MLM

Multidisciplinary Consulting

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Proposed Residential Development

Land at Coopersale Cricket Club
Brickfield Road, Coopersale, Epping, Essex CM16 7QX

Flood Risk Assessment & Drainage Strategy

Document Ref:	618235-REP-CIV-FRA
Revision:	1
Date:	9 December 2016

Prepared: Beverley Hunter
Technical Administrator
.....Redacted.....

Checked: Steve Cox
Managing Director - Civils
.....Redacted.....

Project Revision Sheet

Revision No	Date	Status	Changes	Author	Approved
0	30/11/16	Draft	-	BJH	SJC
1	09/12/16	Final	Updated to suit Planner comments	BJH	JRC

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1 Introduction

1.1 MLM Consulting Engineers Limited has been appointed by The Chisenhale-Marsh Estate Company to undertake a Flood Risk Assessment (FRA) and Drainage Strategy to support the proposed residential development on land at Coopersale Cricket Club, Brickfield Road, Coopersale, Epping, Essex CM16 7QX.

1.2 This report has been prepared for the sole use of The Chisenhale-Marsh Estate Company and the contents should not be relied upon by others without the express written authority of MLM Consulting Engineers Limited. If any unauthorised third party makes use of this report they do so at their own risk and MLM owes them no duty of care or skill.

1.3 This report has been completed in accordance with the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (PPG), and also takes into account the Department for Environment, Food and Rural Affairs (DEFRA) publication *Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems* dated March 2015. The report is an assessment of flood risk to the development, from on and off-site sources, and to off-site receptors caused by the re-development of the site.

1.4 The site is shown on the Environment Agency (EA) web based Flood Map for Planning (see Figure 1) to lie in Flood Zone 1 (low risk). Flood Zone 1 is the area described as having less than a 0.1% annual probability of fluvial or tidal flooding. All land uses are appropriate in this flood zone.

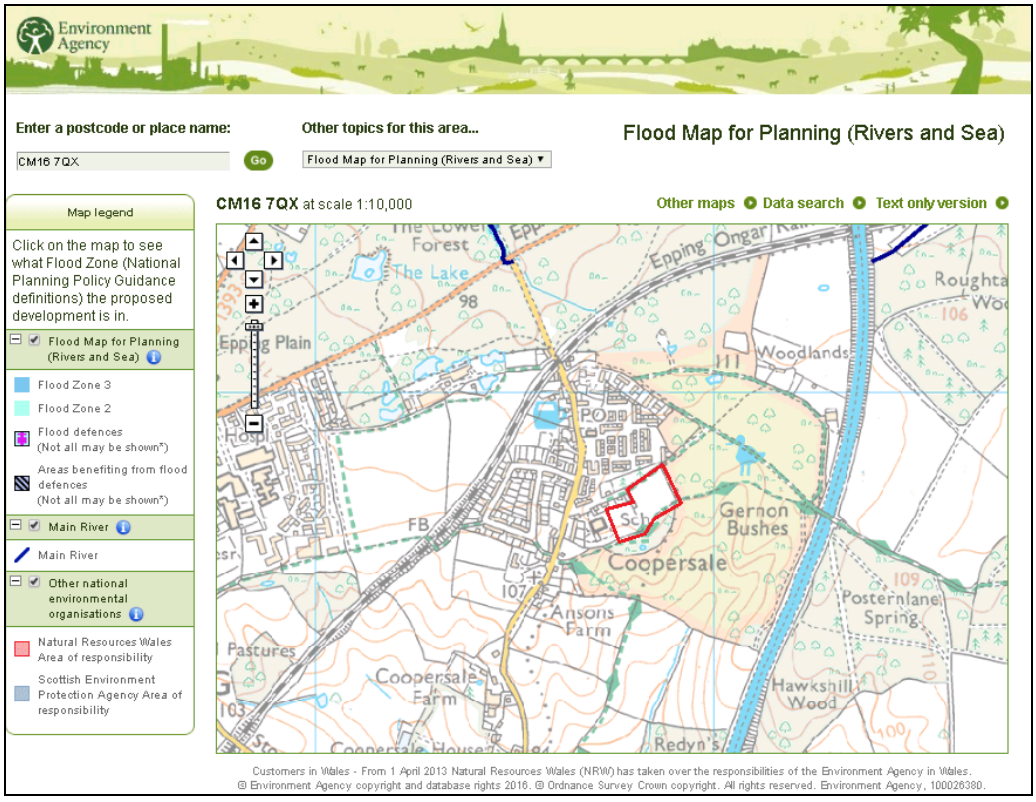

Figure 1 - red outline shows site location

1.5 The Sequential Test, the aim of which is to steer new development to the areas with the lowest probability of flooding, is met; the Exception Test is not required as the site is located within Flood Zone 1.

1.6 This report includes an indicative foul and surface water drainage strategy for the site which sets out how the proposals will not increase off-site flood risk. The surface water drainage strategy has been prepared in accordance with the guidelines set out in the *DEFRA Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems* dated March 2015 the Essex County Council (ECC) document *Sustainable Drainage Systems (SuDS) Design Guide* dated April 2016.

1.7 The report concludes that in flood risk context, the proposals are safe and appropriate and do not cause increased flood risk. There are feasible solutions for the discharge of the surface and foul water generated by the site.

2 Site Description

Existing site

2.1 The site is located to the south-east of the village of Coopersale which is located to the east of Epping in Essex. The site extends to approximately 1.4 hectares (ha) and is centred on approximate Ordnance Survey (OS) grid reference 547847,202738 (see drawing in Appendix A (site ref: SR-0405)).

2.2 The existing predominantly greenfield site comprises Coopersale Cricket Club to the east including a pavilion building (see Photograph 1) and a school playing field to the west. Access to the site is gained off Brickfield Road to the north of the site.

Photograph 1 – Looking west towards Coopersale Cricket Club pavilion

2.3 The site is bound to the north by residential development and associated highway infrastructure, to the south and east by woodland known as Gernon Bushes and to the west by Coopersale and Theydon Garnon Church of England Primary School. A public footpath follows the northern, eastern and southern boundaries of the site.

2.4 As observed during our site visit, ground levels on site and in the surrounding area are relatively flat with a slight fall on the crecket field to the south corner. The topographical survey shows the site having a slight north to south fall, with ground levels in the north at circa 111.4 mAOD (metres Above Ordnance Datum) falling to circa 109.8 mAOD in the south. Ground levels then fall away further from the southern boundary of the site.

2.5 The existing site classification is 'Less Vulnerable' in accordance with *Table 2: Flood Risk Vulnerability Classification* of the PPG.

Proposed site

2.6 Residential development is proposed on the eastern part of the site (the cricket field).

2.7 There are currently two options being proposed; Option 1 includes 19 residential dwellings and Option 2 includes 28 residential dwellings. Both options include associated gardens, highway infrastructure and landscaping/public open space (see Option 1 and Option 2 drawings in Appendix A). Site access is to be retained off Brickfield Road for both options.

2.8 There is the potential for the site to be expanded and linked to the western part of the site, currently school playing fields, in the future.

2.9 The proposed residential development is classified as 'More Vulnerable' in accordance with *Table 2: Flood Risk Vulnerability Classification* of the PPG. As the site is located in Flood Zone 1 the proposed development is shown to be appropriate in accordance with *Table 3: Flood risk vulnerability and flood zone 'compatibility'* of the PPG. The Sequential Test is met and no Exception Test is required because the site is located in Flood Zone 1.

3 Flood Risk

Tidal and fluvial flooding

3.1 The site is shown on the EA *Flood Map for Planning (Rivers and Sea)* (see Figure 1) to lie in the low probability flood zone (Flood Zone 1). The site is not at any significant risk of flooding from either a tidal or fluvial source.

