Proposed Residential Development
47 Harlington Road, Hillingdon

Drainage Strategy

For

Mr Avtar Chauhan

motion

Document Control Sheet

Drainage Strategy

47 Harlington Road, Hillingdon

Mr Avtar Chauhan

This document has been issued and amended as follows:

Date	Issue	Prepared by	Approved by
14/07/20	Draft	VBH	JM

Motion
84 North Street
Guildford
GU1 4AU
T 01483 531 300
E info@motion.co.uk
W www.motion.co.uk

Contents

1.0 Introduction 2
2.0 Proposed Development 3
3.0 Existing Site Conditions 4
4.0 Proposed Surface Water Drainage Scheme 6
5.0 Surface Water Maintenance 7
6.0 A Summary and Conclusions 10

Appendices

A Site Layout
B Thames Water Asset Mapping
C UK SuDS QBar Calculations
D MicroDrainage Calculations
E Surface Water Drainage Strategy
F BGS Borehole records

1.0 Introduction

1.1 This Drainage Strategy has been prepared on behalf of Mr Avtar Chauhan in order to discharge a planning condition relating to surface water drainage, regarding the construction of a new residential development and associated parking off 47 Harlington Road, Hillington, UB8 3HY.

1.2 The surface water drainage planning condition states:

1.3 "No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy 5.15 of the London Plan and will:

- Provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;
- Include a timetable for its implementation; and
- Provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:

- provide details of water collection facilities to capture excess rainwater;
- Provide details of how rain and grey water will be recycled and reused in the development.

Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence"

2.0 Proposed Development

2.1 The development proposals involve the construction of 5 new residential units and associated parking `off 47 Harlington Road, Hillington, UB8 3HY. The development comprises the following elements.

- Construction of 5 residential units.
- New vehicle access off Harlington Road.
- Internal paved roads, footways, driveways and parking areas.
- Soft landscaping.

2.2 The proposed development is shown in Figure 2.1 and can be found in full in **Appendix A**.

Figure 2.1 Proposed development

3.0 Existing Site Conditions

3.1 The proposed development site is approximately 0.09 hectare (ha) and is currently completely made ground and can be described as wholly brownfield. The site is bounded towards the north, south, east and west by residential development. The nearest grid reference is E 507250 N 182598. The existing site location is shown in Figure 3.1.

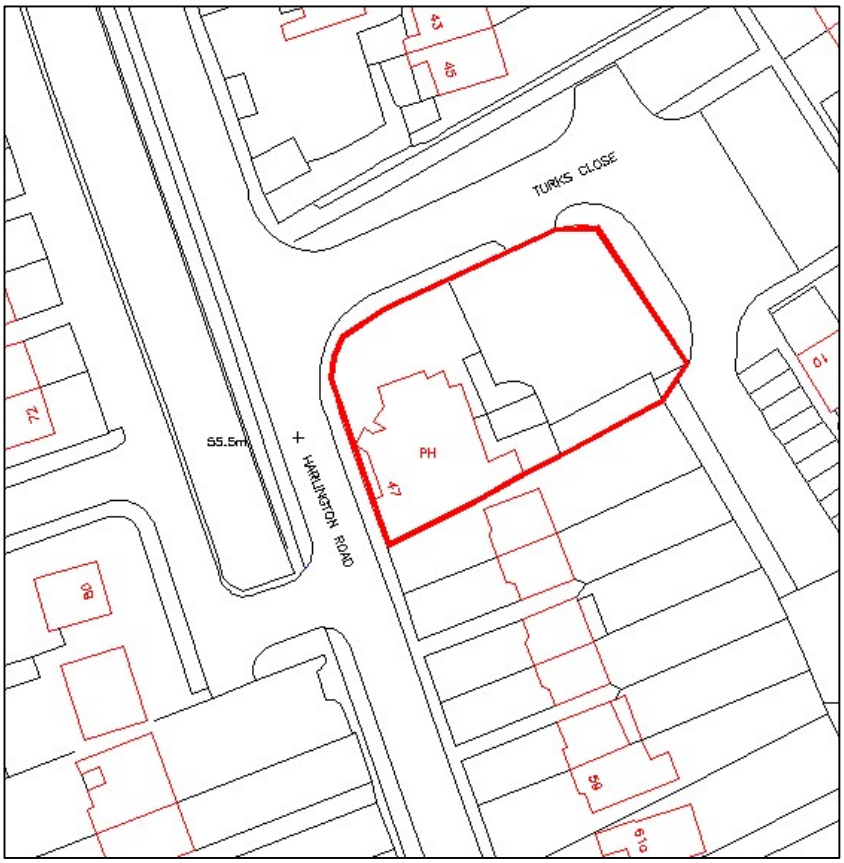


Figure 3.1 site location

Geology and Groundwater

3.2 The British Geological Survey (BGS) online Geoindex Mapping indicates that the site is underlain by London Clay Formation. The BGS borehole records be found in **Appendix F.** Due to the geology the disposal of surface water by infiltration techniques will not be possible on this site.

Existing Surface Water

3.3 Sewer records were requested from Thames Water to determine the existing sewer network available to the site. Figure 3.2 shows an extract of the Thames Water sewer records which can be found in full in **Appendix B.** The plans show that along the north and east of the site along Turks Close there is an existing surface water system.

3.4 It is understood that the existing site drains to the existing surface water system in Turks Close and it is has been assessed that the run-off generated from this area is 12.51 l/s based on a Modified Rationale formula calculation based on a 55mm / hr rainfall intensity.

