LONDON STRUCTURES LAB

Denville Hall

1521-LSL-XX-XX-RP-C-SWS

Surface Water Drainage Strategy

November 2022

DOCUMENT CONTROL

PROJECT NAME	DENVILLE HALL
REPORT TITLE	Surface Water Drainage Strategy
REFERENCE	1521-LSL-XX-XX-RP-C-SWS
CLIENT	Denville Hall 2012 Ltd

Revision	Status	Date	Author	Reviewer
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Content

Figures and Tables

1.0 Introduction

1.1 Scope

London Structures Lab was commissioned by Denville Hall 2012 Ltd to develop the surface water drainage strategy for the proposed development at Denville Hall, 62 Duck's Hill Rd, London, Northwood HA6 2SB.

This report has been produced in support of a planning application and should be read in conjunction with the other planning documents.

1.2 Sources of Information

This report has been prepared based on the following set of information:

- Topographical Survey by Murphy Geospatial drawing MGS41468-T-02 dated May 2021
- Landscape proposal by Kalli-architecture and design Ltd, drawing reference GA (-2) 201.1 Proposed Master Plan
- Utilities records – Thames Water record reference ALS/ALS Standard/2018_3880986, dated September 2018
- Desk Study: Preliminary Risk Assessment – Groundsure investigation report reference GSP-2018-1161 FINAL, dated October 2018
- Environment Agency (EA) online flood maps at https://flood-map-for-planning.service.gov.uk/
- British Geological Survey online mapping available at https://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.111570884.1580712057.1616278391-1852494143.1597654958
- Magic website mapping available at https://magic.defra.gov.uk/magicmap.aspx
- Lead Local Flood Authority (LLFA) information – London Borough of Hillingdon SuDS Design Guide available at https://www.hillingdon.gov.uk/suds
- Lead Local Flood Authority (LLFA) information – Strategic Flood Risk Assessment (SFRA) available at https://westlondonsfra.london/
- Guidance on Flood risk and coastal change – UK Government, available from https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability

1.3 Limitations

This report has been prepared in accordance with the National Planning Policy Framework (NPPF) and Local Planning Policy. The proposed flood management (including ground floor level

recommendations) and surface water management strategies are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice. The findings of this report are based on the information available at the time of the production.

The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves "construction" work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.

2.0 Site Setting

2.1 Site Description

Denville Hall is a care home facility comprising a historic manor house (c.1851) and contemporary extension block (c.2004). The site coverers 1.25 ha in area and is located northwest of Ducks Hill Road, Northwood, London Borough of Hillingdon HA6 2SB. The approximate grid reference for the site is 508107E, 191341N. The planning boundary for the proposed works is shown below.

Figure 2.1 – Proposes planning boundary

2.2 Proposed Development

The proposed development includes demolition of no. 48 and no. 60 Ducks Hill Road, a derelict garage and wooden storage unit and the erection of 12 assisted-living units (Class C2) in two separate buildings (Buildings A and B) and proposed ancillary communal space, including café and restaurant (Building C) accessed through connecting link building and associated landscaping.

2.3 Topography

An onsite topographic survey has been carried out by Murphy Geospatial. The proposed section for development is irregular in shape and slopes gently downward from west to east.

2.4 Hydrology

Ordnance Survey (OS) mapping and the EA's web-based mapping indicate that the River Colne is located approximately 2 km to the northwest of the site and Scarlet Spring is located approximately 2 Km to the southeast of the site.

2.5 Geology

Based on the information available from BGS online mapping:

- Bedrock geology description - Lambeth Group - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 48 to 59 million years ago in the Palaeogene Period. Local environment previously dominated by swamps, estuaries and deltas.
- Superficial deposits – none recorded.

The nearest borehole records with similar geological profiles to the site available from this website are summarised below:

- TQ09SE275, approximately 700 m southeast of the site, dated 2010 - indicated uppermost 0.5 m gravel and topsoil, with sand between 0.5 to 5.0 m and white chalk below to a drilled depth of 50 m. Cover level not reported. Water struck at 25–30 m below ground level, with rest water level reported at 12 m below ground level.
- TQ09SE181, approximately 700 m east of the site, dated 2007 - indicated made ground to a depth of 2 m with stiff to very stiff light brown mottled grey slightly gravelly clay from 2 m to a trial pit depth of 4 m. Cover level not reported. Trial pit remained reportedly dry.
- TQ09SE22, approximately 700 m west southwest of the site, dated 1944 – indicated upper 6.7 m London clay, with Reading beds between 6.7 and 16.5 m, with upper chalk between 16.5 and 97.5 m and middle chalk below to a drilled depth of 106.7 m. Cover level recorded at 74.4 m AOD. No record of water encountered.
- TQ09SE51, approximately 670 m northwest of the site, dated 1903 – indicated upper 3 m gravel sand and clay (drift), with London clay between 3 to 21 m, with Reading beds between 21 to 35.7 m and upper and middle chalk below to a drilled depth of 137 m. Cover level recorded at 103.6 m AOD. Water reportedly struck at 55.5 m below cover level.

