significant constraints to using infiltration drainage techniques at this site.

Drainage Potential

The subsurface is potentially suitable for infiltration drainage for the northwest of the site although the design may be influenced by the ground conditions.

The subsurface is probably suitable for infiltration drainage for the middle section of the site although the design may be influenced by the ground conditions.

The subsurface is likely to be suitable for free-draining infiltration drainage for the southeast and northeast of the site.

It is recommended to quantify the infiltration rate via an infiltration/soakaway test.

Stability of Ground

Ground instability problems are probably present. Increased infiltration may result in ground instability. Before installing infiltration drainage consider the potential for or the consequences of infiltration on ground stability.

Groundwater Vulnerability

The groundwater may be vulnerable to contamination for the south of the site. Where surface water is being infiltrated into the ground, this water should be free of contaminants. Before installing infiltration drainage, consider the risks associated with the transport of contaminants to the groundwater. Check previous land use and potential for the presence of contaminated ground.

The groundwater is not expected to be especially vulnerable to contamination for the north of the site. Where surface water is being infiltrated into the ground, this water should be free of contaminants. There are no known constraints regarding the susceptibility of the groundwater to contaminants, however it is recommended to check the previous land use to understand whether the ground is contaminated.

Superficial Deposit Permeability

There is no information on superficial deposits for the site.

Bedrock Permeability

The bedrock permeability is spatially variable for the Southeast of the site, but likely to permit moderate infiltration.
Bedrock is likely to be free-draining for the North part of the site.
It is recommended that the infiltration rate is quantified via an infiltration/soakaway test.

Proposed Approach

Drainage and Discharge Methods

The application site comprises land over 1ha and therefore is classified as ‘Major’ Development. Any planning application classified as Major Development will need to include a detailed drainage strategy. As per the NPPF, all ‘major’ planning applications being determined must include full details about surface water drainage and sustainable drainage systems, which is a material consideration.

Some areas of the site may be suitable for infiltration-based SuDS techniques however ground conditions and groundwater levels should be fully investigated through intrusive ground investigations and should be provided to support any Planning Application made in respect of the site.

Our guidance documents require that soakage test results should be completed to accompany both full and outline planning applications. If intrusive investigations cannot be completed to accompany any future planning application the applicant should provide robust justification and evidence as to why.

A hierarchical approach should be taken to the discharge of surface water from the site.

- Option 1 - to ground;
- Option 2 - attenuation and discharge to adjacent watercourse;
- Option 3 - attenuation and discharge to surface water sewer.

If infiltration is proposed any future drainage design should demonstrate that a 1m unsaturated zone between the base of any proposed soakaway and highest recorded groundwater level exist.

Any surface water discharged from the site should be restricted to the existing greenfield run-off rate applied to the impermeable area of the site only. Qbar is considered acceptable (applied to the proposed impermeable area only) or a staged discharge approach with greenfield run-off rates applied to the 1 in 1 year, 1 in 30 year and 1 in 100 year events accordingly.

In accordance with Technical Standard S2:

‘For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.’

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event. The upper end allowance should be applied for climate change for residential development. A lower % for climate change may be considered acceptable for commercial property dependent upon the life span of the development, however sensitivity testing will be required up to the upper end allowance event.

In 2022 the peak rainfall allowances in ‘Flood risk assessments: climate change allowances’ were updated so they reflect the latest projections in UKCP Local (2.2km) and subsequent research ‘FUTURE-DRAINAGE: Ensemble climate change rainfall estimates for sustainable drainage’. The site is located within the Mole Management Catchment and therefore the 1% annual exceedance rainfall event for the 2070s Epoch should be considered as the upper end allowance of 40%.

Where appropriate, a 10% allowance for urban creep should be included in the drainage designs.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

Our records indicate that one or more Ordinary Watercourses may be located within the site boundary, these watercourses should be accommodated within the site layout. Watercourses should not be culverted except for where access is required (such works will require consent), the site layout should allow for access to any watercourse for maintenance and generally they should be located within publicly accessible areas.

Further to a MS Teams meeting with the Applicant on 25 July 2023 the following points were discussed and must be considered as part of any planning application for the site.

Any future planning application should:

- Demonstrate how the recreation ponds will provide the additional storage for the western catchment – this should include design storage levels for the existing and proposed scenarios.
- Identify who will be responsible for maintaining the suds features and how they will be maintained.
- Propose additional suds features such as rain gardens, green roofs, etc for the non-residential areas to provide wider benefits.
- Must consider if any remedial works are required to the proposed outfall culvert and how access would be gained to do so, or a new outfall constructed should the pipe not be suitable to receive flows from the site.
- Consider whether there is any flood risk from the existing 150mm dia. pipe that outfalls through the site from the southern pond over the life time of the development, due to climate change. The existing pond to the south may overflow more frequently into the pipe so please consider whether diverting or retaining as like for like is appropriate.

SuDS Components

Paragraph 169 of NPPF states ‘Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) *take account of advice from the lead local flood authority;*
b) *have appropriate proposed minimum operational standards;*
c) *have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
d) *where possible, provide multifunctional benefits’.*

Many schemes deliver the management of water quantity but do not fulfil the four pillars of SuDS design as defined by the SuDS Manual. The manual seeks to encourage schemes that manage the quantity and quality of surface water runoff, provide an amenity that integrates surface water as an attractive part of public space and also enhance biodiversity. Schemes based around the management of quantity alone are purely drainage schemes not SuDS.

As required by the NPPF all development should incorporate sustainable drainage systems, unless there is clear evidence that this would be inappropriate.

The following proposals for SuDS have been put forward as part of the drainage design:

Infiltration should be considered in the first instance however due to the likelihood of a high water table adjacent to the Ordinary Watercourses infiltration may not be suitable. Intrusive ground investigations should be completed to determine ground conditions and assess groundwater levels.

All SuDS principles could be affected if groundwater levels are high, and therefore this information should be gathered to inform the drainage strategy.

If soakaways are unsuitable, above ground attenuation of surface water should be considered in the first instance before below ground storage is proposed. If above ground attenuation of surface water is not considered feasible full justification should be provided.

The Applicant should consider the management and maintenance of the proposed SuDS elements and this information should be presented as part of any Planning Application.

Site Development Details: Cross-check

The table below cross-checks the information provided with the planning application, with information easily available to Surrey County Council and provides recommendations on the suitability of the proposed drainage.

Site Details	Description
Bedrock	The Northern part of the site is Sandstone (Folkestone Formation). The Southern part of the site is Sandstone and Mudstone (Sandgate Formation)
Superficial Deposits	Unspecified (majority of the site). River Terrace deposits (Northern boundary of the site).
Soils	Soilscapes conveys a summary of the broad regional differences in the soil landscapes of England and Wales. Soilscapes is not intended as a means for supporting detailed assessments, such as land planning applications or site investigations; nor should it be used to support commercial activities. For such applications, a parallel service Soils Site Reporter provides comprehensive reporting for specific locations. Ground investigations should also be evidenced when considering infiltration drainage. Freely draining slightly acid loamy soils.
Depth to Water Table (m)	Groundwater is likely to be more than 5 m below the ground surface throughout the year for the majority of the site. Observations of seasonal variations in groundwater level are recommended. Groundwater is likely to be less than 3 m below the ground surface for at least part of the year for the northwestern boundary of the site. It is recommended that the seasonal variation in groundwater levels are determined. The scale of site specific assessments and evidence of groundwater levels should be appropriate to the size and nature of the proposed development site. This Northwestern boundary of the site may not be suitable for infiltration SuDS if the groundwater level reaches <1m below the ground surface.

Discharge method- Sewer (if applicable)	The nearest sewer is more than 50m from the proposed development. This indicates that discharging to the sewer may not be feasible. Infiltration SuDs are mandatory unless where evidenced that they are not appropriate (e.g. contaminated land, high ground water levels or land subsidence). If SuDS are not appropriate, then evidence that connecting to the sewer network is appropriate and has been permitted by the water utility company should be provided along with any third part land permissions.
Discharge method- Watercourse (if applicable)	The nearest watercourse is less than 50m from the proposed development. This indicates that discharging to the watercourse may be appropriate. Consideration should be given to the downstream flood risk and water quality of the watercourse. When discharging to watercourses, there should be a minimum of an 8m buffer from any building for access and maintenance.

Recommendations and Summary

Any surface water discharged from the site should be limited to the existing greenfield run-off rate applied to the proposed positively drained area of the site only.

Evidence must be provided to establish the greenfield runoff rate for the site. For previously developed sites, evidence must be provided where the greenfield runoff rate cannot be reasonably practicably achieved.

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event, with a sensitivity check up to the 1 in 100 year upper end allowance event if not used already.

SCC Surface water drainage pro-forma should be completed to accompany any future Planning Applications with supporting evidence provided.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Ordinary Watercourse Consent

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website Ordinary watercourse consents - Surrey County Council (surreycc.gov.uk).

Additional Information Sources

BRE365. Soakaway Design

Surrey County Council SuDS Design Guidance

CIRIA. 2015. The SuDS Manual (C753).