3.2 The closest Main Rivers are shown on the EA mapping to lie 500m and 750m to the north and north-east of the site respectively; the names of these watercourses are unknown. Both watercourses are shown on OS mapping to lie at a significantly lower level than that of the site and as such should not pose a flood risk to the site.

3.3 The site is not at any significant risk of flooding from this source.

Surface water from off-site

3.4 There is always a potential risk of surface water flooding from very high intensity rainfall events exceeding the capacity of drainage systems.

3.5 As the land to the north and east of the site lies at a similar level to the site it is unlikely that surface water would be shed towards the site from this direction. Land to the south falls away from the site and as such surface water flooding from this direction is also unlikely.

3.6 The GOV.UK *Flood risk from surface water – Extent of flooding* map (see Figure 2) shows that the majority of the site is at a very low risk of flooding.

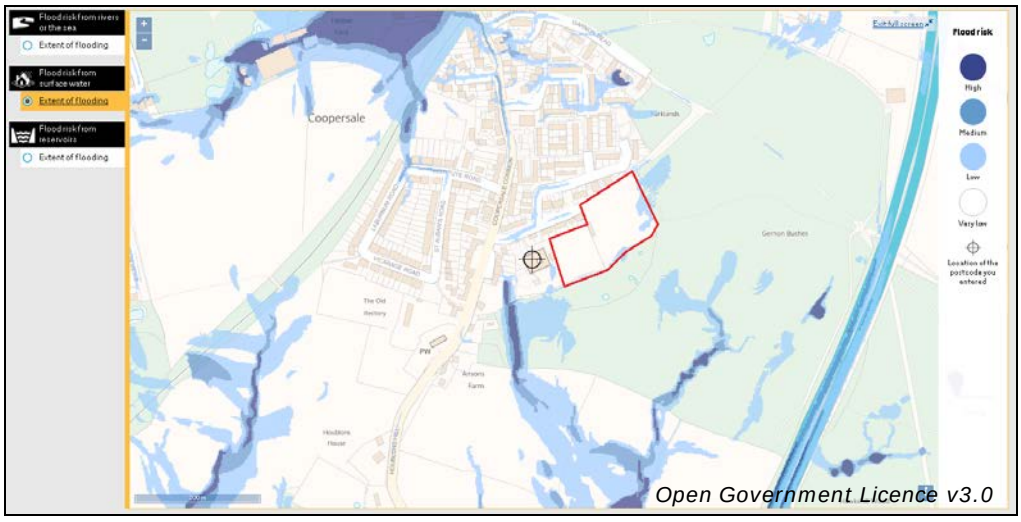

Figure 2 – red outline denotes site boundary

3.7 There is a small area to the east of the site where a low risk of surface water flooding is predicted, this appears to be coming from the north-west of the site. It is assumed that there is a local low point in this location, however, the low risk nature of the flooding should not pose a flood risk to the site. From our observation on site, the adjacent woodland was generally at a lower elevation than the site and therefore unlikely to cause any significant surface water flooding on the site.

3.8 Some patches of low risk flooding are also shown along the southern boundary of the site. Ground levels fall away from the site in this location and any surface water would be directed away from the site in a southerly direction.

3.9 Finished floor levels should adhere to normal good practice and be raised above surrounding ground level with falls away from buildings. This should minimise the risk of any minor localised ponding or overland surface water flow from entering the proposed buildings.

3.10 The site is considered to be at low risk of flooding from this source.

Surface water from on-site

3.11 The proposed development of the site will increase the impermeable surfacing at the site. This increase in impermeable area could, if not managed, lead to an increase of overland flow on the site. This risk will be mitigated by careful design of levels to ensure that any overland flows are directed around the proposed buildings and by ensuring that any low ground levels adjacent to the buildings have a suitable overland flood flow route and do not rely entirely on piped drainage systems.

3.12 It is proposed that surface water will be attenuated on site in an open basin and discharged to a Thames Water (TW) surface water sewer located to the south-west of the site (see Section 4 for further information on the surface water drainage strategy). There will be no uncontrolled off-site discharge.

3.13 Provided that these measures are implemented then the site will be at low risk of flooding from this source.

Infrastructure flooding

3.14 The TW asset plans (see Appendix B) show that there is a foul sewer located to the north of the site.

3.15 If surcharging or blockage of the sewers/drains on or off-site did occur it is possible that there may be localised surface flooding in areas surrounding the site.

3.16 The risk of flooding to the site from sewers or drains is considered to be low, due to the reasons given in 3.5 above.

Water bodies

3.17 There are no significant water bodies (lakes, large ponds, reservoirs etc.) within the immediate vicinity of the site that appear likely to pose a risk to the site.

3.18 The GOV.UK *Flood risk from reservoirs – Extent of flooding* map (see Figure 3) shows that the site is not at risk of flooding from reservoir failure.

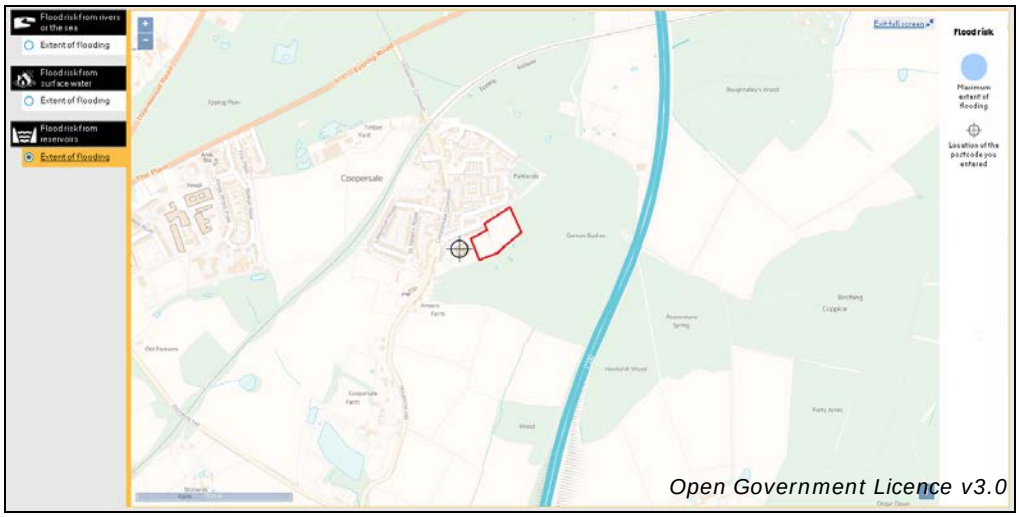

Figure 3 – red outline denotes site boundary

3.19 The site is not at any significant risk of flooding from this source.

Groundwater

3.20 British Geological Survey (BGS) mapping shows the site as being likely to be just beyond the southern extent of the Stanmore Gravel Formation (Sand and Gravel) with a bedrock geology of Claygate Member (Clay, Silt and Sand). A nearby borehole (TL40SE28) on the BGS website shows ground conditions to be silty clay, overlying silty sandy clays and clayey sands and silts. Based upon the local topography there does not appear to be any significant risk of ground water flooding In the unlikely event that groundwater were to express at the surface then it would be routed around buildings as described above and flow away to the south.

