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LANMOR Consulting

Civil Engineers & Transport Planners

27 Knowle Drive

Drainage Calculations

March 2026

251974/DC/IN/KBL/01

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LANMOR Consulting

Civil Engineers & Transport Planners

LANMOR Consulting Ltd,
Thorogood House, 34 Tolworth Close
Surbiton, Surrey, KT6 7EW

Tel: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
Internet: www.lanmor.co.uk

DOCUMENT STATUS

Project: 27 Knowle Drive

Title: Drainage Calculations

Client: Spring Development Ltd

Reference: 251974/DC/IN/KBL/01

Produced by:	IN		Date:	17/03/2026
Checked by:	AG		Date:	17/03/2026
Approved by:	KBL		Date:	17/03/2026

Issue/revision	Date	Status	Issued by
First	03/09/2025	For Approval	IN
A	18/09/2025	For Approval	IN
B	19/12/2025	For Approval	IN
C	17/03/2026	For Approval	IN

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1 INTRODUCTION

1.1.1 Lanmor Consulting Ltd have been appointed to prepare Drainage Calculations for the proposed development at 27 Knowle Drive, Copthorne, Crawley RH10 3LW.

1.1.2 The development proposal seeks the *"erection of 2 No. bungalows and associated landscaping following the demolition of the existing dwelling".* Planning consent for the proposed development has been granted on the 26th of March 2025 by Mid Sussex District Council subject to conditions [REF: DM/23/2154]. Condition 3 under scheduled conditions states that details of the proposed foul and surface water drainage is required to be submitted and approved before any development occurs. The details of the condition are displayed below.

Condition 3:

No development shall commence until details of the proposed foul and surface water drainage and means of disposal have been submitted to and approved in writing by the local planning authority. The details shall include a timetable for its implementation and a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. No building shall be occupied until all the approved drainage works have been carried out in accordance with the approved details and thereafter managed and maintained in accordance with the approved details.

2 EXISTING SITE CONDITIONS

2.1 Location

2.1.1 The site is located within the east side of Copthorne Village in Crawley. The application site is mainly surrounded by residential units. Figure 2.1 below shows the location of the site.

Figure 2.1 – Site Location Plan

2.2 Geology

2.2.1 The British Geological Survey (BGS) indicates that the location of the site is located on Upper Tunbridge Wells Sand consisting of (Sandstone and Siltstone). The sedimentary bedrock is assumed to be formed between 139.3 and 133.9 million years ago during the Cretaceous period.

2.2.2 A Ground investigation report was prepared by Ground and Environmental Investigation Ltd (GEI) following intrusive investigations of the site carried out on the 28th July 2025, including Borehole Drilling and BRE 365 Soakage Testing. The GEI found that the ground conditions encountered on site comprised of soils which are typical of the upper Tunbridge Wells Sand. The made ground consisted of sandy, silty, Clay and this was encountered to a maximum depth of 4.8mbgl, which was further underlain by silty Sand with sandstone pieces to 5.5mbgl to the maximum depth of the boreholes. No groundwater was encountered during the site visit.

2.3 Percolation Testing

2.3.1 The result of the BRE 365 Soakage tests indicated that no infiltration was achieved throughout a test period of 3 hours. Hence the soils within the site are not considered suitable for the use of shallow soakaways for the disposal of surface water. A copy of the investigation report is included in Appendix A.

3 EXISTING DRAINAGE

3.1.1 As part of the investigation into the existing drainage of the site, sewer records have been obtained from Thames Water and these show that there are foul and surface water sewers beneath Knowle Drive. The foul sewer has a diameter of 225mm and flows south. The surface water sewer has a diameter of 375mm and flows south as well. A copy of the Thames Water sewer records has been included in Appendix B.

3.1.2 It is assumed that both foul and surface water from the site currently outfall to the sewers in Knowle Drive. The topographical survey identified a number of manholes that indicates the route of the existing drainage exits the site via the adjacent property.

4 PROPOSED DRAINAGE

4.1 Foul Water Drainage

4.1.1 Foul wastewater from the proposed dwellings will be collected in a below ground drainage network. The foul discharge from the development will connect to the existing sewer system underneath Knowle Drive (at Manhole Ref: 8201). The proposed layout of the foul water strategy for the development has been included in Appendix C as part of drawing 251974-500-01.

4.2 Surface Water Drainage

4.2.1 Sustainable Drainage Systems (SuDS) have been considered for the disposal of surface water runoff from the proposed development in accordance with the drainage hierarchy.

4.2.2 Green roofs have been discounted as the proposed dwellings will have pitched roof structures. Rainwater harvesting was also considered; however, due to the limited reliability of such systems during consecutive storm events and the requirement to size attenuation systems independently of harvesting, this option has been discounted.

4.2.3 Infiltration techniques such as soakaways were assessed through site investigation and soakage testing undertaken on 28th July 2025. The results confirmed that the underlying geology is not sufficiently permeable to support infiltration. Therefore, infiltration techniques have been discounted.

4.2.4 Surface water discharge to a watercourse has also been discounted as there are no suitable watercourses in the vicinity of the site.

4.2.5 Therefore, in accordance with the SuDS hierarchy, surface water runoff will be attenuated on site and discharged at a controlled rate to the existing Thames Water surface water sewer located within Knowle Drive. Figure 4.1 below shows the SuDS hierarchy.

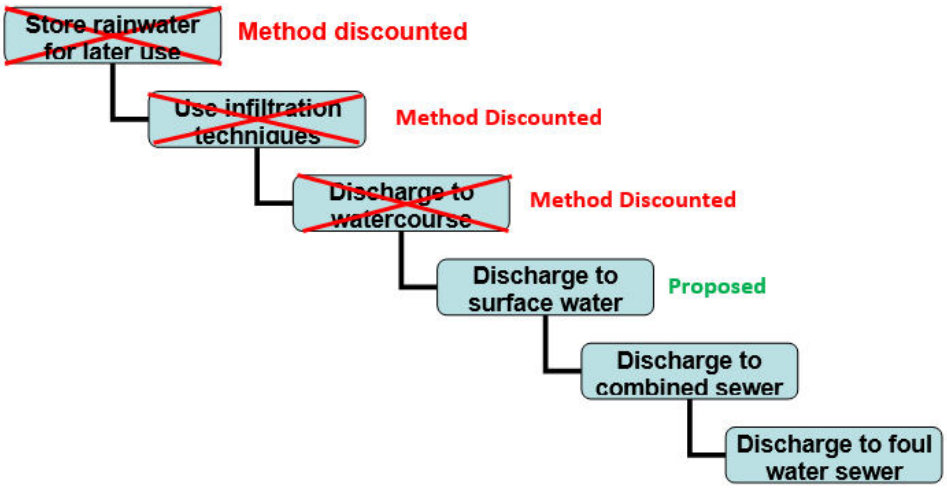

Figure 4.1 – SuDS Hierarchy

4.3 Urban Creep

4.3.1 An allowance for urban creep has been applied in accordance with best practice guidance. A 10% increase in impermeable area has been incorporated into the drainage calculations to account for potential future extensions and additional hardstanding over the lifetime of the development.

4.3.2 The updated impermeable area for each plot is approximately 160m² (0.016ha). This allowance has been applied to roof areas, while the permeable paving areas are excluded as they form part of the proposed SuDS strategy.

4.4 Drainage Design

4.4.1 Each plot will drain independently to its own dedicated permeable paving system located to the front of the dwelling. Surface water runoff from the roofs will be collected via rainwater pipes and conveyed through an underground drainage network before discharging into the permeable paving via diffuser chambers.

4.4.2 Runoff from hardstanding areas will drain directly into the permeable paving.

4.4.3 The permeable paving system will act as a lined attenuation tank, with an impermeable membrane preventing infiltration to ground and ensuring that runoff is attenuated and discharged at a controlled rate to the public sewer.

4.5 Hydraulic Calculations

4.5.1 Calculations have been undertaken to determine the greenfield runoff rates for the site and to establish appropriate discharge criteria for the proposed development.

4.5.2 The greenfield runoff rates presented in Table 4.1 represent the total runoff from the entire site. The proposed discharge rates represent the combined discharge from both plots, which drain independently but discharge to the same receiving public sewer.

4.5.3 Hydraulic modelling has also been undertaken to assess the performance of the permeable paving systems, including discharge control and storage requirements. The results are summarised in Table 4.1 below, with full calculations provided in Appendix E.

Return Period	Greenfield Rate (l/s)	Proposed Rate (l/s)
Q_{BAR}	0.4	-
1 in 1 year	0.4	0.4
1 in 30 year	1.0	0.8
1 in 100 year	1.4	0.8
1 in 100 +40%	-	1.2

Table 4.1 – Greenfield and Proposed Surface Water Discharge Rates (Site-Wide)

4.5.4 Discharge will be controlled via a 20mm orifice plate. This is the minimum diameter recommended in CIRIA SuDS Manual (C753) to reduce the risk of blockage.

4.5.5 The proposed discharge rates are aligned with the greenfield QBAR rate for the 1 in 1-year event and remain significantly below greenfield runoff rates for higher return periods. The development therefore achieves betterment over the existing runoff regime and will not increase flood risk on or off site.

4.5.6 Each plot will connect separately to the Thames Water sewer, resulting in a combined maximum discharge rate of 1.2 l/s for the overall development.

4.6 Attenuation Design

4.6.1 Each permeable paving system has been designed using MicroDrainage to provide sufficient storage to accommodate the critical 1 in 100-year storm event plus 40% allowance for climate change.

4.6.2 The system comprises a 5m x 5m permeable paving area underlain by a 550mm deep sub-base, consisting of:

- 250mm Granular sub-base (30% Void Ratio)
- 300mm Permavoid (95% Void Ratio)

4.6.3 This configuration provides approximately 9m³ of storage per plot.

4.6.4 The system is fully lined to act as an attenuation tank, with flow-controlled discharge to the public sewer.

4.6.5 Hydraulic calculations (Appendix E) demonstrate that the system can accommodate the design storm event without flooding. The system has been designed such that no flooding will occur on site during the critical design event.

4.7 Drainage Layout

4.7.1 A review of the proposed foul and surface water drainage layouts has been undertaken and all pipe clashes have been resolved through adjustment of invert levels. The final layout ensures suitable separation and constructability.

4.8 Connection to Public Sewer

4.8.1 Surface water from each plot will discharge to the Thames Water surface water sewer in Knowle Drive via separate connections.

4.8.2 A Section 106 application has been submitted and approved by Thames Water. A notice of consent to connect to the public sewer has been issued (dated 30th September 2025). A copy of this consent is included in Appendix D.

4.9 Implementation

4.9.1 The drainage design will be implemented during the construction phase of the development. The permeable paving systems, attenuation storage, and flow control devices will be installed prior to occupation of the dwellings.

4.9.2 All drainage infrastructure will be fully operational before first use of the development.

5 SUDS TREATMENT

5.1.1 As part of the CIRIA SuDS Manual C753, Section 26 provides guidance regarding methods for managing pollution risks from surface water runoff.

5.1.2 Part of the assessment is to determine the method of assessing the risk. Table 26.1 of the CIRIA Report C753 reproduced as Table 5.1 below sets the approaches to water quality risk management. For this site the Simple Index Approach will be used.

Design method	Hazard characterisation	Risk reduction	
		For surface water	For groundwater
Simple index approach	Simple pollution hazard indices based on land use (eg Table 26.2 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.3 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.4 or equivalent)
Risk screening[1]	Factors characterising traffic density and extent of infiltration likely to occur (eg Table 26.5 or equivalent)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (eg Table 26.5 or equivalent)
Detailed risk assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in event mean discharge concentrations and total annual load reductions delivered by the system	

Table 5.1 – Approaches to water quality risk management

5.1.3 Table 26.2 in C753 reproduced as Table 5.2, shows the potential hazard indices associated with different land uses. The development will consist of residential houses with access and parking. It is concluded that the site should be classed within the sections shown in Table 5.2 below.

5.1.4 The roofs of the residential buildings are considered to have a “very low” pollution hazard, generating 0.2 total suspended solids, 0.2 metals and 0.05 hydrocarbons. The access and parking areas are considered to have a “low” pollution hazard, generating 0.5 total suspended solids, 0.4 metals and 0.4 hydrocarbons.

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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 5.2 – Pollution hazard indices for different land use classifications

5.1.5 The proposed development will incorporate permeable paving as a lined attenuation system for the storage and controlled discharge of surface water runoff. No infiltration techniques such as soakaways are proposed due to the impermeable ground conditions identified during site investigation.

5.1.6 Table 26.3 of C753 reproduced below as Table 5.3 sets out the mitigation indices provided by SuDS features for discharge to surface waters.

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	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.		

Table 5.3 – SuDS mitigation indices for discharges to surface waters

5.1.7 The permeable paving will provide mitigation of 0.7 for total suspended solids, 0.6 for metals and 0.7 for hydrocarbons. These are all greater than the pollution hazard indices identified in Table 5.2 above so the paving will mitigate the potential hazards associated with the access road etc.

6 SURFACE WATER DRAINAGE MAINTENANCE

6.1.1 Regular inspection of the surface water drainage network for blockages and clearing unwanted debris/silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event of blockages, high pressure water jets can be used to clear the gullies and pipes to ensure they are functioning correctly. This should be undertaken by certified trained professionals.

6.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories “regular maintenance”, “occasional maintenance” and “remedial maintenance”.

6.1.3 Regular maintenance of the drainage and SuDS features will include inspections, removal of litter/debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

6.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms. Thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

6.1.5 For specialist equipment, maintenance brochures will be provided by the manufacturers. These will set out the frequency of inspections and correct methods of cleaning etc. that should be followed. It is recommended that once installed the facility should be inspected monthly for the first three months and thereafter at six monthly intervals or as advised in the maintenance brochure.

6.1.6 A private management company will be responsible for the ongoing maintenance and operation of the drainage system for the lifetime of the development.

6.2 Manholes, Catch pit Chambers and Pipes

6.2.1 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

6.2.2 Pipes are intended for the conveyance of runoff across the development. They are intended to be dry except for rainfall events. These have been designed to be self-cleaning where possible for the smaller diameter pipes, the risk for large diameter pipes is reduced due to the size providing higher velocities

6.2.3 For manholes, catch pit chambers and pipes, the following maintenance is recommended:

Manhole / Pipe Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 6.1 – Manhole and Pipe maintenance Schedule

6.3 Permeable Paving

6.3.1 For the permeable paving, the following maintenance have been provided by the CIRA SuDS Manual (C753) and will be required:

Permeable Paving Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Remove debris and leaves etc.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required- once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting etc	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate frequencies for rehabilitation	Annually
	Monitor inspection chambers	Annually

Table 6.2 – Permeable Paving Maintenance Schedule

6.3.2 The above information is only intended as guidance in standard maintenance practise for surface water drainage and SuDS features. The above measures should be reviewed regularly and modified to suit the site conditions.

7 SUMMARY & CONCLUSION

7.1.1 This Drainage Calculation report was prepared to demonstrate how the proposed development at the site of 27 Knowle Drive will be served in terms of the disposal of foul and surface water discharges.

7.1.2 For the foul drainage, the proposed development will seek to discharge foul water by connecting into the existing sewer network along Knowle Drive, owned by Thames Water.

7.1.3 This report has assessed the use of SuDS and the most sustainable method of disposal has been used. A soakage test was undertaken to assess the ground conditions to determine if infiltration techniques would be suitable for the proposed development. The results showed that, infiltration techniques would not be suitable for the application site. However, permeable paving will still be used as storage for the parking areas. The proposed drainage strategy is in accordance with the principles of the National Planning Policy Framework and the CIRIA SuDS Manual (C753).

7.1.4 Each permeable paving system will be sized at 5m x 5m with a total sub-base depth of 550mm and has been designed to accommodate all rainfall events up to and including the 1 in 100-year storm event plus 40% climate change allowance.

7.1.5 This report demonstrates that the proposed foul and surface water drainage strategy is compliant with Condition 3 of planning permission DM/23/2154. The development will not increase flood risk and provides a sustainable and robust drainage solution. It is therefore considered that the condition can be discharged.

APPENDIX A

Site Investigation Report

Ground and Environmental Investigation Limited

8 Wapping Lane
Marton
Gainsborough
DN21 5AJ
01522 412058

27 Knowle Drive
Copthorne
Crawley
RH10 3LW

Ground Investigation Interpretive Report

On behalf of S Chick Investigations Ltd

Document Reference: 25-954

August 2025

Site: 27 Knowle Drive, Copthorne, Crawley, RH10 3LW

Document Reference No: 25-954

Quality Management

Authorised by:	Marc Pearson BSc MSc MIEnvSc Director
Date	August 2025
Revision	0
Contact	Marc Pearson (marc@groundenvironmental.com)

Ground and Environmental Investigation Ltd is a specialist geo-environmental consultancy and ground investigation company operating nationally.

Our approach to all of projects is to provide our clients with cost-effective solution to potential geo-environmental hazards, essential considerations before site acquisition, or prior to final development scheme design.

We offer a full range of geo-environmental services from initial due diligence site assessments through to engineering and ground remediation design.

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Appendices

1. Limitations
2. Factual Report of Investigation

1 INTRODUCTION

Ground and Environmental Investigation Ltd (GEI) was commissioned by S Chick Investigations Ltd to undertake an interpretive review of a factual ground investigation undertaken at 27 Knowle Drive, Copthorne, Crawley, RH10 3LW.

It is assumed that the proposed development comprises the construction/extension of a low-rise building.

The objectives of this Ground Investigation were to provide outline recommendations for foundation and ground floor design.

1.1 LIMITATIONS

Notes on limitations associated with this assessment are provided in Appendix 1. GEI have not attended site and data from S Chick Investigation Ltd report is being relied on. The factual report is included as Appendix 2.

2 ENVIRONMENTAL SETTING

2.1 GEOLOGY

Reference to the British Geological Survey online geological map of the area indicates that the geology underlying the site comprises solid geology of the Upper Tunbridge Wells Sand of the Tunbridge Wells Sand Formation.

Upper Tunbridge Wells Sand

The unit comprises a complex succession of interbedded deposits with both upward-fining and upward-coarsening cycles. Thinly bedded silty mudstones, siltstones, silty sandstones and fine-grained sandstones are laterally persistent over long distances. Sandstones, which form prominent scarp and dip slope features, are typically fine-grained and quartzose, weathering to a pale yellowish grey or brown colour. They are locally ferruginous in the St Leonard's Forest area where three sandstone beds are sufficiently persistent to be named Shelly Plain Sandstone, Colgate Sandstone and Roffey Park Sandstone (Gallois and Worssam, 1993). Clay ironstone occurs locally, notably in the Horsham-Crawley area (Worssam, 1972). In the Cuckfield area, silt is the dominant component (Lake and Thurrell, 1974). Here, grey and greenish grey silty mudstones and siltstones, red-mottled in part, dominate in the lower part of the unit, whereas pale grey to yellowish grey sandstone mostly appear in the upper part. Channel and slump structures, together with cross-bedding occur in the sandstones. Siltstones are commonly bioturbated.

3 INTRUSIVE INVESTIGATION

3.1 FIELDWORK

The intrusive site works were carried out on the 28th July 2025 and comprised:

- Borehole drilling; and
- BRE 365 Soakage Testing.

The positions of the above works on the site are indicated within Appendix 2.

All intrusive fieldwork was generally executed in accordance with the recommendations given in British Standard BS 5930:2015+A1:2020, "Code of practice for ground investigations".

Boreholes

Two boreholes (BH1 and BH2) were excavated to depths of between 5.2m and 5.5m using a window sampling rig. The boreholes met refusal on dense soils/rock.

One borehole (BH3) was excavated to a depth of 4.0m using hand auguring techniques.

The soils and materials encountered in the boreholes were logged and representative samples recovered for laboratory analysis. Standard penetration tests were carried out in the window sampling boreholes, in-situ hand shear strength testing was undertaken in the location BH3. Upon completion the boreholes were backfilled with arisings.

The borehole logs are presented in Appendix 2.

BRE 365 Soakage Testing

Infiltration testing was undertaken in one location (ST1). The testing was carried out in accordance with the methodology given in BRE 365 'Soakaway design' and comprised discharging water into the excavation and monitoring the fall in water level against time.

The field test data is summarised below in Section 6.3 below and the results presented in Appendix 2.

3.2 GROUNDWATER

No groundwater was encountered during the period of fieldwork.

It should be noted that groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

4 LABORATORY TESTING

4.1 GEOTECHNICAL TESTING

The following range of laboratory tests were scheduled, and the results are presented in Appendix 2.

i. Determination of natural moisture content (4 No.).
ii. Determination of Atterberg Limits (4 No.).

5 GROUND CONDITIONS

The soils encountered during this investigation are described in the borehole logs presented in Appendix 2. The ground profile encountered at the site comprised soils typical of the Upper Tunbridge Wells Sand.

Upper Tunbridge Wells Sand

Soils typical of the Upper Tunbridge Wells Sand were encountered in the boreholes. The formation was proven to a maximum depth of 5.5m in location BH2 where the borehole met refusal on dense soils/rock, the base of the formation was not encountered.

The soils generally comprised orange brown mottled grey, mid and dark grey, dark brown and orange, and orange sandy very silty clay and silty sand with sandstone pieces.

Standard penetration tests within the soils generally recorded N values in the range 10 to 64 indicating firm to hard (cohesive soils) and medium dense to very dense (non-cohesive soils). At location BH1, a N value of 5 was encountered at a depth of 3.0m.

In-situ hand shear vane testing at location BH3 indicated shear strengths of 100kPa to 130kPa.

The test at a depth of 5.0m in location BH1 achieved only partial penetration with 50 blows resulting in a penetration of 46mm.

Classification testing indicated intermediate to high plasticity clays with modified plasticity indices of between 14% and 28%. These soils can be classified using as having a medium shrinkage potential.

For preliminary foundation design purposes, the following parameters may be used for consideration of shallow foundations within the Upper Tunbridge Wells Sand:

Undrained Shear Strength	Su =	50 kN/m^2 (conservative value)
Coefficient of compressibility	m_v =	0.1 m^2/MN (typical value)
Shrinkage Potential	=	Medium

6 ENGINEERING DESIGN

6.1 FOUNDATION DESIGN OPTIONS

At the time of reporting, applied structural loads from the proposed development were unknown.