Defra. 2015. Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

Water Places People https://www.susdrain.org/files/resources/other-guidance/water_people_places_guidance_for_master_planning_sustainable_drainage_into_developments.pdf

NPPF https://www.gov.uk/government/publications/national-planning-policy-framework--2

Local Flood Strategy https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/surrey-local-flood-risk-management-strategy

LPA Websites - SFRAs and SPD

Reigate & Banstead
SFRA - Strategic Flood Risk Assessment (SFRA) | Reigate and Banstead (reigate-banstead.gov.uk)
SPD - Adopted SPDs and SPGs | Supplementary Planning Documents and Supplementary Planning Guidance | Reigate and Banstead (reigate-banstead.gov.uk)

Surrey County Council
PFRA - The Preliminary Flood Risk Assessment - Surrey County Council (surreycc.gov.uk)

F. Thames Water

Asset location search

Property Searches

Waterman Infrastructure & Environment
LONDON
SE1 9DG

Search address supplied RH1 4HE

Your reference WIE19222

Our reference ALS/ALS Standard/2023_4876783

Search date 14 September 2023

Notification of Price Changes

From 1st April 2023 Thames water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches. Historically costs would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%.

Customers will be emailed with the new prices by January 1st 2023.

Any orders received with a higher payment prior to the 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk

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

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

0800 009 4540

Asset location search

Property Searches

Search address supplied: RH1 4HE

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 0800 009 4540, or use the address below:

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

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Thames Water Property Searches

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:

TQ3050NE
TQ3050NW
TQ3050SW
TQ2950SE

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.

The following quartiles have not been printed as they contain no assets:

TQ2950NE

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.

Asset location search

Property Searches

Following examination of our statutory maps, Thames Water has been unable to find any plans of water mains within this area. If you require a connection to the public water supply system, please write to:

New Connections / Diversions
Thames Water
Network Services Business Centre
Brentford
Middlesex
TW8 0EE

Tel: 0845 850 2777
Fax: 0207 713 3858
Email: developer.services@thameswater.co.uk

The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TQ3050NE	Sutton and East Surrey
TQ3050NW	Sutton and East Surrey
TQ2950NE	Sutton and East Surrey
TQ3050SW	Sutton and East Surrey
TQ2950SE	Sutton and East Surrey

Sutton & East Surrey Water
London Road
Redhill
Surrey
RH1 1LJ

Tel: 01737 772 000
Fax: 01737 766 807
Website: www.waterplc.co.uk.

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.

Asset location search

Property Searches

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

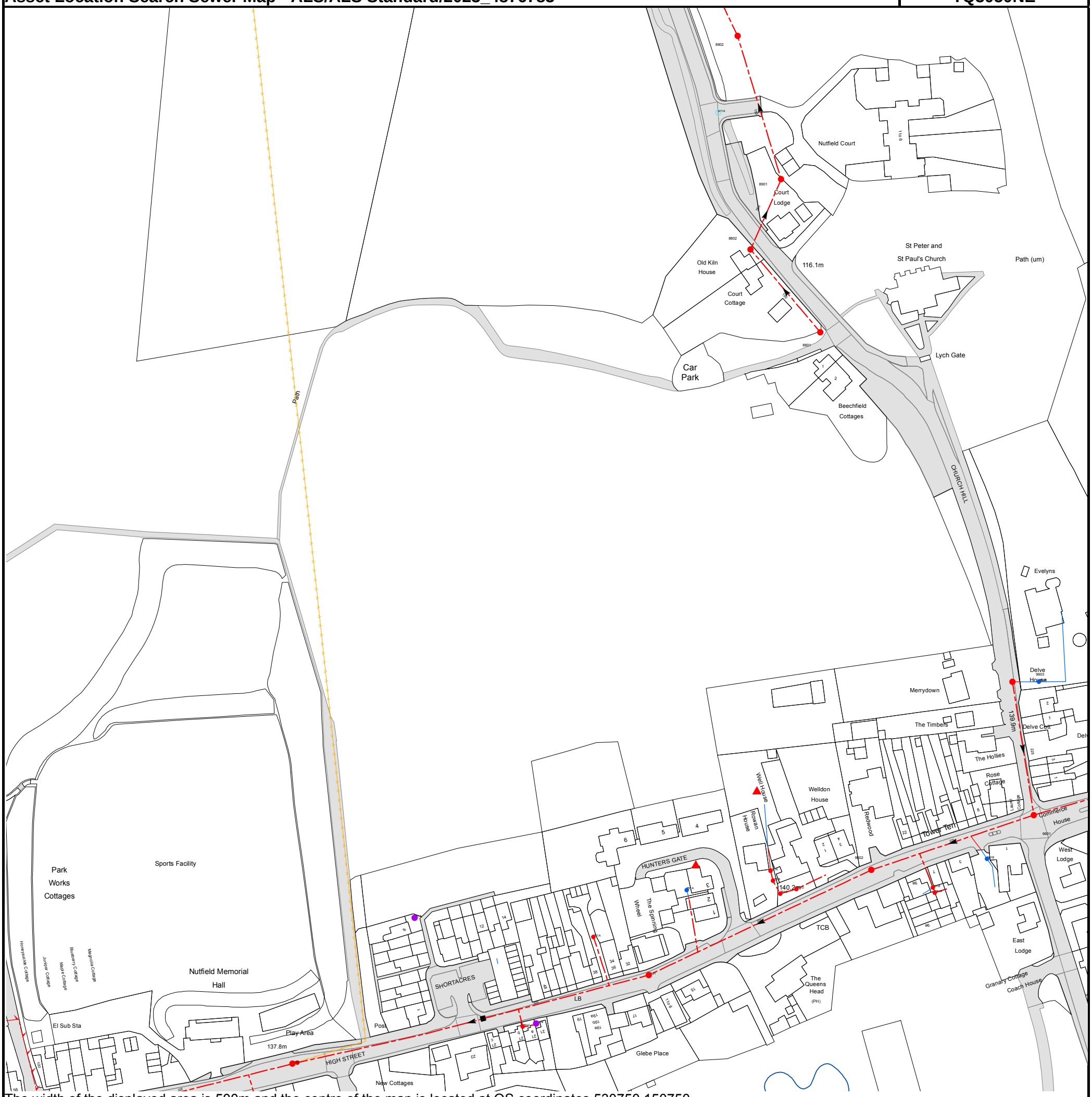
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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/2023_4876783

TQ3050NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 530750,150750

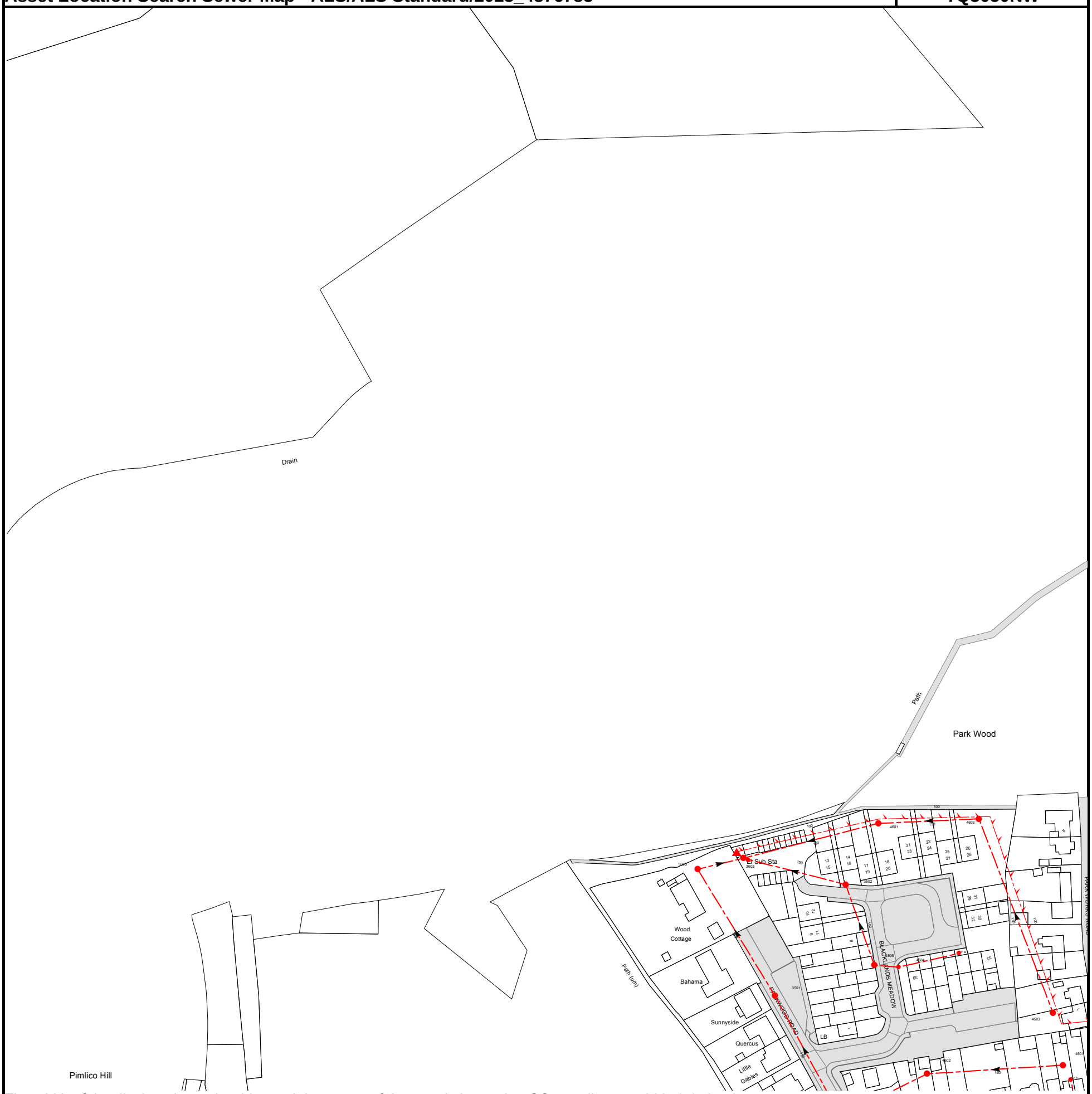
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual 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
751A	n/a	n/a
7501	141.44	135.87
851A	n/a	n/a
8802	116.56	114.92
861A	n/a	n/a
851B	n/a	n/a
851C	n/a	n/a
8901	n/a	n/a
851D	n/a	n/a
8801	n/a	n/a
9602	140.82	136.31
951B	n/a	n/a
951A	n/a	n/a
961B	n/a	n/a
9603	139.64	136.81
9601	141.06	136.6
961A	n/a	n/a
891A	n/a	n/a
8902	n/a	n/a
6502	138.01	135.12
651A	n/a	n/a

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

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4876783	TQ3050NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 530250,150750

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.

