



Client: Bourne Valley Associates

Flood Risk Assessment and
Drainage Strategy for the
Proposed Development
Lister Wilder Ltd, Spencers
Wood, Wokingham

February 2026

FINAL

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1 Scope of Appraisal

EPS has been commissioned by **Bourne Valley Associates** to prepare a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development at **Lister Wilder Ltd, Whitehouse Farm, Beech Hill Road, Spencers Wood, Wokingham, RG7 1HR**.

A Flood Risk Assessment (FRA) appraises the risk of flooding to development at a site-specific scale and recommends appropriate mitigation measures to reduce the impact of flooding to both the site and the surrounding area. New development has the potential to increase the risk of flooding to neighbouring sites and properties through increased surface water runoff and as such, an assessment of the proposed site drainage can help to accurately quantify the runoff rates, flow pathways and the potential for infiltration at the site. This assessment considers the practicality of incorporating Sustainable Drainage Systems (SuDS) into the scheme design, with the aim of reducing the risk of flooding by actively managing surface water runoff.

New developments are also required to undertake an assessment to identify how the foul water from the site will be managed. This assessment considers how foul water is expected to be discharged from the proposed development and whether there are any appropriate connection points, such as nearby sewers or treatment plants.

This report has been prepared to supplement a full planning application and has been prepared in accordance with the requirements of both national and local planning policy. To ensure that due account is taken of industry best practice, reference has also been made to CIRIA Report C753 'The SuDS Manual' and any relevant local planning policy guidance. The surface water management strategy included within this report is not intended to constitute a detailed drainage design.

2 Background Information

2.1 Site Location and Existing Use

The site is located at Ordnance Survey (OS) coordinates 470889, 165967 off Beech Hill Road in Wokingham. The site covers an area of approximately 3.1 hectares (ha) and is currently in use as a farm and associated farmland. The location of the site, in relation to the surrounding area, is shown in Figure 2.1 below.

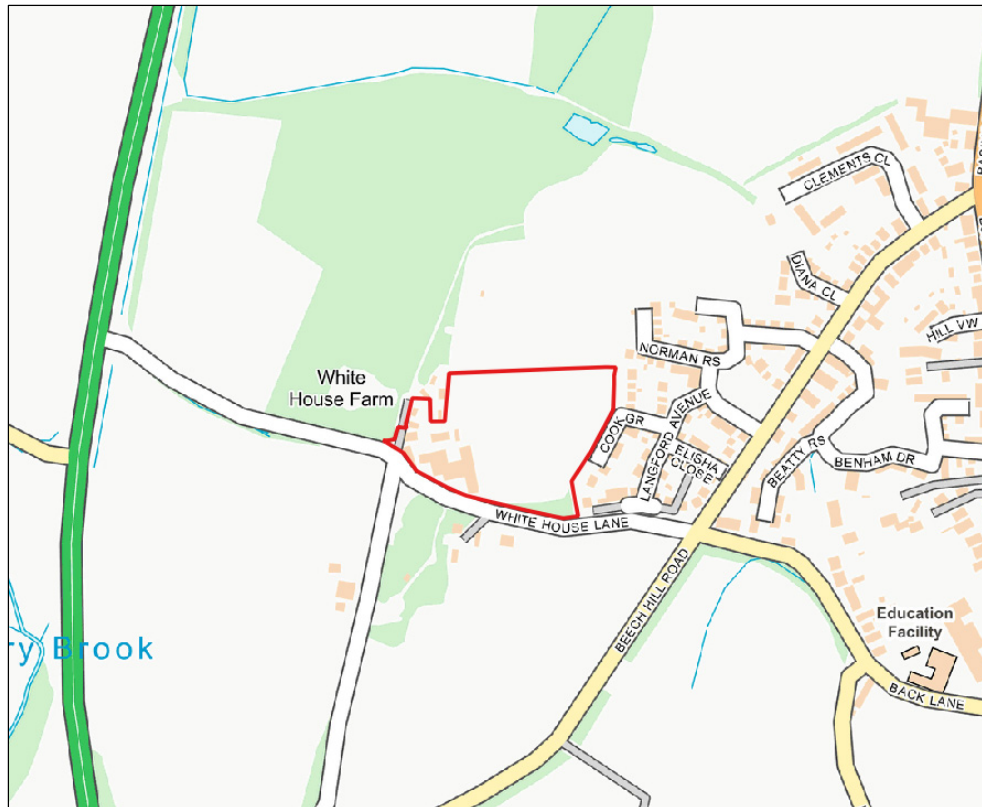


Figure 2.1 – Location map (contains Ordnance Survey data © Crown copyright and database right 2025).

2.2 Proposed Development

The development proposals comprise of the demolition of the existing buildings and replacement with a commercial workshop/store/office building, as well as improved access, associated hardstanding and landscaping.



Further drawings of the proposed scheme are included in Appendix A.1 of this report.

For any new development situated within Flood Zones 2 and 3 of a main river or the sea, or for sites greater than 1ha in size, the National Planning Policy Framework (NPPF) requires a detailed FRA to be undertaken. Inspection of the Environment Agency's (EA's) 'Flood Map for Planning' shows that the site is located within Flood Zone 1 (Figure 2.3). However, the site is greater than 1ha. In addition, reference to the EA's 'Flood Risk from Surface Water' mapping reveals that the site could be at risk of surface water flooding, refer to Section 3.3. As such, the NPPF requires a FRA to appraise the risk of flooding from *all* sources such as surface water runoff, overland flow and groundwater flooding.

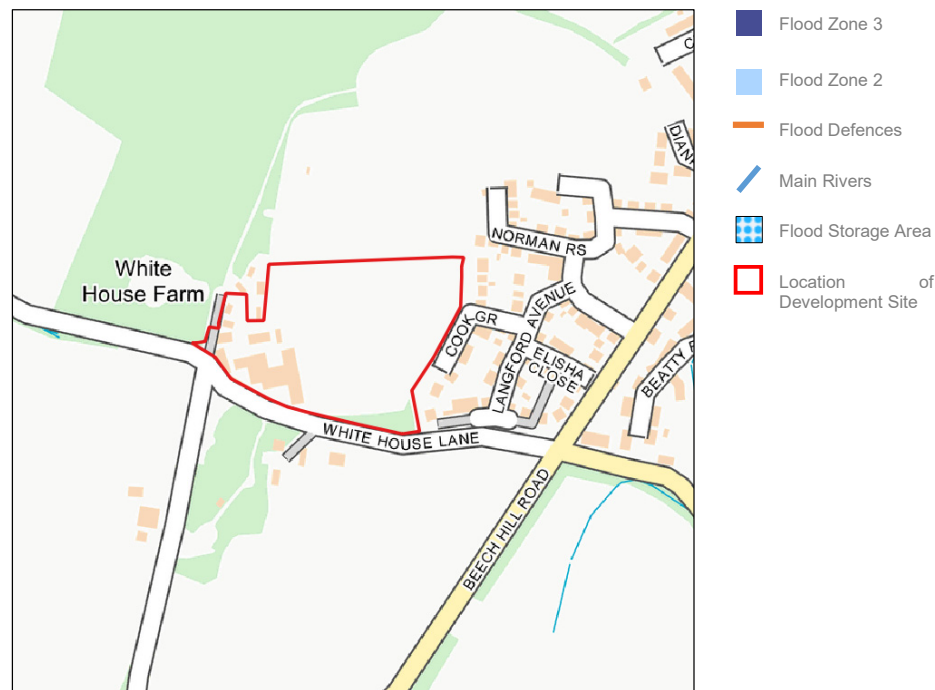


Figure 2.3 – EA's 'Flood Map for Planning' (© Environment Agency, mapping contains Ordnance Survey data © Crown copyright and database right 2025).

Further to providing an FRA, the general requirement for all new development is to ensure that the runoff is managed sustainably, and that the development does not increase the risk of flooding at the site, or within the surrounding area. In the case of brownfield sites, drainage proposals are typically measured against the existing performance of the site, although it is preferable (where practicable) to provide runoff characteristics that are similar to greenfield behaviour.

The National Standards for SuDS specify criteria to ensure sustainable drainage is included within all new developments. It is, however, recognised that SuDS should be designed to ensure that the maintenance and operation requirements are economically proportionate.

2.4 Site Specific Information

Information from a wide range of sources has been referenced to appraise the true risk of flooding at this location. This section summarises the additional information collected as part of this FRA.

Information contained within the Strategic Flood Risk Assessment (SFRA) – The Wokingham Borough Council SFRA (2023) contains detailed mapping showing historic flood records for a wide range of sources. This document has been referenced as part of this site-specific FRA.

Information provided by Thames Water – Thames Water has provided the results of an asset location search for the site. The response is included in Appendix A.2.

Site specific topographic surveys – A site-specific topographic survey has not been undertaken at this stage; however, inspection of aerial height data (LiDAR) records show that the land levels of

the site vary between 63.0m and 71.0m Above Ordnance Datum Newlyn (AODN). Land levels are shown to fall in a western direction from the site toward low-lying land.

Geology – Reference to the British Geological Survey (BGS) map shows that the underlying solid geology in the location of the subject site is London Clay Formation (clay and silt). Overlying this along the western side of the site are superficial deposits of River Terrace Deposits (sand and gravel) (Figure 2.4).

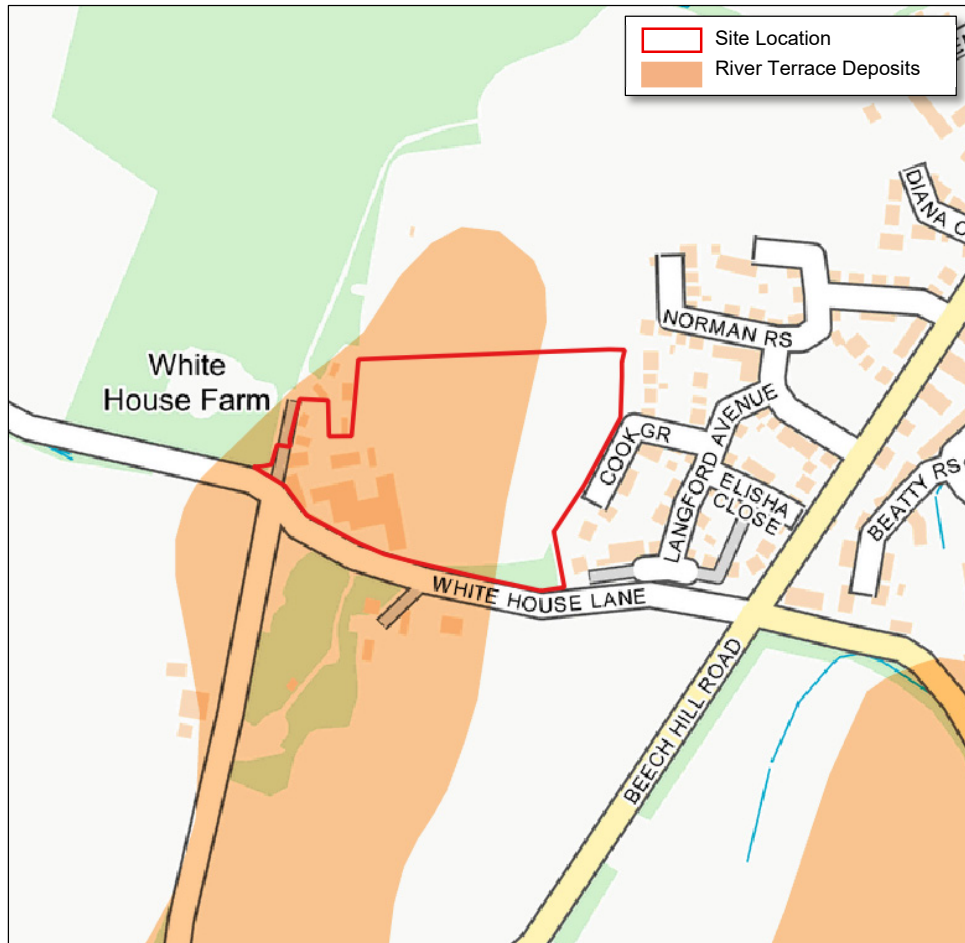


Figure 2.4 - Geology map showing the superficial deposits on the site (© British Geological Survey, mapping contains Ordnance Survey Data © Crown copyright and database right 2025).