3.21 The site is not considered to be at significant risk of flooding from groundwater.

Flood risk summary

3.22 The site is considered to be at a low risk of flooding from all sources.

4 Surface Water Drainage Strategy

Existing surface water drainage

4.1 The existing site is almost entirely greenfield land.

4.2 The DEFRA *Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems* guidance and the ECC *SuDS Design Guide* require that discharge of surface water run-off from the site should be restricted to greenfield rates. Greenfield run-off calculations have been undertaken using the ICP SuDS method in MicroDrainage. This uses the Institute of Hydrology method described in report 124 and adjusts the results to suit the catchment area. The greenfield rates applicable to the site are:

Table 1: Greenfield run-off rates (0.355ha*)

Return Period (Years)	Greenfield Discharge Rate (l/s)
1	1.1
30	3.0
100	4.2

* = proposed impermeable area

Proposed surface water drainage

4.3 The SuDS hierarchy requires that surface water run-off is controlled and preferably re-used wherever possible. In the event that it cannot be re-used it should be disposed of to a receptor in the order described in Building Regulations Part H and C753:

- via infiltration,
- to watercourse, and finally,
- to sewers.

4.4 The proposed development will lead to an increase in impermeable area and as such will increase the volume and rate of surface water run-off from the site unless properly managed.

4.5 Ground conditions appear likely to be clay or clayey (see paragraph 3.20) and as such are not suitable for the use of infiltration drainage.

4.6 Whilst some traces of ditches and overland flow routes could be seen in the woodland, there appeared to be no coherent watercourse suitable to receive an outfall. As there are no suitable watercourses in the vicinity of the site to discharge surface water run-off to, it is proposed to discharge surface water to the TW sewer.

4.7 Discharge of surface water run-off should be restricted to greenfield run-off rates in accordance with *C753* and the ECC *SuDS Design Guide*. The ECC *SuDS Design Guide* requires that the surface water run-off from the site for all events up to and including the 1 in 100 year (1%) rainfall event inclusive of climate change is discharged at a rate of no greater than the 1 in 1 year (100%) greenfield run-off rate.

4.8 An indicative surface water drainage strategy has been produced for both development options at the application site (see drawings in Appendix C). Surface water will be collected and directed to an open basin for attenuation prior to off-site discharge via a flow control device to the TW sewer located to the south-west of the site.

4.9 The ECC SuDS Guide requires that drainage systems should be designed to incorporate a number of surface water treatment stages based on the risk of pollution entering the system. The guide states that a minimum of one stage of treatment will be required for run-off from roofs and two stages of treatment will be required for run-off from car parking/highway areas.

4.10 MicroDrainage calculations have been undertaken (see Appendix C) to determine the size of attenuation required. The minimum attenuation has initially been sized as 445 m^3 based on a discharge rate of 1.1 l/s for the 1 in 100 (1%) year return period rainfall event inclusive of 40% climate change. The calculations included an allowance for 10% urban creep to the contributing area.

4.11 The outfall location for the surface water run-off is to connect into the TW surface water sewer located to the south-west of the application site boundary. A Pre-Development Application has been submitted to TW for their confirmation that the sewer has capacity to take the flows from the proposed development. TW has confirmed that subject to infiltration drainage being ruled out by on site permeability testing and no suitable watercourse in the vicinity of the site, discharge to the surface water sewer is acceptable (see Appendix B). The discharge rate needs to be lower than the 1 in 20 year rainfall event which, due to the requirements of Essex LLFA, is met.

4.12 The table below discusses types of SuDS (taken from C753) and whether they could be utilised at this site.

Table 2: SuDS site suitability

SuDS Component	Site Suitability	Comments
Green roofs	✗	Not usually suitable for pitched roofs on residential developments.
Soakaways	✗	Not suitable for low permeability soils.
Rainwater harvesting systems	✓	Could be utilised for W.C. flushing etc to reduce the use of potable water for the development, subject to financial viability.
Filter strips	✗	Not suitable due to site layout.
Filter trenches	✗	Not suitable due to site layout.
Infiltration trenches	✗	Not suitable due to impermeable superficial geology.
Swales	✗	Not suitable due to site layout.
Bioretention	✓	Could discharge surface water run-off into planted areas to reduce requirement for watering.
Pervious pavements	✓	Could be utilised for private access roads and driveways, but ground not suitable for infiltration so would be attenuation only.

Geocellular systems	✓	Potential to be used to attenuate surface water run-off.
Infiltration basins	✗	Not suitable for low permeability soils.
Detention basins	✗	Not suitable due to site layout.
Ponds	✓	Proposed to be used to attenuate surface water.
Stormwater wetlands	✗	Not suitable due to size of development and nature of ground.
Proprietary devices	✓	Not preferred due to ongoing maintenance requirements but can provide suitable treatment.
Rain gardens	✓	Could be utilised to prevent run-off from small events from leaving the site.

4.13 The final choice of SuDS treatment train elements will be decided at detailed design.

5 Foul Water Drainage Strategy

Existing foul water drainage

5.1 A review of the TW asset maps show a foul water sewer located to the north of the site.

5.2 It is not known whether there is any foul drainage from the pavilion.

Proposed foul water drainage

5.3 The foul water drainage strategy (see Appendix C) has been produced assuming a connection to TW manhole 7703 in Brickfield Road is achievable. A review of the topography of the site and surrounding land shows that a pumped discharge will be required from the site.

5.4 A Pre-Development enquiry has been submitted to TW. TW has identified capacity issues in the local foul sewers and an impact study is required to determine what upgrades are required to the existing network to allow the site to connect (see Appendix B).

5.5 It should be noted that for foul water, TW has an obligation to accept the discharge of foul flows from the site and therefore the lack of available capacity at this stage is not a valid reason to reject planning. In view of the low number of units proposed it is anticipated that the upgrade works would be minimal.

5.6 The drainage strategy shows a private pumping station on site. It may be feasible to have an adopted pumping station subject to meeting the requirements of TW. If the pumping station remains private the rising main to the discharge manhole, which will be a new manhole at least 5 m from manhole 7703, will remain private and will require a Section 50 license for a private services in the public highway.

6 Conclusions

6.1 The proposed site is shown to lie in the low probability flood risk area (Flood Zone 1) according to the EA flood maps.

6.2 Other flood risks to the site have been assessed as low and the site is therefore considered to be at low risk from all sources of flooding.

6.3 Due to the ground conditions being very unlikely to be suitable for the use of infiltration drainage and no suitable watercourses to discharge surface water to, it is proposed to discharge surface water run-off from the site to the TW surface water sewer located to the south-west of the site via the use of an open attenuation basin with a flow control device to restrict discharge to greenfield run-off rates. TW has confirm it is able to accept surface water flows at the proposed discharge rate.

6.4 Further opportunities should be investigated to incorporate SuDS into the development where practicable. These can provide the benefits of slowing the discharge of surface water run-off, removal of pollutants from the run-off and providing ecological benefits to the development.

6.5 It is proposed to discharge foul water from the site via a pumped connection to the foul water sewer located in Brickfield Road. TW need to undertake an impact study to determine what off-site upgrades are required to permit connection to the public sewer.

6.6 Careful thought should be given to the levels design on the site in accordance with normal good practice to ensure that there is no likely flooding caused by overland flow and that any overland flow is directed around buildings in the event of a failure or exceedance of the capacity of the piped drainage system.

6.7 The site is located in Flood Zone 1 and is suitable for residential development. The surface water can be attenuated on-site and disposed of at a controlled rate to the TW surface water sewer, with no increased off-site flood risk.

Appendix A – Existing & Proposed Site

Epping Forest District Local Plan – Draft Plan Consultation 2016 (SR-0405)
Carter Jonas drawing – Topographic Survey
Proposed Site Layout – Option 1: 19 dwellings
Proposed Site Layout – Option 2: 28 dwellings

Figure 5.22 Site allocations for Coopersale

Local Plan 2011-2033 Draft Plan Consultation	Drawing No. EFDC-DP-0004-Rev1	**Content** Proposed Sites for Allocation and Green Belt amendments in Coopersale	**Legend** Residential site with planning permission Proposed residential site allocation Proposed traveller site allocation Existing employment sites Employment site identified for intensification Site identified as an extension to an existing employment site Potential new employment site Existing Green Belt boundary Indicative Green Belt boundary amendment Existing Green Belt boundary to be amended District Open Land
Epping Forest District Council	Date: September 2016		
	Scale: 1:5,000 @A4		

GRID NORTH

N

TREE SCHEDULE	
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0 ??? Metres

SURVEY DRAWING NOTES

1. SURVEY CONTROL DETAILS

HORIZONTAL GRID

The survey is orientated to Ordnance Survey Grid North and is surveyed in to a plane grid. All horizontal measurements and dimensions taken from this survey will be GROUND distance.