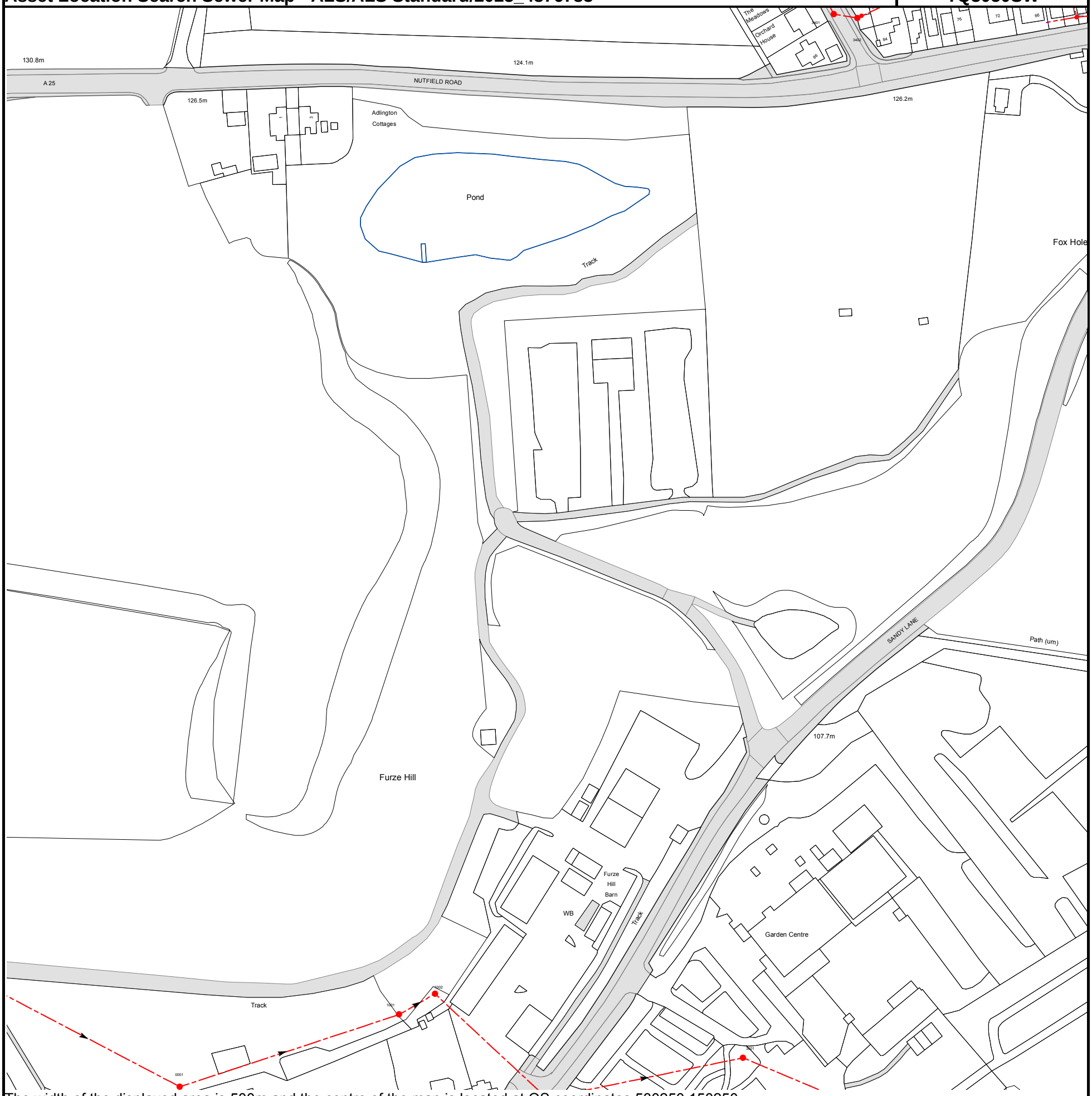
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
451A	n/a	n/a
4502	128.25	127.33
4501	n/a	n/a
4503	128.86	127.49
4504	124.34	122.85
451B	n/a	n/a
4601	120.34	118.39
4602	120.72	119.07
3603	119.77	117.87
3602	119.83	117.66
3501	122.61	121.27
3502	120.83	119.34
4505	123.67	121.92

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.

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4876783

TQ3050SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 530250,150250

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.

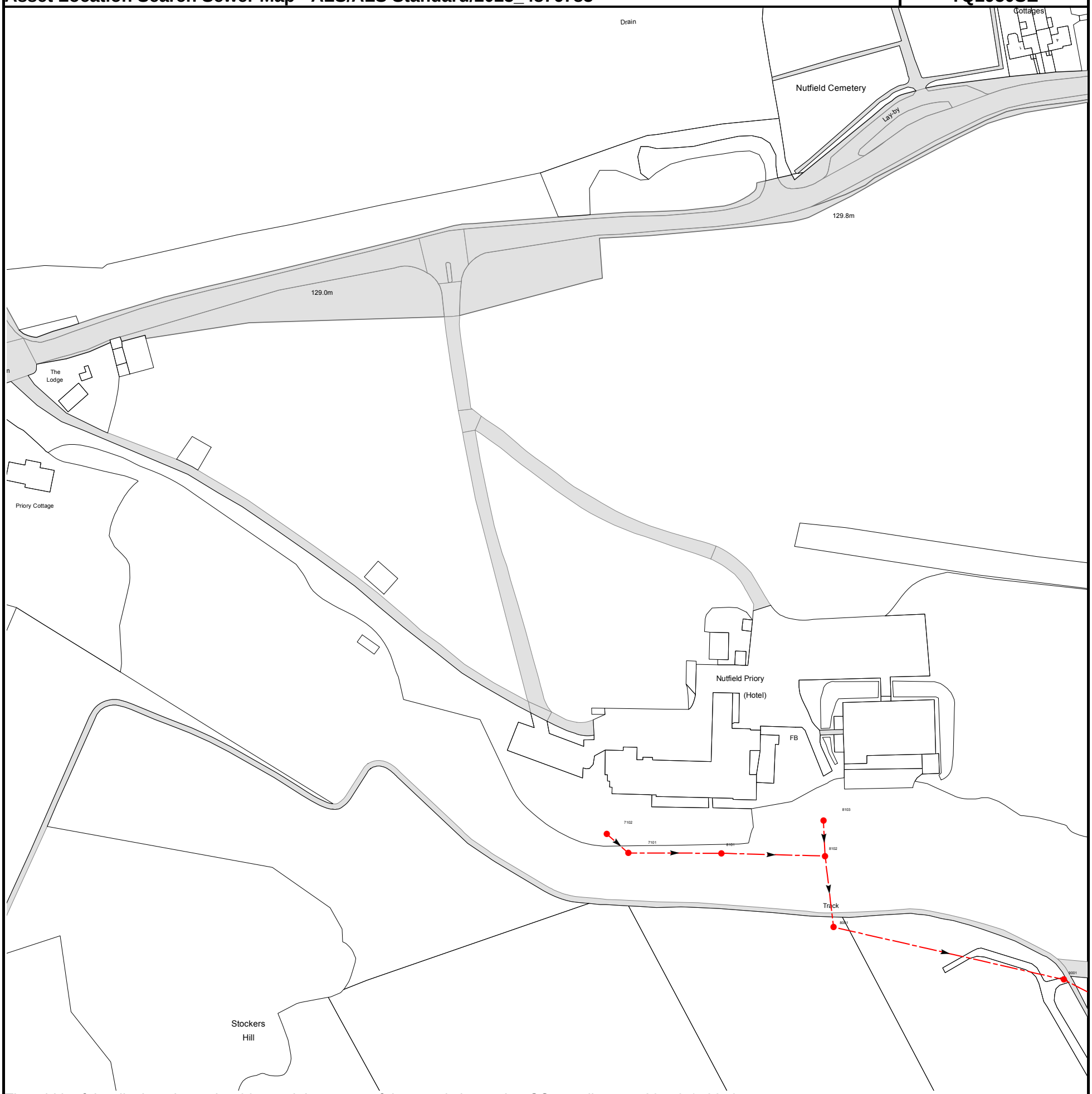
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
441C	n/a	n/a
441D	n/a	n/a
1002	109.4	106.2
3401	125.71	124.03
3402	n/a	n/a
0001	112.13	109.47
1001	112	108.61
3001	99.03	97.83

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.

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4876783

TQ2950SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 529750,150250

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
7102	133.99	n/a
7101	n/a	n/a
8101	n/a	n/a
8103	127.96	n/a
8102	n/a	n/a
8001	112.9	111.7
9001	113.7	110.51

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.