In deliberation of suitable foundation options consideration was given to the geotechnical hazards and risks as presented below:

Geotechnical Hazard	Qualitative Risk & Consequences	Possible Risk Reduction Measures
Existing underground structures such as service runs and old footings.	Low Implication for foundation depth and economic feasibility of shallow foundations.	New foundations to be constructed in undisturbed ground or alternatively disturbed ground to be removed and replaced with suitable engineering fill.
Variations in stiffness of ground below foundation depth that could give rise to unacceptable total and differential settlement.	Low Large span buildings would be particularly sensitive to differential settlement. Would result in cracking of superstructure if conventional brickwork or brick cladding is used.	Calculate likely magnitude of settlement and determine if within acceptable tolerances. Make foundations act as reinforced beams. Consider ground treatment to improve ground conditions or adopt deep foundation.
Shrinkage/swelling of foundation soils due to the action of tree roots.	Low to moderate Foundation movement and cracking of brickwork.	Follow NHBC guidance on building near trees for medium shrink/swell potential soils.

Shallow Foundations

Based upon the findings of the ground investigation, for preliminary design purposes, consideration was given to founding the proposed new structures on shallow foundations within the Upper Tunbridge Wells Sand soils.

Based on field observations, in situ testing and laboratory test results, a maximum allowable bearing pressure of 100 kN/m^2 is recommended for foundations placed at a minimum depth of 1.0m.

Deeper foundations may be required in order to comply with the NHBC guidance for building near trees in medium volume change potential soils depending on the distance of any trees from the proposed development.

Other forms of disturbance that may affect founding depths are:

- the removal of trees;
- the presence of tree roots;
- the removal of disused services;
- the relocation of existing services; and
- the removal of other underground obstructions.

Settlement

Preliminary settlement calculations indicated total settlements would be less than 25mm with approximately 50% immediate and therefore 'built out' during construction.

6.2 GROUND FLOORS

NHBC guidance advises that suspended ground floors should be adopted when the plasticity index (PI) of the founding soils is greater than 10%.

Based upon the results of this ground investigation, it is recommended that suspended floors are adopted.

6.3 SOAKAWAYS

The results of BRE365 soakage tests are presented in Appendix 2.

Soakage testing indicated that no infiltration was achieved throughout a test period of 3 hours and therefore the soils underlying the site are not considered suitable for the use of shallow soakaways for the disposal of surface water.

6.4 TEMPORARY WORKS

Excavations in excess of 1.2 m depth may be required in connection with the proposed development on this site. If there is a requirement for personnel to enter into excavations, then the need for trench side support should be considered for any depth of excavation and, therefore, appropriate equipment should be available on site prior to excavation proceeding. A site-specific risk assessment should be carried out where man entry into excavations is required.

The base of foundation excavations should be inspected and any soft loose, organic or otherwise deleterious material at foundation level removed and replaced with lean mix concrete. The soils encountered will be liable to softening/loosening when exposed to surface water infiltration. In order to avoid deterioration of the prepared formation the base of foundations should be blinded with concrete as soon as practical after excavation and particularly if there is delay before placing foundation concrete.

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation, intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn in respect of the proposed development at 27 Knowle Drive, Copthorne, Crawley, RH10 3LW.

- The ground investigation found the anticipated geology with soils typical of the Upper Tunbridge Wells Sand.
- At the time of reporting, applied structural loads from the proposed redevelopment of the site were unknown.
- The Upper Tunbridge Wells Sand soils were identified as a suitable founding stratum.
- Based on in situ testing, and laboratory test results a maximum allowable bearing of 100kN/m^2.
- Deepening of foundations may be required to comply with the NHBC guidance for building near trees in medium volume change potential soils depending on the distance of any trees from the proposed development.
- The use of suspended ground floors was recommended.
- Shallow soakaways are not considered to be suitable for the disposal of surface water at this site.

APPENDIX 1

LIMITATIONS

The recommendations contained in this Report represent GEI's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant.

GEI does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

GEI obtained, reviewed and evaluated information in preparing this Report from the Client and others. GEI's conclusions, opinions and recommendations has been determined using this information. GEI does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which GEI has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by GEI for the sole and exclusive use of the Client and for the specific purpose for which GEI was instructed.

Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and GEI, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party.

In particular, GEI does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client.

Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless GEI from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of / or resulting from the performance of the work by the Consultant.

APPENDIX 2

FACTUAL REPORT OF GROUND INVESTIGATION

S CHICK INVESTIGATIONS LTD

Factual Report of Investigation

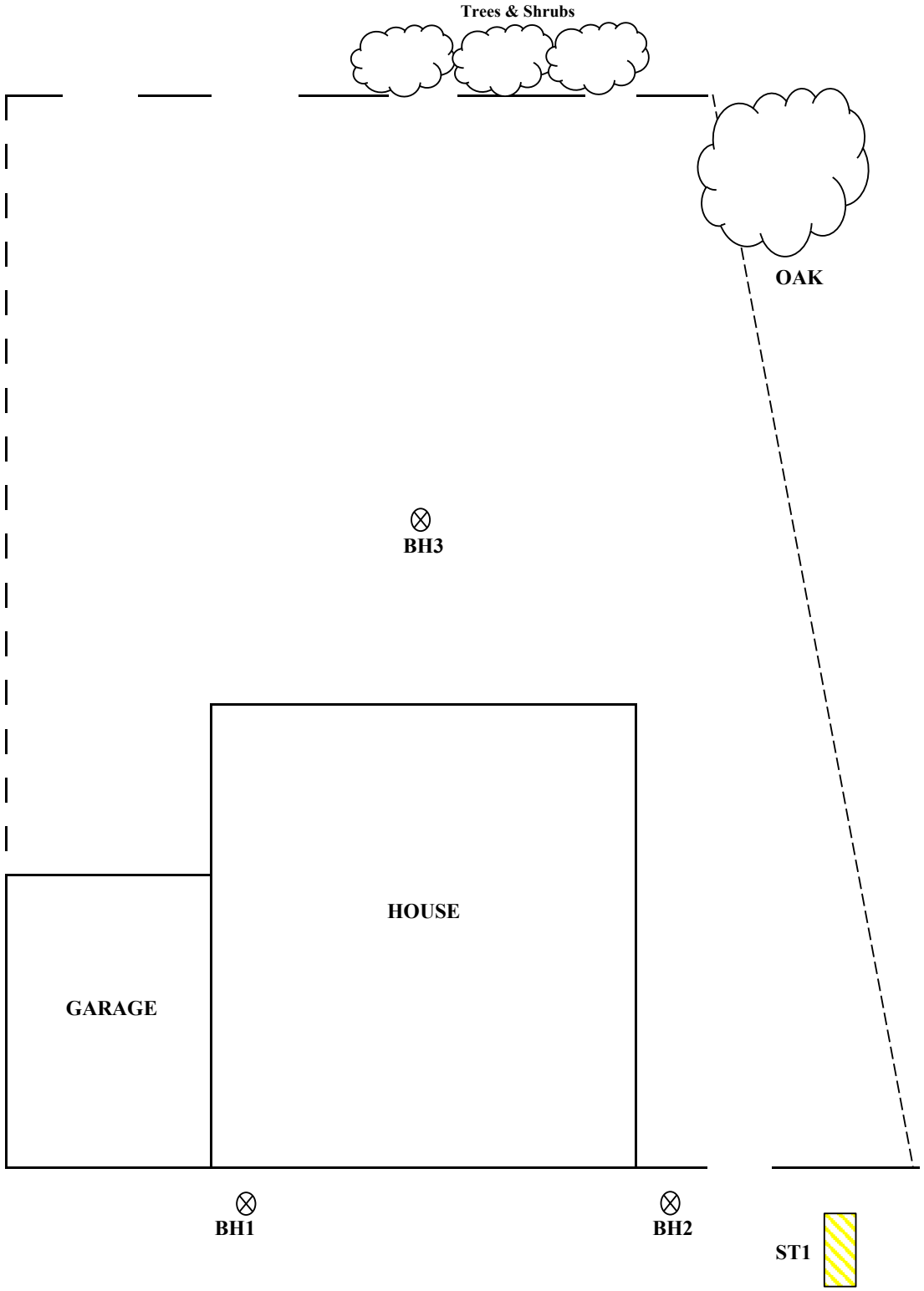
AT: 27 Knowle Drive, RH10 3LW

ON: 28.07.2025

FOR: Spring developments

S CHICK INVESTIGATIONSLTD
26 FERRARO CLOSE
HESTON
TW5 0UL
07508358424

SITE PLAN	Sheet: 1 of 1	SCI
Client: Spring Developments		Site: 27 Knowle Drive
	Date: 28/07/2025	RH10 3LW



REMARKS:					
Logged:	Checked:	Approved:	Scale:	NTS	Weather:

Borehole Log

BH1

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH			0.00	1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025		

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
						(0.30)		Turf, over Topsoil.
						0.30		Stiff, Orange brown mottled grey, sandy, very silty, CLAY.
		1.00 - 1.10	D					
		1.20	SPT	N=12 (3,3/3,3,3,3)				
						(3.00)		
		2.00	SPT	N=11 (2,2/3,3,2,3)				
		2.00 - 2.10	D					
		3.00	SPT	N=5 (1,1/1,1,2,1)				
		3.00 - 3.10	D					
						3.30		Stiff, Dark Grey, sandy, very silty, CLAY.
						(0.60)		
						3.90		Very Stiff, Dark brown and orange, sandy, very silty, CLAY.
		4.00	SPT	N=14 (1,1/3,3,4,4)				
						(0.90)		
						4.80		Dense, orange, silty, SAND, with sandstone pieces.
		5.00	SPT	N=50 for 46mm (14,18/25 for 46mm)		(0.40)		
						5.20		*End of Borehole at 5.20m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

Remarks

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m Stable	HP	Hand Tools	C Allingham
L = 0.40m *W = 0.40m*			
1.20 - 5.20m Stable	BH	Window Sampler	C Allingham
L = 0.10m *W = 0.10m*			

Borehole Log

BH1

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH			0.00	1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025		

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
4.50	0.00	0.00	7/28/25	seepage of water into hole.

SPT - Details

Top Depth (m)	Type	Results	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio
1.20	S	N=12 (3,3/3,3,3,3)		Dry	564	65
2.00	S	N=11 (2,2/3,3,2,3)		Dry	564	65
3.00	S	N=5 (1,1/1,1,2,1)		Dry	564	65
4.00	S	N=14 (1,1/3,3,4,4)		Dry	564	65
5.00	S	N=50 for 46mm (14,18/25...		4.50	564	65

Remarks

Method, Plant, Stability, Dimensions **Logger**

0.00 - 1.20m HP Hand Tools C Allingham
Stable
L = 0.40m
W = 0.40m

1.20 - 5.20m BH Window Sampler C Allingham
Stable
L = 0.10m
W = 0.10m

Borehole Log

BH2

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH				1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025	2025-07-28	2025-07-28

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Samples and Tests

Inst/ Backfill	Water Levels	Depth (m)	Type/ Ref	Results
		1.00 - 1.10	D	
		1.20	SPT	N=10 (1,2/2,2,3,3)
		2.00	SPT	N=12 (2,3/3,3,3,3)
		2.00 - 2.10	D	
		3.00	SPT	N=15 (3,2/3,4,4,4)
		3.00 - 3.10	D	
		4.00	SPT	N=31 (5,5/5,7,9,10)
		5.00	SPT	N=64 (11,16/17,16,14,17)

Strata

Level (m)	Depth (m) (thickness)	Legend	Description
	(0.30)		Turf, over Topsoil.
	0.30		Stiff, Orange brown mottled grey, sandy, very silty, CLAY.
	(3.20)		
	3.50		Stiff, Dark Grey, sandy, very silty, CLAY.
	(0.50)		
	4.00		
	(-0.30) 4.60		
	(0.90) 4.90		Very Stiff, Dark brown and orange, sandy, very silty, CLAY.
	(0.90)		NO DATA!
			Dense, orange, silty, SAND, with sandstone pieces.
	5.50		*End of Borehole at 5.50m*

Remarks

Method, Plant, Stability, Dimensions **Logger**

0.00 - 1.20m HP Hand Tools C Allingham
Stable
L = 0.40m
W = 0.40m

1.20 - 5.50m BH Window Sampler C Allingham
Stable
L = 0.10m
W = 0.10m

Borehole Log

BH2

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH				1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025	2025-07-28	2025-07-28

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
4.30	0.00	0.00	7/28/25	seepage of water into hole.

SPT - Details

Top Depth (m)	Type	Results	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio
1.20	S	N=10 (1,2/2,2,3,3)		Dry	564	65
2.00	S	N=12 (2,3/3,3,3,3)		Dry	564	65
3.00	S	N=15 (3,2/3,4,4,4)		Dry	564	65
4.00	S	N=31 (5,5/5,7,9,10)		Dry	564	65
5.00	S	N=64 (11,16/17,16,14,17)		4.80	564	65

Remarks

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m Stable	HP	Hand Tools	C Allingham
L = 0.40m *W = 0.40m*			
1.20 - 5.50m Stable	BH	Window Sampler	C Allingham
L = 0.10m *W = 0.10m*			

Borehole Log

BH3

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH				1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025	2025-07-28	2025-07-28

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Samples and Tests

Depth (m)	Type/ Ref	Results
1.00	HV	100 (kPa)
1.00	HV(r)	100 (kPa)
1.00 - 1.10	D	
2.00	HV	122 (kPa)
2.00	HV(r)	124 (kPa)
2.00 - 2.10	D	
3.00	HV	130 (kPa)
3.00	HV(r)	130 (kPa)
3.00 - 3.10	D	
4.00	HV	130 (kPa)
4.00	HV(r)	130 (kPa)

Strata

Depth (m)	Thickness (m)	Description
0.50	(0.50)	Made Ground, medium compact, dark brown, clay fill.
2.50	(2.00)	Stiff, mid grey brown, very sandy, very silty, CLAY.
4.00	(1.50)	Very Stiff, Moist, mid grey, very sandy, very sily, CLAY.
		End of Borehole at 4.00m

Inst/ Backfill | Water Levels | Level (m)

Remarks

Method, Plant, Stability, Dimensions | **Logger**

0.00 - 1.20m HP Hand Tools — C Allingham
Stable
L = 0.40m *W = 0.40m*

1.20 - 4.00m HA Hand Auger — C Allingham
Stable
L = 0.10m *W = 0.10m*

Borehole Log

BH3

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
BH				1:50

Project Name	Project No.	Start Date	End Date
27 Knowle Drive, RH10	28072025	2025-07-28	2025-07-28

Client	Contractor	Consultant
Spring Developments	S Chick Investigations	

Driller's Descriptions

Top Depth (m)	Base Depth (m)	Description
0.00	0.80	Roots of up to 3mm diameter observed to 0.8 Metres.

Remarks

Method, Plant, Stability, Dimensions			Logger
0.00 - 1.20m Stable	HP	Hand Tools	C Allingham
L = 0.40m *W = 0.40m*			
1.20 - 4.00m Stable	HA	Hand Auger	C Allingham
L = 0.10m *W = 0.10m*			

S Chick Investigations

Percolation Test Results Sheet

Date:

Site Name: 27 Knowle Drive, RH10 3LW

Client: Spring Developments

Test Pit : 1

Width/mm	Length/mm	Depth/mm
600	1100	1500
300mm of water added		

Percolation Test (date/start time)	Time taken to drain from 75% - 25%
1 28/07/25 @ 8.40	Test failed no drainage after three hours
2	
3	

Description of Strata:

GL – 0.4 = Turf over clayey topsoil

0.4 – 1.5 = Stiff, orange brown mottled grey, sandy very silty CLAY

00 – 00 =

F . S . T

FLAWLESS
SOIL TESTING

REPORT NUMBER:
SCI250

CLIENT :
SCI
26 Ferraro Close
Heston

SITE ADDRESS:
27 Knowle Drive

DATE OF SITE VISIT:
28 July 2025

DATE RECEIVED BY LABORATORY:
31 July 2025

Complied By:.....
L. Kirby - Office Administrator

Approved By:.....
J. Garrett - Director

DATE REPORTED:
07 August 2025

UKAS TESTING
28443

22 Francis Road, Braintree, Essex, CM7 2NR
Tel : 07778442814
Registered in England Company Reg. No. 14487335
VAT No: 443 1025 40

www.Flawless-Soils.com
Email - Enquiries@flawless-soils.com

Laboratory Summary Results

Our Ref :	SCI250	Date Sampled:	28/07/2025
Location :	27 Knowle Drive	Date Received :	31/07/2025
Client:	SCI	Date Tested :	31/07/2025
Address:	26 Ferraro Close, Heston, Middx	Date of Report :	07/08/2025

Sample Ref TP/BH No	Sample Ref Depth (m)	Type	Water Content (%) *[1]*	Soil Fraction > 0.425mm (%) *[2]*	Liquid Limit (%) *[3]*	Plastic Limit (%) *[4]*	Plasticity Index (%) *[5]*	Liquidity Index* *[5]*	Modified Plasticity Index* (%) [6]	Soil Class* *[7]*	Filter Paper Contact Time (d)	Soil Sample Suction (kPa) [8]	Roots Present or No Roots Observed* *[9]*	In situ Shear Vane Strength* (kPa) [10]	Organic Matter O.M (%)*[11]*	pH Value *[12]*	Sulphate Content (g / l) SO_3 *[13]*	Sulphate Content (g / l) SO_4 *[14]*	Class* *[15]*
BH1	1.0	D	22.6	<5	44	22	22	0.03	22	CI									
	2.0	D	33.3	<5	43	21	22	0.56	22	CI									

Test Methods / Notes

[1] BS EN ISO 17892-1 : 2014 + A1 : 2022

[2] Not recorded if <5%, otherwise measured as agreed with client

[3] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 5.3 - 1 Pt Test - Cone 80g/30°

[4] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 5.5

[5] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 6.5

[6] BRE Digest 240 : 1993

[7] BS 5930 : 2018 : Figure 8 - Plasticity Chart for the classification of fine soils

[8] BRE IP 4/93

[9] Roots present at depth or below. Info taken from logs if provided

[10] Values of shear strength were determined in situ using a pilcon hand vane.

[11] E010 based on Walkely-Black methodology. Completed by DETS UKAS no. 4480.

[12] BS 1377 : Part 3 : 2018 + A1 2021 Clause 12. PH testing is completed by K4 Soils Ltd who are accredited for the test UKAS no.2519. Full reports can be provided upon written request.

[13] BS 1377 : Part 3 : 2018 + A1 2021 Clause 7.6. Sulphate testing is completed by K4 Soils Ltd who are accredited for the test UKAS no.2519. Full reports can be provided upon written request.

[14] SO_4 = 1.2 x SO_3

[15] BRE Special Digest One (Concrete in Aggressive Ground) August 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4M or DS-5M class respectively unless water soluble magnesium testing is undertaken to prove otherwise.

*** Non UKAS Accredited Testing.**

Key

D	Disturbed sample (small)
B	Disturbed sample (bulk)
U	Undisturbed sample
W	Groundwater sample
ENP	Essentially Non-Plastic by inspection
U/S	Underside of Foundation
H&F	Hair & Fibrous
D&D	Dead & Decomposing
DEV	Deviation

UKAS TESTING 28443

Test results reported relate only to the items tested.

This report shall not be reproduced except in full without approval of the laboratory.

Version: SumRep (Issue 1, Rev 0 & Issued 17.11.23)

Laboratory Testing Results

Our Ref : SCI250

Location : 27 Knowle Drive

Client: SCI

Address: 26 Ferraro Close, Heston, Middx

Date Sampled : 28/07/2025

Date Received : 31/07/2025

Date Tested : 31/07/2025

Date of Report : 07/08/2025

Sample Ref TP/BH No	Sample Ref Depth (m)	Type	Water Content (%) [1]	Soil Fraction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index* [5]	Modified Plasticity Index* (%) [6]	Soil Class* [7]	Filter Paper Contact Time (d)	Soil Sample Suction (kPa) [8]	Roots Present or No Roots Observed* [9]	In situ Shear Vane Strength* (kPa) [10]	Organic Matter O.M (%)[11]	pH Value* [12]	Sulphate Content (g / l)* SO_3 [13]	Sulphate Content (g / l)* SO_4 [14]	Class* [15]
BH2	1.0	D	21.3	<5	36	22	14	-0.05	14	CI									
	2.0	D	27.3	<5	51	23	28	0.15	28	CH									

Test Methods / Notes

[1] BS EN ISO 17892-1 : 2014 + A1 : 2022

[2] Not recorded if <5%, otherwise measured as agreed with client

[3] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 5.3 - 1 Pt Test - Cone 80g/30°

[4] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 5.5

[5] BS EN ISO 17892-12 : 2018 + A2 : 2022 Clause 6.5

[6] BRE Digest 240 : 1993

[7] BS 5930 : 2018 : Figure 8 - Plasticity Chart for the classification of fine soils

[8] BRE IP 4/93

[9] Roots present at depth or below. Info taken from logs if provided

[10] Values of shear strength were determined in situ using a pilcon hand vane.

[11] E010 based on Walkely-Black methodology. Completed by DETS UKAS no. 4480.

[12] BS 1377 : Part 3 : 2018 + A1 2021 Clause 12. PH testing is completed by K4 Soils Ltd who are accredited for the test UKAS no.2519. Full reports can be provided upon written request.

[13] BS 1377 : Part 3 : 2018 + A1 2021 Clause 7.6. Sulphate testing is completed by K4 Soils Ltd who are accredited for the test UKAS no.2519. Full reports can be provided upon written request.

[14] SO_4 = 1.2 x SO_3

[15] BRE Special Digest One (Concrete in Aggressive Ground) August 2005

Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4M or DS-5M class respectively unless water soluble magnesium testing is undertaken to prove otherwise.