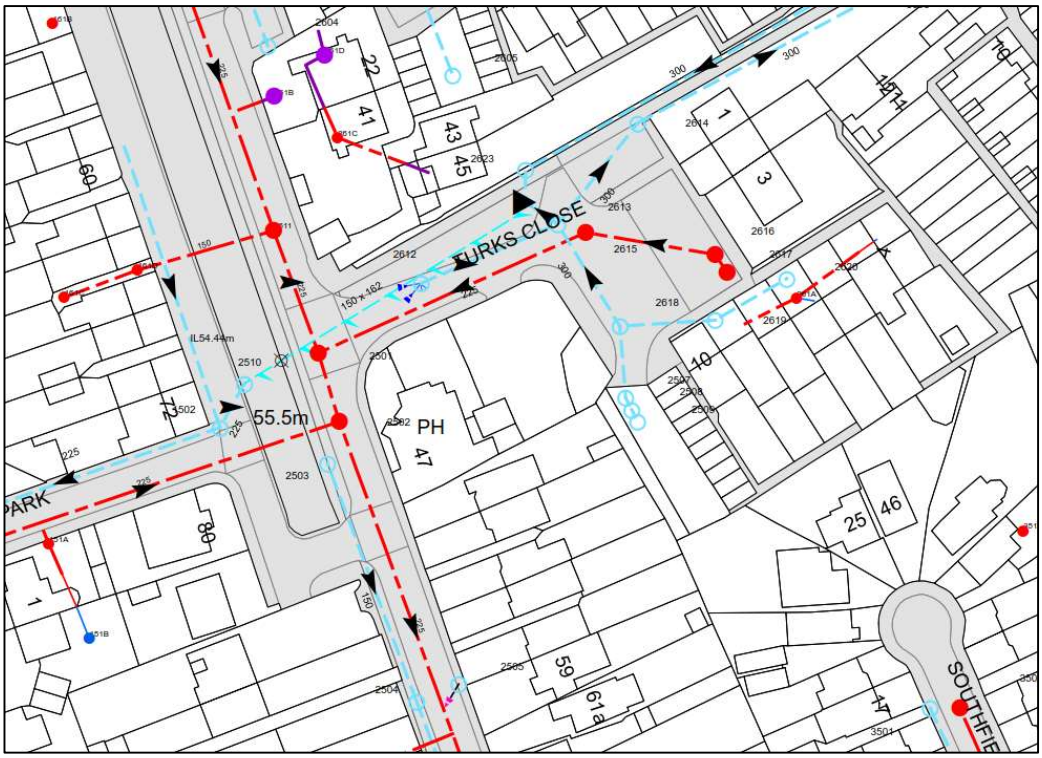


Figure 3.2 Thames Water Asset mapping

4.0 Proposed Surface Water Drainage Scheme

4.1 The proposed development will have a decrease in the amount of hardstanding areas on site. The existing and proposed impermeable areas for the development site are summarised in Table 4.1 below.

Land Use	Roofs Area		Gardens and Landscaping	
	Area (ha)	% Cover	Area (ha)	% Cover
Existing	0.09	100	0	0
Proposed	0.05	56	0.04	44

Table 4.1 Existing and Proposed Surface Cover

4.2 UK SuDS was used to determine the greenfield run off rate for the site. The calculation is included in **Appendix C**. The QBar greenfield runoff rate based on the proposed area of the site is 0.59 l/s or 4.97 l/s/ha. The existing site impermeable areas currently generate a run-off of 12.51 l/s. A proposed discharge rate for this site of 2l/s is recommended, as this is a discharge rate that is reasonably practical to achieve, whilst minimising the risk of blockages occurring in the surface water network. This is still significantly less than the existing site discharge rate and is greater than the recommended fifty percent betterment for brownfield sites as stated in the London Plan. Therefore, the site will provide a betterment in terms of surface water runoff.

4.3 A detailed hydraulic model has been produced using MicroDrainage to represent the proposed drainage. The MicroDrainage model results can be found in **Appendix D**. The model was run for a number of events, they are as follows;

- 1 in 1 rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440 storm durations
- 1 in 30 rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440 storm durations
- 1 in 100+CC (40% increase for climate change) rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440 storm durations

4.4 The proposed drainage strategy can be found in full in **Appendix E.** In order to attenuate the surface water from the development it is proposed to have two small basins incorporating rain gardens and permeable paving in the parking areas. The two rain gardens will vary in size, but will both be 0.5m deep. The raingarden to the west will have a volume of 5 m^3 and the raingarden to the east will have a volume of 7.5 m^3. The permeable paving will be 0.35m deep and provide a minimum storage volume of 17.5 m^3. Water Butts will also be included as part of the development to provide water collection facilities to capture excess rainwater.

4.5 Due to the space restrictions within the building and the complications of having separate plumbing systems for multiple units, greywater recycling is not proposed. Instead what is proposed is enhanced rainwater recycling measures , which includes the collection and reuse of surface water run-off from the building roofs and the treatment of surplus run-off discharging to the public sewer.

4.6 The SuDS features will also improve water quality onsite and will provide the recommended two stages of treatment. The proposed treatment provided will involve permeable paving and the proposed raingardens. The raingardens will act as a sedimentation process and filtration process and the permeable paving will act as a filtration process.

5.0 Surface Water Maintenance

5.1 The proposed drainage scheme is to have a routine maintenance schedule that conforms to CIRIA SuDS Manual (C753) 2015 guidance. An approved maintenance company appointed by the client is to adhere to the maintenance schedule provided in Table 5.1 for the raingarden and Table 5.2 for permeable paving of the CIRIA guidance in order to ensure the correct operation of the drainage.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and the basin surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the treatment area
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 5.1 Operation and maintenance requirements for raingardens

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying.	As required - once per year on less frequently used pavements

Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised within 50mm of the level of the paving.	As requires
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for 3 months after installation.
	inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48h after large storms in first 6 months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

Table 5.2 Operation and maintenance requirements for permeable paving

5.2 The flow control manhole will be fitted with a hydrobrake. During its lifetime this manhole should receive more regular inspections and cleaning as its function is critical to the performance of the drainage system and the management of flood risk. Any additional inspection and maintenance requirements stipulated by the flow control device manufacturer should also be complied with.

5.3 Maintenance of the rain garden during its lifetime will consist of regular visual inspections to ensure there is no detritus within the rain garden that in a significant rainfall event will cause a blockage which either prevents water entering or leaving the rain garden.

5.4 In parking areas there is permeable paving, periodically inspection of the parking area should be undertaken to ensure that the permeable paving areas are functioning correctly areas and are draining surface water and there is no signs of ponding on the surface.

5.5 During the construction phase the contractor and all relevant operatives should have a general understanding of how SuDS work, and the purpose of the specific SuDS components being used on a site, to ensure that appropriate construction practice and component protection is used.

5.6 During Construction measures will be put in place to protect the SuDS drainage systems, which will include measures to prevent silts washing into the permeable paving or the raingarden drainage layer. These measures will include delaying construction of the SuDS until the majority of the building work is complete.

5.7 After the construction of the development and prior to opening the contractor will clean all the chambers and piped drainage network with a low-pressure high-volume water flush and undertake a CCTV survey of the piped drainage network.

5.8 The timetable for the implementation of the development is as follows.

- Programme (duration) of works: 18 months
- Start: June 2020
- Completion: December 2021

5.9 The surface water drainage system and SuDS will be a private system within the grounds of the development and a resident's management company will be responsible for its maintenance. The new connections to the surface water sewer will be adopted by the sewer authority downstream of the demarcation chamber.

6.0 A Summary and Conclusions

6.1 This Drainage Strategy has been prepared on behalf of Mr Avtar Chauhan in order to discharge planning condition relating to surface water of the planning application, relating to the construction of a new residential development and associated parking off 47 Harlington Road, Hillington, UB8 3HY.

6.2 The existing site currently generates a surface water run-off of 12.51 l/s and the proposed surface water discharge rate for this development will be restricted to 2l/s. This is significantly less than the existing site discharge rate and is greater than the recommended fifty percent betterment for brownfield sites as stated in the London Plan. Therefore, the site will provide a substantial betterment in terms of surface water runoff.

6.3 The SudS scheme will provide storage volume in the permeable paving sub-base and the basins that are created to form the raingardens.

6.4 Rainwater recycling has been included in the SuDS scheme, in the form of the collection of water in water butts that will be used to irrigate gardens and, RWPs will discharge into the raingarden that will also irrigate the plants within the raingardens.

6.5 The use of rainwater recycling will reduce the volume of surface water run-off by the take up of run-off by plants (transpiration) and evaporation within the raingarden basins. There will also be some minor infiltration into the ground.