Historic flooding – Inspection of the EA's Historic Flood Map GIS data shows that there are no historic records of fluvial or tidal flooding to the site. In addition, inspection of the Wokingham Borough Council SFRA reveals that there are no historic incidents of flooding from any other source at the site.

Existing Flood Risk Management Measures – Inspection of the EA's 'Spatial Flood Defence' data reveals that there is naturally elevated ground along the Foundry Brook which has a standard of protection of up to the 1 in 2 year return period event. In addition, the EA's data shows that there

is additional naturally elevated ground along the River Loddon which has a standard of protection of up to the 1 in 5 year return period event and is maintained by the Environment Agency.

2.5 Climate Change

The global climate is constantly changing but it is widely recognised that we are now entering a period of accelerating change. Over the last few decades there have been numerous studies into the impact of potential future changes in the climate and there is now an increasing body of scientific evidence which supports the fact that the global climate is changing as a result of human activity. Past, present and future emissions of greenhouse gases are expected to cause significant global climate change during this century.

The nature of climate change at a regional level will vary. For the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall, and more frequent periods of long-duration rainfall (of the type responsible for the recent UK flooding), could be expected.

These effects will tend to increase the size of flood zones associated with rivers and the amount of flooding experienced from other inland sources. Consequently, the following section of this report takes into consideration the impacts of climate change and references the most contemporary guidance that is applicable to the development site.

Planning Horizon

To ensure that any recommended mitigation measures are sustainable and effective throughout the lifetime of the development, it is necessary to base the appraisal on climate change predictions that are commensurate with the planning horizon for the proposed development. The NPPF and supporting Planning Practice Guidance Suite (August 2022) state that residential development should be considered for a minimum of 100 years, but that the lifetime of a non-residential development depends on the characteristics of the development. For commercial development, a 75-year design life is typically assumed. The development that is the subject of this assessment is classified as commercial and therefore, a design life of 75 years has been assumed.

Potential Changes in Climate

Recognising that the impact of climate change will vary across the UK, the allowances were updated in May 2022 to show the anticipated changes to peak rainfall across a series of management catchments. The proposed development site is located in the **Loddon and Tributaries Management Catchment**, as defined by the 'Peak Rainfall Allowance' maps, hosted by the Department for Environment, Food and Rural Affairs. Guidance provided by the EA states that this mapping should be used in small catchments (less than 5km²), or urbanised drainage catchments. For large rural catchments, the peak river flow allowances should be used.

The development site lies within an urbanised drainage catchment and therefore, the Peak Rainfall Allowances for the Loddon and Tributaries Management Catchment should be applied.

For each Management Catchment, a range of climate change allowances are provided for two time epochs and for each epoch, there are two climate change allowances defined. These represent

different levels of statistical confidence in the possible scenarios on which they are calculated. The two levels are as follows:

- Central: based on the 50th percentile
- Upper End: based on the 90th percentile

The EA has provided guidance regarding the application of the climate change allowances and how they should be applied in the planning process. The range of allowances for the Management Catchment in which the development site is located are shown in Table 2.1 below.

Management Catchment Name	Annual exceedance probability	Allowance Category	2050s	2070s
Loddon and Tributaries	3.3 %	Central	20%	25%
		Upper End	35%	35%
	1 %	Central	20%	25%
		Upper End	40%	40%

Table 2.1 – Recommended peak rainfall intensity allowances for each epoch for the Loddon and Tributaries Management Catchment.

For a development with a design life of 75 years the Upper End climate change allowance is recommended to assess whether:

- there is no increase in flood risk elsewhere, and;
- the development will be safe from surface water flooding.

From Table 2.1 above, it can be seen that the recommended climate change allowance for this site is a 40% increase in peak rainfall. Therefore, this increase has been applied to the hydraulic drainage model constructed to inform the surface water management strategy. Where this allowance has been applied the abbreviation “+40%cc” has been used.

3 Potential Sources of Flooding

The main sources of flooding have been assessed as part of this appraisal. The specific issues relating to each one and its impact on this development are discussed below. Table 3.1 at the end of this section summarises the risks associated with each of the sources of flooding.

3.1 Flooding from Rivers, Ordinary or Man-Made Watercourses

Inspection of Ordnance Survey (OS) mapping identifies that there are no watercourses near to the site. As a result, the EA's Flood Zone mapping has located the site within Flood Zone 1, which is the lowest flood risk zone with an annual probability of 0.1% (i.e., 1 in 1000 year return period event), see Figure 2.3. Consequently, the risk of flooding to the site from rivers is considered to be *low*.

3.2 Flooding from the Sea

The site is located a significant distance inland and is elevated above predicted extreme tide levels. Consequently, the risk of flooding from this source is considered to be *low*.

3.3 Flooding from Surface Water

Surface water, or overland flooding, typically occurs in natural valley bottoms as normally dry areas become covered in flowing water and in low spots where water may pond. This mechanism of flooding can occur almost anywhere but is likely to be of particular concern in any topographical low spot, or where the pathway for runoff is restricted by terrain or man-made obstructions.

The EA's 'Flood Risk from Surface Water' map (Figure 3.1) shows that the majority of the site including the area of the proposed development is at 'very low' risk of surface water flooding. However, the EA's data reveals that there are a few areas of localised flooding along the east of the site, as well as towards the centre and the western border of the site which are classified as having a 'low' to 'high' risk of surface water flooding.

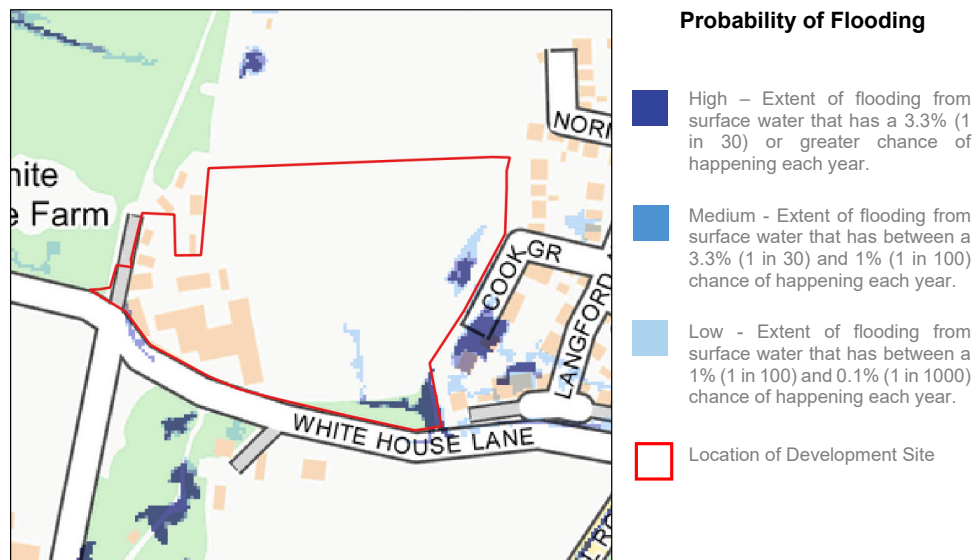


Figure 3.1 – EA's 'Flood Risk from Surface Water' map under current day scenarios. Location of the site outlined in red and the location of the proposed development outlined in green (@ Environment Agency, mapping contains Ordnance Survey Data © Crown copyright and database right 2025).

Inspection of satellite imagery reveals that these localised areas of surface water flooding onsite are situated next to areas of higher ground such as hedgerows, woodland and roads where surface water falling directly onsite could pond against. The above mapping reveals that the only hardstanding area at risk of flooding is shown to be the associated parking spaces to the west of the site, which are seen to be at 'medium' to 'low' risk of surface water flooding. Further analysis of the EA's data shows that under the 'medium' occurrence event, the predicted depths of flooding could reach up to 200mm.

Additionally, when appraising the risk of flooding to new development it is necessary to assess the impact of the 'design flood event'. Flood conditions can be predicted for a range of return periods, and these are expressed in either years or as a probability, i.e., the probability that the event will occur in any given year, or Annual Exceedance Probability (AEP). In this case, the EA's mapping includes a climate change scenario for the 2050s epoch, which has been appraised (Figure 3.2 below).

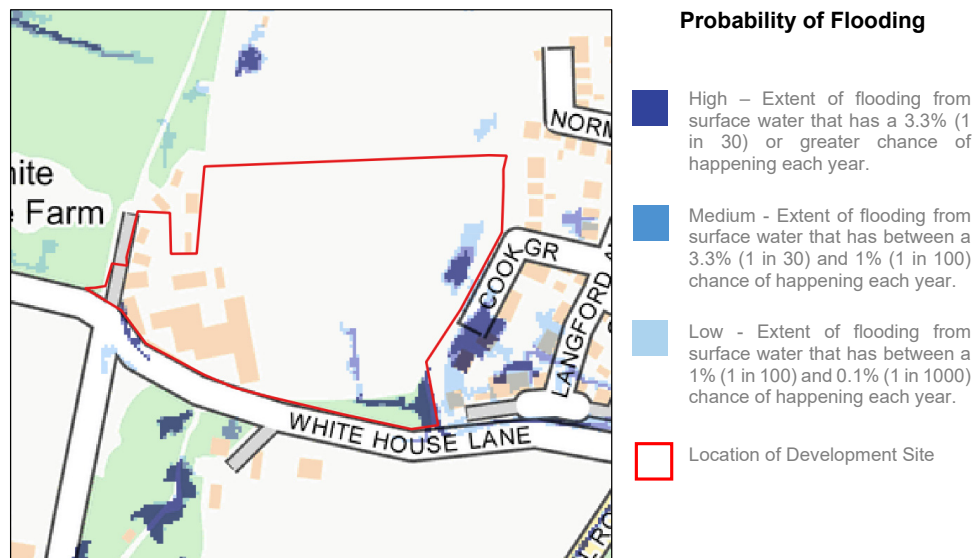


Figure 3.2 – EA's 'Flood Risk from Surface Water' map under current climate change scenarios. Location of the site outlined in red and the location of the proposed development outlined in green (© Environment Agency, mapping contains Ordnance Survey Data © Crown copyright and database right 2025).