Soilscape information available from Magic Maps service indicate this area as:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

At the time of the report production, no detailed site investigation work has taken place.

2.6 Hydrogeology

The following hydrogeological information was obtained from the online Magic Maps service.

- Aquafer destination (Bedrock) – Secondary A
- Aquifer Designation Map (Superficial Drift) – no features found
- Groundwater Vulnerability – Medium

BGS borehole log reference TQ09SE275 recorded water struck at 25 to 30 m, with the rest water level at 12m on completion of drilling. BGS borehole log reference TQ09SE51 recorded water struck at 48.1 m AOD, 55.5 m below a cover level of 103.6 m AOD.

2.7 Existing Drainage

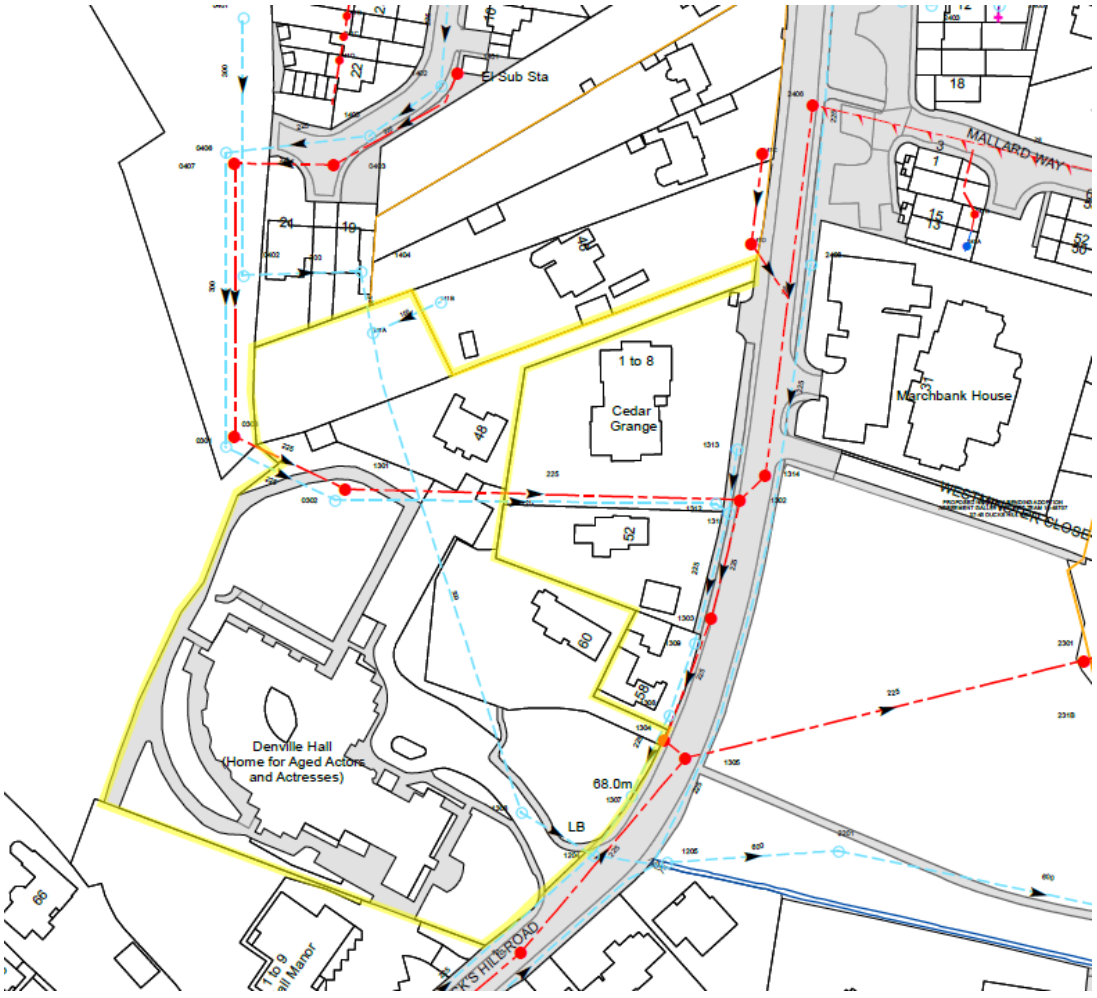


Figure 2.2 – Thames Water asset record reference ALS/ALS Standard/2018_3880986, dated September 2018