6.6 The SuDS features will also improve water quality onsite as the raingardens will act as a sedimentation process and filtration process and the permeable paving will act as a filtration process.

6.7 In addition to the above summary and conclusions, this proposed surface water drainage strategy for the site provides following.

- Information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters, which can be found in Chapter 4.
- A timetable for development implementation, which can be found in section 5.9
- A management and maintenance plan for the lifetime of the development, which can be found in section 5.
- Details of water collection facilities to capture excess rainwater, which can be found in section 4.4;
- Details of the reasons why grey water will not be included in the development, which can be found in section 4.5.

6.8 As all of the requirements of the surface water planning condition have been met as detailed in Section 1.0 of this report, then it is deemed that this condition can be discharged.

Appendix A

Site Layout

NOTES

This drawing and all the information shown is the property of @ architect ltd. and shall not be copied whole, or in part, or used for any other purpose without written permission of the company.

ALL DIMENSIONS TO BE CHECKED ON SITE.

DO NOT SCALE FROM THIS DRAWING EXCEPT FOR THE PURPOSES OF LOCAL AUTHORITY PLANNING

LANDSCAPE SPECIFICATION

SITE PREPARATION

Topsoil

Existing topsoil shall be stripped before building works begin. Imported topsoil shall be to BS3882: 2015 Specification for Topsoil. Topsoil shall be multi-purpose grade, of medium texture, with a high proportion of fertile loamy material. It shall be free from subsoil, rubbish, rubble, contamination, roots of perennial weeds and other materials injurious to plant growth. The maximum stone content of the soil shall be 20%, with the maximum size of stone 25mm in any one dimension. All topsoil shall be stacked in heaps, not exceeding 2m high. During storage, topsoil heaps shall be kept free from compaction, contamination and weeds to BS3882: 2015.

Excavation

Excavation shall NOT be undertaken with machinery within the root protection area of any existing trees or shrubs to be retained. Areas requiring excavation under existing trees are to be hand dug with an arboriculturalist present to oversee the work. Unless otherwise indicated areas to be planted / seeded shall be cleared of all surface rubbish and excavated to the dimensions below finished level as follows, when the soil is not waterlogged or frozen. Ensure the location of all services is known before any excavation operations.

Tree pits: 1000 x 1000 x 600mm deep unless otherwise shown Shrub and hedge pit / trench: 450mm deep Grass areas: 300mm deep

The base of excavated areas shall be forked or otherwise cultivated to a depth of 150mm to facilitate drainage and all bricks, stones and other debris, etc. over 75mm in any one dimension shall be removed. Similarly, areas trafficked by construction vehicles shall be ripped to a depth of 150-300mm to relieve compaction.

Backfilling with Subsoil Where excavated areas are lower than the required depths, excavations shall be backfilled with selected subsoil and lightly consolidated to make up

levels. Selected subsoil shall be friable, second quality topsoil or similar and be free of rubbish, roots, stones over 75mm in any one dimension, perennial weeds or other materials injurious to plant growth to BS8601: 2013.

Backfilling with Topsoil

Tree, shrub and hedge pit / trench excavations shall be backfilled, in layers, with clean topsoil (as specified above) thoroughly mixed with planting compost e.g. 'Melcourt Topgrow' compost at a rate of 20 litres/m². An approved tree and shrub fertilizer shall be added to topsoil, prior to backfilling tree-pits. Grass areas shall be backfilled with topsoil in layers of 150mm depth.

Cultivation

Prior to cultivation if planting / seeding areas are weed infested, weed growth to be strimmed, the arisings removed and re-growth treated with an approved herbicide ie Glyphosate. Treatment to be undertaken in the growing season preceding planting, at a minimum 4 weeks prior to works to allow for repeat treatment if necessary.

Cultivation shall not be undertaken within the root protection area of any trees / shrubs to be retained, without prior agreement from the Local Planning Authority. Topsoil shall be cultivated by hand or machine prior to planting, with minimal compaction by machine. Cultivate to the following depths and tilth, removing all rubbish, vegetation, perennial weeds, roots, stones over 25mm in any one dimension and rake to even levels.

Planting areas: 300mm deep cultivation to medium tilth

Grass seeding areas: 150mm deep cultivation to fine tilth raked to a smooth evenly firmed bed

Turf areas: 150mm deep cultivation to medium tilth raked to a smooth evenly firmed bed

PLANTING

Plant Stock and Timing

Plant material and operations shall conform to BS8545 : 2014, BS 3936 Nursery Stock (Parts 1-10), BS 4428 : 1989, BS 4043 : 1989 and BS 5837 : 2012. The planting season shall be from the 1st October to the 31st March. Container grown stock may be planted outside this season if accompanied by daily watering, or as necessary to ensure healthy establishment. Planting shall not be carried out during periods of frost, drought, cold drying winds or when the soil is waterlogged or frozen.

Planting

All planting that is within the root protection area of existing trees/shrubs to be retained, shall be undertaken by hand and positions altered should tree roots be encountered, in order to avoid damage to the root system.

All plants shall be set out evenly over the areas as indicated, to the density and quantities shown. All plants shall be planted upright at the same depth as the nursery soil level and evenly spaced, leaving room for growth. All restrictive containers shall be removed with roots not twisted. Immediately following planting, all plants shall be watered-in to field capacity.

Container grown and root balled plants shall be planted in a planting pit sufficient to accommodate the plant without causing root damage, with a minimum 50mm backfill beyond the root ball extent. Plants to be firmed, watered-in and dead, damaged or lopsided branches shall be removed after planting. Bare-root plants shall be slit planted, incorporating an approved high phosphate, slow-release fertilizer.

Tree Planting and Support

Trees planted in landscape areas shall be double staked, using 2no. biodegradable fixing with spacer. Tree stakes shall have a minimum top diameter of 75mm, with the length of stake maximum 500mm above ground and minimum 500mm below ground.

All trees to be firmed in after planting. All trees shall have irrigation / aeration system units fitted to fully surround the root ball.

Hedge Planting

Hedges shall be planted in a triple staggered row as per detail. Dead, damaged or straggly branches shall be removed after planting. All transplants in hedge and native mixes shall be fitted with individual protection ie shrub shelters, spiral guards as specified, or alternatively the planting areas shall be protected with rabbit-proof fencing. All shrub shelters / spiral guards shall be black or green, adequately supported and installed to allow for expansion.

Mulching

Prior to the application of mulch the planting areas shall be completely weed free and watered sufficiently to achieve field capacity. The surface of the planting areas shall be mulched with a minimum 75mm depth layer of 15-65mm nominal particle size, dark, matured woodchip mulch, ensuring that the low branches of trees, shrubs and/or herbaceous plants are NOT smothered.

Mulch shall be an approved product and completely weed and weed seed free. The mulch shall be topped-up to maintain, after settlement, a depth of not less than 50mm. Trees in grass areas shall be planted centrally within a 1m diameter mulch bed, to be mulched to 75mm deep. The surface of mulch to be 10mm below the surface of adjacent lawn / hard surface.