Under this scenario, the EA's data reveals that the majority of the site is shown to remain at 'very low' risk of surface water flooding. However, further analysis of Figure 3.2 reveals that larger sections along the east are shown to flood, as well as larger localised areas in the centre of the site. The mapping further reveals that when an allowance for climate change is considered, the extent of flooding at the associated parking spaces to the west of the site is shown to be the same as under current day scenarios. However, the parking spaces could flood more frequent under the climate change scenario. Nevertheless, the predicted depths remain shallow, i.e. less than 0.2m.

Taking the above into account, it can be seen that under current conditions and when an allowance for climate change is considered the risk of flooding to the site is limited to small, localised areas onsite. Furthermore, inspection of the scheme drawings shows that the proposed building is located within an area at 'very low' risk of surface water flooding under both current day and climate change scenarios. The EA's mapping reveals that the only proposed hardstanding area onsite that is shown to be at risk of flooding under both conditions is the parking spaces to the west of the site.

Notwithstanding this, a surface water management strategy will be included within the design of the scheme to ensure that runoff generated from the site is managed sustainably and does not increase the risk elsewhere. Consequently, as a large volume of surface water is considered to be managed through the use of a drainage system, the volume of surface water that is likely to pond within the depressions is considered to reduce as a result of the development.

In addition, inspection of the Wokingham Borough Council SFRA reveals that there are no historic records of flooding on site, it can be considered that the site-specific risk of flooding to the proposed development is low.

Consequently, with the inclusion of surface water management strategies, it can be considered that the risk of flooding from this source is *low*, and the scheme will not increase the risk of surface water flooding offsite under design event conditions.

3.4 Flooding from Groundwater

Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land, as well as reactivating flow in 'bournes' (streams that only flow for part of the year).

Groundwater flooding is most likely to occur in low-lying areas that are underlain by permeable rock (aquifers). The underlying geology in this area is London Clay, which is not typically associated with groundwater flooding. However, the southeastern portion of the site has superficial deposits of River Terrace Deposits (sand and gravel), which is considered to be permeable and therefore, there is a potential for groundwater flooding to occur in the area.

However, inspection of groundwater flood risk mapping data shows that the general area in which the development site lies is identified as being at low risk from groundwater flooding. Mapping provided as part of the Defra Groundwater Flood Scoping Study (May 2004), which shows that no groundwater flooding events were recorded near the site during the very wet periods of 2000/01 or 2002/03. The mapping also identifies that the site itself is not located within an area where groundwater emergence is predicted.

Nevertheless, even in the unlikely event of groundwater emergence close to the site, inspection of aerial height data reveals that floodwater would likely flow in a western direction towards low-lying land and away from this site.

Taking the above into account and considering that inspection of the Wokingham Borough Council Strategic Flood Risk Assessment (SFRA) mapping shows the site to be located in area at low risk of groundwater flooding, the risk of flooding from this source is considered to be *low*.

3.5 Flooding from Sewers

In urban areas, rainwater is typically drained into surface water sewers or sewers containing both surface and wastewater known as "combined sewers". Flooding can result when the sewer is overwhelmed by heavy rainfall, becomes blocked, or has inadequate capacity; this will continue until the water drains away.

Inspection of the asset location mapping provided by Thames Water (Figure 3.2) identifies that the sewers in this area are foul, surface water and unknown sewers not operated by Thames Water.

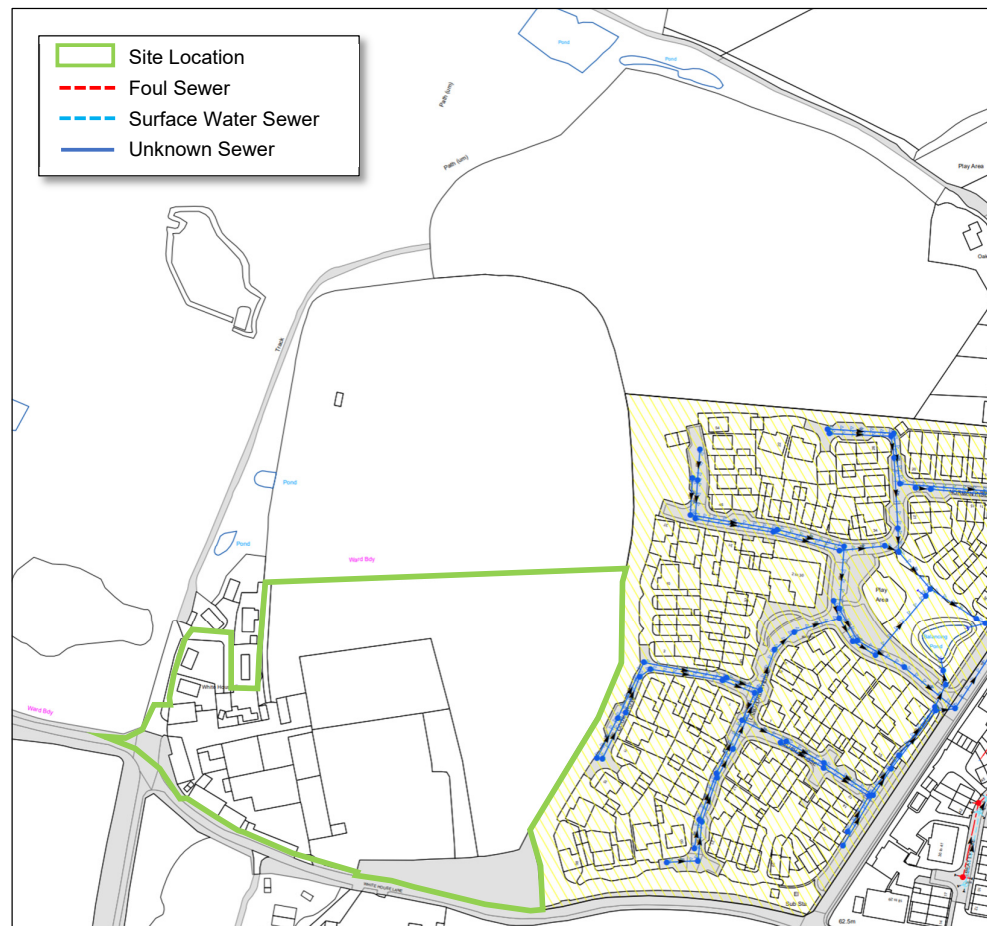


Figure 3.2 - Asset location mapping provided by Thames Water (a full scale copy can be found in Appendix A.2).

Inspection of the asset location data provided by Thames Water reveals that there are no sewers on the site itself. However, further review of the asset location data shows that there are unknown sewers not maintained by Thames Water which run along the roads of the housing complex to the east of the site. Additional review of the above mapping shows that there are foul and surface water sewers further 166m to the west of the site. Notwithstanding this, whilst there may not be any public sewers onsite, private sewers may be present which could cause flooding.

Inspection of aerial height data indicates that if water was to exit the sewer network i.e., as a result of a blockage or exceedance of capacity, it would occur further to the west of the site, where land levels are lower. In addition, even if floodwater was to emerge close to the site, further analysis of aerial height data reveals that floodwater would flow in a western direction and away from the site following the natural topography of the land. This is supported by the Wokingham Bough Council SFRA, which shows there are no known records of flooding from sewers in this area. Consequently, the risk of flooding from this source is considered to be *low*.

3.6 Flooding from Reservoirs, Canals and Other Artificial Sources

Non-natural or artificial sources of flooding can include reservoirs, canals, and lakes, where water is retained above natural ground level. In addition, operational and redundant industrial processes including mining, quarrying, sand and/or gravel extraction, may also increase the depth of floodwater in areas adjacent to these features.

The potential effects of flood risk management infrastructure and other structures also needs to be considered. For example, reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

Inspection of the OS mapping for the area shows that there are no artificial sources of flooding within close proximity to the site. In addition, the EA's 'Flood Risk from Reservoirs' map shows that the site is not within an area considered to be at risk of flooding from reservoirs. Consequently, the risk of flooding is considered to be *low*.

3.7 Summary of Flood Risk

A summary of the overall risk of flooding from each source is provided in Table 3.1 below.

Source of Flooding	Initial Level of Risk	Appraisal method applied at the initial flood risk assessment stage
Rivers, Ordinary and Man-Made Watercourses	Low	OS mapping and the EA's 'Flood Map for Planning'
Sea	Low	OS mapping and the EA's 'Flood Map for Planning'
Surface Water	Low	EA's 'Flood Risk from Surface Water' map, and historic records contained within the Wokingham Borough Council SFRA, aerial height data, and OS mapping
Groundwater	Low	BGS groundwater flood hazard maps, Defra Groundwater Flood Scoping Study, site-specific geological data, aerial height data, OS mapping, historic records in the Wokingham Borough Council SFRA
Sewers	Low	Aerial height data, OS mapping, location data provided by Thames Water and historic sewer records contained within the Wokingham Borough Council SFRA
Reservoirs, Canals and Other Artificial Sources	Low	OS mapping and EA's 'Flood Risk from Reservoirs' map

Table 3.1 – Summary of flood sources and risks.

From the analysis above it can be seen that **the risk of flooding to the site from all sources is low**. Notwithstanding this, to ensure that the development meets the requirements of the NPPF, the following section of the report recommends mitigation measures, where appropriate, to ensure the risk of flooding offsite does not increase as a result of the proposals.

4 Flood Mitigation Measures

4.1 Application of the Sequential Approach at a Local Scale

The sequential approach to flood risk management can also be adopted on a site based scale and this can often be the most effective form of mitigation. For example, on a large scheme this would mean locating the more vulnerable dwellings on the higher parts of the site and placing parking, recreational land or commercial buildings in the lower lying and higher risk areas.

Inspection of the scheme drawing and the EA's 'Risk of Flooding from Surface Water' mapping reveals that the sequential approach has been addressed, whereby the proposed development is located outside of an area at 'low' to 'high' risk of surface water flooding.

4.2 Flood Resistance and Resilience

During a flood event, floodwater can find its way into properties through a variety of routes including:

- Ingress around closed doorways.
- Ingress through airbricks and up through the ground floor.
- Backflow through overloaded sewers discharging inside the property through ground floor toilets and sinks.
- Seepage through the external walls.
- Seepage through the ground and up through the ground floor.
- Ingress around cable services through external walls.

Since flood management measures only manage the risk of flooding rather than eliminate it completely, flood resilience and resistance measures may need to be incorporated into the design of the buildings. The two possible alternatives are:

Flood Resistance or 'dry proofing', where flood water is prevented from entering the building. For example, using flood barriers across doorways and airbricks, or raising floor levels. These measures are considered appropriate for 'more vulnerable' development where recovery from internal flooding is not considered to be practical.

Flood Resilience or 'wet proofing', accepts that flood water will enter the building and allows for this situation through careful internal design for example raising electrical sockets and fitting tiled floors. The finishes and services are such that the building can quickly be returned to use after the flood. Such measures are generally only considered appropriate for some 'less vulnerable' uses and where the use of an existing building is to be changed and it can be demonstrated that no other measure is practicable.

It has been demonstrated as part of this FRA that the risk of flooding from all sources to the proposed development is low and consequently, the use of flood resilient or flood resistant construction techniques is not considered to be strictly necessary in this instance. Nevertheless, a precautionary approach should be adopted whereby flood resilience measures have been recommended to be incorporated into the proposed workshop/store/office building, where possible, in line with best practice.

