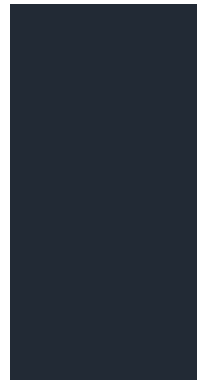




Swan Contractors Ltd

Manor Waye, Uxbridge
SuDS Strategy

Draft
February 2018



Revision Schedule

Flood Risk Assessment

Date February 2018

Doc Ref: SWC-1330-01-DRS-01

Rev	Date	Status	Prepared by	Reviewed by	Approved by
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1	02/02/2018	Planning	Laura Birkin, BSc (Hons), EngTech, MICE	Lee Barnes, BSc(Hons), MCIHT	Ian Kirk-Ellis, MSc, I.Eng. FIHE, MCIHT, MTPS, MEnvSc, ACIWEM

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1.0 INTRODUCTION

1.1 Instructions and purpose

- 1.1.1 Inspire Design and Development Ltd (IDD) has been instructed by Swan Contractors Ltd to undertake a SuDS Strategy in support of discharging condition 8 of a planning application submitted for a site identified as 85-87 Manor Way, Uxbridge.
- 1.1.2 The purpose of the report is to provide a strategy for implementing SuDS on site, in line with the requirements of the London Plan. Additional detail will be required at construction stage from appropriate product manufacturers and suppliers. The report presents the outcomes of the assessment undertaken on the site proposals. The information does not purport to be a design for construction and a quantitative assessment cannot be undertaken at this time.

2.0 THE PRE-DEVELOPMENT SITE

2.1 Location

- 2.1.1 The site is located to the south of Uxbridge, at post code UB8 2BG. The site is predominantly flat, a topographic survey is included in Appendix A.

2.2 Site Area and current use

- 2.2.1 The site area is a broadly 0.53 hectares and broadly rectangular in plan. The site is currently a concrete parking area, with asphalt access and an existing garage/outbuilding.
- 2.2.2 An assessment of the existing drainage on site based on the topographic survey (Appendix A) indicates that surface water from the site is currently positively drained to the public sewer (Section 2.3). The positively drained areas are featured in Table 1.

Table 1: Existing impermeable areas

Existing Impermeable Area	
Surface Type	Area (m ²)
Existing concrete car park to rear	265
Existing asphalt access	75
Existing asphalt footway	32
Existing outbuilding roof	43
Total	415

- 2.2.3 A determination of the existing peak flow from the site based on the modified rational method indicates a value of 5.8l/s, refer to Figure 1.

Figure 1:Peak flow estimation

Estimated peak flow using modified rational method

$$Q = C i A$$

i = intensity in mm/hr,
A = area, acres,
Q = flow
C is runoff coefficient, dimensionless.

$$Q = 2.78 \times 50 \times 0.0415$$
$$\underline{Q = 5.8\text{l/s}}$$

2.3 Sewerage

- 2.3.1 Yorkshire Water sewer records (Appendix B) indicate that there is a public surface water sewer running adjacent to the site in Manor Waye.

2.4 Geology and hydrogeology

- 2.4.1 Online British Geological Survey (BGS) mapping indicates that the superficial geology on site is Langley silt member, which is made up of clay and silt. The bedrock geology is London Clay Formation.

3.0 THE DEVELOPMENT PROPOSAL

3.1 General

- 3.1.1 The proposal comprises the redevelopment of the site for residential end use with 3 units. These plots include associated private gardens to front and rear, in addition to parking provision for each unit.

3.2 Proposed impermeable area

- 3.2.1 The proposed paving and roof areas were measured in AutoCad, and are featured in Table 2.

Table 2: Proposed impermeable areas

Proposed Impermeable Area	
Element	Area (m ²)
Proposed roof area @ 3 x 46m ²	138
Proposed external paving	220
Total	358

- 3.2.2 The overall surfaced area on site as a result of the development offers a reduction compared to existing, from 415m² to 358m². This is a reduction of approximately 10% of the total site area.

4.0 PLANNING GUIDANCE ON SUDS

4.1 London Plan

- 4.1.1 The London Plan Policy 5.13 to 5.15 outline SuDS and water management requirements. This indicates that a Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

- i.* store rainwater for later use
- ii.* use infiltration techniques, such as porous surfaces in non-clay areas
- iii.* attenuate rainwater in ponds or open water features for gradual release
- iv.* attenuate rainwater by storing in tanks or sealed water features for gradual release
- v.* discharge rainwater direct to a watercourse
- vi.* discharge rainwater to a surface water sewer/drain
- vii.* discharge rainwater to the combined sewer.

4.2 London Plan SuDS SPG

- 4.2.1 The Sustainable Design and Construction Supplementary Planning Guidance London Plan 2011 Implementation Framework (April 2014) details from page 83 to 85 the requirements for SuDS. The key points of relevant are as follows:

- a)* developers should aim for a greenfield runoff rate from their developments. Greenfield runoff rates are defined as the runoff rates from a site, in its natural state, prior to any development. Typically this is between 2 and 8 litres per second per hectare.
- b)* The drainage hierarchy set out in London Plan policy 5.13 comprises two elements:
 - i.* managing and storing surface water on-site before it is finally discharged, if required (Numbers 1 to 4); and
 - ii.* •disposal of surface water from a piped drainage system (Numbers 5, 6 and 7).
- c)* The capture and storage of rainwater for later use is always the priority in order to also meet the objective of making efficient use of water resources
- d)* Drainage designs incorporating SuDS measures should include details of how each SuDS feature, and the scheme as a whole, will be managed and maintained throughout its lifetime.