GRASS AREAS

Turf

Turf shall accord with BS 3969: 1998, it shall be good quality meadow / cultivated, amenity turf free from weeds and be laid on even, prepared ground (as detailed above), during periods of suitable warm and moist weather conditions. Pre-turfing fertiliser shall be applied to manufacturer's recommendations and turf shall be laid in accordance with BS 4428: 1989.

Turf shall be laid with broken joints well-butted up, working from timber planks to avoid damaging turf when laying. Water as necessary to avoid shrinkage and achieve satisfactory establishment. Undertake good horticultural practice to ensure establishment of a healthy grass sward.

Grass Seeding

Areas of amenity grass shall be seeded with a general amenity grass mix as specified during the period March to May or September to October.during periods of mild, warm weather conditions without significant wind. Pre-seeding fertiliser shall be applied to manufacturer's recommendations. Seed shall be sown on even, prepared ground (as detailed above), at a rate of 35g/m2 or as specified, in two transverse operations. Lightly roll seed bed after sowing. Water as necessary to avoid shrinkage and achieve satisfactory establishment. Undertake good horticultural practice to ensure establishment of a healthy grass sward.

AFTERCARE PERIOD

Regular Visits

During the specified Aftercare Period maintenance visits shall be carried out, at least monthly from April to September and twice during the dormant season to carry out the following operations to establish healthy growing plants / grass in weed free areas: watering, firming-up, removal of litter, pest and disease control, general pruning, checking guards, ties and stakes, weed control, grass cutting and autumn tidying. All arisings shall be carted away and the site shall be left clean and tidy at all times.

Watering

All planting and grass areas shall not be allowed to dry out and shall be kept well watered during the growing season, ensuring the soil is kept moist at all times but avoiding waterlogging.

Replacement Planting

During each August within the Aftercare Period an inspection shall be made and all plants that have died, are missing, damaged or have failed to thrive, shall be noted and replaced in the following planting season.

Grass Cutting

During the first and subsequent growing seasons amenity grass shall be kept at a height of 25mm to 50mm. Any bare patches are to be resown. Selective weed control shall be undertaken as necessary once the sward is sufficiently established.

HEDGING

Number	Plant Name	Height	Container	Specification	Density
1.	Ilex aquifolium	100-125cm	15L	Leader with Laterals: 5 brks: C	0.4Ctr Triple Staggered at 0.3m offset

FERNS

Number	Plant Name	Container	Specification	Density
2.	Dryopteris filix-mas	1.5-2L	Full Pot: C	5/m²

TREES

Number	Plant Name	Height	Girth	Specification
3.	Acer campestre	200-250cm		Multi-Stemmed: Bushy: 3 Stems min.: C
4.	Corylus colurna	400-450cm	14-16cm	Extra Heavy Standard: 5 brks: C: Clear Stem 175-200cm
5.	Betula utilis jacquemontii	400-500cm	14-16cm	Extra Heavy Standard :5 brks :C :Clear Stem 175-200cm

SHRUBS

Number	Plant Name	Height	Container	Specification	Density
6.	Choisya ternata	40-60cm	10L	Bushy: 7 brks: C	3/m²
7.	Lonicera pileata		10L	Bushy: 10 brks: C	3/m²

REV No.	DATE	REMARKS
E	01.04.20	Amendments to crossover as per JL comments (KD)
D	17.03.20	Landscaping details added (KD)
C	16.10.14	Gate to entrance omitted and safety strip indicated to disabled parking bay (AI)
B	19.03.14	Planner Comments (AI)
A	23.01.14	Planner Comments (NW)

architect ltd
Suite 2.
Clocktower house,
Station Rd,
West Horndon,
Essex.
CM13 3XL
tel.: 01708 477899
fax: 0709 223 4930
e : office@architect.ltd.uk
web.: www.architect.ltd.uk

Client

Avtar Chauhan

Job Title

The Formally Brushwood Inn
47 Harlington Road,
Hillingdon, Uxbridge,

Drawing Title

Site Plan
As Proposed
17.0145

Scale	Sheet size
1:100 / 50	A1
Date: NOV 13	Drn. by: NW

Drg. No.	Rev.
PL03	E

Appendix B

Thames Water Asset Mapping

Asset location search

Property Searches

motion
GUILDFORD
GU1 4AU

Search address supplied 45-47
Harlington Road
Uxbridge
UB8 3HX

Your reference 1chhil/2005020

Our reference ALS/ALS Standard/2020_4193420

Search date 3 June 2020

Knowledge of features below the surface is essential for every development

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

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

Contact us to find out more.

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

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

0845 070 9148

Asset location search

Property Searches

Search address supplied: 45-47, Harlington Road, Uxbridge, UB8 3HX

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

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

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

Waste Water Services

Please provide a copy extract from the public sewer map.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

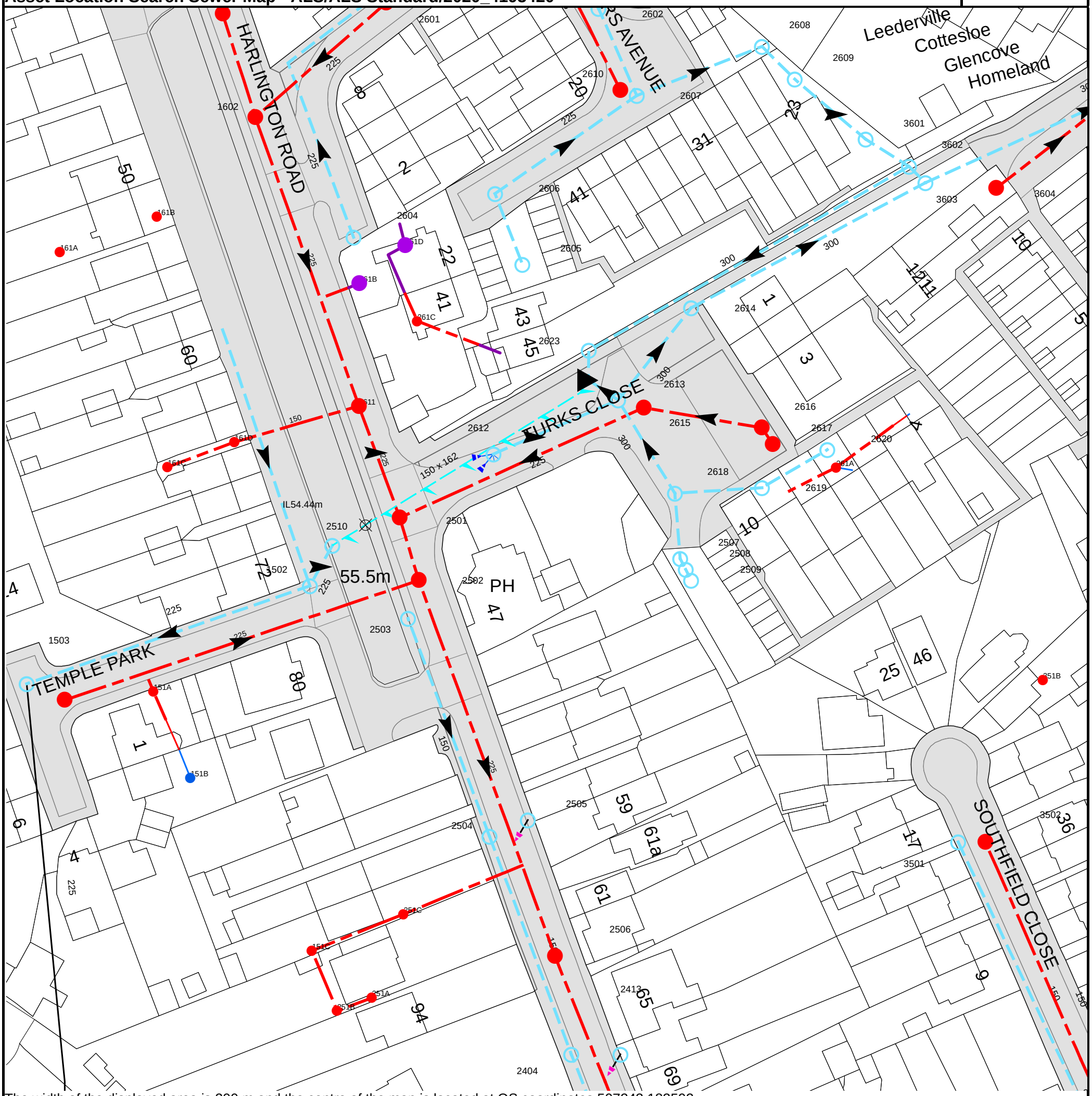
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4193420