Details of flood resilience and flood resistance construction techniques can be found in the document '*Improving the Flood Performance of New Buildings; Flood Resilient Construction*', which can be downloaded from www.gov.uk.

A Code of Practice (CoP) for Property Flood Resilience (PFR) has been put in place to provide a standardised approach for the delivery and management of PFR. Further information on the CoP and guidance on how to make a property more flood resilient can be accessed, and downloaded, from the Construction Industry Research and Information Association (CIRIA) Website:

https://www.ciria.org/Resources/Free_publications/CoP_for_PFR_resource.aspx

4.3 Flood Warning

Inspection of the EA's 'Flood Risk from Surface Water' map (Figure 3.1) shows that the majority of the site including the proposed development is shown to be at 'very low' risk of surface water flooding. Further analysis of the EA's data suggests that only small, localised areas on site could be at risk of flooding. Nevertheless, as a precautionary approach it is recommended that occupants of the development monitor the Met Office's Weather Warnings to provide forewarning of weather conditions which could result in surface water flooding:

www.metoffice.gov.uk/weather/uk/uk_forecast_warnings.html

4.4 Surface Water Management

The proposals are for the demolition of the existing buildings and the construction of a new workshop/store/office building along with improved access, additional hardstanding, and associated parking. Consequently, the surface water runoff from the development site will increase as a result of the proposed development. Therefore, a surface water management strategy has been developed in order to assess and manage the surface water runoff from the site, which is detailed in Section 6 of this report.

5 Existing Drainage

5.1 Existing Surface Water Drainage

The existing site drainage has not been surveyed and it is currently unknown how the existing buildings at the site currently drain. The existing site is therefore assumed to drain informally, with surface water running off the site into adjacent fields and the public highway. Additional investigation may be required as part of the detailed design to confirm the specific layout of the existing underground drainage network if any.

Surface water runoff is assumed to be discharged at an unrestricted rate from the existing site, and this rate of discharge has been calculated for a range of rainfall events with varying return periods. The existing site comprises of approximately 60% greenfield area, and therefore greenfield runoff rates have been calculated for this portion of the site. Brownfield runoff rates have also been calculated for the remaining 40% impermeable area of the existing site. Total existing runoff rates for the site have also been calculated, summing contributions from both greenfield and brownfield areas. These rates are outlined in Table 5.1 below.

These hydrological calculations have been undertaken using the Modified Rational Method. Greenfield runoff rates for the site have also been calculated using the HR Wallingford greenfield runoff calculator and the Flood Estimation Handbook (FEH) statistical method. Both brownfield and greenfield runoff rates have been calculated with synthetic rainfall data derived using the variables obtained from the FEH online web service.

Return Period (years)	Peak Greenfield Runoff Rate from Existing Greenfield Area (l/s)	Peak Brownfield Runoff Rate from Existing Brownfield Area (l/s)	Peak Existing Runoff Rate for Entire Site (l/s)
2	8.8	231.3	240.1
30	23.0	700.3	723.3
100	31.9	907.7	939.6

Table 5.1 – Summary of peak existing runoff rates.

Thames Water has provided sewer mapping as part of their asset location data for the site and surrounding area. An extract of this mapping is provided in Figure 3.1 and shows the location of public sewers in close proximity to the site.

From Figure 5.1, it is evident that the sewers in this area are typically separated into dedicated surface water and foul water networks. However, the nearest public sewers to the site are located approximately 300m east of the site, within Beatty Rise.

6 Sustainable Drainage Assessment

6.1 Site Characteristics

The important characteristics of the site, which have the potential to influence the surface water drainage strategy, are summarised in Table 6.1 below.

Site Characteristic	Development Site	
Total area of site	~3.1 ha	
Current site condition	Part developed (brownfield) and part undeveloped (greenfield)	
Greenfield runoff rates (based on the FEH methodology and the total site area)	1:1 yr = 14.1 l/s Qbar = 14.6 l/s 1:30 yr = 38.3 l/s 1:100 yr = 53.1 l/s	
Infiltration	Unavailable due to underlying geology and typical soil conditions. Confirmed via on-site tests.	
Current surface water discharge method	Unknown (assumed to drain informally offsite)	
Is there a watercourse nearby?	Yes – Series of drainage ditches in local area.	
Impermeable area	Existing ~ 1.25 ha	Proposed ~ 1.68 ha

Table 6.1 – Site characteristics affecting rainfall runoff.

Based on Table 6.1 above, it is evident that the development proposals will increase the total impermeable area across the site. As a result, the rate at which the surface water runoff is discharged from the site is likely to increase. Consequently, measures will need to be put in place to ensure that the impact of this additional surface water runoff is appropriately managed.

Furthermore, the potential use of SuDS within the proposed development will be considered to assess the practicality of better replicating greenfield behaviour, in accordance with Local and National Planning Policy.

6.2 Opportunities to Discharge Surface Water Runoff

The National Standards for SuDS set out a hierarchy of preferred options for the discharge of surface water runoff from developments. This hierarchy prioritises managing surface water runoff at source, by either storing it for later **re-use** or allowing it to **infiltrate** into the ground. If this option

is not viable, the next option of preference is for the runoff to be discharged into a **watercourse**. Water should only be conducted into a **public sewer** system if neither of these former options are possible, with a connection into a surface water sewer being preferred over the discharge into a combined sewer.

The following opportunities for managing the surface water runoff discharged from the development site are listed in order of preference:

Water Re-Use – Water re-use systems need be considered to reduce the reliance on the demand for potable water. However, such systems can rarely manage 100% of the surface water runoff discharged from a development, as this requires the yield from the building and hardstanding area to balance perfectly with the demand from the proposed development. Consequently, whilst rainwater recycling systems should be considered within the detailed design, to provide a conservative approach regarding the management of surface water runoff, it has been assumed that any rainwater harvesting system included within the development proposals are at maximum capacity and additional SuDS will be required to manage the surface water runoff generated.

Infiltration – Geological records indicate that the site is positioned within the London Clay formation bedrock with superficial deposits of River Terrace Deposits (sand and gravel) in the western half of the site. Typically, soakage rates within this area are low and consequently, the sole use of infiltration SuDS is not considered a viable solution at this development site. The applicant has carried out a series of on-site trial pit infiltration tests in general accordance with BRE 365 which confirmed the poor infiltration potential at the site. A rate of 4.3×10^{-6} has been derived from the on-site tests; although this will allow some infiltration into the ground, infiltration has been assumed negligible with the surface water drainage design as a conservative approach.

Discharge to Watercourses – Figure 2.1 shows the location of an existing drainage ditch approximately 130m west of the site entrance along White House Lane. OS mapping for the area surrounding the site has been inspected and it is concluded that this ditch is likely to drain to the wider catchment of the Foundry Brook main river. A direct connection to this ditch can be achieved via the public highway. See Figure 6.1 for sketch showing feasible direct connection from the proposed development site to the ditched watercourse to the west of the site. Consequently, a connection to this watercourse is likely to be the most sustainable solution for draining surface water runoff from the proposed development. It is recommended that additional survey work is undertaken at the detailed design stage to confirm the onward connectivity and depth of the ditch.

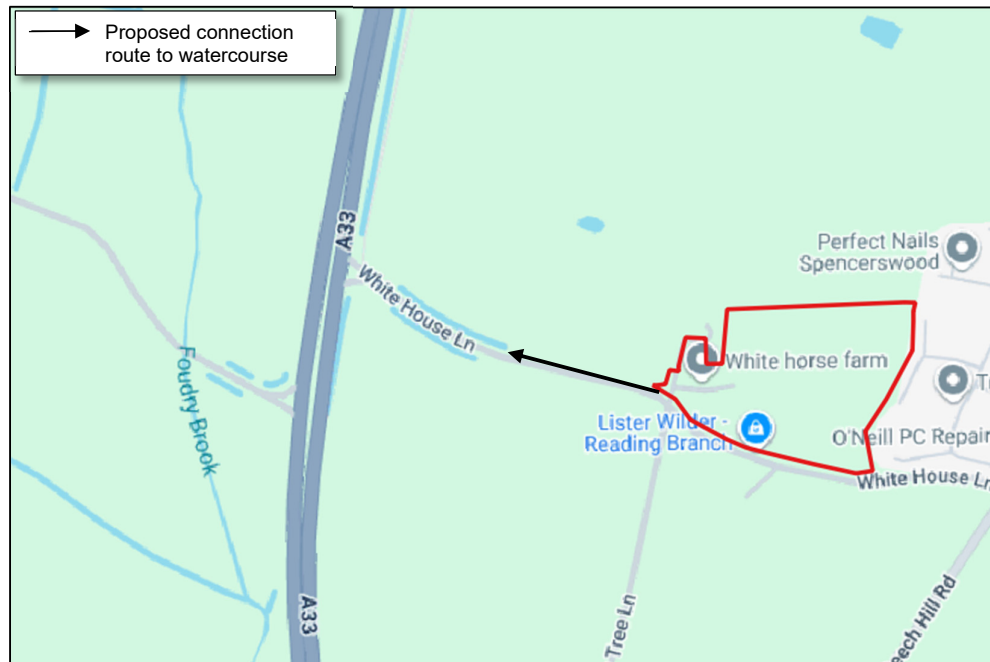


Figure 6.1 – Sketch outline showing proposed connection route to watercourse to the west of the site.

Discharge to Public Sewer System – A more preferable solution for managing surface water runoff discharged from the development is likely to be available and therefore, it is likely that a connection to the public sewer system will not be required.

6.3 Constraints and Further Considerations

The key constraints that are relevant to this development are listed below:

- Due to the limited infiltration at the site, it will not be possible to discharge all surface water runoff via infiltration. Consequently, the use of Type B SuDS is recommended to minimise the volume of surface water discharged from the proposed development.
- Due to the gradient across the site, it may be necessary to incorporate check dams within the sub-base of any permeable paving system.
- If a new connection to the existing watercourse is needed, it will be necessary to obtain ordinary watercourse consent from the LLFA before construction can commence.
- To reduce the risk of polluting receiving waterbodies, additional pollution control measures, such as sediment traps and oil interception devices, should be considered within the detailed drainage design for the development.
- The existing biodiversity constraints and general principles of SuDS mean that the proposed drainage solution must be integrated into the existing site in a way that will promote biodiversity and minimise the risk of damage to existing natural habitats.

6.4 Proposed Surface Water Management Strategy

The drainage strategy set out below discusses each of the different elements of the proposed scheme, along with the results from a numerical drainage model constructed for the site, which can be used to demonstrate how the overall objectives can be achieved. This does not represent a detailed surface water drainage design; it is simply an assessment to demonstrate that the objectives and requirements of the NPPF and the National Standards can be met at the planning stage.

Drainage Basin

A drainage basin will be located north of the proposed development area in the adjacent (applicant-owned) field and merged within the wider landscaping of the surrounding area.

The basin will collect surface water runoff from across the site, via a series of underground pipes, manholes and gullies, aside from the car parking area along the southern site boundary and associated building roofs that drain south. The basin will offer storage for stormwater attenuation before discharging to the downstream drainage network.

There is potential for the basin to also include a shallow amenity level, surrounding the base. Walkways around the basin can be implemented at the amenity level and can include play areas. The basin has been sized to manage surface runoff for all rainfall events up to and including the design event, providing a 300mm freeboard above the maximum water level.