4.3 London Borough of Hillingdon

- 4.3.1 The London Borough of Hillingdon include additional SuDS Guidance on their website, extracts of which are included below.

'Sustainable drainage requirements for planning applications

Drainage is now a material planning consideration for the Local Planning Authority. Any new developments or redevelopment should ensure their drainage system utilises sustainable drainage.

Water sensitive design

As the London Borough of Hillingdon is in an area where water resources are provided generally from groundwater supplies and these are heavily abstracted.

It is expected that drainage proposals should include some at source water collection and water reuse, through the provision of rainwater harvesting tanks or even water butts, or grey water recycling. This is to minimise water use proportionate with the scale of the proposed development.'

5.0 SUDS STRATEGY

- 5.1.1 The SuDS strategy described in the following section and indicated on drawing SWC-1330-01-DR-001 is intended to adhere to the requirements of the planning documents described in Section 4, and facilitate the discharge of planning conditions related to SuDS (condition 8).

5.2 Pre-development runoff assessment

- 5.2.1 A Greenfield runoff assessment was completed for the 0.53ha developable area using the UK SuDS online tool, the results of which are included in Table 3. Outputs from the calculations are included in Appendix C.

Table 3: Pre-development runoff assessment

Site discharge rates	Default	Edited
Qbar total site area (l/s)	0.09	0.09
Qbar net site area (l/s)	0.09	0.09
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

- 5.2.2 Given the scale of the development, the existing site run-off assessment (Section 2.2) and the reduction in impermeable area overall, calculations suggest that a peak flow of 4l/s is practicable (rather than the 5l/s default value in table 3), which offers a 30% betterment on existing rates.

5.3 Method of disposal of surface water

- 5.3.1 Following the London Plan SuDS hierarchy (Section 4.1.1), it is proposed that rainwater from roofs is stored for re-use in a proprietary domestic rainwater harvesting system. An assessment of the volume requirements is included in Appendix C, which suggests that approximately 4m³ per dwelling is required. It is proposed to include this to the front of each property in a below ground tank. This will be designed in detail by the manufacturer at construction stage. An example product brochure for an appropriate system is included in Appendix C.
- 5.3.2 Next in the hierarchy is infiltration, however given that the site is located on clay/silt superficial deposits and London Clay Formation (Section 2.4), it is determined that infiltration methods are unsuitable for the site.
- 5.3.3 Similarly, the scale of the development site mean that surface attenuation features are impractical. As such, it is proposed to use below-ground storage in the sub-base of a permeable paving system. This design has been modelled using PDS Flow Software and is demonstrated to function up to the 1% (1 in 100) AEP with allowance for climate change. Refer to Appendix C for calculation outputs.
- 5.3.4 Note that the permeable paving system will be Type C (sealed) to act as storage, with a minimum of 30% voids, but will not infiltrate.
- 5.3.5 A proposed drainage concept drawing is included in Appendix D.

6.0 SUMMARY AND CONCLUSION

- 6.1.1 The site proposals consist of the construction of a residential development of 3 units with associated parking and gardens
- 6.1.2 A proposed SuDS strategy is designed to manage runoff from the development in line with the hierarchy detailed in the London Plan and limit discharge from the site to 4l/s up to the 1% (1 in 100) AEP.
- 6.1.3 The proposals are considered to meet the requirements of The London Plan and facilitate the discharge of planning conditions relating to SuDS.

Appendix A Topographic Survey

NOTES

ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT BUILDING REGULATIONS.

ALL DIMENSIONS / LEVELS TO BE CHECKED AND VERIFIED ON SITE BEFORE COMMENCING ANY WORK AND ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY.

THIS DRAWING TO BE READ IN CONJUNCTION WITH CONTRACT DOCUMENTS, PROJECT WORKING DRAWINGS, SPECIFICATION, ALL CONSULTANTS / SPECIALIST DRAWINGS, DETAILS AND SPECIFICATION.

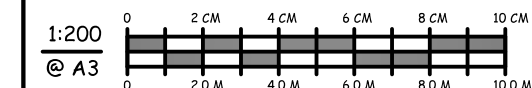
ALL MATERIALS USED IN ANY EXTERIOR WORK SHALL OF A SIMILAR APPEARANCE TO THOSE USED IN THE CONSTRUCTION OF THE EXTERIOR OF THE EXISTING BUILDING.

CLIENT IS ADVISED TO ACT AS PER "THE PARTY WALL ACT 1996" BEFORE STARTING OF ANY WORK.

THESE DRGS. ARE PREPARED FOR THE PRE PLANNING APPLICATION ONLY.

EXISTING BOUNDARY TO BE VARIFIED ON SITE BY CLIENT / BOUNDARY SURVEYOR.

THE CLIENT / CONTRACTOR IS RESPONSIBLE FOR ENSURING COMPETENCE WITH THE CDM REGULATIONS 2015 AND APPROPRIATE HEALTH & SAFETY ON SITE PRECAUTIONS.



REV: DATE: AMENDMENT:



**studio
infinitii**

architectural +
interior designers

ff flat 145 thornbury road TW7 4QD
ph: 02070963935 mo: 07506582244

CLIENT:
Mr. P. PAREKH (SWAN CONTRACTORS LTD.)

