Land Parcel to the North of Langley Bottom Farm: Flood Risk Assessment and Outline Drainage Strategy

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Document Control

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Land Parcel to the North of Langley Bottom Farm: Flood Risk Assessment and Outline Drainage Strategy

Client

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1. Introduction

1.1. Instruction

Aqua Terra Consultants Ltd (Aqua Terra) was instructed by Fairfax Acquisitions Ltd (the Client; Fairfax) to provide a Flood Risk Assessment (FRA) and Outline Drainage strategy (ODS) for a proposed residential development of a parcel of greenfield land to the north of Langley Bottom Farm, Epsom, Surrey (the Site). Instruction to proceed was provided by email on the 6th January 2025.

1.2. Background

Fairfax is seeking planning permission for a residential development in Epsom. The proposed development involves the construction of up to 110 new homes with the associated green spaces, access roads, parking areas and SuDS features.

This FRA and ODS provide information on the nature of flood risk at the Site, the risk posed by the development to off-Site flood risk, and follows Government guidance with regards to development and flood risk and surface water management.

1.3. Scope of the report

The assessment has been undertaken in accordance with the standing advice and requirements of the Environment Agency for Flood Risk Assessments as outlined in the Communities and Local Governments Technical Guidance to the National Planning Policy Framework (NPPF).

The assessment has:

- Considered the procedures of the National Planning Policy Guidance and Local Authority Guidance;
- Considered the Council Local Flood Risk Management Strategy and the Council Strategic Flood Risk Assessment;
- Considered the site constraints;
- Investigated all potential risks of current and future flooding to the site;
- Considered the impact the development may have elsewhere with regards to flood risk;
- Considered design proposals to mitigate any potential risk of flooding determined to be present; and,
- Development of an outline SuDS strategy to mitigate any potential increase in runoff and deterioration in water quality as well as providing amenity and biodiversity benefits.

1.4. Data sources

The main sources of data utilised in this assessment are summarised below:

- The proposed development plans as provided by the Client;
- Trial pit and infiltration test results;
- LiDAR Digital Terrain Model (DTM) data obtained through data.gov.uk;
- Environment Agency (EA) flood risk data;
- Soilscapes soil mapping;
- British Geological Survey (BGS) mapping;

- Epsom and Ewell Borough Council (EEBC) – Strategic Flood Risk Assessment, Level 1 (Metis Consultants, 2024);
- Hydrological descriptor data from the Flood Estimation Handbook (FEH) website (UK Centre for Ecology & Hydrology, 2023);
- The CIRIA SuDS Manual (CIRIA, 2015);
- Surrey County Council – Sustainable Drainage System Design Guide (online); and,
- Water. People. Places. A guide for master planning sustainable drainage into developments. Prepared by the Lead Local Flood Authorities of the South East of England (Aecom, 2013).

1.5. Limitations

This report is written strictly for the benefit of the Client and bound by the conditions presented in Appendix A.

2. Site Description

2.1. Site setting and surrounding area

The Site is located in Langley Vale c. 2.8 km south from Epsom, Surrey (see Figure 2-1). The nearest postcode is KT18 6HX, and the National Grid Reference for the approximate centre of the Site is TQ 20766 57571. The Site lies within the Epsom and Ewell District, and is within the Green Belt & Area of Landscape Value.

The Site covers an approximate area of 5.11 Ha and is currently a greenfield site - covered primarily with agricultural land, and a small residential house at the north-western corner (see Figure 2-2). The Site is surrounded by agricultural land to the west and south, residential area (Langley Vale) to the north-east, ancient woodland (the Warrens) to the east, and Langley Bottom Farm to the south-west. The Site will be accessed by Langley Vale Road to the north-west.

Figure 2-1 Site location

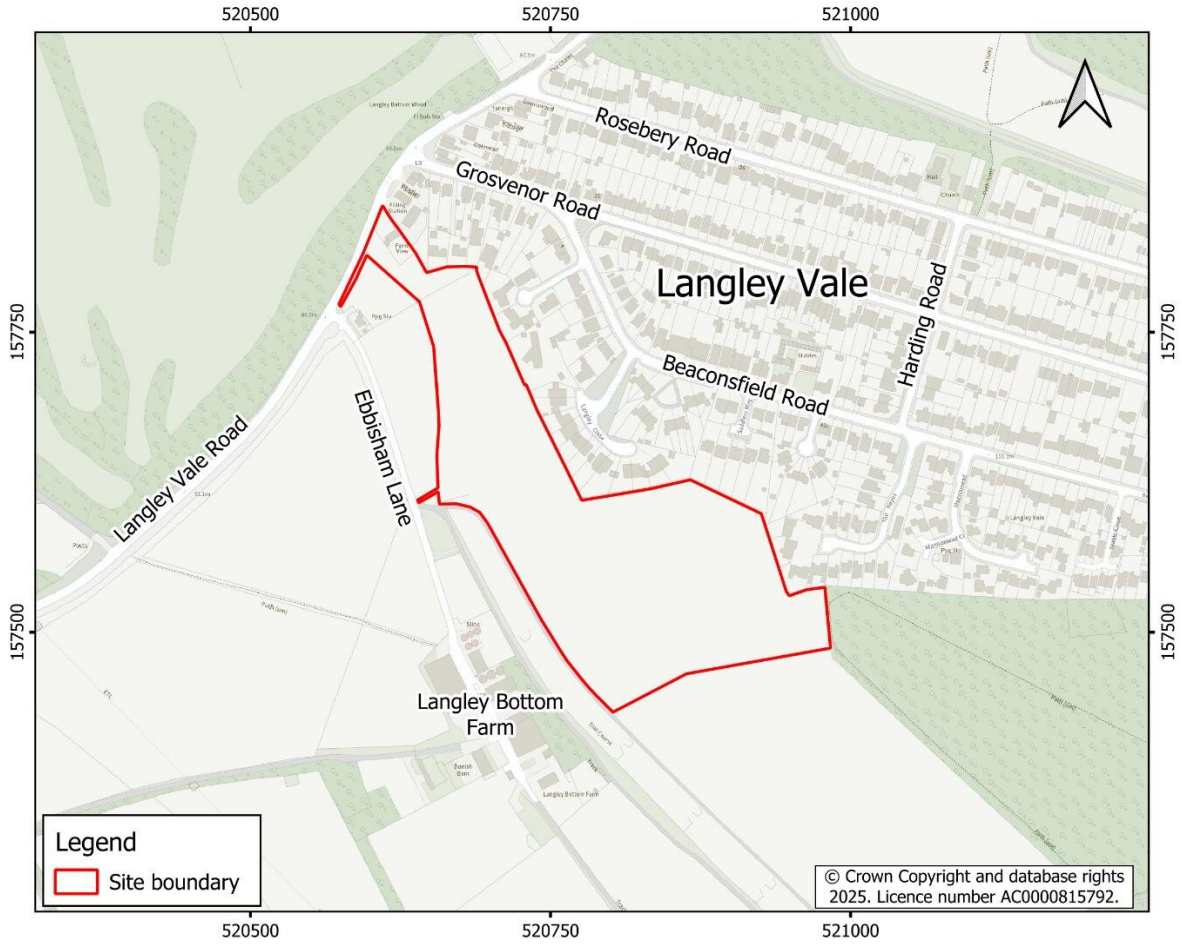
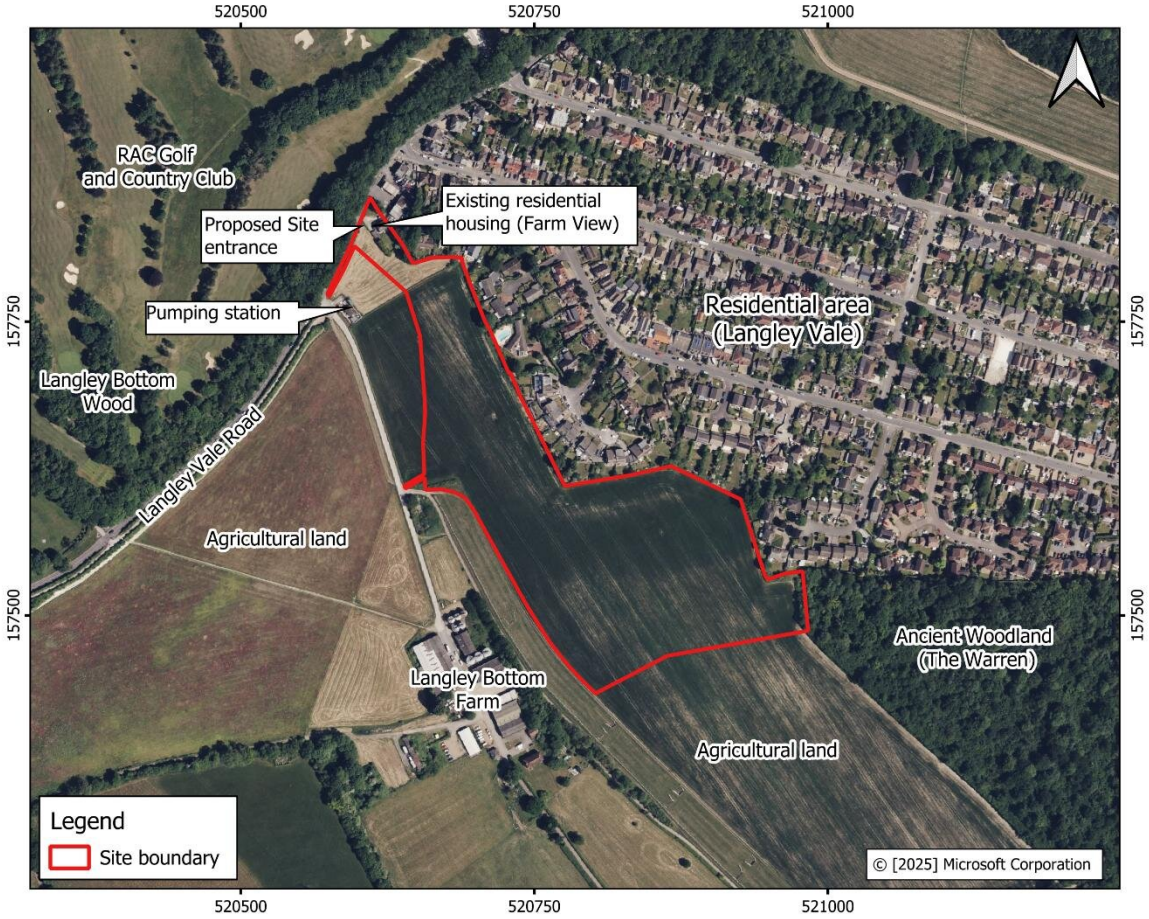


Figure 2-2 Current site layout / condition

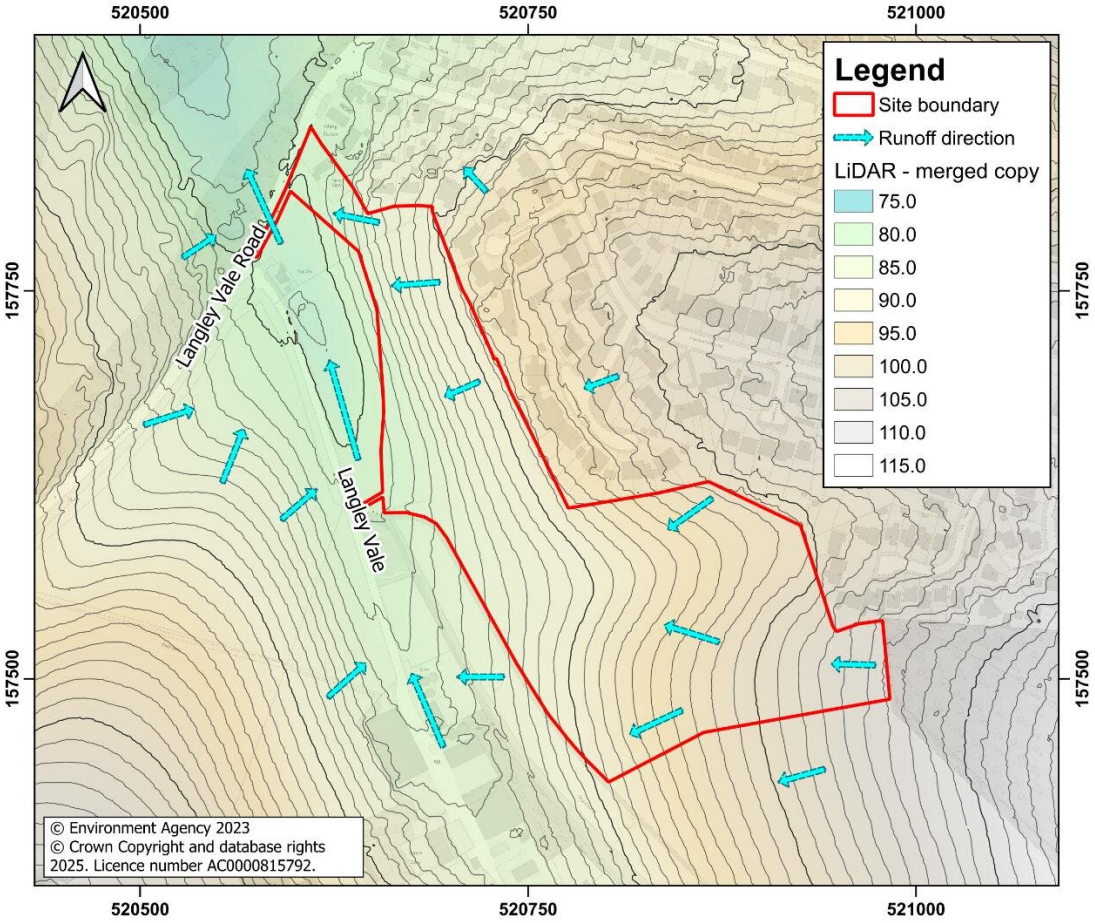


2.2. Topography

According to 1m LiDAR DTM data (see Figure 2-3), the elevation around the Site slopes westward, ranging between 106.2m above Ordnance Datum (m aOD) in the south-east corner and 79.8m aOD in the north-west corner.

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Figure 2-3 Existing ground elevations (LiDAR data) and inferred flow directions



2.3. Soils, geology and hydrogeology

2.4. Soils, geology and hydrogeology

According to Soilscapes mapping and British Geological Survey (BGS) 1:50,000 scale mapping, the general geological sequence underlying the Site is as follows:

- Soils: Shallow lime-rich soils over chalk or limestone.
- Superficial deposits: Absent across the Site.
- Solid geology: White Chalk.

2.4.1. Infiltration testing

Four trial pits up to a depth of 3.15m were excavated in February 2025 in lower parts of the Site. Trial pit borehole logs (see Appendix C) indicate an average topsoil/ subsoil depth of c.0.5m with the weathered White Chalk below.

The calculated soakaway infiltration rates range between 2.03 x 10^{-5} to 5.70 x 10^{-4} m/s, with a mean value (over a total of 11 tests) of 1.97 x 10^{-4} m/s – 0.71 m/hr. Infiltration testing undertaken at the nearby Langley Bottom Farm (Stantec, 2020) collected similar rates of between 1.11 x 10^{-5} to 2.61 x 10^{-4} m/s..

2.4.2. Hydrogeology

The bedrock is classified as a Principal aquifer, which are designated by the EA as strategically important rock units that have high permeability and water storage capacity. The bedrock has 'High' Groundwater vulnerability with 'Soluble Rock Risk'.

The Site is within Source Protection Zone 1 (Inner Protection Zone) associated with a Thames Water pumping station located c. 50 m west of the Site's northern section (see Figure 2-2).

2.5. Climate

The Standard Annual Average Rainfall (SAAR) for the area is 715 mm (CEH, 2025). In general, the mean annual rainfall is below the national average, although similar to other areas in the southeast.

2.6. Hydrology

There are no water features in the immediate vicinity of the Site. The nearest water feature is an unnamed pond c. 410 m west of the Site at the Langley Bottom Wood, and the nearest watercourse (the Rye) is c. 1.25 km to the north-west of the Site.

Hydrological descriptors for the Site are provided in Table 2.1. The Base Flow Index (BFI) is very high (indicating that more of the incident rainfall is diverted to infiltration – which is unsurprising given the local geology as described above).

Table 2.1 Hydrological point descriptors

Descriptor	Value
NGR	TQ 20708 57646
BFIHOST19	0.923
PROPWET	0.36
SAAR6190	715 mm

2.7. Current drainage arrangements

At present, the Site does not have a formal drainage system and surface water runoff will either infiltrate into the ground or run off overland. Surface runoff at the Site follows the topographical gradient, flowing roughly westward towards the base of the dry Langley Bottom valley, where it is then channelled northward towards Epsom. Note this occurs in wet conditions, when surface water flows over the road and causes a flooding nuisance on the road.

As part of the development plans for the adjacent Langley Bottom Farm Site, it was proposed to install a large swale/attenuation basin to store runoff and allow increased infiltration to ground. This was proposed to help mitigate the flooding issue on Langley Vale Road. The feature will border the Site to the northwest.

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3. Proposed Development

The illustrative masterplan for the Site is provided in Appendix B. The proposed development aims to construct up to 110 new residential houses (various sizes), with multiple green spaces, a wooded buffer zone at the margins of the Site and water attenuation features along the western boundary.

The Site will be accessed via the Langley Vale Road at the north-west of the Site.

The proposed development will change the use of the site from agricultural to residential, therefore the Site's flood risk vulnerability classification would change from "Less vulnerable" to "More vulnerable".

A total lifespan of 100 years has been considered within this assessment.

4. Flood Risk to the Development

4.1. Rivers and Seas

The EA's flood risk for planning data is shown in Figure 4-1 and definitions of each Flood Zone are included in Table 4.1.

The Site is entirely within Flood Zone 1 and therefore at very low risk of fluvial flooding. The nearest area in Flood Zone 2 or 3 is located c. 1.98 km north-west of the Site.

Neither the EEBC SFRA (Metis Consultants, 2024) nor the EA database of historical flooding contains any evidence of fluvial flooding having occurred in this area.

Figure 4-1 EA Flood Risk for Planning data

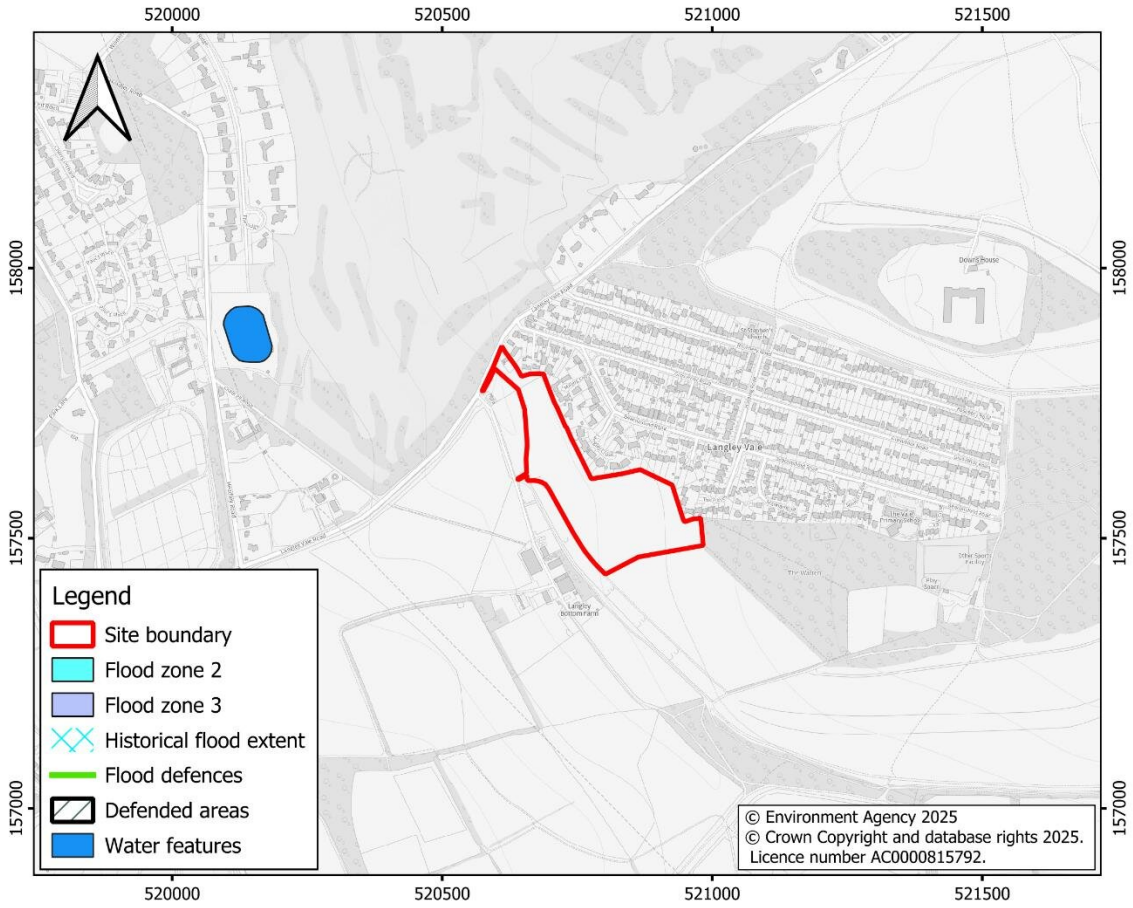


Table 4.1 EA Flood Zone definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

4.2. Surface Water

Surface water (pluvial) flooding is usually associated with extreme rainfall events but may also occur when rain falls on land that is already saturated or has a low permeability. Rainfall that is unable to infiltrate into the ground generates overland flow which can lead to flooding or 'ponding' in localised topographical depressions before the runoff is able to enter local drainage systems and watercourses.

A map of EA's Risk of Flooding from Surface Water (RoFSW) data is shown in Figure 4-2, and the risk of surface water flooding reaching or exceeding a depth of 0.2 m is shown in Figure 4-3. This data includes the 'Central' climate change allowance for the 2050s epoch (2040-2060).

The Site contains three areas at risk of surface water flooding. The first is a small (c. 177 m^2) section at the north-western corner of the Site with surface water flood risk ranging from Low (<1.0% annual chance) to High (>3.3% annual chance) risk of occurring. This area partially overlaps with the Site's proposed access road at its junction with Langley Vale Road, and is modelled by the EA to reach maximum depths up to 0.30 m (only along the southern part of the road). The northern extent of the road is expected to remain dry under all scenarios.

The second area is a very small (c. 40 m^2) section along the Site's western central border, inside the planned development's green area / water attenuation area. This is the maximum extent of the Low risk area associated with the Langley Vale flow path.

The third area at risk of surface water flooding is a narrow strip (c. 2,100 m^2) of Low to Medium (1.0-3.3% annual chance) risk in the Site's central area that follows the topographical gradient from east to west. The majority of the runoff catchment area is captured by the upstream residential area's drainage infrastructure (meaning that the surface water flood risk data in this area may be an over estimation). Environment Agency's modelled data indicates that if surface water flooding were to occur at this location, it would be very shallow and not exceed 0.2 m depth even in 1-in-1000 year event.

Small sections of the Site are within a Critical Drainage Area (CDA) (see Figure 4-4). As defined by the EEBC SFRA (Metis Consultants, 2024), CDAs are "specific geographic areas that are usually hydrological catchments where multiple and cumulative flood risk sources could trigger flooding in one or more Local Flood Risk Zones". These sections are largely within the areas of elevated surface water flood risk indicated in Figure 4-2.

Surface water flooding is known to have historically been a localised issue in the vicinity of the Site along the Langley Bottom Farm access track (Ebbisham Lane; see Figure 2-1), around the Thames Water pumping station and on the public highway (Langley Vale Road) due to the local topography. Proposals have been approved by the local council to install a large swale/infiltration basin in the between the Site and the Langley Bottom Farm access road to mitigate the flooding issue in the area. In addition, proposals for an enlarged highway soakaway have also been approved by the local highways team to mitigate the frequency and severity of flooding on Langley Vale Road.

Figure 4-2 Flood Risk from Surface Water (with climate change allowance)

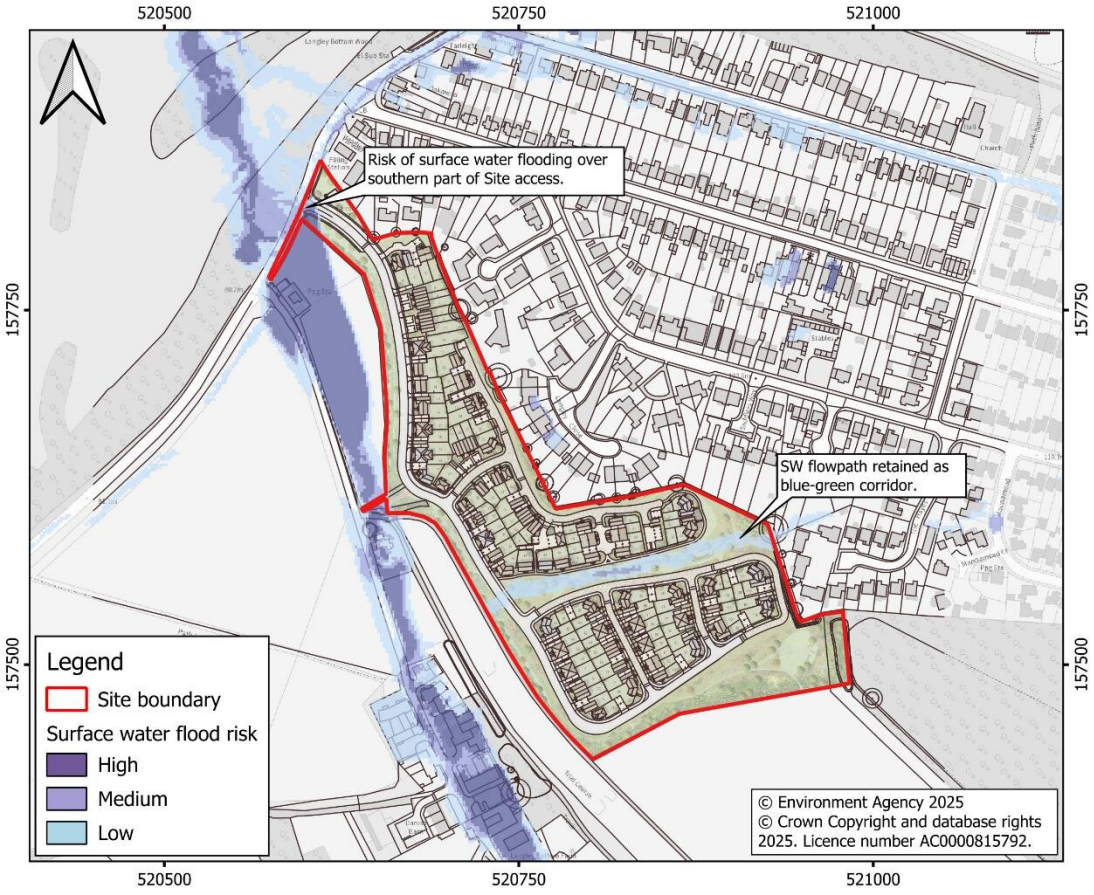


Figure 4-3 EA surface water flood depth risk (0.2m; with climate change allowance)

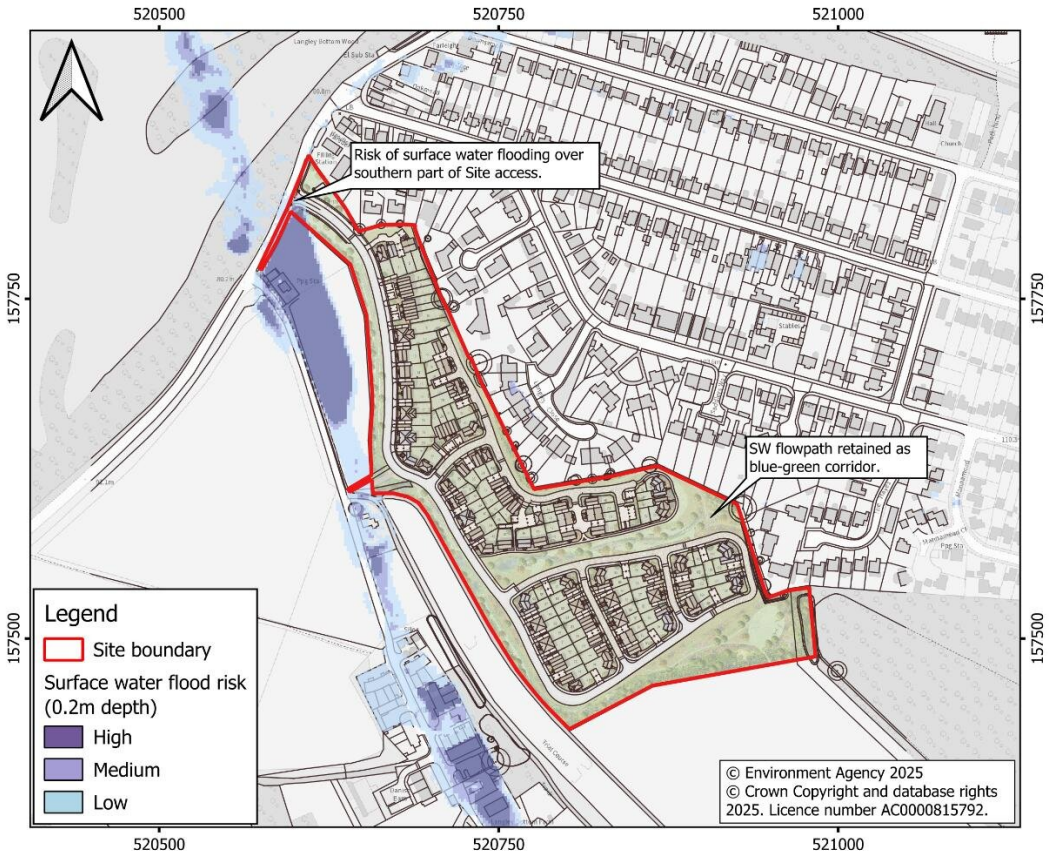
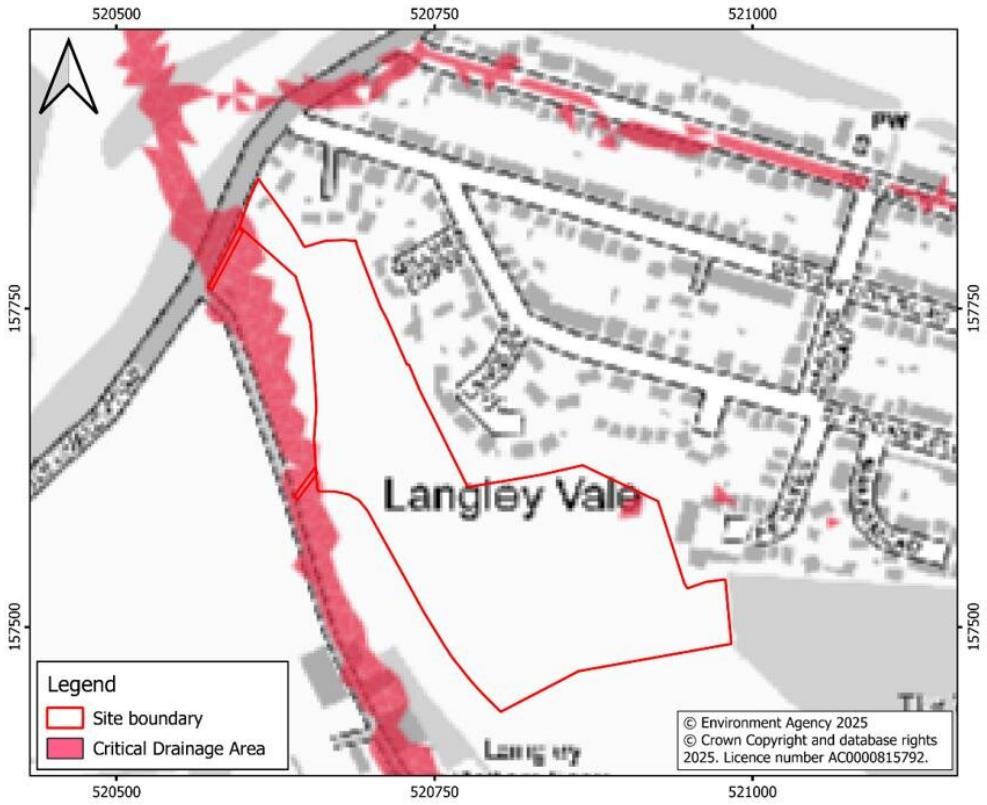


Figure 4-4 EEBC SFRA Critical Drainage Areas



4.3. Groundwater

Groundwater flooding is caused by the natural emergence of water at surface level originating from underlying permeable sediments or rocks (aquifers). The groundwater may emerge as one or more-point discharges (springs) or as diffuse upwelling of water over an extended area. Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days.

The EEBC SFRA (Metis Consultants, 2024) provides mapping of areas at risk of groundwater flooding. This indicates that the Site is entirely in an area with Low (<25%) susceptibility of groundwater flooding.

Neither the EEBC SFRA (Metis Consultants, 2024) nor the EA database of historical flooding contains any evidence of groundwater flooding having occurred in this area.

No groundwater seepages were noted during the trial pitting and infiltration testing (see Appendix C) and subsequently installed monitoring wells in TP02, TP03 and TP04 have all remained dry throughout the monitoring period to date which spanned from 5th February to 22nd May 2025. In total. 12 months' worth of data will be collected.

The groundwater within the chalk is thought to be at a significant depth below the surface. BGS borehole TQ25NW36 is located within the site boundary – near to the western boundary. This logged a groundwater depth of 33.98 m below the well top in April 1974.

4.4. Sewers

Sewer flooding can occur during periods of intense rainfall and/or if a sewer becomes blocked with debris.

It has not been possible to obtain detailed sewer flooding records for the area and no sewer flooding data is available in the Epsom and Ewell Borough Council SFRA Level 1 report.

Flooding of the highway drains along Langley Vale Road are a known issue in this area. The road intersects the valley from east to west, with soakaways installed at the valley bottom. Given the location of the soakaways (beneath or very close to the road), traffic management measures are required before routine maintenance can be undertaken. This makes maintenance costly and time consuming. This means that maintenance is undertaken infrequently, which exacerbates the flooding issue in the area. Proposals have been drafted and accepted to install a new, enlarged highway soakaway in the land to the south of the Site access. This will have a greater capacity to store and infiltrate runoff from the catchment as well as being easier to maintain. This should reduce the frequency and magnitude of flooding in this area.

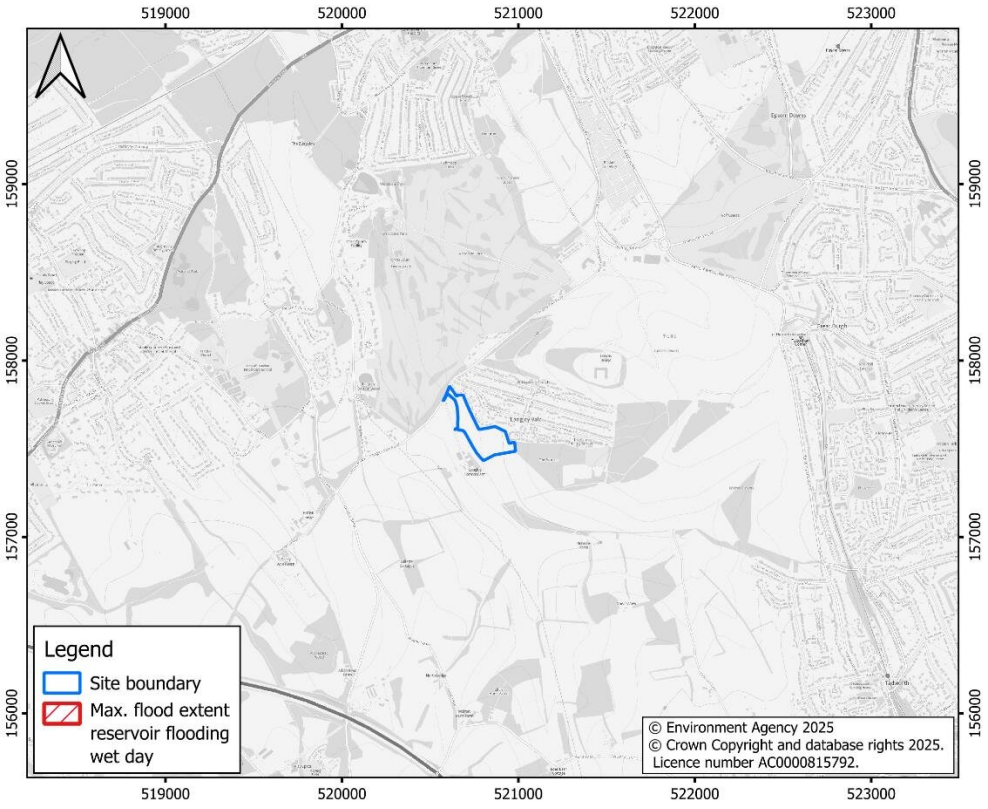
4.5. Reservoirs

The Site is not at risk of flooding in the event of reservoir failure (see Figure 4-5). The risk of reservoir flooding is related to the failure of a large water storage reservoir. The risk of failure is considered to be extremely low (DEFRA, 2010), therefore the mapped flood extent represents a worst-case scenario.

There are no other large water bearing feature in the area of interest which may impact flood risk at the Site.

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Figure 4-5 EA's risk of flooding from reservoir failure (wet day scenario)



5. Suitability of the development

5.1. Sequential Test

The Sequential Test, outlined in the PPG for Flood risk and Coastal Change, identifies that developments should be directed to areas at the lowest probability of flooding.

The Site is entirely within Flood Zone 1, and is not thought to be at risk of flooding from groundwater, sewer or reservoirs. There are small areas of the site at a low to medium risk of surface water flooding, although these are excluded from the development areas (residential development blocks).

The development is classified as “More Vulnerable” with regards to flood risk. According to the NPPF (see Table 5.1), "More Vulnerable" site uses are considered appropriate within Flood Zones 1 (and low risk from other sources) and an Exception Test is not required.

Therefore, the Sequential Test is not considered to be required in this instance.

Table 5.1 Flood risk vulnerability and flood zone compatibility.