*** Non UKAS Accredited Testing.**

Key

D	Disturbed sample (small)
B	Disturbed sample (bulk)
U	Undisturbed sample
W	Groundwater sample
ENP	Essentially Non-Plastic by inspection
U/S	Underside of Foundation
H&F	Hair & Fibrous
D&D	Dead & Decomposing
DEV	Deviation

UKAS TESTING 28443

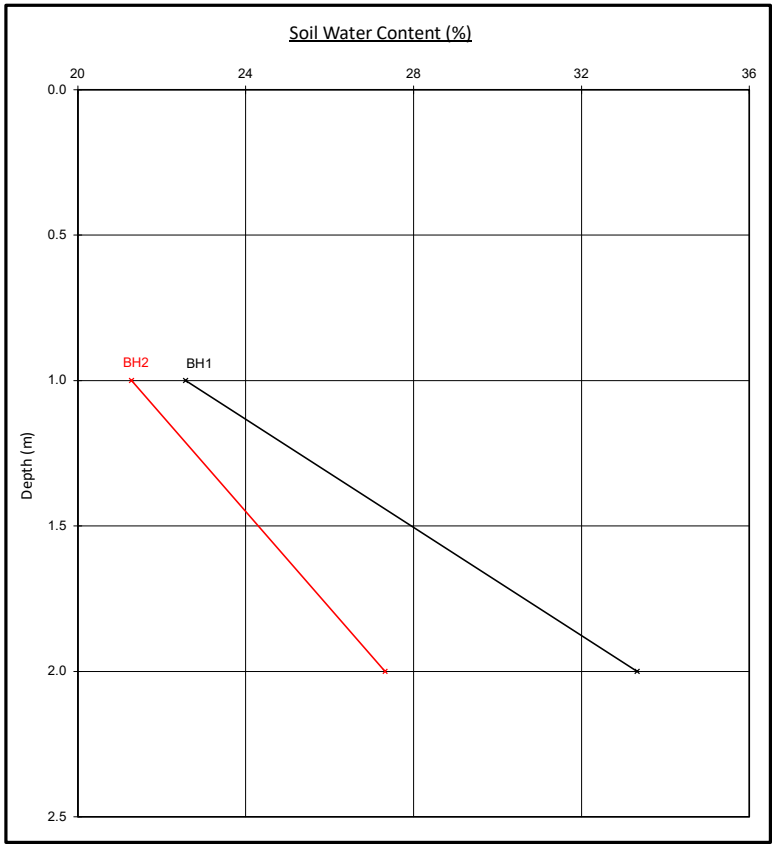
Test results reported relate only to the items tested.

This report shall not be reproduced except in full without approval of the laboratory.

Version: SumRep (Issue 1, Rev 0 & Issued 17.11.23)

Water Content Profiles

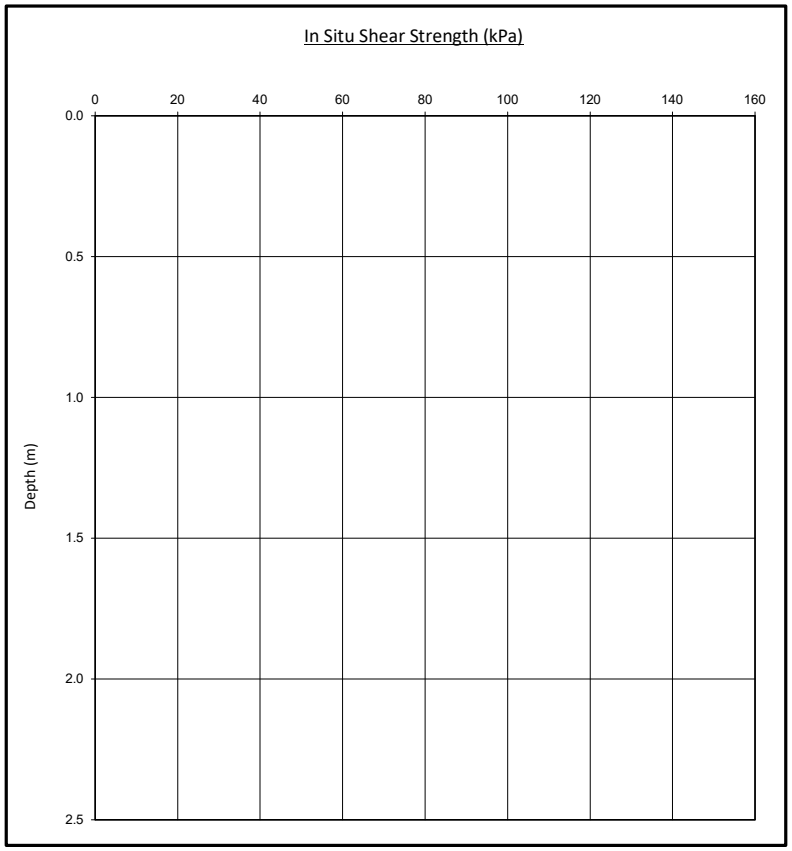
Our Ref : SCI250
Location : 27 Knowle Drive
Work carried out for: SCI
26 Ferraro Close, Heston, Middx



Notes
1. If plotted, 0.4 LL and PL+2 (after Driscoll, 1983) should only be applied to London Clay (and similarly overconsolidated clay) at shallow depths.

Shear Strength Profiles

Date Sampled : 28/07/2025
Date Received : 31/07/2025
Date Tested : 31/07/2025
Date of Report : 07/08/2025

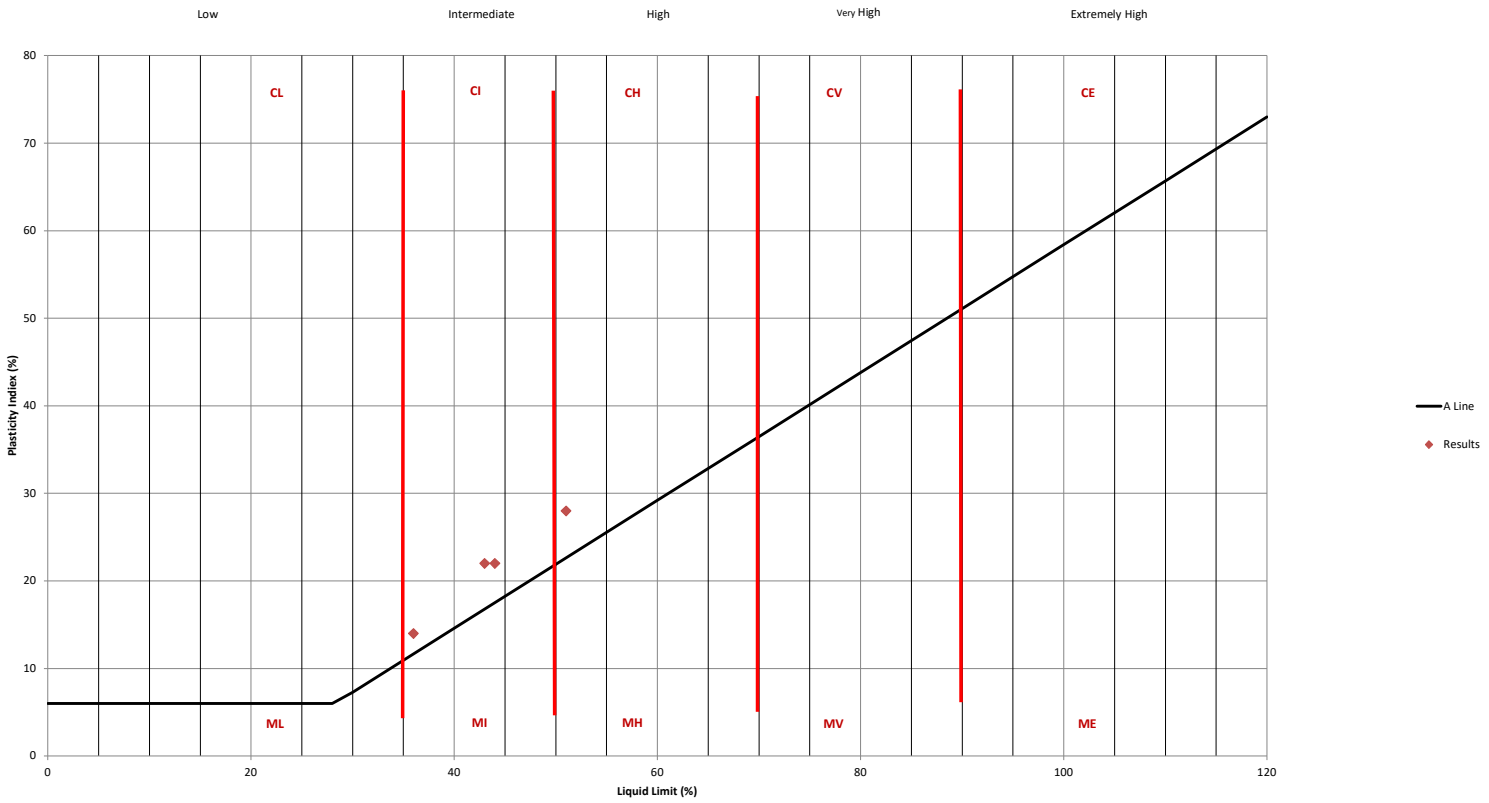


Note
1. Values of Shear Strength were determined in situ by use of a pilcon hand vane of which is limited to a maximum reading of 140kPa.

Plasticity Chart

Our Ref : SCI250
Location : 27 Knowle Drive
Work carried out for: SCI
26 Ferraro Close, Heston, Middx

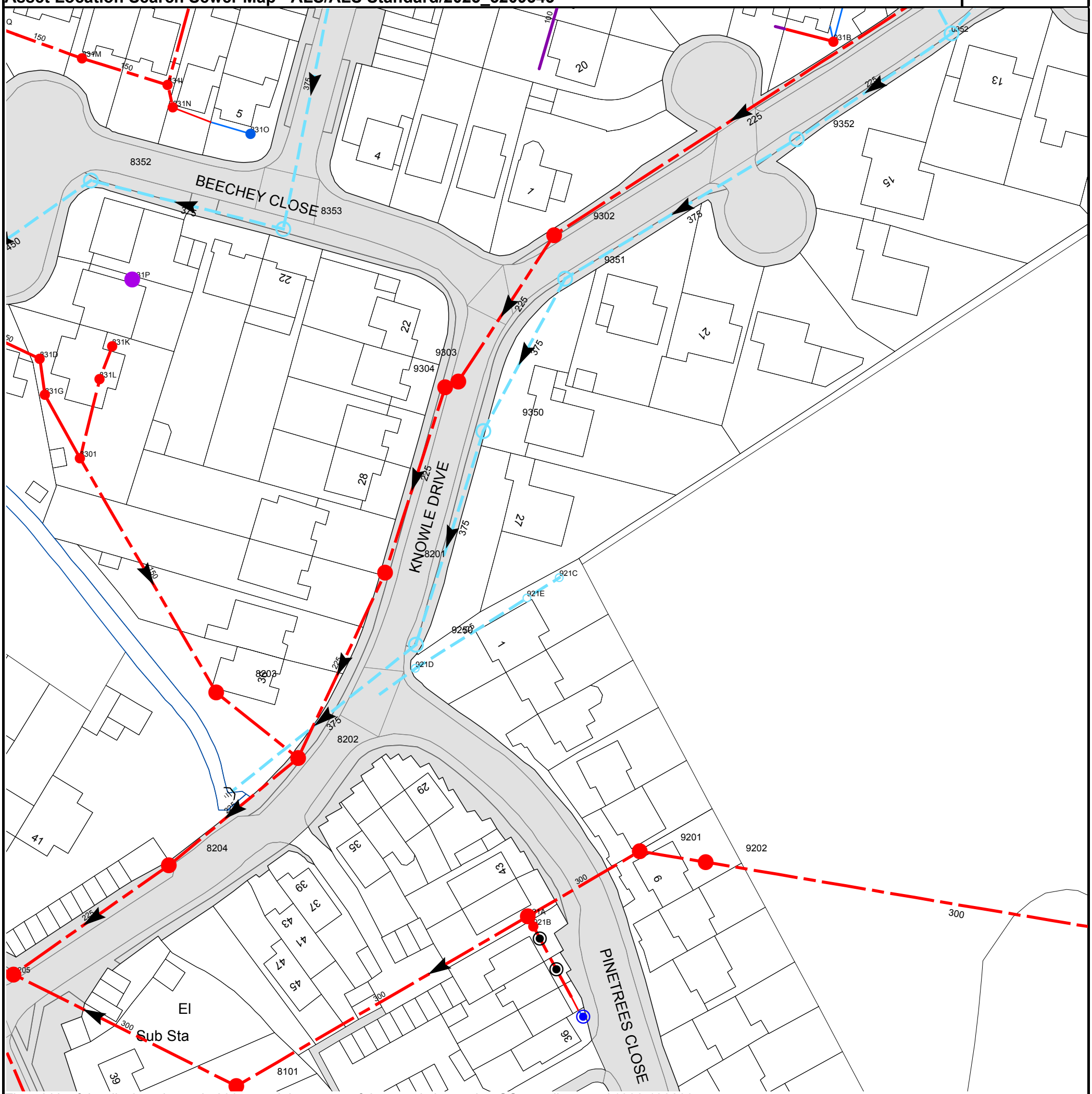
Date Sampled : 28/07/2025
Date Received : 31/07/2025
Date Tested : 31/07/2025
Date of Report : 07/08/2025



APPENDIX B

Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2025_5209343



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 531930,139293

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 (2024) with the Sanction of the controller of H.M. Stationery Office, License no. AC0000849556 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
8201	71.82	70.6
921D	n/a	n/a
9250	71.85	70.09
9304	72.28	70.68
9303	72.38	70.73
9350	72.22	70.4
921E	n/a	n/a
9302	72.82	70.87
921C	n/a	n/a
9351	72.56	70.95
9201	n/a	n/a
9202	n/a	n/a
9352	73.32	71.59
931B	n/a	n/a
0352	73.89	72.06
8101	71.61	70.52
921B	n/a	n/a
921A	n/a	n/a
8204	71.64	70.32
8202	71.42	70.39
8203	71.25	70.62
8301	71.56	70.98
831G	n/a	n/a
831L	n/a	n/a
831D	n/a	n/a
831K	n/a	n/a
831P	n/a	n/a
8353	71.38	70.02
8352	71.56	69.87
831O	n/a	n/a
831N	n/a	n/a
831I	n/a	n/a
831M	n/a	n/a
8205	72.07	70.22

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

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

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

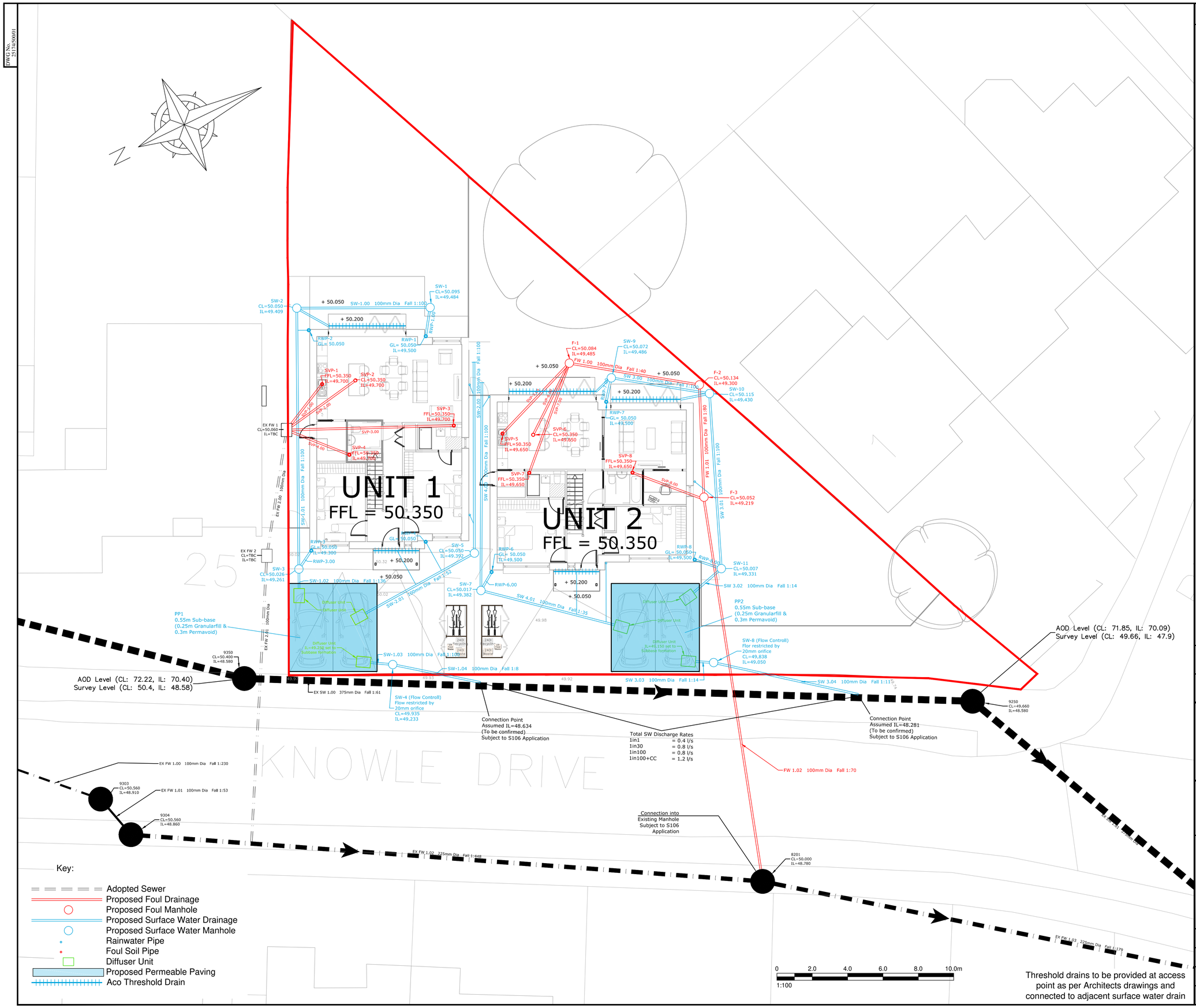
Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

APPENDIX C

251974/500/01 – Proposed Drainage Layout

DWG No.
251974500001



NOTES

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10. All precast concrete manhole units are to conform to B.S. 5911. Precast concrete cover slabs are to be heavy duty.
11. Downstream exit pipes of 600mm dia. and over should be fitted with heavy duty safety chains across their mouths.
12. Where large differential settlement is probable, several short lengths of pipe with flexible joints should be laid on either side of the chamber.
13. Where drains pass through foundations, a flexible joint should be provided within 150mm of the face of the structure.
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Rev	Amendment	Drawn	Checked	Approved	Date
P4	Increase size of Permeable Paving	IN	RS	KBL	17/03/26
P3	DRAWING REVISED	IN	RS	KBL	18/12/25
P2	DRAWING REVISED	RS	KBL	KBL	17/09/25
P1	RELLIMINARY ISSUE	RS	KBL	KBL	01/09/25

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
e-mail: info@lanmor.co.uk
www.lanmor.co.uk

27 Knowle Drive
Crawley

Drainage Layout
Site Plan

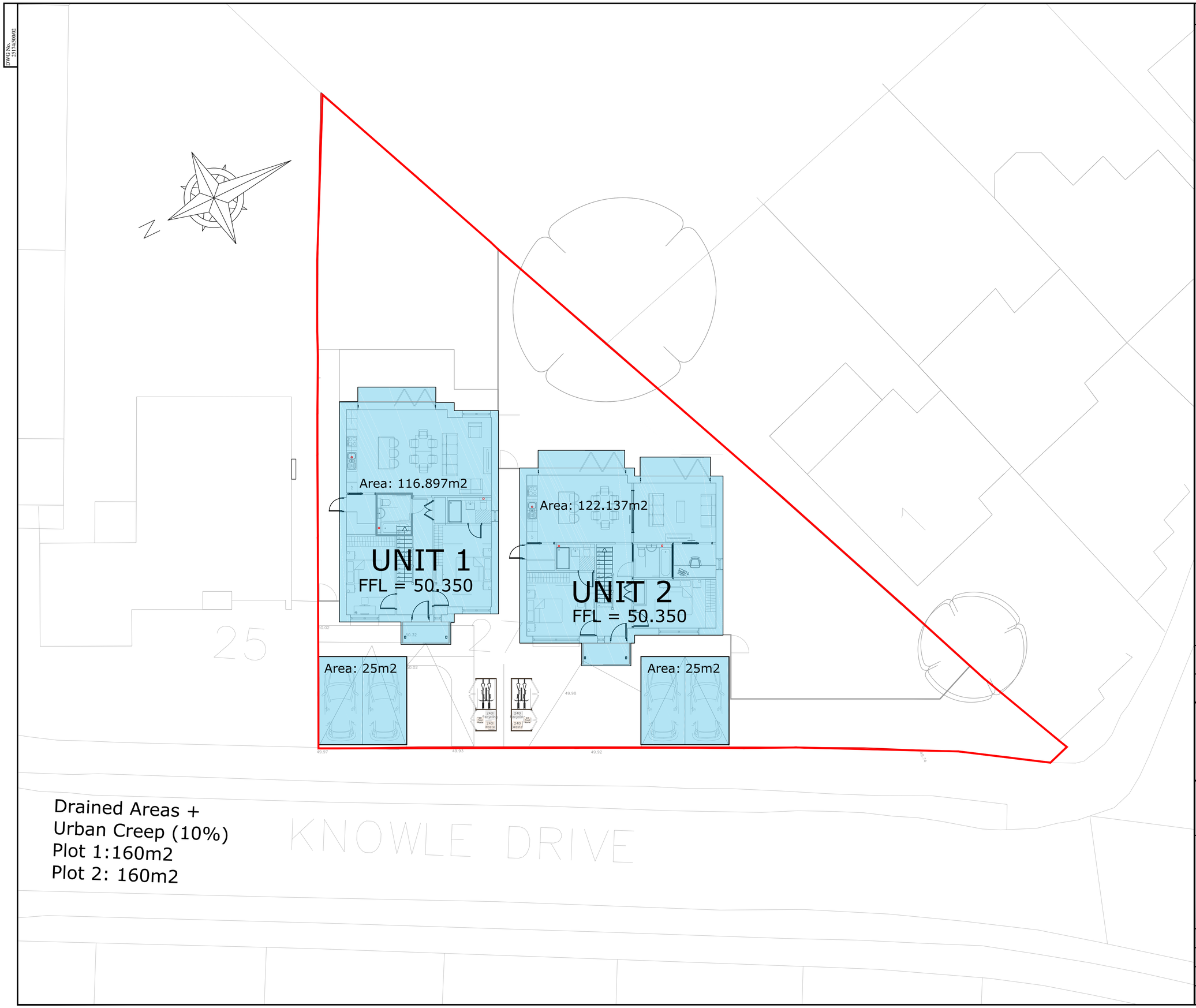
Sheet 1 of 4

DRAWN	CHECKED	APPROVED
RS	KBL	KBL
DATE Sep-25	DATE Sep-25	DATE Sep-25

SCALE	PRJ No.	SIZE	REV
1:100	251974	A1	P4
DWG No. 251974/500/01			

251974/500/02 – Drained Areas

DWG No.
251974500/02



Drained Areas +
Urban Creep (10%)
Plot 1:160m2
Plot 2: 160m2

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Rev	Amendment	Drawn	Checked	Approved	Date
P4	Urban Creep included for hardstandings	IN	RS	KBL	17/03/26
P3	DRAWING REVISED	IN	RS	KBL	18/12/25
P2	DRAWING REVISED	RS	KBL	KBL	17/09/25
P1	RELLIMINARY ISSUE	RS	KBL	KBL	01/09/25