JOB:
REAR OF 85-87 MANOR WAYE
UNDERIDGE URB 2DG

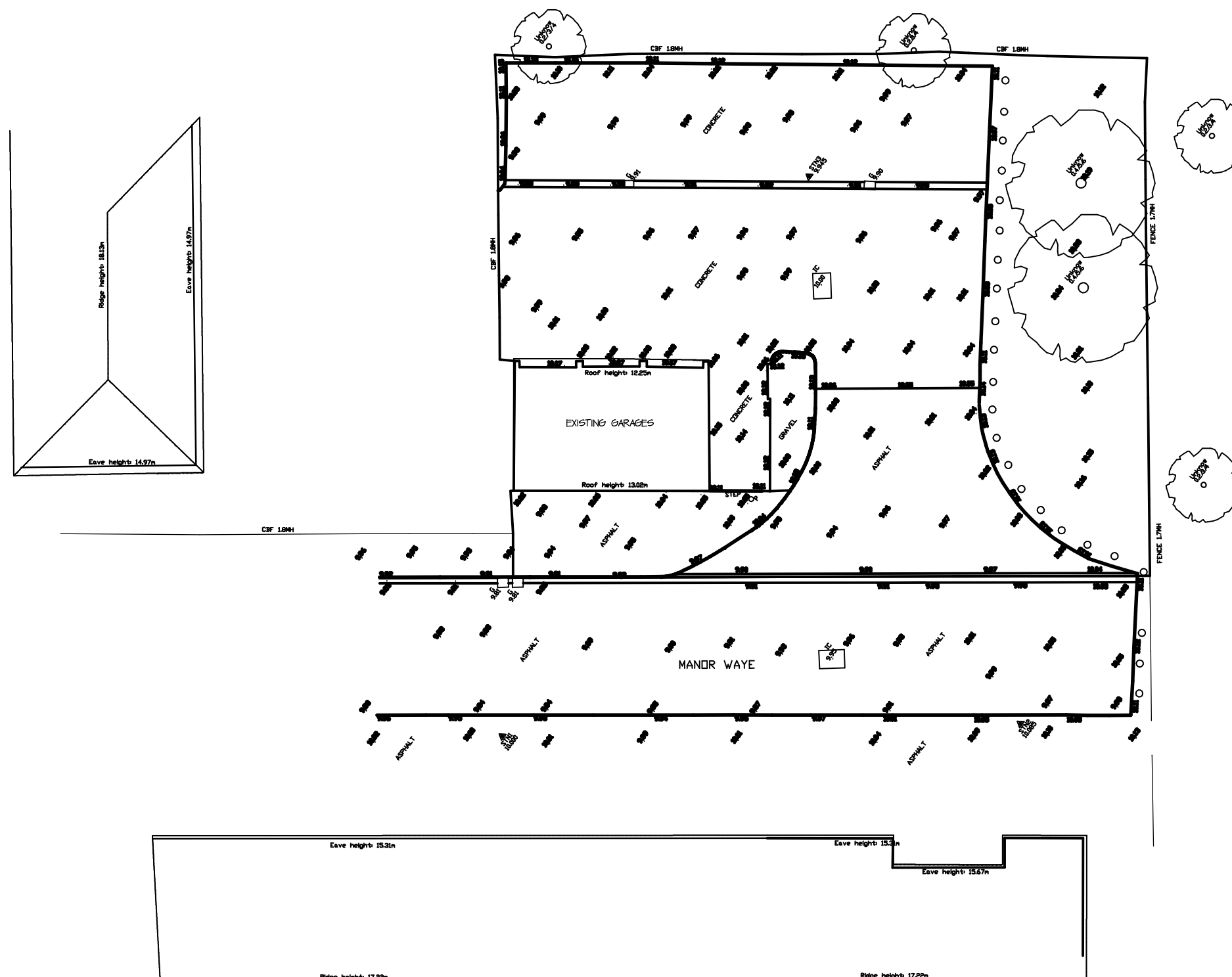
TITLE:
EXISTING SITE PLAN

SCALE: 1:200 @ A3 DRAWN BY:

DATE: MAY 2017 JOB NO: SI 2017003

DRAWING NO: SI 2017003 01 REV:

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Appendix B Sewer records

Asset location search



Property Searches

Mikaela Hill
STD Civils Ltd
Unit 16
81Leighton Road
LEIGHTON BUZZARD
LU7 9HW

Search address supplied 505723 183568
Land To The Rear Of
85 - 87
Manor Waye
Uxbridge
UB8 2DG

Your reference N/A

Our reference ALS/ALS Standard/2018_3720684

Search date 16 January 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.



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



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



0845 070 9148



Search address supplied: 505723 183568, Land To The Rear Of, 85 - 87, Manor Waye, Uxbridge, UB8 2DG

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 search provides 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: 0845 7823333

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

Thank you for your payment covering the cost of this enquiry. We have enclosed a VAT Receipt for your records.

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

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
6501	n/a	n/a
651A	n/a	n/a
6508	n/a	n/a
6506	n/a	n/a
6505	n/a	n/a
7503	n/a	n/a
7501	n/a	n/a
7502	38.18	36.65
7603	38.61	37.51
7601	38.35	37.21
7602	38.66	36.97
861B	n/a	n/a
6601	n/a	n/a
6602	n/a	n/a
6605	n/a	n/a
6507	n/a	n/a
6502	n/a	n/a
6504	n/a	n/a
6509	n/a	n/a
7504	n/a	n/a
6510	n/a	n/a
6503	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.



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

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.

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		Gully
	Culverted Watercourse		Proposed
			Abandoned Sewer

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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.