The drainage basin will also improve water quality by filtering out pollutants from the surface water runoff with lined vegetation across the base and sides of the basin.

A summary of the Causeway Flow+ analysis for the infiltration drainage basin is shown in Table 6.2 below.

Parameter	Value (1:100yr+40%cc event)
SuDS	Drainage Basin
Area draining to SuDS	1.394 ha
Area (at surface)	1454 m ²
Area (at base)	1039 m ²
Depth of basin	1.0 m
Embankment	1:3
Infiltration	Permitted but assumed negligible
Flow control device	None
Critical storm duration	180 minutes
Storage volume	842 m ³

Table 6.2 – Summary of drainage basin SuDS.

Permeable Paving

Runoff from the proposed car parking areas along the southern boundary as well as adjacent building roofs that will drain south, will be directed via underground pipes into a layer of open graded subbase material, located beneath sections of permeable paving. The permeable paving offers storage for surface water runoff, filtering out any pollutants via the subbase, before discharging downstream along the proposed drainage network.

A summary of the Causeway Flow+ analysis for permeable paving is shown in Table 6.3 below.

Parameter	Value (1:100yr+40%cc event)
SuDS	Permeable Paving
Total area draining to permeable paving	0.291 ha
Area of permeable surfacing	~ 545 m ²
Infiltration	Permitted but assumed negligible
Sub-base depth	500 mm
Porosity	30%
Flow control device	None assumed (however likely required when considering slope of site at detailed design/check dams should also be included)
Critical storm duration	30 minutes
Storage Volume	78 m ³

Table 6.3 – Summary of permeable surfacing SuDS.

Geocellular Storage Tank

Surface water runoff stored within the permeable paving system and drainage basin will be discharged into a geocellular storage tank located beneath the entrance area to the site. The system will allow for additional storage before discharging runoff offsite, towards the drainage ditch, at a restricted rate. Calculations have been undertaken to determine the depth and volume of the geocellular tank system required and the results are summarised in Table 6.4 below.

Parameter	Value (1:100yr+40%cc event)
SuDS	Geocellular Storage Tank
Upstream SuDS	Permeable Paving and Drainage Basin
Dimensions	6.5 m x 17 m x 2.8 m (depth)
Porosity	95%
Infiltration	Permitted but assumed negligible
Flow control device	Vortex flow control device
Limiting discharge rate	30.0 l/s
Critical storm duration	180 minutes
Storage Volume	294 m ³

Table 6.4 – Summary of geocellular storage tank SuDS.

Runoff rates have been calculated for a range of annual return probabilities, including the 100-year return period event with a 40% increase in rainfall intensity, to account for future climatic changes. These values are summarised below in Table 6.5 for a range of return periods.

Return Period	Greenfield Runoff Rate for Entire Site (l/s)	Existing Runoff Rate for Entire Site (l/s)	Proposed Runoff Rate for Entire Site (l/s)	Betterment on Existing Runoff Rates
QBar/1 in 2yr	14.6	240.1	29.8	88%
1 in 30yr	38.3	723.3	30.0	96%
1 in 30yr+35%cc	-	-	30.0	96%
1 in 100yr	53.1	939.6	30.0	97%
1 in 100yr+40%cc	-	-	30.0	97%

Table 6.5 – Summary of peak discharge rates for a range of return period events.

It is evident that with the inclusion of the proposed SuDS, there is the potential to accommodate all the surface water runoff from the site, up to and including, the design rainfall event. This assumes the rate at which water is discharged to the public sewer system will be attenuated to a rate that is no greater than 30.0 l/s. This proposed rate provides a betterment on existing greenfield runoff rates for the entire site for all rainfall events above the 1:2 year storm event. However, an 88% betterment is provided for the 1:2 year storm event compared to the existing discharge rate from the site for the same event.

6.5 Indicative Drainage Layout Plan

Figure 6.2 is an indicative drainage layout plan delineating how the proposed SuDS can be incorporated into the scheme proposals.

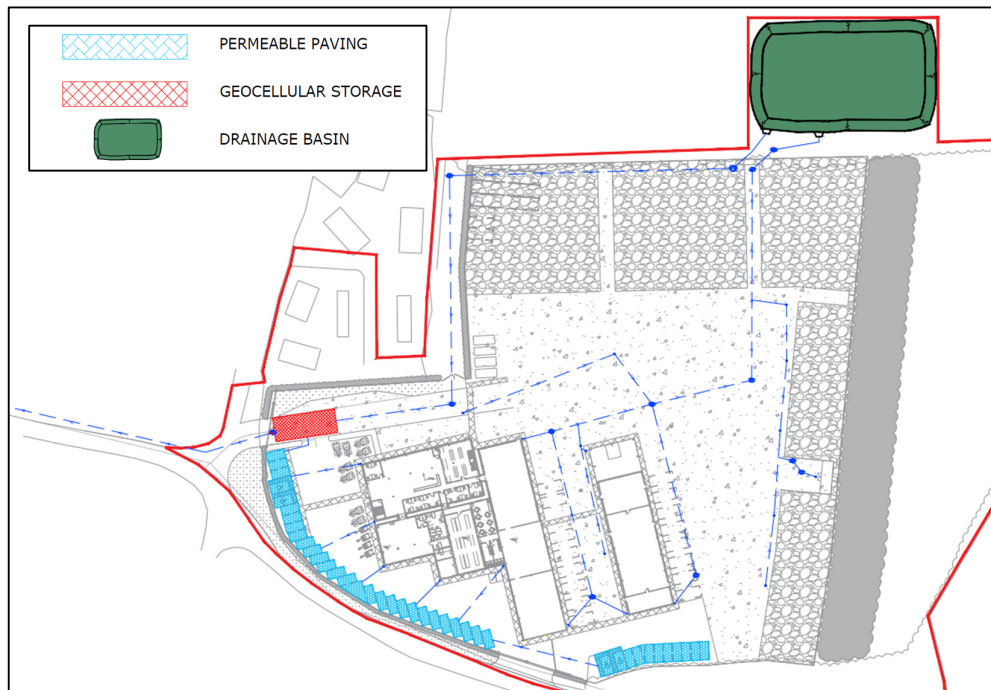


Figure 6.2 - Indicative drainage layout plan showing the proposed location of SuDS.

A full-scale copy of this layout is located in Appendix A.4 of this report.

6.6 Management and Maintenance

In order for any surface water drainage system to operate as originally designed, it is necessary to ensure that it is adequately maintained throughout its lifetime. Therefore, over the lifetime of a development there is a possibility that the performance of the system could be reduced or could fail if it is not correctly maintained. This is even more important when SuDS form a part of the surface water management system, as these require a more onerous maintenance regime than a typical piped network.

The key requirements of any management regime are routine inspection and maintenance. When the development is taken forward to the detailed design stage, an 'owner's manual' will need to be prepared. This should include:

- A description of the drainage scheme.
- A location plan showing all of the SuDS features and equipment, such as flow control devices etc.
- Maintenance requirements for each element, including any manufacturer-specific requirements.
- An explanation of the consequences of not carrying out the specified maintenance.
- Details of who will be responsible for the ongoing maintenance of the drainage system.

For the SuDS recommended by this assessment, the most obvious maintenance tasks will be the cleaning and desilting of the geocellular storage tank, permeable paving and drainage basin and pruning the vegetation within the drainage basin. General maintenance schedules have been included within the appendices of this report, which demonstrate the maintenance requirements of these SuDS.

For developments such as this, that rely to some extent on the ongoing inspection and maintenance of SuDS, it will be necessary to ensure that measures are in place to maintain the system for the lifetime of the development. In this case, the development site is for commercial use, therefore, the maintenance of the SuDS will be the responsibility of a designated management company responsible for managing the rest of the site.

For some elements of the drainage system, such as flow control device, it may be necessary to use specialist contractors or have the original manufacturer inspect the features. If this is the case the management will need to make allowances for these inspections and works to be carried out.

Further details of the maintenance and management strategy should be confirmed, following the completion of a detailed drainage design for the development.

6.7 Sensitivity Testing and Residual Risk

When considering residual risk, it is necessary to consider the impact of a flood event that exceeds the design event, or the implications if the proposed drainage system was to become blocked.

The proposed drainage system has been designed to accommodate surface water runoff generated under an extreme rainfall event, with a return period of 1 in 100 years, including a 40% increase in peak rainfall intensity (to account for the impacts of climate change). As such, this additional percentage increase complies with the EA's most contemporary guidance on climate change for the upper allowances.

Nonetheless, if a rainfall event was to occur which exceeds the design parameters, surface water would fill up the drainage network and overflow from the lowest point first, which is the drainage basin. In this scenario, the basin can act as a warning system; if the basin starts to exceed the designed freeboard level and begins to fill to the surface, this can provide an indication that the system may become overwhelmed and flooding may occur. Water overflowing from the drainage basin would likely flow in the easterly direction where land levels continue to fall towards the adjacent fields and away from the proposed development (see Figure 6.3 for exceedance/blockage flow routes).

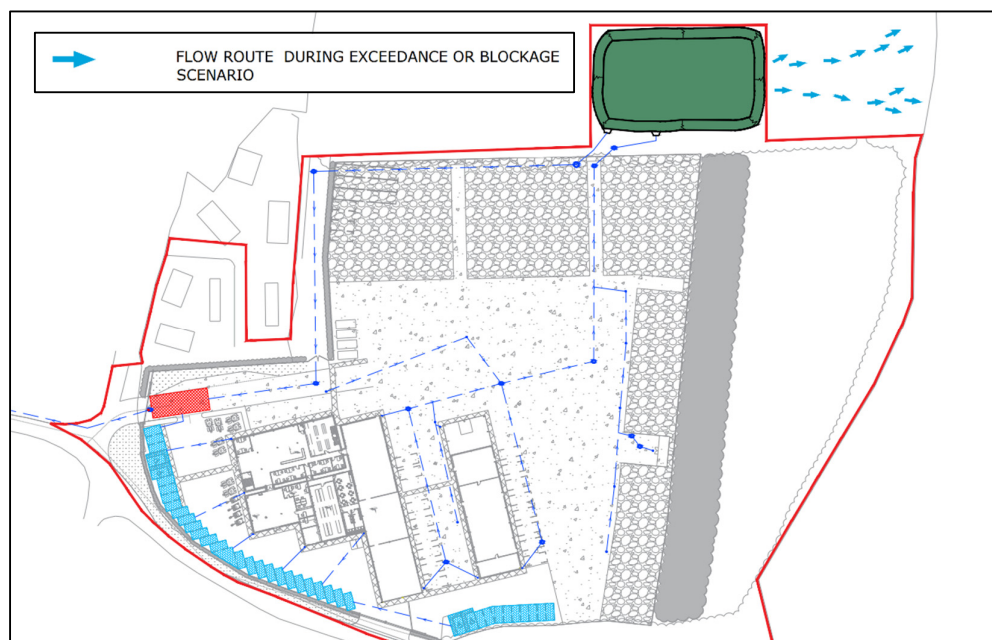


Figure 6.3 – Flow route during exceedance/blockage scenario.

To minimise the risk of the uncontrolled discharge of floodwater from the drainage basin, an overflow pipe has been incorporated into the design of the flow control chamber adjacent to the geocellular storage tank. If the primary flow control device becomes blocked, this overflow pipe will be used to bypass the flow control device, allowing excess water to drain directly to the watercourse.