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
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www.lanmor.co.uk

27 Knowle Drive
Crawley

Drained Areas
Site Plan

Sheet 2 of 4

DRAWN	CHECKED	APPROVED
RS	KBL	KBL
DATE Sep-25	DATE Sep-25	DATE Sep-25

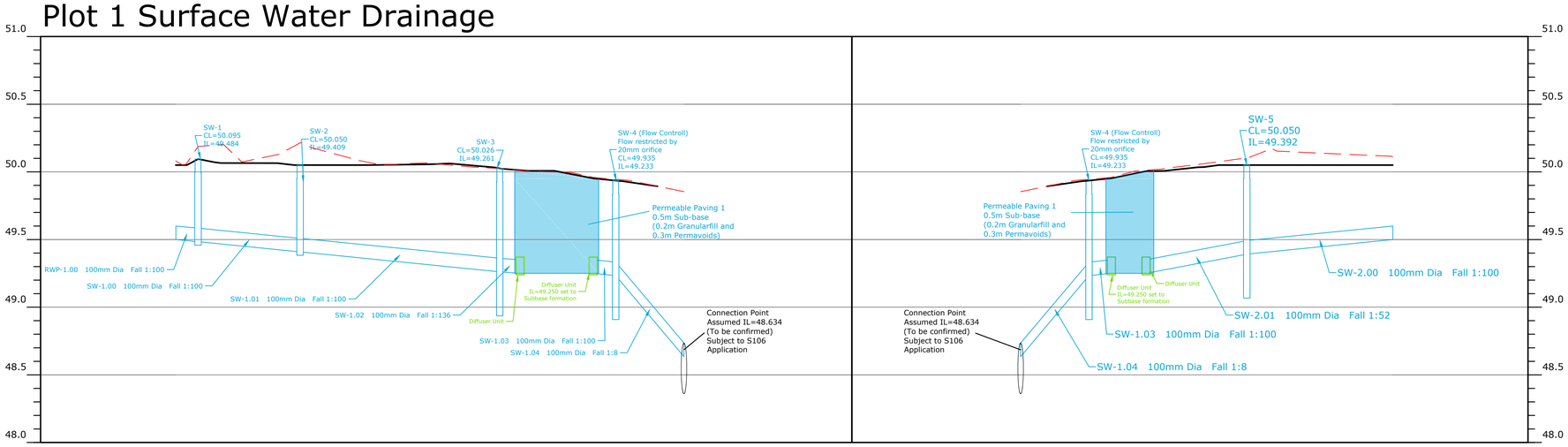
SCALE	PRJ No.	SIZE	REV
1:100	251974	A1	P4

DWG No. 251974/500/01

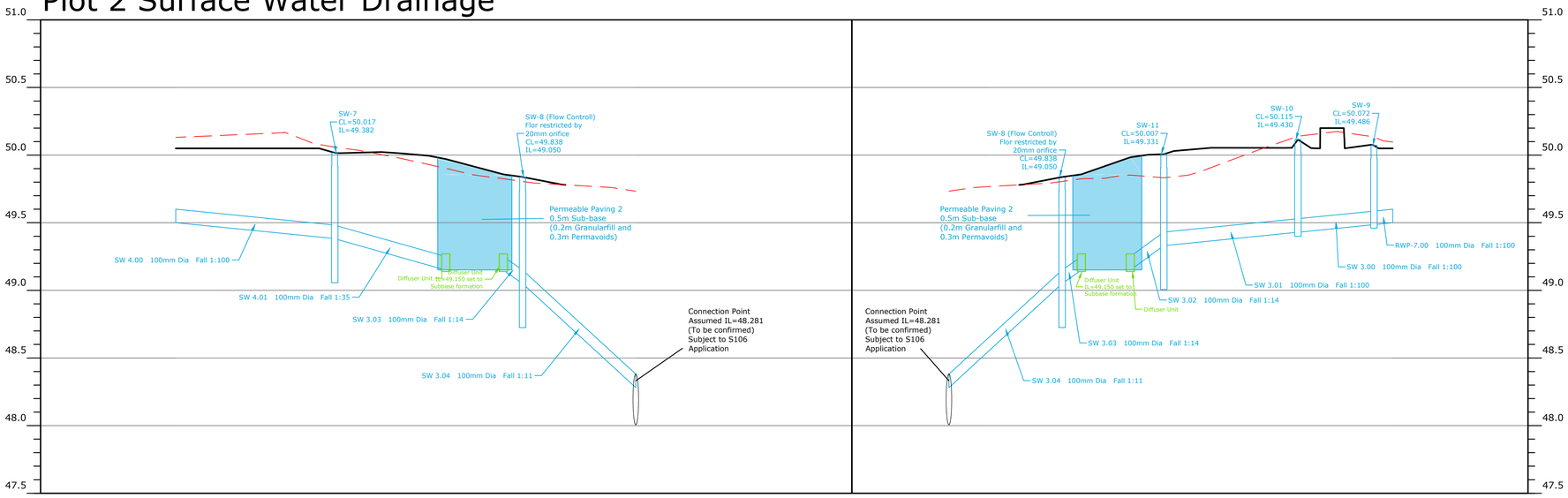
251974/510/01 – Sewer Long Sections

DWG No. 251974/510/01

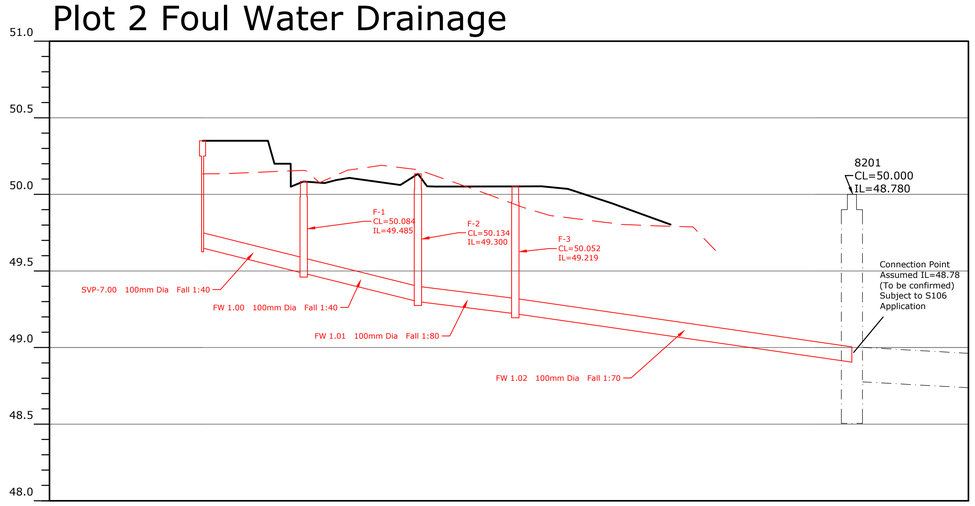
Plot 1 Surface Water Drainage



Plot 2 Surface Water Drainage



Plot 2 Foul Water Drainage



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Rev	Amendment	Drawn	Checked	Approved	Date
P4	Invert levels changed to avoid clashing	IN	RS	KBL	17/02/26
P3	DRAWING REVISED	IN	RS	KBL	18/12/25
P2	DRAWING REVISED	RS	KBL	KBL	17/09/25
P1	PRELLIMINARY ISSUE	RS	KBL	KBL	01/09/25

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Spring Developments Ltd

27 Knowle Drive
Crawley, RH10 3LW

Drainage Layout
Sewer Long Sections

Sheet 3 of 4

DRAWN	CHECKED	APPROVED
RS	KBL	KBL
DATE Aug-25	DATE Aug-25	DATE Aug-25

SCALE	PRJ No.	SIZE	REV
H 1:200 V 1:20	251974	A1	P4
DWG No. 251974/510/01			

251974/520/01 – Manhole & Sewer Schedules

DWG No. 251974/520/01

FOUL MANHOLE SCHEDULE

MH Ref	MH Internal Diameter	Cover Level	Depth of MH	MH Type	MH Cover	Pipe Connections	Comments
F-1	450 mm	50.084 m	0.599 m	PVC	Min Opening 430 x 430 Grade D400	No of pipe connections 4 SVP-5.00 100 mm Dia IL=49.485 m SVP-7.00 100 mm Dia IL=49.485 m SVP-6.00 100 mm Dia IL=49.485 m FW 1.00 100 mm Dia IL=49.485 m	
F-2	450 mm	50.134 m	0.834 m	PVC	Min Opening 430 x 430 Grade D400	No of pipe connections 2 FW 1.00 100 mm Dia IL=49.300 m FW 1.01 100 mm Dia IL=49.300 m	
F-3	450 mm	50.052 m	0.833 m	PVC	Min Opening 430 x 430 Grade D400	No of pipe connections 3 FW 1.01 100 mm Dia IL=49.219 m SVP-8.00 100 mm Dia IL=49.219 m FW 1.02 100 mm Dia IL=49.219 m	
SVP-1	100 mm	50.350 m	0.650 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-1.00 100 mm Dia IL=49.700 m	Standard
SVP-2	100 mm	50.350 m	0.650 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-2.00 100 mm Dia IL=49.700 m	Standard
SVP-3	100 mm	50.350 m	0.650 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-3.00 100 mm Dia IL=49.700 m	Standard
SVP-4	100 mm	50.350 m	0.650 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-4.00 100 mm Dia IL=49.700 m	Standard
SVP-5	100 mm	50.350 m	0.700 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-5.00 100 mm Dia IL=49.650 m	Standard
SVP-6	100 mm	50.350 m	0.700 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-6.00 100 mm Dia IL=49.650 m	Standard
SVP-7	100 mm	50.350 m	0.700 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-7.00 100 mm Dia IL=49.650 m	Standard
SVP-8	100 mm	50.350 m	0.700 m	Reinforced Concrete	Standard	No of pipe connections 1 SVP-8.00 100 mm Dia IL=49.650 m	Standard

FOUL PIPE SCHEDULE

Pipe Name	Diameter	Length	Slope	Material	Pipe Bed	Upstream Manhole	Upstream Invert	Downstream Manhole	Downstream Invert
FW 1.00	100 mm	7.458 m	1:40	PVC	S or Z	F-1	49.485 m	F-2	49.300 m
FW 1.01	100 mm	6.476 m	1:80	PVC	S or Z	F-2	49.300 m	F-3	49.219 m
FW 1.02	100 mm	21.857 m	1:70	PVC	S or Z	F-3	49.219 m	8201	48.905 m
SVP-1.00	100 mm	3.282 m	1:14	PVC	S or Z	SVP-1	49.700 m	EX FW 1	49.463 m
SVP-2.00	100 mm	4.797 m	1:20	PVC	S or Z	SVP-2	49.700 m	EX FW 1	49.463 m
SVP-3.00	100 mm	9.461 m	1:40	PVC	S or Z	SVP-3	49.700 m	EX FW 1	49.463 m
SVP-4.00	100 mm	3.817 m	1:16	PVC	S or Z	SVP-4	49.700 m	EX FW 1	49.463 m
SVP-5.00	100 mm	5.493 m	1:33	PVC	S or Z	SVP-5	49.650 m	F-1	49.485 m
SVP-6.00	100 mm	4.538 m	1:28	PVC	S or Z	SVP-6	49.650 m	F-1	49.485 m
SVP-7.00	100 mm	6.602 m	1:40	PVC	S or Z	SVP-7	49.650 m	F-1	49.485 m
SVP-8.00	100 mm	4.317 m	1:10	PVC	S or Z	SVP-8	49.650 m	F-3	49.219 m

SURFACE WATER MANHOLE SCHEDULE

MH Ref	MH Internal Diameter	Cover Level	Depth of MH	Sump Depth	MH Type	MH Cover	Pipe Connections	Comments
SW-1	450 mm	50.095 m	0.611 m	0.000 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 RWP-1.00 100 mm Dia IL=49.484 m SW-1.00 100 mm Dia IL=49.484 m	
SW-2	450 mm	50.050 m	0.641 m	0.000 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 SW-1.00 100 mm Dia IL=49.409 m SW-1.01 100 mm Dia IL=49.409 m	
SW-3	450 mm	50.026 m	1.065 m	0.300 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 3 SW-1.01 100 mm Dia IL=49.261 m RWP-3.00 100 mm Dia IL=49.261 m SW-1.02 100 mm Dia IL=49.261 m	Catchpit
SW-4	450 mm	49.935 m	1.002 m	0.300 m	PVC	Min Opening 430 x 430 Grade B125	No of pipe connections 2 SW-1.03 100 mm Dia IL=49.233 m SW-1.04 100 mm Dia IL=49.233 m	Flow Control Manhole Flow restricted by 20mm orifice
SW-5	450 mm	50.050 m	0.958 m	0.300 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 SW-2.00 100 mm Dia IL=49.392 m SW-2.01 100 mm Dia IL=49.392 m	Catchpit
SW-7	450 mm	50.017 m	0.935 m	0.300 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 3 SW 4.00 100 mm Dia IL=49.382 m RWP-6.00 100 mm Dia IL=49.382 m SW 4.01 100 mm Dia IL=49.382 m	Catchpit
SW-8	450 mm	49.838 m	1.088 m	0.300 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 SW 3.03 100 mm Dia IL=49.050 m SW 3.04 100 mm Dia IL=49.050 m	Flow Controll Manhole Flor restricted by 20mm orifice
SW-9	450 mm	50.072 m	0.586 m	0.000 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 RWP-7.00 100 mm Dia IL=49.486 m SW 3.00 100 mm Dia IL=49.486 m	
SW-10	450 mm	50.115 m	0.690 m	0.005 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 2 SW 3.00 100 mm Dia IL=49.430 m SW 3.01 100 mm Dia IL=49.430 m	
SW-11	450 mm	50.007 m	0.976 m	0.300 m	PVC	Max Opening 430 x 430 Grade B125	No of pipe connections 3 SW 3.01 100 mm Dia IL=49.331 m RWP-8.00 100 mm Dia IL=49.331 m SW 3.02 100 mm Dia IL=49.331 m	Catchpit

SURFACE WATER PIPE SCHEDULE

Pipe Name	Diameter	Length	Slope	Material	Pipe Bed	Upstream Manhole	Upstream Invert	Downstream Manhole	Downstream Invert
RWP-1.00	100 mm	1.640 m	1:100	PVC	S or Z	RWP-1	49.500 m	SW-1	49.484 m
RWP-3.00	100 mm	1.254 m	1:32	PVC	S or Z	RWP-3	49.300 m	SW-3	49.261 m
RWP-6.00	100 mm	1.202 m	1:10	PVC	S or Z	RWP-6	49.500 m	SW-7	49.382 m
RWP-7.00	100 mm	1.390 m	1:100	PVC	S or Z	RWP-7	49.500 m	SW-9	49.486 m
RWP-8.00	100 mm	1.590 m	1:9	PVC	S or Z	RWP-8	49.500 m	SW-11	49.331 m
SW-1.00	100 mm	7.541 m	1:100	PVC	S or Z	SW-1	49.484 m	SW-2	49.409 m
SW-1.01	100 mm	14.755 m	1:100	PVC	S or Z	SW-2	49.409 m	SW-3	49.261 m
SW-1.02	100 mm	1.500 m	1:136	PVC	S or Z	SW-3	49.261 m	D-1	49.250 m
SW-1.03	100 mm	1.657 m	1:100	PVC	S or Z	D-3	49.250 m	SW-4	49.233 m
SW-1.04	100 mm	5.053 m	1:8	PVC	S or Z	SW-4	49.233 m	EX SW 1.00	48.635 m
SW-2.00	100 mm	10.797 m	1:100	PVC	S or Z	RE	49.500 m	SW-5	49.392 m
SW-2.01	100 mm	7.446 m	1:52	PVC	S or Z	SW-5	49.392 m	D-2	49.250 m
SW 3.00	100 mm	5.623 m	1:100	PVC	S or Z	SW-9	49.486 m	SW-10	49.430 m
SW 3.01	100 mm	9.921 m	1:100	PVC	S or Z	SW-10	49.430 m	SW-11	49.331 m
SW 3.02	100 mm	2.480 m	1:14	PVC	S or Z	SW-11	49.331 m	D-5	49.150 m
SW 3.03	100 mm	1.422 m	1:14	PVC	S or Z	D-6	49.150 m	SW-8	49.050 m
SW 3.04	100 mm	8.372 m	1:11	PVC	S or Z	SW-8	49.050 m	EX SW 1.00	48.281 m
SW 4.00	100 mm	11.753 m	1:100	PVC	S or Z	RE	49.500 m	SW-7	49.382 m
SW 4.01	100 mm	8.211 m	1:35	PVC	S or Z	SW-7	49.382 m	D-4	49.150 m

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P3	DRAWING REVISED	IN	RS	KBL	18/12/25
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Telephone: 0208 339 7899 Fax: 0208 339 7898
e-mail: info@lanmor.co.uk
www.lanmor.co.uk

Spring Developments Ltd

27 Knowle Drive
Crawley, RH10 3LW

Surface Water & Foul
Manhole and Sewer Schedules

Sheet 4 of 4

DRAWN RS	CHECKED KBL	APPROVED KBL
DATE Aug-25	DATE Aug-25	DATE Aug-25

SCALE NTS	PRJ No. 251974	SIZE	REV
DWG No. 251974/520/01		A1	P4

APPENDIX D

Notice on Consent to connect to a Public Sewer

DS reference DS6148260

developer.services@thameswater.co.uk

0800 009 3921
Monday to Friday, 8am to 5pm

thameswater.co.uk/developerservices

Lanmor Consulting Ltd
Mr Robert Steventon
Thorogood House, 34 Tolworth Close
Surbiton
KT6 7EW

30 September 2025

Notice of consent to connect to a public sewer / public lateral drain

Site address: 27 Knowle Drive, Copthorne, Crawley RH10 3LW

Dear Mr Robert Steventon,

Thank you for your application for a new sewer connection at the above address.

We are pleased to inform you that we have given our conditional consent for your proposed connection(s) to the public sewer under Section 106 of the Water Industry Act 1991.

What is this consent for?

This consent is given solely for the legal right of communication (i.e. method/mode of connection) with the public sewer, in accordance with the description in the below box.

This consent does not and cannot be used to discharge any drainage related planning conditions. Any planning conditions related to drainage should be applied to be removed to the LPA and Thames Waters Development Control team. For pre planning capacity-based enquiries or pre planning concerns regarding our network please make a Pre-Planning Enquiry application. Applications can be made on the Thames Water website.

This Consent does not give you any inferred right to enter or cross land owned by a third party and must not be used to discharge any drainage-related planning conditions. You will be responsible for obtaining any necessary licences and/or permission from the highway authority, planning authority and/or private/third-party landowners.

Inspections and Completion certificates

We'll need to inspect the work if you're connecting directly to a public sewer or relocating/altering one of our manhole chambers. Please try to give us as much notice as possible to accommodate your preferred inspection date.

Call us on 0800 009 3921 Monday to Friday, 8am – 5pm to arrange an inspection.

Thames Water Utilities Limited – Registered Office: Clearwater Court, Vastern Road, Reading RG1 8DB
Company number 02366661. VAT registration no GB 537-4569-15

There are a few steps to remember:

- The work needs to be done exactly as described in the 'Consent to Connect' and as per our agreed specification
- You should be ready with all work completed to be inspected on date of inspection
- Make sure you leave the connection point open so we can fully inspect the work

If you fail to comply with any of the above at the time of inspection, e.g. the works are not complete, you are not ready, or the works do not meet the approved design specifications and fail to pass, we will charge you to come back another time. The revisit fee is £220 + VAT per visit.

Once you've passed the inspection, we'll issue a completion certificate. This confirms that your work has been completed and to the required standard.

This certificate authenticates the standards to which your connection works were carried out and does not infer adoption of your new drains or sewers. You will be responsible for repairs and maintenance of all drains including those outside your site boundary. You will need to submit an adoption application under section 102 or 104 of the Water Industry Act if you want us to adopt any of your lateral drains or sewers. You can do this via https://developers.thameswater.co.uk/Developing-a-large-site/Apply-and-pay-for-services/Wastewater-services/Adopting-sewers-and-other-assets

Sewer Connection Quotes

If you would like us to carry out the connection works on your behalf, we will provide you a quote and deliver in accordance with the below.

Waste connection only (no pipe laying)

We will discuss the requirements with you and quote for the works required and charge in accordance with section 7 (pages 25-28) of our current fixed price charging arrangements.

lateral drain and sewer requisitions

Waste connections including pipelaying for the provision of a lateral drain (pipe serving one property or one curtilage) and/or a new sewer (pipe serving more than one property).

If there is no public sewer easily accessible to your property or your site has no means to connect your lateral drain and/or sewer due to third party land, you can requisition (formally request) Thames Water to lay these pipes as part of our public network under Section 98-101 of the Water Industry Act 1991. Please refer to section 8 (pages 29-31) of our current charging arrangements.

You can estimate the costs for these connections yourself by referring to section 7 and 8 of our current charging arrangements here.

Charges | Developer services | Thames Water

Thames Water Utilities Limited – Registered Office: Clearwater Court, Vastern Road, Reading RG1 8DB
Company number 02366661. VAT registration no GB 537-4569-15

Our consent is subject to the conditions below:

Location	Description
27 Knowle Drive Copthorne, Crawley RH10 3LW	**FOUL - Direct Foul water Connection** 1 x 100mm internal diameter direct foul water connection into an existing uncharted 100mm internal diameter foul water sewer located in no.25 via an existing manhole chamber in accordance with Code for Adoption sewerage. **SURFACE - Direct Surface water Connection** 2 x 100mm internal diameter direct surface water connection into an existing 375mm internal diameter surface water sewer located in Knowle Drive via a pre-formed 'Y' junction in accordance with Code for Adoption sewerage **FOUL - Direct Foul water Connection** 1 x 100mm internal diameter direct foul water connection into an existing 225mm internal diameter foul water sewer located in Knowle Drive via a existing manhole chamber referenced TQ31398201 in accordance with Code for Adoption sewerage. As per drawing: 251974/500/01 p2

Please note that we will allow ONE amendment to be made to this consent within 12 months from date of issue. Any more than ONE amendment within this time will entail additional fees. Any amendments sought beyond this time will require a new application to be submitted.

The reference number for your application is DS6148260 please quote this in any future correspondence.

If you're making a connection from a basement, you'll need to ensure that you install the necessary backflow prevention devices to protect the property from internal flooding. You should assume that the local sewerage network will surcharge to local ground level. Please refer to condition 18 for more details.