Invoice



Mikaela Hill
STD Civils Ltd
81
Leighton Road
Leighton Buzzard
LU7 9HW

Thames Water Utilities Ltd.
PO Box 3189
Slough
SL1 4WW

Customer Reference: N/A

Invoice No: ADS18398600
Our Ref: ALS/ALS
Standard/2018_3720684

Customer Number: ADS115178
Purchase Order No:

Posting Date: 16-01-2018
Due Date: 30-01-2018

Search Address Supplied: 505723 183568, Land To The Rear Of, 85 - 87, Manor Waye, Uxbridge, UB8 2DG

Description of Charges	Qty	Unit Price	VAT (20%)	Amount (Inc VAT)
Asset Location Search	1	£48.27	£9.65	£57.92

Thank you for your payment of 000000	£57.92
---	--------

OUTSTANDING AMOUNT (Inc. VAT) £0.00

Please send any outstanding amount to Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.

For queries please contact the Property Searches Customer Support Team on Tel: 0845 070 9148.

VAT Reg. No GB 537456915





Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

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

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- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

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

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

TPOs Contact Details

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

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

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

Appendix C Calculations

Rainwater Harvesting Brochure

Calculated by: Laura Birkin

Site name: Manor Way

Site location: Uxbridge

Site coordinates

Latitude: 51.54115° N

Longitude: 0.47664° W

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Reference: 6229969

Date: 2018-01-25T12:49:42

Methodology

IH124

Site characteristics

Total site area (ha)	0.053
Significant public open space (ha)	0
Area positively drained (ha)	0.053
Pervious area contribution (%)	30
Impermeable area (ha)	0.038
Percentage of drained area that is impermeable (%)	72
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0.014
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	0.05
Net impermeable area for storage volume design (ha)	0.03

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage	
	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5
Qbar estimation method	Calculate from SPR and SAAR	
SPR estimation method	Calculate from SOIL type	
	Default	Edited
Qbar total site area (l/s)	0.09	--
SOIL type	2	2
HOST class	N/A	N/A
SPR	0.3	0.3

Hydrology

	Default	Edited
SAAR (mm)	632	632
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.4	0.4
Rainfall 100 yrs 6 hrs	63	
Rainfall 100 yrs 12 hrs	91.63	
FEH/FSR conversion factor	1.19	1.19
Hydrological region	6	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	0.09	0.09
Qbar net site area (l/s)	0.09	0.09
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes

	Default	Edited
Interception storage (m³)	1	1
Attenuation storage (m³)	3	3
Long term storage (m³)	0	0
Treatment storage (m³)	3	3
Total storage (excluding treatment) (m³)	4	4

Rainwater Harvesting Tank Sizing for Individual Residential Properties

Site name: Manor Waye
Site location: Uxbridge
House reference: Standard 2 bed
Roof type: Standard pitch
No. of bedrooms: 2

Reference: 1516884714452

Date: 25/1/2018

This report provides an assessment of the volume of rainwater harvesting system storage required for the property to provide stormwater management control for a specific design storm event in addition to the non-potable water supply benefit. The report also provides compliance information (the probability of providing effective stormwater control) for the property.

• Input Data

No. of occupants:	1.74 (Default)
Standard deviation of occupants:	0.73 (Default)
Roof area (m²):	46 (User-entry)
Daily consumption per person (l/p/d):	40 (Default)
Average annual rainfall depth (mm):	632 (User-entry)
No. of rainfall events per year:	150 (Default)
Depression storage loss (mm):	0.5 (Default)
Runoff proportion coefficient:	0.9 (Default)
Filter coefficient:	0.9 (Default)
Design rainfall depth (mm):	60 (Default)

• Results

Ratio Y/D: 0.82

The ratio of Yield to Demand (Y/D) does not exceed 0.95 (i.e. on average, demand exceeds supply), which indicates that the rainwater harvesting tank is suitable to be used as a means of effective stormwater management.

Tank size (m³): 4.2

This is the estimated tank size that will be required to provide control of the design storm rainfall depth.

Compliance: 57%

This is the estimated probability that a property of the type specified will comply ie that spillage will not occur from the rainwater harvesting tank. The probability is likely to be less than 100% unless the number of occupants is known and remains unchanged.

[HR Wallingford](#) is not liable for the actual performance of any tank designed using this tool. Considering the uncertainties associated with rainfall and house occupancy, the results should be regarded as a best estimate based on current science of the storage required. Appropriate consideration of the implications of both larger events and unusually wet seasons occurring, should be carried out.

Drainage Design Report

Flow

v4.0

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Network	Storm Network
Filename	C:\Users\Laura\CloudStation\1330 - Manor Waye Uxbridge\5. Design\5.3 Flow\Manor Waye.pfd
Username	FMQ-037780\Laura
Last analysed	07/02/2018 10:05:32
Report produced on	07/02/2018 10:09:44

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Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	30
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	4.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Enforce best practice design rules	

	Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
1		0.001	4.00		9.900	Manhole	Adoptable	450				0.900	
2		0.007	4.00		10.000	Manhole	Adoptable	450				1.073	
3		0.014	4.00		10.100	Manhole	Adoptable	450				1.246	
4		0.003	4.00		9.900	Manhole	Adoptable	450				0.900	
5		0.004	4.00		10.000	Manhole	Adoptable	450				1.080	
6		0.007	4.00		10.100	Manhole	Adoptable	450				1.299	
7					9.950	Manhole	Adoptable	450				1.182	