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.

Payment 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 within 14 days of the 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. 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'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. 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 still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

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 0300 034 2222 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**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	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

G. Surface Water Drainage Calculations

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sean Whelan
Site name:	Nutfield Green
Site location:	Surrey

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.24111° N
Longitude:	0.13313° W
Reference:	3575254270
Date:	Mar 29 2023 12:57

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	760	760
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

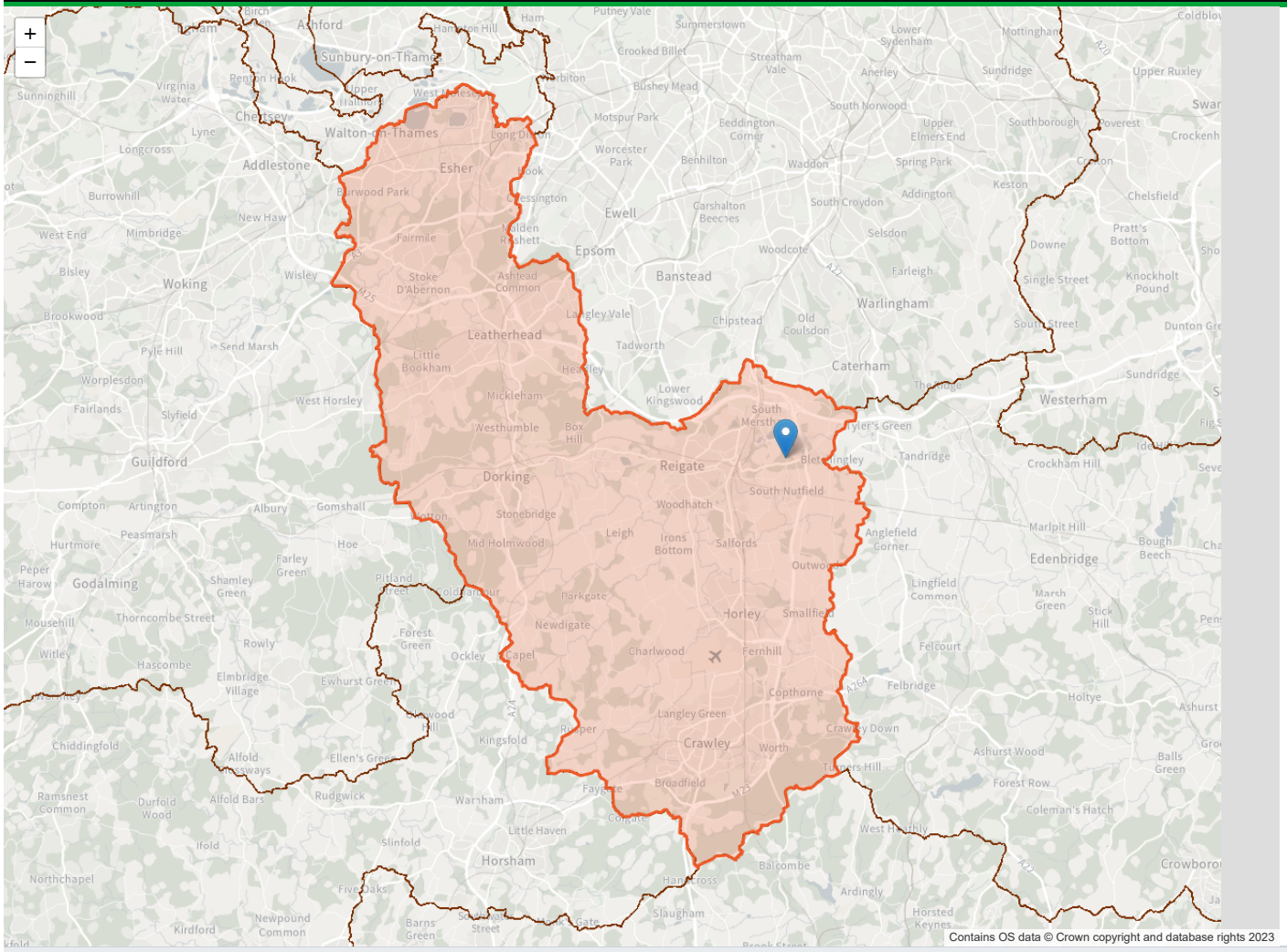
(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	5.32	5.32
1 in 1 year (l/s):	4.52	4.52
1 in 30 years (l/s):	12.23	12.23
1 in 100 year (l/s):	16.96	16.96
1 in 200 years (l/s):	19.88	19.88



Mole Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	35%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	40%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	101.032	0.532	4.9	0.0	4.9	74.5	O K
30 min Summer	101.199	0.699	4.9	0.0	4.9	97.9	O K
60 min Summer	101.367	0.867	4.9	0.0	4.9	121.4	O K
120 min Summer	101.423	0.923	4.9	0.0	4.9	129.2	O K
180 min Summer	101.435	0.935	4.9	0.0	4.9	130.9	O K
240 min Summer	101.427	0.927	4.9	0.0	4.9	129.8	O K
360 min Summer	101.397	0.897	4.9	0.0	4.9	125.6	O K
480 min Summer	101.364	0.864	4.9	0.0	4.9	121.0	O K
600 min Summer	101.331	0.831	4.9	0.0	4.9	116.3	O K
720 min Summer	101.299	0.799	4.9	0.0	4.9	111.8	O K
960 min Summer	101.238	0.738	4.9	0.0	4.9	103.3	O K
1440 min Summer	101.126	0.626	4.9	0.0	4.9	87.6	O K
2160 min Summer	100.978	0.478	4.9	0.0	4.9	66.9	O K
2880 min Summer	100.862	0.362	4.9	0.0	4.9	50.7	O K
4320 min Summer	100.719	0.219	4.5	0.0	4.5	30.7	O K
5760 min Summer	100.648	0.148	4.1	0.0	4.1	20.7	O K
7200 min Summer	100.616	0.116	3.7	0.0	3.7	16.2	O K
8640 min Summer	100.600	0.100	3.2	0.0	3.2	14.0	O K
10080 min Summer	100.590	0.090	2.9	0.0	2.9	12.6	O K
15 min Winter	101.032	0.532	4.9	0.0	4.9	74.5	O K
30 min Winter	101.199	0.699	4.9	0.0	4.9	97.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	105.912	0.0	77.6	0.0	18
30 min Summer	70.934	0.0	104.1	0.0	33
60 min Summer	45.512	0.0	134.0	0.0	62
120 min Summer	26.142	0.0	154.0	0.0	122
180 min Summer	19.004	0.0	167.9	0.0	180
240 min Summer	15.191	0.0	179.0	0.0	240
360 min Summer	11.112	0.0	196.4	0.0	298
480 min Summer	8.926	0.0	210.4	0.0	358
600 min Summer	7.544	0.0	222.3	0.0	420
720 min Summer	6.583	0.0	232.7	0.0	486
960 min Summer	5.321	0.0	250.8	0.0	616
1440 min Summer	3.959	0.0	279.9	0.0	880
2160 min Summer	2.943	0.0	312.5	0.0	1252
2880 min Summer	2.378	0.0	336.5	0.0	1612
4320 min Summer	1.749	0.0	371.0	0.0	2292
5760 min Summer	1.401	0.0	396.7	0.0	2992
7200 min Summer	1.171	0.0	414.3	0.0	3672
8640 min Summer	1.013	0.0	430.0	0.0	4408
10080 min Summer	0.899	0.0	445.1	0.0	5136
15 min Winter	105.912	0.0	77.6	0.0	18
30 min Winter	70.934	0.0	104.1	0.0	32

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	101.367	0.867	4.9	0.0	4.9	121.4	O K
120 min Winter	101.424	0.924	4.9	0.0	4.9	129.3	O K
180 min Winter	101.436	0.936	4.9	0.0	4.9	131.1	O K
240 min Winter	101.429	0.929	4.9	0.0	4.9	130.1	O K
360 min Winter	101.388	0.888	4.9	0.0	4.9	124.3	O K
480 min Winter	101.340	0.840	4.9	0.0	4.9	117.6	O K
600 min Winter	101.291	0.791	4.9	0.0	4.9	110.7	O K
720 min Winter	101.241	0.741	4.9	0.0	4.9	103.8	O K
960 min Winter	101.146	0.646	4.9	0.0	4.9	90.4	O K
1440 min Winter	100.979	0.479	4.9	0.0	4.9	67.1	O K
2160 min Winter	100.798	0.298	4.8	0.0	4.8	41.8	O K
2880 min Winter	100.693	0.193	4.4	0.0	4.4	27.1	O K
4320 min Winter	100.612	0.112	3.6	0.0	3.6	15.7	O K
5760 min Winter	100.591	0.091	2.9	0.0	2.9	12.7	O K
7200 min Winter	100.578	0.078	2.4	0.0	2.4	11.0	O K
8640 min Winter	100.571	0.071	2.1	0.0	2.1	9.9	O K
10080 min Winter	100.566	0.066	1.9	0.0	1.9	9.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	45.512	0.0	134.0	0.0	62
120 min Winter	26.142	0.0	154.0	0.0	120
180 min Winter	19.004	0.0	167.9	0.0	176
240 min Winter	15.191	0.0	179.0	0.0	232
360 min Winter	11.112	0.0	196.4	0.0	330
480 min Winter	8.926	0.0	210.4	0.0	370
600 min Winter	7.544	0.0	222.3	0.0	442
720 min Winter	6.583	0.0	232.7	0.0	514
960 min Winter	5.321	0.0	250.8	0.0	654
1440 min Winter	3.959	0.0	279.9	0.0	910
2160 min Winter	2.943	0.0	312.5	0.0	1260
2880 min Winter	2.378	0.0	336.5	0.0	1588
4320 min Winter	1.749	0.0	371.0	0.0	2244
5760 min Winter	1.401	0.0	396.7	0.0	2936
7200 min Winter	1.171	0.0	414.3	0.0	3672
8640 min Winter	1.013	0.0	430.0	0.0	4408
10080 min Winter	0.899	0.0	445.2	0.0	5128