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 507243,182592

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

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2617	53.62	52.68
161D	n/a	n/a
2616	53.61	52.63
2615	53.7	52.42
2611	55.79	52.06
2613	53.72	52.63
2623	53	52.13
261C	n/a	n/a
2614	53.64	52.63
261B	n/a	n/a
2605	53.87	53.42
161A	n/a	n/a
261D	n/a	n/a
2604	55.71	53.99
161B	n/a	n/a
2606	53.98	53.23
3603	53.62	52.54
3602	53.51	52.45
3601	53.63	52.54
1602	56.21	52.35
2607	53.88	52.78
2610	53.93	53.12
2609	53.93	52.65
2608	53.87	52.7
1601	56.37	52.42
2602	53.9	52.91
2601	54.77	52.44
3501	53.86	52.51
3502	53.74	51.97
3604	54.41	53.23
351B	n/a	n/a
2404	54.64	53.54
2413	54.74	54.15
251B	n/a	n/a
251A	n/a	n/a
2506	54.75	51.22
151C	n/a	n/a
251C	n/a	n/a
2504	55.07	53.87
2505	55.04	54.65
151B	n/a	n/a
1503	56.12	55.35
151A	n/a	n/a
1501	53.17	52.03
2503	55.69	54.03
1502	53.78	52.59
2509	53.58	52.95
2502	55.53	51.83
2508	53.59	52.94
2507	53.6	52.93
2510	54	52.7
2501	55.65	51.8
2618	53.64	52.86
2619	53.86	52.87
261A	n/a	n/a
161C	n/a	n/a
2612	54.79	53.3
2620	53.68	53.14

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

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

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

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

Weir

End Items

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

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

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

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Terms and Conditions

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

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

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

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

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

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

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

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

Appendix C

UK SuDS QBar calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	victoria berg-holdo
Site name:	
Site location:	

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:	51.53199° N
Longitude:	0.45513° W
Reference:	4119580685
Date:	Jun 02 2020 11:00

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:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	625	625
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):	1.6	1.6
1 in 1 year (l/s):	1.36	1.36
1 in 30 years (l/s):	3.67	3.67
1 in 100 year (l/s):	5.09	5.09
1 in 200 years (l/s):	5.97	5.97

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix D

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.435	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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
S1.000	4.557	0.100	45.6	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	2.493	0.050	49.9	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	2.493	0.050	49.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	8.869	1.400	6.3	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	3.317	0.400	8.3	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	4.586	0.100	45.9	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	4.781	0.050	95.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	7.933	0.093	85.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

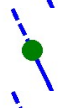
Network Results Table

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)
S1.000	50.00	5.05	54.800	0.000	0.0	0.0	0.0	1.49	26.4	0.0
S1.001	50.00	5.08	54.700	0.002	0.0	0.0	0.0	1.43	25.2	0.3
S1.002	50.00	5.11	54.650	0.002	0.0	0.0	0.0	1.43	25.2	0.3
S1.003	50.00	5.15	54.600	0.018	0.0	0.0	0.0	4.03	71.2	2.4
S1.004	50.00	5.16	53.200	0.037	0.0	0.0	0.0	3.52	62.2	5.0
S1.005	50.00	5.21	52.800	0.045	0.0	0.0	0.0	1.49	26.3	6.1
S1.006	50.00	5.29	52.700	0.050	0.0	0.0	0.0	1.03	18.2	6.8
S1.007	50.00	5.41	52.650	0.050	0.0	0.0	0.0	1.09	19.2	6.8

©1982-2019 Innovyze

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	55.300	0.500	Open Manhole	1200	S1.000	54.800	150				
S2	55.300	0.600	Open Manhole	1200	S1.001	54.700	150	S1.000	54.700	150	
S3	55.300	0.650	Open Manhole	1200	S1.002	54.650	150	S1.001	54.650	150	
S3	55.300	0.700	Open Manhole	1200	S1.003	54.600	150	S1.002	54.600	150	
S4	53.857	0.657	Open Manhole	1200	S1.004	53.200	150	S1.003	53.200	150	
S5	53.857	1.057	Open Manhole	1200	S1.005	52.800	150	S1.004	52.800	150	
S6	53.550	0.850	Open Manhole	1200	S1.006	52.700	150	S1.005	52.700	150	
S7	53.550	0.900	Open Manhole	1200	S1.007	52.650	150	S1.006	52.650	150	
S	53.550	0.993	Open Manhole	0		OUTFALL		S1.007	52.557	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	896.883	238.572	896.883	238.572	Required	
S2	901.439	238.468	901.439	238.468	Required	
S3	902.518	236.221	902.518	236.221	Required	
S3	903.597	233.973	903.597	233.973	Required	
S4	912.091	236.524	912.091	236.524	Required	
S5	915.353	237.126	915.353	237.126	Required	
S6	919.862	237.963	919.862	237.963	Required	
S7	924.403	239.459	924.403	239.459	Required	

©1982-2019 Innovyze

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S	930.840	244.095			No Entry	

©1982-2019 Innovyze

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.002	0.002	0.002
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.011	0.011	0.011
	User	-	100	0.004	0.004	0.016
1.004	User	-	100	0.018	0.018	0.018
1.005	User	-	100	0.008	0.008	0.008
1.006	User	-	100	0.005	0.005	0.005
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.050	0.050	0.050

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)
S1.007	S	53.550	52.557	52.557	0	0

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.435		

©1982-2019 Innovyze

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S7, DS/PN: S1.007, Volume (m³): 1.1

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	52.650
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

©1982-2019 Innovyze

Storage Structures for Storm

Tank or Pond Manhole: S2, DS/PN: S1.001

Invert Level (m) 54.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.500	10.0	0.510	0.0