If required, full Ordnance Survey co-ordinates can be calculated by scaling the survey about Eastings xxxxx.xxx Northings xxxxx.xxx and multiplying the coordinates by
Easting xxxxx.xxx Northings xxxxx.xxx using the following scale factor value

Local Scale factor = xxxxxxxxx

This is derived using Trimble Business Center software Local Site Settings calculations
The control has been established by tying into the active Ordnance Survey control network as follows:
The co-ordinate system used for the primary control is OSGB36; this has been calculated from ETRS89 using the OSTN15/15 transformation parameters.

For this particular project, the TRIMBLE VRS NOW network has been used with observations taken on the following date(s) DD/MM/2018

Manufacturers quoted accuracy is typically: RMS 10 – 20 mm in plan and 20 – 30 mm in height. These values can however fluctuate depending upon time of day, satellite geometry and other conditions that could cause degradation to the final solutions. for salient control and wherever possible and practical, Carter Jonas have used an open sky with good satellite geometry so as to minimise the effects of multipath as much as possible. Accuracy reports can be supplied of final observations accuracies if required.

Mean sea level corrections (MSL) are deemed to be insignificant and have therefore not been applied due to the low level of this site

VERTICAL DATUM:

Altitudes for the control have been calculated from GPS derived heights and converted to Orthometric heights (Ordnance Datum Newlyn - ODN) using OSGM02/15 transformation parameters.

2. This drawing is to be read in conjunction with all other relevant drawings :
   xxxxxxxx topographic survey
   xxxxxxxxxx
3. Check scale bar and grid before taking non-figured dimensions from this drawing.
4. If there is any doubt please the Contact carter Jonas mapping team.
5. Ordnance Survey data where used is reproduced from the Ordnance Survey Map with permission of the Controller of Her Majesty's Stationery Office. © Crown Copyright 2018.
   Carter Jonas LLP es100021719

LEGEND

BUILDING
GATE
HEDGE/ VEGETATION /TREE CANOPY
CONTOUR
SPOT LEVEL
BANKING
SURVEY STATION WITH LEVEL
SAPLING
FENCE & DESCRIPTION
TREE (INDICATIVE ONLY)

FENCE TYPE ABBREVIATIONS

BW	Barbed wire	Ht	Hedge
C/P	Chestnut Paling	I/R	Iron Railing
C/B	Close Boarded	P/W	Post and Wire
C/I	Corrugated Iron	P/R	Post and rail
C/L	Cyclone	P/C	POST AND CHAIN
C/Ba	Crash Barrier	P/Bw	POST AND BARBED WIRE
C/Pa	Concrete Panel	S/S	STEEL SECURITY
E/L	Electric	W/M	WIRE MESH
H/D	Hoarding		

SURVEY PLAN ABBREVIATIONS

BOL	BOLLARD	LP	LAMP POST
BS	BOUNDARY BEACON	MP	MARKED POST
BH	BOREHOLE	MH	MANHOLE
BP	BOUNDARY POST	MP	MILE POST
BS	BUS STOP	OHC	OVERHEAD CABLES
BT	BRITISH TELECOM IC	P	POST
CCTV	CLOSE CIRCUIT TV CAMERA	PM	PARKING METER
CCTV	CLOSE CIRCUIT TV	PO	POST
CBX	CONTROL CABINET	PYL	ELECTRIC PYLON
CL	CENTRE LEVEL	RL	ROOF RIDGE LEVEL
COL	COLUMN	RE	ROOF/EDGE LEVEL
CP	CATCH PIT	NP	NAME PLATE
CTV	CABLE TELEVISION POINT	RS	ROAD SIGN
DK	DROP KERB	RWP	RAINWATER PIPE
DEN	DENOTE	SA	SAMPLE
DWP	DOWN WATER PIPE	SFL	SOFFIT LEVEL
DP	DOWN PIPE	SPO	SIGN POST/BOARD
EC	ELECTRICITY CONTROL BOX	ST	STOP TAP
ECB	ELECTRICITY CABLE	STP	STUMP
EVE	EAVES LEVEL	SV	STOP VALVE
EP	ELECTRICITY POLE	SW	STORM WATER
ER	EARTH ROD	TAP	WATER TAP
FFL	FINISHED FLOOR LEVEL	TBX	TELEPHONE CALL BOX
FH	FIRE HYDRANT	THL	THRESHOLD LEVEL
FL	FLOOR LEVEL	TL	TRAFFIC LIGHT
G	GULLY	TP	TELEPHONE POLE
GV	GAS VALVE	TRAIL PIT	TRIAL PIT
GP	GATE POST	TW	TOP OF WALL
IC	INSPECTION COVER	UP	SOIL & VENT PIPE
IL	INVERT LEVEL	WL	WATER LEVEL
KB	KERB	WM	WATER METER
KO	KERB OUTLET GULLY	WV	WATER VALVE
LB	LITTER BIN	WO	WASH OUT

SITE LOCATION

NOT TO SCALE

GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH ARE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- ALL UNDERGROUND SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION. CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK. SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THE SITE CONDITIONS, THE CONSULTANTS, THEN TOWER SURVEYS SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
- EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
- UNLESS OTHERWISE SPECIFIED FEATURES SHOWN USING LINE STYLES OR SYMBOLOGY SHOULD BE TAKEN TO BE CENTRE OF ROAD MARKINGS, HEDGE CENTRELINES, BRICK HATCHING AND GLAZING DETAIL.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

Carter Jonas

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Oxford OX2 7DE T: 01865 511444

carterjonas.co.uk

Client: **XXXXXX**

Project: **COOPERSALE CRICKET CLUB**

Title: **TOPOGRAPHIC SURVEY**

Scale: XXX @A0 Date: XXXXXX

Drawn by: XXX Surveyed by AMW

Checked by: XXX Dwg no: XX

Option 1: 19 dwellings

November 2016
Scale 1:1,000 @ A3

Option 2: 28 dwellings

November 2016
Scale 1:1,000 @ A3

Appendix B – Thames Water

Asset Location Search ref: ALS/ALS Standard/2016_3448462
Pre-development Enquiry response dated 7 December 2016

Asset Location Search

MLM Consulting Engineers Limited
Felaw Maltings
46Felaw Street
IPSWICH
IP2 8PN

Search address supplied Coopersale & Theydon Garnon C Of E Primary School
Brickfield Road
Coopersale
Epping
CM16 7QX

Your reference 618235

Our reference ALS/ALS Standard/2016_3448462

Search date 9 November 2016

Notification of Price Changes…

From **1 September 2016** Thames Water Property Searches will be increasing the prices of its Asset Location Searches. This will be the first price rise in three years and is in line with the RPI at 1.84%. The increase follows significant capital investment in improving our systems and infrastructure.

Enquiries received with a higher payment prior to 1 September 2016 will be non-refundable. For further details on the price increase please visit our website at

www.thameswater-propertysearches.co.uk

Asset Location Search

Search address supplied: Coopersale & Theydon Garnon C Of E Primary School, Brickfield Road, Coopersale, Epping, CM16 7QX

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

Asset Location Search

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TL4703SE
TL4702NW
TL4702NE

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.