If you're proposing to build within three metres of a public sewer, or within one metre of a lateral drain, you'll need to apply to us for a separate build over agreement. You can do this via thameswater.co.uk/buildover.

If you've any queries, please call our helpdesk on 0800 009 3921 (8am to 5pm, Monday to Friday) or email developer.services@thameswater.co.uk.

Thames Water Utilities Limited – Registered Office: Clearwater Court, Vastern Road, Reading RG1 8DB
Company number 02366661. VAT registration no GB 537-4569-15

Yours sincerely,

Ciara O'Connor on behalf of Thames Water
Technical Coordinator – Wastewater Connections

Thames Water Utilities Limited – Registered Office: Clearwater Court, Vastern Road, Reading RG1 8DB
Company number 02366661. VAT registration no GB 537-4569-15

Conditions of Consent

1. This consent is subject to conditions that may be imposed through the planning process.
2. An infrastructure charge will be payable as a result of connecting a property to the Public Sewerage System for the first time for domestic purposes by virtue of Section 146(2)b of the Water Industry Act 1991. We will invoice this charge separately if applicable.
3. Where the connection is to be made to a public sewer in third party land (i.e. outside your site boundary including public land), it is recommended that a demarcation chamber is constructed on the lateral drain at the property boundary, or as near to the property boundary as possible. The demarcation chamber and lateral drain will not be adopted as part of the section 106 agreement. You will need to submit an adoption agreement under section 102 or 104 of the Water Industry Act if you want us to adopt any of your private drains or sewers. You can do this via https://developers.thameswater.co.uk/Developing-a-large-site/Apply-and-pay-for-services/Wastewater-services/Adopting-sewers-and-other-assets
4. All materials used and standard of sewer connection works should be in accordance with Code for Adoption sewerage. Where the connection is to be constructed in plastic, please confirm the standards of materials to be used with a technical coordinator/project engineer prior to carrying out the connection. Please ensure that the specification sheet/documents for the plastic materials used are kept for review by the field engineer. Please refer to the attached Construction and Connection guide for best practice.
5. It is your responsibility to ensure that your works are inspected before the trench is backfilled. You must arrange our attendance by calling 0800 009 3921 and giving us at least ten working days' notice. If the connection cannot be inspected by a field engineer for any reason, we may request that the trench is reopened for inspection or require additional information deemed necessary for us to approve the connection. Where a connection is made via a heading/tunnelling or a field engineer cannot attend site within the agreed ten working days' notice period required, we may, in exceptional circumstances accept photographs and/or a CCTV survey report and footage subject to prior agreement with a Technical Coordinator or Project Engineer.
6. It is your responsibility to confirm the exact location, diameter, and invert levels of the public sewer prior to making the connection. You will be held liable for any misconnection (i.e. foul water discharge to a surface water sewer or surface water discharge to foul water sewer) resulting from this connection. Where you are making an indirect connection, you should carry out connectivity surveys to confirm the type of sewer your existing private drains connect to and take appropriate action to rectify if you find cross connections.
7. Connections into manholes must be made with soffits level and must enter 'with the flow'. Backdrops must be constructed outside the manhole chamber.
8. Junction connections must be made by cutting in a purpose made oblique or swept junction fitting of the same material as the public sewer, jointed using flexible couplings. Core drilled saddle connections are usually not permitted on sewers smaller than 375mm (unless otherwise approved by a Technical Coordinator/Project Engineer in writing).

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Where a core drilled saddle connection is approved, a flexible saddle fitting must be used to ensure that no part of the new drains protrude into the existing sewer. We do not accept clay saddles attached to the public sewer with mortar.

9. Some Infill/recessed manhole/chamber covers are permitted on adoptable drains/sewers in accordance with the attached construction and connection guide.
10. All connections to the public sewer should be via a gravity-fed pipe. A direct connection of a rising/pumped main to the public sewer is not permitted. Where there is a proposed connection from a pump station, a break chamber should be installed at the end of the pumped main to ensure that flows into the public sewer are via gravity for a minimum of 5m
11. It is your responsibility to ensure that your appointed private drainage contractor is competent and has all relevant permits necessary to carry out the connection. You will be responsible for obtaining any easements for crossing third party land and licences from the highway authority. All requirements of the highway authority must be observed and signing, guarding and lighting will be required at all times in accordance with Chapter 8 of the Department of Transport's Traffic Signs Manual 2009.
12. Where there is a proposed discharge from a private pumping station and rising main system, it is your responsibility to design the system to ensure acceptable discharge levels of hydrogen sulphide (H2S), this can be achieved by ensuring that all effluent is cycled through the pumping station and rising main within a maximum of six hours to prevent septicity. Where necessary, preventative measures to ensure H2S cannot build up to dangerous levels in the system should be installed. You will be responsible for the ongoing maintenance and monitoring of the private system. Hydrogen sulphide is a major public health risk and causes serious damage to the receiving sewerage network which may result in a third party damage claim against you under Section 111 of the Water Industry Act 1991.
13. Under no circumstances should foul water be discharged into the surface water sewerage system. Surface water drainage must not discharge to the foul sewerage system unless otherwise stated in the description above. If you want to discharge surface water directly to a soakaway or to a watercourse, then you will need to obtain the consent of the Environment Agency or the Lead Local Flood Authority.
14. All proposed discharge of surface water flows must be in accordance with the site's drainage strategy as approved by planning application, which should specify the final discharge rates and volumes. Sites proposing to discharge surface water flows with no planning requirement must connect into the nearest surface water sewer unless otherwise agreed by Thames Water.
15. Only the connections detailed in the enclosed notice are approved by Thames Water. No other works affecting the public sewerage system may be carried out without Thames Water's written consent.
16. Confined space entry procedures must be observed when breaking into the existing public sewerage system.

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17. Where the developer/owner/occupier proposes to discharge trade effluent into the public sewer, a trade effluent consent will be required. Trade effluent can be best described as anything other than domestic sewage (toilet, bath or sink waste) or uncontaminated surface water and roof drainage (rainwater). For enquiries and application forms contact your Retailer or visit the Thames Water website at https://wholesale.thameswater.co.uk/Wholesale-services/Business-customers/Trade-effluent

18. For low-lying sites (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connection connects to the public sewer) care should be taken to ensure that the property is not at increased risk of flooding. For more information on how to protect your property (s) from internal flooding please refer to Building Regs Part H1 (Surcharging of drains, conditions 2.8, 2.9.2.11 & 2.12)

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Hazard information
Third-party connection to sewers

Anyone wishing to connect their property to a Thames Water sewer must comply with the requirements of Section 106 of the Water Act 1991, as amended.

Significant Hazards

We strongly recommend that before carrying out work to connect to our sewers, you consider the following significant hazards:

- Oxygen deficiency
- Toxic gases, fumes or vapours
- Explosion (methane, petrol)
- Flooding
- Physical injury (slips, trips, falls)
- Infections from sewage (Weils disease)

Confined spaces

Particular care must be taken before entering or working in confined spaces. A confined space is defined as any place in which, by virtue of its enclosed nature, there arises a foreseeable specified risk. A specified risk is a risk of any of the following:

- Serious injury from a fire or explosion
- Loss of consciousness due to an increase in body temperature
- Loss of consciousness or asphyxiation arising from gases or the lack of oxygen
- Drowning arising from an increase in the level of a liquid

In addition:

- When detailing the private drainage, you should assume that the public sewer might occasionally surcharge up to ground level, and particular care is needed where development is proposed in low lying areas.
- Before entering any Thames Water asset a competent person must carry out an assessment to determine the need for entry and a safe system of work to be applied.
- Children and young persons must not enter the workspace.
- After the sewer connection work, it is important to wash before eating, smoking or treating cuts and abrasions. It is also important to avoid infection by maintaining strict personal hygiene and effective care of cuts and abrasions.

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Company number 02366661. VAT registration no GB 537-4569-15

APPENDIX E

MicroDrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.079	Urban	0.000
SAAR (mm)	840	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.4
QBAR Urban	0.4
Q100 years	1.4
Q1 year	0.4
Q30 years	1.0
Q100 years	1.4

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Summary of Results for 1 year Return Period

Half Drain Time : 92 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.287	0.037	0.0	0.1	0.1	0.9	O K
30 min Summer	49.299	0.049	0.0	0.2	0.2	1.2	O K
60 min Summer	49.311	0.061	0.0	0.2	0.2	1.4	O K
120 min Summer	49.320	0.070	0.0	0.2	0.2	1.7	O K
180 min Summer	49.325	0.075	0.0	0.2	0.2	1.8	O K
240 min Summer	49.327	0.077	0.0	0.2	0.2	1.8	O K
360 min Summer	49.327	0.077	0.0	0.2	0.2	1.8	O K
480 min Summer	49.325	0.075	0.0	0.2	0.2	1.8	O K
600 min Summer	49.322	0.072	0.0	0.2	0.2	1.7	O K
720 min Summer	49.319	0.069	0.0	0.2	0.2	1.6	O K
960 min Summer	49.313	0.063	0.0	0.2	0.2	1.5	O K
1440 min Summer	49.303	0.053	0.0	0.2	0.2	1.3	O K
2160 min Summer	49.293	0.043	0.0	0.2	0.2	1.0	O K
2880 min Summer	49.286	0.036	0.0	0.1	0.1	0.9	O K
4320 min Summer	49.279	0.029	0.0	0.1	0.1	0.7	O K
5760 min Summer	49.275	0.025	0.0	0.1	0.1	0.6	O K
7200 min Summer	49.273	0.023	0.0	0.1	0.1	0.5	O K
8640 min Summer	49.271	0.021	0.0	0.1	0.1	0.5	O K
10080 min Summer	49.270	0.020	0.0	0.1	0.1	0.5	O K
15 min Winter	49.287	0.037	0.0	0.1	0.1	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.648	0.0	0.9	18
30 min Summer	19.726	0.0	1.3	32
60 min Summer	12.800	0.0	1.8	60
120 min Summer	8.156	0.0	2.3	90
180 min Summer	6.242	0.0	2.7	124
240 min Summer	5.155	0.0	3.0	158
360 min Summer	3.898	0.0	3.4	226
480 min Summer	3.196	0.0	3.8	292
600 min Summer	2.740	0.0	4.1	358
720 min Summer	2.417	0.0	4.3	422
960 min Summer	1.983	0.0	4.7	548
1440 min Summer	1.501	0.0	5.3	794
2160 min Summer	1.134	0.0	6.0	1148
2880 min Summer	0.930	0.0	6.6	1504
4320 min Summer	0.704	0.0	7.4	2208
5760 min Summer	0.578	0.0	8.0	2936
7200 min Summer	0.495	0.0	8.5	3672
8640 min Summer	0.436	0.0	8.9	4400
10080 min Summer	0.391	0.0	9.2	5136
15 min Winter	29.648	0.0	0.9	18

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.300	0.050	0.0	0.2	0.2	1.2	O K
60 min Winter	49.311	0.061	0.0	0.2	0.2	1.5	O K
120 min Winter	49.320	0.070	0.0	0.2	0.2	1.7	O K
180 min Winter	49.323	0.073	0.0	0.2	0.2	1.7	O K
240 min Winter	49.324	0.074	0.0	0.2	0.2	1.7	O K
360 min Winter	49.321	0.071	0.0	0.2	0.2	1.7	O K
480 min Winter	49.317	0.067	0.0	0.2	0.2	1.6	O K
600 min Winter	49.312	0.062	0.0	0.2	0.2	1.5	O K
720 min Winter	49.308	0.058	0.0	0.2	0.2	1.4	O K
960 min Winter	49.301	0.051	0.0	0.2	0.2	1.2	O K
1440 min Winter	49.290	0.040	0.0	0.1	0.1	0.9	O K
2160 min Winter	49.280	0.030	0.0	0.1	0.1	0.7	O K
2880 min Winter	49.276	0.026	0.0	0.1	0.1	0.6	O K
4320 min Winter	49.272	0.022	0.0	0.1	0.1	0.5	O K
5760 min Winter	49.269	0.019	0.0	0.1	0.1	0.5	O K
7200 min Winter	49.268	0.018	0.0	0.1	0.1	0.4	O K
8640 min Winter	49.266	0.016	0.0	0.0	0.0	0.4	O K
10080 min Winter	49.265	0.015	0.0	0.0	0.0	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	19.726	0.0	1.3	31
60 min Winter	12.800	0.0	1.8	58
120 min Winter	8.156	0.0	2.3	94
180 min Winter	6.242	0.0	2.7	132
240 min Winter	5.155	0.0	3.0	170
360 min Winter	3.898	0.0	3.4	242
480 min Winter	3.196	0.0	3.8	310
600 min Winter	2.740	0.0	4.1	376
720 min Winter	2.417	0.0	4.3	442
960 min Winter	1.983	0.0	4.7	568
1440 min Winter	1.501	0.0	5.3	810
2160 min Winter	1.134	0.0	6.0	1152
2880 min Winter	0.930	0.0	6.6	1496
4320 min Winter	0.704	0.0	7.4	2208
5760 min Winter	0.578	0.0	8.0	2936
7200 min Winter	0.495	0.0	8.5	3728
8640 min Winter	0.436	0.0	8.9	4360
10080 min Winter	0.391	0.0	9.2	5112

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.950

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.250	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.550	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.250

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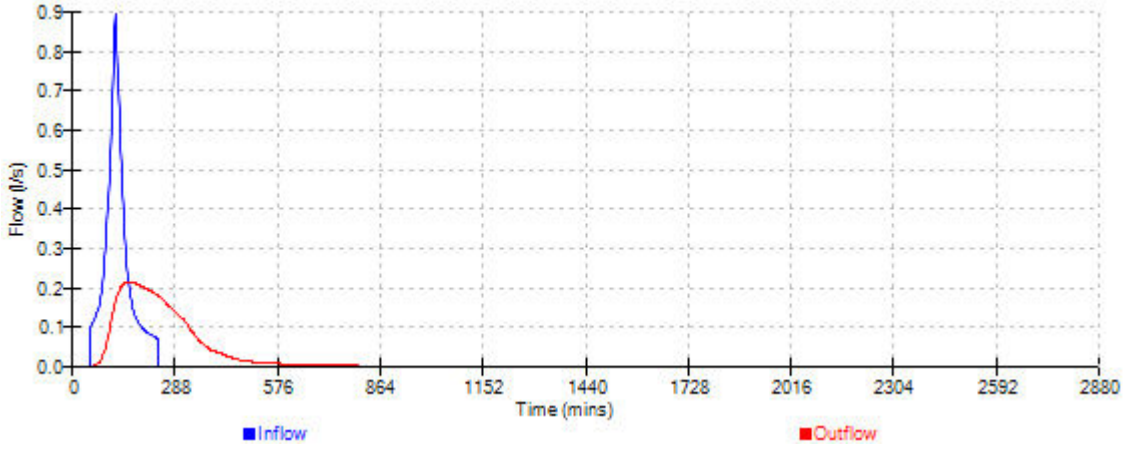
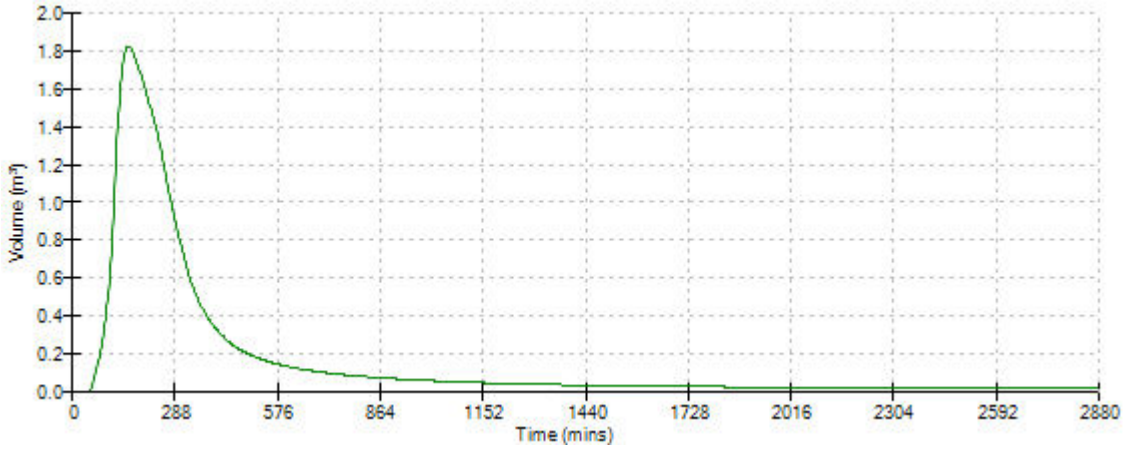
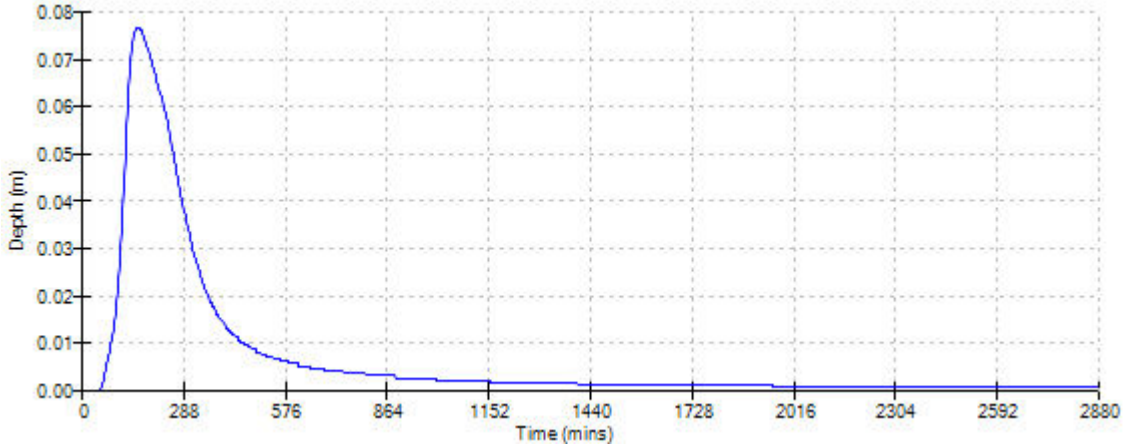
Event: 240 min Summer







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Summary of Results for 30 year Return Period

Half Drain Time : 129 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.356	0.106	0.0	0.3	0.3	2.5	O K
30 min Summer	49.389	0.139	0.0	0.3	0.3	3.3	O K
60 min Summer	49.418	0.168	0.0	0.3	0.3	4.0	O K
120 min Summer	49.435	0.185	0.0	0.3	0.3	4.4	O K
180 min Summer	49.441	0.191	0.0	0.4	0.4	4.5	O K
240 min Summer	49.442	0.192	0.0	0.4	0.4	4.6	O K
360 min Summer	49.440	0.190	0.0	0.4	0.4	4.5	O K
480 min Summer	49.434	0.184	0.0	0.3	0.3	4.4	O K
600 min Summer	49.426	0.176	0.0	0.3	0.3	4.2	O K
720 min Summer	49.419	0.169	0.0	0.3	0.3	4.0	O K
960 min Summer	49.405	0.155	0.0	0.3	0.3	3.7	O K
1440 min Summer	49.380	0.130	0.0	0.3	0.3	3.1	O K
2160 min Summer	49.353	0.103	0.0	0.3	0.3	2.5	O K
2880 min Summer	49.335	0.085	0.0	0.2	0.2	2.0	O K
4320 min Summer	49.311	0.061	0.0	0.2	0.2	1.4	O K
5760 min Summer	49.297	0.047	0.0	0.2	0.2	1.1	O K
7200 min Summer	49.289	0.039	0.0	0.1	0.1	0.9	O K
8640 min Summer	49.283	0.033	0.0	0.1	0.1	0.8	O K
10080 min Summer	49.279	0.029	0.0	0.1	0.1	0.7	O K
15 min Winter	49.356	0.106	0.0	0.3	0.3	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.682	0.0	2.6	18
30 min Summer	48.363	0.0	3.6	32
60 min Summer	30.811	0.0	4.7	62
120 min Summer	19.036	0.0	5.8	102
180 min Summer	14.191	0.0	6.5	134
240 min Summer	11.467	0.0	7.0	168
360 min Summer	8.493	0.0	7.8	236
480 min Summer	6.855	0.0	8.5	304
600 min Summer	5.801	0.0	8.9	374
720 min Summer	5.059	0.0	9.4	440
960 min Summer	4.074	0.0	10.1	568
1440 min Summer	2.998	0.0	11.1	822
2160 min Summer	2.203	0.0	12.2	1188
2880 min Summer	1.769	0.0	13.0	1556
4320 min Summer	1.297	0.0	14.2	2252
5760 min Summer	1.040	0.0	15.1	2992
7200 min Summer	0.876	0.0	15.8	3680
8640 min Summer	0.762	0.0	16.4	4408
10080 min Summer	0.677	0.0	16.9	5136
15 min Winter	72.682	0.0	2.6	18

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.389	0.139	0.0	0.3	0.3	3.3	O K
60 min Winter	49.419	0.169	0.0	0.3	0.3	4.0	O K
120 min Winter	49.436	0.186	0.0	0.4	0.4	4.4	O K
180 min Winter	49.440	0.190	0.0	0.4	0.4	4.5	O K
240 min Winter	49.439	0.189	0.0	0.4	0.4	4.5	O K
360 min Winter	49.432	0.182	0.0	0.3	0.3	4.3	O K
480 min Winter	49.422	0.172	0.0	0.3	0.3	4.1	O K
600 min Winter	49.411	0.161	0.0	0.3	0.3	3.8	O K
720 min Winter	49.401	0.151	0.0	0.3	0.3	3.6	O K
960 min Winter	49.382	0.132	0.0	0.3	0.3	3.1	O K
1440 min Winter	49.353	0.103	0.0	0.3	0.3	2.4	O K
2160 min Winter	49.324	0.074	0.0	0.2	0.2	1.8	O K
2880 min Winter	49.306	0.056	0.0	0.2	0.2	1.3	O K
4320 min Winter	49.288	0.038	0.0	0.1	0.1	0.9	O K
5760 min Winter	49.279	0.029	0.0	0.1	0.1	0.7	O K
7200 min Winter	49.275	0.025	0.0	0.1	0.1	0.6	O K
8640 min Winter	49.273	0.023	0.0	0.1	0.1	0.5	O K
10080 min Winter	49.271	0.021	0.0	0.1	0.1	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	48.363	0.0	3.6	32
60 min Winter	30.811	0.0	4.7	60
120 min Winter	19.036	0.0	5.8	112
180 min Winter	14.191	0.0	6.5	140
240 min Winter	11.467	0.0	7.0	178
360 min Winter	8.493	0.0	7.8	254
480 min Winter	6.855	0.0	8.5	326
600 min Winter	5.801	0.0	8.9	398
720 min Winter	5.059	0.0	9.4	464
960 min Winter	4.074	0.0	10.1	598
1440 min Winter	2.998	0.0	11.1	852
2160 min Winter	2.203	0.0	12.2	1216
2880 min Winter	1.769	0.0	13.0	1584
4320 min Winter	1.297	0.0	14.2	2288
5760 min Winter	1.040	0.0	15.1	2944
7200 min Winter	0.876	0.0	15.8	3680
8640 min Winter	0.762	0.0	16.4	4336
10080 min Winter	0.677	0.0	16.9	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.950