Thames Water asset record reference ALS/ALS Standard/2018_3880986, dated September 2018 indicates foul water and surface water sewers run west to east and cross the northern region of the site; with manhole access to each within the site boundary close to the western edge. A

further surface water sewer crosses the site near the northwest corner and runs to the southeast corner of the site. Manhole access to this surface water sewer is available in both the northwest and southeast corners within the site boundary. In addition, foul water and surface water sewers run adjacent to the site's eastern boundary along Duck's Hill Road. A schematic excerpt from Thames Water asset record reference ALS/ALS Standard/2018_3880986 reproduced in Figure 2.1.

2.8 Summary of Flood Risk

The following table provides a summary of flood risk for the site. Please refer to the Flood Risk Assessment report (Ref: 1521-LSL-XX-XX-RP-C-FRA) for further details on sources of flooding.

Table 2.1 – Summary of Sources of Flood Risk

Source of Flooding	Risk Level	Source of Data	Comments, Mitigation Requirements
Fluvial	Low	EA mapping	Flood zone 1
Tidal	Low	EA mapping	Inland location
Surface water (Pluvial)	High	EA mapping and site-specific surface water flood modelling	Surface water flood mapping indicate some localised flooding around the northern, western and eastern site boundaries, with further surface water flooding indicated along Duck's Hill Road adjacent to the eastern site boundary. Site specific flood modelling indicate a flow path passing through the site affecting the proposed layout
Groundwater	Low	BGS mapping	Borehole records within a 700 m radius of the site recorded groundwater levels to be substantially lower than proposed FFLs.
Sewers	Low	LLFA information	No available records of sewer flooding in the area
Reservoirs, Canals	Low	EA mapping	Site not affected

Key	Description
	Low/Negligible Risk – No noticeable impact to site and not considered to be a constraint to development.
	Medium Risk – Issue requires consideration but not a significant constraint to development
	High Risk – Major constraint to development requiring active consideration in mitigation proposals

3.0 Surface Water Drainage Strategy

3.1 Policy Requirements

The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

London Plan 2021 Policy SI 13 states the drainage hierarchy to be followed when developing the SuDS elements for the scheme.

Policy SI 13 Sustainable drainage:

A. *Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.*

B. *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*

   1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

   2) rainwater infiltration to ground at or close to source

   3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

   4) rainwater discharge direct to a watercourse (unless not appropriate)

   5) controlled rainwater discharge to a surface water sewer or drain

   6) controlled rainwater discharge to a combined sewer.

C. *Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*

D. *Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.*

Guidance on Hillingdon planning website states that "All major applications should adopt the approaches, provide the information and meet the standards explained within the Hillingdon SuDS Design and Evaluation Guide". The guidance in this document is in line with the national and London Plan requirements.

3.2 Contributing Areas

This assessment includes an overview and comparison of the existing greenfield/brownfield scenarios and proposed development scenario. The full area within the redline boundary is 1.25 ha. However, 0.35 ha of area to the southwest of the site will not be altered as a part of the development. Therefore, our calculations are based on a development area of 0.87 ha.

Table 3.1 – Contributing areas

Parameter	Existing (ha)	Existing (%)	Proposed (ha)	Proposed (%)
Development area	0.873	100%	0.873	100%
Impermeable area	0.212	24%	0.308	35%
Permeable area	0.661	76%	0.565	65%

3.3 Pre-development Situation

3.3.1 Greenfield Rates

The Greenfield runoff tool available from www.uksuds.com has been used to estimate the greenfield rates. Calculations are contained in Appendix C and the results are summarised in Table 3.2.

Table 3.2 – Greenfield runoff rates

Rainfall event	Greenfield rate (l/s)
Qbar	4
1 in 1 year	3.4
1 in 30 year	9.2
1 in 100 year	12.77

3.3.2 Brownfield Rates

As this is a brownfield site, the existing run-off rates for a variety of return periods have been calculated using the Wallingford Method (also referred to as Modified Rational Method).

The Modified Rational method uses the following equation to calculate peak runoff rate from an area:

$$Q = 2.78\ C_v\ C_r\ i\ A$$

Where:

2.78 = Coefficient which accounts for the differences in units used for the inputs and the outputs of the equation

C_v = Volumetric Runoff Coefficient - a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system, assumed to be 0.95 for impermeable areas

C_r = Routing Coefficient - a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner, assumed to be 1.3 for urban areas

i = Rainfall Intensity (mm/hr)

A = Area (ha)

Taking conservative peak 1 year, 30 year and 100-year rainfall rates of 50 mm/hr, 125 mm/hr and 185 mm/hr respectively, the maximum existing peak discharge rates have been calculated as follows. The existing impermeable area is 24 % of the development area.