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	C.Offset (m)	Min DS IL (m)
?	1.000	1	2	11.000	0.600	Colebrook-White	9.000	8.927	0.073	150.0	150	Circular_Default Sewer Type	4.22	50.0		
?	1.002	2	3	11.000	0.600	Colebrook-White	8.927	8.854	0.073	150.0	150	Circular_Default Sewer Type	4.45	50.0		
?	1.003	3	6	8.000	0.600	Colebrook-White	8.854	8.801	0.053	150.0	150	Circular_Default Sewer Type	4.61	50.0		
?	2.000	4	5	12.000	0.600	Colebrook-White	9.000	8.920	0.080	150.0	150	Circular_Default Sewer Type	4.24	50.0		
?	2.001	5	6	10.000	0.600	Colebrook-White	8.920	8.853	0.067	150.0	150	Circular_Default Sewer Type	4.45	50.0		
?	1004	6	7	5.000	0.600	Colebrook-White	8.801	8.768	0.033	150.0	150	Circular_Default Sewer Type	4.71	50.0		

Link ID	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node ID	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node ID	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	11.000	150.0	150	Circular_Default Sewer Type	9.900	9.000	0.750	10.000	8.927	0.923	1	450		Manhole	Adoptable	2	450		Manhole	Adoptable
1.002	11.000	150.0	150	Circular_Default Sewer Type	10.000	8.927	0.923	10.100	8.854	1.096	2	450		Manhole	Adoptable	3	450		Manhole	Adoptable
1.003	8.000	150.0	150	Circular_Default Sewer Type	10.100	8.854	1.096	10.100	8.801	1.149	3	450		Manhole	Adoptable	6	450		Manhole	Adoptable
2.000	12.000	150.0	150	Circular_Default Sewer Type	9.900	9.000	0.750	10.000	8.920	0.930	4	450		Manhole	Adoptable	5	450		Manhole	Adoptable
2.001	10.000	150.0	150	Circular_Default Sewer Type	10.000	8.920	0.930	10.100	8.853	1.097	5	450		Manhole	Adoptable	6	450		Manhole	Adoptable
1004	5.000	150.0	150	Circular_Default Sewer Type	10.100	8.801	1.149	9.950	8.768	1.032	6	450		Manhole	Adoptable	7	450		Manhole	Adoptable

Rainfall Methodology	FSR		Return Period (years)	Climate Change (%)
FSR Region	England and Wales		1	0
M5-60 (mm)	20.000		30	0
Ratio-R	0.400		100	0
Summer CV	0.750		100	30
Winter CV	0.840			
Analysis Speed	Normal			
Drain Down Time (mins)	240			
Additional Storage (m³/ha)	20.0			
Storm Durations (mins)	15			
	30			
	60			
	120			
	180			
	240			
	360			
	480			
	600			
	720			
	960			
	1440			
Check Discharge Rate(s)	x			
1 year (l/s)				
30 year (l/s)				
100 year (l/s)				
Check Discharge Volume	x			
100 year 360 minute (m³)				

Head/Flow									
Node	Flap Valve	Online / Offline	Replaces Downstream Link	Loop to Node	Invert Level (m)	Design Depth (m)	Design Flow (l/s)	Head (m)	Flow (l/s)
6	x	Online			8.801	0.280	4.0	1.000	14.286

Depth/Area/Inf Area									
Node	Base Infiltration Coefficient (m/hr)	Side Infiltration Coefficient (m/hr)	Safety Factor	Porosity	Invert Level (m)	Time to half empty (mins)	Depth (m)	Area (m²)	Inf. Area (m²)
2	0.00000	0.00000	2.0	0.30	8.927	28	0.000	27.0	0.0
							0.300	27.0	0.0
							0.310	0.0	0.0
3	0.00000	0.00000	2.0	0.30	8.854	37	0.000	68.0	0.0
							0.300	68.0	0.0
							0.310	0.0	0.0
6	0.00000	0.00000	2.0	0.30	8.801	45	0.000	7.0	0.0
							0.300	7.0	0.0
							0.310	0.0	0.0
4	0.00000	0.00000	2.0	0.30	9.000	19	0.000	13.5	0.0
							0.300	13.5	0.0
							0.310	0.0	0.0
5	0.00000	0.00000	2.0	0.30	8.920	28	0.000	14.0	0.0
							0.300	14.0	0.0
							0.310	0.0	0.0

Node Size	
Node Losses	
Link Size	
Minimum Diameter (mm)	150
Link Length	
Maximum Length (m)	100.000
Coordinates	
Accuracy (m)	1.000
Crossings	
Cover Depth	
Minimum Cover Depth (m)	
Maximum Cover Depth (m)	3.000
Backdrops	
Minimum Backdrop Height (m)	
Maximum Backdrop Height (m)	1.500
Full Bore Velocity	
Minimum Full Bore Velocity (m/s)	
Maximum Full Bore Velocity (m/s)	3.000
Proportional Velocity	
Return Period (years)	
Minimum Proportional Velocity (m/s)	0.750
Maximum Proportional Velocity (m/s)	3.000
Surcharged Depth	
Return Period (years)	
Maximum Surcharged Depth (m)	0.100
Flooding	
Return Period (years)	30
Discharge Rates	
1 year (l/s)	
30 year (l/s)	
100 year (l/s)	
Discharge Volume	
100 year 360 minute (m³)	