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.250	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.550	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.250

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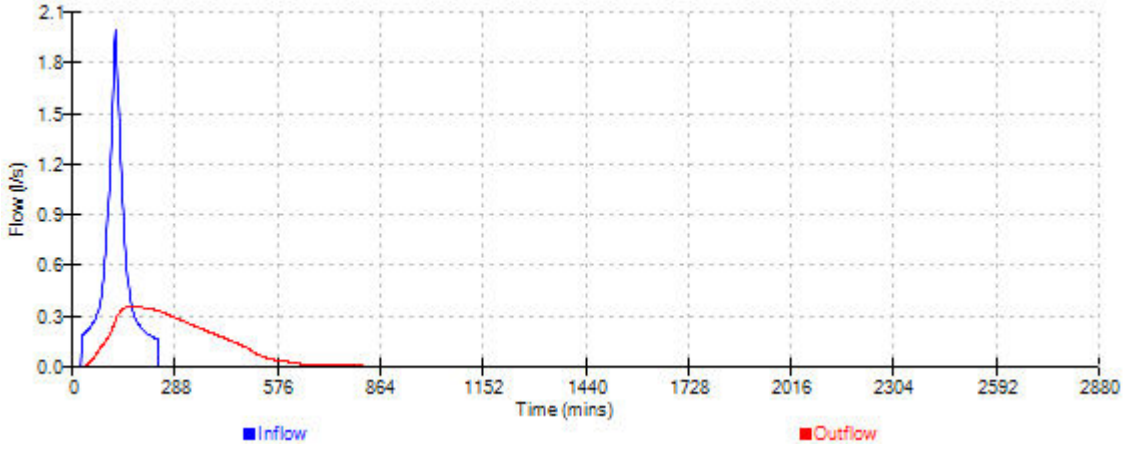
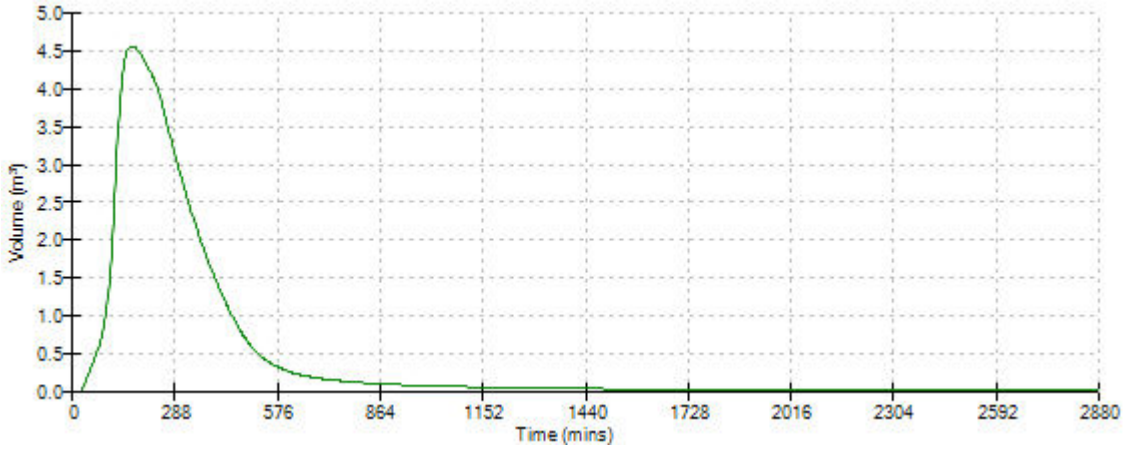
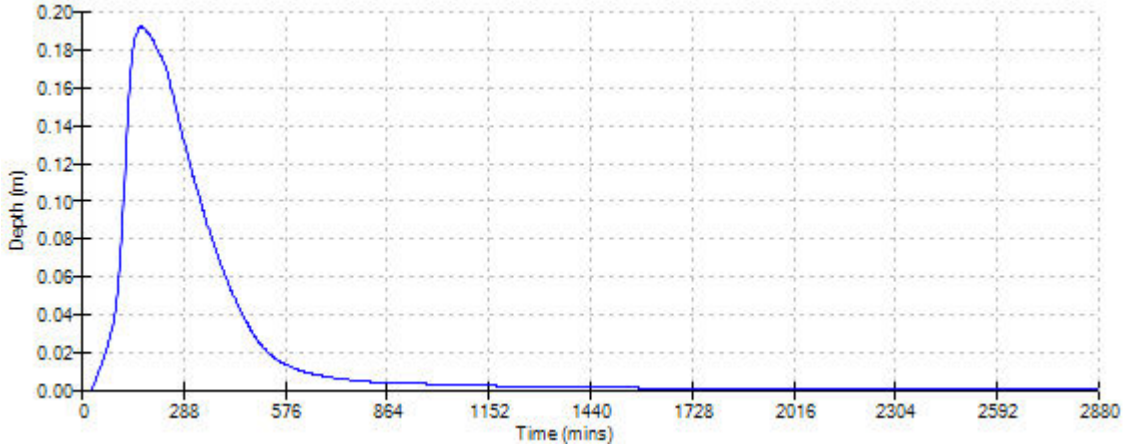
Event: 240 min Summer







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Summary of Results for 100 year Return Period

Half Drain Time : 151 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.391	0.141	0.0	0.3	0.3	3.3	O K
30 min Summer	49.436	0.186	0.0	0.4	0.4	4.4	O K
60 min Summer	49.477	0.227	0.0	0.4	0.4	5.4	O K
120 min Summer	49.502	0.252	0.0	0.4	0.4	6.0	O K
180 min Summer	49.508	0.258	0.0	0.4	0.4	6.1	O K
240 min Summer	49.509	0.259	0.0	0.4	0.4	6.1	O K
360 min Summer	49.505	0.255	0.0	0.4	0.4	6.1	O K
480 min Summer	49.497	0.247	0.0	0.4	0.4	5.9	O K
600 min Summer	49.488	0.238	0.0	0.4	0.4	5.7	O K
720 min Summer	49.478	0.228	0.0	0.4	0.4	5.4	O K
960 min Summer	49.459	0.209	0.0	0.4	0.4	5.0	O K
1440 min Summer	49.426	0.176	0.0	0.3	0.3	4.2	O K
2160 min Summer	49.390	0.140	0.0	0.3	0.3	3.3	O K
2880 min Summer	49.365	0.115	0.0	0.3	0.3	2.7	O K
4320 min Summer	49.332	0.082	0.0	0.2	0.2	1.9	O K
5760 min Summer	49.313	0.063	0.0	0.2	0.2	1.5	O K
7200 min Summer	49.300	0.050	0.0	0.2	0.2	1.2	O K
8640 min Summer	49.292	0.042	0.0	0.1	0.1	1.0	O K
10080 min Summer	49.286	0.036	0.0	0.1	0.1	0.9	O K
15 min Winter	49.391	0.141	0.0	0.3	0.3	3.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.179	0.0	3.5	18
30 min Summer	63.261	0.0	4.8	32
60 min Summer	40.510	0.0	6.2	62
120 min Summer	25.003	0.0	7.7	110
180 min Summer	18.552	0.0	8.6	140
240 min Summer	14.912	0.0	9.3	172
360 min Summer	10.975	0.0	10.2	240
480 min Summer	8.815	0.0	11.0	310
600 min Summer	7.430	0.0	11.6	378
720 min Summer	6.458	0.0	12.1	444
960 min Summer	5.172	0.0	12.9	578
1440 min Summer	3.774	0.0	14.1	836
2160 min Summer	2.748	0.0	15.3	1208
2880 min Summer	2.192	0.0	16.3	1560
4320 min Summer	1.590	0.0	17.6	2288
5760 min Summer	1.265	0.0	18.6	3000
7200 min Summer	1.060	0.0	19.3	3680
8640 min Summer	0.917	0.0	20.0	4416
10080 min Summer	0.812	0.0	20.5	5144
15 min Winter	94.179	0.0	3.5	18

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.437	0.187	0.0	0.4	0.4	4.4	O K
60 min Winter	49.478	0.228	0.0	0.4	0.4	5.4	O K
120 min Winter	49.504	0.254	0.0	0.4	0.4	6.0	O K
180 min Winter	49.507	0.257	0.0	0.4	0.4	6.1	O K
240 min Winter	49.506	0.256	0.0	0.4	0.4	6.1	O K
360 min Winter	49.498	0.248	0.0	0.4	0.4	5.9	O K
480 min Winter	49.485	0.235	0.0	0.4	0.4	5.6	O K
600 min Winter	49.471	0.221	0.0	0.4	0.4	5.3	O K
720 min Winter	49.458	0.208	0.0	0.4	0.4	4.9	O K
960 min Winter	49.433	0.183	0.0	0.3	0.3	4.3	O K
1440 min Winter	49.393	0.143	0.0	0.3	0.3	3.4	O K
2160 min Winter	49.353	0.103	0.0	0.3	0.3	2.4	O K
2880 min Winter	49.328	0.078	0.0	0.2	0.2	1.9	O K
4320 min Winter	49.301	0.051	0.0	0.2	0.2	1.2	O K
5760 min Winter	49.287	0.037	0.0	0.1	0.1	0.9	O K
7200 min Winter	49.279	0.029	0.0	0.1	0.1	0.7	O K
8640 min Winter	49.276	0.026	0.0	0.1	0.1	0.6	O K
10080 min Winter	49.274	0.024	0.0	0.1	0.1	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	63.261	0.0	4.8	32
60 min Winter	40.510	0.0	6.2	60
120 min Winter	25.003	0.0	7.7	114
180 min Winter	18.552	0.0	8.6	144
240 min Winter	14.912	0.0	9.3	182
360 min Winter	10.975	0.0	10.2	258
480 min Winter	8.815	0.0	11.0	332
600 min Winter	7.430	0.0	11.6	404
720 min Winter	6.458	0.0	12.1	472
960 min Winter	5.172	0.0	12.9	608
1440 min Winter	3.774	0.0	14.1	866
2160 min Winter	2.748	0.0	15.3	1236
2880 min Winter	2.192	0.0	16.3	1588
4320 min Winter	1.590	0.0	17.6	2292
5760 min Winter	1.265	0.0	18.6	3000
7200 min Winter	1.060	0.0	19.3	3680
8640 min Winter	0.917	0.0	20.0	4408
10080 min Winter	0.812	0.0	20.5	5008

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.950

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.250	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.550	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.250

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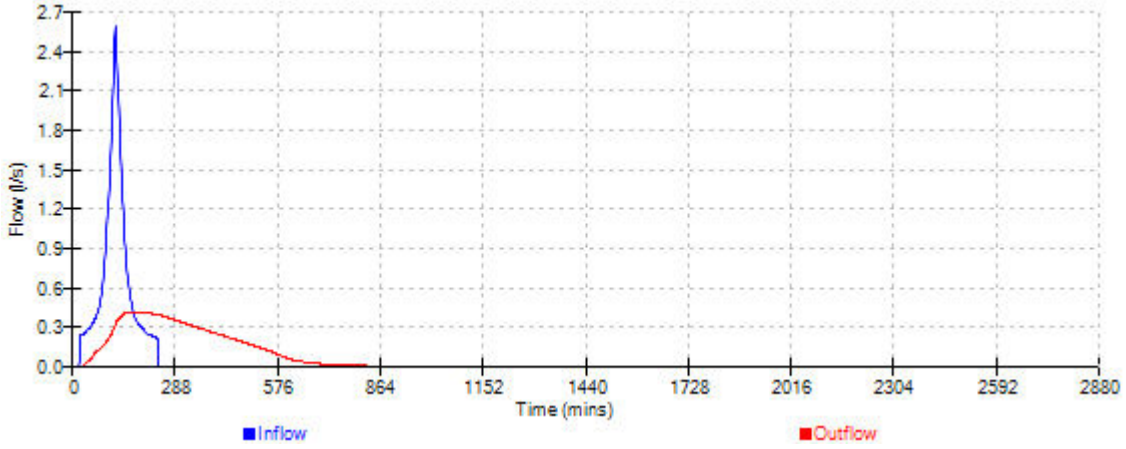
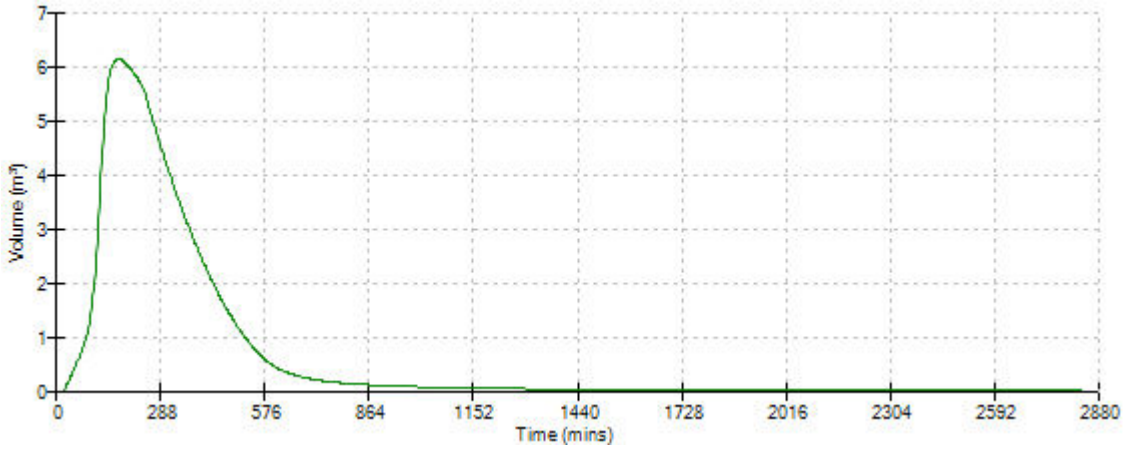
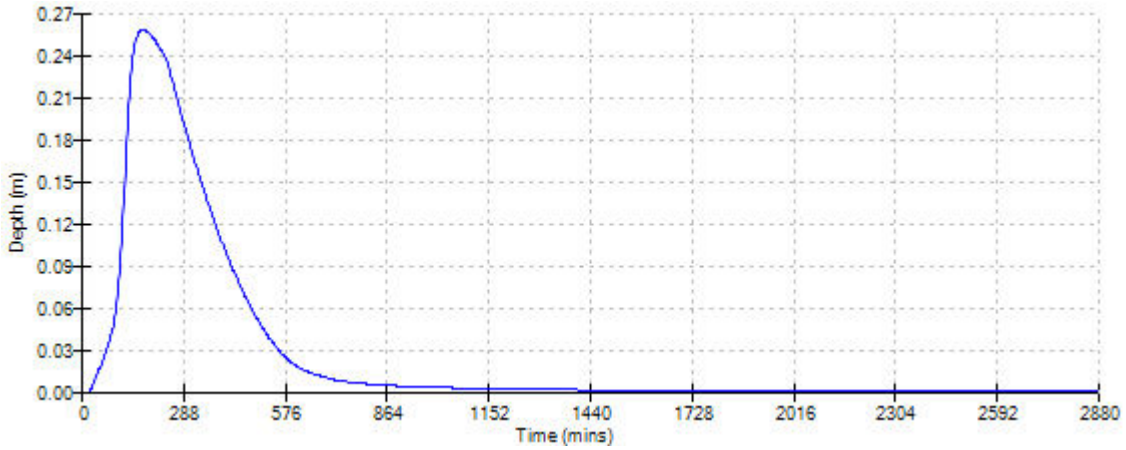
Event: 240 min Summer







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

Half Drain Time : 159 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.452	0.202	0.0	0.4	0.4	4.8	O K
30 min Summer	49.518	0.268	0.0	0.4	0.4	6.4	O K
60 min Summer	49.635	0.385	0.0	0.5	0.5	7.8	O K
120 min Summer	49.741	0.491	0.0	0.6	0.6	8.6	Flood Risk
180 min Summer	49.770	0.520	0.0	0.6	0.6	8.8	Flood Risk
240 min Summer	49.776	0.526	0.0	0.6	0.6	8.8	Flood Risk
360 min Summer	49.766	0.516	0.0	0.6	0.6	8.7	Flood Risk
480 min Summer	49.740	0.490	0.0	0.6	0.6	8.6	Flood Risk
600 min Summer	49.708	0.458	0.0	0.6	0.6	8.3	Flood Risk
720 min Summer	49.673	0.423	0.0	0.5	0.5	8.0	Flood Risk
960 min Summer	49.606	0.356	0.0	0.5	0.5	7.5	O K
1440 min Summer	49.526	0.276	0.0	0.4	0.4	6.6	O K
2160 min Summer	49.474	0.224	0.0	0.4	0.4	5.3	O K
2880 min Summer	49.437	0.187	0.0	0.4	0.4	4.4	O K
4320 min Summer	49.386	0.136	0.0	0.3	0.3	3.2	O K
5760 min Summer	49.354	0.104	0.0	0.3	0.3	2.5	O K
7200 min Summer	49.334	0.084	0.0	0.2	0.2	2.0	O K
8640 min Summer	49.319	0.069	0.0	0.2	0.2	1.6	O K
10080 min Summer	49.309	0.059	0.0	0.2	0.2	1.4	O K
15 min Winter	49.452	0.202	0.0	0.4	0.4	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.851	0.0	5.0	18
30 min Summer	88.566	0.0	6.8	33
60 min Summer	56.713	0.0	8.8	62
120 min Summer	35.004	0.0	10.9	110
180 min Summer	25.973	0.0	12.2	138
240 min Summer	20.877	0.0	13.1	170
360 min Summer	15.365	0.0	14.4	240
480 min Summer	12.341	0.0	15.5	308
600 min Summer	10.402	0.0	16.3	378
720 min Summer	9.042	0.0	17.0	446
960 min Summer	7.241	0.0	18.2	580
1440 min Summer	5.284	0.0	19.9	850
2160 min Summer	3.848	0.0	21.7	1228
2880 min Summer	3.068	0.0	23.0	1588
4320 min Summer	2.226	0.0	24.9	2296
5760 min Summer	1.771	0.0	26.3	3048
7200 min Summer	1.483	0.0	27.5	3744
8640 min Summer	1.284	0.0	28.4	4488
10080 min Summer	1.137	0.0	29.2	5144
15 min Winter	131.851	0.0	5.0	18

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.518	0.268	0.0	0.4	0.4	6.4	O K
60 min Winter	49.638	0.388	0.0	0.5	0.5	7.8	O K
120 min Winter	49.751	0.501	0.0	0.6	0.6	8.6	Flood Risk
180 min Winter	49.771	0.521	0.0	0.6	0.6	8.8	Flood Risk
240 min Winter	49.770	0.520	0.0	0.6	0.6	8.8	Flood Risk
360 min Winter	49.744	0.494	0.0	0.6	0.6	8.6	Flood Risk
480 min Winter	49.701	0.451	0.0	0.6	0.6	8.3	Flood Risk
600 min Winter	49.654	0.404	0.0	0.5	0.5	7.9	Flood Risk
720 min Winter	49.607	0.357	0.0	0.5	0.5	7.6	O K
960 min Winter	49.537	0.287	0.0	0.4	0.4	6.8	O K
1440 min Winter	49.481	0.231	0.0	0.4	0.4	5.5	O K
2160 min Winter	49.422	0.172	0.0	0.3	0.3	4.1	O K
2880 min Winter	49.382	0.132	0.0	0.3	0.3	3.1	O K
4320 min Winter	49.336	0.086	0.0	0.2	0.2	2.0	O K
5760 min Winter	49.312	0.062	0.0	0.2	0.2	1.5	O K
7200 min Winter	49.297	0.047	0.0	0.2	0.2	1.1	O K
8640 min Winter	49.288	0.038	0.0	0.1	0.1	0.9	O K
10080 min Winter	49.282	0.032	0.0	0.1	0.1	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.566	0.0	6.8	32
60 min Winter	56.713	0.0	8.8	60
120 min Winter	35.004	0.0	10.9	114
180 min Winter	25.973	0.0	12.2	142
240 min Winter	20.877	0.0	13.1	182
360 min Winter	15.365	0.0	14.4	258
480 min Winter	12.341	0.0	15.5	332
600 min Winter	10.402	0.0	16.3	404
720 min Winter	9.042	0.0	17.0	478
960 min Winter	7.241	0.0	18.2	624
1440 min Winter	5.284	0.0	19.9	892
2160 min Winter	3.848	0.0	21.7	1272
2880 min Winter	3.068	0.0	23.0	1640
4320 min Winter	2.226	0.0	24.9	2336
5760 min Winter	1.771	0.0	26.3	3048
7200 min Winter	1.483	0.0	27.5	3752
8640 min Winter	1.284	0.0	28.4	4488
10080 min Winter	1.137	0.0	29.2	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.950

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.250	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.550	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.250