Notwithstanding this, it is recognised that the drainage proposals will incorporate a significant volume of additional storage for storm water, which is not currently provided on the existing site. As a result, when compared to the existing site, it is likely that the volume of water discharged from the site during an extreme rainfall event will be reduced, thus minimising the potential impact of flooding to the surrounding area.

7 Foul Water Management Strategy

7.1 Background

The objective of this foul water drainage strategy is to ensure a viable solution is available for managing foul effluent discharged from the proposed development site.

In general, there are two methods for draining effluent from proposed developments. The preferred solution is a connection to the public sewer network, which is controlled by the sewerage undertaker. Nonetheless, if there are no sewers near to the development site or there are particular reasons why a connection to the public sewer system would not be possible i.e., topography, cost, environmental concerns, then the use of package treatment systems or cesspits is permitted.

The Environment Agency's "Binding Rules" control the use of package treatment systems and require the development to connect to the public sewer system if the site boundary is located a specific distance from the public foul sewer.

The calculation for discerning whether a new commercial development is obliged to connect to the public foul sewer is to divide the maximum daily discharge volume in cubic metres by 0.75 and multiply the result by 30 metres. If the calculated distance is greater than the distance to the public foul sewer, the proposed development must connect to the public foul sewer system.

In this case, the proposed development falls under the distance requirement, therefore, the use of package treatment systems is considered to be appropriate for this development.

7.2 Packaged Wastewater Treatment System

Foul water discharged from the development is proposed to be managed through the use of a new package treatment plant (PTP). The PTP will be located in the north east corner of the yard buried below the stoned yard area and will receive all foul water discharge from across the site.

The treated effluent from the PTP is proposed to be discharged to the same outfall that will discharge surface water runoff away from the site towards the ditched watercourse. The treated foul water will connect to the outfall downstream of the surface water geocellular storage tank.

Figure 7.1 is an indicative drainage layout plan delineating how the proposed foul water drainage strategy can be incorporated into the scheme proposals. A full-scale copy of this layout is located in Appendix A.4 of this report.

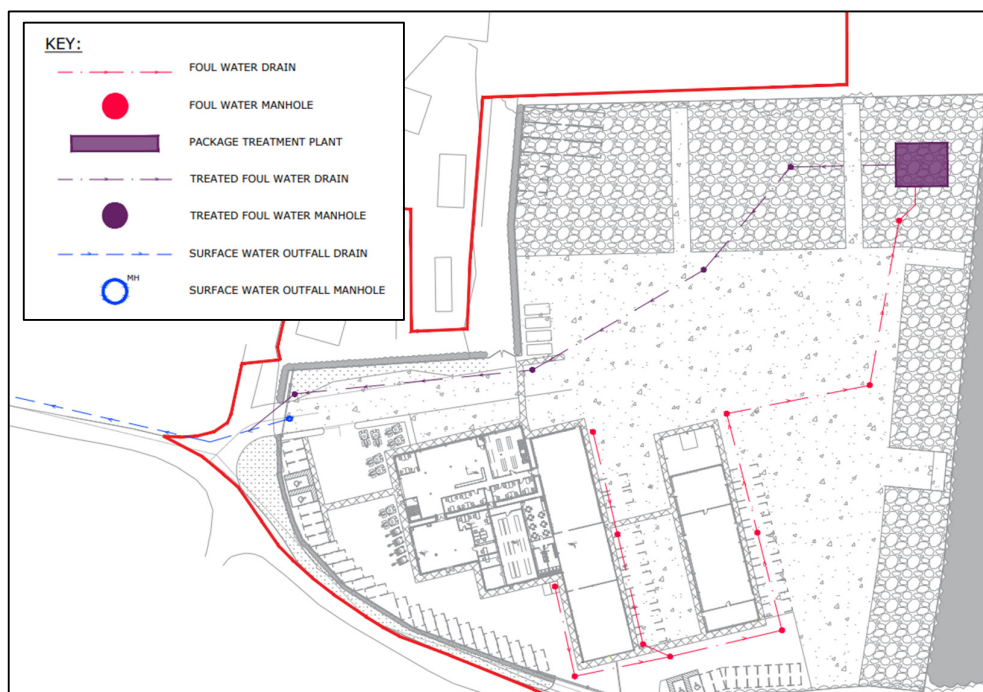


Figure 7.1 – Indicative drainage layout plan showing the proposed foul water management strategy.

The peak discharge from the proposed development has been calculated to ensure the package treatment plant is sized accordingly and will remain effective. The calculations provided follow the guidance outlined in Flows and loads Vol. 4 and is based on assumptions that the development hosts an open industrial site and will require 40 full time day staff. The results are presented in Table 7.1.

Site Specific Flows	Site Specific BOD	Site Specific Ammonia
3.66 m ³	1.55 kg	205 mg/l of nitrogen

Table 7.1 – Daily effluent flows from the proposed development.

7.3

Summary

The opportunities for managing foul effluent discharged from the development site have been analysed and it is concluded that a new packaged treatment plant is likely to present the most viable solution.

Following the award of planning permission, a full detailed design of the site layout and foul drainage system will be required. However, based on the above analysis, it is recognised that a solution for managing foul wastewater from the proposed development will be available.

8 Conclusions and Recommendations

The overarching objective of this report is to appraise the risk of flooding at Lister Wilder Ltd, Spencers Wood, Wokingham, to ensure that the proposals for development are acceptable in this location and that any risk of flooding to the occupants of the development is appropriately mitigated. In addition, the NPPF also requires the risk of flooding offsite to be managed, to prevent any increase in flood risk as a result of the development. This report has therefore been prepared to appraise the risk of flooding from all sources in accordance with the NPPF.

In this case, the site is greater than 1 hectare in size and reference to the EA's 'Risk of Flooding from Surface Water' mapping reveals that the site could be at risk of surface water flooding. As such, it is necessary to examine the risk of flooding from all sources on the development in detail, which has been the focus of this site-specific FRA.

The risk of flooding has been considered for a wide range of sources, and it has been identified that the risk to the proposed development from offsite sources is low. However, it is recognised that localised areas on site are shown to be at risk of flooding from surface water. Nevertheless, a more detailed review would suggest that the majority of water accumulating within the localised areas are as a result of rainfall falling directly onto the site itself. The EA's 'Risk of Flooding from Surface Water' data shows that under both current day conditions and when an allowance for climate change is considered, it is only the associated parking spaces to the west of the site which could be at risk of surface water flooding to shallow depths.

Consequently, whilst the proposed development itself is shown to be at low risk of flooding from all other sources, a precautionary approach has been considered whereby flood mitigation measures have been recommended in order to reduce the impact of flooding should the scenarios discussed in this report be exceeded. As such, the following measures should be explored further, where possible:

- It is recommended to include flood resilience measures into the proposed workshop/store/office building where possible in line with best practice, which are outlined in Section 4.2.
- It is recommended for occupants of the development to monitor the Met Office's Weather Warnings to provide forewarning of weather conditions which could result in surface water flooding.

It is concluded that the most viable solution for managing all of the surface water runoff discharged from the proposed development will be via a new connection to the ditched watercourse west of the site along White House Lane. It is recommended that further survey work is commissioned at the detailed design stage to confirm the onward connectivity and depth of the drainage ditch.

In order to restrict the rate at which surface water runoff is discharged offsite, various SuDS have been proposed, including permeable paving, a drainage basin and a geo-cellular storage tank. These SuDS will be used to store water onsite and maximise the water which can be adsorbed by vegetation, before it is discharged to the nearby watercourse.

A vortex flow control device has been specified to attenuate the rate at which surface water runoff is discharged from the site, limiting the rate to a maximum of 30.0l/s. This is considered to be as close as reasonably practicable to the calculated greenfield runoff rates for the site, in accordance with the National Standards for SuDS. This proposed rate provides a betterment on existing greenfield runoff rates for the entire site for all rainfall events above the 1:2 year storm event. However, an 88% betterment is provided for the 1:2 year storm event compared to the existing discharge rate from the site for the same event.

Details of the typical maintenance and management requirements for each element of the drainage system have been provided to ensure that the proposed drainage solution can be maintained and will continue to operate over the lifetime of the development. It is, however, recommended that an “owner’s manual” containing additional product specific maintenance requirements is produced as part of the detailed design for the site.

In conclusion, following the recommendations of this report and with the inclusion of sustainable drainage systems, the development will not increase the risk of flooding elsewhere and a sustainable solution for managing the surface water runoff is available. Consequently, the proposals will meet the requirements of the NPPF, the National Standards for SuDS, and local planning policy.

9 Appendices

Appendix A.1 – Drawings

Appendix A.2 –Thames Water Asset Location Data

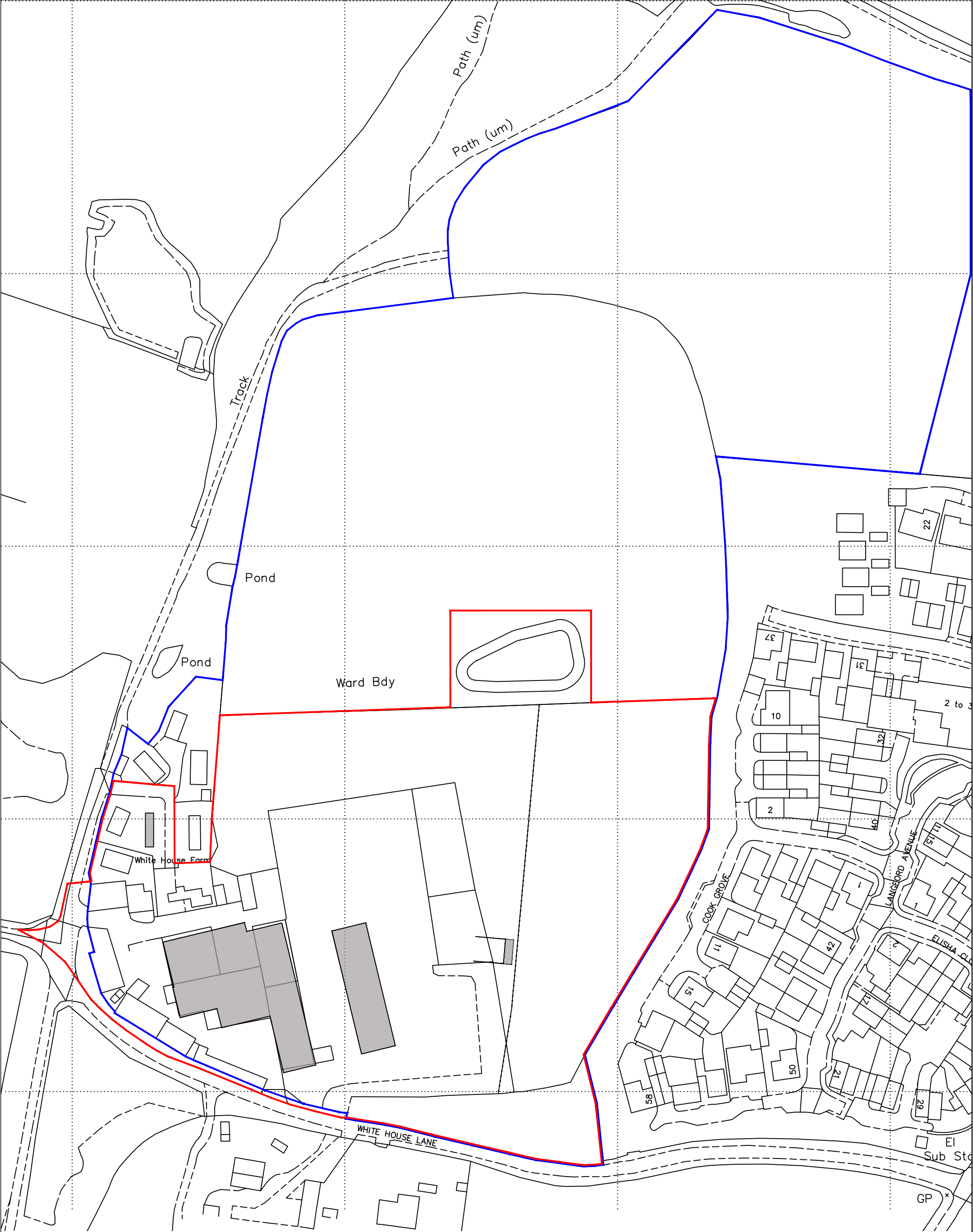
Appendix A.3 – Indicative Drainage Layout