Tank or Pond Manhole: S5, DS/PN: S1.005

Invert Level (m) 52.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15.0	0.500	15.0	0.510	0.0

Tank or Pond Manhole: S6, DS/PN: S1.006

Invert Level (m) 52.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	50.0	0.350	50.0	0.360	0.0

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	1	+0%					54.800
S1.001	S2	30 Winter	1	+0%					54.708
S1.002	S3	30 Winter	1	+0%					54.658
S1.003	S3	15 Winter	1	+0%					54.617
S1.004	S4	15 Winter	1	+0%					53.233
S1.005	S5	15 Winter	1	+0%	100/15 Summer				52.849
S1.006	S6	60 Winter	1	+0%	30/60 Winter				52.749
S1.007	S7	60 Winter	1	+0%	30/15 Summer				52.750

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.142	0.000	0.01		0.2	OK	

©1982-2019 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.142	0.000	0.01		0.2	OK	
S1.003	S3	-0.133	0.000	0.03		2.0	OK	
S1.004	S4	-0.117	0.000	0.11		4.2	OK	
S1.005	S5	-0.101	0.000	0.24		4.7	OK	
S1.006	S6	-0.101	0.000	0.12		1.6	OK	
S1.007	S7	-0.050	0.000	0.10		1.6	OK	

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	30	+0%					54.800
S1.001	S2	15 Winter	30	+0%					54.719
S1.002	S3	15 Winter	30	+0%					54.669
S1.003	S3	15 Winter	30	+0%					54.631
S1.004	S4	15 Winter	30	+0%					53.259
S1.005	S5	15 Winter	30	+0%	100/15 Summer				52.898
S1.006	S6	60 Winter	30	+0%	30/60 Winter				52.851
S1.007	S7	240 Summer	30	+0%	30/15 Summer				52.889

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.131	0.000	0.04		0.6	OK	

©1982-2019 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.131	0.000	0.04		0.6	OK	
S1.003	S3	-0.119	0.000	0.10		6.1	OK	
S1.004	S4	-0.091	0.000	0.33		13.1	OK	
S1.005	S5	-0.052	0.000	0.76		15.1	OK	
S1.006	S6	0.001	0.000	0.18		2.5	SURCHARGED	
S1.007	S7	0.089	0.000	0.11		1.8	SURCHARGED	

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	100	+40%					54.800
S1.001	S2	15 Winter	100	+40%					54.730
S1.002	S3	15 Winter	100	+40%					54.679
S1.003	S3	15 Winter	100	+40%					54.644
S1.004	S4	15 Winter	100	+40%					53.285
S1.005	S5	120 Winter	100	+40%	100/15 Summer				53.004
S1.006	S6	120 Winter	100	+40%	30/60 Winter				53.003
S1.007	S7	480 Winter	100	+40%	30/15 Summer				53.056

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.120	0.000	0.09		1.2	OK	

©1982-2019 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.121	0.000	0.09		1.2	OK	
S1.003	S3	-0.106	0.000	0.18		11.4	OK	
S1.004	S4	-0.065	0.000	0.61		24.0	OK	
S1.005	S5	0.054	0.000	0.39		7.8	SURCHARGED	
S1.006	S6	0.153	0.000	0.15		2.1	SURCHARGED	
S1.007	S7	0.256	0.000	0.11		1.8	SURCHARGED	

©1982-2019 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.435	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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
S1.000	4.557	0.100	45.6	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	2.493	0.050	49.9	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	2.493	0.050	49.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	8.869	1.400	6.3	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	3.317	0.400	8.3	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	4.586	0.100	45.9	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	4.781	0.050	95.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	7.933	0.093	85.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

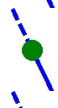
Network Results Table

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)
S1.000	50.00	5.05	54.800	0.000	0.0	0.0	0.0	1.49	26.4	0.0
S1.001	50.00	5.08	54.700	0.002	0.0	0.0	0.0	1.43	25.2	0.3
S1.002	50.00	5.11	54.650	0.002	0.0	0.0	0.0	1.43	25.2	0.3
S1.003	50.00	5.15	54.600	0.018	0.0	0.0	0.0	4.03	71.2	2.4
S1.004	50.00	5.16	53.200	0.037	0.0	0.0	0.0	3.52	62.2	5.0
S1.005	50.00	5.21	52.800	0.045	0.0	0.0	0.0	1.49	26.3	6.1
S1.006	50.00	5.29	52.700	0.050	0.0	0.0	0.0	1.03	18.2	6.8
S1.007	50.00	5.41	52.650	0.050	0.0	0.0	0.0	1.09	19.2	6.8

©1982-2019 Innovyze

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	55.300	0.500	Open Manhole	1200	S1.000	54.800	150				
S2	55.300	0.600	Open Manhole	1200	S1.001	54.700	150	S1.000	54.700	150	
S3	55.300	0.650	Open Manhole	1200	S1.002	54.650	150	S1.001	54.650	150	
S3	55.300	0.700	Open Manhole	1200	S1.003	54.600	150	S1.002	54.600	150	
S4	53.857	0.657	Open Manhole	1200	S1.004	53.200	150	S1.003	53.200	150	
S5	53.857	1.057	Open Manhole	1200	S1.005	52.800	150	S1.004	52.800	150	
S6	53.550	0.850	Open Manhole	1200	S1.006	52.700	150	S1.005	52.700	150	
S7	53.550	0.900	Open Manhole	1200	S1.007	52.650	150	S1.006	52.650	150	
S	53.550	0.993	Open Manhole	0		OUTFALL		S1.007	52.557	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	896.883	238.572	896.883	238.572	Required	
S2	901.439	238.468	901.439	238.468	Required	
S3	902.518	236.221	902.518	236.221	Required	
S3	903.597	233.973	903.597	233.973	Required	
S4	912.091	236.524	912.091	236.524	Required	
S5	915.353	237.126	915.353	237.126	Required	
S6	919.862	237.963	919.862	237.963	Required	
S7	924.403	239.459	924.403	239.459	Required	

©1982-2019 Innovyze

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S	930.840	244.095			No Entry	

©1982-2019 Innovyze

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.002	0.002	0.002
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.011	0.011	0.011
	User	-	100	0.004	0.004	0.016
1.004	User	-	100	0.018	0.018	0.018
1.005	User	-	100	0.008	0.008	0.008
1.006	User	-	100	0.005	0.005	0.005
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.050	0.050	0.050

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)
S1.007	S	53.550	52.557	52.557	0	0

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.435		

©1982-2019 Innovyze

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S7, DS/PN: S1.007, Volume (m³): 1.1

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	52.650
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

©1982-2019 Innovyze

Storage Structures for Storm

Tank or Pond Manhole: S2, DS/PN: S1.001

Invert Level (m) 54.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	10.0	0.500	10.0	0.510	0.0

Tank or Pond Manhole: S5, DS/PN: S1.005

Invert Level (m) 52.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15.0	0.500	15.0	0.510	0.0

Tank or Pond Manhole: S6, DS/PN: S1.006

Invert Level (m) 52.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	50.0	0.350	50.0	0.360	0.0