Table 3.3 – Modified Rational Method pre-development surface water runoff

Return period	Rainfall Intensity (mm/hr)	Peak flow (l/s)
1 in 1 year	50	36.5
1 in 30 year	125	91.2
1 in 100 year	185	134.9

3.4 Offsite Discharge Options

3.4.1 Discharge to Ground

The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

As the area is underlain by London Clay, infiltration is not considered as a suitable option.

3.4.2 Discharge to Surface Water Body

There are no suitable surface water bodies near to the site that can be used for surface water discharge.

3.4.3 Discharge to Surface Water Sewer/Combined Sewer

Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

It is proposed that the surface water is discharged via the existing Thames Water surface water sewers located onsite.

3.5 Post-development Situation

3.5.1 Discharge Rate

It is proposed that the surface water discharge is restricted to 4.1 l/s for all rainfall events up to 1 in 100-year storm plus an allowance for climate change which equivalent to the Qbar rate for the development area.

3.5.2 Climate Change Allowance

Based on the latest guidance from Environment Agency, the climate change factor to apply has been taken as 40 % for this development.

3.5.3 Urban Creep

A 10 % allowance has been applied to account for urban creep.

3.6 Sustainable Drainage Systems (SuDS)

To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 3.4 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Table 3.4 – SuDS Selection based on the SuDS hierarchy

Component	Recommendation
Rainwater reuse	Rainwater harvesting can offer opportunities to reuse rainwater. Rainwater harvesting tank is currently not proposed for the scheme. This is to be reviewed at the next design stage.
Green/Blue roofs	Whilst the use of green and blue roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority. If feasible, depending on the roof design, a green/blue roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green/blue roofs can offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1 in 2-year storms). A green roof is proposed for part of the Building C roof. The architectural layouts showing the showing the extent of this green roof is provided in Appendix B.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. Open storage features are not considered suitable for the development due to the proposed use of the scheme.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within runoff. They also create biodiverse areas for planting and habitat. Swales are incorporated to the boundary of the staff car parking areas to accommodate the existing overland flow paths. French drains are proposed for the boundaries of the proposed building in some areas, also to direct the overland flow paths as well as to allow water quality treatments. The opportunities to allow existing flow paths to continue as close to the existing locations as possible are being incorporated to the design.

Component	Recommendation
Infiltration Devices	Infiltration is not considered a suitable option due to the underlaying geology of London Clay.
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. Permeable surfaces are proposed as far as practicable to parking areas. This will include gravel finishes to the parking areas and the access road to the west. Where more harder surface finishes are required to allow wheelchair access, permeable resin bound gravel finishes are proposed.
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. Some of the required attenuation storage is to be provided with the tanks located within the car park areas and near Buildings A and C.

3.7 Attenuation Requirements

The attenuation estimations presented below are based on the proposed discharge rates as listed below. Calculations and further details are provided in Appendix C.

Table 3.5 – Attenuation requirements

Rainfall event	Discharge rate
1 in 1-yr	4 l/s
1 in 30-yr	4 l/s
1 in 100-yr	4 l/s
Attenuation estimate for 1 in 100-yr + 40 % climate change allowance	147 m^3

Pumping may be required if connecting invert levels were proven to be too shallow for a gravity connection. This is subjected to further onsite investigations.

3.8 Flood Risk Reduction

It is proposed to discharge the surface water from the development via the existing Thames Water sewer. Compared to the existing situation this will reduce the runoff from the site.

The calculations include an assessment of the proposed drainage system for all storm events up to the 1 in 100-year storm + 40 % climate change.

3.9 Exceedance Flooding and Overland Flow

There are existing flow paths through the site and it is proposed that these are accommodated in the layout. The drainage system for the proposed development has been designed to cater for the 1 in 100 year + 40 % climate change storm. i.e., in such a storm event, all surface water would be collected on site and slowly released. Thus, the overland flow route would only be required in the event of a drainage network failure, or if a storm in excess of the design rainfall event caused flows from offsite to flow through the site. Surface water from a rainfall event in excess of the deign-rainfall, would follow the existing topography.

3.10 Consents, Offsite Works and Diversions

The proposed surface water drainage strategy is accommodated entirely on site. A pre-development enquiry has been submitted to Thames Water regarding the connection from the development.