Appendix A.4 – Surface Water Management Calculations

Appendix A.5 – Maintenance Schedules

Appendix A.6 – Site Infiltration Testing Results

Appendix A.1 – Drawings



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Rev No.	Revision Note.	Date	Drawn	Checked
I	Area hatched in Red to show proposed area for change of use	10.12.20	CJB	AW
J	Drainage ditch added	23.02.21	AW	AW
K	Drainage soakaways added	04.03.21	AW	AW
L	New depot building and revised site plan	13.04.22	AW	AW
M	Access ownership plan created	04.11.24	AW	AW
N	Highways land added to access ownership plan	05.02.25	AW	AW

NUMBER - REV - CLIENT - PROJECT
00836-00 - N - Lister Wilder - White House Farm

TITLE
Location Plan

DATE
16.10.25

SHEET
02

SCALE
1:1250

DRN BY
AW

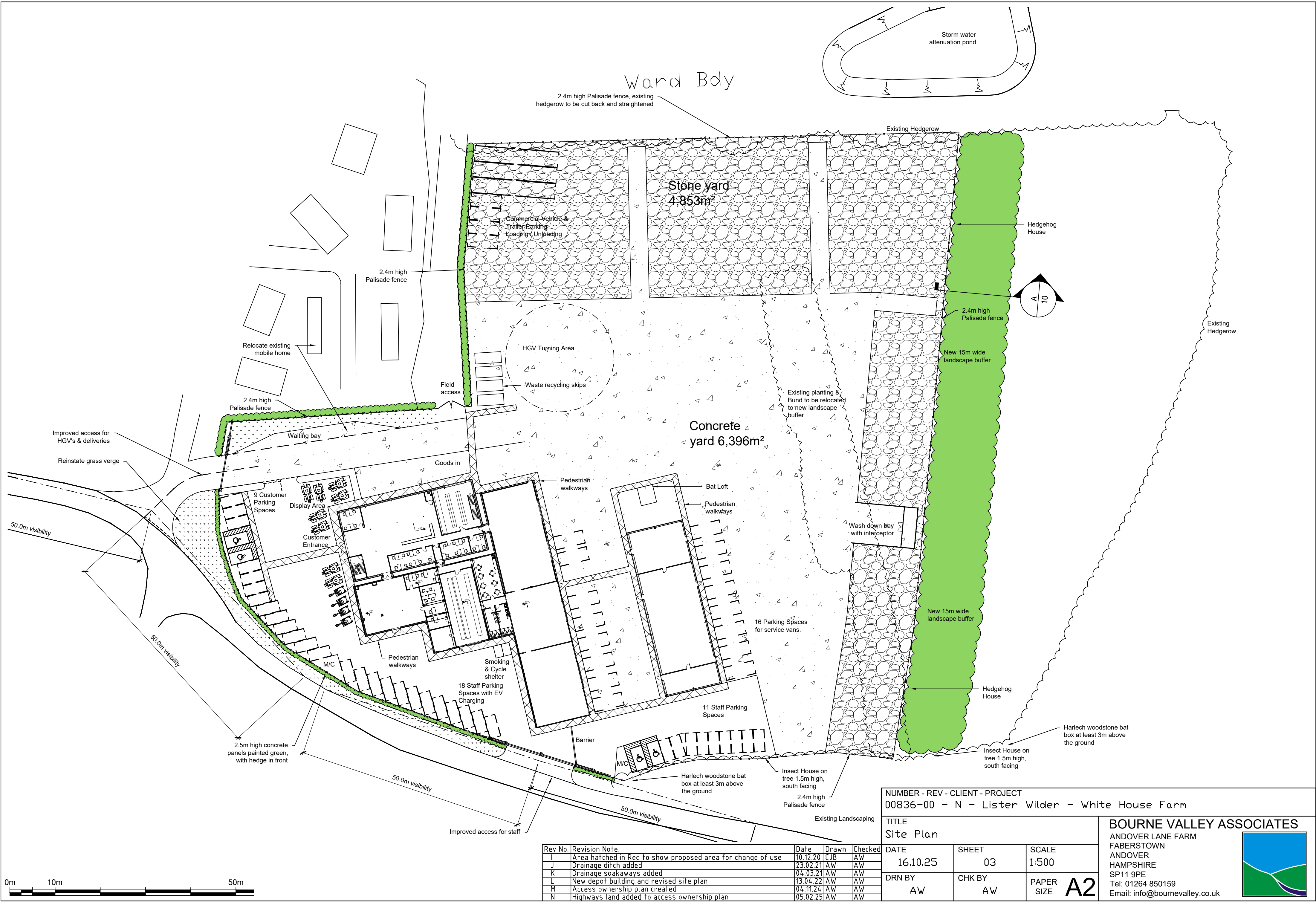
CHK BY
AW

PAPER SIZE
A3

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Rev No.	Revision Note.	Date	Drawn	Checked
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NUMBER - REV - CLIENT - PROJECT
00836-00 - N - Lister Wilder - White House Farm

TITLE
Site Plan

DATE
16.10.25

DRN BY
AW

SHEET
03

CHK BY
AW

SCALE
1:500

PAPER SIZE
A2

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Appendix A.2 – Thames Water Asset Location Data

Herrington Consulting
UNIT 7, BARHAM BUSINESS PARK,
BARHAM
CT4 6DQ

Search address supplied Lister Wilder Ltd
Whitehouse Farm
Beech Hill Road
Spencers Wood
Reading
RG7 1HR

Your reference 4339/KT

Our reference ALS/ALS Standard/2025_5181850

Search date 19 June 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

Search address supplied: Lister Wilder Ltd, Whitehouse Farm, Beech Hill Road, Spencers Wood, Reading, RG7 1HR

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

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority. Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners. 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.

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.

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

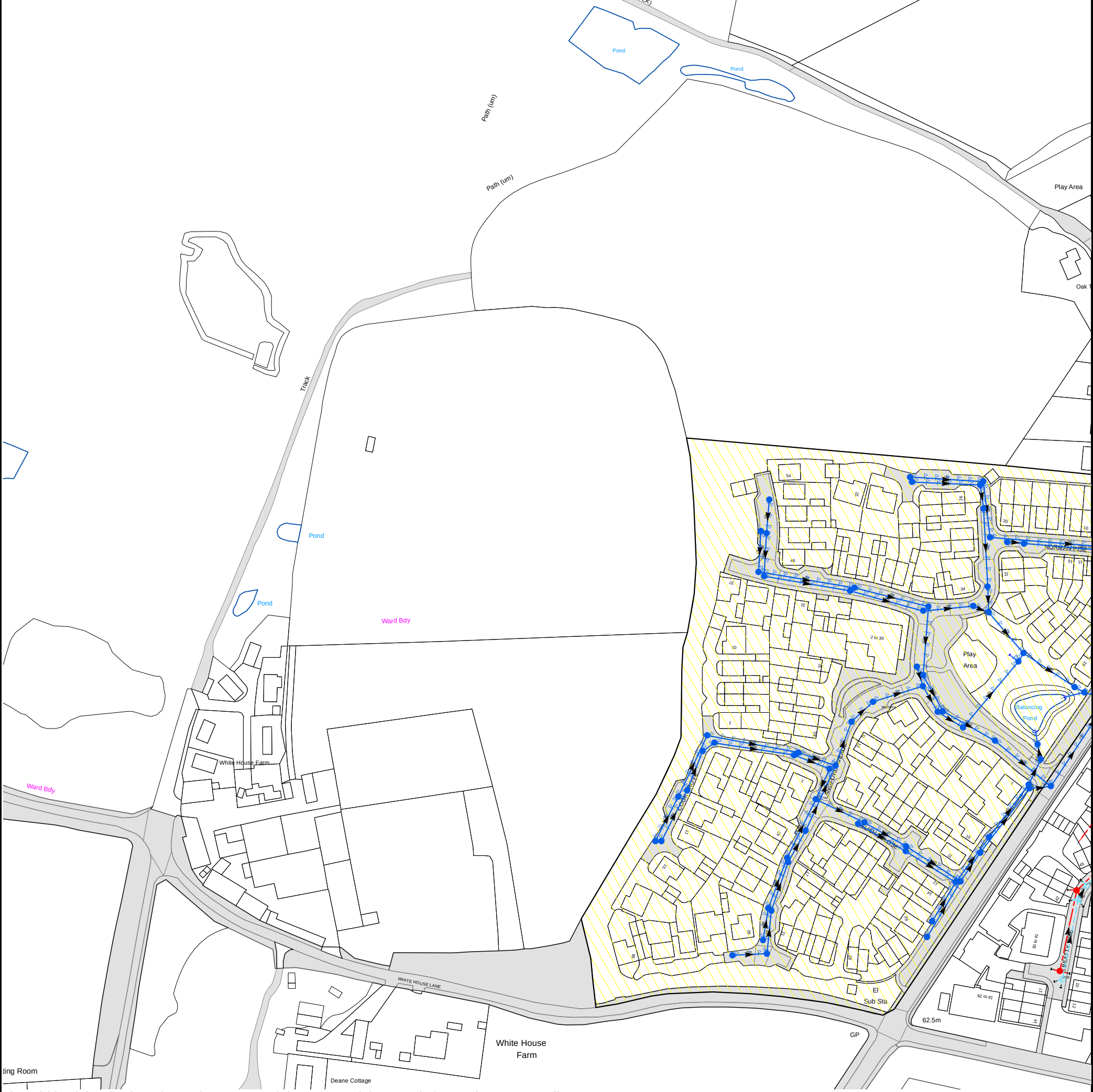
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

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



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 470974,166085
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

[illegible]



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

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.

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.