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	1	+0%					54.800
S1.001	S2	30 Winter	1	+0%					54.708
S1.002	S3	30 Winter	1	+0%					54.658
S1.003	S3	15 Winter	1	+0%					54.617
S1.004	S4	15 Winter	1	+0%					53.233
S1.005	S5	15 Winter	1	+0%	100/15 Summer				52.849
S1.006	S6	30 Winter	1	+0%	30/60 Winter				52.749
S1.007	S7	60 Winter	1	+0%	30/15 Summer				52.750

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.142	0.000	0.01		0.2	OK	

©1982-2019 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.142	0.000	0.01		0.2	OK	
S1.003	S3	-0.133	0.000	0.03		2.0	OK	
S1.004	S4	-0.117	0.000	0.11		4.2	OK	
S1.005	S5	-0.101	0.000	0.24		4.7	OK	
S1.006	S6	-0.101	0.000	0.12		1.6	OK	
S1.007	S7	-0.050	0.000	0.10		1.6	OK	

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	30	+0%					54.800
S1.001	S2	15 Winter	30	+0%					54.719
S1.002	S3	15 Winter	30	+0%					54.669
S1.003	S3	15 Winter	30	+0%					54.631
S1.004	S4	15 Winter	30	+0%					53.259
S1.005	S5	15 Winter	30	+0%	100/15 Summer				52.898
S1.006	S6	60 Winter	30	+0%	30/60 Winter				52.851
S1.007	S7	60 Winter	30	+0%	30/15 Summer				52.854

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.131	0.000	0.04		0.6	OK	

©1982-2019 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.131	0.000	0.04		0.6	OK	
S1.003	S3	-0.119	0.000	0.10		6.1	OK	
S1.004	S4	-0.091	0.000	0.33		13.1	OK	
S1.005	S5	-0.052	0.000	0.76		15.1	OK	
S1.006	S6	0.001	0.000	0.18		2.5	SURCHARGED	
S1.007	S7	0.054	0.000	0.11		1.9	SURCHARGED	

©1982-2019 Innovyze

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.435
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	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)
S1.000	S1	60 Winter	100	+40%					54.800
S1.001	S2	15 Winter	100	+40%					54.730
S1.002	S3	15 Winter	100	+40%					54.679
S1.003	S3	15 Winter	100	+40%					54.644
S1.004	S4	15 Winter	100	+40%					53.285
S1.005	S5	15 Winter	100	+40%	100/15 Summer				52.992
S1.006	S6	30 Summer	100	+40%	30/60 Winter				52.936
S1.007	S7	30 Winter	100	+40%	30/15 Summer				52.966

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.150	0.000	0.00		0.0	OK	
S1.001	S2	-0.120	0.000	0.09		1.2	OK	

©1982-2019 Innovyze

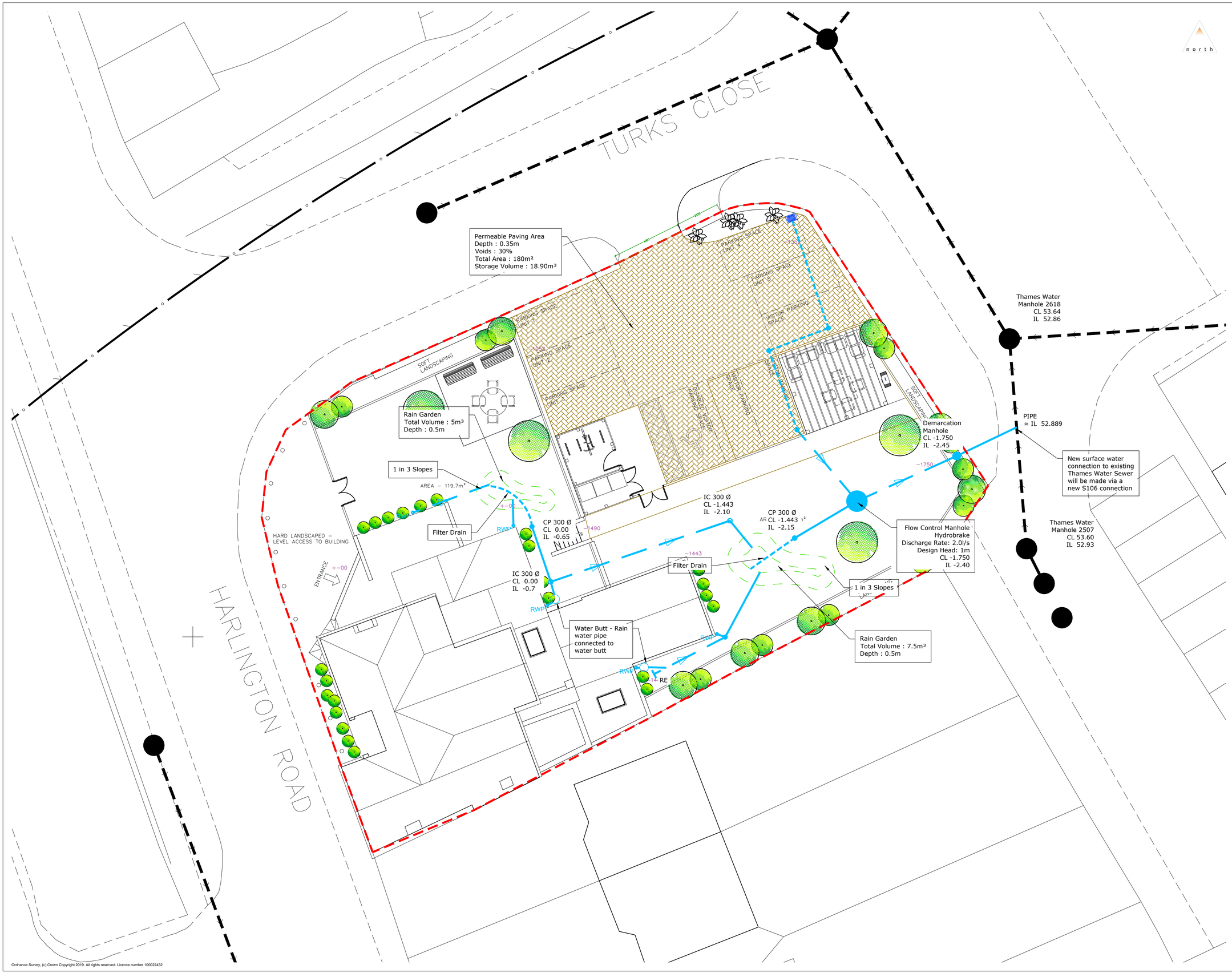
100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.121	0.000	0.09		1.2	OK	
S1.003	S3	-0.106	0.000	0.18		11.4	OK	
S1.004	S4	-0.065	0.000	0.61		24.0	OK	
S1.005	S5	0.042	0.000	1.21		23.9	SURCHARGED	
S1.006	S6	0.086	0.000	0.21		2.9	SURCHARGED	
S1.007	S7	0.166	0.000	0.12		1.9	SURCHARGED	

©1982-2019 Innovyze

Appendix E

Surface Water Drainage Strategy



Ordnance Survey, (c) Crown Copyright 2019. All rights reserved. Licence number 100022432