Following examination of our statutory maps, Thames Water has been unable to find

any plans of water mains within this area. If you require a connection to the public water supply system, please write to:

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

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

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

TL4703SE Affinity Water
TL4702NW Affinity Water
TL4702NE Affinity Water

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.

Asset Location Search

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: 0845 850 2777
Email: developer.services@thameswater.co.uk

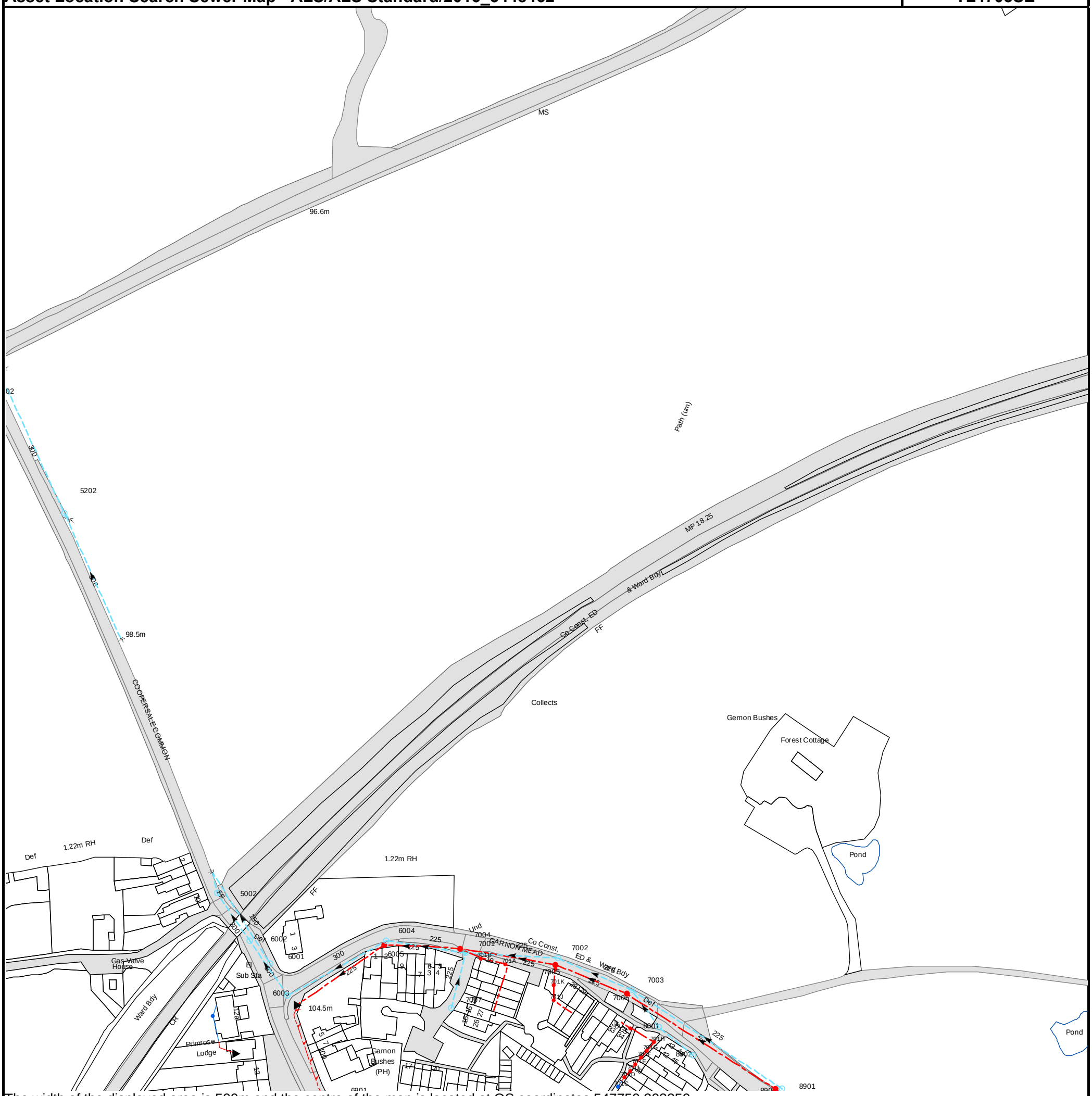
Clean Water queries

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: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2016_3448462	TL4703SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 547750,203250

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

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

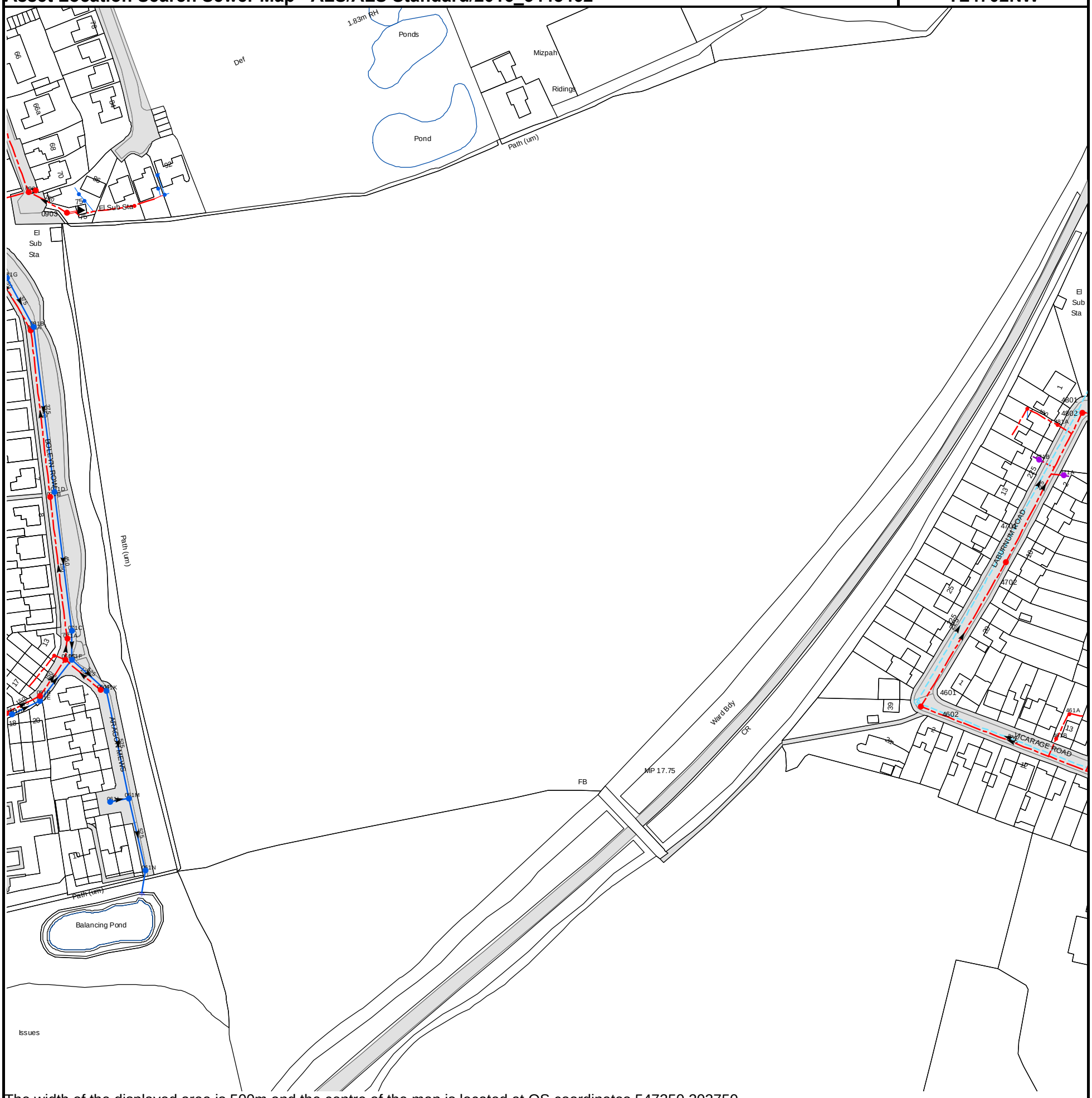
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7005	107.79	105.61
7002	107.8	106.23
701C	n/a	n/a
701D	n/a	n/a
7006	108.37	106.2
701I	n/a	n/a
701L	n/a	n/a
7003	108.37	106.84
701E	n/a	n/a
701F	n/a	n/a
701G	n/a	n/a
701H	n/a	n/a
8001	108.75	107.35
8002	109.01	107.46
8902	109.6	107.36
8901	109.63	107.9
6005	105.42	103.22
6004	105.36	103.83
7007	107.05	105.28
7004	106.71	104.21
7001	106.54	105.15
701B	n/a	n/a
701A	n/a	n/a
701J	n/a	n/a
701K	n/a	n/a
5202	96.74	95.38
501A	n/a	n/a
5002	102.24	101.01
6002	102.68	101.76
6001	103.42	102.67
6003	104.24	102.24