Flood risk vulnerability classification	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Zone 1 (low probability)	✓	✓	✓	✓	✓
Zone 2 (medium probability)	✓	✓	Exception Test required	✓	✓
Zone 3a (high probability)	Exception Test required	✓	x	Exception Test required	✓
Zone 3b (functional floodplain)	Exception Test required	✓	x	x	x

✓ *Development is appropriate.*
x *Development should not be permitted.*

6. Mitigation

6.1. Fluvial/tidal/reservoir flooding mitigation

The development Site lies entirely within Flood Zone 1, and there are no flood risks from reservoirs. Therefore, no mitigation measures are necessary.

6.2. Groundwater flooding mitigation

As per the EEBC SFRA mapping (Metis Consultants, 2024), the area is classed as having low susceptibility to groundwater flooding, as such no mitigation measures are deemed necessary.

6.3. Mitigation of sewer flooding to the Site

Non-return valves to sewer connections are a viable mitigation against sewer flooding. However, the risk of sewer flooding is considered to be low in this instance.

6.4. Mitigation of surface water flooding to the Site

The Site layout plans (see Appendix B and Figure 4-2)) have been developed to ensure that the development areas are located outside of the surface water flood risk areas.

The slight topographical valley through the centre of the Site is mapped as a surface water flowpath – with maximum simulated depth of <0.20 m under a 1 in 1,000 year +CCA storm event. This area has been set aside for green space and water management, as discussed in Section 7

6.5. Mitigation of surface water flooding from the Site

The National Planning Policy Framework (NPPF) stipulates that all new developments must be “safe, without increasing flood risk elsewhere”. As such, the following stipulations are provided in the EA guidance for managing rainfall runoff (Environment Agency, 2013):

1. Stormwater runoff rates and volumes discharged from urban developments should approximate to the Site greenfield response over a range of storm frequencies of occurrence (return periods).
2. Runoff for extreme events should be managed on-site. This requires:
    - the peak rate of stormwater runoff to be limited;
    - the volume of runoff to be limited;
    - the pollution load to receiving waters from stormwater runoff to be minimised;
    - the assessment of overland flows and temporary flood storage across the Site.

An Outline Drainage Strategy has been created to demonstrate that there will be no increase in runoff from the Site under a range of design storm scenarios, and that all site runoff will be sustainably managed in accordance with the local and national policy and guidance. This includes suitable allowances for future increases in rainfall intensity caused by climate change. The Drainage Strategy is presented in Section 7.

6.6. Flood evacuation plan

Considering the Flood Zone 1 classification, a flood warning and evacuation plan is not required in this instance.

7. Drainage Strategy

7.1. Introduction

The following sections describe the outline SuDS Strategy for the proposed development with due regard to DEFRA's Non-Statutory Technical Standards for SuDS (DEFRA, 2015) and the Surrey County Council Sustainable Drainage System Design Guidance (Surrey Council, 2022), and the 'Water. People. Places. A guide for master planning sustainable drainage into developments guidance.

The proposed residential development will be located on largely previously undeveloped, 'greenfield' land. A proportion of the Site would comprise impermeable areas following its development (for example, rooftops and roads). Without appropriate management, this would result in an increase in both the volume and rate of surface runoff generated by the Site, which could lead to an increase in surface water flood risk elsewhere (i.e. downstream). Surface runoff from the developed Site will, however, be sustainably managed using SuDS, as described in the following sections.

SuDS aim to mimic the natural drainage characteristics of a site prior to its development by controlling surface water runoff as close to where the rain falls as possible e.g. through interception and re-use, evaporation and infiltration into the ground. Furthermore, SuDS provide opportunities to remove pollutants from runoff and also provide amenity and biodiversity benefits.

7.2. Greenfield runoff and permissible discharge rates

The IH1242 method has been used to estimate the greenfield runoff rate for the existing Site using the data presented in Table 7.1. The 'QBAR' (i.e. 1 in 2.3 year return period) greenfield runoff along with runoff rates for other return period storm events are presented in Table 7.1. These results represent the runoff from the entire site, excluding any significant public spaces; this will be refined down in due course to represent the "positively drained area" only.

Table 7.1 Greenfield runoff rates

Return period (yrs)	Runoff rate (l/s)	Runoff rate per hectare (l/s/ha)
1	21.5	4.2
2	22.3	4.4
2.3 (Qbar)	25.4	5.0
30	60.7	6.3
100	80.7	11.9

No permissible discharge rate has been set in this instance as all runoff will discharge to ground.

7.3. Runoff Destination

The Surrey local guidance requires the following hierarchy is followed for the disposal of surface water from new developments, in order of priority:

a) *At source reductions and reuse;*
b) *Infiltration to ground;*
c) *Attenuated discharge to a surface water body;*

d) To a public surface water sewer;
e) To highway drain, or other private drainage system; or
f) To a combined sewer where there are absolutely no other options, and only where agreed in advance with the relevant sewage undertaker.

The following sections comment on the suitability of each of these measures in turn.

7.3.1. At source reductions and reuse

Some capture and reuse of rainfall at the site is achievable for the proposed development.

Water recycling is recommended in the form of water butts but rainwater harvesting cannot be relied on for stormwater management unless sophisticated "smart" systems are employed to ensure storage features are empty ahead of incoming storm events. These could be incorporated at detailed design; however, they will not be included in the outline design to ensure the system has sufficient capacity should they not be implemented, or fail to work consistently.

7.3.2. Infiltration to ground

The chalk bedrock under the site is permeable. Calculated soil infiltration rates at the Site (see Section 2.2) suggests rates ranging between 2.03 x 10^{-5} to 5.70 x 10^{-4} m/s, which are favourable for infiltration.

The principal method for water disposal at the Langley Bottom Farm (adjacent) site is via infiltration to ground.

Infiltration is a highly appropriate method for water disposal in this instance. The conceptual proposals for water management are to install surface water attenuation features along the Site's western border to attenuate the majority of Site runoff. The surface runoff will drain via infiltration into the underlying White Chalk following suitable treatment in accordance with the SuDS Manual. This will ensure that the nearby Thames Water pumping station remains protected from potential pollution incidents.

Direct infiltration to ground without prior treatment will be avoided owing to the presence of the Source Protection Zone (see Section 2.3).

7.3.3. Discharge to surface water body

There are no surface water features proximal to the site. Discharging surface water to a water body is not a viable option in this instance.

7.3.4. Discharge to a public surface water sewer

It is not thought that discharge to a sewer should be required as either infiltration to ground has been demonstrated to be viable. Sewer asset location plans are included in Appendix D.

7.4. Climate change

The design must include an appropriate allowance for climate change. For the London Management Catchment, the required climate change allowances are 35% and 40 % for the 1 in 30 and 1 in 100 year events respectively.

7.5. Proposed SuDS layout

Infiltration features (infiltration basins) are recommended along the western (downgradient) boundary. This area could be set aside for attenuation and infiltration to ground. Given the presence of the SPZ, water treatment features (such as lined, vegetated forebays, swales and attenuation basins) will be required upgradient of the infiltration features.

The surface water flowpath through the centre of the Site will be retained as a blue-green corridor for water storage, ecological features and amenity space. This would act as a conduit for runoff from eastern parts of the Site towards the infiltration features in the west and include a large attenuation basin in the downgradient edge. The swales and attenuation basin would be lined features, provide storage capacity and water quality treatment functionality, forming a SuDS treatment train across the site which utilises and mimics existing flowpaths.

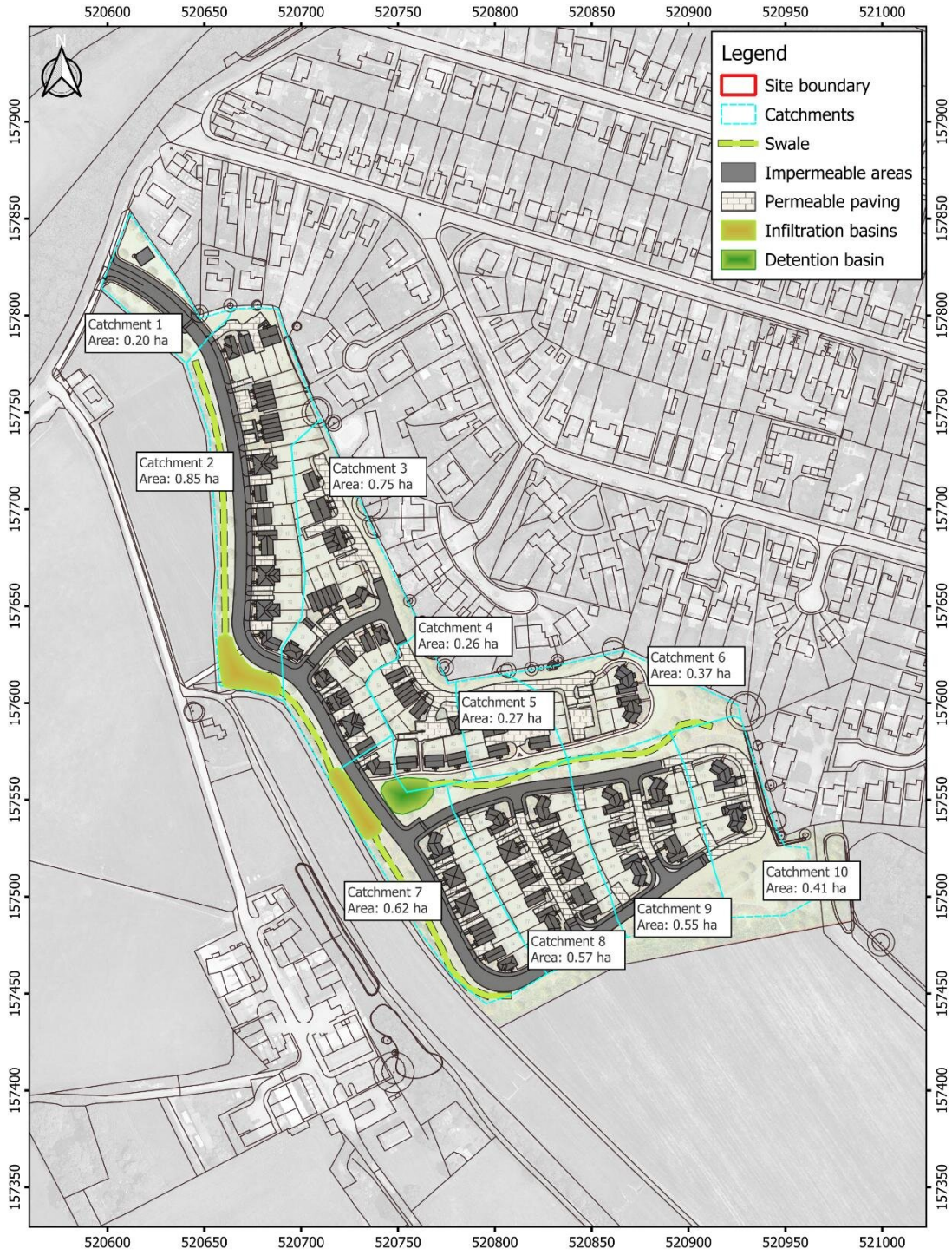
Permeable paving would also be installed in low use access roads and parking areas. The access road catchment will drain to an adjacent filter drain and onwards to an infiltration trench in the west. Dimensions of the drainage features proposed are set out in Section 7.6

The post-development Site has been sub-divided into catchment areas that will each drain via gravity to the SuDS features (note that the features will all ultimately drain to the infiltration features in the west). These sub-catchments have been delineated based on the development layout plan included in Appendix B and LiDAR Digital Terrain Model (DTM) data.

The Site is not expected to require land raising/lowering to accommodate a gravity driven drainage system; there is already a gradient to the west across the Site (towards the bottom of Langley Vale). An initial drainage network has been drafted based upon the outline development plan and the current Site topography (see Figure 7-2). Indicative key node (manholes or inspection chambers) locations are included in Figure 7-2 along with current ground levels at each location (extracted from LiDAR data).

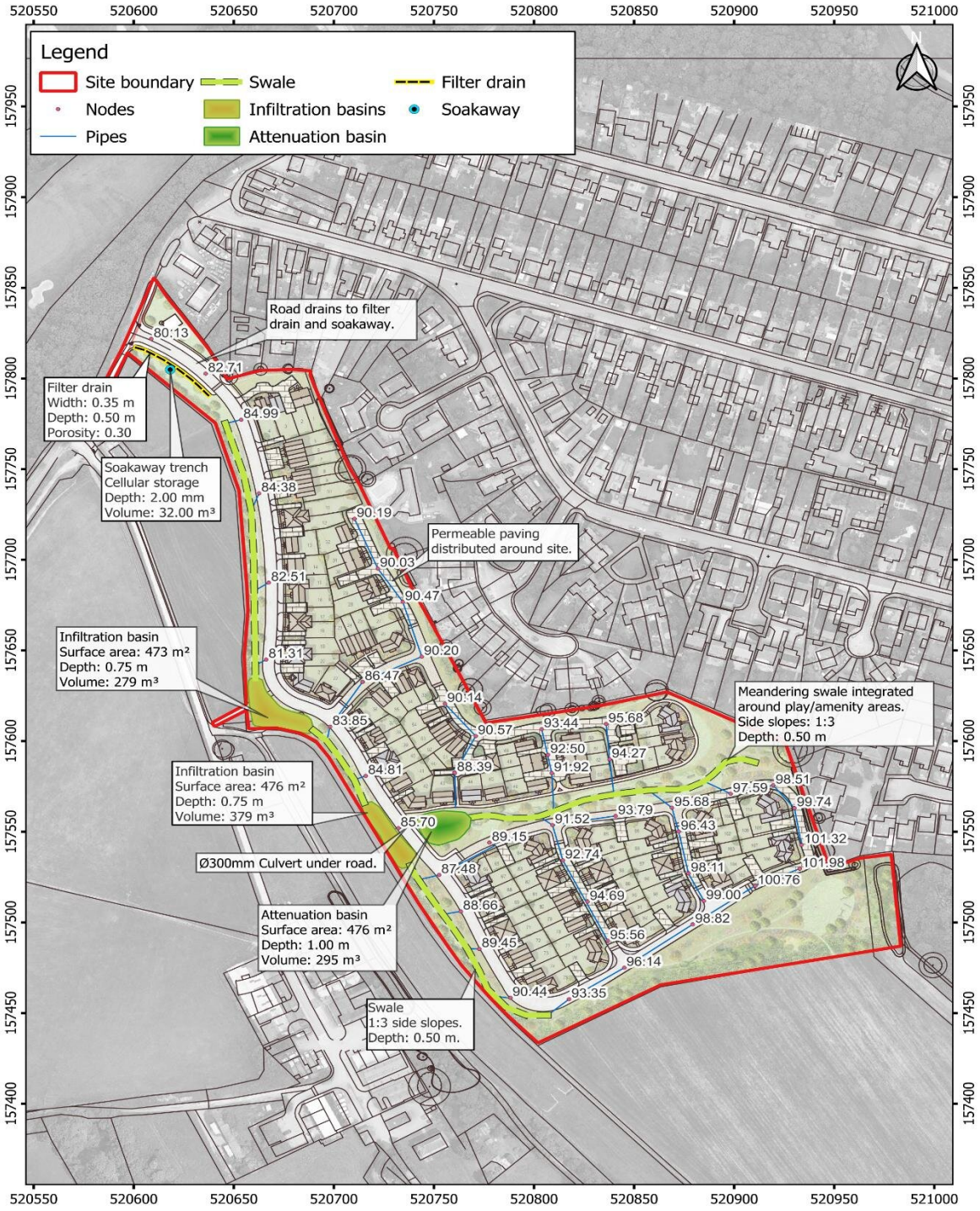
The proposed SuDS layout plan with technical details is displayed in Figure 7-2.

Figure 7-1 Catchment areas serving the proposed SuDS features



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Figure 7-2 Outline drainage strategy



7.6. SuDS features design and drainage modelling

The initial design of the SuDS features has been undertaken using the Causeway "Flow+" v 15 industry standard software. Simulations were run for the 1 in 30-year event plus a 35% CCA and the 1 in 100-year event plus a 40% CCA (as defined by the EA for the For the London Management Catchment for the 2070s epoch).

Hydrological descriptors for the Site were obtained from the Flood Estimation Handbook (FEH) website (CEH, 2024). These are shown in Table 7.2 below.

Table 7.2 FEH Hydrological Descriptors

Catchment Descriptor	Abbreviation	Value
Base Flow Index associated with each HOST soil class	BFIHOST19	0.236
Proportion of time when soil moisture deficit was equal to, or below, 6mm during 1961-90	PROPWET	0.34 (i.e. 34% of the time)
Average Annual Rainfall (1961 – 1990)	SAAR	855 mm

GIS software was used to calculate the total sub-catchment areas and impermeable surface area within the sub-catchments were delineated within GIS and are shown in Figure 7-1 (see Table 7.3 below). The impermeable areas were uplifted by a further 15% in the calculations to account for urban creep and some residual runoff from permeable surfaces.

Table 7.3 Catchment areas draining to each SuDS feature

Catchment	Total area (ha)	Contributing impermeable runoff area in catchment(ha)	Uplifted areas used in calculations (ha)
Catchment 1	0.243	0.074	0.085
Catchment 2	0.796	0.287	0.330
Catchment 3	0.920	0.219	0.252
Catchment 4	0.259	0.048	0.055
Catchment 5	0.270	0.047	0.054
Catchment 6	0.373	0.024	0.028
Catchment 7	0.646	0.216	0.248
Catchment 8	0.565	0.193	0.222
Catchment 9	0.553	0.157	0.181
Catchment 10	0.406	0.027	0.031

The dimensions/ details of each SuDS feature are presented below (Table 7.5).

The infiltration rate for all SuDS features other than the eastern infiltration basins and access road soakaway was set to zero (these features will be sealed/lined and used for attenuation and water

quality treatment purposes only. The infiltration rate for the infiltration basins and soakaways utilised the on-site test results as explained within Table 7.4 below.

Table 7.4 Infiltration rates used in drainage calculations

SuDS feature:	Infiltration rate (m/hr)	Notes
Soakaway	0.196	Mean result from TP1
Northern IB	1.951	Mean result from TP3
Southern IB	0.393	Mean result from TP3 and TP4

The swale will follow the site's natural topography, providing both a functional drainage feature and an interactive space for children. Wooden bridges will span the swale at key points, enhancing accessibility and connectivity across the corridor. Mown paths will invite exploration and provide informal walking routes throughout the space.

Note that the Site has a gradient to the east so some check dams within the swale would maximise the storage capacity available. This fine tuning of the scheme can be achieved during the detailed design phase and for now single invert/ bank levels have been utilised to demonstrate the broad feasibility of the scheme. The swale would be located in the blue/green corridor running through the centre of the Site. The feature will be a meandering channel, with shallow ephemeral pools and mature vegetation along the banks to maximise the ecological potential of the feature.

The storage capacity provided by the permeable paving has not been explicitly included in the modelling process at this stage but the areas proposed to be covered with permeable paving were excluded in the overall impermeable area values used in the calculations.

Appendix E contains the output from the drainage model simulations. This confirms that, based on the parameters described above, the proposed drainage scheme will be able to manage all runoff generated during the 1 in 100 year storm event with a 45% allowance for climate change. The simulated maximum water levels within each basin is over 300 mm below the bank level in each instance. A summary of the performance of each feature is included in Table 7.6.

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Table 7.5 Details of SuDS features

Feature	Feature invert level (m aOD)	Cover/bank level (m aOD)	Feature Depth (m)	Side slopes	Area of base (m^2)	Surface area (m^2)	Total volume (m^3)
Attenuation basin	86.3	87.3	1.00	01:03	205	385	294.0
Infiltration basin (northern)	80.54	81.29	0.75	01:03	270	473	278.0
Infiltration basin (southern)	84.75	85.5	0.75	01:03	200	379	215.0
Filter drain	Variable	Variable	1.00	n/a	19.0	19.0	5.7
Swale (Blue/green corridor)	Variable	Variable	0.50	01:03	76	532	152.0
Swale (NW)	Variable	Variable	0.50	01:03	43	469	76.7
Swale (SW)	Variable	Variable	0.50	01:03	34	376	61.6
Swale (C)	Variable	Variable	0.50	01:03	14	158	25.9
Soakaway	77.8	79.8	2.00	01:03	32	32	64.0

Table 7.6 Performance of the SuDS features under a 1 in 100 year + 45% storm event.

Feature	Critical duration (mins)	Max. water level (m aOD)	Min. freeboard remaining (m)	Half drain time (mins)
Detention basin	480 (Summer)	86.83	0.48	n/a
Southern infiltration basin	60 (Summer	84.89	0.61	50
Northern infiltration basin	60 (Summer	80.71	0.57	60
Soakaway	720 (Summer)	79.76	0.04	370

** Estimated peak elevation near outfall to detention basin.*

It should be noted that the Flow model calculations for the SuDS features are conservative, as they assume that these are the only SuDS features that will serve the proposed development. As the detailed layout plan evolves, it will be possible to include further SuDS techniques within the development layout in order to enhance the 'SuDS Management Train'. Techniques such as rainwater capture and re-use and bio-retention areas will be considered during the development of the detailed layout to maximise water efficiency, water quality, biodiversity, health and wellbeing, and amenity benefits.

7.7. Exceedance routes

The available freeboard within each feature will ensure that their respective capacity will, in reality, be somewhat greater than the 1 in 100-year (plus 45% for climate change) event. Due consideration, however, also needs to be given to the exceedance routes that could occur during events above the design standard of the various components of the proposed SuDS Strategy (i.e. surface water sewers, swale and the detention basin).

Figure 7-3 shows exceedance routes for two scenarios:

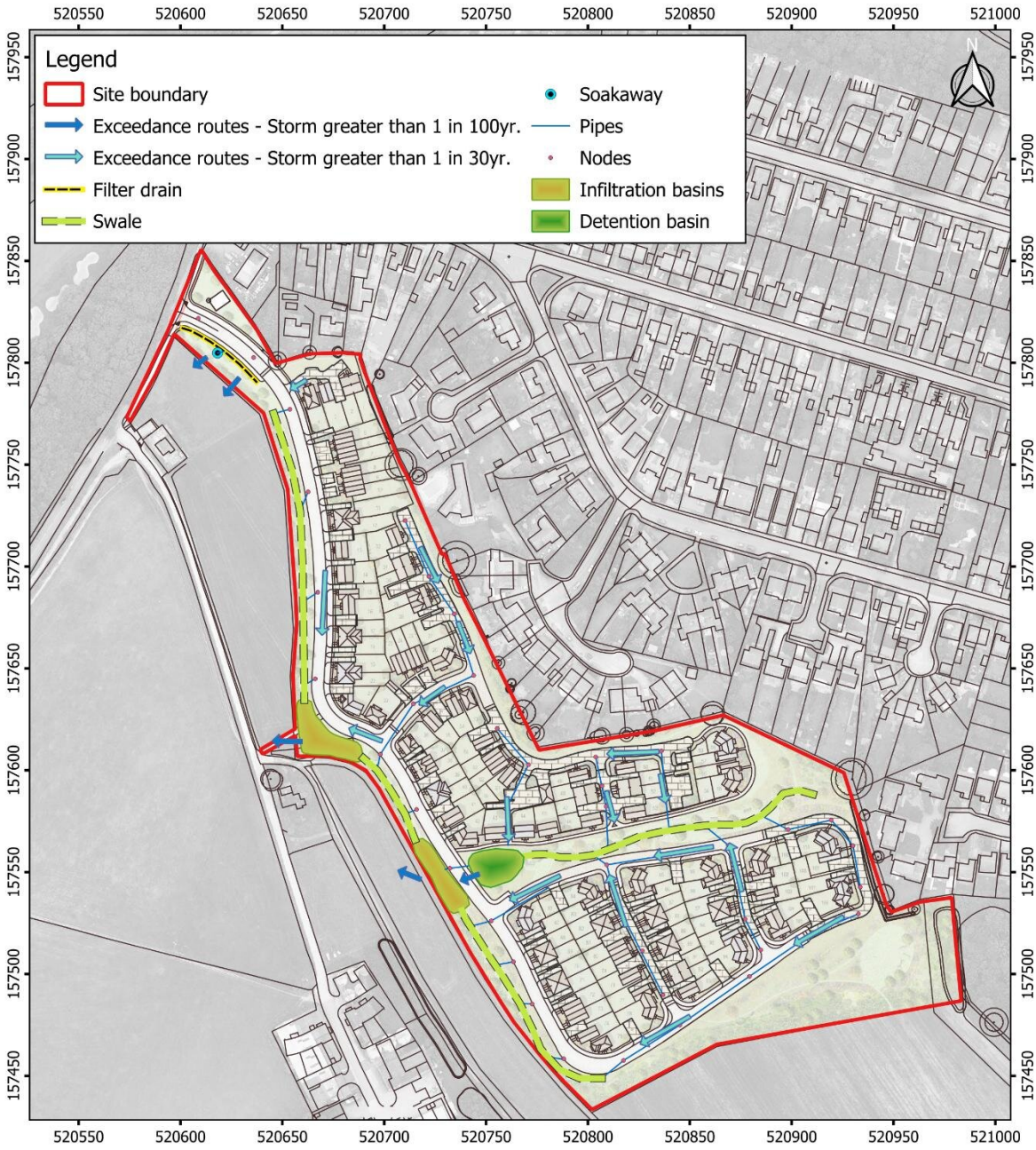
3. Surcharging water from the proposed surface water sewers under storm conditions ranging from the 1 in 30-year event to the 1 in 100-year event plus climate change.

Under this scenario, water would surcharge from manholes/inspection chambers and be conveyed along the road surfaces to the downstream SuDS features. These exceedance flows would be shallow and contained within road kerbing. These exceedance routes have been calculated using the proposed stormwater drainage routes (Figure 7-2) and the existing LiDAR DTM data.

- Over-topping of the SuDS features under events well in excess of the 1 in 100 year plus 45% return period - which has been used for the feature design in this instance.

Under these extreme events, exceedance flows from the SuDS features will run off along the existing preferential surface water flow pathway (i.e. to the west) to the valley bottom.

Figure 7-3 Exceedance flow routes



7.8. Water quality

SuDS techniques can be used to effectively manage the quality of surface water flowing across a site. Different methods can be used to intercept pollutants and allow them to degrade or be stored in-situ without impacting the quality of water further downstream. Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5mm to 10 mm of rainfall (i.e. the 'first flush') should be adequately treated using SuDS.

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The proposed development will include residential dwellings, low traffic roads and driveways. The CIRIA SuDS manual categorises runoff from residential dwellings as presenting a very low water quality hazard and runoff from low usage roads and residential driveways as presenting a low hazard rating (Table 7.7).

Table 7.7 Water quality hazard ratings (CIRIA, 2015)

Land use	Hazard level
Residential roof drainage	Very Low
Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.	Low
Commercial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).	Medium
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemical and fuels (other than domestic fuel oil) are delivered, handled, stored used or manufactured, industrial sites.	High
Trunk roads and motorways	High

The CIRIA SuDS manual (CIRIA, 2015) advocates a qualitative approach to designing a SuDS scheme for a site with a low hazard rating. This should provide adequate controls on pollutants contained in runoff water.

As the proposed development is residential in nature with a low hazard rating, hazard indices of 0.5 for total suspended solids (TSS), 0.4 for metals and 0.4 for hydrocarbons are considered applicable.

The measures detailed in Table 7.8 are examples which are suitable for inclusion in a drainage strategy for a residential development to mitigate a potential increase in sediment load within on-site and off-site runoff – note text in bold are measures included in this SuDS Strategy. Removal indices are included for each feature type relative to the specific pollutant.

Table 7.8 Mitigation indices for SuDS components (discharges to surface water)

Component Type	TSS	Metals	Hydrocarbons
Filter drain	**0.4**	**0.4**	**0.4**
Swale	**0.5**	**0.6**	**0.6**
Permeable paving	**0.7**	**0.6**	**0.7**
Detention basin	**0.5**	**0.5**	**0.6**
Pond	0.7	0.7	0.5

Various combinations of the features listed above (depending on the sub-catchment being considered) will provide adequate treatment to mitigate the low hazard associated with runoff from the development. Runoff from the access road will be treated via the filter drain running parallel to the road.

Separators and sediment traps will be installed upgradient of the infiltration features to further protect the groundwater in the area and facilitate the maintenance of the SuDS features.

All runoff from roads will pass through at least one water treatment feature prior to discharging to ground.

7.9. SuDS maintenance

Inspection and long-term maintenance of SuDS components ensures efficient operation and prevents failure.

This section outlines the maintenance and management schedules for the proposed stormwater drainage system. The schedules have been formulated in line with guidelines contained within the CIRIA SuDS Manual. There are three categories of maintenance activities referred to in this report:

- **Regular maintenance** – tasks which are required to be undertaken on a weekly or monthly basis, or as required.
- **Occasional maintenance** – tasks which are required to be undertaken periodically, typically at intervals of three months or more.
- **Remedial maintenance** – tasks which are not required on a regular basis but are done when necessary.

This section is intended to give an overview of the operation and maintenance for the range of drainage features included within the surface water drainage strategy and in relation to typical/ standard details only.

Maintenance schedules for the proposed SuDS components are provided in the following tables. These requirements will be implemented following the completion of the proposed development, and will be undertaken either by the Lead Local Flood Authority, a private management company or by the local water company, subject to discussions regarding this responsibility. These schedules are not exhaustive and should be reassessed at regular intervals to determine if any additional maintenance requirements are required to preserve the performance and condition of the drainage system.

Table 7.9 Management and maintenance requirements for pipes and manholes

Maintenance schedule	Required action	Maintenance frequency
Regular maintenance	Remove any accumulation of silt, sediment, leaves and debris etc	Monthly, or as required
	Inspect for evidence of poor operation	Monthly (during the first year), then half yearly
Occasional maintenance	High pressure water jet removal of silt build-up and avoid blockages, particularly at bends or changes in direction	Six monthly, or as required
	Remove or control tree roots where they are encroaching pipe runs, using recommended methods	As required
Remedial actions	Clear pipework and gully grates of blockages	As required
	Replace any damaged or failed pipes, gullies or manholes	As required

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Table 7.10 Management and maintenance requirements for permeable paving

Maintenance schedule	Required action	Maintenance frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 7.11 Management and maintenance requirements for swales

Maintenance schedule	Required action	Maintenance frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Manage vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or as required
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required, or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required

Table 7.12 Management and maintenance requirements for detention basins

Maintenance schedule	Required action	Maintenance frequency
Regular maintenance	Remove any accumulation of silt, sediment, leaves and debris etc	Monthly, or as required
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)

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Maintenance schedule	Required action	Maintenance frequency
	Manage other vegetation and remove nuisance plants	Monthly (at start), or as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from outlets, forebays and main basin when required	Every 5 years, or as required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 7.13 Management and maintenance requirements for control devices

SuDS Device	Maintenance requirements	Maintenance frequency
Regular maintenance	Inspect/check pipework to ensure that the flow control is in good condition and operating as designed	Monthly
	Inspect for evidence of poor operation	Monthly, or as required
Occasional maintenance	High pressure water jet removal of silt build-up	Six monthly, or as required
Remedial actions	Clear pipework of blockages	As required
	Replace the flow control if it becomes damaged	As required

Table 7.14 Management and maintenance requirements for filter drains

SuDS Device	Maintenance requirements	Maintenance frequency
Regular maintenance	Remove litter and debris from trench surface	As required.
Remedial actions	Replace sacrificial gravel top layer.	Annually or as required.

7.10. Further SuDS considerations

Rainwater harvesting (i.e. the use of water butts or more sophisticated tank systems) could be implemented at the Site to capture and reuse runoff at source. These systems collect water from clean

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surfaces (such as rooftops) for (generally non-potable) use on-site. Rainwater harvesting is particularly useful at sites with a low infiltration potential and limited space for attenuation features. It also has wider sustainability benefits with regards to lowering the water supply demand.

7.11. Foul drainage

A pre-planning application was submitted to Thames Water in May 2025 to assess the capacity within the public sewer network to receive foul water discharge from the proposed development.

Thames Water confirmed that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve the development. A connection could be made to the existing network beneath Langley Vale Road (see Appendix D).

7.12. Biodiversity and amenity

SuDS schemes present opportunities to enhance habitat for wildlife on-site and this often improves the biodiversity of the surrounding areas. Ponds, constructed wetlands and other surface water features are landscape assets that have amenity value and improve the aesthetics of a site more than conventional drainage systems. The use of a grassed basins and the large central swale (with larger, more mature vegetation along the tops of the banks) will enhance the biodiversity and amenity value of the Site post-development. Ecological diversity should be enhanced by the use of native planting within each feature.

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8. Conclusions

The assessment has been undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).

The assessment has:

- Investigated all reasonably foreseeable potential risks of flooding to the Site.
- Considered outline design proposals and suggested mitigation measures against the potential risk of flooding determined to be present.
- Considered the impact the development may have elsewhere with regards to flooding.
- Provided a sustainable drainage strategy for the Site.

The report concludes that:

- The Site's flood risk vulnerability classification would change from “Less vulnerable” to “More vulnerable”.
- The Site is located entirely in Flood Zone 1 and is not known to have flooded in the past from fluvial sources.
- Most of the site has a negligible risk of surface water flooding. Small areas of the Site are at elevated risk of surface water flooding and are inside a Critical Drainage Area.
- The Site has low susceptibility of groundwater flooding, low risk of sewer flooding and it is not in an area at risk of flooding from a reservoir failure.
- All runoff from the site can be discharged to ground without increasing on-site or off-site flood risk.
- Water quality risks to the environment can be adequately mitigated using the features included within the drainage strategy.

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Appendix A Report conditions

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Report Conditions

This report has been prepared by Aqua Terra Consultants Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Aqua Terra take no responsibility for variation in ground conditions between exploratory positions.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.

Appendix B Development plans

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NORTH

Metres
0 10 20 30 40 50
1:1250



_Survey Notes

This survey was carried out in accordance with the specification guidelines in
The RICS Surveys of Land, Buildings and Utility Surveys at Scales of 1:500 and Larger.
Planimetric accuracies expected:
+/-30mm from survey control at 1/100
+/-60mm from survey control at 1/200
The scales quoted are at which the survey was carried out NOT at which it is reproduced.
Any dimensions that require greater accuracy should be specifically measured on site.

Tree species are identified by use of reference books and whilst the surveyor has taken reasonable care to ensure that they are indentified correctly Marvin & Partners recommend that an Arboriculturist should be commissioned if the species are critical to the project.

All drainage connectivity is done by visual inspection and soundings, and assumed to be a straight line between man entry points, unless it has been specifically requested that all connections to be proven on site by use of electrodetection.

All drainage details are recorded from the surface. No Confined Space entry by survey personnel.

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Fairfax

FAIRFAX AQUISITIONS LTD

project:

Land at:

LANGLEY BOTTOM FARM FIELD

EPSOM

title:

ILLUSTRATIVE MASTERPLAN

date: Jul '25 **scale:** 1:1250 @ A1

drawing number:	Rev.
2503/PL.04	F

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Appendix C Trial Pit and Infiltration Test Results

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Land north of Langley Bottom Farm: Soakaway Testing

P24062_R2_Rev1
July 2025



AQUA TERRA
CONSULTING

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P24062_R2_D01 Site Location

P24062_R2_D02_Rev1 Exploratory positions plan

List of Appendices

Appendix A: Report Conditions
Appendix B: Service plans
Appendix C: Engineering logs
Appendix D: Infiltration test results
Appendix E: Photos

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1. Introduction

1.1. Instruction

Aqua Terra Consultants Ltd (Aqua Terra) was instructed by Fairfax Acquisitions Limited (the Client) to undertake infiltration testing for a parcel of land to the north/ north east of Langley Bottom Farm, Epsom (the Site). Instruction to proceed in accordance with proposal P24062_P1 was confirmed by email dated 6th January 2025.

1.2. Site location

A Site location plan is presented as drawing P24062_R2_D01 and the Site address is given as follows:

Parcel of land adjacent to Langley Bottom Farm,
Langley Vale Road,
Epsom,
Surrey,
KT18 6AP

The Site is approximately 5.2 Ha in size and is centred on National Grid Reference 520788, 157592. The Site spans across two fields to the south west of Langley Vale.

1.3. Brief

The Client is planning to submit an outline planning application for up to 110 dwellings (including affordable homes) with all matters reserved apart from access from Langley Vale Road. To support the application a sustainable drainage strategy is required which this report supports by demonstrating whether infiltration drainage may be viable at the Site.

1.4. Scope

The scope of work was to undertake infiltration testing across the Site in accordance with BRE365 (2016), to inform the proposed development drainage strategy. Aqua Terra have also been commissioned to prepare a flood risk assessment and sustainable drainage strategy which the data herein informs and is presented separately.

1.5. Geology

A review of British Geological Survey (BGS) 1:50,000 scale mapping and Reigate map sheet 286 indicates the geological sequence underlying the Site is as follows:

- Superficial geology: None.
- Solid geology: White Chalk.

1.6. Limitations

This report is written strictly for the benefit of the Client and bound by the conditions presented in Appendix A.

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2. Fieldwork

2.1. Fieldwork

Fieldwork was undertaken between 4th and 5th February 2025 with the location of each exploratory hole agreed with the Client and designed to minimise Site damage whilst providing suitable coverage. TP01 was placed off Site within the proposed Surrey CC Highway Soakaway, adjacent to the Thames Water Pumping Station. Drawing P24062_R2_D02 details the locations of the exploratory holes, and the ground conditions encountered are discussed in Section 3. A return Site visit was completed on 20th June 2025 to remove TP03 and TP04 installations and replace them with TP03A and TP04A. The works undertaken are summarised in the following table:

Table 2-1 Fieldwork undertaken

Work element	Comments/ rationale
Utilities and service clearance	Prior to the Site works a utilities report was obtained and each position was checked for services by trained and competent Aqua Terra staff using the plans (see Appendix B) and non-intrusive CAT and Genny techniques.
Trial pits	Four trial pit locations (TP01 to TP04) were machine excavated (using a tracked excavator) to depths of between 2.38m and 3.15m below ground level (m bgl). All trial pits were terminated within the White Chalk. The faces and base of each pit were cut to create as square a shape as possible, the dimensions of each pit were measured and recorded.
Logging of strata	All strata were logged by competent Aqua Terra staff in accordance with BS5930. The engineering logs are presented in Appendix C.
Soakaway testing	Soakaway testing in general accordance with BRE 365 (2016) was carried out in each trial pit using a 1,000 litre IBC, which rapidly inundated the trial pits to the required depth. Water levels were measured at regular intervals across the test period. If tests were successful, repeat tests were run in the same saturated pit as detailed by BRE365. The results of this testing are presented in Appendix D.
Installations	3No. trial pits across the Site were fitted with an observation pipe prior to being backfilled with clean imported gravel, a bentonite seal and upstanding cover for future groundwater monitoring purposes. Above ground, the installations were clearly marked using a blue standpipe.
Backfill	Where there were no installations, on completion of excavation and testing, the pits were backfilled with arisings, which were compacted in discrete layers by the tracked excavator in reverse order to excavation. Excess materials were carefully mounded on the backfilled pits to accommodate future settlement.
Reinstatement of TP03 and TP04	TP03 and TP04 were mistakenly placed outside the Site boundary. On 20th June, the headworks were removed by hand digging and the installation filled with bentonite. The scar of the trial pit was levelled by hand, topsoil spread across it and grass seed placed as agreed with the Client.