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 530409 150740 TQ 30409 50740
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.295

Time (mins) From:	To:	Area (ha)
0	4	0.295

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	140.0	1.500	140.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	100.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 102.000

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow Σ (l/s)	Max Volume (m³)	Status
15 min Summer	101.254	0.754	4.9	0.0	4.9	105.6	O K
30 min Summer	101.498	0.998	4.9	0.0	4.9	139.7	O K
60 min Summer	101.743	1.243	4.9	0.0	4.9	174.0	Flood Risk
120 min Summer	101.842	1.342	4.9	0.0	4.9	187.9	Flood Risk
180 min Summer	101.879	1.379	4.9	0.0	4.9	193.1	Flood Risk
240 min Summer	101.888	1.388	4.9	0.0	4.9	194.3	Flood Risk
360 min Summer	101.868	1.368	4.9	0.0	4.9	191.5	Flood Risk
480 min Summer	101.844	1.344	4.9	0.0	4.9	188.1	Flood Risk
600 min Summer	101.819	1.319	4.9	0.0	4.9	184.7	Flood Risk
720 min Summer	101.795	1.295	4.9	0.0	4.9	181.4	Flood Risk
960 min Summer	101.749	1.249	4.9	0.0	4.9	174.8	Flood Risk
1440 min Summer	101.657	1.157	4.9	0.0	4.9	162.0	O K
2160 min Summer	101.509	1.009	4.9	0.0	4.9	141.2	O K
2880 min Summer	101.322	0.822	4.9	0.0	4.9	115.1	O K
4320 min Summer	101.010	0.510	4.9	0.0	4.9	71.4	O K
5760 min Summer	100.828	0.328	4.8	0.0	4.8	45.9	O K
7200 min Summer	100.723	0.223	4.5	0.0	4.5	31.2	O K
8640 min Summer	100.663	0.163	4.2	0.0	4.2	22.8	O K
10080 min Summer	100.630	0.130	3.9	0.0	3.9	18.2	O K
15 min Winter	101.254	0.754	4.9	0.0	4.9	105.6	O K
30 min Winter	101.498	0.998	4.9	0.0	4.9	139.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	148.277	0.0	108.8	0.0	19
30 min Summer	99.308	0.0	145.9	0.0	33
60 min Summer	63.716	0.0	187.7	0.0	62
120 min Summer	36.599	0.0	215.7	0.0	122
180 min Summer	26.605	0.0	235.2	0.0	182
240 min Summer	21.267	0.0	250.7	0.0	240
360 min Summer	15.557	0.0	275.1	0.0	322
480 min Summer	12.496	0.0	294.6	0.0	382
600 min Summer	10.561	0.0	311.2	0.0	448
720 min Summer	9.216	0.0	325.9	0.0	514
960 min Summer	7.449	0.0	351.2	0.0	654
1440 min Summer	5.542	0.0	391.9	0.0	936
2160 min Summer	4.121	0.0	437.5	0.0	1344
2880 min Summer	3.329	0.0	471.2	0.0	1732
4320 min Summer	2.448	0.0	519.6	0.0	2420
5760 min Summer	1.962	0.0	555.5	0.0	3104
7200 min Summer	1.639	0.0	580.0	0.0	3752
8640 min Summer	1.418	0.0	602.1	0.0	4416
10080 min Summer	1.258	0.0	623.3	0.0	5144
15 min Winter	148.277	0.0	108.8	0.0	18
30 min Winter	99.308	0.0	145.9	0.0	33

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	101.745	1.245	4.9	0.0	4.9	174.3	Flood Risk
120 min Winter	101.846	1.346	4.9	0.0	4.9	188.5	Flood Risk
180 min Winter	101.886	1.386	4.9	0.0	4.9	194.0	Flood Risk
240 min Winter	101.898	1.398	4.9	0.0	4.9	195.7	Flood Risk
360 min Winter	101.881	1.381	4.9	0.0	4.9	193.3	Flood Risk
480 min Winter	101.844	1.344	4.9	0.0	4.9	188.1	Flood Risk
600 min Winter	101.812	1.312	4.9	0.0	4.9	183.7	Flood Risk
720 min Winter	101.777	1.277	4.9	0.0	4.9	178.8	Flood Risk
960 min Winter	101.703	1.203	4.9	0.0	4.9	168.4	Flood Risk
1440 min Winter	101.547	1.047	4.9	0.0	4.9	146.5	O K
2160 min Winter	101.245	0.745	4.9	0.0	4.9	104.3	O K
2880 min Winter	100.998	0.498	4.9	0.0	4.9	69.8	O K
4320 min Winter	100.733	0.233	4.6	0.0	4.6	32.7	O K
5760 min Winter	100.634	0.134	4.0	0.0	4.0	18.7	O K
7200 min Winter	100.606	0.106	3.4	0.0	3.4	14.8	O K
8640 min Winter	100.592	0.092	2.9	0.0	2.9	12.8	O K
10080 min Winter	100.583	0.083	2.6	0.0	2.6	11.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	63.716	0.0	187.7	0.0	62
120 min Winter	36.599	0.0	215.7	0.0	120
180 min Winter	26.605	0.0	235.2	0.0	178
240 min Winter	21.267	0.0	250.7	0.0	234
360 min Winter	15.557	0.0	275.1	0.0	340
480 min Winter	12.496	0.0	294.6	0.0	392
600 min Winter	10.561	0.0	311.2	0.0	466
720 min Winter	9.216	0.0	325.9	0.0	544
960 min Winter	7.449	0.0	351.2	0.0	702
1440 min Winter	5.542	0.0	391.9	0.0	1010
2160 min Winter	4.121	0.0	437.5	0.0	1408
2880 min Winter	3.329	0.0	471.2	0.0	1732
4320 min Winter	2.448	0.0	519.6	0.0	2376
5760 min Winter	1.962	0.0	555.5	0.0	3000
7200 min Winter	1.639	0.0	580.0	0.0	3672
8640 min Winter	1.418	0.0	602.1	0.0	4408
10080 min Winter	1.258	0.0	623.4	0.0	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 530409 150740 TQ 30409 50740
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.295

Time (mins) From:	To:	Area (ha)
0	4	0.295

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	140.0	1.500	140.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	100.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 102.000

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	100.675	0.175	4.3	0.0	4.3	24.6	O K
30 min Summer	100.717	0.217	4.5	0.0	4.5	30.3	O K
60 min Summer	100.749	0.249	4.6	0.0	4.6	34.8	O K
120 min Summer	100.782	0.282	4.7	0.0	4.7	39.5	O K
180 min Summer	100.792	0.292	4.8	0.0	4.8	40.9	O K
240 min Summer	100.791	0.291	4.8	0.0	4.8	40.8	O K
360 min Summer	100.778	0.278	4.7	0.0	4.7	38.9	O K
480 min Summer	100.759	0.259	4.7	0.0	4.7	36.2	O K
600 min Summer	100.740	0.240	4.6	0.0	4.6	33.6	O K
720 min Summer	100.721	0.221	4.5	0.0	4.5	31.0	O K
960 min Summer	100.690	0.190	4.4	0.0	4.4	26.5	O K
1440 min Summer	100.645	0.145	4.1	0.0	4.1	20.4	O K
2160 min Summer	100.613	0.113	3.6	0.0	3.6	15.8	O K
2880 min Summer	100.596	0.096	3.1	0.0	3.1	13.5	O K
4320 min Summer	100.580	0.080	2.5	0.0	2.5	11.2	O K
5760 min Summer	100.571	0.071	2.1	0.0	2.1	10.0	O K
7200 min Summer	100.566	0.066	1.9	0.0	1.9	9.2	O K
8640 min Summer	100.562	0.062	1.7	0.0	1.7	8.6	O K
10080 min Summer	100.559	0.059	1.6	0.0	1.6	8.2	O K
15 min Winter	100.676	0.176	4.3	0.0	4.3	24.6	O K
30 min Winter	100.717	0.217	4.5	0.0	4.5	30.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	36.624	0.0	26.6	0.0	17
30 min Summer	23.879	0.0	34.8	0.0	31
60 min Summer	15.179	0.0	44.6	0.0	56
120 min Summer	9.884	0.0	58.1	0.0	90
180 min Summer	7.562	0.0	66.7	0.0	124
240 min Summer	6.215	0.0	73.1	0.0	158
360 min Summer	4.675	0.0	82.5	0.0	226
480 min Summer	3.803	0.0	89.5	0.0	292
600 min Summer	3.234	0.0	95.2	0.0	358
720 min Summer	2.831	0.0	100.0	0.0	420
960 min Summer	2.292	0.0	107.9	0.0	540
1440 min Summer	1.706	0.0	120.4	0.0	780
2160 min Summer	1.278	0.0	135.6	0.0	1124
2880 min Summer	1.047	0.0	148.1	0.0	1476
4320 min Summer	0.801	0.0	169.9	0.0	2204
5760 min Summer	0.669	0.0	189.4	0.0	2936
7200 min Summer	0.585	0.0	206.9	0.0	3672
8640 min Summer	0.527	0.0	223.5	0.0	4384
10080 min Summer	0.484	0.0	239.8	0.0	5120
15 min Winter	36.624	0.0	26.6	0.0	17
30 min Winter	23.879	0.0	34.8	0.0	31