3.11 Adoption and Maintenance

The long-term maintenance of the SuDS features within the site boundary will most likely be undertaken by a management company.

Maintenance of SuDS features should be undertaken in line with maintenance schedules outlined in the SuDS Manual. Full maintenance schedules should be confirmed at the detailed design stage in consultation with appropriate product suppliers. An example maintenance schedule is provided in Appendix D.

3.12 Drainage During Construction

Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site. A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known.

Run-off control measures will need to be implemented in order not to overwhelm the temporary system and cause flooding issues. Runoff rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading. All drainage

infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.

4.0 Water Quality

In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of runoff to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water runoff close to source
- Treat surface water runoff on the surface
- Treat surface water runoff to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

SuDS Manual Table 26.2 provides the details for assessing the pollution levels associated with the developments. This table is reproduced below in Table 4.1 with the applicable land use highlighted.

Table 4.1 – Extract of SuDS Manual Table 26.2: Pollution hazard indices for different land use classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, home zones and general access roads) and non-residential car parking with infrequent	Low	0.5	0.4	0.4

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
change (e.g., schools, offices) i.e., <300 traffic movements/day				
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

The proposed drainage strategy utilises the following SuDS features:

- Green roof
- French drains
- Swales
- Permeable resin bound gravel
- Attenuation tanks

The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed in relation to the proposed measures. This table is reproduced in Table 4.2.

Table 4.2 – Extract of Table 26.3: Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydro-carbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8

Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydro-carbons
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

The SuDS Manual States:

Total SuDS mitigation index (for each contaminant type)	≥	pollution hazard index (for each contaminant type)

Residential roofs have very low levels of pollution hazard indexes. Therefore, the use of the permeable paving alone can provide the level of treatment required.

5.0 Foul Water Drainage Design

5.1 Existing Arrangements

There is an existing Thames Water foul water sewer running through the site.

5.2 Proposed Arrangement

It is proposed that any new foul water drainage is connected to the existing Thames Water sewer utilising the existing connection if possible. Build over agreements are required to accommodate Building B on the proposed location.

6.0 Conclusion

London Structures Lab was commissioned Denville Hall 2012 Ltd to develop a surface water drainage strategy for the proposed development at Denville Hall, 62 Duck's Hill Rd, London, Northwood HA6 2SB.

The existing site coverers 1.25 ha with a proposed development area of 0.8 7ha. The existing area is 24 % impermeable with the development proposing to increase the impermeable area to 35%. The development will see the demolition of 4No. existing structures and construction of 12 assisted living units, with associated communal spaces and landscaping.

The site has been identified as at a high risk from surface water flooding and at a low risk of flooding from all other sources. The surface water overland flow running through the site has been assessed with site specific modelling. The modelling output has been taken into account when developing the surface water drainage strategy for the site.

In accordance with local and national policy, a range of SuDS techniques have been considered for inclusion within the scheme with the aim of providing a reduction in runoff rates from the site.

It is proposed that, in line with the local policy requirements, the discharge from the development is restricted to 4 l/s, which is equivalent to the Qbar rate for the development; this being is a significant reduction from the existing discharge rates. Attenuation storage is provided to accommodate all rainfall event up to and including 1 in 100-year event plus 40 % climate change allowance.

This report demonstrates that the site can be developed in a sustainable manner to manage the surface water discharge from the development.

Appendix A – Surveys and Investigations

NOTES

GENERAL NOTES :-

TOPOGRAPHICAL SURVEY SUPPLIED BY THIRD PARTY COMPANY, THEREFORE MIDLAND SURVEY LTD. ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THIS DRAWING.

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200

SERVICE COVERS INDICATED WHERE VISIBLE, PIPE INVERTS / DETAILS SURVEYED FROM SURFACE INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

THE SURVEYOR WILL NOT BE RESPONSIBLE FOR THE OMISSION OF DETAILS OBSCURED DURING SITE SURVEY

RICS PROFESSIONAL STANDARDS 3RD EDITION RULE 1.19 APPLIES TO THIS SURVEY.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-