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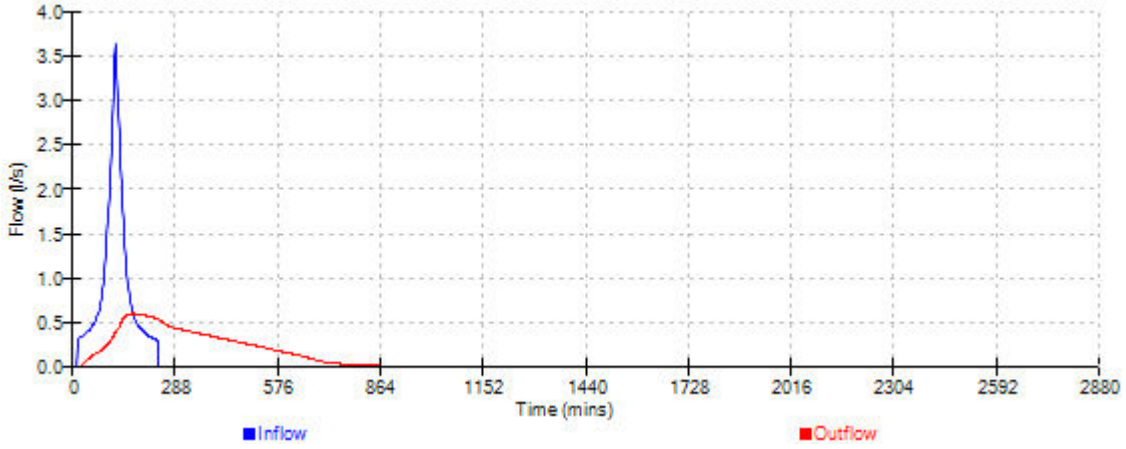
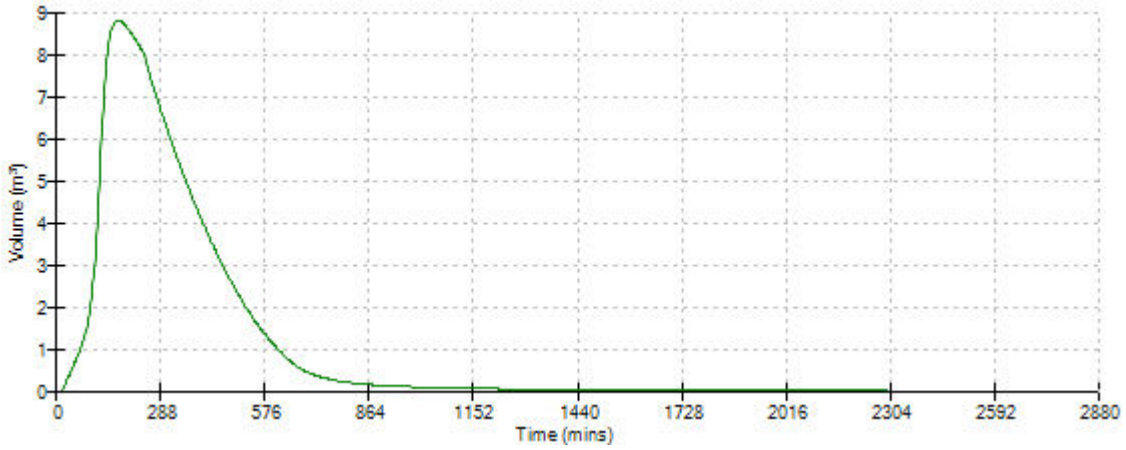
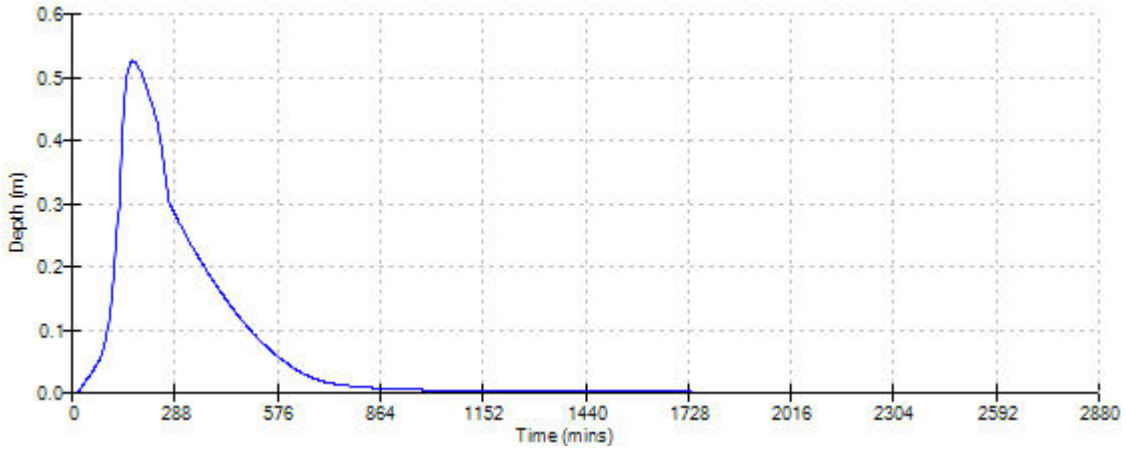
Event: 240 min Summer







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Summary of Results for 1 year Return Period

Half Drain Time : 92 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.187	0.037	0.0	0.1	0.1	0.9	O K
30 min Summer	49.199	0.049	0.0	0.2	0.2	1.2	O K
60 min Summer	49.211	0.061	0.0	0.2	0.2	1.4	O K
120 min Summer	49.220	0.070	0.0	0.2	0.2	1.7	O K
180 min Summer	49.225	0.075	0.0	0.2	0.2	1.8	O K
240 min Summer	49.227	0.077	0.0	0.2	0.2	1.8	O K
360 min Summer	49.227	0.077	0.0	0.2	0.2	1.8	O K
480 min Summer	49.225	0.075	0.0	0.2	0.2	1.8	O K
600 min Summer	49.222	0.072	0.0	0.2	0.2	1.7	O K
720 min Summer	49.219	0.069	0.0	0.2	0.2	1.6	O K
960 min Summer	49.213	0.063	0.0	0.2	0.2	1.5	O K
1440 min Summer	49.203	0.053	0.0	0.2	0.2	1.3	O K
2160 min Summer	49.193	0.043	0.0	0.2	0.2	1.0	O K
2880 min Summer	49.186	0.036	0.0	0.1	0.1	0.9	O K
4320 min Summer	49.179	0.029	0.0	0.1	0.1	0.7	O K
5760 min Summer	49.175	0.025	0.0	0.1	0.1	0.6	O K
7200 min Summer	49.173	0.023	0.0	0.1	0.1	0.5	O K
8640 min Summer	49.171	0.021	0.0	0.1	0.1	0.5	O K
10080 min Summer	49.170	0.020	0.0	0.1	0.1	0.5	O K
15 min Winter	49.187	0.037	0.0	0.1	0.1	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.648	0.0	0.9	18
30 min Summer	19.726	0.0	1.3	32
60 min Summer	12.800	0.0	1.8	60
120 min Summer	8.156	0.0	2.3	90
180 min Summer	6.242	0.0	2.7	124
240 min Summer	5.155	0.0	3.0	158
360 min Summer	3.898	0.0	3.4	226
480 min Summer	3.196	0.0	3.8	292
600 min Summer	2.740	0.0	4.1	358
720 min Summer	2.417	0.0	4.3	422
960 min Summer	1.983	0.0	4.7	548
1440 min Summer	1.501	0.0	5.3	794
2160 min Summer	1.134	0.0	6.0	1148
2880 min Summer	0.930	0.0	6.6	1504
4320 min Summer	0.704	0.0	7.4	2208
5760 min Summer	0.578	0.0	8.0	2936
7200 min Summer	0.495	0.0	8.5	3672
8640 min Summer	0.436	0.0	8.9	4400
10080 min Summer	0.391	0.0	9.2	5136
15 min Winter	29.648	0.0	0.9	18

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.200	0.050	0.0	0.2	0.2	1.2	O K
60 min Winter	49.211	0.061	0.0	0.2	0.2	1.5	O K
120 min Winter	49.220	0.070	0.0	0.2	0.2	1.7	O K
180 min Winter	49.223	0.073	0.0	0.2	0.2	1.7	O K
240 min Winter	49.224	0.074	0.0	0.2	0.2	1.7	O K
360 min Winter	49.221	0.071	0.0	0.2	0.2	1.7	O K
480 min Winter	49.217	0.067	0.0	0.2	0.2	1.6	O K
600 min Winter	49.212	0.062	0.0	0.2	0.2	1.5	O K
720 min Winter	49.208	0.058	0.0	0.2	0.2	1.4	O K
960 min Winter	49.201	0.051	0.0	0.2	0.2	1.2	O K
1440 min Winter	49.190	0.040	0.0	0.1	0.1	0.9	O K
2160 min Winter	49.180	0.030	0.0	0.1	0.1	0.7	O K
2880 min Winter	49.176	0.026	0.0	0.1	0.1	0.6	O K
4320 min Winter	49.172	0.022	0.0	0.1	0.1	0.5	O K
5760 min Winter	49.169	0.019	0.0	0.1	0.1	0.5	O K
7200 min Winter	49.168	0.018	0.0	0.1	0.1	0.4	O K
8640 min Winter	49.166	0.016	0.0	0.0	0.0	0.4	O K
10080 min Winter	49.165	0.015	0.0	0.0	0.0	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	19.726	0.0	1.3	31
60 min Winter	12.800	0.0	1.8	58
120 min Winter	8.156	0.0	2.3	94
180 min Winter	6.242	0.0	2.7	132
240 min Winter	5.155	0.0	3.0	170
360 min Winter	3.898	0.0	3.4	242
480 min Winter	3.196	0.0	3.8	310
600 min Winter	2.740	0.0	4.1	376
720 min Winter	2.417	0.0	4.3	442
960 min Winter	1.983	0.0	4.7	568
1440 min Winter	1.501	0.0	5.3	810
2160 min Winter	1.134	0.0	6.0	1152
2880 min Winter	0.930	0.0	6.6	1496
4320 min Winter	0.704	0.0	7.4	2208
5760 min Winter	0.578	0.0	8.0	2936
7200 min Winter	0.495	0.0	8.5	3728
8640 min Winter	0.436	0.0	8.9	4360
10080 min Winter	0.391	0.0	9.2	5112

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.850

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.150	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.450	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.150

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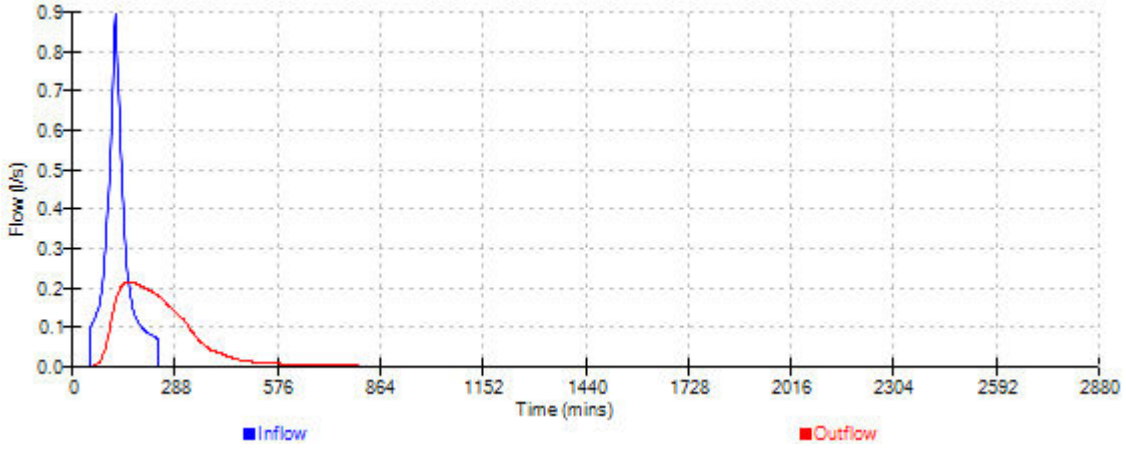
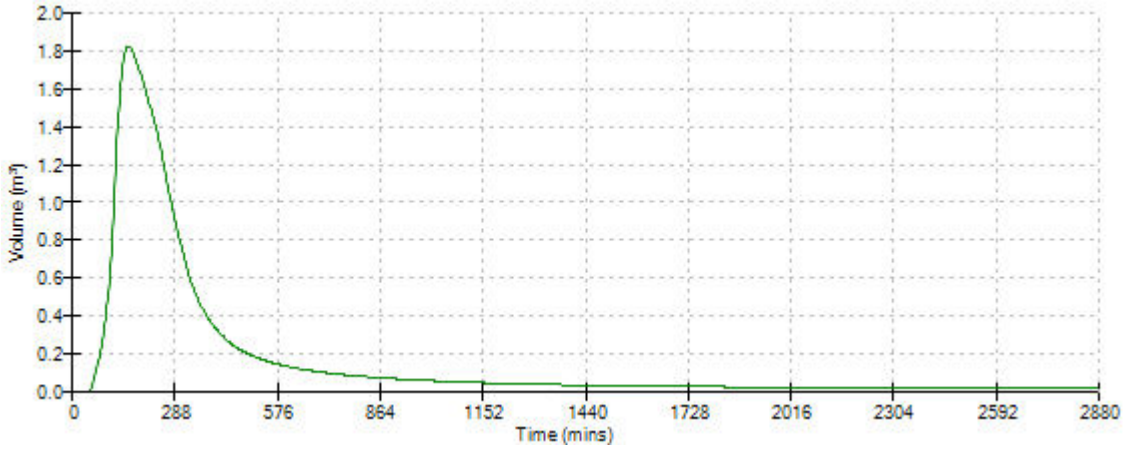
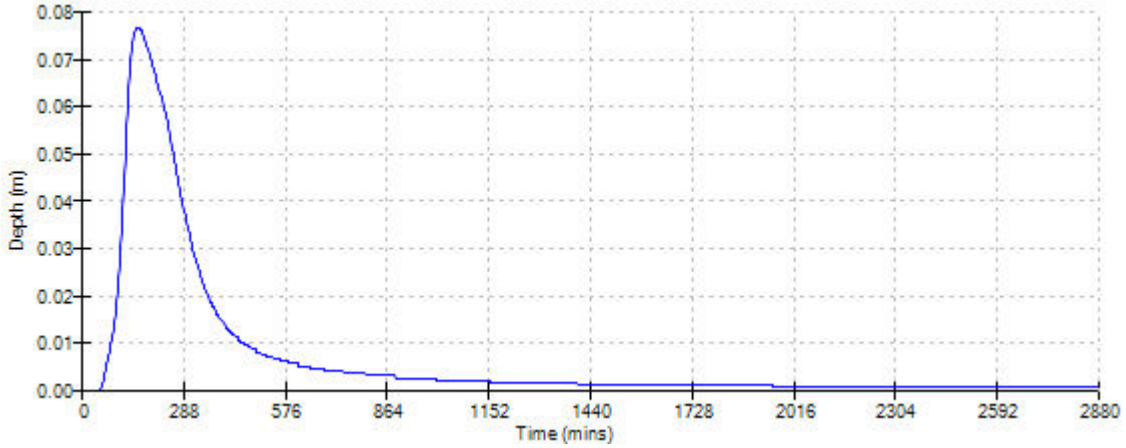
Event: 240 min Summer







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Summary of Results for 30 year Return Period

Half Drain Time : 129 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.256	0.106	0.0	0.3	0.3	2.5	O K
30 min Summer	49.289	0.139	0.0	0.3	0.3	3.3	O K
60 min Summer	49.318	0.168	0.0	0.3	0.3	4.0	O K
120 min Summer	49.335	0.185	0.0	0.3	0.3	4.4	O K
180 min Summer	49.341	0.191	0.0	0.4	0.4	4.5	O K
240 min Summer	49.342	0.192	0.0	0.4	0.4	4.6	O K
360 min Summer	49.340	0.190	0.0	0.4	0.4	4.5	O K
480 min Summer	49.334	0.184	0.0	0.3	0.3	4.4	O K
600 min Summer	49.326	0.176	0.0	0.3	0.3	4.2	O K
720 min Summer	49.319	0.169	0.0	0.3	0.3	4.0	O K
960 min Summer	49.305	0.155	0.0	0.3	0.3	3.7	O K
1440 min Summer	49.280	0.130	0.0	0.3	0.3	3.1	O K
2160 min Summer	49.253	0.103	0.0	0.3	0.3	2.5	O K
2880 min Summer	49.235	0.085	0.0	0.2	0.2	2.0	O K
4320 min Summer	49.211	0.061	0.0	0.2	0.2	1.4	O K
5760 min Summer	49.197	0.047	0.0	0.2	0.2	1.1	O K
7200 min Summer	49.189	0.039	0.0	0.1	0.1	0.9	O K
8640 min Summer	49.183	0.033	0.0	0.1	0.1	0.8	O K
10080 min Summer	49.179	0.029	0.0	0.1	0.1	0.7	O K
15 min Winter	49.256	0.106	0.0	0.3	0.3	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.682	0.0	2.6	18
30 min Summer	48.363	0.0	3.6	32
60 min Summer	30.811	0.0	4.7	62
120 min Summer	19.036	0.0	5.8	102
180 min Summer	14.191	0.0	6.5	134
240 min Summer	11.467	0.0	7.0	168
360 min Summer	8.493	0.0	7.8	236
480 min Summer	6.855	0.0	8.5	304
600 min Summer	5.801	0.0	8.9	374
720 min Summer	5.059	0.0	9.4	440
960 min Summer	4.074	0.0	10.1	568
1440 min Summer	2.998	0.0	11.1	822
2160 min Summer	2.203	0.0	12.2	1188
2880 min Summer	1.769	0.0	13.0	1556
4320 min Summer	1.297	0.0	14.2	2252
5760 min Summer	1.040	0.0	15.1	2992
7200 min Summer	0.876	0.0	15.8	3680
8640 min Summer	0.762	0.0	16.4	4408
10080 min Summer	0.677	0.0	16.9	5136
15 min Winter	72.682	0.0	2.6	18

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.289	0.139	0.0	0.3	0.3	3.3	O K
60 min Winter	49.319	0.169	0.0	0.3	0.3	4.0	O K
120 min Winter	49.336	0.186	0.0	0.4	0.4	4.4	O K
180 min Winter	49.340	0.190	0.0	0.4	0.4	4.5	O K
240 min Winter	49.339	0.189	0.0	0.4	0.4	4.5	O K
360 min Winter	49.332	0.182	0.0	0.3	0.3	4.3	O K
480 min Winter	49.322	0.172	0.0	0.3	0.3	4.1	O K
600 min Winter	49.311	0.161	0.0	0.3	0.3	3.8	O K
720 min Winter	49.301	0.151	0.0	0.3	0.3	3.6	O K
960 min Winter	49.282	0.132	0.0	0.3	0.3	3.1	O K
1440 min Winter	49.253	0.103	0.0	0.3	0.3	2.4	O K
2160 min Winter	49.224	0.074	0.0	0.2	0.2	1.8	O K
2880 min Winter	49.206	0.056	0.0	0.2	0.2	1.3	O K
4320 min Winter	49.188	0.038	0.0	0.1	0.1	0.9	O K
5760 min Winter	49.179	0.029	0.0	0.1	0.1	0.7	O K
7200 min Winter	49.175	0.025	0.0	0.1	0.1	0.6	O K
8640 min Winter	49.173	0.023	0.0	0.1	0.1	0.5	O K
10080 min Winter	49.171	0.021	0.0	0.1	0.1	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	48.363	0.0	3.6	32
60 min Winter	30.811	0.0	4.7	60
120 min Winter	19.036	0.0	5.8	112
180 min Winter	14.191	0.0	6.5	140
240 min Winter	11.467	0.0	7.0	178
360 min Winter	8.493	0.0	7.8	254
480 min Winter	6.855	0.0	8.5	326
600 min Winter	5.801	0.0	8.9	398
720 min Winter	5.059	0.0	9.4	464
960 min Winter	4.074	0.0	10.1	598
1440 min Winter	2.998	0.0	11.1	852
2160 min Winter	2.203	0.0	12.2	1216
2880 min Winter	1.769	0.0	13.0	1584
4320 min Winter	1.297	0.0	14.2	2288
5760 min Winter	1.040	0.0	15.1	2944
7200 min Winter	0.876	0.0	15.8	3680
8640 min Winter	0.762	0.0	16.4	4336
10080 min Winter	0.677	0.0	16.9	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.850

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.150	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.450	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.150

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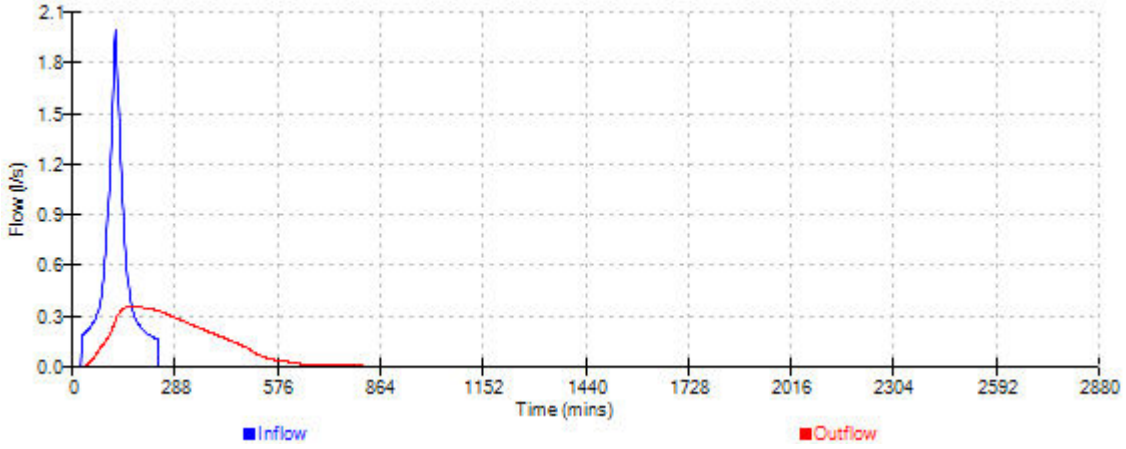
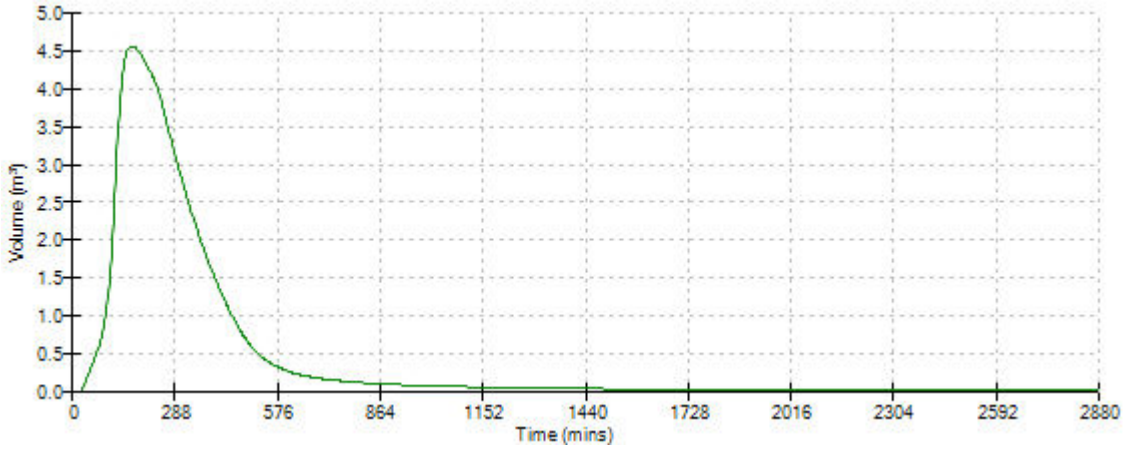
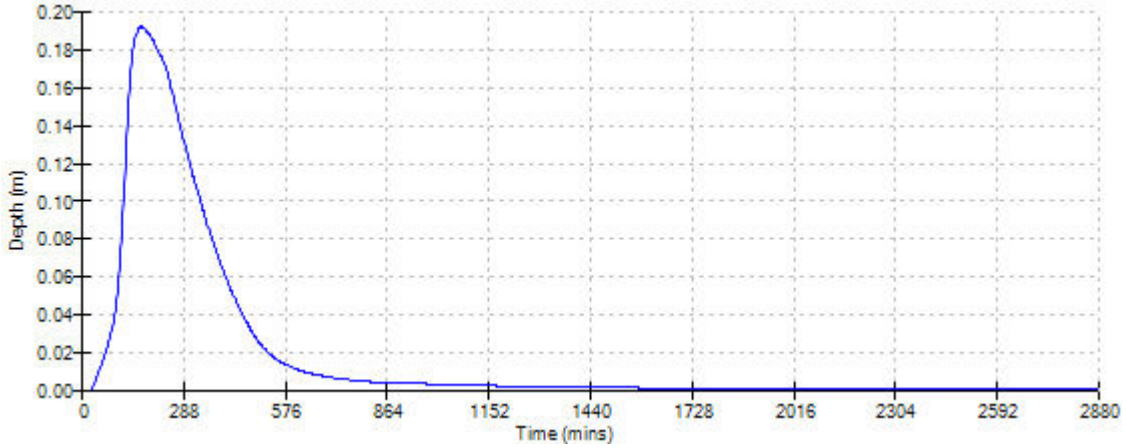
Event: 240 min Summer