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	100.749	0.249	4.6	0.0	4.6	34.9	O K
120 min Winter	100.778	0.278	4.7	0.0	4.7	38.9	O K
180 min Winter	100.782	0.282	4.7	0.0	4.7	39.5	O K
240 min Winter	100.775	0.275	4.7	0.0	4.7	38.5	O K
360 min Winter	100.750	0.250	4.6	0.0	4.6	35.0	O K
480 min Winter	100.722	0.222	4.5	0.0	4.5	31.0	O K
600 min Winter	100.695	0.195	4.4	0.0	4.4	27.3	O K
720 min Winter	100.672	0.172	4.3	0.0	4.3	24.1	O K
960 min Winter	100.637	0.137	4.0	0.0	4.0	19.1	O K
1440 min Winter	100.603	0.103	3.3	0.0	3.3	14.5	O K
2160 min Winter	100.582	0.082	2.6	0.0	2.6	11.5	O K
2880 min Winter	100.572	0.072	2.1	0.0	2.1	10.0	O K
4320 min Winter	100.561	0.061	1.6	0.0	1.6	8.5	O K
5760 min Winter	100.555	0.055	1.4	0.0	1.4	7.6	O K
7200 min Winter	100.551	0.051	1.2	0.0	1.2	7.1	O K
8640 min Winter	100.548	0.048	1.1	0.0	1.1	6.7	O K
10080 min Winter	100.546	0.046	1.0	0.0	1.0	6.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	15.179	0.0	44.6	0.0	58
120 min Winter	9.884	0.0	58.1	0.0	94
180 min Winter	7.562	0.0	66.7	0.0	132
240 min Winter	6.215	0.0	73.1	0.0	170
360 min Winter	4.675	0.0	82.5	0.0	240
480 min Winter	3.803	0.0	89.5	0.0	308
600 min Winter	3.234	0.0	95.2	0.0	372
720 min Winter	2.831	0.0	100.0	0.0	434
960 min Winter	2.292	0.0	107.9	0.0	548
1440 min Winter	1.706	0.0	120.4	0.0	778
2160 min Winter	1.278	0.0	135.6	0.0	1128
2880 min Winter	1.047	0.0	148.2	0.0	1496
4320 min Winter	0.801	0.0	169.9	0.0	2204
5760 min Winter	0.669	0.0	189.4	0.0	2952
7200 min Winter	0.585	0.0	206.9	0.0	3672
8640 min Winter	0.527	0.0	223.6	0.0	4352
10080 min Winter	0.484	0.0	239.8	0.0	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 530409 150740 TQ 30409 50740
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.295

Time (mins) From:	To:	Area (ha)
0	4	0.295

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	140.0	1.500	140.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	100.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 102.000

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	100.911	0.411	4.9	0.0	4.9	57.6	O K
30 min Summer	101.034	0.534	4.9	0.0	4.9	74.8	O K
60 min Summer	101.144	0.644	4.9	0.0	4.9	90.2	O K
120 min Summer	101.177	0.677	4.9	0.0	4.9	94.7	O K
180 min Summer	101.171	0.671	4.9	0.0	4.9	93.9	O K
240 min Summer	101.160	0.660	4.9	0.0	4.9	92.3	O K
360 min Summer	101.130	0.630	4.9	0.0	4.9	88.2	O K
480 min Summer	101.098	0.598	4.9	0.0	4.9	83.7	O K
600 min Summer	101.066	0.566	4.9	0.0	4.9	79.2	O K
720 min Summer	101.034	0.534	4.9	0.0	4.9	74.8	O K
960 min Summer	100.975	0.475	4.9	0.0	4.9	66.5	O K
1440 min Summer	100.878	0.378	4.9	0.0	4.9	52.9	O K
2160 min Summer	100.774	0.274	4.7	0.0	4.7	38.3	O K
2880 min Summer	100.706	0.206	4.5	0.0	4.5	28.9	O K
4320 min Summer	100.633	0.133	4.0	0.0	4.0	18.7	O K
5760 min Summer	100.607	0.107	3.4	0.0	3.4	15.0	O K
7200 min Summer	100.593	0.093	3.0	0.0	3.0	13.0	O K
8640 min Summer	100.583	0.083	2.6	0.0	2.6	11.7	O K
10080 min Summer	100.577	0.077	2.4	0.0	2.4	10.8	O K
15 min Winter	100.912	0.412	4.9	0.0	4.9	57.6	O K
30 min Winter	101.035	0.535	4.9	0.0	4.9	74.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	82.711	0.0	60.6	0.0	18
30 min Summer	55.123	0.0	80.8	0.0	33
60 min Summer	34.947	0.0	102.9	0.0	62
120 min Summer	20.383	0.0	120.0	0.0	120
180 min Summer	14.877	0.0	131.4	0.0	160
240 min Summer	11.900	0.0	140.2	0.0	190
360 min Summer	8.683	0.0	153.4	0.0	254
480 min Summer	6.950	0.0	163.8	0.0	322
600 min Summer	5.853	0.0	172.4	0.0	388
720 min Summer	5.089	0.0	179.9	0.0	456
960 min Summer	4.089	0.0	192.7	0.0	588
1440 min Summer	3.021	0.0	213.5	0.0	838
2160 min Summer	2.246	0.0	238.4	0.0	1192
2880 min Summer	1.823	0.0	258.0	0.0	1552
4320 min Summer	1.359	0.0	288.4	0.0	2244
5760 min Summer	1.106	0.0	313.0	0.0	2936
7200 min Summer	0.938	0.0	332.0	0.0	3672
8640 min Summer	0.823	0.0	349.4	0.0	4400
10080 min Summer	0.740	0.0	366.3	0.0	5136
15 min Winter	82.711	0.0	60.6	0.0	18
30 min Winter	55.123	0.0	80.8	0.0	32

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	101.145	0.645	4.9	0.0	4.9	90.3	O K
120 min Winter	101.179	0.679	4.9	0.0	4.9	95.0	O K
180 min Winter	101.172	0.672	4.9	0.0	4.9	94.1	O K
240 min Winter	101.153	0.653	4.9	0.0	4.9	91.5	O K
360 min Winter	101.112	0.612	4.9	0.0	4.9	85.7	O K
480 min Winter	101.065	0.565	4.9	0.0	4.9	79.0	O K
600 min Winter	101.016	0.516	4.9	0.0	4.9	72.2	O K
720 min Winter	100.969	0.469	4.9	0.0	4.9	65.7	O K
960 min Winter	100.886	0.386	4.9	0.0	4.9	54.0	O K
1440 min Winter	100.762	0.262	4.7	0.0	4.7	36.7	O K
2160 min Winter	100.659	0.159	4.2	0.0	4.2	22.2	O K
2880 min Winter	100.616	0.116	3.7	0.0	3.7	16.2	O K
4320 min Winter	100.588	0.088	2.8	0.0	2.8	12.3	O K
5760 min Winter	100.575	0.075	2.3	0.0	2.3	10.5	O K
7200 min Winter	100.567	0.067	1.9	0.0	1.9	9.4	O K
8640 min Winter	100.562	0.062	1.7	0.0	1.7	8.7	O K
10080 min Winter	100.558	0.058	1.5	0.0	1.5	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	34.947	0.0	102.9	0.0	60
120 min Winter	20.383	0.0	120.0	0.0	118
180 min Winter	14.877	0.0	131.4	0.0	170
240 min Winter	11.900	0.0	140.2	0.0	194
360 min Winter	8.683	0.0	153.5	0.0	268
480 min Winter	6.950	0.0	163.8	0.0	342
600 min Winter	5.853	0.0	172.4	0.0	416
720 min Winter	5.089	0.0	179.9	0.0	484
960 min Winter	4.089	0.0	192.7	0.0	616
1440 min Winter	3.021	0.0	213.6	0.0	854
2160 min Winter	2.246	0.0	238.4	0.0	1192
2880 min Winter	1.823	0.0	258.0	0.0	1500
4320 min Winter	1.359	0.0	288.4	0.0	2208
5760 min Winter	1.106	0.0	313.0	0.0	2936
7200 min Winter	0.938	0.0	332.0	0.0	3672
8640 min Winter	0.823	0.0	349.4	0.0	4368
10080 min Winter	0.740	0.0	366.3	0.0	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 530409 150740 TQ 30409 50740
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.295

Time (mins) From:	To:	Area (ha)
0	4	0.295

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	140.0	1.500	140.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	100.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 102.000