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1	37	9.009	0.009	0.1	0.0016	0.0000	OK	1.000	2	0.1	0.128	0.007	0.0102	
15 minute winter	2	12	8.951	0.024	1.1	0.2010	0.0000	OK	1.002	3	0.8	0.376	0.055	0.0324	
30 minute winter	3	25	8.907	0.053	2.5	1.0927	0.0000	OK	1.003	6	1.1	0.232	0.074	0.0749	
15 minute winter	4	12	9.016	0.016	0.4	0.0685	0.0000	OK	2.000	5	0.3	0.254	0.024	0.0166	
15 minute winter	5	12	8.944	0.024	0.9	0.1044	0.0000	OK	2.001	6	0.8	0.356	0.054	0.0295	
30 minute winter	6	24	8.907	0.106	2.0	0.2497	0.0000	OK	Head/Flow	7	1.5				2.9
15 minute summer	7	1	8.768	0.000	1.3	0.0000	0.0000	OK							

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	10	9.017	0.017	0.4	0.0031	0.0000	OK	1.000	2	0.4	0.169	0.027	0.0358	
30 minute winter	2	24	8.996	0.069	2.2	0.5760	0.0000	OK	1.002	3	2.0	0.373	0.142	0.1374	
30 minute winter	3	26	8.995	0.141	6.3	2.9221	0.0000	OK	1.003	6	2.2	0.236	0.149	0.1390	
15 minute winter	4	10	9.026	0.026	1.1	0.1133	0.0000	OK	2.000	5	1.0	0.344	0.068	0.0524	
30 minute winter	5	25	8.994	0.074	2.3	0.3281	0.0000	OK	2.001	6	1.7	0.349	0.117	0.1290	
30 minute winter	6	25	8.994	0.193	3.6	0.4559	0.0000	SURCHARGED	Head/Flow	7	2.8				7.4
15 minute summer	7	1	8.768	0.000	2.4	0.0000	0.0000	OK							

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	23	9.034	0.034	0.4	0.0062	0.0000	OK	1.000	2	0.4	0.195	0.028	0.0897	
30 minute winter	2	25	9.034	0.107	3.6	0.8997	0.0000	OK	1.002	3	2.2	0.363	0.155	0.1709	
30 minute winter	3	26	9.034	0.180	8.2	3.7307	0.0000	SURCHARGED	1.003	6	2.3	0.236	0.159	0.1408	
30 minute winter	4	25	9.034	0.034	1.1	0.1458	0.0000	OK	2.000	5	1.0	0.335	0.071	0.1029	
30 minute winter	5	24	9.033	0.113	2.4	0.4997	0.0000	OK	2.001	6	2.3	0.369	0.162	0.1590	
30 minute winter	6	26	9.032	0.231	4.5	0.5468	0.0000	SURCHARGED	Head/Flow	7	3.3				9.7
15 minute summer	7	1	8.768	0.000	2.8	0.0000	0.0000	OK							

Results for 100 year +30% Critical Storm Duration. Lowest mass balance: 100.00%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1	45	9.085	0.085	0.6	0.0155	0.0000	OK	1.000	2	0.3	0.154	0.024	0.1538	
60 minute winter	2	44	9.085	0.158	2.6	1.3219	0.0000	SURCHARGED	1.002	3	1.6	0.326	0.112	0.1937	
60 minute winter	3	44	9.084	0.230	5.0	4.7876	0.0000	SURCHARGED	1.003	6	2.6	0.236	0.181	0.1408	
60 minute winter	4	44	9.082	0.082	1.3	0.3522	0.0000	OK	2.000	5	0.9	0.298	0.061	0.1651	
60 minute winter	5	44	9.083	0.163	2.1	0.7206	0.0000	SURCHARGED	2.001	6	1.8	0.341	0.125	0.1760	
60 minute winter	6	44	9.082	0.281	4.1	0.6659	0.0000	SURCHARGED	Head/Flow	7	4.0				15.9
15 minute summer	7	1	8.768	0.000	3.4	0.0000	0.0000	OK							



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leading German technology



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The *Wisy®* Vortex filter supplies super clean water, and is safe and easy to maintain. No need to open the tank.

Low energy, durability and ease of use give the *RainSava Eco Pro* its unique qualities. Coupled with our unrivalled professional support, it is the perfect choice for installers and homeowners alike.

Evolved System Design

- Class-leading filtration technology.
- Class-leading low energy controller.
- Unique 4-step water cleaning:

1. Vortex fine filter

- the finest rainwater filter available, self-cleaning and oxygen enriching.

2. Calmed inlet

- provides stable sedimentation and further oxygenation.