(ht) – height
ø – diameter
● – pec trap
a/g – above ground
a/r – assumed route
b/f – base of
bb – bellaby beacon
bd – back drop
bh – bore hole
bol – bollard
box – bottom of shaft
c/box – control box
c/fe – close boarded fence
c/box – control box
catv – cable television
cl – cover level
cp – concrete
cr – cable riser
cws – combined water sewer
d/c – dished channel
e/b – electric junction box
elec – electric
exit – exit of trace
ep – electric pole
f/c – face of
f/bd – flower bed
fh – fire hydrant
fl – flood light
fs – fire switch
fws – foul water sewer
g – grid
g/run – gully run
h/c – hand clean
h/chestnut – horse chestnut
h/thorn – hawthorn
ic – inspection cover
l – invert level
ill – illuminated
inv – invert level
l/p – lamp post
mh – manhole cover
mkr – marker
o/h – over head
ol – off lot
ows – off survey area
OSBM – ordnance survey bench mark
p/f – post & panel & rail fence
pd – pit depth
pr – pipe riser
ptg – pipe to ground
ptp – pipe to surface
rm – reference mark
ret wall – retaining wall
rs – road sign
s/pipe – sewer pipe
s/birch – silver birch
s/g – safety paving
sbd – soil board
sec fence – security fence
sfc – soil filled chamber
sl – spot light
sp – soil pipe
spp – soil pipe
sv – stop valve
svp – soil vent pipe
swp – surface water sewer
TBM – temporary bench mark
tbr – taken from records
tbm – temporary
toc – top of cap
topp – top of pipe
tot – top of tank
tp – telecom pole
tr – trial hole
t/a – trench sor
u/s – underside
uc – under cut lift
ufr – unable to rod
ufs – unable to survey
utl – unable to trace
v – valve
vfc – void filled chamber
wl – water level
wm – water meter
wr – water riser
wt – water tank

INDICATIVE NORTH

UTILITY SURVEY KEY :-

HATCHED AREA
BOREHOLE
CPT
TRIAL PIT
HAND PIT
WINDOW SAMPLE

ELECTRIC CABLE
WATER PIPE
FOUL SEWER
STORM SEWER
COMBINED SEWER
DUCTS
CABLE TELEVISION
DATA CABLE
TELECOM CABLE
GAS MAIN
UNIDENTIFIED SERVICE
OTHER
CCTV
TRAFFIC LIGHT
OIL/DIST PLL
VENT
FUEL PIPE
GAUGE LINES
SUPPLY
ABANDONED ROUTE
TAKEN FROM RECORDS

DISCLAIMER :-

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm the presence, position, condition and depths where these are critical. The completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all detected services should be treated as live. This drawing may not include the location of all public services that may cross the site, therefore the relevant service drawings should be obtained from the appropriate utility company and used in conjunction with this drawing.

Although service pipes and cables in highways are not shown, but there presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be present. Reference should be made to historical plans and as-built drawings. Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document avoiding dangers from underground services

Please note that factors such as ground conditions, proximity of other utilities, material type and depth of construction have an influence on the quality of the data collected on site.

TSA Standards – "A utility mapping survey can be considered a 100% accurate depiction of the sub-surface environment, and the use of these drawings does not remove the requirement for the use of safe digging techniques at all times, in line with requirements of HSG47 and current CDM regulations".

UTILITY NOTES

UNABLE TO LIFT A NUMBER OF MANHOLES ACROSS SITE DUE TO SEIZED/BOLTED COVERS, IT WOULD BE RECOMMENDED FOR THESE TO BE LIFTED AND SURVEYED AS THERE WILL BE UNKNOWN UTILITIES AND DRAINAGE THAT HAS NOT BEEN ESTABLISHED AND WILL BE ABSENT FROM THE DRAWING.

ALL DRAINAGE RUNS HAVE BEEN ROODED WERE POSSIBLE. SOME STORM RUNS HAVE BEEN BACK FILLED AND/OR HEAVILY SILTED.

UNABLE TO TRACE WATER & GAS DUE TO PLASTIC MATERIAL, ROUTES HAVE BEEN TAKEN FROM RECORDS AND ASSUMED THESE SHOULD BE TREATED AS INDICATIVE ONLY.

UNABLE TO GAIN ACCESS TO SOME OUT BUILDINGS DUE TO BOARDED DOORS.

MULTIPLE GROUND PENETRATING RADAR AND EML RESPONSES FOUND AT A VARIATION OF DEPTHS, A HAND DUG TRENCH WOULD BE RECOMMENDED TO OBTAIN ROUTE AND DEPTH INFORMATION BEFORE ANY INTRUSIVE WORKS BEGIN.

UNABLE TO CARRY OUT GROUND PENETRATING RADAR AND EML SWEEPS IN SOME AREAS DUE TO DENSE VEGETATION AND CARS AT TIME OF SURVEY.

ALL RELEVANT RECORD INFORMATION HAS BEEN ADDED TO THE DRAWING.