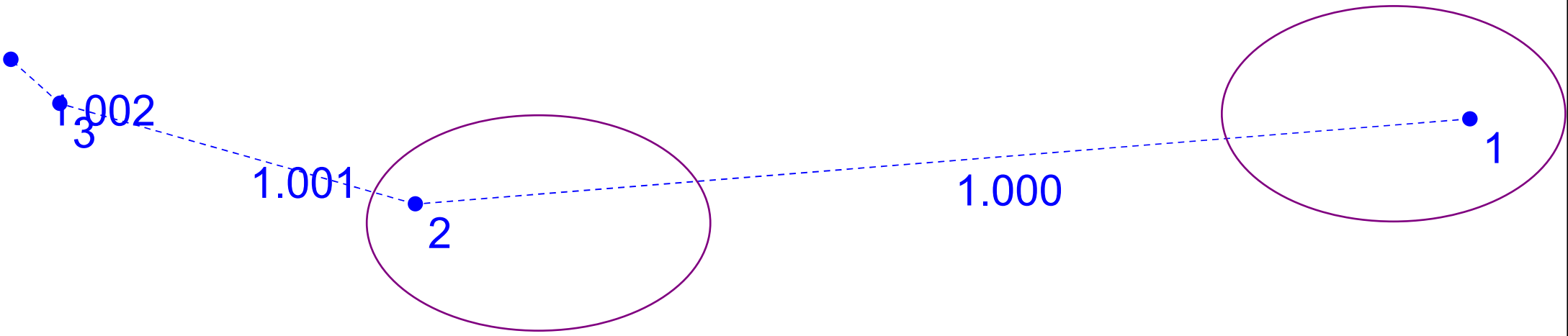
STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	320.000	9.500	33.7	5.890	5.00	0.0	0.600	o	1200	Pipe/Conduit	
1.001	155.000	4.000	38.8	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.83	98.500	5.890	0.0	0.0	0.0	6.46	7301.9	797.6
1.001	50.00	6.26	89.000	5.890	0.0	0.0	0.0	6.02	6806.9	797.6


1.002
3
1.001
2
1.000
1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0
Site Location	GB 530409 150740 TQ 30409 50740	Minimum Backdrop Height (m)	0.200
Data Type	Point	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

Network Design Table for Storm

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	178.616	0.100	1786.2	24.012	5.00	58.0	0.600		o	225	Pipe/Conduit	
1.001	62.359	0.100	623.6	5.726	0.00	0.0		0.045	2 _/	1000	1:2 Ditch	
1.002	11.128	0.100	111.3	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	14.90	80.900	24.012	58.0	0.0	0.0	0.30	12.0«	3309.5
1.001	50.00	18.26	80.500	29.738	58.0	0.0	0.0	0.31	148.5«	4084.9
1.002	50.00	18.45	80.400	29.738	58.0	0.0	0.0	0.95	16.8«	4084.9

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002		81.000	80.300	80.400	150	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs 0	Number of Offline Controls 0	Number of Time/Area Diagrams 0
Number of Online Controls 0	Number of Storage Structures 2	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 530409 150740 TQ 30409 50740	Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

Storage Structures for Storm

Tank or Pond Manhole: 1, DS/PN: 1.000

Invert Level (m) 80.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	8456.2	0.600	13745.1	1.200	15693.8	1.800	18612.7	2.400	20842.1	3.000	22465.1
0.100	10986.1	0.700	14044.0	1.300	16103.7	1.900	19100.7	2.500	21069.5	3.100	22771.8
0.200	12074.9	0.800	14336.7	1.400	16583.4	2.000	19590.8	2.600	21331.1		
0.300	12641.2	0.900	14660.6	1.500	17138.5	2.100	19980.2	2.700	21595.7		
0.400	13067.3	1.000	15000.4	1.600	17665.4	2.200	20345.4	2.800	21862.2		
0.500	13439.1	1.100	15331.6	1.700	18157.2	2.300	20608.9	2.900	22154.9		

Tank or Pond Manhole: 2, DS/PN: 1.001

Invert Level (m) 80.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10545.4	0.200	10837.1	0.400	11147.5	0.600	11489.1	0.800	11888.5
0.100	10692.8	0.300	10984.7	0.500	11312.0	0.700	11685.6	0.900	12086.3

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1	10080 Summer	2	+0%	2/30 Summer				83.239	2.114	0.000	3.16		

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	50.3	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	10080 Summer	2	+0%	30/8640 Summer	30/8640 Summer			81.458	-0.042	0.000	0.04	
1.002	3	10080 Winter	2	+0%	2/180 Summer	30/8640 Summer			81.447	0.897	0.000	3.17	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		61.8	FLOOD RISK	22
1.002	3		48.0	FLOOD RISK	22

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1 10080	Summer	30	+0%	2/30 Summer				83.564	2.439	0.000	3.32		

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	52.9	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	10080 Winter	30	+0%	30/8640 Summer	30/8640 Summer			81.592	0.092	1114.680	0.04	
1.002	3	10080 Winter	30	+0%	2/180 Summer	30/8640 Summer			81.589	1.039	91.891	3.39	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		67.4	FLOOD	22
1.002	3		51.3	FLOOD	22

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1	10080 Summer	100	+0%	2/30 Summer				83.768	2.643	0.000	3.42		

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	54.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	7200 Summer	100	+0%	30/8640 Summer	30/8640 Summer			81.575	0.075	918.905	0.06	
1.002	3	10080 Summer	100	+0%	2/180 Summer	30/8640 Summer			81.677	1.127	177.407	3.51	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		96.4	FLOOD	22
1.002	3		53.2	FLOOD	22

101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1	10080 Winter	101	+40%	2/30 Summer				84.234	3.109	0.000	3.68		

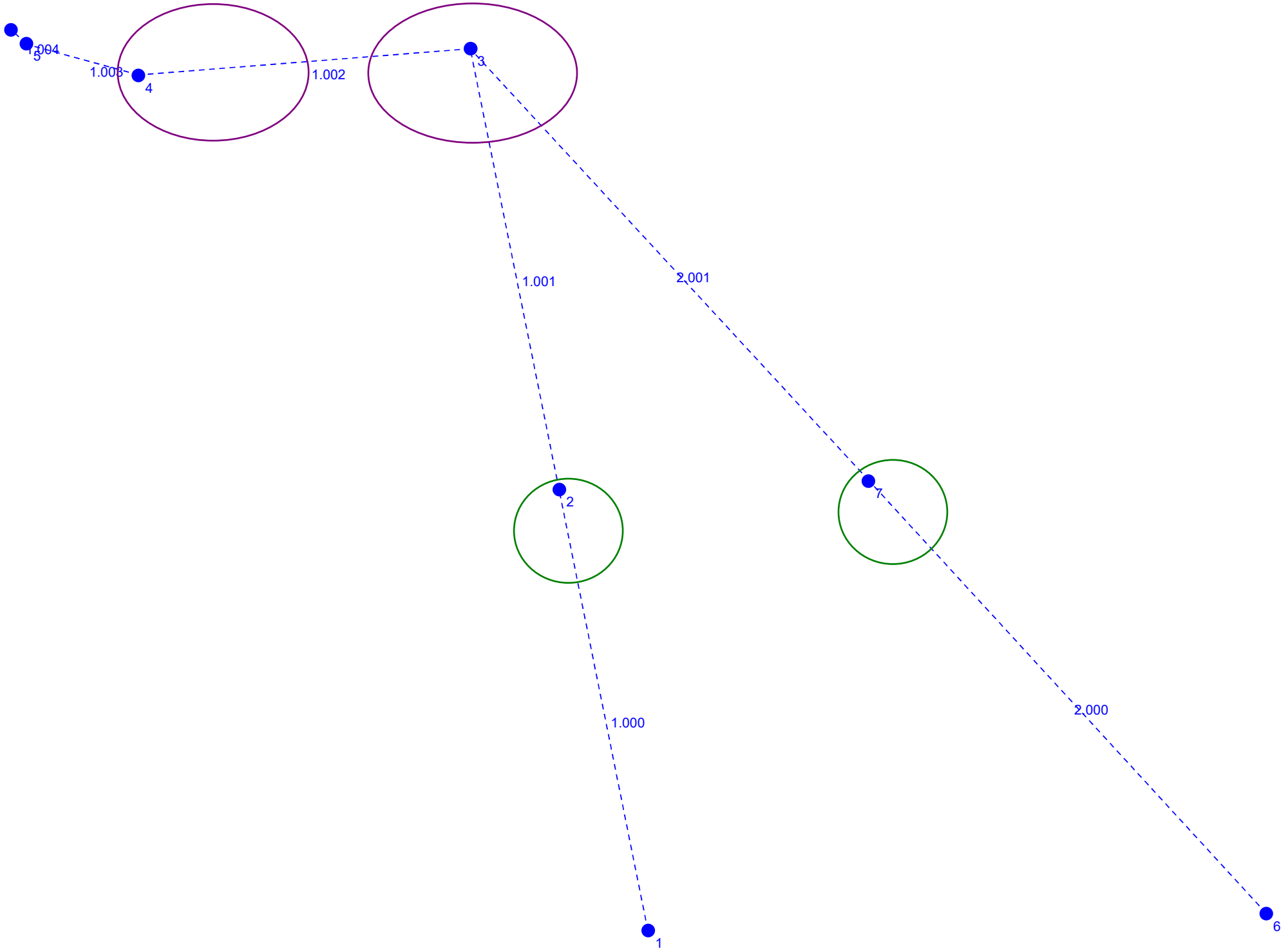
101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	58.5	SURCHARGED	

101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	10080 Summer	101	+40%	30/8640 Summer	30/8640 Summer			81.863	0.363	4402.982	0.06	
1.002	3	10080 Winter	101	+40%	2/180 Summer	30/8640 Summer			81.880	1.330	392.346	3.77	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		110.1	FLOOD	22
1.002	3		57.1	FLOOD	22


5
1.004
1.003
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1.001
2.001
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1.000
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Pickfords Wharf
Clink Street
London, SE1 9DG

Date 10/10/2023 15:46
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Innovyze | Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0
Site Location	GB 530409 150740 TQ 30409 50740	Minimum Backdrop Height (m)	0.200
Data Type	Point	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