3. Ground conditions

3.1. Strata Encountered

The strata encountered during the fieldwork are summarised as follows:

- **Topsoil:** 0.25m to 0.56m thick. Encountered in all positions as a grass covered, soft brown to dark brown, gravelly, sandy LOAM. Gravel is fine to coarse, sub angular of flint and chalk. Frequent rootlets.
- **Made Ground:** Encountered between 0.25 and 0.55m bgl in TP01 only, as a firm, grey, gravelly, sandy, silty CLAY. Gravel is fine to coarse, sub angular to angular of flint, brick, sandstone and concrete.
- **Head Deposits:** Encountered between 0.55 and 1.3m bgl in TP01, as a soft light brown, gravelly, sandy, clayey SILT. Gravel is fine to medium, sub angular of flint and occasional chalk. Encountered in TP03A and TP04A between 0.25 and 1.1m bgl as light brown, gravelly, fine to coarse SAND.
- **White Chalk:** Encountered from 0.45m bgl. Encountered in all positions, typically as structureless CHALK composed of off-white, slightly sandy, slightly silty fine to coarse GRAVEL. Gravel is fine to coarse, sub angular of chalk and flint. Common flint cobbles and occasional flint boulders (Grade Dc).

Exploratory logs of each position can be found in Appendix C and a photographic log is shown in Appendix E.

3.2. Progress and Obstructions

A shallow SPT refusal was noted within TP04A at 0.8m bgl. No other obstructions were noted in any of the exploratory positions.

3.3. Stability

Some minor side instability was noted in TP03 and TP04 during soakaway testing, with the pits collapsing inwards to 2.8 from 2.9m bgl and to 2.84m from 3.15m bgl respectively. All other exploratory positions remained open and stable during excavation and testing.

3.4. Visual and olfactory evidence of contamination

There was no evidence of significant or gross impact to soils encountered within exploratory positions.

3.5. Groundwater

No seepages or groundwater strikes were noted in any of the exploratory positions. Installations were placed in TP02, TP03 and TP04.

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4. Summary of infiltration testing results

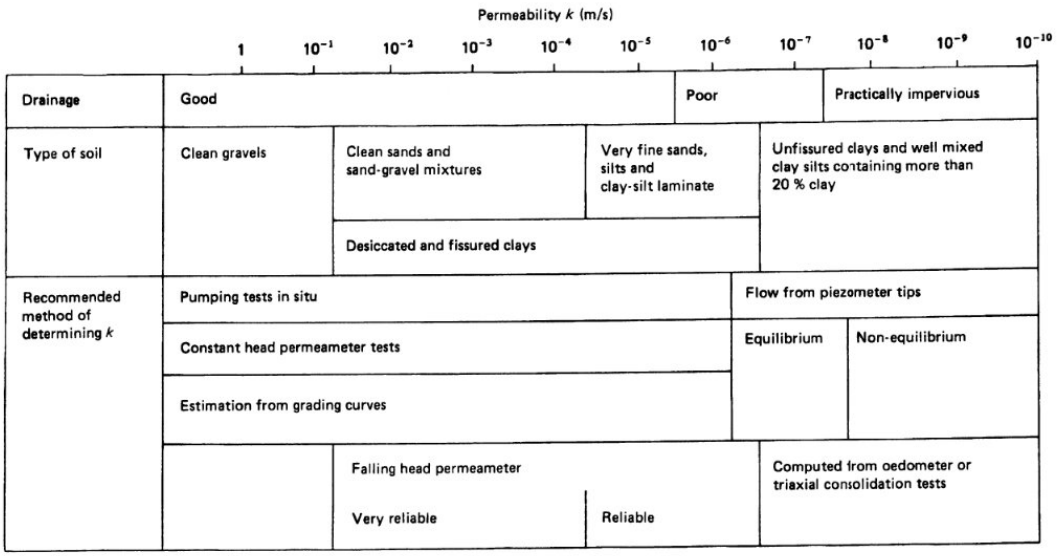
A summary of the infiltration testing is presented in Table 4-1 below with full results presented in Appendix D. The infiltration values for each pit have been calculated in accordance with the methodology set out in BRE 365.

Table 4-1 Summary of infiltration testing

Trial pit	Test	Depth of pit (m)	Geology of test section	Permeability (m/s)	Average (m/s)
TP01	1	2.93	White Chalk	8.97E-05	5.44E-05
	2			5.32E-05	
	3			2.03E-05	
TP02	1	2.38	White Chalk	2.76E-05	2.61E-05
	2			2.46E-05	
TP03	1	2.9	White Chalk	5.16E-04	5.42E-04
	2			5.4E-04	
	3			5.7E-04	
TP04	1	3.15	White Chalk	9.57E-05	1.09E-04
	2			1.02E-04	
	3			1.3E-04	

The results above concur with Lewis 1989 typical hydraulic conductivity of common rock types, with an average conductivity of 10^{-5}m/s for chalk deposits. Figure 4-1 below classifies the soil as clean sands and sand-gravel mixtures to very fine sands, silts and clay-silt laminate with good drainage.

Figure 4-1 Permeability and drainage characteristics of soils from BS 8004:1986



5. Conclusions

5.1. Ground conditions encountered

The trial pitting confirmed the published geology at the Site, consisting of approximately 0.5m of Topsoil underlain by the weathered White Chalk to a maximum excavated (proven) depth of 3.15m bgl. A thin layer of Made Ground and suspected Head Deposits were also encountered within TP01 adjacent to the Thames Water pumping station.

No groundwater strikes or seepages were noted within the excavations. All three installations were noted to be dry at the end of works. Whilst some minor instability was noted in two of the trial pits, the overall stability was generally good. No visual or olfactory evidence of gross contamination was noted within the excavations.

Whilst not directly evidenced on Site, the underlying geology is known for suffering from the potential for subsidence as a result of solution features within the White Chalk. This should be factored into any proposed drainage strategy. However, it is acknowledged that solution features are typically more problematic where there is a cover/ bridging deposit (i.e. they are hidden) which is not the case on Site.

5.2. Infiltration drainage potential

Infiltration rates have been calculated for each trial pit. All positions drained away within sufficient timescales. As a result, it is possible to conclude that that soakaway drainage will likely be appropriate for the Site.

Infiltration rate ranged between 2.03E-05m/s in TP01 and 1.09E-04m/s in TP03. TP03 drained away within 10 minutes on all three repeat tests, and it should be noted these results may not be typical of actual drainage characteristics for the majority of the Site. Nonetheless, TP03 along with TP02 and TP04 have been installed to allow for a 12-month programme of groundwater monitoring.

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Drawings

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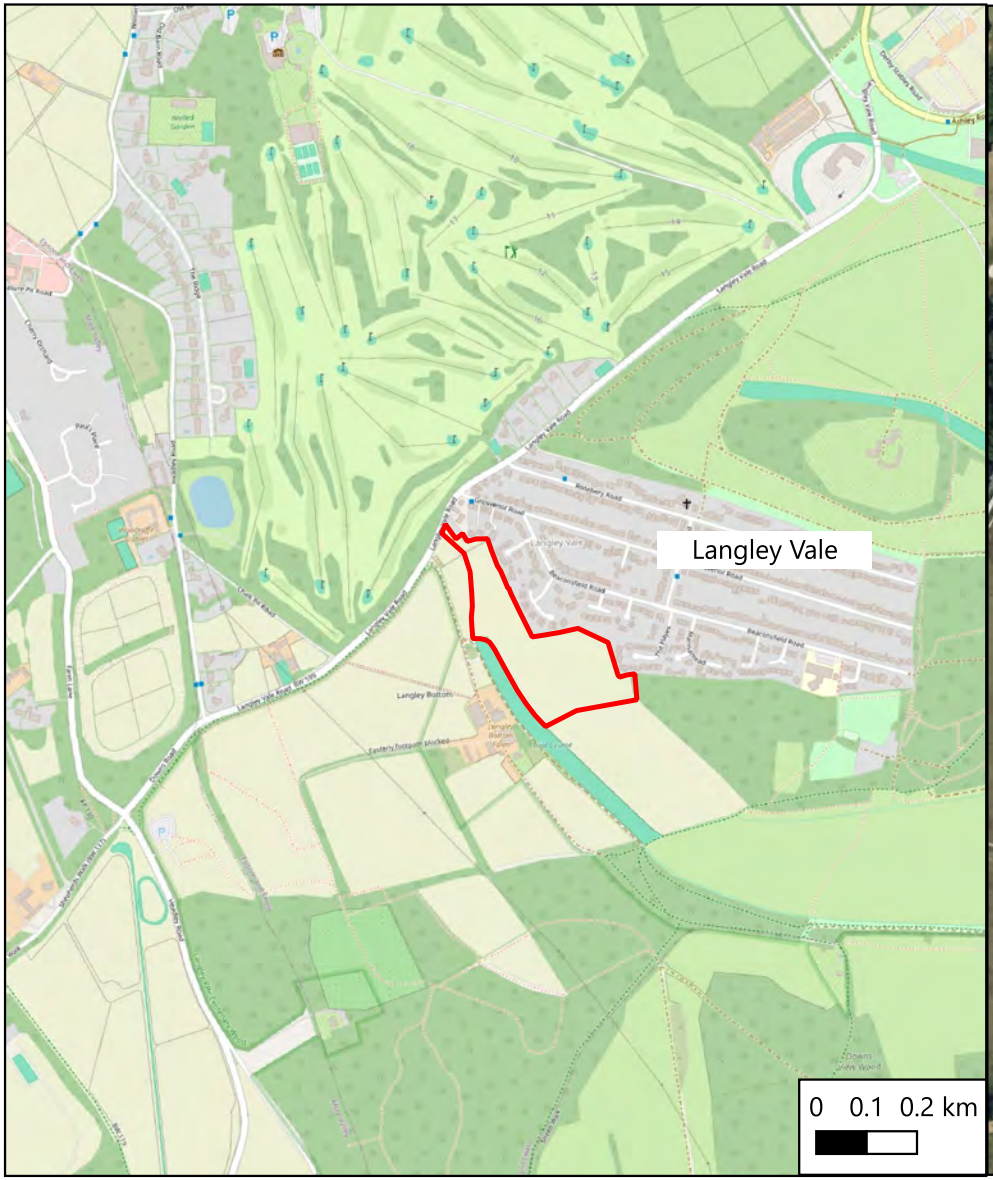




Figure Title

Site location

Client

Fairfax Acquisitions Ltd

Drawing Number	Scale	Original
P24062_D01	**NTS**	**A4**
Project Number	**Drawn**	**Checked**
P24062	**RLW**	**JEM**

Date

11/02/2025

Site Location

Langley Bottom Farm, Epsom

AQUA TERRA CONSULTING



Figure Title

Exploratory hole locations

Client

Fairfax Acquisitions Ltd

Drawing Number	Scale	Original
P24062_D02_Rev1	**1:3000**	**A4**
Project Number	**Drawn**	**Checked**
P24062	**RLW**	**JEM**
Date	**Site Location**	
24/06/2025	**Langley Bottom, Epsom**	

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Appendix A Report conditions

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Report Conditions

This report has been prepared by Aqua Terra Consultants Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Aqua Terra take no responsibility for variation in ground conditions between exploratory positions.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.

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Appendix B Service Plans

Apogee Property
& Utility Consultants

Report Type: Full Utility Search

Apogee Job Number: 428615

Client Site Name: Langley Bottom Farm

Client Job Number: P24062

Report Speed: 5 (Working) Days

Percentage Complete: 100%

No. Utilities Affected: 5

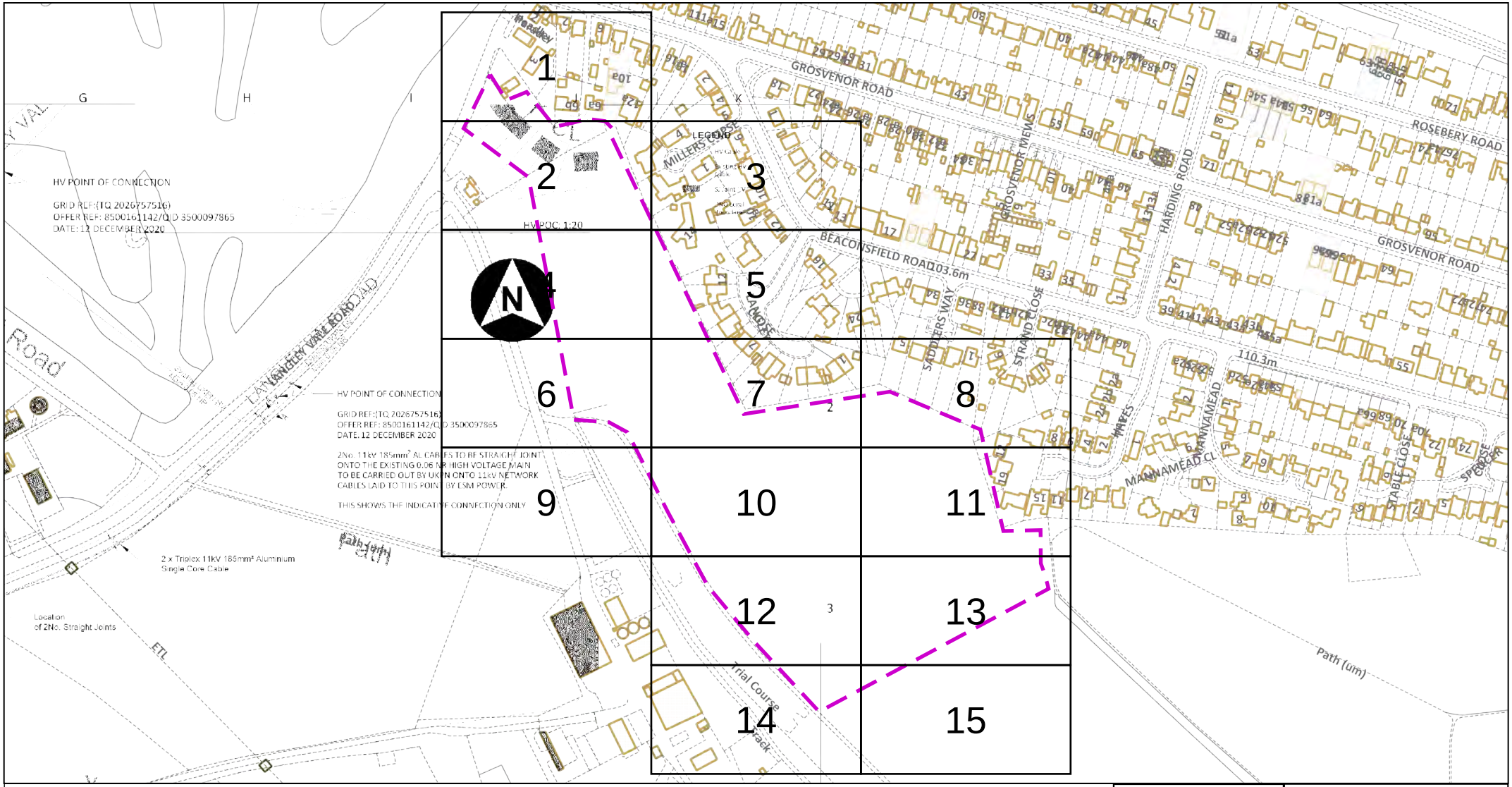
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C2 Stats Plans Responses Summary

Apogee Job Number: 428615
Client Site Name: Langley Bottom Farm
Client Job Number: P24062
Percentage Complete: 100%

Utility Name	Utility Type	Affected	Not Affected	No Response Received	Comments
UKPN	Electric	22/01/2025			
SGN	Gas	22/01/2025			
Eclipse Networks	Multi		28/01/2025		
Energy Assets	Multi		22/01/2025		
GTC	Multi		28/01/2025		
Last Mile (Energetics)	Multi		22/01/2025		
Equans (Engie)	Multi		22/01/2025		
Leep Utilities	Multi		28/01/2025		
Thames Water	Water	23/01/2025			
Thames Water	Sewerage	23/01/2025			
BT	Telecoms	28/01/2025			
Vodafone (C&W, Energis, Thus)	Telecoms			*	Not Requested By Client.
Virgin Media	Telecoms			*	Not Requested By Client.
Cityfibre	Telecoms		28/01/2025		
Colt (CA Telecom)	Telecoms		25/01/2025		
EUNetworks	Telecoms		22/01/2025		
Lumen Technologies	Telecoms		22/01/2025		
Kcom	Telecoms		22/01/2025		
MBNL	Telecoms		28/01/2025		
Sky	Telecoms		22/01/2025		
Sota	Telecoms		22/01/2025		
Arelion (Telent)	Telecoms		22/01/2025		
Verizon	Telecoms		22/01/2025		
Linesearch	Linesearch	22/01/2025			
Mast Data	Telecoms		28/01/2025		
Lon Underground	Infrastructure		23/01/2025		
Lon Overgrounds	Infrastructure		23/01/2025		
PO/Tuns	Infrastructure		22/01/2025		
Crossrail	Infrastructure		23/01/2025		
Network Rail	Infrastructure		22/01/2025		
TFL Streetworks	Infrastructure		24/01/2025		

See end of report for acronyms key, basic risk assumptions and further information on how to interpret and use the information in this report.



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Job Reference: 36048608
Site Location: 520586 157408
Requested by:
Mr Morgan Langford
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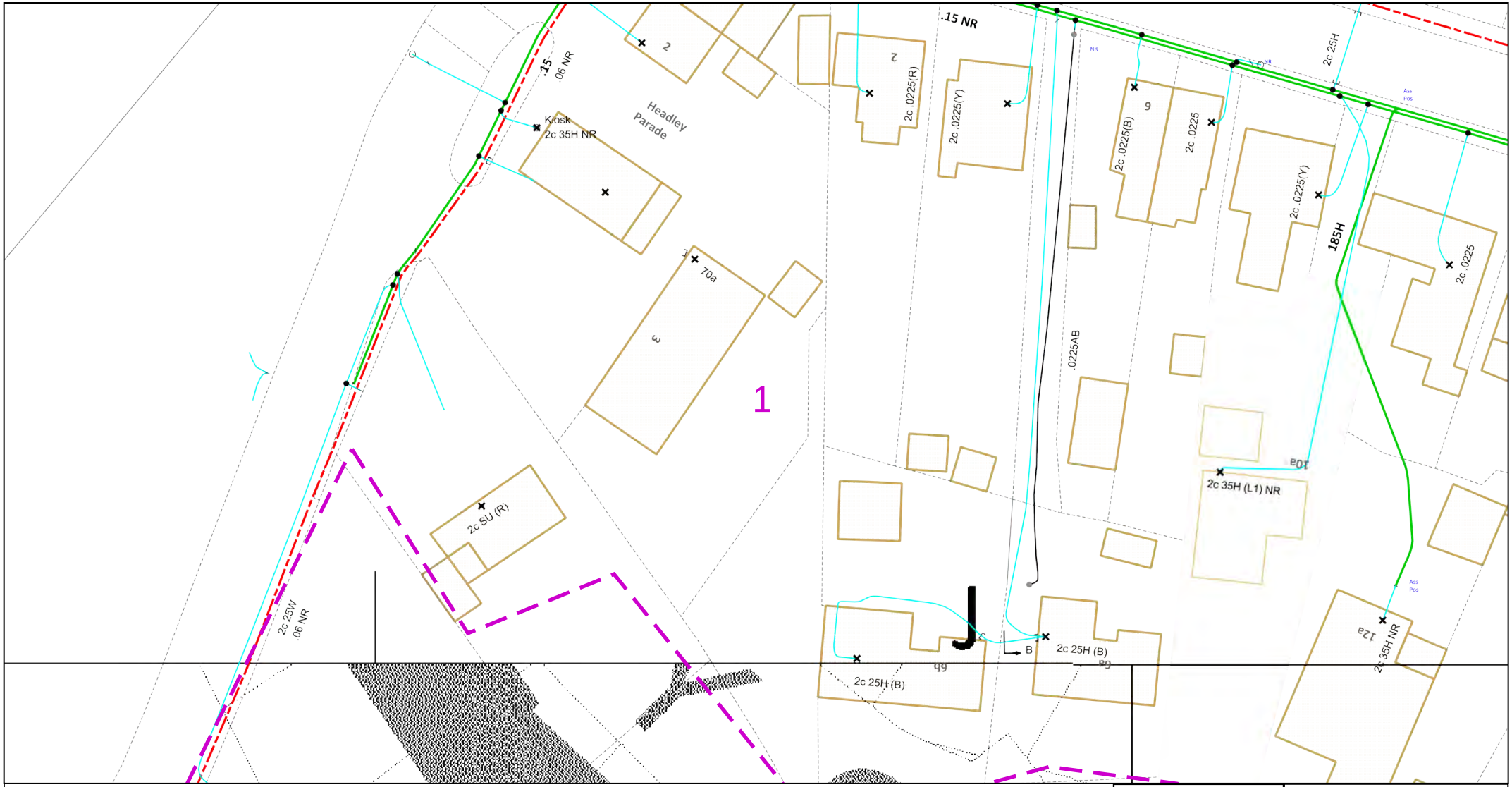
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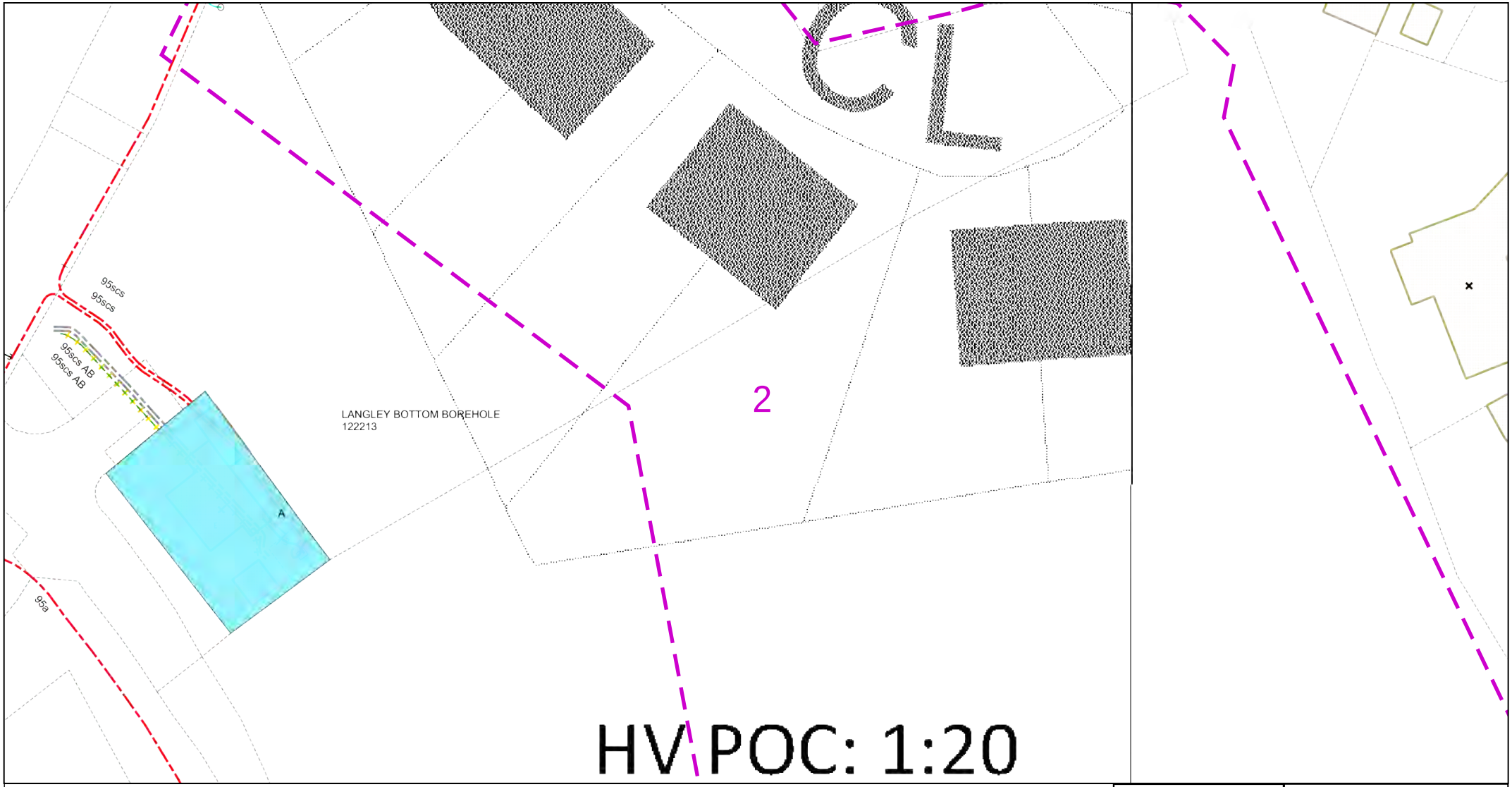
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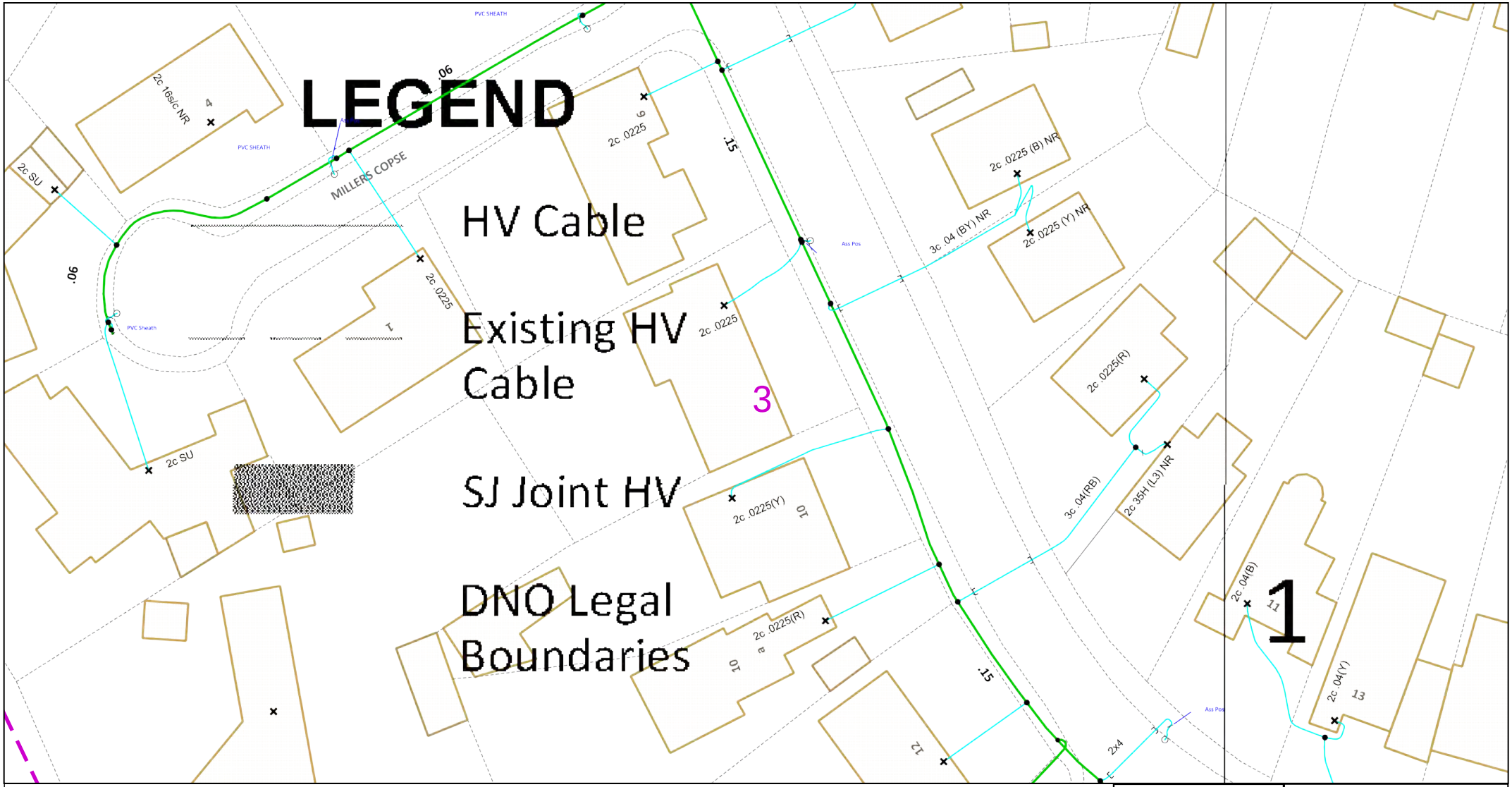
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Site Location: 520586 157408
Requested by: Mr Morgan Langford

Your Scheme/Reference: 428615
Scale: 1:500 (When plotted at A4)

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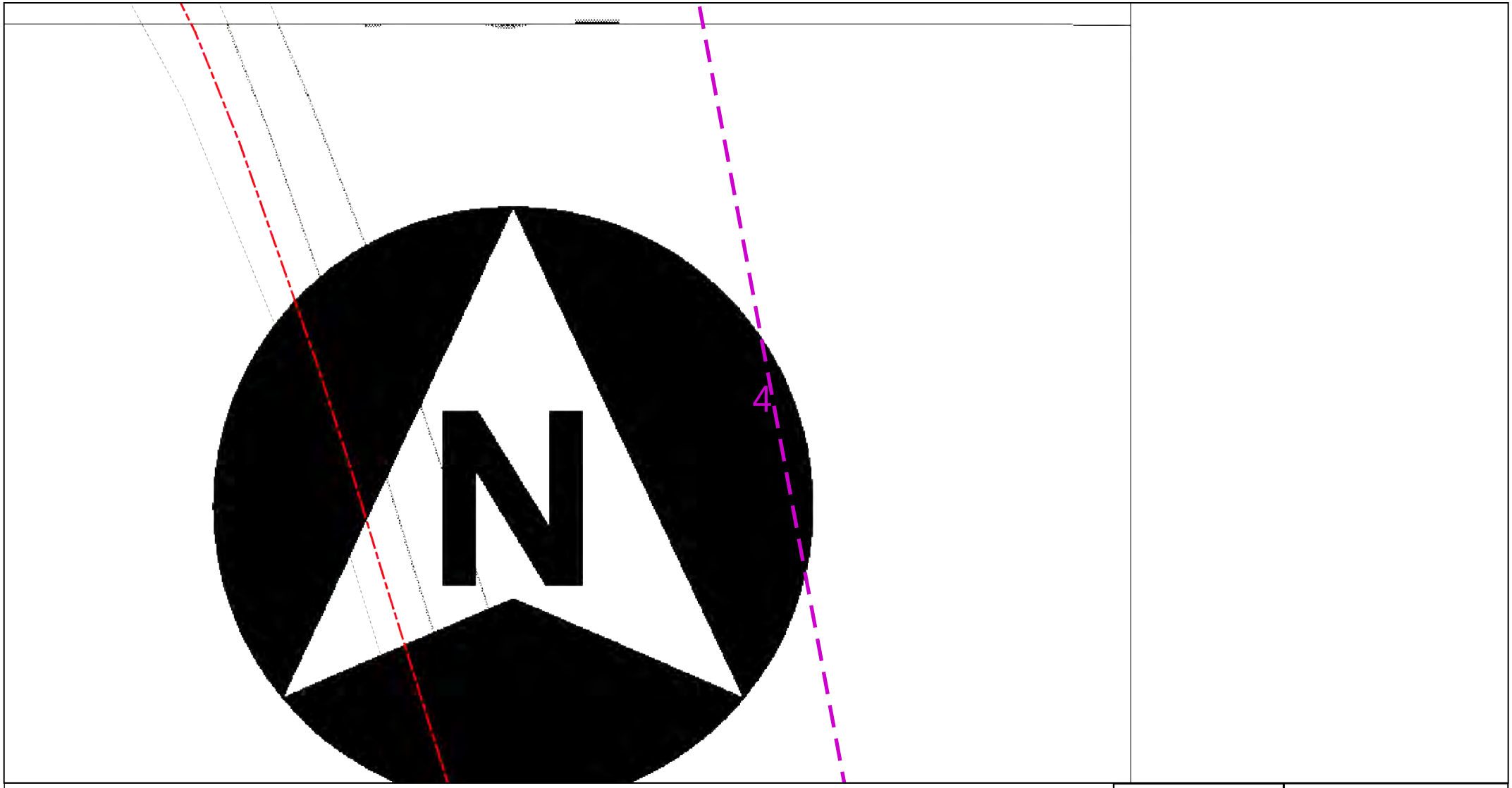
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Job Reference: 36048608
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Requested by: Mr Morgan Langford