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

Asset Location Search Sewer Map - ALS/ALS Standard/2016_3448462

TL4702NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 547250,202750

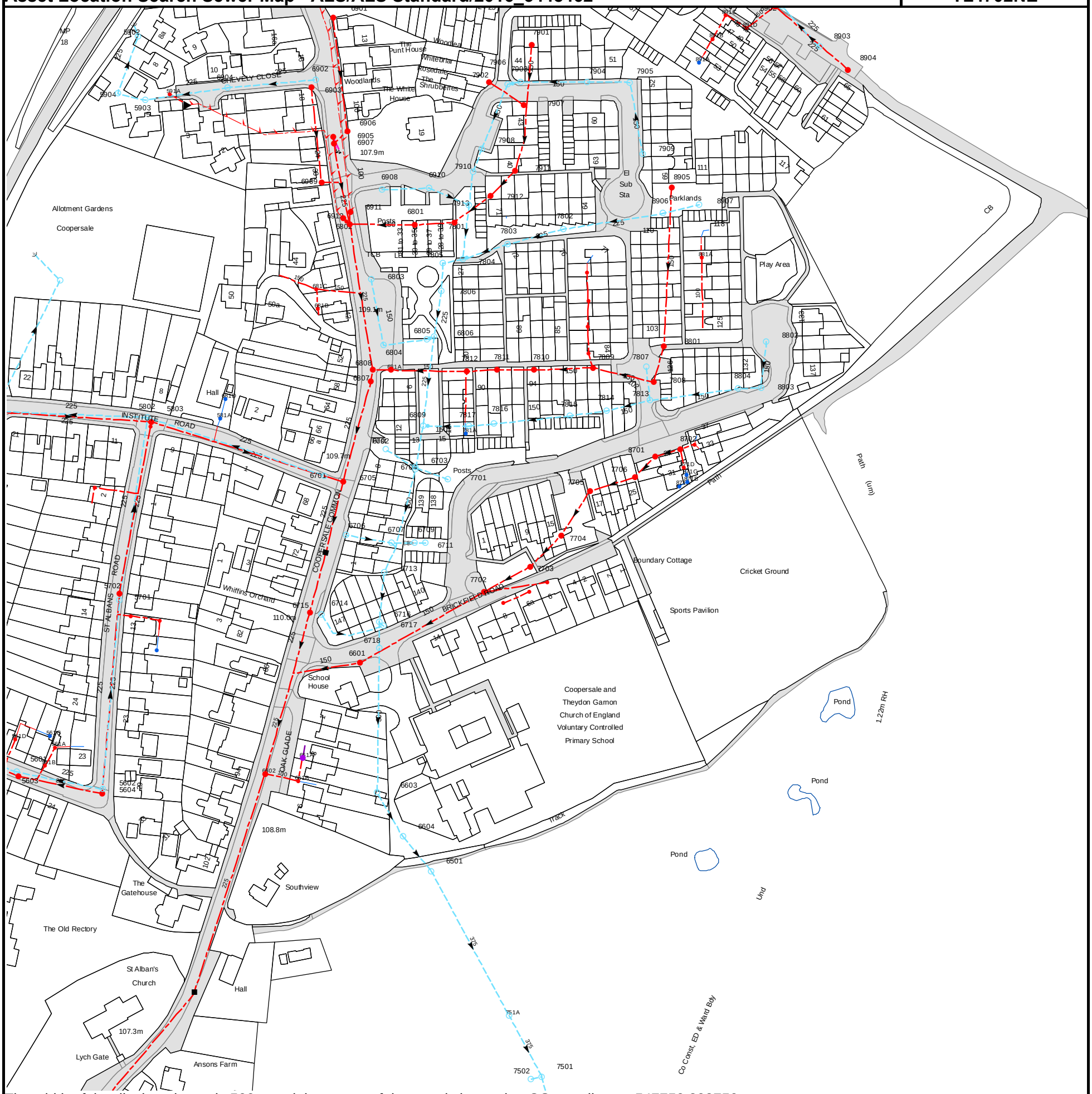
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual 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
061K	n/a	n/a
061L	n/a	n/a
061M	n/a	n/a
091B	n/a	n/a
061N	n/a	n/a
091C	n/a	n/a
091D	n/a	n/a
091A	n/a	n/a
4601	n/a	n/a
4602	109.98	107.28
4701	n/a	n/a
4702	108.93	106.5
481B	n/a	n/a
471B	n/a	n/a
461B	n/a	n/a
481A	n/a	n/a
471A	n/a	n/a
461A	n/a	n/a
4801	107.39	105.93
4802	107.46	105.78
061D	n/a	n/a
061E	n/a	n/a
061B	n/a	n/a
061P	n/a	n/a
061F	n/a	n/a
061C	n/a	n/a
071E	n/a	n/a
071A	n/a	n/a
071C	n/a	n/a
071B	n/a	n/a
071D	n/a	n/a
081A	n/a	n/a
081B	n/a	n/a
0903	n/a	n/a
091F	n/a	n/a
091E	n/a	n/a
0901	n/a	n/a
0904	n/a	n/a