0 2 4 8 12 16 20

MIDLAND SURVEY LTD

HEAD OFFICE
Cromwell House, Westfield Road, Southam, Warwickshire, CV47 0JH.
Tel: 01926 810811 Fax 01926 810812
E-Mail: mail@midlandsurvey.co.uk
www.midlandsurvey.co.uk

Client	CBG CONSULTANTS
Project	DENVILLE HALL, 62 DUCKS HILL ROAD, LONDON, HA6 2SB
Title	UTILITY SURVEY
Date	JULY 2022
Scale	1:200@A0
Dwg No	41830 1
Surveyor	MB
Checked	LKB
Revisions	

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

Asset location search

Thames Water Property Searches

Premier Energy Services
Premier House
Daux Road
BILLINGSHURST
RH14 9SJ

Search address supplied Denville Hall
Ducks Hill Road
Northwood
HA6 2SB

Your reference 604521 - Denville Hall

Our reference ALS/ALS Standard/2018_3880986

Search date 27 September 2018

Keeping you up-to-date

Notification of Price Changes

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

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

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

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

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: Denville Hall, Ducks Hill Road, Northwood, HA6 2SB

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: 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

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

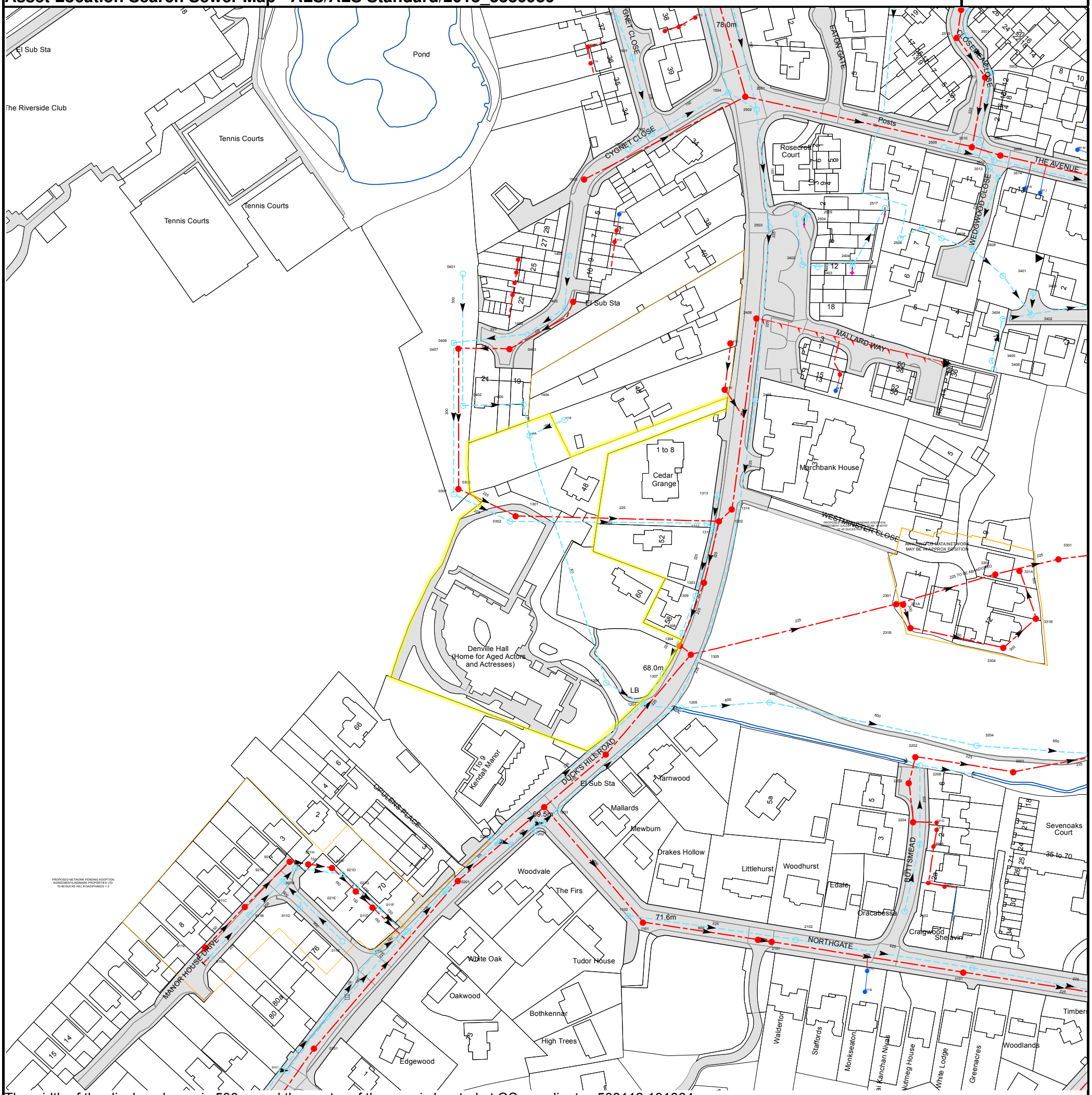
Clean Water queries

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/2018_3880986



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 508112,191364

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
0401	75.28	71.66
041D	n/a	n/a
041B	n/a	n/a
041A	n/a	n/a
1403	72.92	71.52
1402	73.13	72.3
1405	74.13	72.75
1401	73.7	72.7
1505	n/a	n/a
351L	n/a	n/a
2517	n/a	n/a
3513	n/a	n/a
3510	n/a	n/a
2509	73.03	71.43
3503	n/a	n/a
2502	76.22	75.25
2501	74.32	73.35
1504	77.14	75.74
3511	n/a	n/a
3502	n/a	n/a
2515	n/a	n/a
3501	n/a	n/a
161C	n/a	n/a
3603	n/a	n/a
3604	n/a	n/a
151G	n/a	n/a
151H	n/a	n/a
151D	n/a	n/a
151E	n/a	n/a
1606	n/a	n/a
151F	n/a	n/a
1503	77.98	76.68
1501	79.35	77.99