3. Floating suction extraction

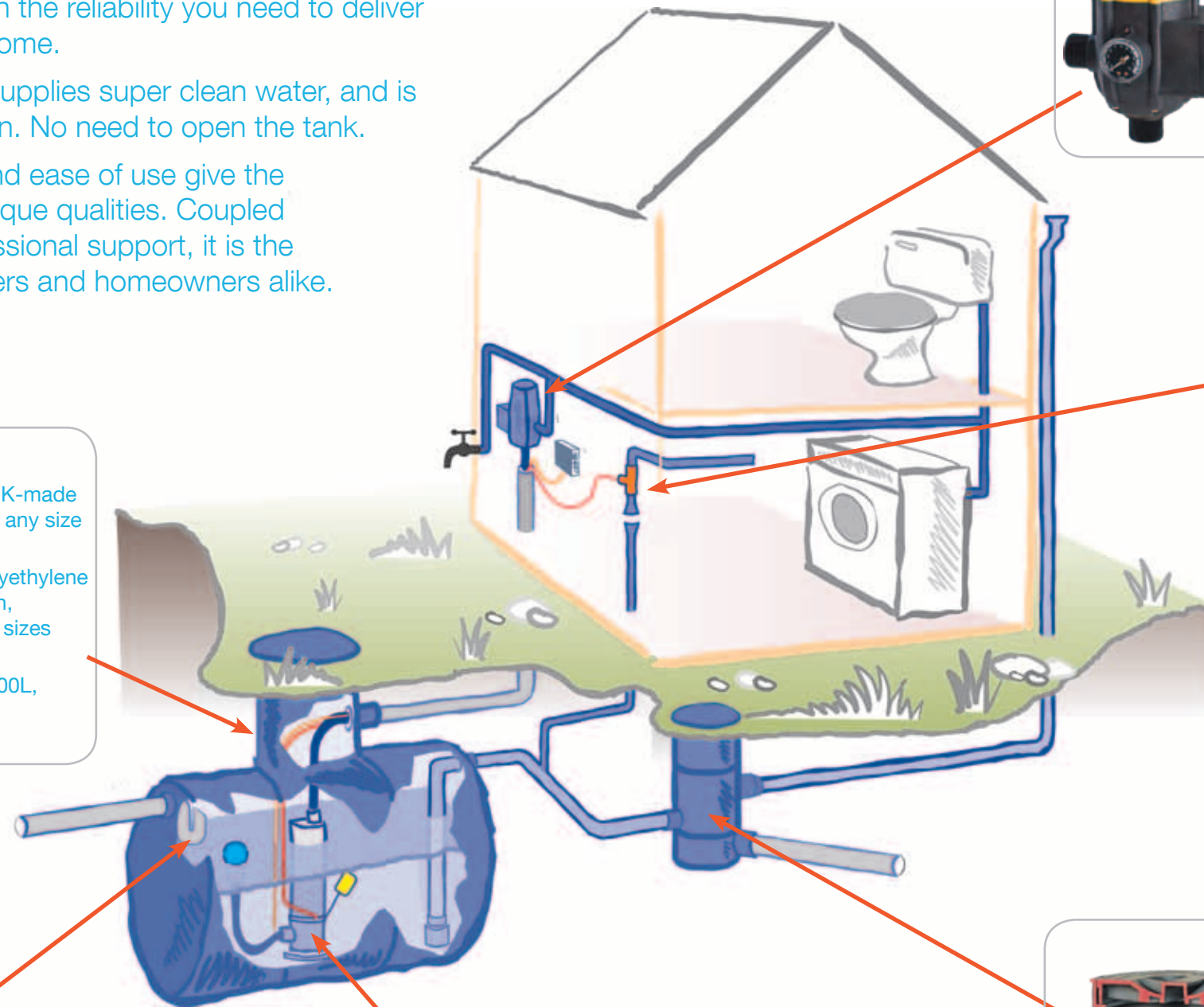
- takes water from the cleanest level of the tank, avoiding sediments.

4. Multisiphon overflow

- horizontal outlet provides effective surface skimming. Deep U-bend prevents drain odour. Unique anti-surge device prevents backflow.

Extensive selection of tanks

- *RainSava GRP Range* — UK-made cost-effective GRP tanks in any size from 1500L upwards
- *GT Range* — UK-made polyethylene tanks. Unique robust design, available in a wide range of sizes
- *LP Range* — low-profile polyethylene flat tanks - 1500L, 3000L, 5000L & 7500L



Wisy® Zeta 02 advanced technology dedicated pump controller

- Consumes up to 97% less energy than conventional devices.
- Complete pump protection
- Diagnostic capability.
- Adjustable pump run-on time.
- Adjustable continuous running limit.
- Adjustable maximum pump starts limit



Unique *Wisy®* mains water top-up unit

- Rapid-fill device can give up to 44 litres/minute
- Quality stainless steel & brass construction
- Integral isolating valve
- Integral dirt trap to protect solenoid
- Unique splash-proof design
- Fully compliant with EN 1717



Unique *Wisy®* Multisiphon overflow unit

- Effective and efficient skimming overflow removes surface debris
- Deep water trap prevents odours from the drains entering the tank
- Built-in anti-backflow device prevents dirty water flowing back into the tank (necessary to comply with British Standard BS 8515)



Multigo submersible multi-stage pressure pump

- Stainless steel housing
- Low-noise, high performance
- Water-cooled motor
- Fitted with 20m cable
- Supplied complete with rubber base mounts and polypropylene lifting rope



Wisy® Vortex Fine Filter (WFF) The Original and Unique Vortex filter.

- Finest filter on the market 0.28mm!
- High grade stainless steel mesh
- Vertical filter surface for enhanced self-cleaning
- 5 year warranty
- Vehicle safe - 30T GVW rated
- No need to open the tank just to clean the filter!





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Rainwater harvesting solutions for any installation

In addition to our best-selling *Eco Pro* system, we have several other options available for certain applications:

RainSava *Classic* – Our low-cost system with automatic pump.

RainSava *Gravity* – As per the Eco Pro system but with the addition of an internal header tank providing a gravity feed.

RainSava *Maxima* – Our top of the range domestic pressure system for the larger home. All-in-one unit ideal for basement or plant room. Can also be used for light commercial applications.

RainSava *Garden* – Simple cost-effective system for garden watering and external use only. The 'no-mains' version is exempt from hosepipe bans.