Asset Location Search Sewer Map - ALS/ALS Standard/2016_3448462

TL4702NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 547750,202750

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
7904	109.61	108.37
7905	109.72	108.53
7909	110.25	108.84
8905	110.49	108.95
8907	110.43	109.16
891A	n/a	n/a
891B	n/a	n/a
891C	n/a	n/a
891D	n/a	n/a
8903	110.06	107.99
8904	110.25	108.03
871B	n/a	n/a
7706	n/a	n/a
871C	n/a	n/a
871D	n/a	n/a
8701	n/a	n/a
8702	n/a	n/a
871E	n/a	n/a
7816	106.3	105.36
7815	110.29	n/a
7814	n/a	n/a
7813	110.54	109.27
8804	111.25	n/a
8803	n/a	n/a
7808	110.48	108.12
7810	110.21	107.58
7811	109.52	107.42
7809	110.52	107.84
7807	110.66	110.04
781E	n/a	n/a
8801	110.95	108.3
8802	111.27	n/a
781D	n/a	n/a
781C	n/a	n/a
781B	n/a	n/a
881A	n/a	n/a
7803	109.77	108.5
7802	109.86	108.72
8906	110.48	109.01
7502	95.48	94.49
7501	95.79	94.35
751A	n/a	n/a
6501	107.07	103.67
6604	107.92	104.19
6603	n/a	n/a
6601	109.37	107.97
6718	109.28	105.09
6717	109.3	107.91
6716	109.29	105.18
6714	109.93	108.28
771A	n/a	n/a
7702	110.12	108.7
771B	n/a	n/a
771C	n/a	n/a
6713	108.93	105.22
7703	n/a	n/a
6707	109.39	108.32
6709	109.24	108.36
6711	109.27	n/a
7704	n/a	n/a
6706	n/a	n/a
7705	n/a	n/a
871A	n/a	n/a
6705	109.69	104.99
681C	n/a	n/a
681B	n/a	n/a
6701	109.46	108.52
6912	108.23	107.69
6802	108.29	105.64
6911	108.23	106.81
6807	109.35	105.26
6803	108.52	107.43
6808	109.28	105.33
6804	109.09	107.19
6702	109.09	107.6
681A	n/a	n/a
6801	109.12	106.24
6703	109.15	107.12
6704	109.19	105.28
6809	109.04	105.45
6805	109.45	106.92
6806	109.43	105.81
7806	109.11	106.03
7805	109	106.06
7701	109.51	108.76
7801	n/a	n/a
7804	109.22	106.18
781A	n/a	n/a
7812	109.45	107.34
7817	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7913	109.36	106.76
6903	107.47	106.54
6902	107.29	106
6909	107.98	106.03
6905	107.88	105.94
6901	106.91	106.61
6907	107.91	105.93
6906	107.85	106.09
6908	108.49	n/a
6910	109.59	108.17
7910	108.86	106.89
7908	109.04	106.94
7902	109.07	107.88
7912	110.47	107.66
7906	108.97	107.19
7911	n/a	n/a
7903	109.27	108.13
7907	109.21	107.47
7901	n/a	n/a
571A	n/a	n/a
5604	109.87	107.92
5602	109.9	108.29
5904	104.2	102.45
5702	109.95	107.61
5701	109.94	107.95
571D	n/a	n/a
5902	105.22	103.13
5903	104.65	103.09
5802	n/a	n/a
5803	108.43	105.55
571B	n/a	n/a
571C	n/a	n/a
591A	n/a	n/a
581A	n/a	n/a
681D	n/a	n/a
6904	105.94	104.24
6602	109.2	104.23
661B	n/a	n/a
661A	n/a	n/a
6715	109.89	104.66
561D	n/a	n/a
5601	109.9	108.37
5603	n/a	n/a
561B	n/a	n/a
561C	n/a	n/a
561A	n/a	n/a
581B	n/a	n/a

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2016_3448462

0 15 30 60 90 120
Meters

Scale:	1:2863
Width:	800m
Printed By:	Vkumar1
Print Date:	09/11/2016
Map Centre:	547730,202822
Grid Reference:	TL4702NE

Comments:

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.

Mrs Beverley Hunter
MLM Consulting Engineers
North Kiln
Felaw Maltings
46 Felaw Street
Ipswich
IP2 8PN

Your account number
DS4021083

Developer.services@thameswater.co.uk

0800 009 3921
Mon – Fri 9am-5pm,

7 December 2016

Pre Development Enquiry

Site Address: 8 BRICKFIELD ROAD, COOPERSALE, EPPING, ESSEX, CM16 7QX

Development Details: Existing site comprising of school field and cricket field, small pavilion, no formal FW discharge. Proposal for 19 units, FW to be pumped at 3.8l/s to MH7703. SW to be attenuated and discharged at 5 l/s to SW sewer via MH 6501 by gravity connection. Infiltration not possible as underlying ground conditions are clay and no watercourses in the vicinity.

Dear Mrs Hunter,

I write in relation to the above site regarding the proposed development here.

Please note: your initial fee of £398+ VAT covers the expense of our asset planners reviewing your proposed discharges in relation to the capacity in our existing network. They also carry out flood risk assessments. At this stage if your proposal is accepted, we issue an approval letter for you to progress with your development.

Foul Water

In this instance we have notified our Catchment Planners for the area and they have made comment regarding the capacity of the public sewers. They have concerns regarding Waste Water Services in relation to this site. Specifically, the sewerage network capacity in this area as it is unlikely to be able to support the demand anticipated from this development. It will therefore be necessary for us to undertake investigations into the impact of the development by means of a developer funded impact study to determine possible connection points on the existing system or what upgrades to the existing network are required before the site can be connected to it.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to be not viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Store rain water for Later Use; 2nd Use infiltration techniques, such as porous surfaces in non-clay area; 3rd Attenuate rainwater in ponds or open water features for gradual release to a watercourse; 4th Attenuate rainwater by storing in tanks or sealed water features for gradual

release to a watercourse; 5th Discharge rainwater direct to a watercourse; 6th Discharge rainwater to a surface water drain; 7th Discharge rainwater to the combined sewer.

You should be aware that in the public sewer system will be unable to accommodate any storm greater than a 1 in 20 year event. You should assume this level of storm when calculating the current discharge rate. Please ensure that storm flows are attenuated or regulated into the receiving public network through on or off site storage.

Only when it can be proven that soakage into the ground or a connection into the adjacent watercourse is not possible would we consider a restricted discharge into the public surface water sewer network. A reduction of at least 50% on existing flows from the same site area would be sought for a range of storm conditions.

What Next

Firstly we will require the full drainage strategy for our Modelling Group in order to scope what is required as part of the impact study. On receipt of this information, a development pro forma will be created specifically for your site. At this point the modelling team require 10-12 working days in order to produce the scope of works which details the total cost of the impact study and the time in which the study may take.

Impact study costs can vary from £6,000 to £20,000+ pending the complexity of the proposed drainage system and size of the development. Subsequently Impact studies can range from 10 - 24 weeks for completion.

Once the impact study has been paid for we may invite you for a meeting in Reading at our Clearwater Court office to discuss your development in more detail. This meeting will include modelling team and asset planning team representatives.

Please Note

All connection requests are subject to a full Section 106 (Water Industry Act 1991) application before the Company can confirm approval to the connection itself. Please also note that capacity in the public sewerage system cannot be reserved.

The views expressed by Thames Water in this letter are in response to this pre development enquiry at this time and do not represent our final views on any future planning applications made in relation to this site.

Yours sincerely

Dr Will Nodes – BSc, MSc

Development Engineer

Appendix C – Drainage Strategy

Greenfield Calculations
MLM drawing 618235/110 – Option 1: Indicative Foul & Surface Water Drainage Strategy
MLM drawing 618235/115 – Option 2: Indicative Foul & Surface Water Drainage Strategy
MicroDrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.355	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	1.3
QBAR Urban	1.3
Q100 years	4.2
Q1 year	1.1
Q30 years	3.0
Q100 years	4.2

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND SPECIALIST'S DRAWINGS AND THE SPECIFICATION.

2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

3. THIS DRAINAGE STRATEGY DRAWING SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON SITE WITH A RESTRICTED OFF-SITE DISCHARGE, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD EVENT PLUS 40% CLIMATE CHANGE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THE PROPOSED DEVELOPMENT.

THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT.