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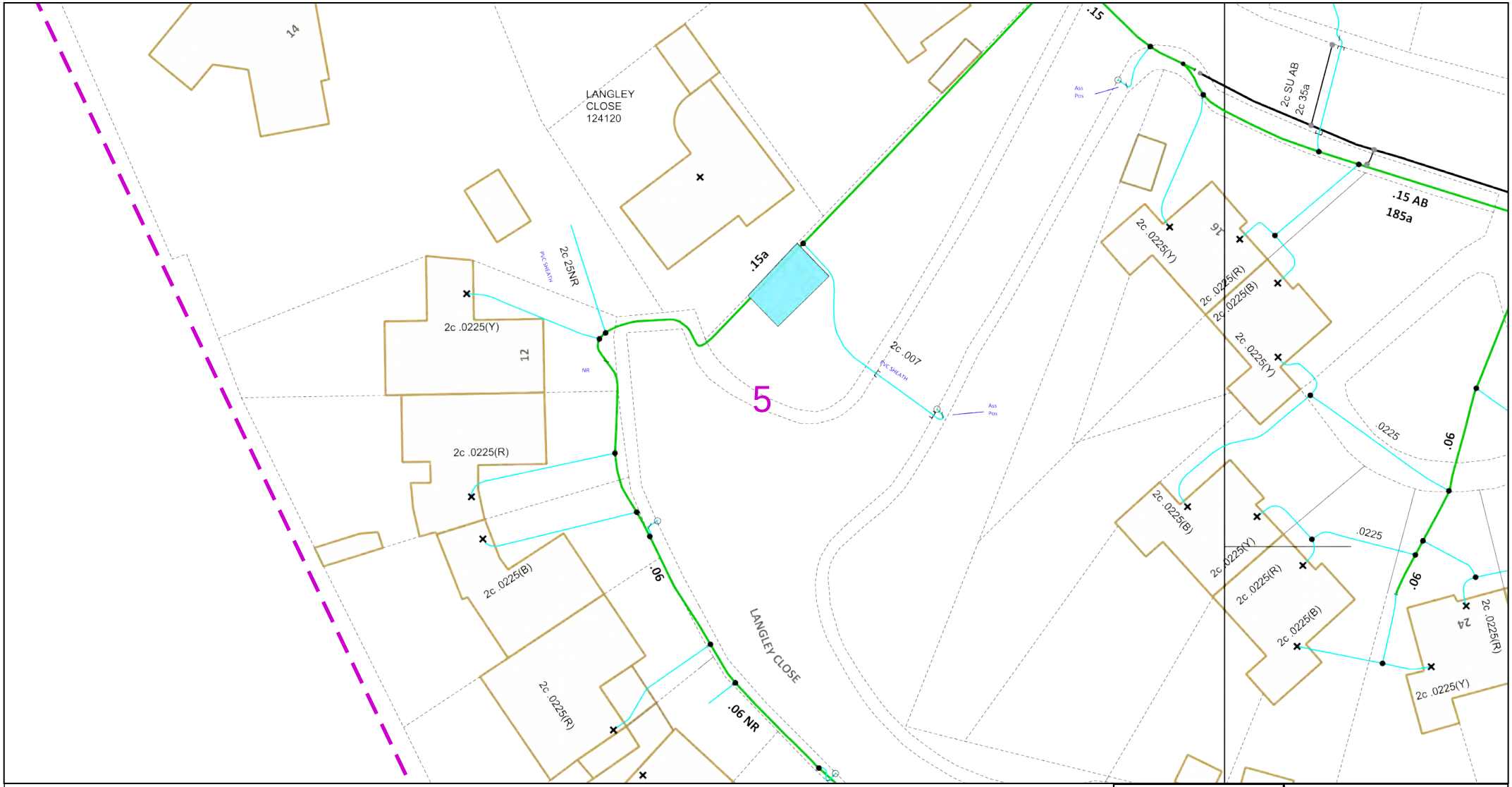
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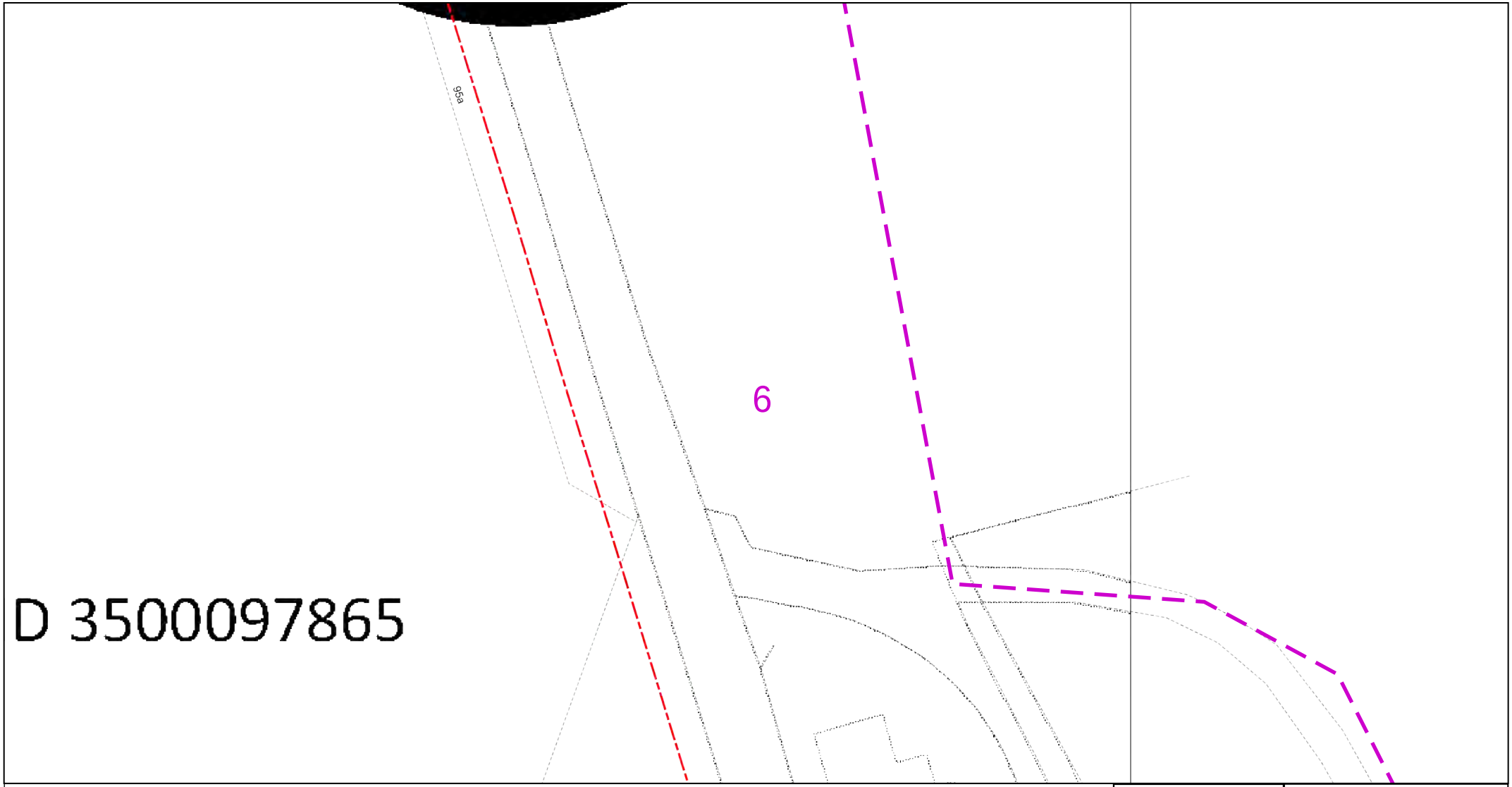
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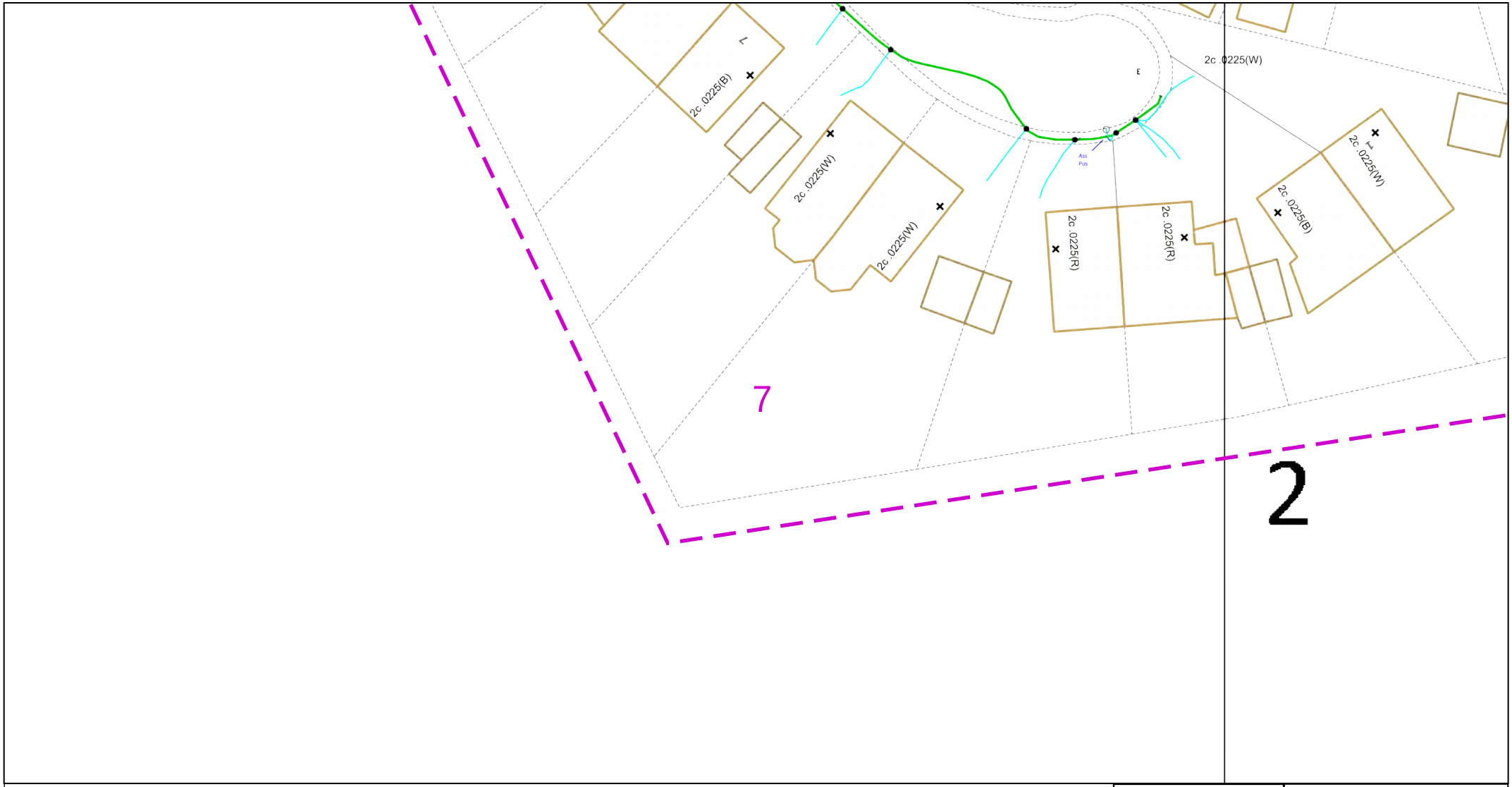
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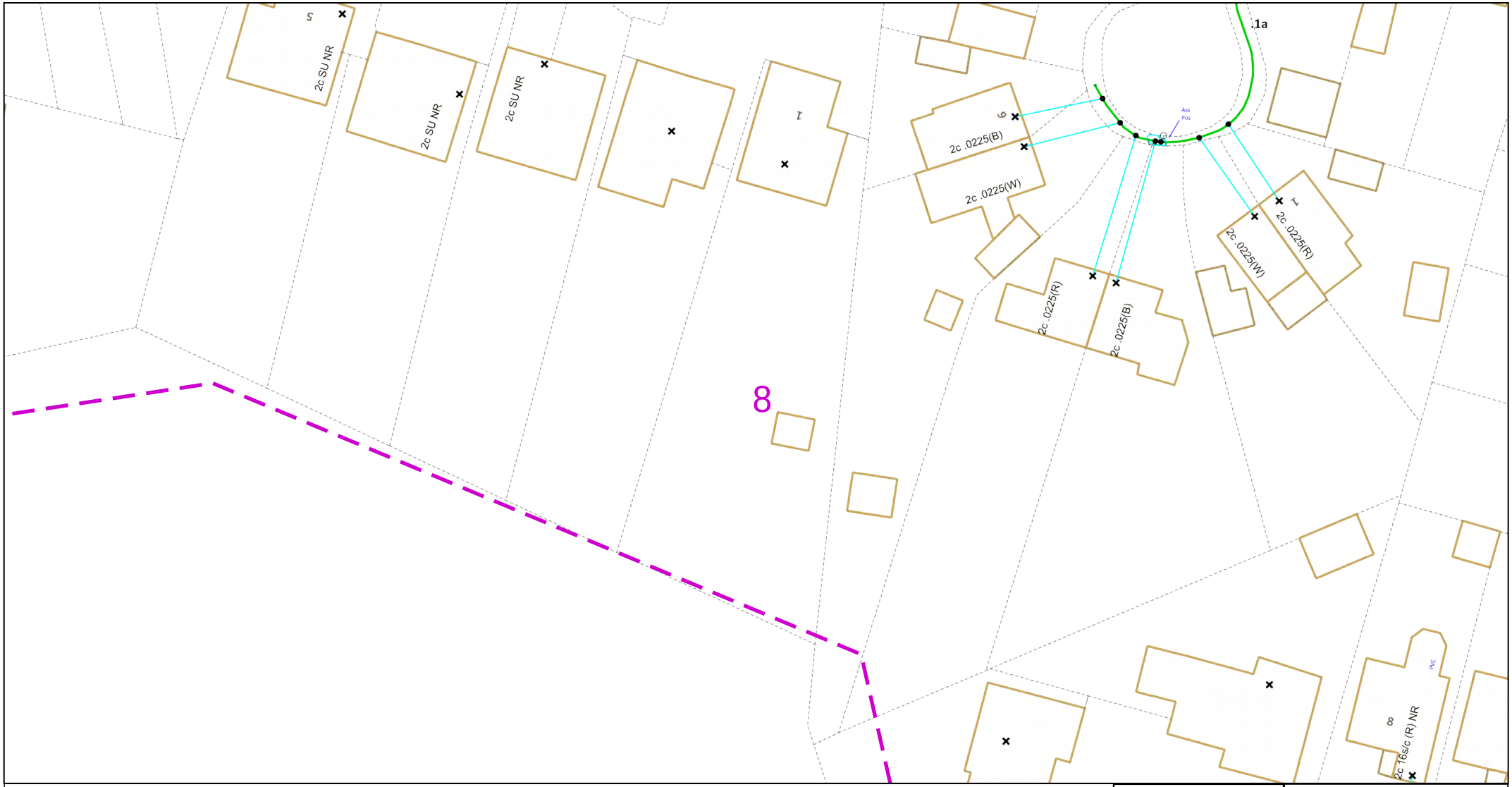
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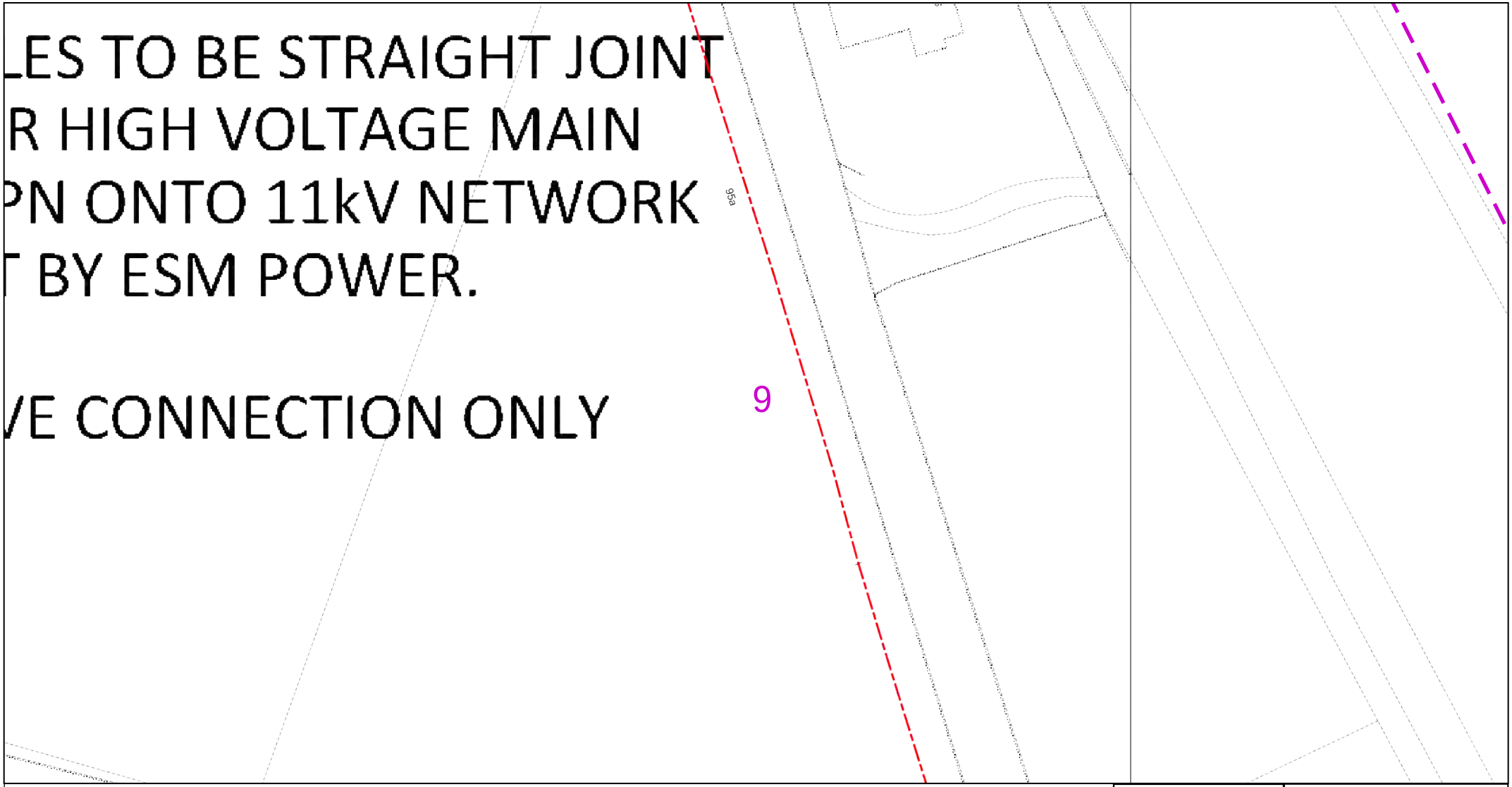
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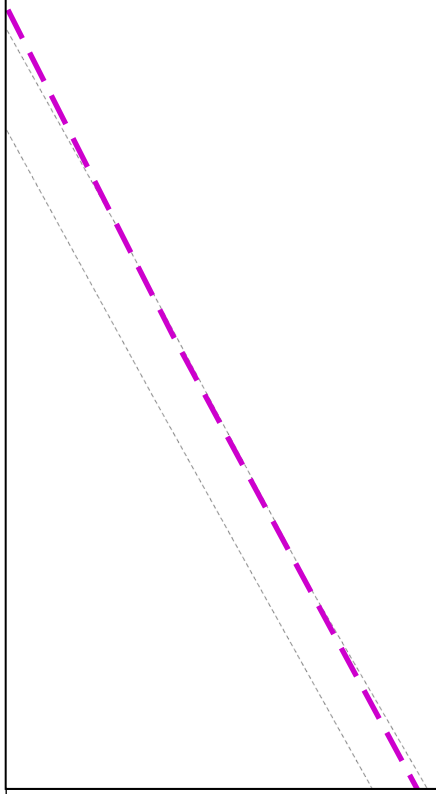
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Date Requested: 22/01/2025
Job Reference: 36048608
Site Location: 520586 157408
Requested by: Mr Morgan Langford

Your Scheme/Reference: 428615
Scale: 1:500 (When plotted at A4)

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UK Power Networks

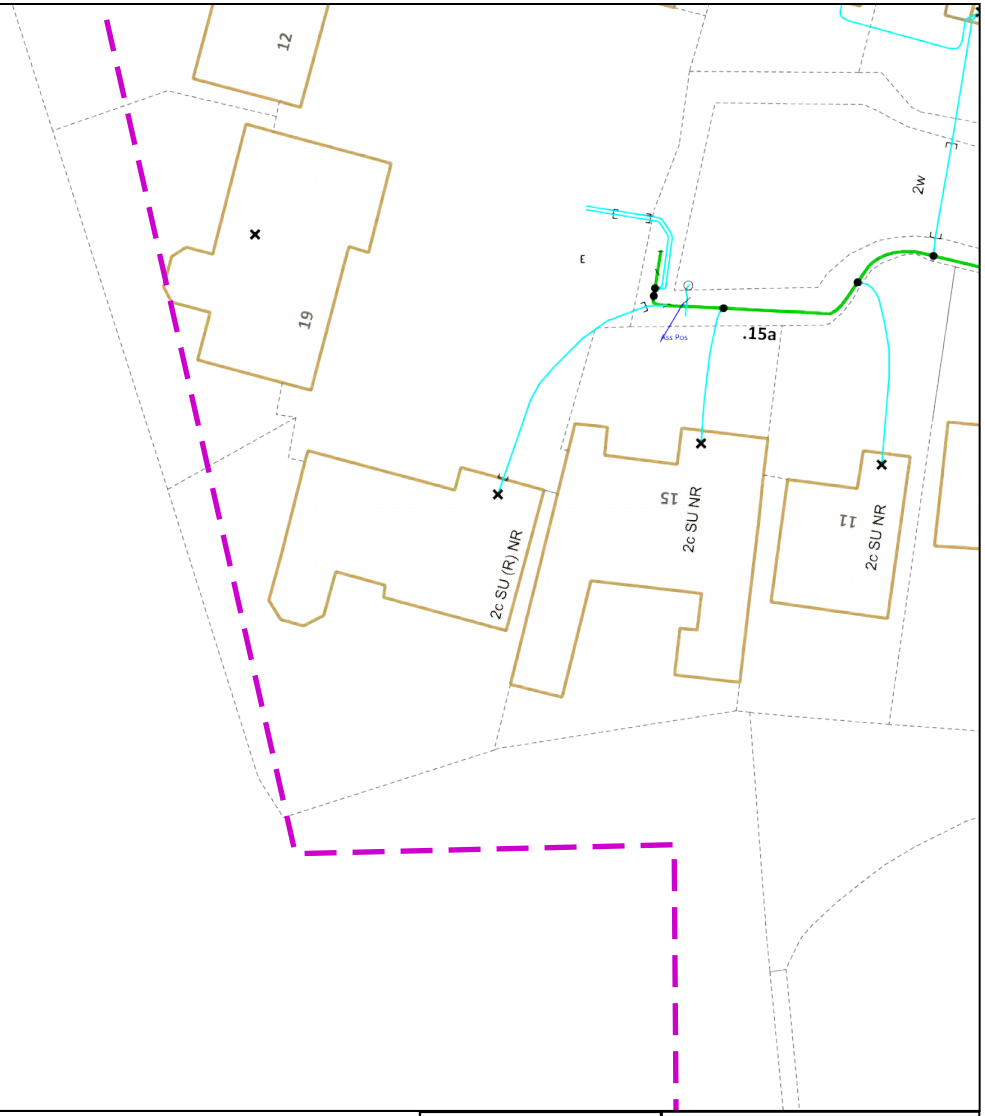
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URGENTLY



ALWAYS LOOK UP BEFORE YOU START WORK
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0 12.5 25
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N W E S

UK Power Networks

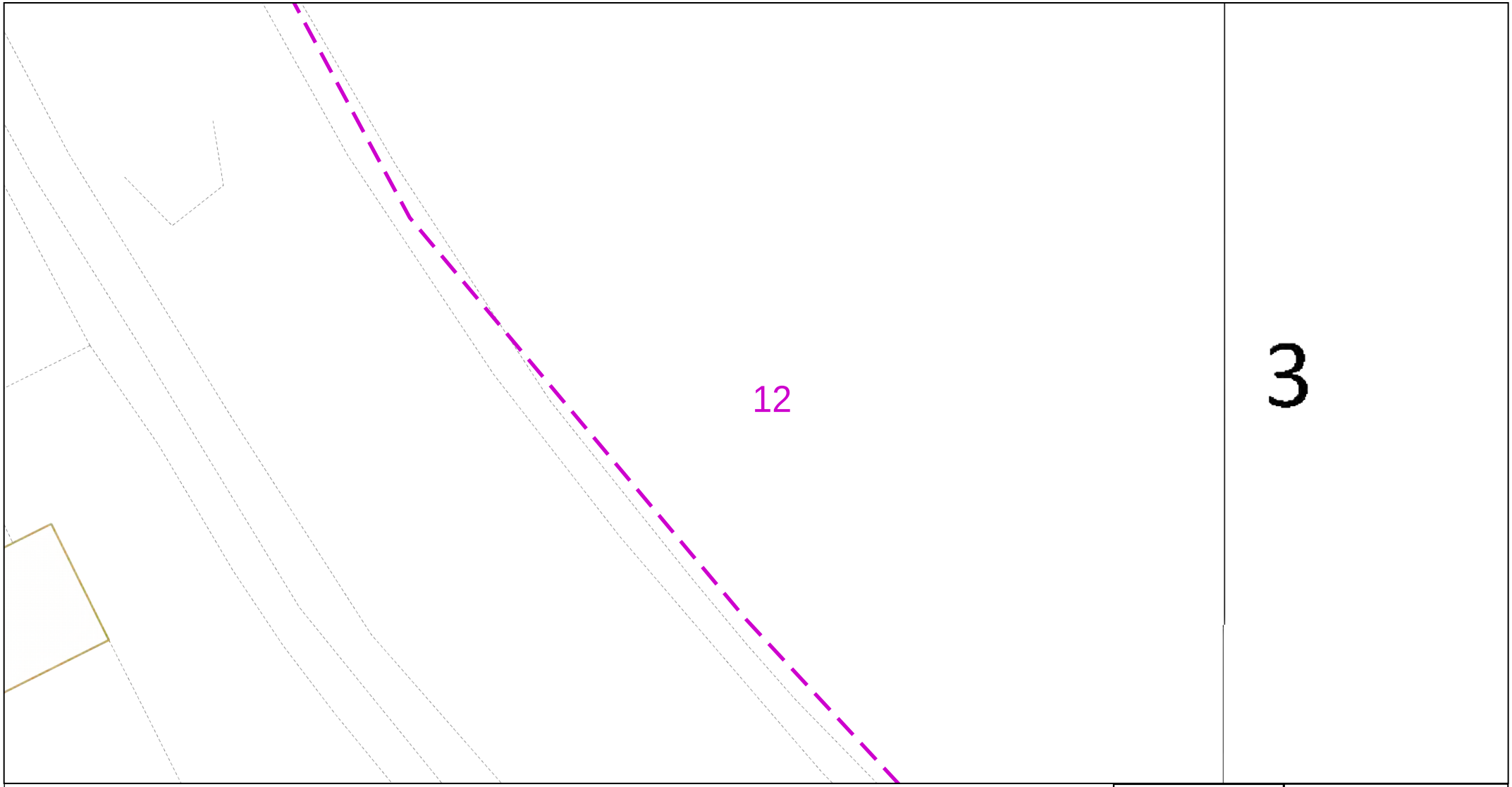
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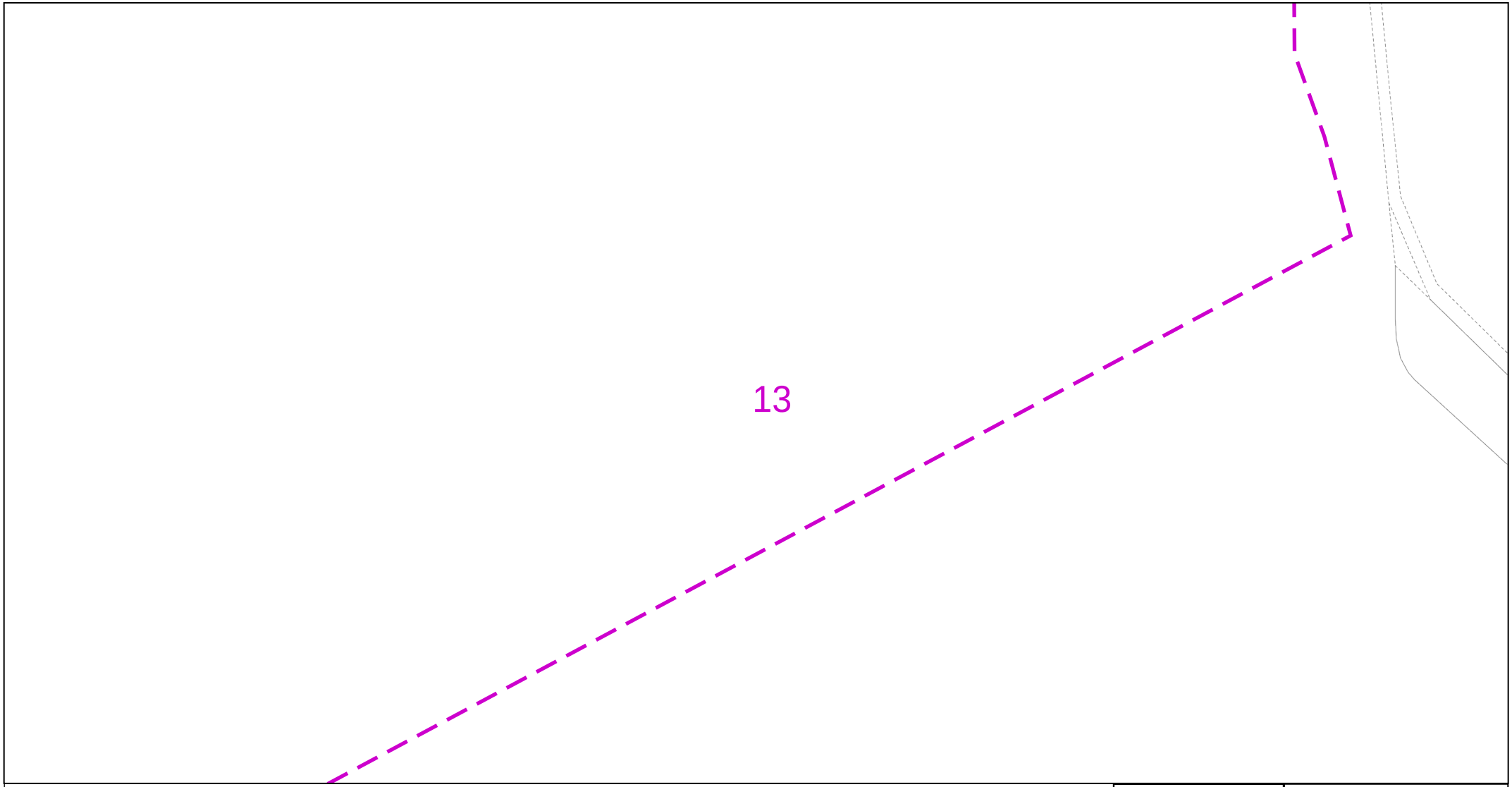
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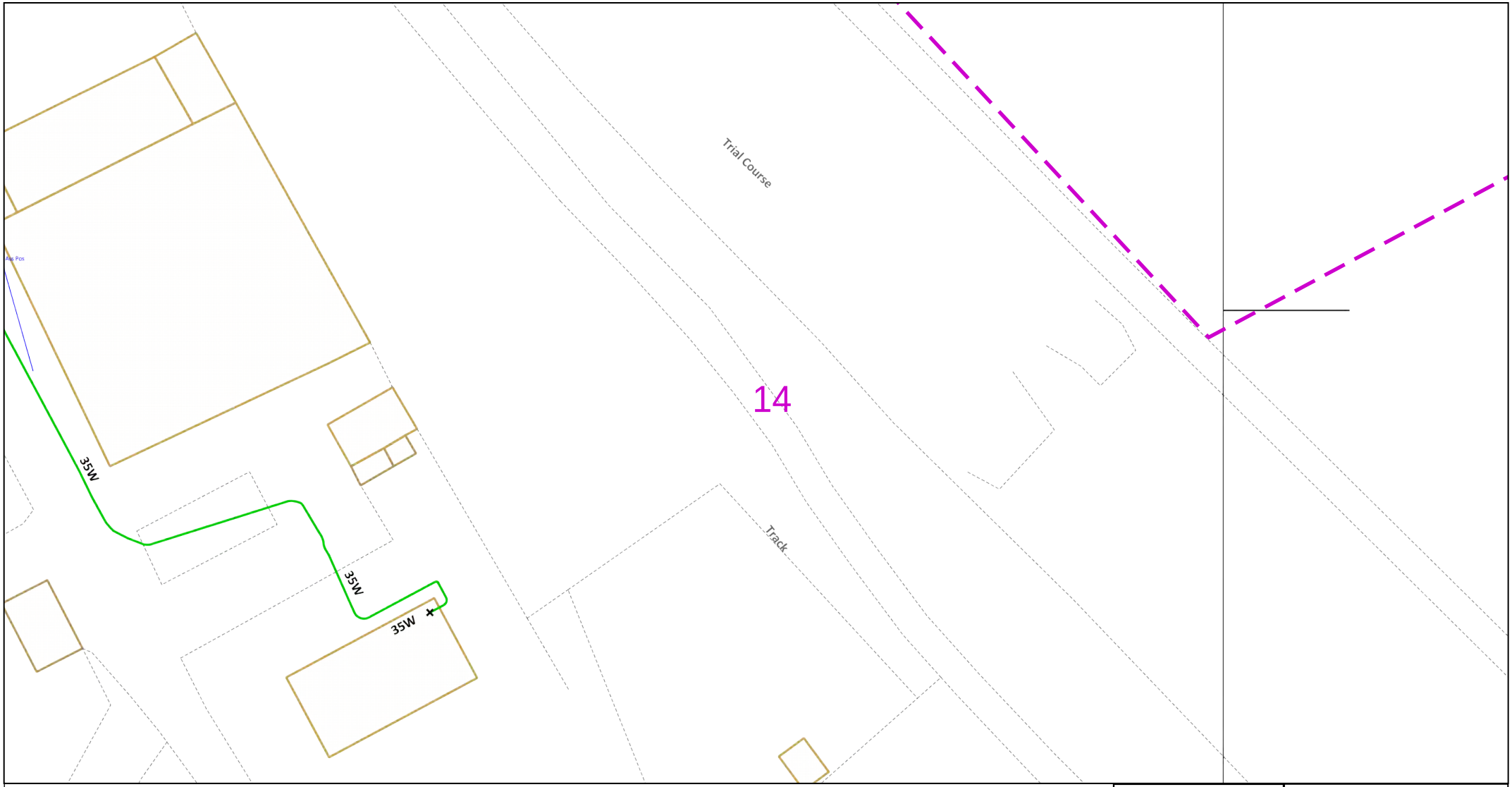
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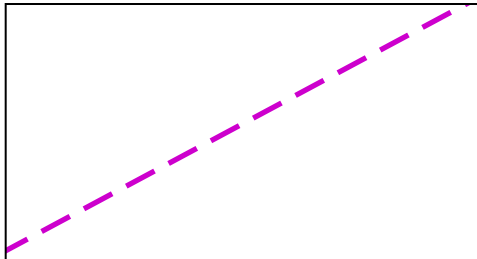
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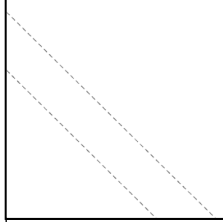
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15



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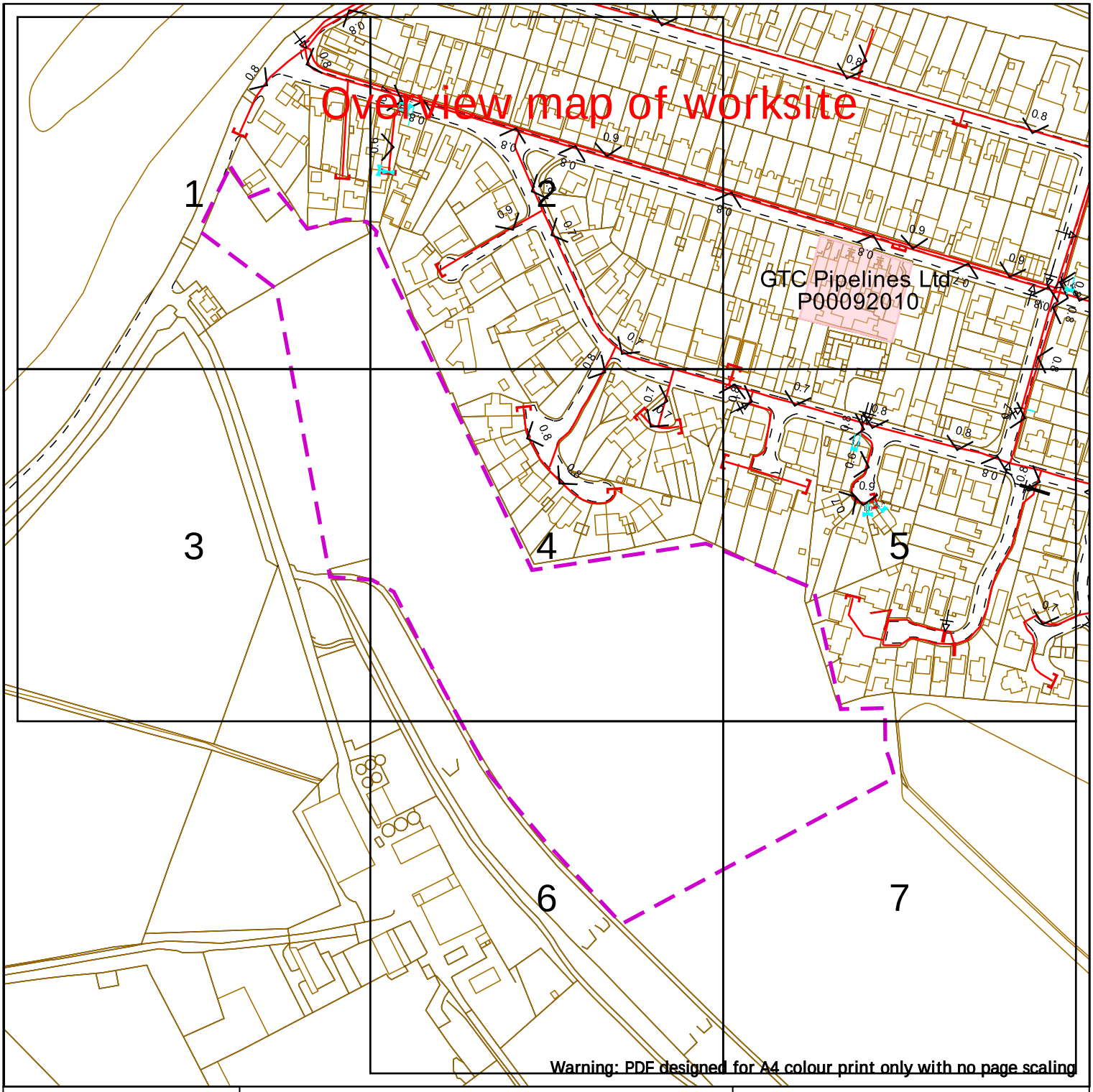
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Medium Pressure Mains
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H100 Hydrogen Network
Some Examples Of Plant Items
Valve
Syphon
Depth of Cover
Diameter Change
Material Change
Digsite:
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Area:
LAs
GTs
SSSIs

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Date Requested: 22/01/2025
Job Reference: 36048608
Site Location: 520689 157694
Requested by: Mr Morgan Langford

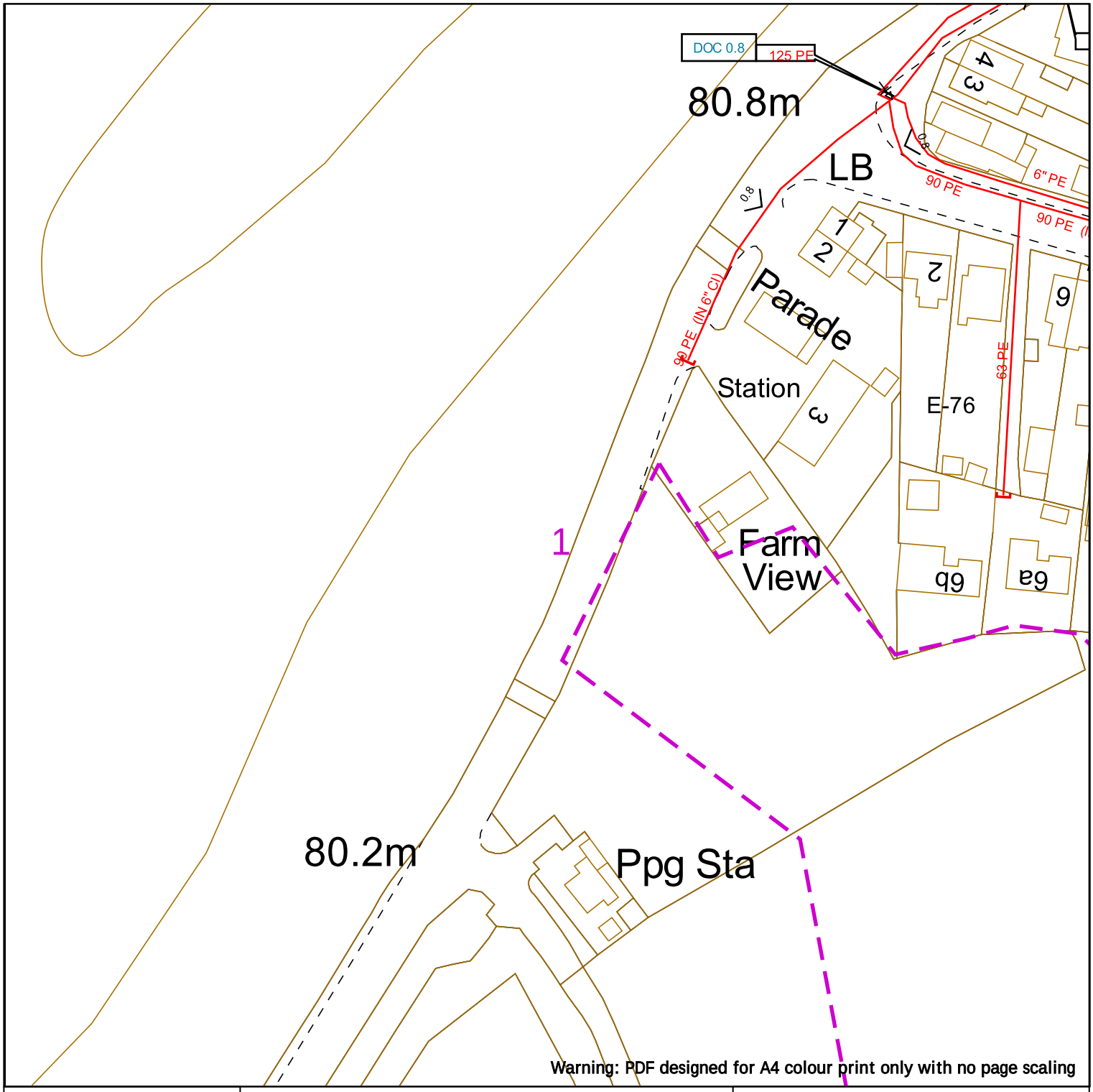
Your Scheme/Reference: 428615

This plan shows the location of those pipes owned by Scotia Gas Networks (SGN) by virtue of being a licensed Gas Transporter (GT). Gas pipes owned by other GTs or third parties may also be present in this area but are not shown on this plan. Information with regard to such pipes should be obtained from the relevant owners. No warranties are given with regard to the accuracy of the information shown on this plan. Service pipes, valves, siphons, sub-connections etc. are not shown but their presence should be anticipated. You should be aware that a small percentage of our pipes/assets may be undergoing review and will temporarily be highlighted in yellow. If your proposed works are close to one of these pipes, you should contact the SGN Safety Admin Team on 0800 912 1722 for advice. No liability of any kind whatsoever is accepted by SGN or its agents, servants or sub-contractors for any error or omission contained herein. Safe digging practices, in accordance with HS (G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that plant location information is provided to all persons (whether direct labour or sub-contractors) working for you on or near gas apparatus. Information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Report damage immediately – KEEP EVERYONE AWAY FROM THE AREA
0800 111 999