Network Design Table for Storm

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000#	0.100	100.0	0.000	5.00	0.0	0.600		o	225	Pipe/Conduit	
1.001	250.000#	9.800	25.5	2.760	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.000	250.000#	0.100	2500.0	0.000	5.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	250.000#	18.300	13.7	1.680	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.002	25.000#	0.100	250.0	22.667	0.00	58.0	0.600		o	225	Pipe/Conduit	
1.003	62.359	0.100	623.6	5.726	0.00	0.0		0.045	2 _/	1000	1:2 Ditch	
1.004	11.128	0.100	111.3	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.13	100.600	0.000	0.0	0.0	0.0	1.31	52.0	0.0
1.001	50.00	6.73	100.500	2.760	0.0	0.0	0.0	2.60	103.4«	373.7
2.000	50.00	21.49	117.600	0.000	0.0	0.0	0.0	0.25	10.0	0.0
2.001	50.00	22.66	117.500	1.680	0.0	0.0	0.0	3.56	141.5«	227.5
1.002	50.00	23.17	80.900	27.107	58.0	0.0	0.0	0.82	32.7«	3728.6
1.003	50.00	26.53	80.500	32.834	58.0	0.0	0.0	0.31	148.5«	4504.1
1.004	50.00	26.72	80.400	32.834	58.0	0.0	0.0	0.95	16.8«	4504.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		81.000	80.300	80.400	150	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	21600
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	2

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	3	Number of Storage Structures	4	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	No
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 530409 150740 TQ 30409 50740	Cv (Winter)	1.000
Data Type	Point	Storm Duration (mins)	10080

Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 2.0

Diameter (m) 0.155 Discharge Coefficient 0.600 Invert Level (m) 100.500

Orifice Manhole: 7, DS/PN: 2.001, Volume (m³): 11.6

Diameter (m) 0.105 Discharge Coefficient 0.600 Invert Level (m) 117.500

Orifice Manhole: 3, DS/PN: 1.002, Volume (m³): 62.9

Diameter (m) 0.130 Discharge Coefficient 0.600 Invert Level (m) 80.900

Storage Structures for Storm

Tank or Pond Manhole: 2, DS/PN: 1.001

Invert Level (m) 100.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1185.0	1.500	1185.0

Tank or Pond Manhole: 7, DS/PN: 2.001

Invert Level (m) 117.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	850.0	1.500	850.0

Tank or Pond Manhole: 3, DS/PN: 1.002

Invert Level (m) 80.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	8456.2	0.500	13439.1	1.000	15000.4	1.500	17138.5	2.000	19590.8	2.500	21069.5
0.100	10986.1	0.600	13745.1	1.100	15331.6	1.600	17665.4	2.100	19980.2	2.600	21331.1
0.200	12074.9	0.700	14044.0	1.200	15693.8	1.700	18157.2	2.200	20345.4	2.700	21595.7
0.300	12641.2	0.800	14336.7	1.300	16103.7	1.800	18612.7	2.300	20608.9	2.800	21862.2
0.400	13067.3	0.900	14660.6	1.400	16583.4	1.900	19100.7	2.400	20842.1	2.900	22154.9

Tank or Pond Manhole: 3, DS/PN: 1.002

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
3.000	22465.1	3.100	22771.8								

Tank or Pond Manhole: 4, DS/PN: 1.003

Invert Level (m) 80.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10545.4	0.200	10837.1	0.400	11147.5	0.600	11489.1	0.800	11888.5		
0.100	10692.8	0.300	10984.7	0.500	11312.0	0.700	11685.6	0.900	12086.3		

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	1	30 Summer	2	+0%	2/120 Summer				100.751	-0.074	0.000	0.00			0.1

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
1.000	1	OK	

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	480 Summer	2	+0%	2/30 Summer				100.912	0.187	0.000	0.28	
2.000	6	360 Winter	2	+0%	2/180 Summer				117.864	0.039	0.000	0.00	
2.001	7	600 Summer	2	+0%	2/60 Summer				117.874	0.149	0.000	0.09	
1.002	3	10080 Winter	2	+0%	2/30 Summer				83.489	2.364	0.000	1.61	
1.003	4	8640 Winter	2	+0%	30/10080 Summer	30/10080 Summer			81.317	-0.183	0.000	0.04	
1.004	5	10080 Summer	2	+0%	2/180 Summer	30/10080 Summer			81.379	0.829	0.000	3.06	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		29.0	SURCHARGED	
2.000	6		0.0	SURCHARGED	
2.001	7		13.1	SURCHARGED	
1.002	3		48.5	SURCHARGED	
1.003	4		75.3	FLOOD RISK	18
1.004	5		46.3	FLOOD RISK	18

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	1	15 Summer	30	+0%	2/120 Summer				100.946	0.121	0.000	0.00			0.1

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
1.000	1	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	360 Summer	30	+0%	2/30 Summer				101.292	0.567	0.000	0.41	
2.000	6	240 Winter	30	+0%	2/180 Summer				118.220	0.395	0.000	0.00	
2.001	7	480 Summer	30	+0%	2/60 Summer				118.222	0.497	0.000	0.13	
1.002	3	10080 Summer	30	+0%	2/30 Summer				83.868	2.743	0.000	1.69	
1.003	4	10080 Summer	30	+0%	30/10080 Summer	30/10080 Summer			81.534	0.034	417.918	0.07	
1.004	5	10080 Summer	30	+0%	2/180 Summer	30/10080 Summer			81.540	0.990	109.975	3.30	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		42.4	SURCHARGED	
2.000	6		0.0	SURCHARGED	
2.001	7		18.8	SURCHARGED	
1.002	3		51.1	SURCHARGED	
1.003	4		111.7	FLOOD	18
1.004	5		50.0	FLOOD	18

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	1	15 Winter	100	+0%	2/120 Summer				101.073	0.248	0.000	0.00			0.1

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
1.000	1	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	360 Summer	100	+0%	2/30 Summer				101.533	0.808	0.000	0.48	
2.000	6	360 Winter	100	+0%	2/180 Summer				118.448	0.623	0.000	0.00	
2.001	7	600 Summer	100	+0%	2/60 Summer				118.453	0.728	0.000	0.16	
1.002	3	10080 Winter	100	+0%	2/30 Summer				84.104	2.979	0.000	1.75	
1.003	4	10080 Winter	100	+0%	30/10080 Summer	30/10080 Summer			81.605	0.105	1277.917	0.07	
1.004	5	10080 Summer	100	+0%	2/180 Summer	30/10080 Summer			81.611	1.061	113.095	3.42	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		49.0	SURCHARGED	
2.000	6		0.0	SURCHARGED	
2.001	7		21.8	SURCHARGED	
1.002	3		52.8	SURCHARGED	
1.003	4		117.9	FLOOD	18
1.004	5		51.8	FLOOD	18

101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 530409 150740 TQ 30409 50740 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100, 101
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1	240 Winter	101	+40%	2/120 Summer				101.995	1.170	0.000	0.00		

101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.1	FLOOD RISK	

101 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
1.001	2	240 Winter	101	+40%	2/30 Summer				101.995	1.270	0.000	0.58	
2.000	6	360 Winter	101	+40%	2/180 Summer				118.883	1.058	0.000	0.00	
2.001	7	720 Summer	101	+40%	2/60 Summer				118.892	1.167	0.000	0.19	
1.002	3	10080 Summer	101	+40%	2/30 Summer				84.638	3.513	0.000	1.88	
1.003	4	4320 Summer	101	+40%	30/10080 Summer	30/10080 Summer			81.578	0.078	937.451	0.07	
1.004	5	10080 Winter	101	+40%	2/180 Summer	30/10080 Summer			81.815	1.265	330.262	3.69	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	2		59.7	FLOOD RISK	
2.000	6		0.0	FLOOD RISK	
2.001	7		26.6	FLOOD RISK	
1.002	3		56.8	SURCHARGED	
1.003	4		115.1	FLOOD	18
1.004	5		55.8	FLOOD	18

H. Surface Water Drainage Strategy Drawings

Glebe Lake

Existing Water Body

Existing Water Body

Existing Water Body

FP 195

FP 616

FP 624

FP 192

FP 572

FP 621

area = 1647 m²

area = 6234 m²

Landform

area = 1792 m²

FP 622

St Peter & St Paul Church

Central Woodland

Green Park East

Park Wood Hamlet

FP 571

FP 568

area = 15741 m²

Integrated Retirement Community

area = 4101 m²

area = 2025 m²

area = 11995 m²

The Shire

area = 5915 m²

Memorial Hall and Sports Pitch

Park Works Road

area = 1602 m²

Green Park West

area = 2768 m²

area = 8186 m²

area = 7305 m²

NUTFIELD ROAD

1:1 0 10 20 30 40 50 60 70 80 90 100

Rev	Date	Description	By	Chk
P01	11.10.23	FIRST ISSUE	SW	SH

Amendments

Project

NUTFIELD GREEN

Title

PROPOSED IMPERMEABLE AREAS

Client

MACE LIMITED

waterman

Office Address

Telephone & Fax numbers

mail@watermangroup.com www.watermangroup.com

Suitability			
COORDINATION			S1
Designed By	SW	Director	SH	Waterman Ref	WIE19222
Drawn By	SW	Date	11/10/2023	Scales @ A1	1:2000

Project - Originator - Volume - Level - Type - Role - Number: 19222-WIE-ZZ-XX-DR-D-92001

Revision: P01

File Path: N:\Projects\WIE19222\100\7_CAD\92_Drainage\

A1-Wat-ISO-S, x-drainage features, x-existing drainage, x-masterplan, x-RPA