4. ATTENUATION BASIN SIZE BASED ON INCLUDING 10% EXTRA IMPERMEABLE AREA FOR URBAN CREEP.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

1. IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.

2. TO BE COMPLETED AT DETAILED DESIGN.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

PRIVATE DRAINAGE AND LEVELS KEY

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING THAMES WATER MANHOLE
- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- FOUL WATER DRAIN
- FOUL WATER MANHOLE
- SURFACE WATER CONVEYANCE ROUTE
- FOUL WATER RISING MAIN
- APPROX. SITE BOUNDARY

Issue	Date	Description	Made	Checked
P2	08.12.16	UPDATED DRAWING TITLE	CB	JRC
P1	30.11.16	PRELIMINARY ISSUE	CB	JRC

Drawing Status: PRELIMINARY

MLM
Multidisciplinary Consulting
North Kiln, Felaw Maltings, 46 Felaw Street,
Ipswich, Suffolk IP2 8PN
Tel: 01473 231100
Website: www.mlm.uk.com

Client: THE CHISENHALE-MARSH ESTATE COMPANY

Project: LAND AT COOPERSALE CRICKET CLUB

Drawing Title: OPTION 1: INDICATIVE FOUL & SURFACE WATER DRAINAGE STRATEGY

Drawn/Design	CB	Date	NOV 2016	Scales	1:500 @ A1
Checked	JRC	Approved	JRC		1:1000 @ A3

Drawing No. 618235/110 Rev P2

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND SPECIALIST'S DRAWINGS AND THE SPECIFICATION.

2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

3. THIS DRAINAGE STRATEGY DRAWING SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON SITE WITH A RESTRICTED OFF-SITE DISCHARGE, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD EVENT PLUS 40% CLIMATE CHANGE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THE PROPOSED DEVELOPMENT.

THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT.

4. ATTENUATION BASIN SIZE BASED ON INCLUDING 10% EXTRA IMPERMEABLE AREA FOR URBAN CREEP.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

1. IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.

2. TO BE COMPLETED AT DETAILED DESIGN.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

PRIVATE DRAINAGE AND LEVELS KEY

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING THAMES WATER MANHOLE
- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- FOUL WATER DRAIN
- FOUL WATER MANHOLE
- SURFACE WATER CONVEYANCE ROUTE
- FOUL WATER RISING MAIN
- APPROX. SITE BOUNDARY

Issue	Date	Description	Made	Checked
P1	08.12.16	PRELIMINARY ISSUE	CB	JRC

Drawing Status: **PRELIMINARY**

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Client: THE CHISENHALE-MARSH ESTATE COMPANY

Project: LAND AT COOPERSALE CRICKET CLUB

Drawing Title: OPTION 2: INDICATIVE FOUL & SURFACE WATER DRAINAGE STRATEGY

Drawn/Design	CB	Date	NOV 2016	Scales	1:500 @ A1
Checked	JRC	Approved	JRC		1:1000 @ A3

Drawing No. 618235/115 Rev P1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	109.339	0.839	0.8	193.4	O K
30 min Summer	109.424	0.924	0.9	221.2	O K
60 min Summer	109.515	1.015	0.9	252.4	O K
120 min Summer	109.609	1.109	1.0	286.9	O K
180 min Summer	109.664	1.164	1.0	308.4	O K
240 min Summer	109.704	1.204	1.0	323.9	Flood Risk
360 min Summer	109.757	1.257	1.0	345.8	Flood Risk
480 min Summer	109.793	1.293	1.0	361.0	Flood Risk
600 min Summer	109.820	1.320	1.0	372.2	Flood Risk
720 min Summer	109.839	1.339	1.0	380.8	Flood Risk
960 min Summer	109.853	1.353	1.1	386.9	Flood Risk
1440 min Summer	109.859	1.359	1.1	389.6	Flood Risk
2160 min Summer	109.843	1.343	1.0	382.4	Flood Risk
2880 min Summer	109.812	1.312	1.0	369.0	Flood Risk
4320 min Summer	109.738	1.238	1.0	337.7	Flood Risk
5760 min Summer	109.675	1.175	1.0	312.6	O K
7200 min Summer	109.622	1.122	1.0	291.9	O K
8640 min Summer	109.574	1.074	0.9	274.1	O K
10080 min Summer	109.531	1.031	0.9	258.3	O K
15 min Winter	109.411	0.911	0.9	216.7	O K
30 min Winter	109.502	1.002	0.9	247.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	235.861	0.0	68.5	19
30 min Summer	135.203	0.0	71.9	34
60 min Summer	77.503	0.0	141.9	64
120 min Summer	44.428	0.0	149.6	124
180 min Summer	32.084	0.0	153.8	184
240 min Summer	25.467	0.0	156.5	244
360 min Summer	18.392	0.0	159.9	364
480 min Summer	14.599	0.0	161.9	484
600 min Summer	12.204	0.0	162.9	602
720 min Summer	10.543	0.0	163.5	722
960 min Summer	8.251	0.0	162.8	962
1440 min Summer	5.842	0.0	159.6	1442
2160 min Summer	4.136	0.0	311.8	2160
2880 min Summer	3.237	0.0	307.8	2736
4320 min Summer	2.256	0.0	291.7	3368
5760 min Summer	1.746	0.0	538.1	4096
7200 min Summer	1.431	0.0	520.5	4904
8640 min Summer	1.216	0.0	501.3	5712
10080 min Summer	1.060	0.0	481.6	6552
15 min Winter	235.861	0.0	71.4	19
30 min Winter	135.203	0.0	74.9	34

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	109.598	1.098	1.0	283.0	O K
120 min Winter	109.699	1.199	1.0	322.0	O K
180 min Winter	109.758	1.258	1.0	346.4	Flood Risk
240 min Winter	109.801	1.301	1.0	364.1	Flood Risk
360 min Winter	109.859	1.359	1.1	389.4	Flood Risk
480 min Winter	109.898	1.398	1.1	407.1	Flood Risk
600 min Winter	109.927	1.427	1.1	420.4	Flood Risk
720 min Winter	109.950	1.450	1.1	430.7	Flood Risk
960 min Winter	109.967	1.467	1.1	438.9	Flood Risk
1440 min Winter	109.980	1.480	1.1	445.0	Flood Risk
2160 min Winter	109.973	1.473	1.1	441.4	Flood Risk
2880 min Winter	109.950	1.450	1.1	430.8	Flood Risk
4320 min Winter	109.869	1.369	1.1	393.8	Flood Risk
5760 min Winter	109.800	1.300	1.0	364.0	Flood Risk
7200 min Winter	109.736	1.236	1.0	337.0	Flood Risk
8640 min Winter	109.676	1.176	1.0	313.0	O K
10080 min Winter	109.620	1.120	1.0	291.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	77.503	0.0	148.7	64
120 min Winter	44.428	0.0	156.3	122
180 min Winter	32.084	0.0	160.4	182
240 min Winter	25.467	0.0	163.1	242
360 min Winter	18.392	0.0	166.3	360
480 min Winter	14.599	0.0	168.1	478
600 min Winter	12.204	0.0	169.0	596
720 min Winter	10.543	0.0	169.4	714
960 min Winter	8.251	0.0	168.4	946
1440 min Winter	5.842	0.0	164.4	1412
2160 min Winter	4.136	0.0	324.9	2096
2880 min Winter	3.237	0.0	319.8	2740
4320 min Winter	2.256	0.0	302.2	3544
5760 min Winter	1.746	0.0	563.3	4384
7200 min Winter	1.431	0.0	551.0	5328
8640 min Winter	1.216	0.0	535.1	6224
10080 min Winter	1.060	0.0	514.1	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 547450 203650 TL 47450 03650
C (1km)	-0.023
D1 (1km)	0.303
D2 (1km)	0.254
D3 (1km)	0.215
E (1km)	0.318
F (1km)	2.551
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.439

Time (mins) From:	To:	Area (ha)
0	4	0.439

Model Details

Storage is Online Cover Level (m) 110.000

Tank or Pond Structure

Invert Level (m) 108.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	155.6	1.500	480.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0045-1100-1500-1100
Design Head (m)	1.500
Design Flow (l/s)	1.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	108.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.1
Flush-Flo™	0.197	0.7
Kick-Flo®	0.399	0.6
Mean Flow over Head Range	-	0.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.1		

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