Scale: 1:3075 (When plotted at A4)

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Medium Pressure Mains
Intermediate Pressure Mains
High Pressure Mains
H100 Hydrogen Network
Some Examples Of Plant Items
Valve
Syphon
Depth of Cover
Diameter Change
Material Change
Digsite:
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Site Location: 520689 157694
Requested by: Mr Morgan Langford

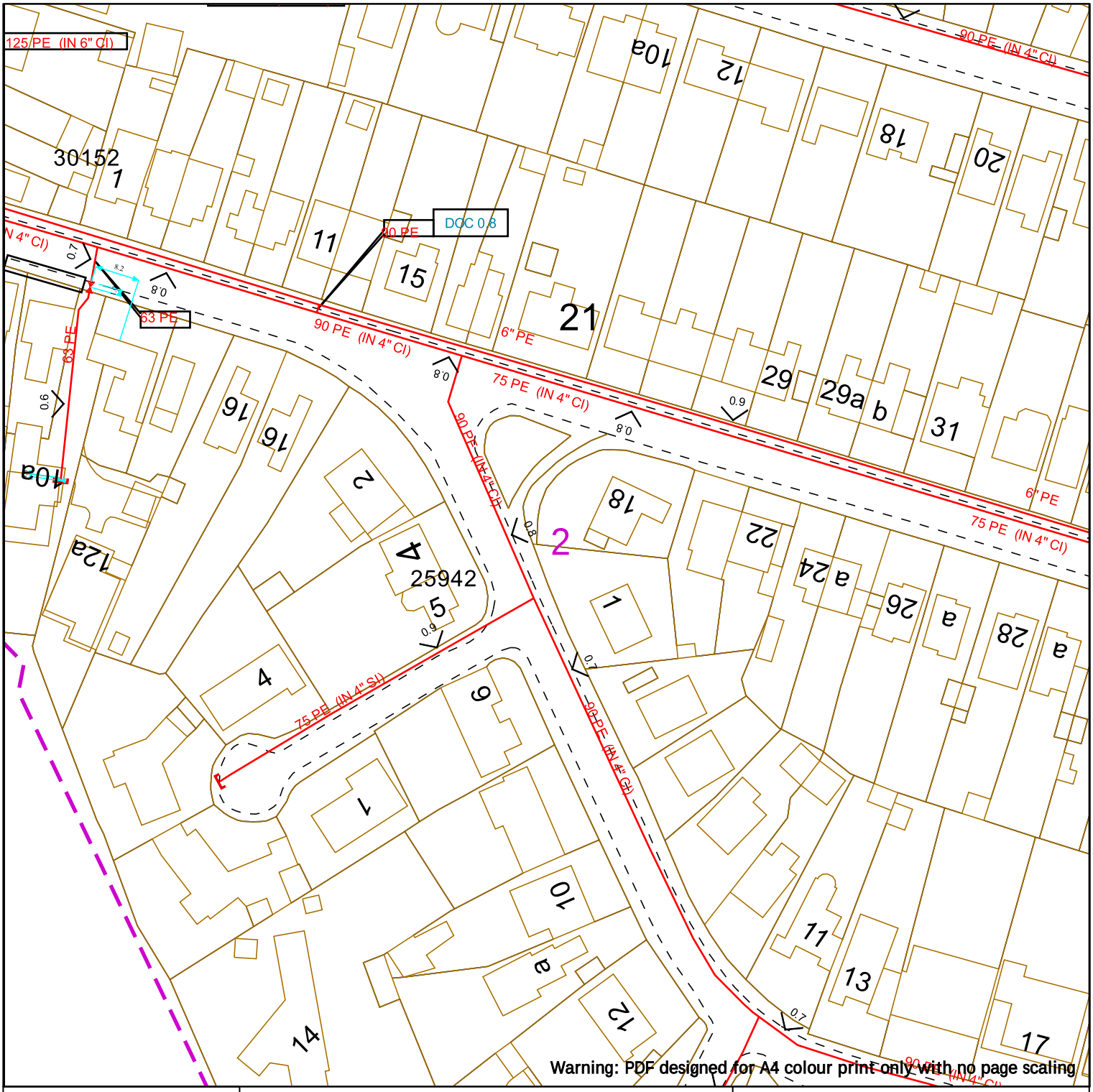
Your Scheme/Reference: 428615

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Report damage immediately – KEEP EVERYONE AWAY FROM THE AREA
0800 111 999

Scale: 1:1000 (When plotted at A4)

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Syphon
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Diameter Change
Material Change
Digsite:
Line:
Area:
LAs
GTs
SSSIs

N
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Linesearch before Udig

Date Requested: 22/01/2025
Job Reference: 36048608
Site Location: 520689 157694
Requested by: Mr Morgan Langford

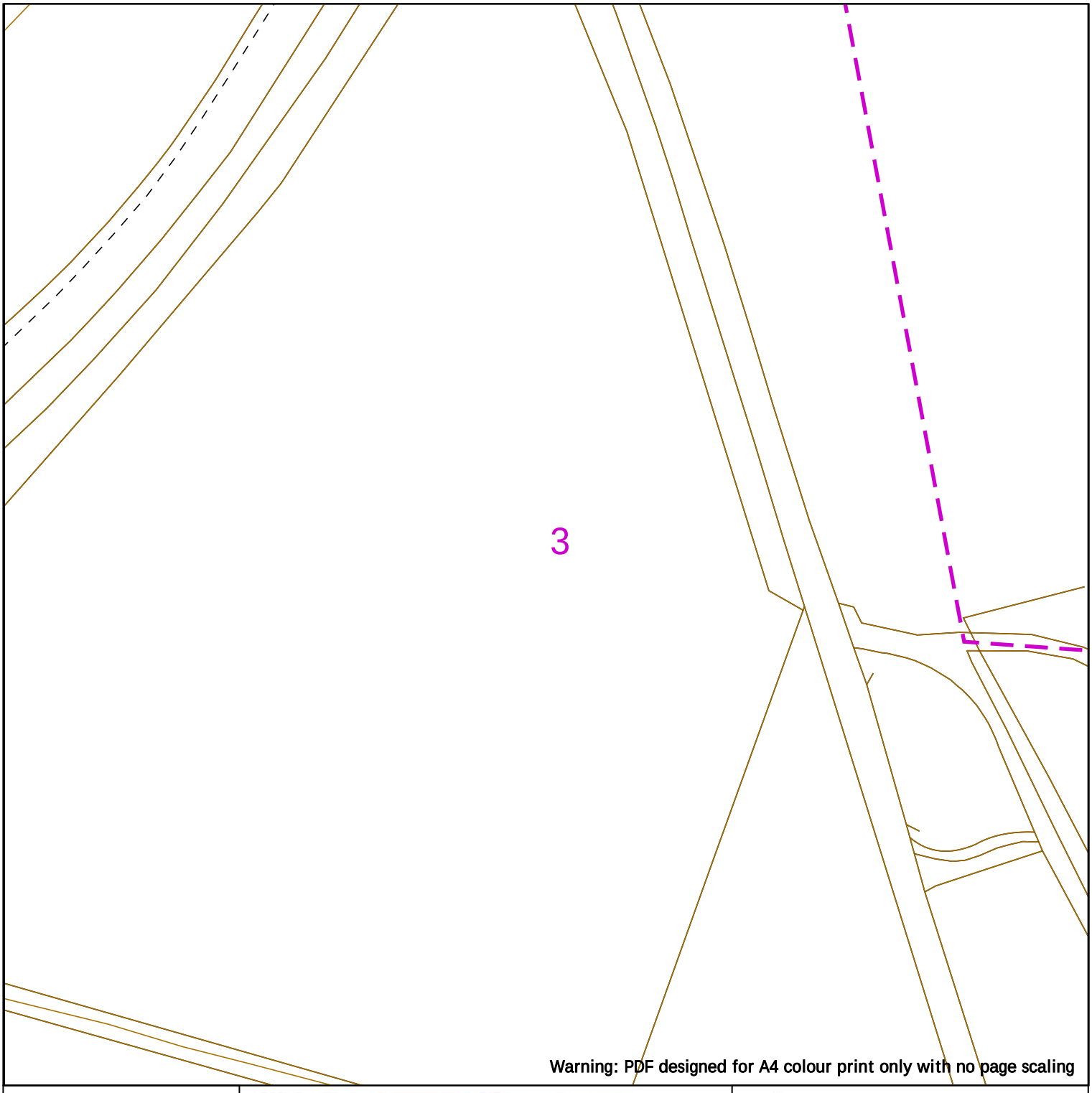
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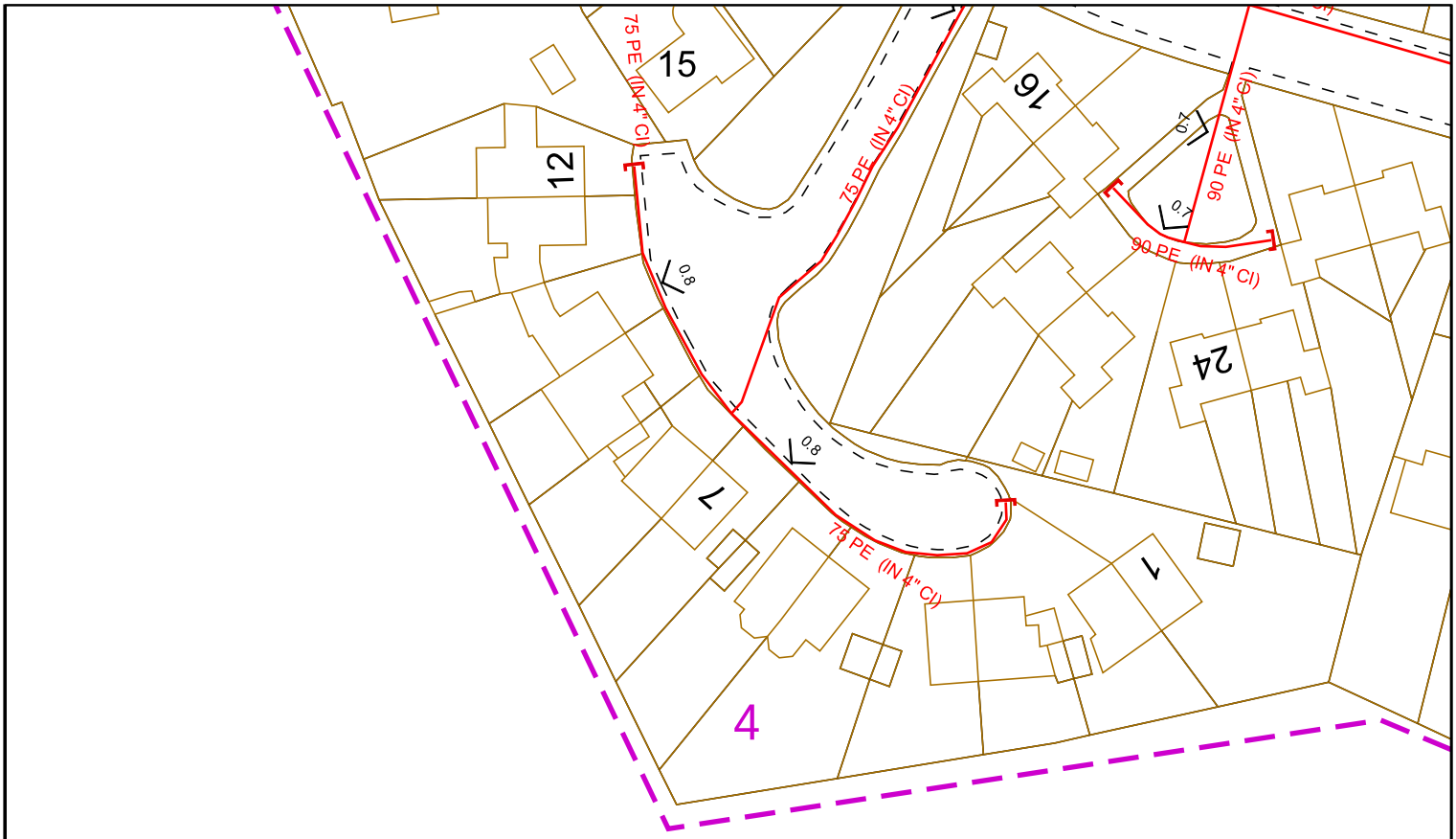
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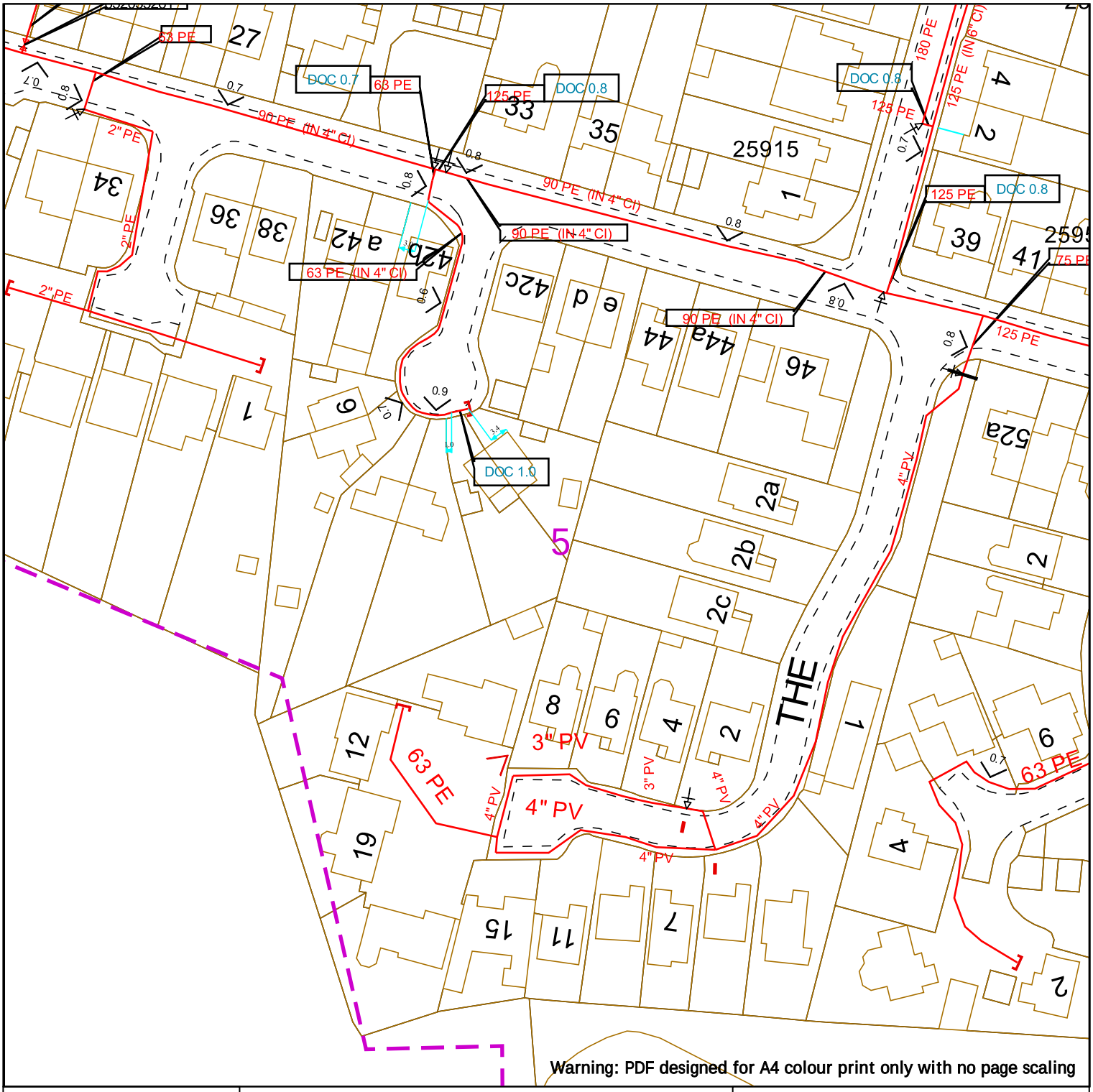
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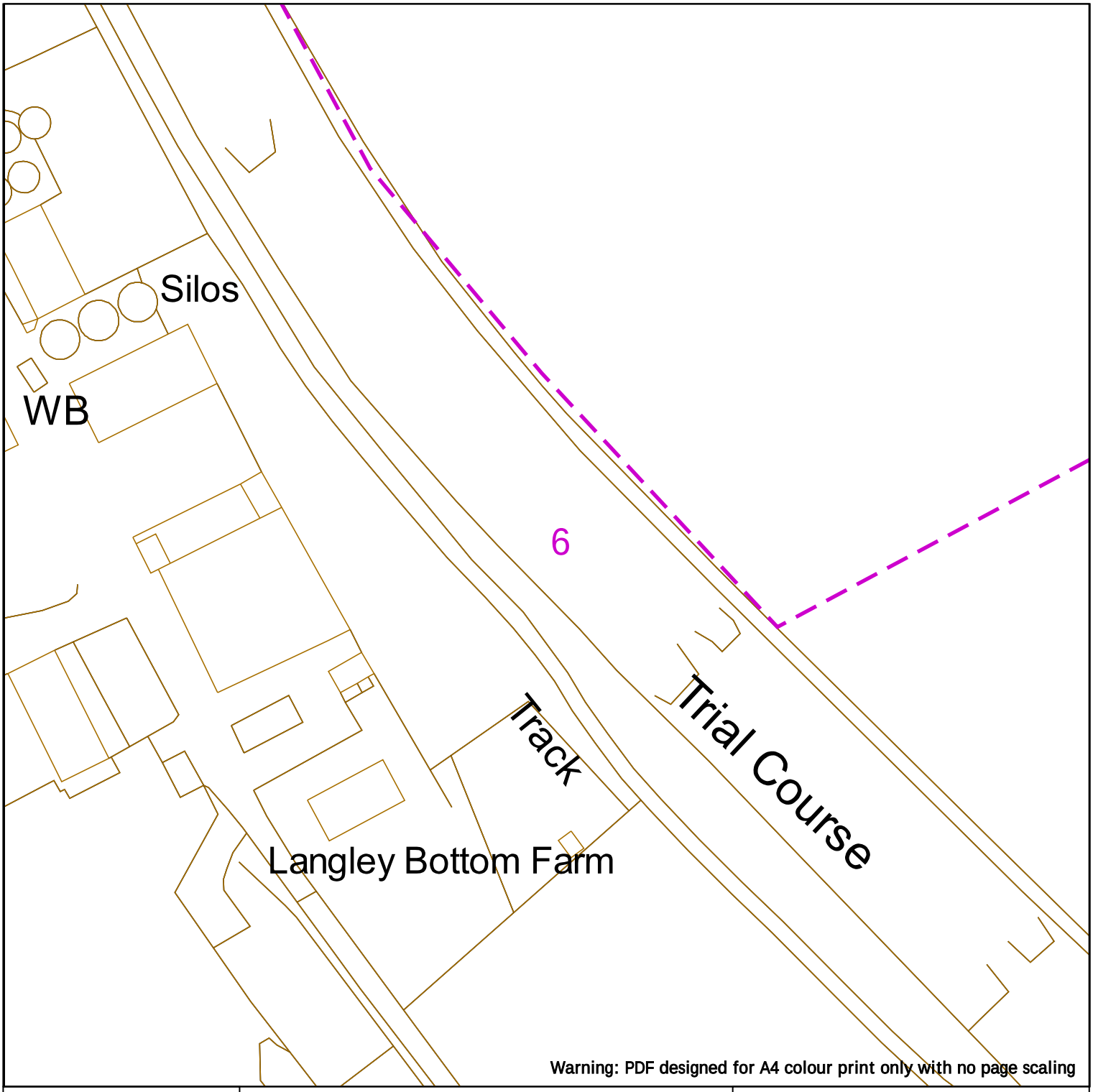
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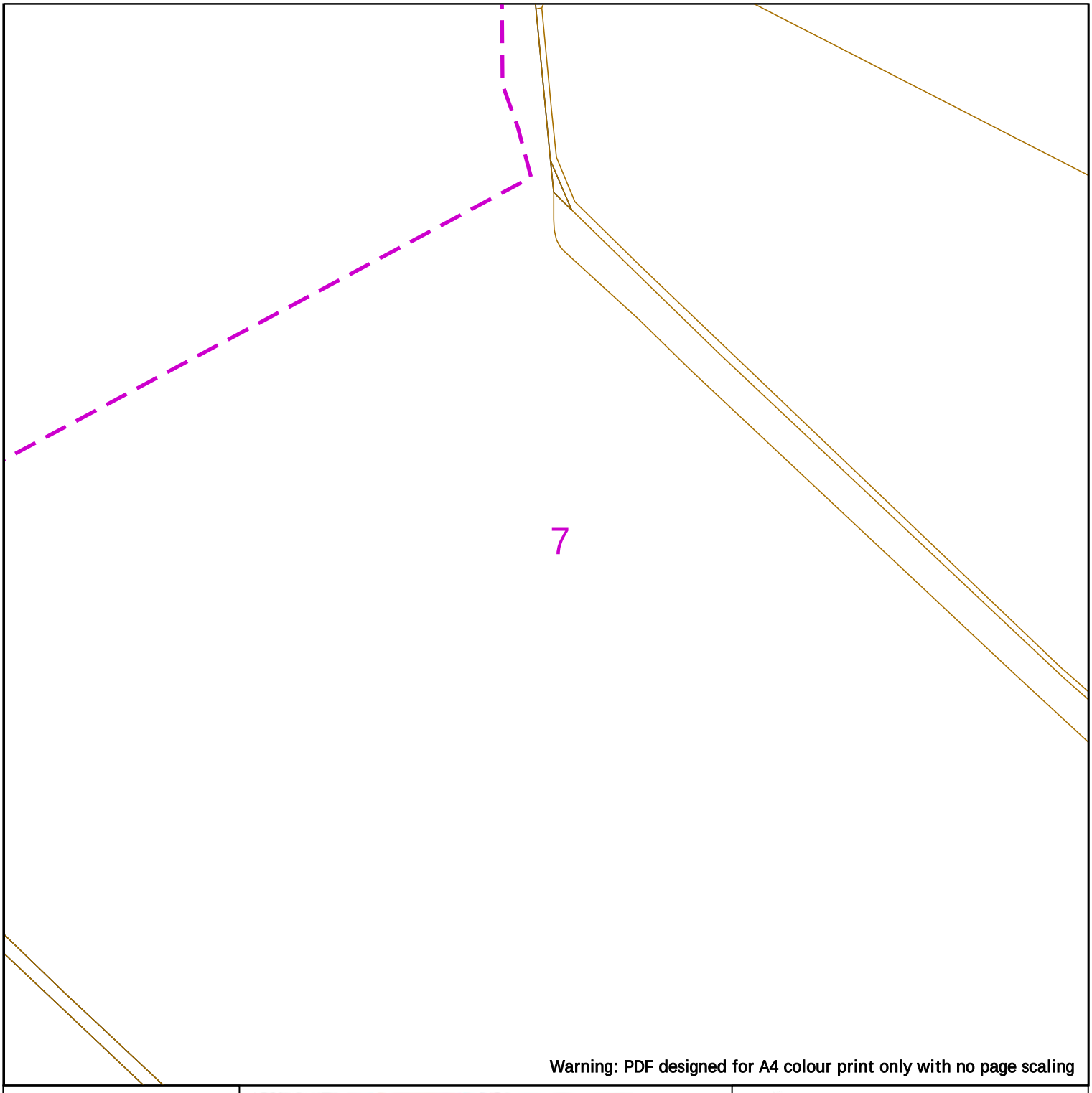
Date Requested: 22/01/2025
Job Reference: 36048608
Site Location: 520689 157694
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Asset Location Search

Thames Water Property Searches

Apogee Property & Utility Consultants
15St Mary's Street
NEWPORT
TF10 7AF

Search address supplied

F G Marshall Ltd
Danish Barn
Langley Bottom Farm
Langley Vale Road
Epsom
KT18 6AP

Your reference 428615

Our reference ALS/ALS Standard/2025_5108473

Search date 22 January 2025

Notification of Price Changes

From 1st April 2024 Thames Water Property Searches will be increasing the prices of its CON29DW Residential and Commercial searches along with the Asset Location Search. Costs will rise in line with RPI as per previous years, which is sat at 6%.

Customers will be emailed with the new prices by February 28th 2024.

Any orders received with a higher payment prior to the 1st April 2024 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk.

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

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

0800 009 4540

Asset Location Search

Property Searches

Search address supplied: F G Marshall Ltd, Danish Barn, Langley Bottom Farm, Langley Vale Road, Epsom, KT18 6AP

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

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

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

Asset Location Search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

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

TQ2057NE
TQ2057SE
TQ2157NW

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

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

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

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

The following quartiles have not been printed as they contain no assets:

TQ2157SW

For your guidance:

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

Clean Water Services

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

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

TQ2157SW
TQ2057NE
TQ2157NW

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

The following quartiles have not been printed as they contain no assets:

TQ2057SE

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

Clean Water queries

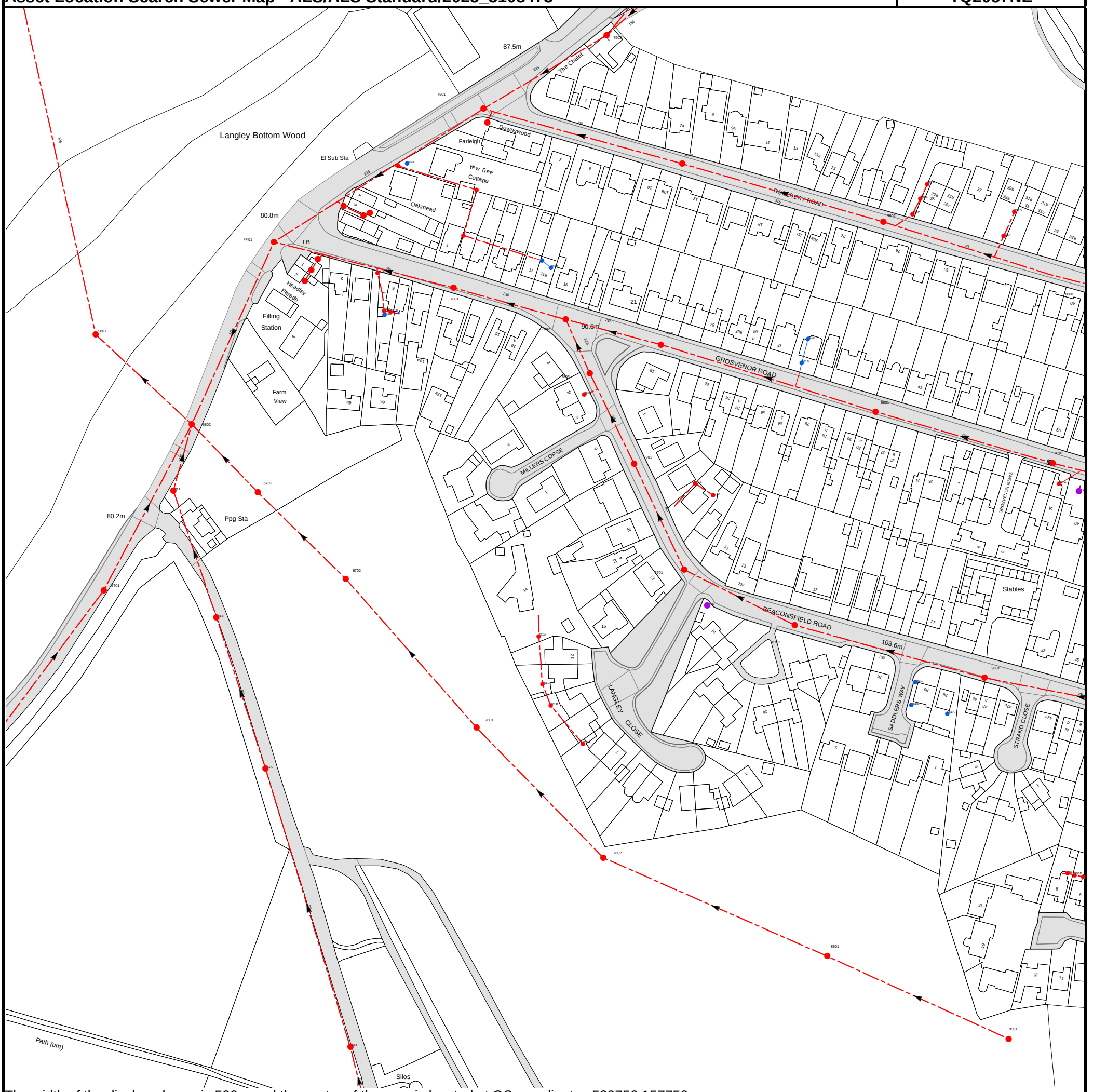
Should you require any advice concerning clean water operational issues or clean water connections, please contact:

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2025_5108473

TQ2057NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157750

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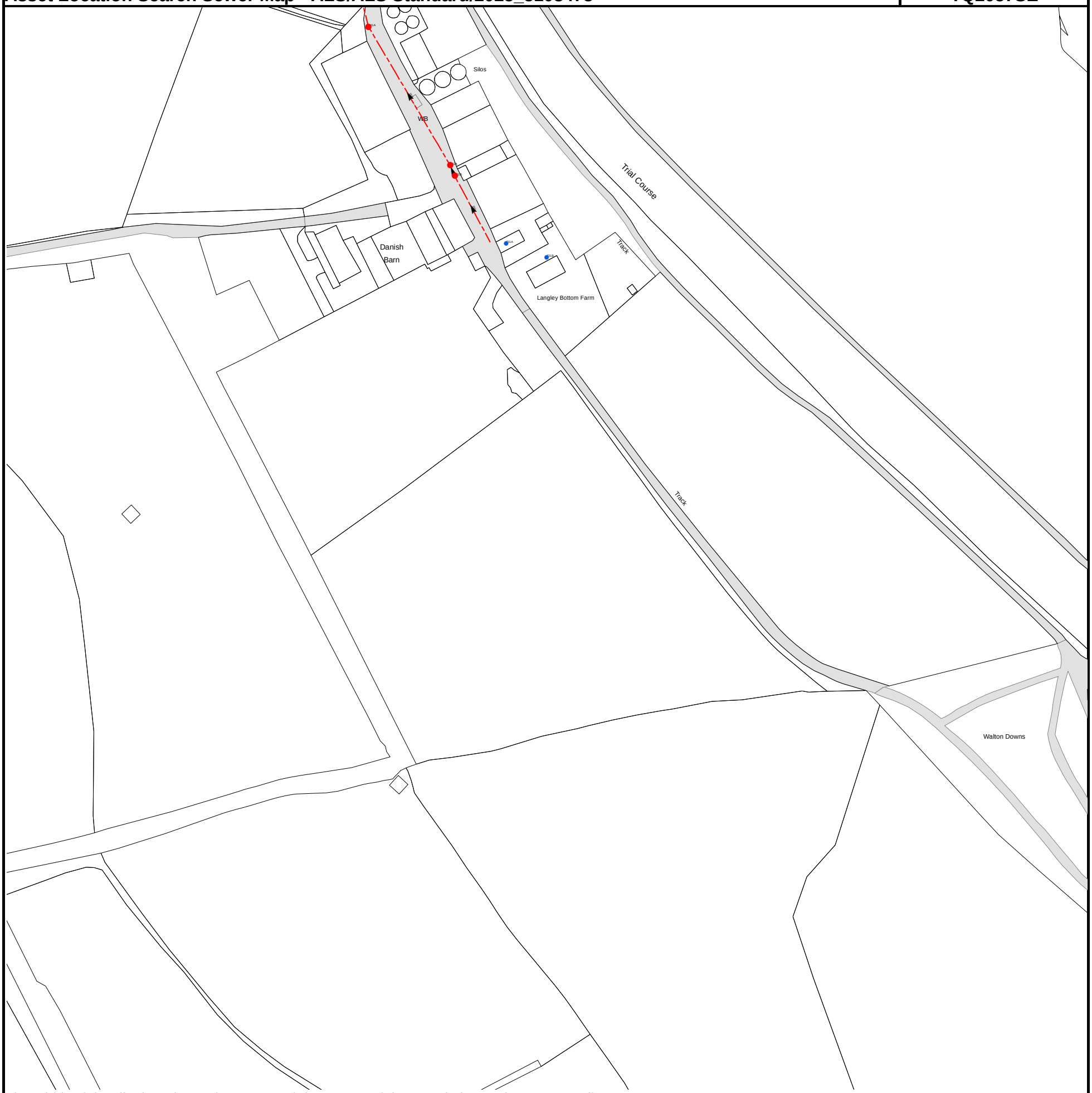
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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6801	80.55	78.13
68ZX	n/a	n/a
68ZW	n/a	n/a
68ZV	n/a	n/a
6902	n/a	n/a
6903	n/a	n/a
6901	n/a	n/a
681A	n/a	n/a
681C	n/a	n/a
681D	n/a	n/a
69ZY	n/a	n/a
691A	n/a	n/a
7801	83.97	81.59
78ZR	n/a	n/a
79ZS	n/a	n/a
7901	84.52	81.33
79ZW	n/a	n/a
78ZS	n/a	n/a
971B	n/a	n/a
971A	n/a	n/a
9701	99.8	n/a
961D	n/a	n/a
951A	n/a	n/a
951D	n/a	n/a
951B	n/a	n/a
951C	n/a	n/a
651A	n/a	n/a
661A	n/a	n/a
7601	n/a	n/a
761C	n/a	n/a
771A	n/a	n/a
571B	n/a	n/a
5701	n/a	n/a
6702	n/a	n/a
6701	n/a	n/a
571A	n/a	n/a
5802	79.94	77.04
5801	n/a	n/a
681B	n/a	n/a
9501	n/a	n/a
8501	n/a	n/a
7602	n/a	n/a
761A	n/a	n/a
961A	n/a	n/a
761B	n/a	n/a
961B	n/a	n/a
961C	n/a	n/a
9601	105.11	n/a
8702	101.66	99.75
871D	n/a	n/a
8701	99.52	97.35
871A	n/a	n/a
871B	n/a	n/a
7701	96.82	n/a
9801	96.02	92.83
781A	n/a	n/a
7803	92.33	90.37
8801	93.1	n/a
7802	89.85	88.04
781B	n/a	n/a
981A	n/a	n/a
9802	90.59	88.56
991C	n/a	n/a
991D	n/a	n/a
991B	n/a	n/a
991A	n/a	n/a
8901	86.23	84.33
7902	89.11	85.24

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Asset Location Search Sewer Map - ALS/ALS Standard/2025_5108473	TQ2057SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157250

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
731A	n/a	n/a
741B	n/a	n/a
741A	n/a	n/a
641A	n/a	n/a
731B	n/a	n/a

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Asset Location Search Sewer Map - ALS/ALS Standard/2025_5108473

TQ2157NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 521250,157750

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.