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Summary of Results for 100 year Return Period

Half Drain Time : 151 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.291	0.141	0.0	0.3	0.3	3.3	O K
30 min Summer	49.336	0.186	0.0	0.4	0.4	4.4	O K
60 min Summer	49.377	0.227	0.0	0.4	0.4	5.4	O K
120 min Summer	49.402	0.252	0.0	0.4	0.4	6.0	O K
180 min Summer	49.408	0.258	0.0	0.4	0.4	6.1	O K
240 min Summer	49.409	0.259	0.0	0.4	0.4	6.1	O K
360 min Summer	49.405	0.255	0.0	0.4	0.4	6.1	O K
480 min Summer	49.397	0.247	0.0	0.4	0.4	5.9	O K
600 min Summer	49.388	0.238	0.0	0.4	0.4	5.7	O K
720 min Summer	49.378	0.228	0.0	0.4	0.4	5.4	O K
960 min Summer	49.359	0.209	0.0	0.4	0.4	5.0	O K
1440 min Summer	49.326	0.176	0.0	0.3	0.3	4.2	O K
2160 min Summer	49.290	0.140	0.0	0.3	0.3	3.3	O K
2880 min Summer	49.265	0.115	0.0	0.3	0.3	2.7	O K
4320 min Summer	49.232	0.082	0.0	0.2	0.2	1.9	O K
5760 min Summer	49.213	0.063	0.0	0.2	0.2	1.5	O K
7200 min Summer	49.200	0.050	0.0	0.2	0.2	1.2	O K
8640 min Summer	49.192	0.042	0.0	0.1	0.1	1.0	O K
10080 min Summer	49.186	0.036	0.0	0.1	0.1	0.9	O K
15 min Winter	49.291	0.141	0.0	0.3	0.3	3.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.179	0.0	3.5	18
30 min Summer	63.261	0.0	4.8	32
60 min Summer	40.510	0.0	6.2	62
120 min Summer	25.003	0.0	7.7	110
180 min Summer	18.552	0.0	8.6	140
240 min Summer	14.912	0.0	9.3	172
360 min Summer	10.975	0.0	10.2	240
480 min Summer	8.815	0.0	11.0	310
600 min Summer	7.430	0.0	11.6	378
720 min Summer	6.458	0.0	12.1	444
960 min Summer	5.172	0.0	12.9	578
1440 min Summer	3.774	0.0	14.1	836
2160 min Summer	2.748	0.0	15.3	1208
2880 min Summer	2.192	0.0	16.3	1560
4320 min Summer	1.590	0.0	17.6	2288
5760 min Summer	1.265	0.0	18.6	3000
7200 min Summer	1.060	0.0	19.3	3680
8640 min Summer	0.917	0.0	20.0	4416
10080 min Summer	0.812	0.0	20.5	5144
15 min Winter	94.179	0.0	3.5	18

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.337	0.187	0.0	0.4	0.4	4.4	O K
60 min Winter	49.378	0.228	0.0	0.4	0.4	5.4	O K
120 min Winter	49.404	0.254	0.0	0.4	0.4	6.0	O K
180 min Winter	49.407	0.257	0.0	0.4	0.4	6.1	O K
240 min Winter	49.406	0.256	0.0	0.4	0.4	6.1	O K
360 min Winter	49.398	0.248	0.0	0.4	0.4	5.9	O K
480 min Winter	49.385	0.235	0.0	0.4	0.4	5.6	O K
600 min Winter	49.371	0.221	0.0	0.4	0.4	5.3	O K
720 min Winter	49.358	0.208	0.0	0.4	0.4	4.9	O K
960 min Winter	49.333	0.183	0.0	0.3	0.3	4.3	O K
1440 min Winter	49.293	0.143	0.0	0.3	0.3	3.4	O K
2160 min Winter	49.253	0.103	0.0	0.3	0.3	2.4	O K
2880 min Winter	49.228	0.078	0.0	0.2	0.2	1.9	O K
4320 min Winter	49.201	0.051	0.0	0.2	0.2	1.2	O K
5760 min Winter	49.187	0.037	0.0	0.1	0.1	0.9	O K
7200 min Winter	49.179	0.029	0.0	0.1	0.1	0.7	O K
8640 min Winter	49.176	0.026	0.0	0.1	0.1	0.6	O K
10080 min Winter	49.174	0.024	0.0	0.1	0.1	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	63.261	0.0	4.8	32
60 min Winter	40.510	0.0	6.2	60
120 min Winter	25.003	0.0	7.7	114
180 min Winter	18.552	0.0	8.6	144
240 min Winter	14.912	0.0	9.3	182
360 min Winter	10.975	0.0	10.2	258
480 min Winter	8.815	0.0	11.0	332
600 min Winter	7.430	0.0	11.6	404
720 min Winter	6.458	0.0	12.1	472
960 min Winter	5.172	0.0	12.9	608
1440 min Winter	3.774	0.0	14.1	866
2160 min Winter	2.748	0.0	15.3	1236
2880 min Winter	2.192	0.0	16.3	1588
4320 min Winter	1.590	0.0	17.6	2292
5760 min Winter	1.265	0.0	18.6	3000
7200 min Winter	1.060	0.0	19.3	3680
8640 min Winter	0.917	0.0	20.0	4408
10080 min Winter	0.812	0.0	20.5	5008

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.850

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.150	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.450	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.150

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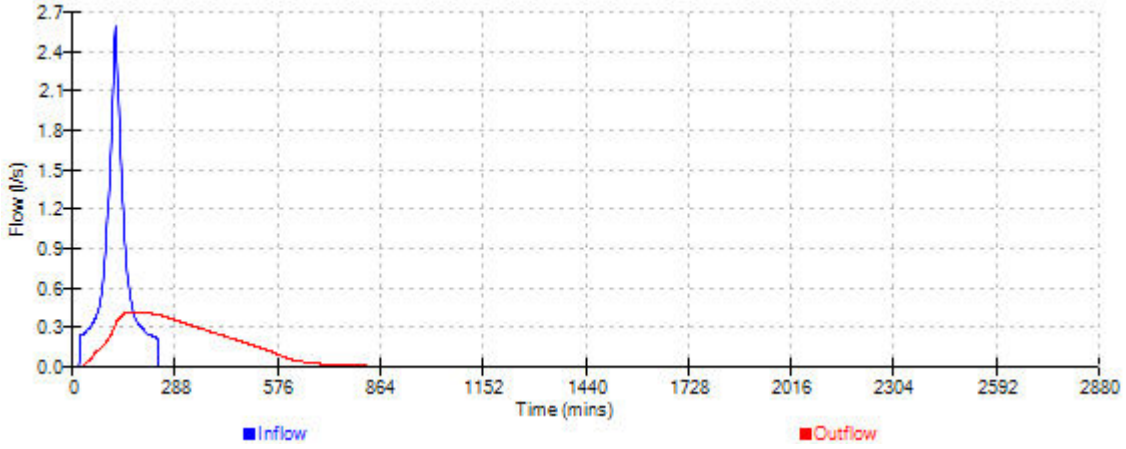
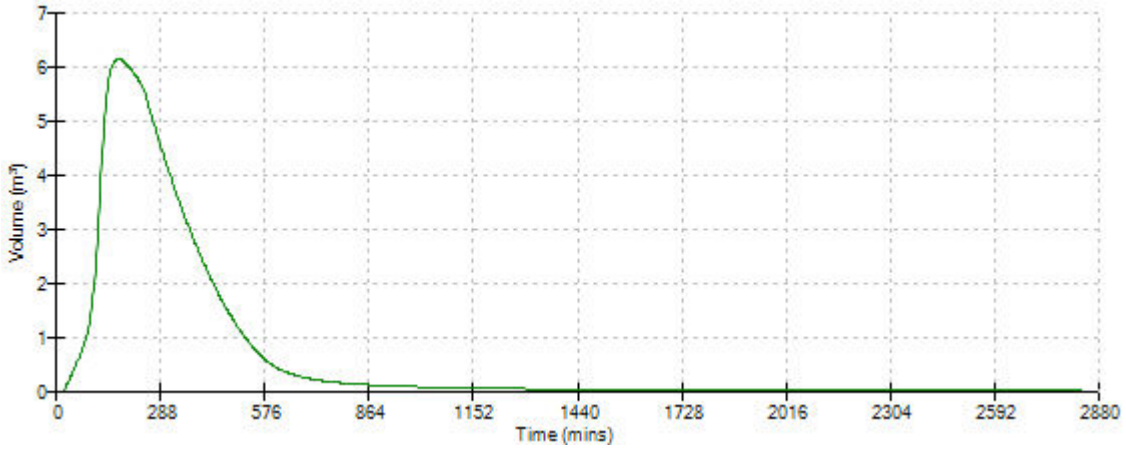
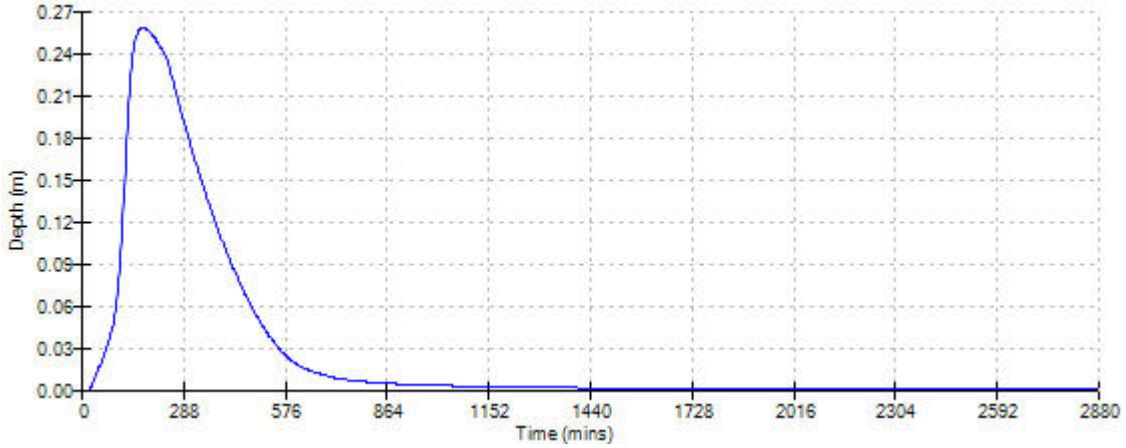
Event: 240 min Summer







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

Half Drain Time : 159 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.352	0.202	0.0	0.4	0.4	4.8	O K
30 min Summer	49.418	0.268	0.0	0.4	0.4	6.4	O K
60 min Summer	49.535	0.385	0.0	0.5	0.5	7.8	O K
120 min Summer	49.641	0.491	0.0	0.6	0.6	8.6	Flood Risk
180 min Summer	49.670	0.520	0.0	0.6	0.6	8.8	Flood Risk
240 min Summer	49.676	0.526	0.0	0.6	0.6	8.8	Flood Risk
360 min Summer	49.666	0.516	0.0	0.6	0.6	8.7	Flood Risk
480 min Summer	49.640	0.490	0.0	0.6	0.6	8.6	Flood Risk
600 min Summer	49.608	0.458	0.0	0.6	0.6	8.3	Flood Risk
720 min Summer	49.573	0.423	0.0	0.5	0.5	8.0	Flood Risk
960 min Summer	49.506	0.356	0.0	0.5	0.5	7.5	O K
1440 min Summer	49.426	0.276	0.0	0.4	0.4	6.6	O K
2160 min Summer	49.374	0.224	0.0	0.4	0.4	5.3	O K
2880 min Summer	49.337	0.187	0.0	0.4	0.4	4.4	O K
4320 min Summer	49.286	0.136	0.0	0.3	0.3	3.2	O K
5760 min Summer	49.254	0.104	0.0	0.3	0.3	2.5	O K
7200 min Summer	49.234	0.084	0.0	0.2	0.2	2.0	O K
8640 min Summer	49.219	0.069	0.0	0.2	0.2	1.6	O K
10080 min Summer	49.209	0.059	0.0	0.2	0.2	1.4	O K
15 min Winter	49.352	0.202	0.0	0.4	0.4	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.851	0.0	5.0	18
30 min Summer	88.566	0.0	6.8	33
60 min Summer	56.713	0.0	8.8	62
120 min Summer	35.004	0.0	10.9	110
180 min Summer	25.973	0.0	12.2	138
240 min Summer	20.877	0.0	13.1	170
360 min Summer	15.365	0.0	14.4	240
480 min Summer	12.341	0.0	15.5	308
600 min Summer	10.402	0.0	16.3	378
720 min Summer	9.042	0.0	17.0	446
960 min Summer	7.241	0.0	18.2	580
1440 min Summer	5.284	0.0	19.9	850
2160 min Summer	3.848	0.0	21.7	1228
2880 min Summer	3.068	0.0	23.0	1588
4320 min Summer	2.226	0.0	24.9	2296
5760 min Summer	1.771	0.0	26.3	3048
7200 min Summer	1.483	0.0	27.5	3744
8640 min Summer	1.284	0.0	28.4	4488
10080 min Summer	1.137	0.0	29.2	5144
15 min Winter	131.851	0.0	5.0	18

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.418	0.268	0.0	0.4	0.4	6.4	O K
60 min Winter	49.538	0.388	0.0	0.5	0.5	7.8	O K
120 min Winter	49.651	0.501	0.0	0.6	0.6	8.6	Flood Risk
180 min Winter	49.671	0.521	0.0	0.6	0.6	8.8	Flood Risk
240 min Winter	49.670	0.520	0.0	0.6	0.6	8.8	Flood Risk
360 min Winter	49.644	0.494	0.0	0.6	0.6	8.6	Flood Risk
480 min Winter	49.601	0.451	0.0	0.6	0.6	8.3	Flood Risk
600 min Winter	49.554	0.404	0.0	0.5	0.5	7.9	Flood Risk
720 min Winter	49.507	0.357	0.0	0.5	0.5	7.6	O K
960 min Winter	49.437	0.287	0.0	0.4	0.4	6.8	O K
1440 min Winter	49.381	0.231	0.0	0.4	0.4	5.5	O K
2160 min Winter	49.322	0.172	0.0	0.3	0.3	4.1	O K
2880 min Winter	49.282	0.132	0.0	0.3	0.3	3.1	O K
4320 min Winter	49.236	0.086	0.0	0.2	0.2	2.0	O K
5760 min Winter	49.212	0.062	0.0	0.2	0.2	1.5	O K
7200 min Winter	49.197	0.047	0.0	0.2	0.2	1.1	O K
8640 min Winter	49.188	0.038	0.0	0.1	0.1	0.9	O K
10080 min Winter	49.182	0.032	0.0	0.1	0.1	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.566	0.0	6.8	32
60 min Winter	56.713	0.0	8.8	60
120 min Winter	35.004	0.0	10.9	114
180 min Winter	25.973	0.0	12.2	142
240 min Winter	20.877	0.0	13.1	182
360 min Winter	15.365	0.0	14.4	258
480 min Winter	12.341	0.0	15.5	332
600 min Winter	10.402	0.0	16.3	404
720 min Winter	9.042	0.0	17.0	478
960 min Winter	7.241	0.0	18.2	624
1440 min Winter	5.284	0.0	19.9	892
2160 min Winter	3.848	0.0	21.7	1272
2880 min Winter	3.068	0.0	23.0	1640
4320 min Winter	2.226	0.0	24.9	2336
5760 min Winter	1.771	0.0	26.3	3048
7200 min Winter	1.483	0.0	27.5	3752
8640 min Winter	1.284	0.0	28.4	4488
10080 min Winter	1.137	0.0	29.2	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

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Model Details

Storage is Online Cover Level (m) 49.850

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	49.150	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.450	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 49.150

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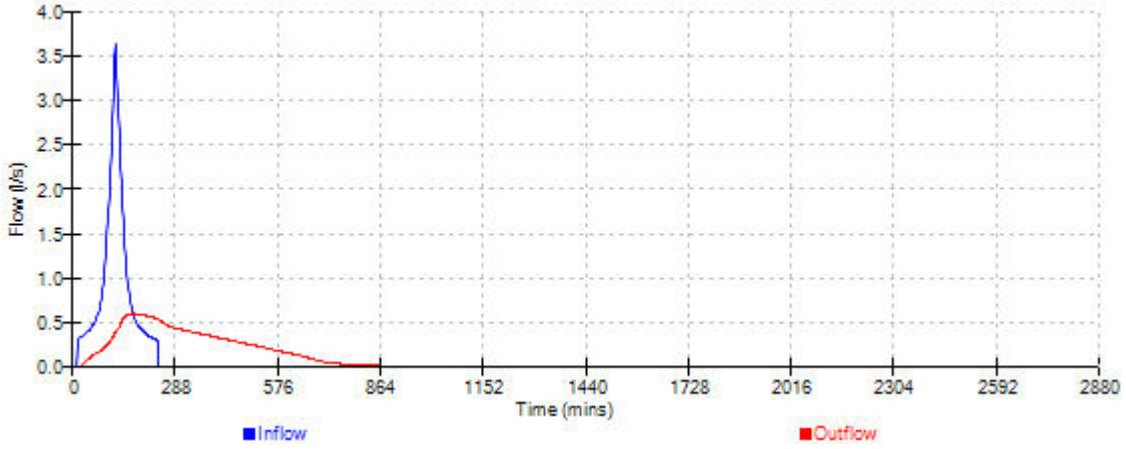
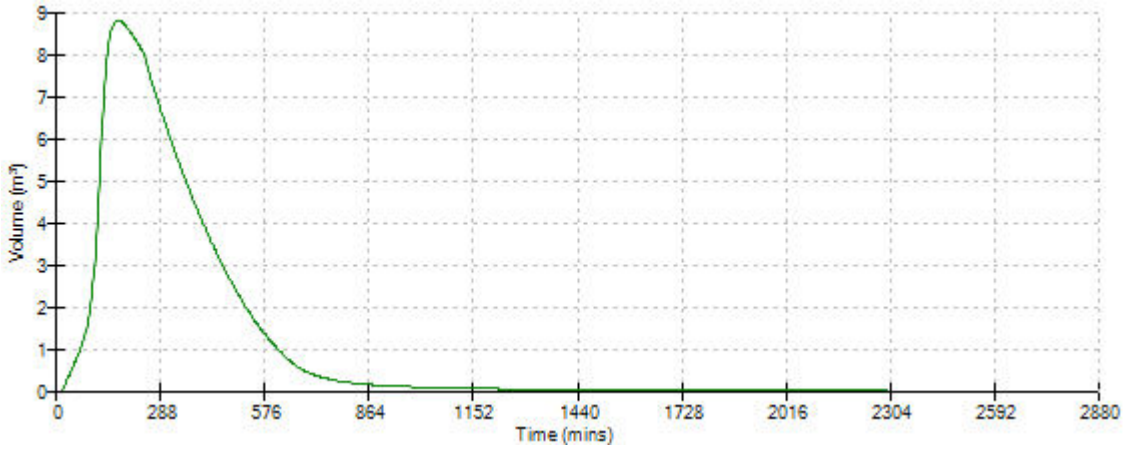
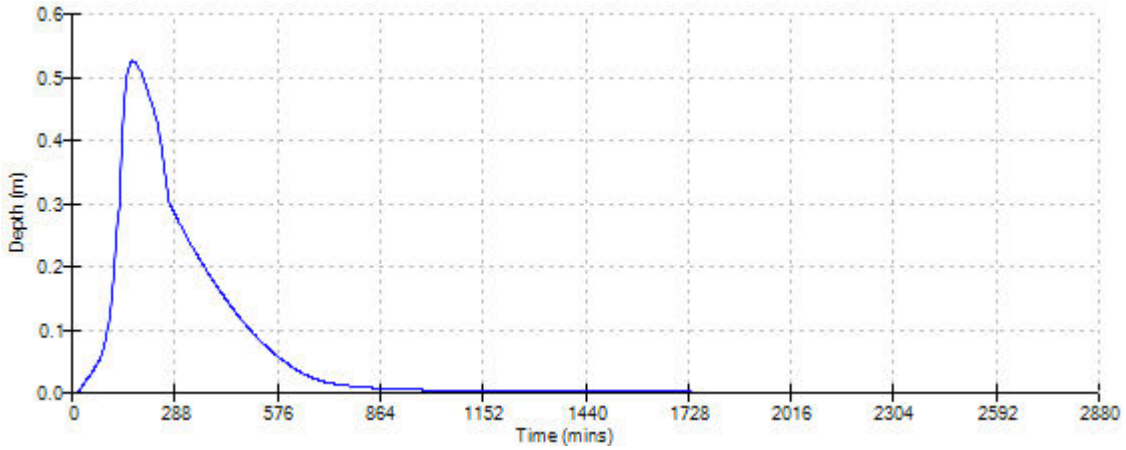
Event: 240 min Summer







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