1502	77.78	76.47
161A	n/a	n/a
161B	n/a	n/a
3404	n/a	n/a
3402	n/a	n/a
3403	n/a	n/a
3401	n/a	n/a
351J	n/a	n/a
351K	n/a	n/a
3514	n/a	n/a
3512	n/a	n/a
3505	72.49	70.9
351I	n/a	n/a
351M	n/a	n/a
1309	69.93	68.84
1303	69.99	68.46
1311	71.43	69.98
1312	71.74	70.09
1302	71.52	70.05
1314	n/a	n/a
1313	72.17	71.03
2408	73.71	72.74
241A	n/a	n/a
141D	74.09	72.57
241B	n/a	n/a
3406	n/a	n/a
3405	n/a	n/a
141C	74.31	72.7
2406	n/a	n/a
2405	n/a	n/a
2403	n/a	n/a
2402	n/a	n/a
2404	n/a	n/a
3508	91.52	85
2508	n/a	n/a
2506	n/a	n/a
2503	74.99	74.16
2507	n/a	n/a
2504	n/a	n/a
2505	n/a	n/a
2516	n/a	n/a
921C	75.7	73.6
021F	74.3	73.6
021H	75.7	73.75
921A	75.75	74.25
021A	70.636	69.436
021B	70.743	69.873
0202	70.73	69.6
1202	69.77	69.1
121B	69.58	68.83
121C	69.58	68.83
1203	69.49	68.57
121A	69.61	67.5
1201	n/a	n/a
1204	67.934	66.694
1306	68.66	66.85
1307	68.088	66.978
0302	71.83	70.79

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1301	71.85	70.74
0301	73.66	71.06
0303	n/a	n/a
141A	72.42	70.93
141B	74.14	72.1
0402	72.95	69.96
1404	71.87	69
0403	72.7	71.4
0407	n/a	n/a
0406	n/a	n/a
041C	n/a	n/a
211B	n/a	n/a
3101	65.59	62.32
211C	n/a	n/a
3105	65.35	63.72
2101	69.18	67.22
211A	69.21	67.263
2102	68.67	66.57
2103	66.04	65.22
221E	n/a	n/a
221A	n/a	n/a
221B	n/a	n/a
2205	64.59	63.73
221C	n/a	n/a
221D	n/a	n/a
2204	64.34	62.6
2203	63.96	62.36
2206	64.2	62.47
2202	64.37	62.1
3204	63.9	59.72
1205	67.6	65.7
2201	66.14	61.51
1305	68.7	66.08
1304	68.58	67.3
1308	68.86	68.11
231B	68.85	64.82
231A	67.4	65.05
2301	68.08	64.8
3302	66.1	64.19
3304	65.35	63.56
3201	63.2	61.18
331A	66.2	63.12
331B	65.35	63.56
3301	63.38	60.26
911A	81.863	80.813
9101	82.48	81.43
0101	80.26	77.95
011B	78.857	77.827
9103	78.1	76.3
011C	75.91	74.61
911E	78.2	76.7
011E	75.6	73.6
011A	74.653	72.11
1101	71.59	67.373
1102	71.61	70.27
911B	76.8	73.6
011F	74.4	72.43
911D	n/a	n/a
011D	74.4	73.29
911C	n/a	n/a
021E	74.4	73.46
021C	72.592	71.092
021G	74.4	72.62
921B	75.6	73.4
0201	72.29	69.77
021D	74.3	72.71

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.