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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
2601	114.7	112.32
27ZW	n/a	n/a
2701	109.94	106.84
2702	106.22	103.12
2602	117.93	115.08
2603	118.54	115.79
2604	n/a	n/a
351A	n/a	n/a
3603	n/a	n/a
3602	n/a	n/a
351B	n/a	n/a
371B	n/a	n/a
3601	111.46	108.31
361B	n/a	n/a
3701	111.49	108.29
371C	n/a	n/a
361C	n/a	n/a
361A	n/a	n/a
3501	122.16	119.36
451A	n/a	n/a
461A	n/a	n/a
4601	114.85	111.73
4701	115.94	112.96
47ZW	n/a	n/a
47ZV	n/a	n/a
4501	126.34	123.49
0701	104.94	101.74
071D	n/a	n/a
071A	n/a	n/a
071C	n/a	n/a
171A	n/a	n/a
181A	n/a	n/a
1801	101.46	99.56
081E	n/a	n/a
081D	n/a	n/a
081C	n/a	n/a
0802	97.62	95.86
081B	n/a	n/a
0801	94.16	92.24
081A	n/a	n/a
061E	n/a	n/a
061C	n/a	n/a
061D	n/a	n/a
061F	n/a	n/a
061A	n/a	n/a
0601	107.72	105.4
071E	n/a	n/a
061B	n/a	n/a
071G	n/a	n/a
071F	n/a	n/a
071B	n/a	n/a
0606	50.58	48.64
1601	110.4	108.16
171C	n/a	n/a
171B	n/a	n/a
171G	n/a	n/a
171I	n/a	n/a
171H	n/a	n/a
1701	108.52	105.4
17ZR	n/a	n/a
17ZS	n/a	n/a
17ZT	n/a	n/a
051A	n/a	n/a
0513	47.65	44.74
0512	48.46	45.39
0505	48.79	45.68
0504	48.32	45.77
0609	48.45	44.95
0605	48.43	46.92
0610	49.68	45.64
0511	49.35	45.17
0503	48.96	46.63
0514	48.48	44.79
0602	50.18	48.72
0502	50.42	48.5
1603	50.2	47.76
1509	52.05	47.4
1502	52.66	50.92
161D	n/a	n/a
161E	n/a	n/a
161A	n/a	n/a
1508	53.84	50.78
1501	54.56	53.08
151A	n/a	n/a
161B	n/a	n/a
151B	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level

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

ALS/ALS Standard/2025_5108473



0 45 90 180 270 360
Meters

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Scale:	1:7161
Width:	2000m
Printed By:	ASuji
Print Date:	22/01/2025
Map Centre:	520852,157572
Grid Reference:	TQ2057NE

Comments:

ALS/ALS Standard/2025_5108473

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
9501		
87AH		
0301	95.24	92.6
0701	104.94	101.74
3501		
5701		
4602		
5001		
0101		
6702		
69ZY		
78ZR		
7901	84.52	81.33
0201	100.18	98.57
3301		
3401	114.7	113.7
2603	118.54	115.79
5402		
7802	89.85	88.04
7602		
7701	96.82	
8901	86.23	84.33
8001	91.91	90.14
8003	93.39	91.02
0503	48.96	46.63
0502	50.42	48.5
4601	114.85	111.73
47ZV		
6501	126.89	124.91
8004	95.14	93.44
9802	90.59	88.56
1502	52.66	50.92
1701	108.52	105.4
1801	101.46	99.56
17ZT		
4301		
2701	109.94	106.84
2702	106.22	103.12
5601	120.64	117.09
4401		
6502	127.42	125.36
6801	80.55	78.13
68ZW		
9101		
9501		
1201	95.74	93.17
1101		
6301	115.67	114.12
071B		
0602	50.18	48.72
0504	48.32	45.77
8702	101.66	99.75
1102	109.85	105.34
971A		
4501	126.34	123.49
2604		
0511	49.35	45.17
1508	53.84	50.78
0513	47.65	44.74
0609	48.45	44.95
1509	52.05	47.4
071C		
161B		
061A		
901B		
361B		
081A		
041A		
871A		
761B		
771A		
361C		
181A		
991A		
151B		
1501	54.56	53.08
351B		
081B		
951B		
961B		
5501	123.93	122.89

REFERENCE	COVER LEVEL	INVERT LEVEL
8101	85.24	83.59
87AG		
0505	48.79	45.68
5802	79.94	77.04
5801		
4201		
4101		
8301	120.61	118.63
0403	95.8	92.08
6903		
7801	83.97	81.59
79ZS		
0801	94.16	92.24
0601	107.72	105.4
3601	111.46	108.31
3501	122.16	119.36
5701	118.75	115.37
78ZS		
7803	92.33	90.37
7902	89.11	85.24
8801	93.1	
8701	99.52	97.35
8002	92.31	88.42
0605	48.43	46.92
0802	97.62	95.86
0606	50.58	48.64
47ZW		
4302		
8501		
9801	96.02	92.83
1601	110.4	108.16
1201	103.61	102.51
17ZR		
17ZS		
2601	114.7	112.32
5502	125.62	124.2
2301	109.61	108.66
2602	117.93	115.08
4601		
4301		
6701		
68ZX		
68ZV		
9601	105.11	
9701	99.8	
1202	96.85	93.57
1103	108.14	103.61
6902		
6401	115.36	113.85
7301	119.07	116.9
7601		
27ZW		
871B		
79ZW		
6901		
3602		
0514	48.48	44.79
3603		
0512	48.46	45.39
1603	50.2	47.76
071A		
161A		
371B		
901A		
691A		
361A		
0402	93.3	89.44
041B		
761A		
761C		
781A		
171A		
991C		
991B		
151A		
351A		
681B		
951A		
961A		
961C		
681A		

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ALS/ALS Standard/2025_5108473

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
681C		
4701	115.94	112.96
4401	119.44	118.26
0610	49.68	45.64
951C		
051A		
171C		
071B		
981A		
971B		
071D		
731B		
741B		
641A		
571B		
371C		
781B		
071F		
071E		
871D		
081E		
171H		
171G		
061D		
061C		
061E		
881B		

REFERENCE	COVER LEVEL	INVERT LEVEL
681D		
3701	111.49	108.29
5401	121.33	
161D		
951D		
171B		
071A		
991D		
451A		
701A		
731A		
741A		
651A		
571A		
661A		
0001		
161E		
061B		
071G		
081D		
081C		
171I		
461A		
961D		
061F		
881A		

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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.

Asset Location Search Water Map - ALS/ALS Standard/2025_5108473

TQ2157SW



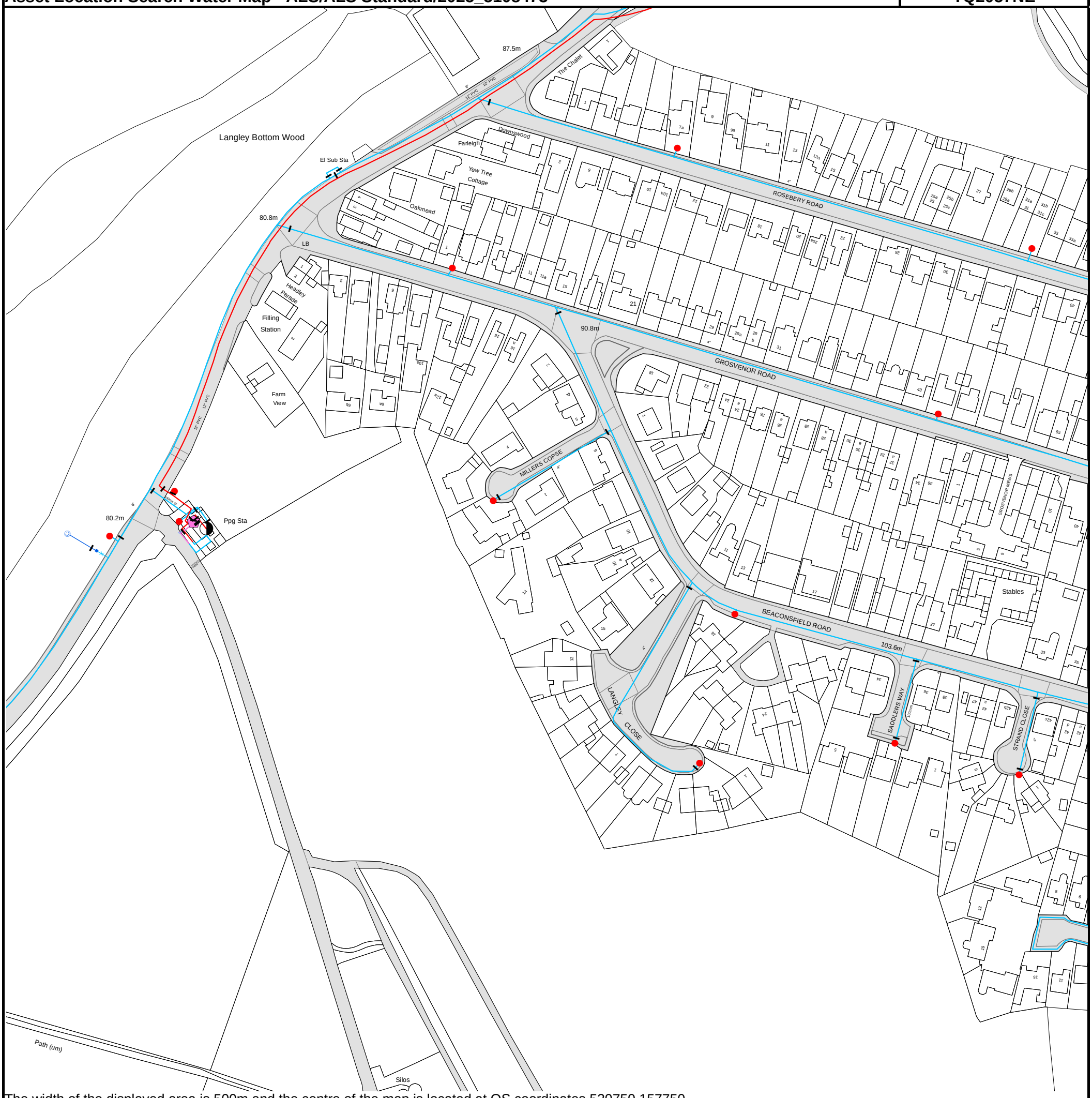
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 521250,157250

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Asset Location Search Water Map - ALS/ALS Standard/2025_5108473

TQ2057NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157750

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.

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Asset Location Search Water Map - ALS/ALS Standard/2025_5108473

TQ2157NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 521250,157750

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.

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ALS/ALS Standard/2025_5108473



0 45 90 180 270 360
Meters

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Scale:	1:7161
Width:	2000m
Printed By:	ASuji
Print Date:	22/01/2025
Map Centre:	520852,157572
Grid Reference:	TQ2057NE

Comments:

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger
- **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Payment Terms and Conditions

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

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

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

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 980 8800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

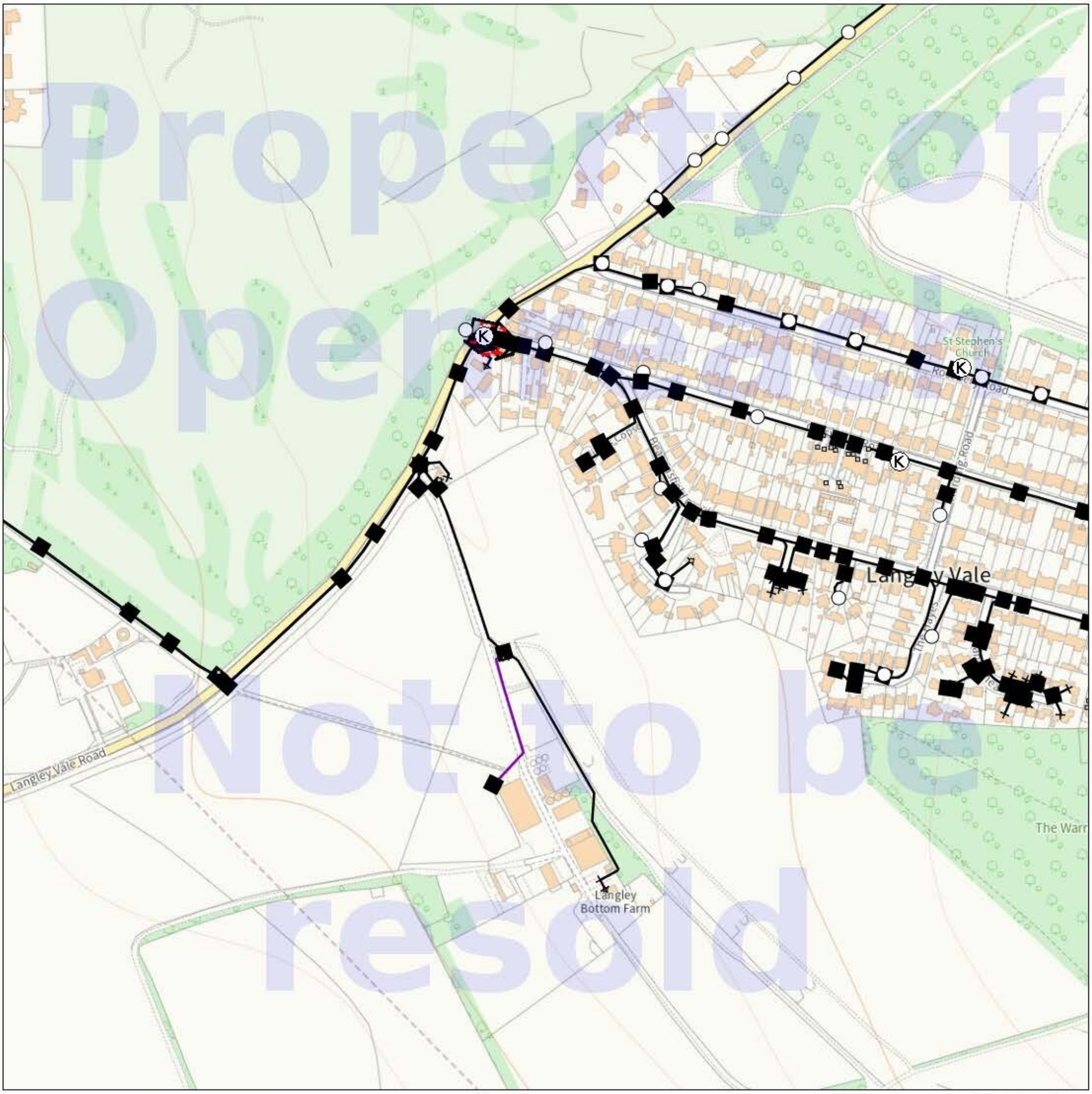
If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Maps on Demand Plant Information Reply



Property of
Openreach
Not to be
resold

IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made newar to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

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KEY TO BT SYMBOLS

	Planned	*Live*
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling	×	Built	
Duct Tee	▲	Planned	
Building		Inferred	
Kiosk	K	Duct	

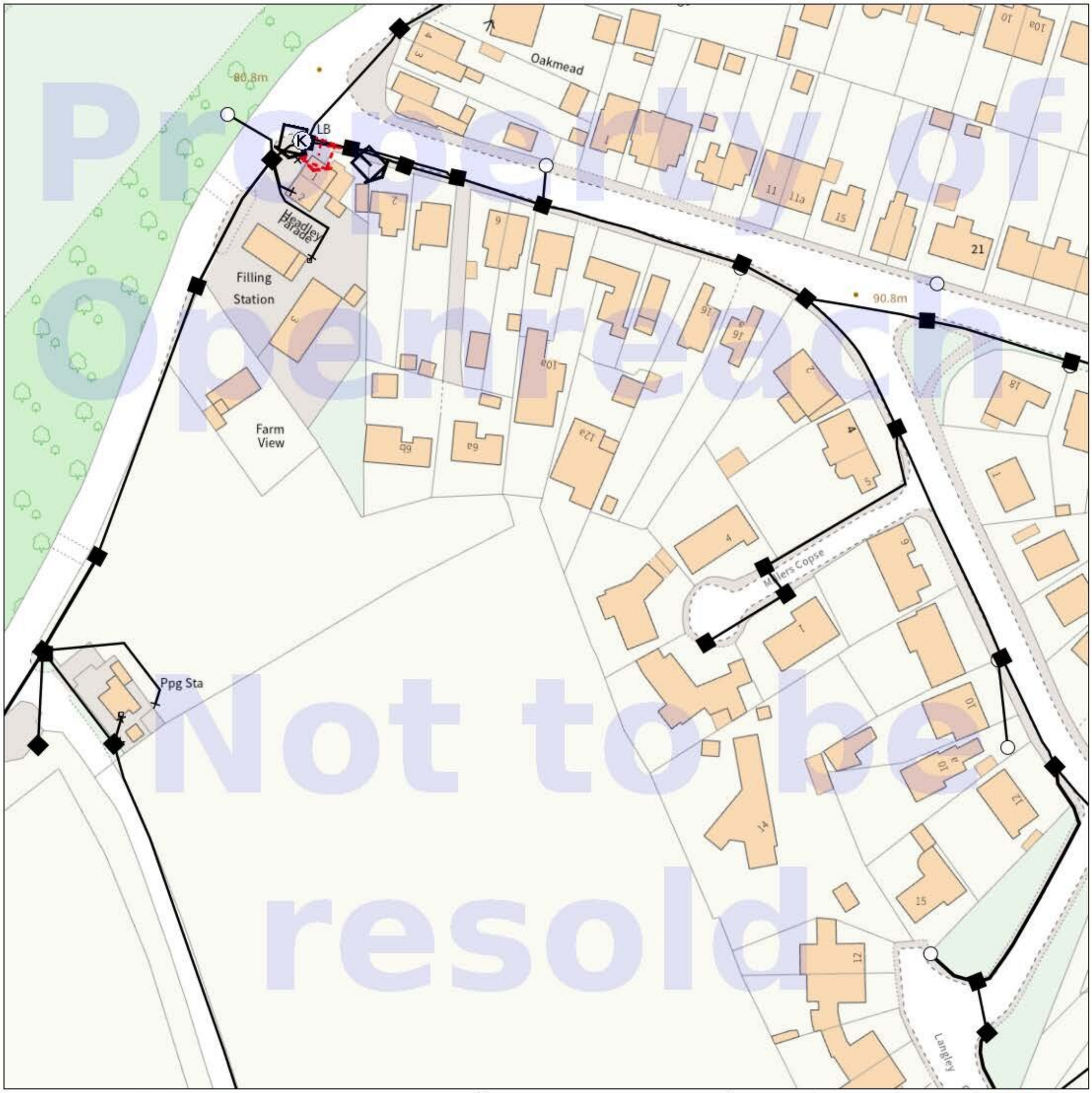
Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	*In Place*	*Pending Remove*	*Not In Use*
Power Cable				
Power Duct				N/A

BT Ref : SMZ09599X
Map Reference : (centre) TQ2068957694
Easting/Northing : (centre) 520689,157694
Scale : 1:1000
Issued : 28/01/2025 09:59:14

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Maps on Demand Plant Information Reply



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Not to be resold

IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made newar to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

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KEY TO BT SYMBOLS

	Planned	*Live*
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling	×	Built	
Duct Tee	▲	Planned	
Building		Inferred	
Kiosk	K	Duct	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	*In Place*	*Pending Remove*	*Not In Use*
Power Cable				
Power Duct				N/A

BT Ref : HTV10002N
Map Reference : (centre) TQ2068957794
Easting/Northing : (centre) 520689,157794
Scale : 1:250
Issued : 28/01/2025 10:00:20

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Enquiry Confirmation

LSBUD Ref: 36048608

Date of enquiry: 22/01/2025
Time of enquiry: 11:40

Enquirer

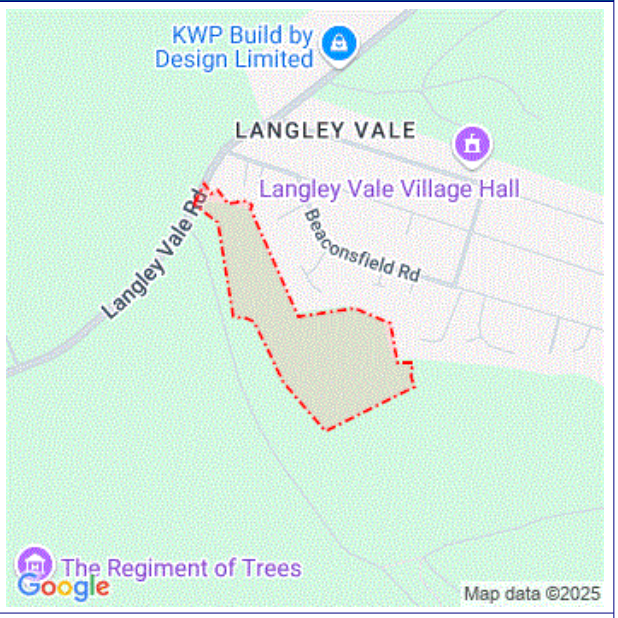
Name	Mr Morgan Langford	Phone	01952686570
Company	Apogee Property and Utility consultants	Mobile	Not Supplied
Address	Apogee Property Utility Consultants Blount House Telford Shropshire TF3 4NQ		
Email	morgan.langford@apogeepropertyandutilityconsultants.co.uk		

Enquiry Details

Enquiry type	Initial Enquiry
Work category	Utility Works
Work type	Single excavations site (1.5m or shallower)
Work type buffer*	25 metres
Start date	23/01/2025
End date	23/01/2025
Scheme/Reference	428615
Search location	KT186AP
Confirmed location	520689 157694
Site size	56568 metres square
Site Contact Name	Not Supplied
Site Phone No.	Not Supplied
Description of Works	

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.

Site Map



Please note that the above map only displays the location of the proposed work site and will not display any of the Members' pipes and cables. It is imperative that this area accurately reflects the proposed work site.

Affected LSBUD members

(LSBUD Members who have assets registered on LSBUD within the vicinity of your search area.)

Do not proceed until all Members listed below have confirmed that your works can continue.

Asset Owner	Phone/Email	Emergency Only	Status
SGN	08009121722	0800111999	Await response
UK Power Networks	08000565866	08000565866	Await response

Status explanation

Await Response means that the asset owner will contact you. This is typically by sending the plan response but they may ask for further information before being able to do so, particularly if any payments or authorisations are required.

Email Additional Info means that the asset owner needs further information about your works to assess your enquiry before providing a response. Please provide any details you have available including plans, method statements etc. if available.

Enquiry Confirmation
LSBUD Ref: 36048608

Date of enquiry: 22/01/2025
Time of enquiry: 11:40

Important notices

It is very important that you correctly understand what the service does and the procedures in order for you to work safely. Please refer to the LSBUD Support Page (www.lsbud.co.uk/linesearchbeforeudig-support) for further guidance.
This information includes how to provide additional information to the LSBUD Members who request it to provide a response to your enquiry.
Validity and search criteria. The results of this enquiry are based on the confirmed information you entered and are valid only as at the date and time of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LinesearchbeforeUdig (LSBUD) accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.
Terms and Conditions. Please note that this enquiry is subject always to our standard terms and conditions available at www.lsbud.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

List of not affected LSBUD members
(LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area.)

AllPoints Fibre	Angus Energy	AWE Pipeline
B & D Energy Limited	Balfour Beatty Investments Limited	BOC Limited (A Member of the Linde Group)
Box Broadband	BP Exploration Operating Company Limited	BPA
Cadent Gas	Cambridge Water	Cambridgeshire County Council Climate Change and Energy Services
CATS Pipeline c/o Wood Group PSN	Cemex	Centrica Storage Ltd
CNG Services Ltd	Concept Solutions People Ltd	ConocoPhillips (UK) Teesside Operator Ltd
D.S.Smith	Diamond Transmission Corporation	DIO (MOD Live Pipelines)
Drax Power Limited	EDF Energy Renewables Ltd	EET Fuels
EirGrid	Eleclink Limited	Electricity North West Limited
Energy Assets Networks	ENI & Himor c/o Penspen Ltd	EnQuest NNS Limited
EP Langage Limited	ESB CCGT Power station (Carrington Gas Pipeline)	ESP Utilities Group
Esso Petroleum Company Limited	euNetworks Fiber UK Ltd	EXA Infrastructure
Exolum Pipeline System	Fulcrum Electricity Assets Limited	Fulcrum Pipelines Limited
G.Network Communication Ltd c/o JSM Group Ltd	Gamma	Gas Networks Ireland (UK)
Gateshead Energy Company	Gigaclear Ltd	Greenlink Interconnector Ltd
Harbour Energy	Heathrow Airport LTD	Humbly Grove Energy
IGas Energy	INEOS FPS Pipelines	INEOS Manufacturing (Scotland and TSEP)
INOVYN ChlorVinyls Limited	INOVYN Enterprises Limited	Intergen (Coryton Energy or Spalding Energy)
Kensa Utilities	Last Mile	Liverpool City Region Connect
Mainline Pipelines Limited	Manchester Jetline Limited	Manx Cable Company
Marchwood Power Ltd (Gas Pipeline)	Melbourn Solar Limited	MUA Group Limited
National Gas Transmission	National Grid Electricity Distribution	National Grid Electricity Transmission
National Grid Ventures	Neos Networks	Northern Gas Networks Limited
Northumbrian Water Group	NPower CHP Pipelines	NTT Global Data Centers EMEA UK Ltd
NYnet Ltd	Ogi	Oikos Storage Limited
Ørsted	Palm Paper Ltd	Perenco UK Limited (Purbeck Southampton Pipeline)
Petroineos	Phillips 66	Portsmouth Water
Premier Transmission Ltd (SNIP)	Redundant Pipelines - LPDA	RWE - Great Yarmouth Pipeline (Bacton to Great Yarmouth Power Station)
RWEnpower (Little Barford and South Haven)	SABIC UK Petrochemicals	SAS Utility Services Ltd
Scottish and Southern Electricity Networks	Scottish Power Generation	Seabank Power Ltd
SES Water	Shell	Shell NOP

Appendix C Engineering logs

AQUA TERRA CONSULTING

Trial Pit

TP01

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	520525.70	157806.70		1:25

Project Name	Project No.	Start Date	End Date
Langley Bottom Farm	P24062	2025-02-04	2025-02-04

Client
Fairfax Acquisitions Ltd

Consultant
RLW

Contractor
ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.25)		Grass covered, soft, dark brown, sandy, gravelly LOAM. Sand is fine to coarse. Gravel is fine to coarse, sub rounded to sub angular of flint. Frequent rootlets. (TOPSOIL)
						0.25		MADE GROUND: Firm, grey, gravelly, sandy, silty CLAY. Sand is medium. Gravel is fine to coarse, sub angular to angular of flint, brick, sandstone and concrete.
						(0.30)		
						0.55		Soft, light brown, gravelly, sandy, clayey SILT. Sand is fine to medium. Gravel is fine to medium, sub angular of flint and occasional chalk. (HEAD DEPOSITS)
						(0.75)		
						1.30		Structureless CHALK composed of cream mottled light brown, sandy, slightly silty, fine to coarse GRAVEL. Sand is fine to medium. Gravel is sub rounded to sub angular of flint and medium to high density chalk. Frequent flint cobbles and rare flint boulders up to 31cm. Occasional cobbles of high density chalk up to 20cm. Grade Dc. (WHITE CHALK)
								Becoming off white in colour. (2.00 - 2.93m)
						(1.63)		
						2.93		*End of Trial Pit at 2.93m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Trial pit cleared using CAT and genny. Trial pit excavated by JCB to 2.93m bgl. Soakaway testing was carried out within trial pit. Position was backfilled with arisings.

Method, Plant, Stability, Dimensions
0.00 - 2.93m TP JCB
L = 2.80m
W = 0.80m

Logger
RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

AQUA TERRA CONSULTING

Trial Pit

TP02

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	520395.50	157710.10		1:25

Project Name	Project No.	Start Date	End Date
Langley Bottom Farm	P24062	2025-02-04	2025-02-04

Client
Fairfax Acquisitions Ltd

Consultant
RLW

Contractor
ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.56)		Soft, brown, gravelly, sandy LOAM. Sand is medium to coarse. Gravel is fine to coarse, sub angular to angular of flint and fine chalk. Frequent rootlets. (TOPSOIL) *Becoming orangish brown. (0.28 - 0.56m)*
						0.56		Structureless CHALK composed of off white, sandy, slightly silty, fine to coarse GRAVEL. Sand is medium to coarse. Gravel is sub angular too angular of medium to high density chalk and flint. Occasional chalk cobbles up to 18cm and occasional flint cobbles up to 24cm. Grade Dc. (WHITE CHALK)
						(1.82)		
						2.38		*End of Trial Pit at 2.38m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Trial pit cleared using CAT and genny. Trial pit excavated by JCB to 2.93m bgl. Soakaway testing was carried out within trial pit. Position was installed with 1m plain and 1.5m slotted pipe.

Method, Plant, Stability, Dimensions
0.00 - 2.38m TP JCB
L = 3.90m
W = 0.80m

Logger
RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

Created using Pebble Geo

AQUA TERRA CONSULTING

Trial Pit

TP03

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	520699.30	157575.30		1:25
Project Name		**Project No.**	**Start Date**	**End Date**
Langley Bottom Farm		P24062	2025-02-05	2025-02-05

Client
Fairfax Acquisitions Ltd

Consultant
RLW

Contractor
ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
						(0.45)		Grass covered, soft, brown, gravelly, sandy LOAM. Sand is medium to coarse. Gravel is fine to coarse, sub angular of flint and chalk. Frequent rootlets. (TOPSOIL) *Becoming mottled light brown. (0.25 - 0.45m)*
						0.45		Structureless CHALK composed of off white, slightly sandy, slightly silty, fine to coarse GRAVEL. Sand is fine to medium. Gravel is fine to coarse, sub angular of medium to high density chalk and flint. Occasional flint and chalk cobbles up to 20cm. Grade Dc. (WHITE CHALK).
						(2.45)		
						2.90		*End of Trial Pit at 2.90m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Trial pit cleared using CAT and genny. Trial pit excavated by JCB to 2.93m bgl. Soakaway testing was carried out within trial pit. Position was installed with 2m slotted and 1m plain pipe.

Method, Plant, Stability, Dimensions
0.00 - 2.90m TP JCB
L = 2.80m
W = 0.80m

Logger
RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

AQUA TERRA CONSULTING

Trial Pit

TP04

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP	520751.50	157482.50		1:25

Project Name	Project No.	Start Date	End Date
Langley Bottom Farm	P24062	2025-02-05	2025-02-05

Client
Fairfax Acquisitions Ltd

Consultant
RLW

Contractor
ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.50)		Grass covered, soft, brown, gravelly, sandy LOAM. Sand is medium to coarse. Gravel is fine to coarse, sub angular of flint and low density chalk. Frequent rootlets. (TOPSOIL)
						0.50		Structureless CHALK composed of off white, slightly sandy, slightly silty, fine to coarse GRAVEL. Sand is medium to coarse. Gravel is fine to coarse, sub angular of chalk and flint. Occasional chalk cobbles up to 18cm. Common flint cobbles and occasional flint boulders up to 32cm. Grade dc. (WHITE CHALK)
						(2.65)		
						3.15		*End of Trial Pit at 3.15m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Trial pit cleared using CAT and genny. Trial pit excavated by JCB to 2.93m bgl. Soakaway testing was carried out within trial pit. Position was installed with 2m slotted and 1m plain pipe.

Method, Plant, Stability, Dimensions
0.00 - 3.15m TP JCB
L = 3.30m
W = 0.70m

Logger
RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

Created using Pebble Geo

AQUA TERRA CONSULTING

Window Sampler

TP03A

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	520707.10	157578.60		1:25

Project Name	Project No.	Start Date	End Date
Langley Bottom Farm	P24062	2025-05-20	2025-05-20

Client
Fairfax Acquisitions Ltd

Consultant
RLW

Contractor
ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
						(0.30) 0.30		Grass covered, soft, brown, gravelly, sandy LOAM. Sand is fine to medium. Gravel is fine to coarse, sub angular of flint and chalk. Rare cobbles of flint. Frequent rootlets. (TOPSOIL)
						(0.60) 0.90		Very dense, light brown, gravelly, fine to coarse, SAND. Gravel is fine to coarse, sub rounded to sub angular of flint and low to medium density chalk. Occasional cobbles of flint. (HEAD DEPOSITS)
		0.80	SPT	N=50 for 180mm (10,15/20,20,10 for 30mm)				Medium dense, structureless CHALK composed of off white, slightly sandy, silty, fine to coarse, GRAVEL. Sand is medium. Gravel is sub angular to sub rounded of flint and medium density chalk. Grade Dc. (WHITE CHALK)
								Frequent flint cobbles. (0.90 - 1.20m)
		2.00	SPT	N=24 (9,6/6,6,6,6)		(2.10)		*Becoming sandy. (2.00 - 3.00m)*
								Occasional iron oxide staining. (1.50 - 3.00m)
						3.00		*End of Borehole at 3.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks
Borehole cleared with CAT and genny and hand dug service pit was terminated at 1m bgl due to the ground being too dense to progress further. Base of pit was rescanned with CAT. Borehole terminated at target depth of 3m bgl within the White Chalk. Position was installed with 2m slotted and 1m plain pipe.

Method, Plant, Stability, Dimensions
0.00 - 3.00m WS Dart 554

Logger
RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

AQUA TERRA CONSULTING

Window Sampler

TP04A

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
WS	520761.30	157488.80		1:25

Project Name	Project No.	Start Date	End Date
Langley Bottom Farm	P24062	2025-05-20	2025-05-20

Client Fairfax Acquisitions Ltd

Consultant RLW

Contractor ADP Group

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
						(0.25) 0.25		Grass covered, soft, brown, gravelly, sandy LOAM. Sand is medium. Gravel is fine to coarse, sub angular of flint. Frequent rootlets. (TOPSOIL)
						(0.85)		Dense, off white, mottled light brown, gravelly, slightly clayey, fine to coarse SAND. Gravel is fine to coarse, sub rounded to sub angular of flint and chalk. Occasional flint cobbles up to 10cm. (HEAD DEPOSITS)
		1.00	SPT	N=35 (9,8/5,10,10,10)		1.10		Medium dense, structureless CHALK composed of off white, mottled dark brown, slightly sandy, silty, fine to coarse GRAVEL. Sand is medium to coarse. Gravel is sub rounded of low and medium density chalk. Grade Dc. (WHITE CHALK)
								No longer mottled brown. Gravel becoming sub angular to angular of medium and high density chalk. (1.60 - 3.00m)
		2.00	SPT	N=14 (3,4/3,4,4,3)		(1.90)		*Occasional iron oxide staining. (2.00 - 3.00m)*
						3.00		*End of Borehole at 3.00m*

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Remarks

Borehole cleared with CAT and genny and hand dug service pit was terminated at 0.8m bgl due to the ground being too dense to progress further. Base of pit was rescanned with CAT. SPT refusal was recorded at 0.8m bgl. Borehole terminated at target depth of 3m bgl within the White Chalk. Position was installed with 2m slotted and 1m plain pipe.