	Eco Pro	Maxima	Gravity	Classic	Garden
Vortex Fine Filter	•	•	•	•	•
Separate low energy pump controller	•	•	•		
Leak detection	•	•	•		
Pump monitoring	•	•	•		
BS 8515 Compliant	•	•	•	•	•
Rapid fill mains water top-up	•	•		•	optional
Tank backflow protection	•	•	•	•	•
Pump with inbuilt controller				•	•
Separate internal tank for mains water		•	•		

*Wisy® Maxima unit
for domestic and small
commercial applications.
Intelligent all-in-one rainwater
centre with integral mains
water tank.*



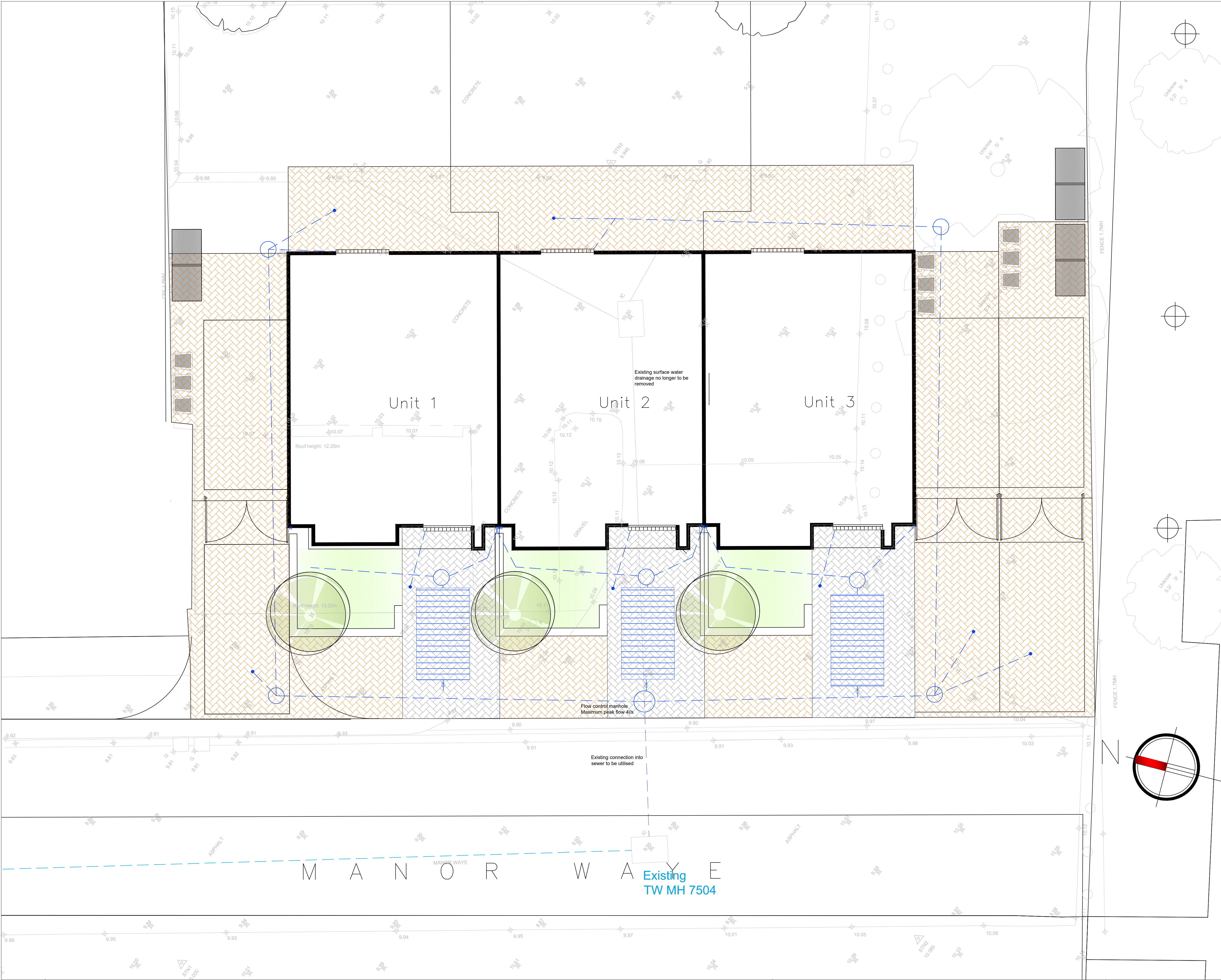
*Specially adapted RainSava header
tank as used in our Gravity system.*

*Beta automatic
submersible pump as
used in our Classic
and Garden systems.*



Distributor:

Appendix D Drainage Strategy Drawing



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- LEGEND
- Existing public surface water sewer
 - Proposed private surface water drainage
 - Proposed below ground rainwater harvesting tank compliant with BS ISO 9518 top provide 4m³ per plot, fitted with non-return valve. Design for installation to be undertaken by manufacturer
 - Proposed permeable paving - Type C with impermeable surround and minimum 30% void ratio sub-base
 - Proposed pipe inlet/outlet to permeable paving
 - Proposed non-permeable paving

- NOTES:
- THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SHOULD NOT BE USED AS A DESIGN OR CONSTRUCTION DRAWING.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH REPORT SWC-1330-01-DRS-01.
 - FOUL DRAINAGE TO BE DESIGNED BY OTHERS.

REV	DATE	NAME	CHECK	NOTE
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DRAWING STATUS:

FOR INFORMATION

CLIENT

SWAN CONTRACTORS LTD



PROJECT

MANOR WAYE, UXBRIDGE

DRAWING TITLE

DRAINAGE CONCEPT
FOR PLANNING

DRAWN	CHECKED	APPROVED
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LJB CR LB

DATE SCALE @ A1

01 February 2018 N.T.S

DRAWING No. REVISION No.

SWC-1330-01-DR-001