N:\Projects\Lithil 2005020\Drawings\2005020-DS (Drainage Strategy).dwg

1. The site levels and drainage levels are based on a local datum and grid provided by the Architect and the Sewer Authority invert levels are based on a OS Datum. Prior to commencement of the drainage works, the existing and proposed site levels are to be confirmed and surveyed and related to an ordnance survey datum and provided to the drainage engineer in order to confirm the drainage levels detailed design.
2. Permeable paving with 30% voids, sub-base thickness of 270mm-350mm in accordance with Architect's details. Drainage design has assumed a thickness of 350mm with a total storage volume of 18.90m³.
3. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
4. Any discrepancies shall be reported to the architect and/or engineer immediately, so that clarification can be sought prior to the commencement of works.
5. This drawing shall be read in conjunction with all other relevant architect and engineering details, drawings and specification.
6. All private drainage is to be 100mmØ laid at a minimum gradient of 1 in 100 for surface water, unless otherwise stated. 350mm min cover to be provided for pipes laid in soft/paved areas. 900mm min cover to be provided for pipes laid beneath roads/driveways unless not practicable. This is based on a UPVC system for private surface water system.
7. All private drainage to be in accordance with the Building Regulations approved document "H" 2015 edition. It is the contractors responsibility to ensure compliance with these regulations.
8. Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames.
9. Shallow private drains may require protection using concrete surround or paving slabs bridging the trench subject to the nhbc inspector's requirements. In areas where 450mm cover to private sewer is not achievable protective measures should be undertaken as above.
10. The contractor is to keep a record of any variations made on site, including the relocation of sewers or drains, for their "as built" drawings to be prepared upon project completion.
11. All pipes shall be laid soffit to soffit with outgoing pipes unless otherwise stated.

Legend

- Site Boundary
- Existing Thames Water Surface Water Sewer
- Proposed Surface Water Drain
- Proposed Filter Drain
- Permeable Paving
- SW 300Ø Inspection Chamber
- SW 300Ø Catchpit
- SW 450Ø Demarcation Chamber
- SW Manhole
- RE Rodding Eye
- Road Gully
- RWP Rain Water Pipe
- Water Butt

Revision Notes:	Drn	Chk	App	Date

Drawing Status:

DRAFT

motion

84 North Street
Guildford
Surrey
GU1 4AU

T: 01483 531 300

Cargo Works
1-2 Hatfields
London
SE1 9PG

T: 020 8065 5208

www.motion.co.uk

Client:
Mr Avtar Chauhan

Project:
47 Harlington Road, Hillingdon

Title:
Surface Water Drainage Strategy

Scale: 1:100	Size: A1	Date: 2020-07-08
Drawn:NM	Chk'd: VBH	Appr'd:JM

Drawing:	Revision:
2005020-DS	-

Appendix F

BGS Borehole records

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Version 2.0.6

BGS ID: 576562 : BGS Reference: TQ08SE229
British National Grid (27700) : 507420,182640
Report an issue with this borehole

TQ 08 SE 229

May Gurney May Gurney (Technical Services) Limited

JOB No. 45854

0742 8264

LOCATION: HILLINGDON

COMMENCED: 24.07.95 COMPLETED: 24.07.95 DIAMETER: 150mm BOREHOLE No: BH2 (1 of 1)

DESCRIPTION	DEPTH (m)	REDUCED LEVEL	SAMPLE/TEST	DEPTH (m)	REMARKS
GROUND LEVEL	0.00				
TARMAC on reinforced concrete	0.30		J1 B1 J2 B2 J3 B3	0.30 0.30-0.50 0.50 0.50-0.85 0.85 0.85-1.15	
Orangish brown silty fine to coarse SAND with much subangular fine flint gravel with clay pockets from 0.5m	0.85				
Brown clayey very silty fine to coarse SAND with some subangular fine and medium flint gravel	1.10		J4 B4 C1 W1	1.15 1.15-1.80 1.20-1.65 1.55	N=33
Dense orangish brown silty fine to coarse SAND with much subangular to subrounded fine flint gravel	1.80		J5 S2 B5	1.80 2.00-2.45 2.00-2.75	N=33
Firm to stiff yellowish brown silty CLAY with much subangular to subrounded fine and medium flint gravel	2.00		J6	2.45	
Dense yellowish brown silty subangular to subrounded fine and medium flint GRAVEL with some medium and coarse sand	2.75		C3 J7 B6	2.75-3.20 2.75 2.75-3.50	N=15
Firm orangish brown becoming greyish brown silty CLAY	3.40		J8 U1	3.40 3.50-3.95	(43) for 70% recovery
Firm brownish grey CLAY			J9	3.95	
			S4	5.00-5.45	N=15
			J10	5.45	
			U2	6.50-6.95	(53) for 80% recovery
....from 6.95m becoming closely fissured and locally thinly laminated with a little pyrite			J11	6.95	
....from 8.1m firm to stiff			S5	8.10-8.55	N=21
			J12	8.55	
			U3	9.50-9.95	(62)
END OF BOREHOLE	10.00		J13	9.95	

GROUNDWATER NOTES

DATE/TIME	STRUCK	STANDING	RATE OF RISE	DEPTH OF CASING	DEPTH OF SEAL
24.07.95/*	2.0m	1.55m	Medium	1.7m	3.2m

REMARKS Hand excavated pit to 1.2m

SAMPLE/TEST KEY

- J Jar disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample (No of Blows)
- P 100mm dia. piston sample
- W Water sample
- S Standard Penetration Test
- C Cone Penetration Test
- N = No. blows/300mm penetration
- FHT Falling head test
- V Vane Test

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Version 2.0.6

BGS ID: 576565 : BGS Reference: TQ08SE232
British National Grid (27700) : 507430,182650
Report an issue with this borehole

TQ 08SE 232

May Gurney — May Gurney (Technical Services) Limited — JOB No. 45854

LOCATION: HILLINGDON — 0743 8265

COMMENCED: 24.07.95 COMPLETED: 24.07.95 — Method: JCB — TRIAL PIT No: TP3 (1 of 1)

DESCRIPTION	LEGEND	DEPTH (m)	REDUCED LEVEL	SAMPLE/ TEST	DEPTH (m)	REMARKS
GROUND LEVEL		0.00				
Brown very silty fine and medium SAND with a little subangular fine to coarse flint gravel		0.30		B1	0.30-0.50	
Yellowish brown silty fine and medium SAND and subangular to subrounded fine and medium GRAVEL		0.60		B2	0.60-0.90	
Yellowish brown slightly silty fine to coarse SAND with some subangular fine and medium flint gravel		0.90				
Dark brown silty fine to coarse SAND with some subangular fine and medium flint gravel		1.10				
Yellowish brown silty fine to coarse SAND with some subrounded fine and medium flint gravel		1.20				
END OF TRIAL PIT						

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

REMARKS

Hand auger abandoned at 1.2m on dense gravelly sand

SAMPLE/TEST KEY

- J Jar disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample (No of Blows)
- P 100mm dia. piston sample
- W Water sample
- S Soakaway Test
- FHT Falling head test
- V Vane Test

British Geological Survey