Method, Plant, Stability, Dimensions

0.00 - 3.00m WS Dart 554

Logger RLW

Checked By: RLW **Approved By:** JEM **Status:** FINAL

Appendix D Infiltration test results

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP01	Test number:	1	Date of test:	04/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.93
Effective depth of Pit, D [(1)]	(m)	0.8
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g [(2)]		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.90
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.90
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	5.12

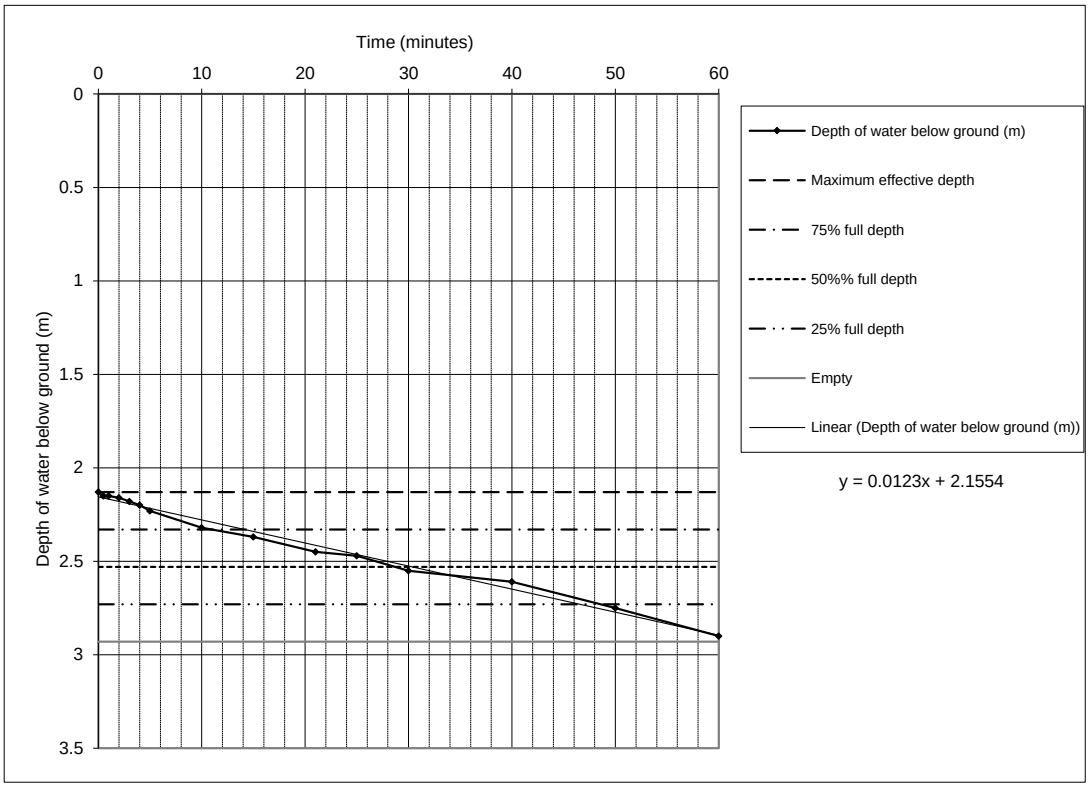
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.13
0.5	2.15
1	2.15
2	2.16
3	2.18
4	2.2
5	2.23
10	2.32
15	2.37
21	2.45
25	2.47
30	2.55
40	2.61
50	2.75
60	2.9



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	14.195122
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	46.7154472
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	32.5203252
Time t_{p75-25} (seconds)	1951.21951

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.90}{5.12 \times 1951.21951}$

Hence, **Soil infiltration rate, f = 8.97E-05** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP01	Test number:	2	Date of test:	04/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.9
Effective depth of Pit, D [(1)]	(m)	0.88
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g [(2)]		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.99
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.99
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	5.41

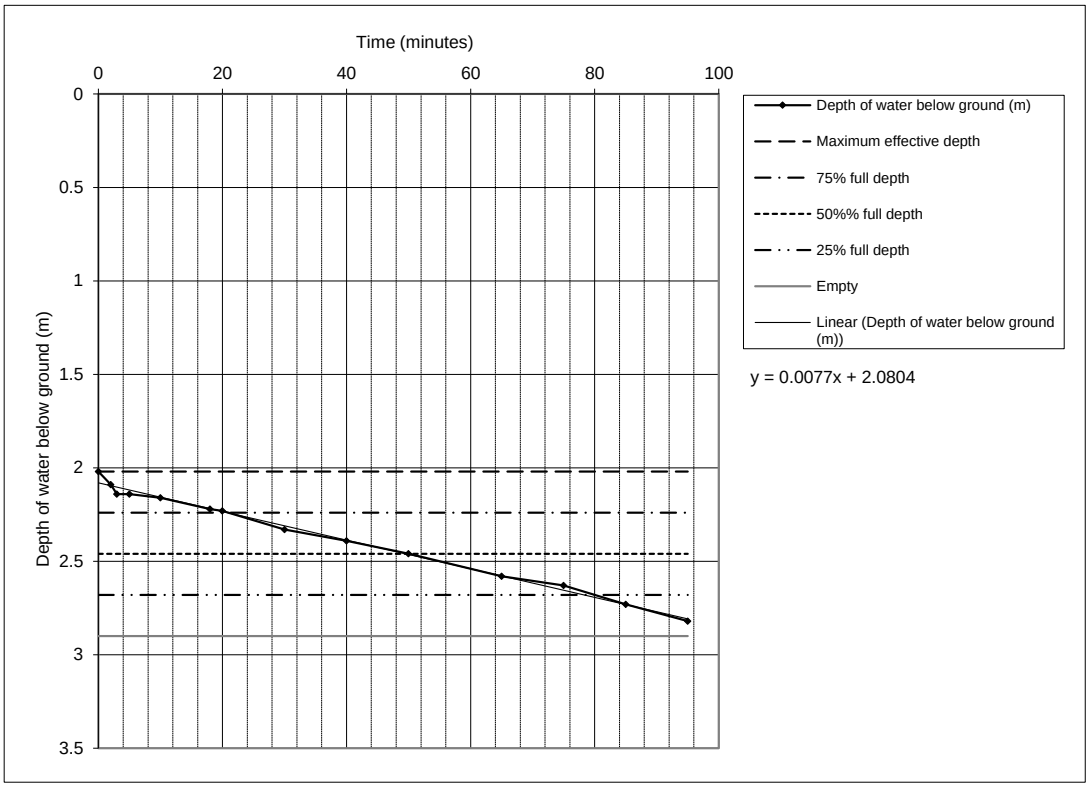
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.02
2	2.09
3	2.14
5	2.14
10	2.16
18	2.22
20	2.23
30	2.33
40	2.39
50	2.46
65	2.58
75	2.63
85	2.73
95	2.82



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	20.7272727
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	77.8701299
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	57.1428571
Time t_{p75-25} (seconds)	3428.57143

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.99}{5.41 \times 3428.57143}$

Hence, **Soil infiltration rate, f = 5.32E-05** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP01	Test number:	3	Date of test:	04/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.9
Effective depth of Pit, D (1)	(m)	0.86
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.96
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.96
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	5.34

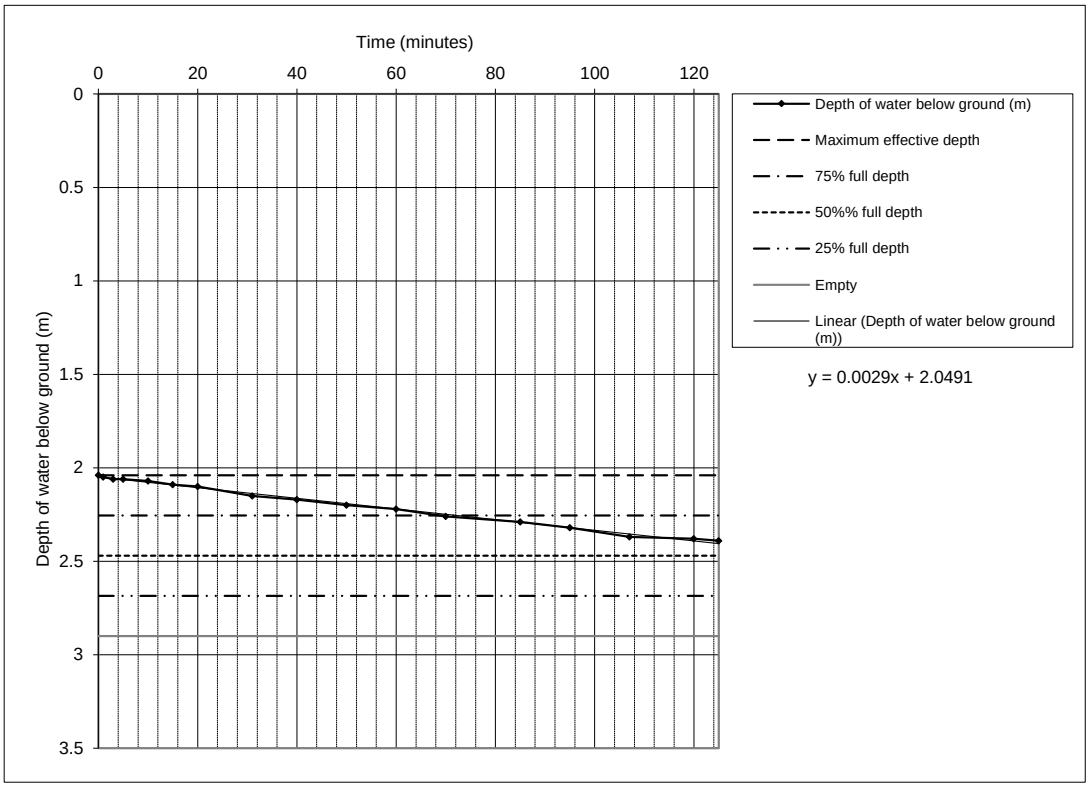
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.04
1	2.05
3	2.06
5	2.06
10	2.07
15	2.09
20	2.1
31	2.15
40	2.17
50	2.2
60	2.22
70	2.26
85	2.29
95	2.32
107	2.37
120	2.38
125	2.39



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	71	
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	219.275862	Extrapolated
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	148.275862	
Time t_{p75-25} (seconds)	8896.55172	

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.96}{5.34 \times 8896.55172}$

Hence,	**Soil infiltration rate, f**	**2.03E-05**	m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP02	Test number:	1	Date of test:	04/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.38
Effective depth of Pit, D (1)	(m)	0.74
Length of Pit, L	(m)	3.9
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	1.15
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	1.15
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	6.60

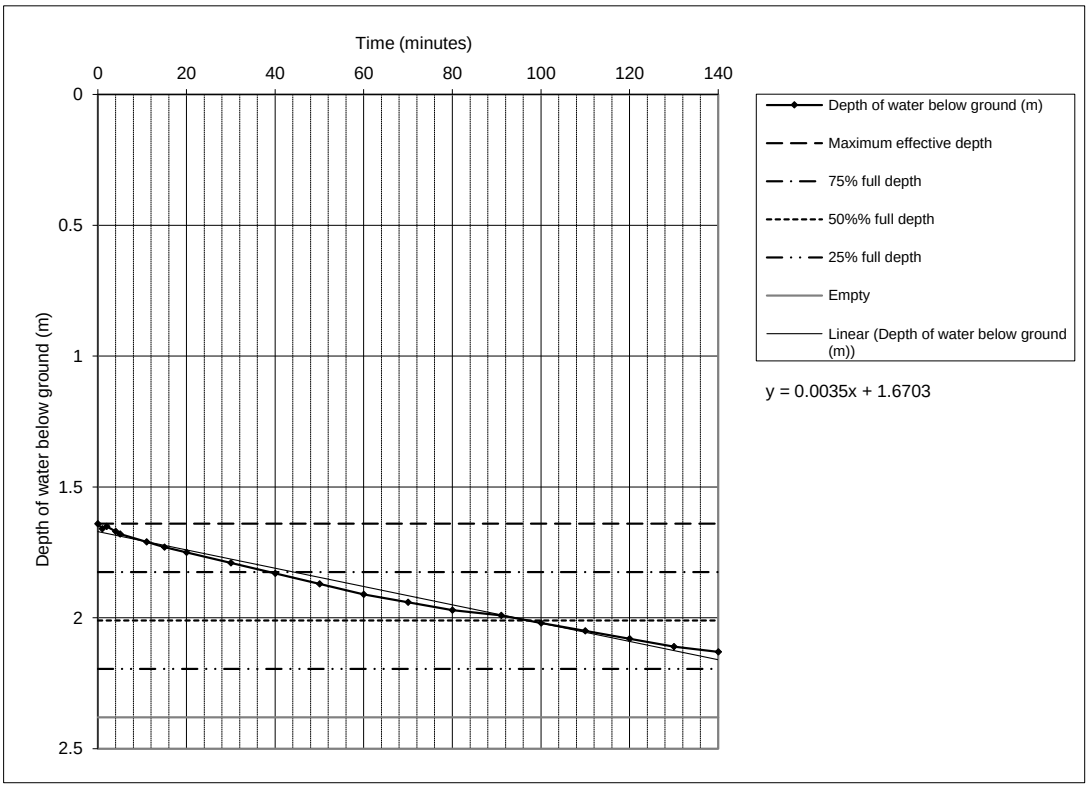
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	1.64
1	1.66
2	1.65
4	1.67
5	1.68
11	1.71
15	1.73
20	1.75
30	1.79
40	1.83
50	1.87
60	1.91
70	1.94
80	1.97
91	1.99
100	2.02
110	2.05
120	2.08
130	2.11
140	2.13



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	44.2
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	149.914286
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	105.714286
Time t_{p75-25} (seconds)	6342.85714

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{1.15}{6.60 \times 6342.85714}$

Hence, **Soil infiltration rate, f = 2.76E-05** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP02	Test number:	2	Date of test:	04/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.38
Effective depth of Pit, D (1)	(m)	0.82
Length of Pit, L	(m)	3.9
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	1.28
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	1.28
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	6.97

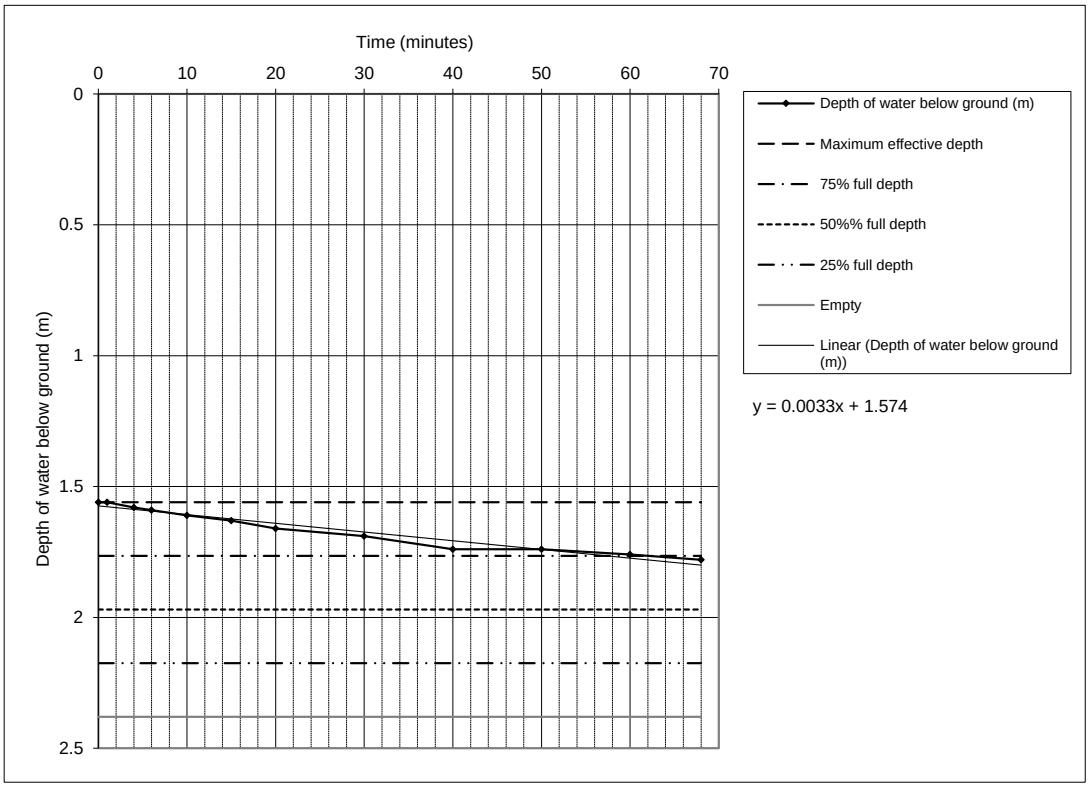
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	1.56
1	1.56
4	1.58
6	1.59
10	1.61
15	1.63
20	1.66
30	1.69
40	1.74
50	1.74
60	1.76
68	1.78



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	57.8787879
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	182.121212
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	124.242424
Time t_{p75-25} (seconds)	7454.54545

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{1.28}{6.97 \times 7454.54545}$

Hence, **Soil infiltration rate, f = 2.46E-05** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP03	Test number:	1	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.9
Effective depth of Pit, D (1)	(m)	0.45
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.50
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.50
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	3.86

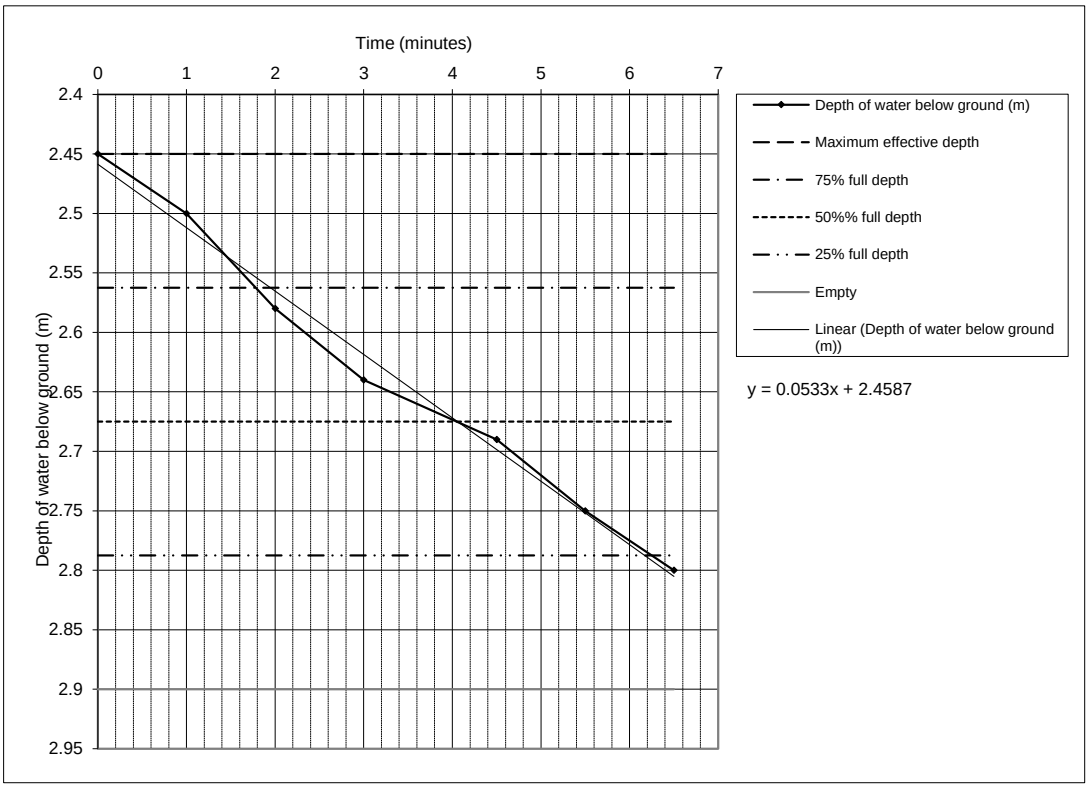
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.45
1	2.5
2	2.58
3	2.64
4.5	2.69
5.5	2.75
6.5	2.8



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	1.94746717
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	6.16885553
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	4.22138837
Time t_{p75-25} (seconds)	253.283302

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.50}{3.86 \times 253.283302}$

Hence, **Soil infiltration rate, f = 5.16E-04** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP03	Test number:	2	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.8
Effective depth of Pit, D (1)	(m)	0.35
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.39
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.39
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	3.50

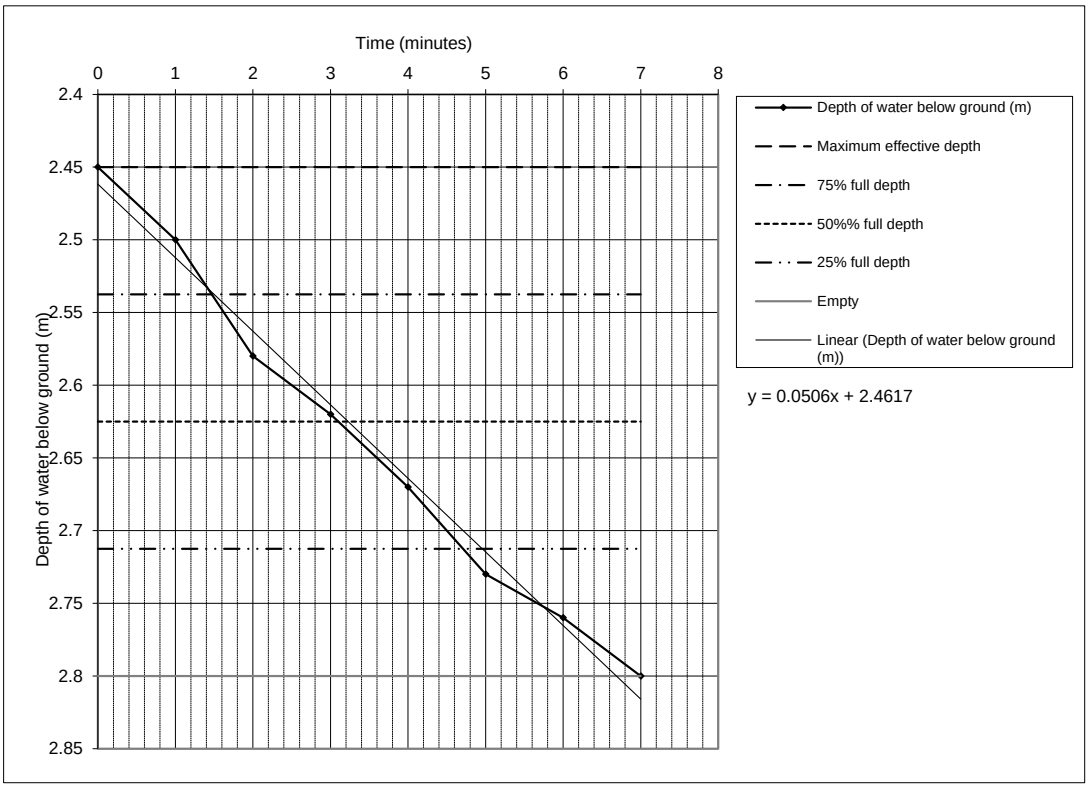
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.45
1	2.5
2	2.58
3	2.62
4	2.67
5	2.73
6	2.76
7	2.8



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	1.49802372
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	4.95652174
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	3.45849802
Time t_{p75-25} (seconds)	207.509881

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.39}{3.50 \times 207.509881}$

Hence, **Soil infiltration rate, f = 5.40E-04** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP03	Test number:	3	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.8
Effective depth of Pit, D (1)	(m)	0.48
Length of Pit, L	(m)	2.8
Width of Pit, W	(m)	0.8
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.54
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.54
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	3.97

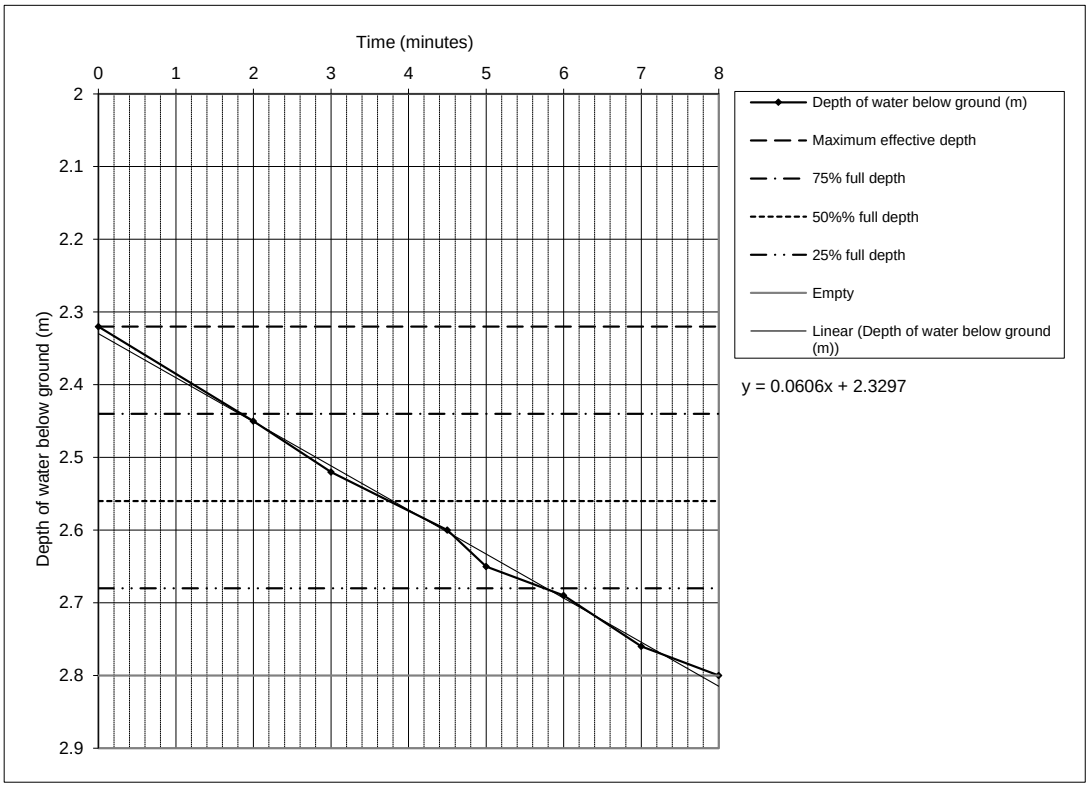
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.32
2	2.45
3	2.52
4.5	2.6
5	2.65
6	2.69
7	2.76
8	2.8



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	1.819967
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	5.78036304
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	3.96039604
Time t_{p75-25} (seconds)	237.623762

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.54}{3.97 \times 237.623762}$

Hence, **Soil infiltration rate, f = 5.70E-04** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP04	Test number:	1	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	3.15
Effective depth of Pit, D (1)	(m)	0.73
Length of Pit, L	(m)	3.3
Width of Pit, W	(m)	0.7
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.84
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.84
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	5.23

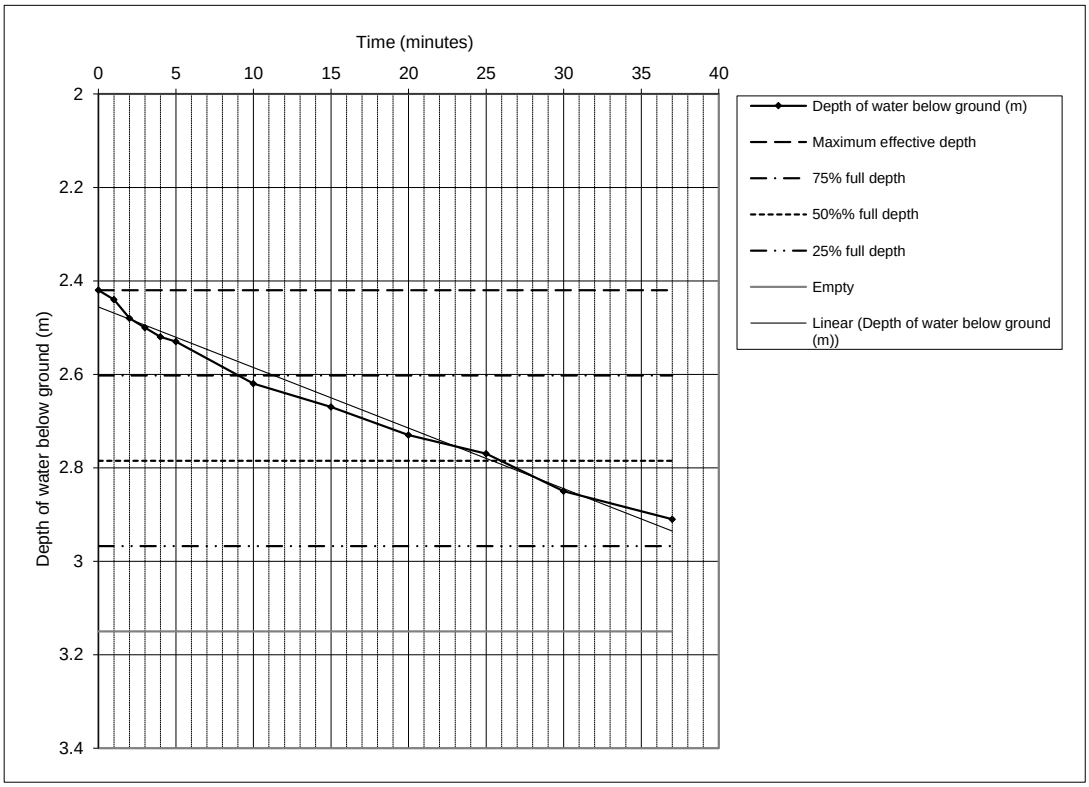
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.42
1	2.44
2	2.48
3	2.5
4	2.52
5	2.53
10	2.62
15	2.67
20	2.73
25	2.77
30	2.85
37	2.91



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	11.2769231
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	39.3538462
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	28.0769231
Time t_{p75-25} (seconds)	1684.61538

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.84}{5.23 \times 1684.61538}$

Hence, **Soil infiltration rate, f = 9.57E-05** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP04	Test number:	2	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	3.08
Effective depth of Pit, D (1)	(m)	0.6
Length of Pit, L	(m)	3.3
Width of Pit, W	(m)	0.7
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.69
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.69
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	4.71

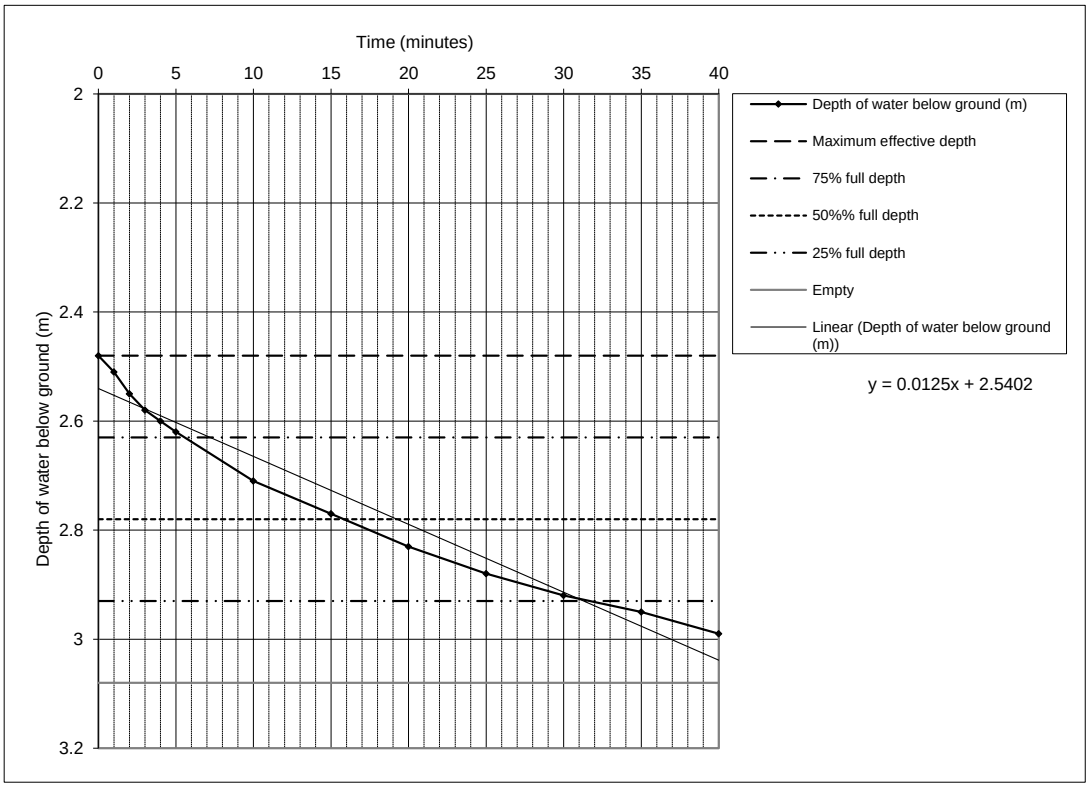
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.48
1	2.51
2	2.55
3	2.58
4	2.6
5	2.62
10	2.71
15	2.77
20	2.83
25	2.88
30	2.92
35	2.95
40	2.99



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	7.184
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	31.184
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	24
Time t_{p75-25} (seconds)	1440

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.69}{4.71 \times 1440}$

Hence, **Soil infiltration rate, f = 1.02E-04** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

AQUA TERRA CONSULTING

BRE SOAKAWAY INFILTRATION RATE CALCULATION

9-B

APPENDIX TO CHAPTER 9	Sheet	1	of	1

The following spreadsheet calculations are based on the method given in BRE Digest 365

Note: enter values only in the yellow-highlighted cells - do not alter any other cell, even if it appears to be blank.

Project title:	Langley Bottom			Project number:	P24062
Trial pit number:	TP04	Test number:	3	Date of test:	05/02/2025
Test carried out by:	RLW	Calculations by:	RLW	Verified by:	JEM

Details of pit

Actual depth of pit, D'	(m)	2.84
Effective depth of Pit, D (1)	(m)	0.5
Length of Pit, L	(m)	3.3
Width of Pit, W	(m)	0.7
Proportion of pit volume occupied by gravel solids, P_g (2)		0

Volume, V, of pit between 75% and 25% depths (m^3) = L x W x ½D =	0.58
Effective volume between 75% and 25% depths, V_{p75-25}, = V x P_g =	0.58
Internal surface area of pit up to 50% level, a_{p50}, (m^2) = area of 2 sides + 2 ends + base = (2 x L x ½D) + (2 x W x ½D) + (L x W)	4.31

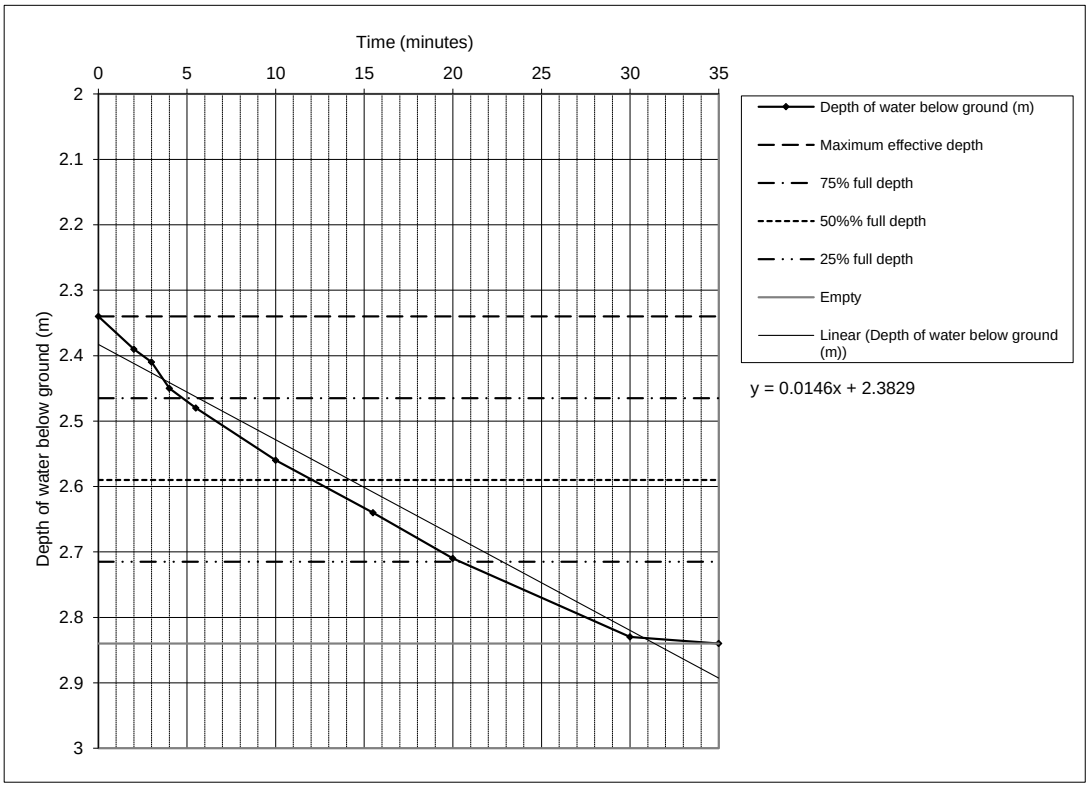
Notes:

(1) For a standard test in which the pit is filled with water, the effective depth will be equal to the actual depth. If the pit is not completely filled, it will be equal to the depth at the start of each test.

(2) Typically, for a gravel of dry density 18kN/m^3, specific gravity of rock solids 2.65, the proportion of volume occupied by rock is 0.69 (i.e. 69%). For dry density 16kN/m^3, the rock volume is 0.61 (61%), and for dry density 20kN/m^3, it is 0.77 (77%). If the pit is left open (gravel is not used) then put P_g = 0.

Water level readings

Time elapsed (min)	Depth of water below ground (m)
0	2.34
2	2.39
3	2.41
4	2.45
5.5	2.48
10	2.56
15.5	2.64
20	2.71
30	2.83
35	2.84



Time t_{p25} at which water is at 75% of effective depth, from graph (minutes)	5.62328767
Time t_{p75} at which water is at 25% of effective depth, from graph (minutes)	22.7465753
Hence time t_{p75-25} for water to fall from 75% depth to 25% depth (minutes)	17.1232877
Time t_{p75-25} (seconds)	1027.39726

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}} = \frac{0.58}{4.31 \times 1027.39726}$

Hence, **Soil infiltration rate, f = 1.30E-04** m/s

Pit inundated with 1000l of water. Instant infiltration noted to have occurred prior to test

Appendix E Photos





Pumping Station at north west of Site		Looking eastwards across field at north of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





Properties bordering the north east of the Site		Looking north west across the field at north of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





Adjacent garage at north east of the Site		Looking westwards across the northern boundary	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





	Damage borehole cover at north of Site		Damaged drain cover at north of Site
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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Looking southwards along west of Site		Looking eastwards across south of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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Construction site at Langley Bottom Farm		Mound of soil at the west of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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Mound of soil at the west of Site		Rubble at west of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





Derelict structures/debris at west of Site		Locked borehole installation at the west of Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





Looking northwards across Site		Residential properties bordering the east of the Site	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





TP01		TP01	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, Wales, CF10 3BH





TP01 arisings		TP01 location	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





TP02		TP02	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





TP02 arisings		TP02 arisings	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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TP03		TP03	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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TP03 arisings		TP03 arisings	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	





TP04		TP04	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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TP04 arisings		TP04 arisings	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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TP04 flint boulders		TP03 installation	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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TP04 installation		TP02 installation	
Project	Langley Bottom	Date	4-5/2/25
Project No.	P24062	Engineer	RLW
Client	Fairfax Acquisitions Ltd	Comments	

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Appendix D Sewer asset location plans And pre-development enquiry response

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, Wales, CF10 3BH

Asset Location Search

Thames Water Property Searches

HK Hydrology Ltd.
10 ST HUBERT ROAD, HORNDEAN
WATERLOOVILLE
PO8 0EJ

Search address supplied 1
Mannamead Close
Epsom
KT18 6HX

Your reference Langley

Our reference ALS/ALS/24/2025_5167718

Search date 21 May 2025

Keeping you up-to-date

Notification of price changes

We're changing our report prices from 4th June 2025. The price will increase by 3.5% based on Retail Price Index (RPI).

Find our new prices on our website thameswater.co.uk/property-searches

Any Questions? We're happy to talk through the changes with you – give our Property Searches team a call on 0800 009 4540 .

Thames Water Utilities Ltd
Property Searches,
Clearwater Court, Vastern Road, Reading RG1 8DB

property.searches@thameswater.co.uk
thameswater.co.uk/propertysearches

0800 009 4540

Asset Location Search

Property Searches

Search address supplied: 1, Mannamead Close, Epsom, KT18 6HX

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the contact details below:

Thames Water Utilities Ltd
Property Searches
Clearwater Court
Vastern Road
Reading
RG1 8DB

Email: property.searches@thameswater.co.uk
Web: thameswater.co.uk/propertysearches

Asset Location Search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

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

TQ2057NE
TQ2057SE

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority. Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners. The public sewer map relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus. The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

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

Clean Water Services

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

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

TQ2057NE

Asset Location Search

Property Searches

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies. For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

The following quartiles have not been printed as they contain no assets:

TQ2057SE

For your guidance:

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

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. You can do this by emailing customer.feedback@thameswater.co.uk with the email subject header 'Enquiry – TWOSA', along with details of the request.

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

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

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

Clean Water queries

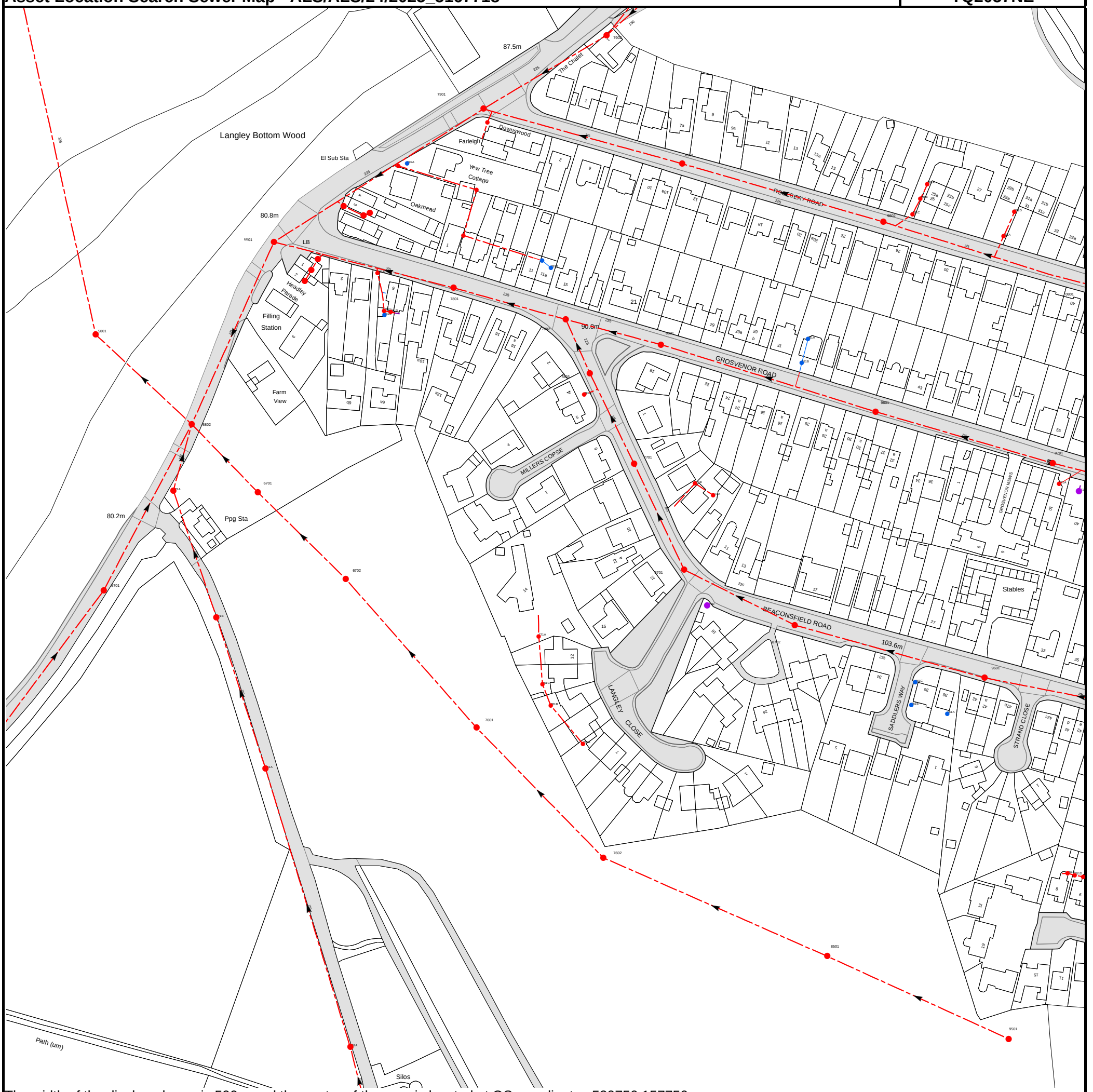
Should you require any advice concerning clean water connections, please contact:

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

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

Asset Location Search Sewer Map - ALS/ALS/24/2025_5167718

TQ2057NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157750

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
961D	n/a	n/a
951A	n/a	n/a
951D	n/a	n/a
951B	n/a	n/a
951C	n/a	n/a
971B	n/a	n/a
971A	n/a	n/a
9701	99.8	n/a
9801	96.02	92.83
781A	n/a	n/a
7803	92.33	90.37
881B	n/a	n/a
8801	93.1	n/a
881A	n/a	n/a
7802	89.85	88.04
781B	n/a	n/a
981A	n/a	n/a
9802	90.59	88.56
991C	n/a	n/a
991D	n/a	n/a
991B	n/a	n/a
991A	n/a	n/a
8901	86.23	84.33
7902	89.11	85.24
9501	n/a	n/a
8501	n/a	n/a
7602	n/a	n/a
761A	n/a	n/a
961A	n/a	n/a
761B	n/a	n/a
961B	n/a	n/a
961C	n/a	n/a
9601	105.11	n/a
8702	101.66	99.75
871D	n/a	n/a
8701	99.52	97.35
871A	n/a	n/a
871B	n/a	n/a
7701	96.82	n/a
6801	80.55	78.13
68ZX	n/a	n/a
68ZW	n/a	n/a
68ZV	n/a	n/a
6902	n/a	n/a
6903	n/a	n/a
6901	n/a	n/a
681A	n/a	n/a
681C	n/a	n/a
681D	n/a	n/a
69ZY	n/a	n/a
691A	n/a	n/a
7801	83.97	81.59
78ZR	n/a	n/a
79ZS	n/a	n/a
7901	84.52	81.33
79ZW	n/a	n/a
78ZS	n/a	n/a
651A	n/a	n/a
661A	n/a	n/a
7601	n/a	n/a
761C	n/a	n/a
771A	n/a	n/a
571B	n/a	n/a
5701	n/a	n/a
6702	n/a	n/a
6701	n/a	n/a
571A	n/a	n/a
5802	79.94	77.04
5801	n/a	n/a
681B	n/a	n/a

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

Asset Location Search Sewer Map - ALS/ALS/24/2025_5167718 | TQ2057SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157250

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
731B	n/a	n/a
731A	n/a	n/a
741B	n/a	n/a
741A	n/a	n/a
641A	n/a	n/a

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

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.

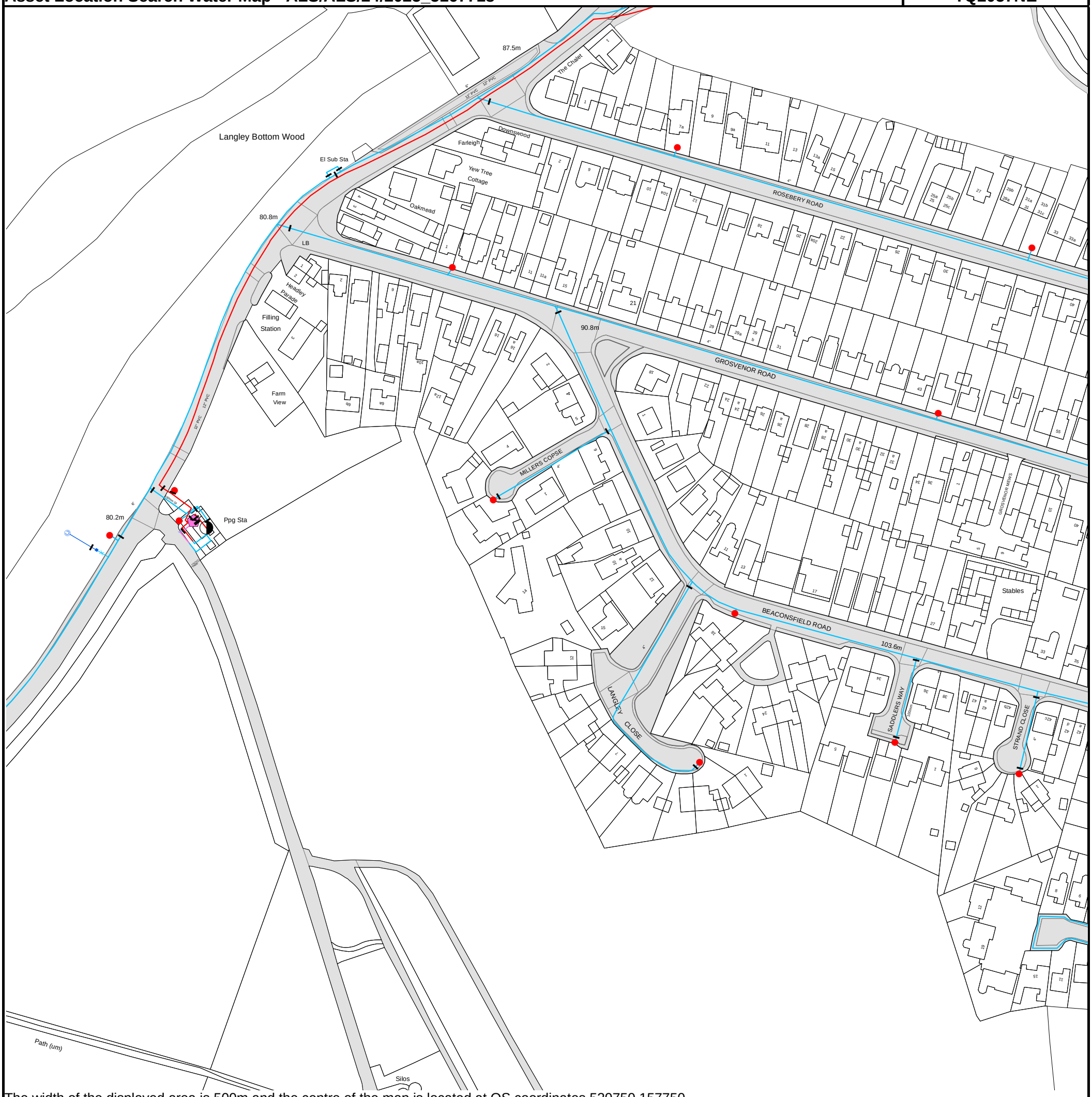
- Conduit Bridge
- Subway
- Tunnel

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.

Asset Location Search Water Map - ALS/ALS/24/2025_5167718

TQ2057NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 520750,157750

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.

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Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger
- **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Henry Kelly

HK Hydrology Ltd
10 St Hubert Road
Waterlooville
Hampshire
PO8 0EJ

Wastewater pre-planning
Our ref DS6140588/DTS79073

29 May 2025

Pre-planning enquiry: Confirmation of sufficient capacity (foul water)

Site Address: Land to the north of Langley Bottom Farm, Epsom, Surrey, KT18 6HX

Dear Henry,

Thank you for providing information on your proposed development of 130 houses. Foul water to discharge via gravity into manhole TQ2057**5802** on a 225mm foul sewer along Langley Vale Road.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

Surface water capacity was not assessed under this application.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

Where disposal of surface water is other than to a public sewer, then the applicant shall ensure that approval for the discharge has been obtained from the appropriate authorities.

Please see our FAQ's leaflet for additional information.

Capacity at STW?

The receiving network is served by Hogsmill Valley STW which is being upgraded. For more information, please visit Investment plans for storm discharge sites | Thames Water.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection.

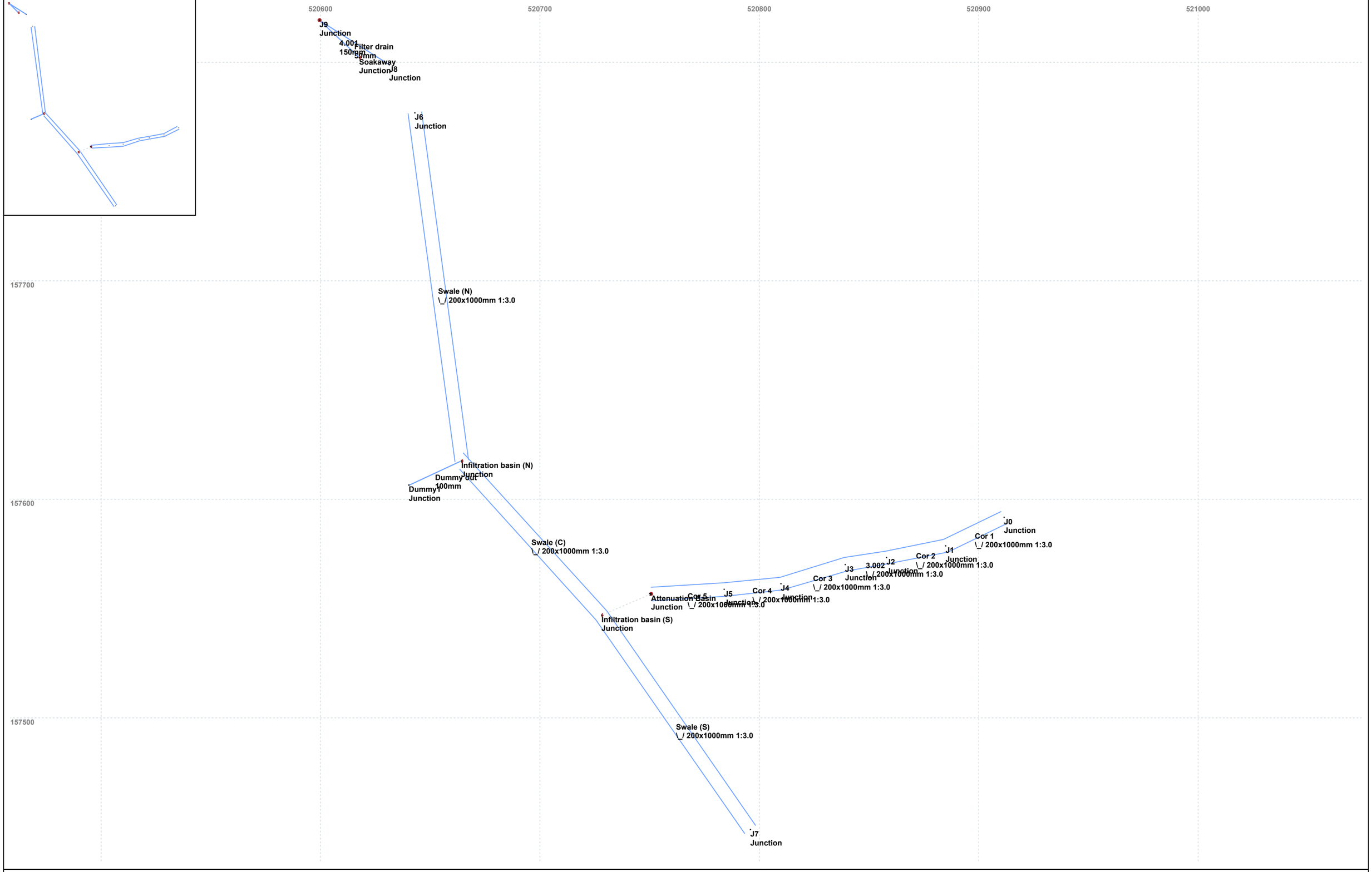
If you have any further questions, please contact us.

Yours sincerely,

Jiahang Yu
Adoptions & Pre-Planning Engineer
Developer Services

Appendix E Drainage model settings and results

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, Wales, CF10 3BH



Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

1:3 Swale Link Type

Template	Freeform Carrier	Auto Increment (mm)	50
Shape	Trapezoidal	Steep Slope (1:X)	350
Barrels	1	Follow Ground	x
Width (mm)	200	Velocity	Manning
Side Slope (1:X)	3.0	ks (mm) / n	0.030

Available Diameters (mm)

1000

Circular Link Type

Template	Freeform Carrier	Auto Increment (mm)	75
Shape	Circular	Follow Ground	x
Barrels	1		

Available Diameters (mm)

100	150

FilterCarrier Link Type

Template	Freeform Carrier	Auto Increment (mm)	75
Shape	Circular	Follow Ground	x
Barrels	1		

Available Diameters (mm)

150	225	300	375

(Trench) Link Type

Template	Freeform Carrier	Height (mm)	1000
Shape	Rectangular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Nodes

	Name	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
✓	Infiltration basin (N)		81.290	Junction	0.750
✓	Infiltration basin (S)		85.500	Junction	0.750
✓	Attenuation Basin		87.300	Junction	1.000
✓	J6	5.00	83.790	Junction	2.200
✓	J7	5.00	91.540	Junction	0.500
✓	J0	5.00	98.100	Junction	0.500
✓	J1		96.900	Junction	2.200
✓	J2		94.980	Junction	2.200
✓	J3		93.570	Junction	2.200
✓	J4		91.370	Junction	2.200
✓	J5		89.310	Junction	2.200
✓	Dummy1		80.000	Junction	2.706
✓	J9		79.950	Junction	1.000
✓	J8	5.00	82.450	Junction	1.000
✓	Soakaway		79.800	Junction	2.000

Links

Name	US Node	DS Node	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
Swale (N)	J6	Infiltration basin (N)	0.030	81.590	80.540	1.050	153.1	1000	6.60	50.0
Swale (C)	Infiltration basin (S)	Infiltration basin (N)	0.030	84.750	80.540	4.210	22.6	1000	5.78	50.0
Swale (S)	J7	Infiltration basin (S)	0.030	91.040	84.750	6.290	19.0	1000	5.42	50.0
Cor 1	J0	J1	0.110	97.600	94.700	2.900	10.2	1000	5.28	50.0
Cor 2	J1	J2	0.100	94.700	92.780	1.920	14.3	1000	5.56	50.0
3.002	J2	J3	0.100	92.780	91.370	1.410	13.5	1000	5.75	50.0
Cor 3	J3	J4	0.100	91.370	89.170	2.200	13.9	1000	6.05	50.0
Cor 4	J4	J5	0.100	89.170	87.110	2.060	12.6	1000	6.30	50.0
Cor 5	J5	Attenuation Basin	0.100	87.110	86.300	0.810	41.2	1000	6.87	50.0
Dummy out	Infiltration basin (N)	Dummy1	0.030	80.540	77.294	3.246	8.1	100	7.04	50.0
Filter drain	J8	J9	0.800	81.450	78.950	2.500	15.1	50	5.53	50.0
4.001	J9	Soakaway	0.800	78.950	77.800	1.150	21.6	150	5.73	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Swale (N)	1.676	5361.7	0.0	1.200	-0.250	-0.250	0.000	0.0	0	0.000
Swale (C)	4.360	13952.1	0.0	-0.250	-0.250	-0.250	0.000	0.0	0	0.000
Swale (S)	4.759	15230.3	0.0	-0.500	-0.250	-0.500	0.000	0.0	0	0.000
Cor 1	1.768	5656.2	0.0	-0.500	1.200	-0.500	0.000	0.0	0	0.000
Cor 2	1.644	5260.5	0.0	1.200	1.200	1.200	0.000	0.0	0	0.000
3.002	1.690	5407.7	0.0	1.200	1.200	1.200	0.000	0.0	0	0.000
Cor 3	1.668	5337.0	0.0	1.200	1.200	1.200	0.000	0.0	0	0.000
Cor 4	1.750	5600.6	0.0	1.200	1.200	1.200	0.000	0.0	0	0.000
Cor 5	0.969	3101.8	0.0	1.200	0.000	0.000	0.000	0.0	0	0.000
Dummy out	1.000	7.9	0.0	0.650	2.606	0.650	0.000	0.0	0	0.000
Filter drain	1.195	2.3	0.0	0.950	0.950	0.950	0.000	0.0	0	0.000
4.001	2.086	36.9	0.0	0.850	1.850	0.850	0.000	0.0	0	0.000

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Swale (N)	160.732	153.1	1000	1:3 Swale	83.790	81.590	81.290	80.540	-0.250
Swale (C)	95.176	22.6	1000	1:3 Swale	85.500	84.750	81.290	80.540	-0.250
Swale (S)	119.331	19.0	1000	1:3 Swale	91.540	91.040	85.500	84.750	-0.250
Cor 1	29.671	10.2	1000	1:3 Swale	98.100	97.600	96.900	94.700	1.200
Cor 2	27.479	14.3	1000	1:3 Swale	96.900	94.700	94.980	92.780	1.200
3.002	19.097	13.5	1000	1:3 Swale	94.980	92.780	93.570	91.370	1.200
Cor 3	30.591	13.9	1000	1:3 Swale	93.570	91.370	91.370	89.170	1.200
Cor 4	26.011	12.6	1000	1:3 Swale	91.370	89.170	89.310	87.110	1.200
Cor 5	33.345	41.2	1000	1:3 Swale	89.310	87.110	87.300	86.300	0.000
Dummy out	26.357	8.1	100	Circular	81.290	80.540	80.000	77.294	2.606
Filter drain	37.747	15.1	50	FilterCarrier	82.450	81.450	79.950	78.950	0.950
4.001	24.865	21.6	150	Circular	79.950	78.950	79.800	77.800	1.850

Link	US Node	Node Type	DS Node	Node Type
Swale (N)	J6	Junction	Infiltration basin (N)	Junction
Swale (C)	Infiltration basin (S)	Junction	Infiltration basin (N)	Junction
Swale (S)	J7	Junction	Infiltration basin (S)	Junction
Cor 1	J0	Junction	J1	Junction
Cor 2	J1	Junction	J2	Junction
3.002	J2	Junction	J3	Junction
Cor 3	J3	Junction	J4	Junction
Cor 4	J4	Junction	J5	Junction
Cor 5	J5	Junction	Attenuation Basin	Junction
Dummy out	Infiltration basin (N)	Junction	Dummy1	Junction
Filter drain	J8	Junction	J9	Junction
4.001	J9	Junction	Soakaway	Junction

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Rainfall Events	Singular	Drain Down Time (mins)	240	Check Discharge Volume	x
Summer CV	0.750	Additional Storage (m³/ha)	20.0		
Analysis Speed	Normal	Starting Level (m)			

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	35	0	0
100	40	0	0

Node J0 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m²)	4060		

Applies to All storms

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Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.010	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.010	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.010	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node J1 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m^2)	3730		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.009	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.009	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.009	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

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Node J2 Time-Area Diagram

Overrides Design Area x
Overrides Design Additional Inflow x
Depression Storage Area (m²) 5530
Depression Storage Depth (mm) 5
Evapo-transpiration (mm/day) 1

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.060	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.060	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.000	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node J3 Time-Area Diagram

Overrides Design Area x
Overrides Design Additional Inflow x
Depression Storage Area (m²) 2700
Depression Storage Depth (mm) 5
Evapo-transpiration (mm/day) 1

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.018	48-51	0.000	96-99	0.000	144-147	0.000	192-195	0.000	240-243	0.000
3-6	0.018	51-54	0.000	99-102	0.000	147-150	0.000	195-198	0.000	243-246	0.000
6-9	0.018	54-57	0.000	102-105	0.000	150-153	0.000	198-201	0.000	246-249	0.000
9-12	0.000	57-60	0.000	105-108	0.000	153-156	0.000	201-204	0.000	249-252	0.000
12-15	0.000	60-63	0.000	108-111	0.000	156-159	0.000	204-207	0.000	252-255	0.000
15-18	0.000	63-66	0.000	111-114	0.000	159-162	0.000	207-210	0.000	255-258	0.000
18-21	0.000	66-69	0.000	114-117	0.000	162-165	0.000	210-213	0.000	258-261	0.000
21-24	0.000	69-72	0.000	117-120	0.000	165-168	0.000	213-216	0.000	261-264	0.000
24-27	0.000	72-75	0.000	120-123	0.000	168-171	0.000	216-219	0.000	264-267	0.000
27-30	0.000	75-78	0.000	123-126	0.000	171-174	0.000	219-222	0.000	267-270	0.000
30-33	0.000	78-81	0.000	126-129	0.000	174-177	0.000	222-225	0.000	270-273	0.000
33-36	0.000	81-84	0.000	129-132	0.000	177-180	0.000	225-228	0.000	273-276	0.000
36-39	0.000	84-87	0.000	132-135	0.000	180-183	0.000	228-231	0.000	276-279	0.000
39-42	0.000	87-90	0.000	135-138	0.000	183-186	0.000	231-234	0.000	279-282	0.000
42-45	0.000	90-93	0.000	138-141	0.000	186-189	0.000	234-237	0.000	282-285	0.000
45-48	0.000	93-96	0.000	141-144	0.000	189-192	0.000	237-240	0.000	285-288	0.000

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Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
288-291	0.000	300-303	0.000	312-315	0.000	324-327	0.000	336-339	0.000	348-351	0.000
291-294	0.000	303-306	0.000	315-318	0.000	327-330	0.000	339-342	0.000	351-354	0.000
294-297	0.000	306-309	0.000	318-321	0.000	330-333	0.000	342-345	0.000	354-357	0.000
297-300	0.000	309-312	0.000	321-324	0.000	333-336	0.000	345-348	0.000	357-360	0.000

Node J4 Time-Area Diagram

Overrides Design Area x
Overrides Design Additional Inflow x
Depression Storage Area (m²) 5650
Depression Storage Depth (mm) 5
Evapo-transpiration (mm/day) 1

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.074	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.074	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.074	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node J7 Time-Area Diagram

Overrides Design Area x
Overrides Design Additional Inflow x
Depression Storage Area (m²) 6460
Depression Storage Depth (mm) 5
Evapo-transpiration (mm/day) 1

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.083	27-30	0.000	54-57	0.000	81-84	0.000	108-111	0.000	135-138	0.000
3-6	0.083	30-33	0.000	57-60	0.000	84-87	0.000	111-114	0.000	138-141	0.000
6-9	0.083	33-36	0.000	60-63	0.000	87-90	0.000	114-117	0.000	141-144	0.000
9-12	0.000	36-39	0.000	63-66	0.000	90-93	0.000	117-120	0.000	144-147	0.000
12-15	0.000	39-42	0.000	66-69	0.000	93-96	0.000	120-123	0.000	147-150	0.000
15-18	0.000	42-45	0.000	69-72	0.000	96-99	0.000	123-126	0.000	150-153	0.000
18-21	0.000	45-48	0.000	72-75	0.000	99-102	0.000	126-129	0.000	153-156	0.000
21-24	0.000	48-51	0.000	75-78	0.000	102-105	0.000	129-132	0.000	156-159	0.000
24-27	0.000	51-54	0.000	78-81	0.000	105-108	0.000	132-135	0.000	159-162	0.000

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Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
162-165	0.000	195-198	0.000	228-231	0.000	261-264	0.000	294-297	0.000	327-330	0.000
165-168	0.000	198-201	0.000	231-234	0.000	264-267	0.000	297-300	0.000	330-333	0.000
168-171	0.000	201-204	0.000	234-237	0.000	267-270	0.000	300-303	0.000	333-336	0.000
171-174	0.000	204-207	0.000	237-240	0.000	270-273	0.000	303-306	0.000	336-339	0.000
174-177	0.000	207-210	0.000	240-243	0.000	273-276	0.000	306-309	0.000	339-342	0.000
177-180	0.000	210-213	0.000	243-246	0.000	276-279	0.000	309-312	0.000	342-345	0.000
180-183	0.000	213-216	0.000	246-249	0.000	279-282	0.000	312-315	0.000	345-348	0.000
183-186	0.000	216-219	0.000	249-252	0.000	282-285	0.000	315-318	0.000	348-351	0.000
186-189	0.000	219-222	0.000	252-255	0.000	285-288	0.000	318-321	0.000	351-354	0.000
189-192	0.000	222-225	0.000	255-258	0.000	288-291	0.000	321-324	0.000	354-357	0.000
192-195	0.000	225-228	0.000	258-261	0.000	291-294	0.000	324-327	0.000	357-360	0.000

Node J5 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m^2)	2590		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.018	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.018	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.018	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node Infiltration basin (S) Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m^2)	9200		

Applies to All storms

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Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.084	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.084	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.084	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node J6 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m²)	7960		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.110	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.110	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.110	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

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Node J8 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	5
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	1
Depression Storage Area (m²)	2430		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-3	0.028	60-63	0.000	120-123	0.000	180-183	0.000	240-243	0.000	300-303	0.000
3-6	0.028	63-66	0.000	123-126	0.000	183-186	0.000	243-246	0.000	303-306	0.000
6-9	0.028	66-69	0.000	126-129	0.000	186-189	0.000	246-249	0.000	306-309	0.000
9-12	0.000	69-72	0.000	129-132	0.000	189-192	0.000	249-252	0.000	309-312	0.000
12-15	0.000	72-75	0.000	132-135	0.000	192-195	0.000	252-255	0.000	312-315	0.000
15-18	0.000	75-78	0.000	135-138	0.000	195-198	0.000	255-258	0.000	315-318	0.000
18-21	0.000	78-81	0.000	138-141	0.000	198-201	0.000	258-261	0.000	318-321	0.000
21-24	0.000	81-84	0.000	141-144	0.000	201-204	0.000	261-264	0.000	321-324	0.000
24-27	0.000	84-87	0.000	144-147	0.000	204-207	0.000	264-267	0.000	324-327	0.000
27-30	0.000	87-90	0.000	147-150	0.000	207-210	0.000	267-270	0.000	327-330	0.000
30-33	0.000	90-93	0.000	150-153	0.000	210-213	0.000	270-273	0.000	330-333	0.000
33-36	0.000	93-96	0.000	153-156	0.000	213-216	0.000	273-276	0.000	333-336	0.000
36-39	0.000	96-99	0.000	156-159	0.000	216-219	0.000	276-279	0.000	336-339	0.000
39-42	0.000	99-102	0.000	159-162	0.000	219-222	0.000	279-282	0.000	339-342	0.000
42-45	0.000	102-105	0.000	162-165	0.000	222-225	0.000	282-285	0.000	342-345	0.000
45-48	0.000	105-108	0.000	165-168	0.000	225-228	0.000	285-288	0.000	345-348	0.000
48-51	0.000	108-111	0.000	168-171	0.000	228-231	0.000	288-291	0.000	348-351	0.000
51-54	0.000	111-114	0.000	171-174	0.000	231-234	0.000	291-294	0.000	351-354	0.000
54-57	0.000	114-117	0.000	174-177	0.000	234-237	0.000	294-297	0.000	354-357	0.000
57-60	0.000	117-120	0.000	177-180	0.000	237-240	0.000	297-300	0.000	357-360	0.000

Node Attenuation Basin Offline Orifice Control

Flap Valve	x	Diameter (m)	0.300
Loop to Node	Infiltration basin (S)	Discharge Coefficient	0.600
Invert Level (m)	86.700		

Node Infiltration basin (N) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	1.95000	Safety Factor	2.0	Invert Level (m)	80.540
Side Inf Coefficient (m/hr)	1.95000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	270.0	270.0	0.750	473.0	479.2

Node Infiltration basin (S) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	1.17000	Safety Factor	2.0	Invert Level (m)	84.750
Side Inf Coefficient (m/hr)	1.17000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	200.0	0.750	378.7	384.2

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Node Attenuation Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	86.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	205.0	205.0	1.000	385.5	395.3

Node J9 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	225
Side Inf Coefficient (m/hr)	0.00000	Link	Filter drain
Safety Factor	2.0	Surround Shape	(Trench)
Porosity	0.30	Diameter (mm)	350
Invert Level (m)	78.950		

Node Soakaway Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.20000	Invert Level (m)	77.800	Depth (m)	2.000
Side Inf Coefficient (m/hr)	0.20000	Time to half empty (mins)	235	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	2.000	Number Required	1
Porosity	0.95	Pit Length (m)	8.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	63.950	18.096
1 year 30 minute summer	41.550	11.757
1 year 60 minute summer	28.011	7.402
1 year 120 minute summer	22.285	5.889
1 year 180 minute summer	18.932	4.872
1 year 240 minute summer	15.817	4.180
1 year 360 minute summer	12.784	3.290
1 year 480 minute summer	10.324	2.728
1 year 600 minute summer	8.573	2.345
1 year 720 minute summer	7.706	2.065
1 year 960 minute summer	6.395	1.684
1 year 1440 minute summer	4.687	1.256
30 year +35% CC 15 minute summer	374.536	105.981
30 year +35% CC 30 minute summer	247.448	70.019
30 year +35% CC 60 minute summer	166.931	44.115
30 year +35% CC 120 minute summer	103.047	27.232
30 year +35% CC 180 minute summer	79.138	20.365
30 year +35% CC 240 minute summer	62.429	16.498
30 year +35% CC 360 minute summer	47.295	12.171
30 year +35% CC 480 minute summer	36.907	9.753
30 year +35% CC 600 minute summer	29.959	8.195
30 year +35% CC 720 minute summer	26.486	7.098
30 year +35% CC 960 minute summer	21.454	5.649
30 year +35% CC 1440 minute summer	15.227	4.081
100 year +40% CC 15 minute summer	496.075	140.372
100 year +40% CC 30 minute summer	329.780	93.316
100 year +40% CC 60 minute summer	224.455	59.317

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 120 minute summer	135.684	35.857
100 year +40% CC 180 minute summer	103.629	26.667
100 year +40% CC 240 minute summer	81.664	21.581
100 year +40% CC 360 minute summer	62.018	15.959
100 year +40% CC 480 minute summer	48.658	12.859
100 year +40% CC 600 minute summer	39.710	10.862
100 year +40% CC 720 minute summer	35.277	9.455
100 year +40% CC 960 minute summer	28.805	7.585
100 year +40% CC 1440 minute summer	20.568	5.512

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Infiltration basin (N)	570	80.542	0.002	2.4	0.4307	0.0000	OK
960 minute summer	Infiltration basin (S)	570	84.752	0.002	1.6	0.5011	0.0000	OK
1440 minute summer	Attenuation Basin	1680	86.375	0.075	1.3	15.9155	0.0000	OK
960 minute summer	J6	555	81.655	0.065	2.8	0.1958	0.0000	OK
960 minute summer	J7	570	91.059	0.019	1.8	0.1893	0.0000	OK
15 minute summer	J0	1	97.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J1	1	94.700	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J2	1	92.780	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J3	1	91.370	0.000	0.0	0.0000	0.0000	OK
960 minute summer	J4	555	89.196	0.026	1.6	0.0530	0.0000	OK
960 minute summer	J5	570	87.172	0.062	1.5	0.0306	0.0000	OK
960 minute summer	Dummy1	570	77.294	0.000	0.0	0.0000	0.0000	OK
1440 minute summer	J9	870	78.961	0.011	0.4	0.0001	0.0000	OK
1440 minute summer	J8	870	81.465	0.015	0.4	0.0245	0.0000	OK
1440 minute summer	Soakaway	900	77.834	0.034	0.4	0.5101	0.0000	OK

US Node	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
Infiltration basin (N)	Dummy1	0.0	0.000	0.000	0.0004	0.0
Infiltration basin (N)		2.3				
Infiltration basin (S)	Infiltration basin (N)	0.1	0.000	0.000	0.0394	
Infiltration basin (S)		1.6				
Attenuation Basin	Infiltration basin (S)	0.0				0.0
J6	Infiltration basin (N)	2.3	0.232	0.000	2.1016	
J7	Infiltration basin (S)	1.6	0.661	0.000	0.3214	
J0	J1	0.0	0.000	0.000	0.0002	
J1	J2	0.0	0.000	0.000	0.0002	
J2	J3	0.0	0.000	0.000	0.0001	
J3	J4	0.0	0.000	0.000	0.0002	
J4	J5	1.5	0.148	0.000	0.4047	
J5	Attenuation Basin	1.6	0.141	0.001	0.4389	
J9	Soakaway	0.4	0.559	0.011	0.0425	
J8	J9	0.4	1.000	0.169	0.0150	
Soakaway		0.3				

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Infiltration basin (N)	44	80.604	0.064	110.9	17.7333	0.0000	OK
60 minute summer	Infiltration basin (S)	41	84.845	0.095	133.1	20.6179	0.0000	OK
960 minute summer	Attenuation Basin	585	86.770	0.470	20.0	116.3294	0.0000	OK
30 minute summer	J6	23	81.811	0.221	103.0	0.6630	0.0000	OK
30 minute summer	J7	22	91.172	0.132	77.7	1.3171	0.0000	OK
15 minute summer	J0	1	97.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J1	1	94.700	0.000	0.0	0.0000	0.0000	OK
60 minute summer	J2	39	92.903	0.123	20.7	0.1343	0.0000	OK
120 minute summer	J3	70	91.481	0.111	26.6	0.0544	0.0000	OK
30 minute summer	J4	21	89.359	0.189	69.3	0.3809	0.0000	OK
60 minute summer	J5	39	87.433	0.323	64.2	0.1588	0.0000	OK
60 minute summer	Dummy1	44	77.357	0.063	5.7	0.0000	0.0000	OK
480 minute summer	J9	376	79.181	0.231	3.6	0.0412	0.0000	SURCHARGED
15 minute summer	J8	17	82.450	1.000	21.9	2.7052	0.0000	FLOOD RISK
480 minute summer	Soakaway	376	79.176	1.376	3.6	20.9176	0.0000	OK

US Node	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
Infiltration basin (N)	Dummy1	5.7	1.091	0.729	0.1383	4.4
Infiltration basin (N)		74.2				
Infiltration basin (S)	Infiltration basin (N)	41.0	1.245	0.003	3.2819	
Infiltration basin (S)		34.4				
Attenuation Basin	Infiltration basin (S)	8.2				107.4
J6	Infiltration basin (N)	81.9	1.173	0.015	15.8652	
J7	Infiltration basin (S)	73.0	2.123	0.005	5.2749	
J0	J1	0.0	0.000	0.000	0.0002	
J1	J2	0.0	0.000	0.000	0.0002	
J2	J3	21.4	0.428	0.004	0.9682	
J3	J4	25.7	0.316	0.005	2.5355	
J4	J5	71.8	0.604	0.013	6.0521	
J5	Attenuation Basin	68.2	0.402	0.022	6.8193	
J9	Soakaway	3.6	0.990	0.097	0.4377	
J8	J9	2.7	1.560	1.149	0.0605	
Soakaway		1.2				

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Infiltration basin (N)	47	80.717	0.177	209.0	52.0999	0.0000	SURCHARGED
60 minute summer	Infiltration basin (S)	39	84.889	0.139	190.1	30.9887	0.0000	OK
480 minute summer	Attenuation Basin	296	86.827	0.527	45.2	133.1599	0.0000	OK
30 minute summer	J6	22	81.852	0.262	141.2	0.7846	0.0000	OK
30 minute summer	J7	20	91.192	0.152	106.5	1.5173	0.0000	OK
960 minute summer	J0	615	97.616	0.016	0.5	0.0196	0.0000	OK
960 minute summer	J1	630	94.719	0.019	0.8	0.0046	0.0000	OK
60 minute summer	J2	35	92.952	0.172	45.1	0.1875	0.0000	OK
60 minute summer	J3	37	91.530	0.160	65.0	0.0784	0.0000	OK
60 minute summer	J4	37	89.391	0.221	133.9	0.4463	0.0000	OK
60 minute summer	J5	38	87.554	0.444	148.6	0.2179	0.0000	OK
120 minute summer	Dummy1	68	77.384	0.090	8.4	0.0000	0.0000	OK
720 minute summer	J9	540	79.763	0.813	4.0	0.5198	0.0000	FLOOD RISK
15 minute summer	J8	14	82.450	1.000	33.7	6.7165	0.0000	FLOOD RISK
720 minute summer	Soakaway	540	79.761	1.961	3.9	29.8129	0.0000	OK

US Node	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
Infiltration basin (N)	Dummy1	8.3	1.132	1.062	0.2005	14.3
Infiltration basin (N)		83.4				
Infiltration basin (S)	Infiltration basin (N)	105.0	1.481	0.008	8.6354	
Infiltration basin (S)		36.3				
Attenuation Basin	Infiltration basin (S)	20.1				156.3
J6	Infiltration basin (N)	128.8	1.293	0.024	22.0577	
J7	Infiltration basin (S)	111.4	2.254	0.007	8.3762	
J0	J1	0.5	0.146	0.000	0.1148	
J1	J2	0.8	0.101	0.000	0.3109	
J2	J3	52.8	0.548	0.010	1.8959	
J3	J4	58.3	0.397	0.011	4.5795	
J4	J5	130.2	0.570	0.023	11.2873	
J5	Attenuation Basin	157.5	0.507	0.051	12.4118	
J9	Soakaway	3.9	0.730	0.106	0.4377	
J8	J9	3.5	1.927	1.473	0.0615	
Soakaway		1.5				

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