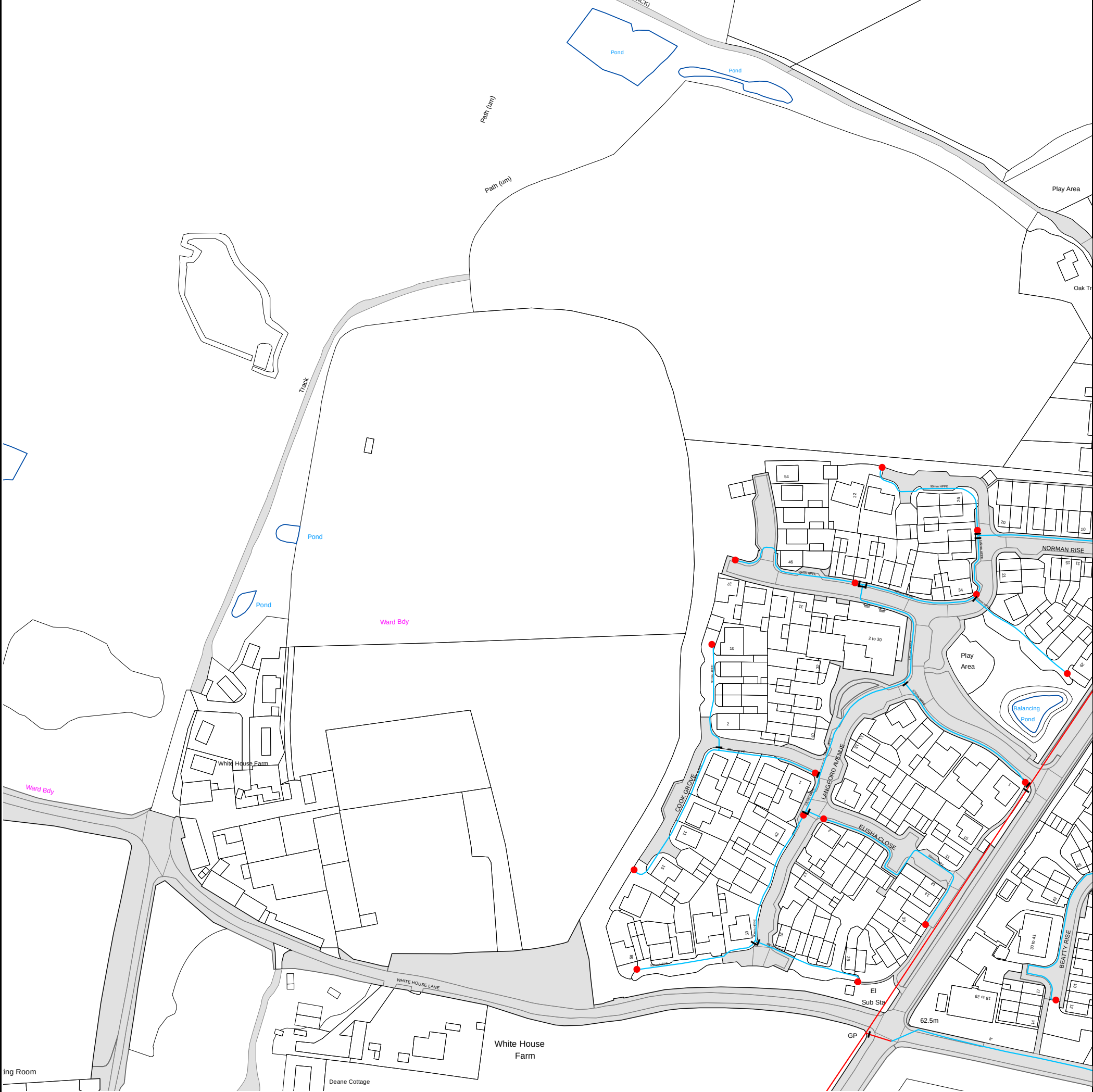
	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

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.



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 470974, 166085.

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.



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.

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')

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.

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:** Indicates 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.

Appendix A.3 – Indicative Drainage Layout

GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS', ARCHITECTS' AND SPECIALISTS' DRAWINGS AND THE SPECIFICATION.
- ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, EUROPEAN NORMS, CODES OF PRACTICE AND BUILDING PRACTICE.
- ALL DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
- ALL DRAINAGE SYSTEMS WILL NEED TO BE INSTALLED AND DESIGNED FOR SUITABLE LOADING REQUIREMENTS.
- THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL AND ALL NECESSARY LICENCES FROM THE HIGHWAY AUTHORITY AND/OR SEWERAGE UNDERTAKER BEFORE CARRYING OUT ANY WORKS.
- THIS DRAWING WAS PRODUCED FOR USE IN CONJUNCTION WITH A PLANNING SUBMISSION AND SHOULD NOT BE USED FOR OTHER PURPOSES. A MORE DETAILED DESIGN INCLUDING PRODUCT SPECIFICATIONS WILL NEED TO BE PRODUCED PRIOR TO CONSTRUCTION.

KEY:

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- ROAD GULLY
- RWP
- FLOW CONTROL DEVICE
- PERMEABLE PAVING
- GEOCELLULAR STORAGE
- DRAINAGE BASIN
- HEADWALL



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P1	Second issue	HA	EC	19/12/25
P0	First issue	HA	EC	19/12/25
Rev	Description	Author	Checked	Date

CLIENT
Bourne Valley Associates

PROJECT
Lister Wilder, Spencers Wood

SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:500	4339	HA	EC

EPS DWG REF:
4339_DWG_r0

DWG TITLE	DWG No.
INDICATIVE SURFACE WATER DRAINAGE LAYOUT	EPS-4339-501



DRAINAGE BASIN
DEPTH: 1.0m
STORAGE VOLUME UNDER DESIGN EVENT: 842m³
AREA (AT 1.0 METERS): 1454m²
EMBANKMENT: 1:3
FREEBOARD: 300mm

GEOCELLULAR STORAGE TANK
DIMENSIONS: 6.5m x 17m x 2.8m (DEPTH)
POROSITY: 95%
STORAGE VOLUME UNDER DESIGN EVENT: 294m³

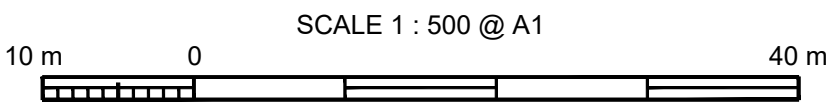
ALL RAINWATER PIPE AND YARD GULLY
LOCATIONS ARE INDICATIVE

OIL INTERCEPTOR INCLUDED WITHIN THIS CHAMBER
MUD TRAP INCLUDED WITHIN THIS CHAMBER

FLOW CONTROL CHAMBER
VORTEX FLOW CONTROL DEVICE (E.G. HYDRO-BRAKE OR SIMILAR)
DISCHARGE RATES
1:2YR = 29.0 l/s
1:30YR = 30.0 l/s
1:30YR + 35%cc = 30.0 l/s
1:100YR = 30.0 l/s
1:100YR + 40%cc = 30.0 l/s

DUE TO SLOPE, CHECK DAMS SHOULD BE
INCLUDED WITHIN THE DESIGN OF PERMEABLE
PAVING SURBASE. IF INCLUDED, VARIABLE
SUBBASE DEPTH SHOULD BE DESIGNED TO
ACCOMMODATE STORAGE VOLUME REQUIRED.

PERMEABLE PAVING
AREA: 545m²
SUBBASE DEPTH: 0.5m
POROSITY: 30%
STORAGE VOLUME UNDER DESIGN EVENT: 78m³



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3. ALL DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. ALL DRAINAGE SYSTEMS WILL NEED TO BE INSTALLED AND DESIGNED FOR SUITABLE LOADING REQUIREMENTS.
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KEY:

- FOUL WATER DRAIN
- FOUL WATER MANHOLE
- PACKAGE TREATMENT PLANT
- TREATED FOUL WATER DRAIN
- TREATED FOUL WATER MANHOLE
- SURFACE WATER OUTFALL DRAIN
- SURFACE WATER OUTFALL MANHOLE



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P0	First issue	HA	EC	20/01/26
Rev	Description	Author	Checked	Date

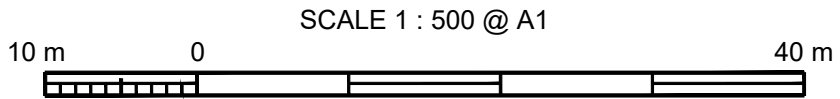
CLIENT	Bourne Valley Associates
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PROJECT	Lister Wilder, Spencers Wood
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SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:500	4339	HA	EC

EPS DWG REF:	4339_DWG_r0
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DWG TITLE	DWG No.
INDICATIVE FOUL WATER DRAINAGE LAYOUT	EPS-4339-601



Appendix A.4 – Surface Water Management Calculations

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	17/12/2025
Calculated by	Hamza Askari
Reference	HA/4339
Model version	2.2.2

Location

Site name	Lister Wilder
Site location	Spencers Wood, Wokingham



Site easting (British National Grid)	470855
Site northing (British National Grid)	165949

Site details

Total site area (ha)	3.109	ha
----------------------	------------------------------------	----

Greenfield runoff

Method

Method

FEH statistical (2025)

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	682	mm
BFIHOST19scaled	0.268	
QMed-QBar conversion	1.136	1.136
QMed (l/s)	14.6	l/s
QBar (FEH statistical 2025) (l/s)	16.6	l/s

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	6	6
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

Results

Method	FEH statistical (2025)	
Flow rate 1 year (l/s)	14.1	l/s
Flow rate 2 year (l/s)	14.6	l/s
Flow rate 10 years (l/s)	26.9	l/s
Flow rate 30 years (l/s)	38.3	l/s
Flow rate 100 years (l/s)	53.1	l/s
Flow rate 200 years (l/s)	62.2	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.



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File: 4339_existing_r0.pfd
Network: Storm Network
Hamza Askari
19/12/2025

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Lister Wilder
Spencers Wood
Existing Brownfield Rates

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	4.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	999.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Existing site	1.248	4.00	10.000	2000	-21.558	98.882	3.000	7.000
Offsite			10.000	2000	-13.344	98.163	3.500	6.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Existing site	Offsite	50.000	0.600	7.000	6.500	0.500	100.0	525	4.37	188.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.240	484.8	1191.3	2.475	2.975	1.248	0.0	525	2.260

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.000	100.0	525	Circular	10.000	7.000	2.475	10.000	6.500	2.975

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Existing site	2000	Manhole	Adoptable	Offsite	2000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Existing site	-21.558	98.882	10.000	3.000	2000				
						0	1.000	7.000	525
Offsite	-13.344	98.163	10.000	3.500	2000		1	1.000	6.500
								525	



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Spencers Wood
Existing Brownfield Rates

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1500	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m ³ /ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0



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Spencers Wood
Existing Brownfield Rates

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Existing site	10	7.269	0.269	231.1	0.8441	0.0000	OK
15 minute summer	Offsite	10	6.750	0.250	231.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	Existing site	1.000	Offsite	231.3	2.180	0.477	5.3070	89.7



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Spencers Wood
Existing Brownfield Rates

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Existing site	10	8.268	1.268	700.4	3.9827	0.0000	SURCHARGED
15 minute summer	Offsite	9	6.997	0.497	700.3	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	Existing site	1.000	Offsite	700.3	3.242	1.445	10.6924	272.7



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Spencers Wood
Existing Brownfield Rates

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Existing site	10	9.132	2.132	907.3	6.7000	0.0000	SURCHARGED
15 minute summer	Offsite	9	6.997	0.497	907.7	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	Existing site	1.000	Offsite	907.7	4.202	1.872	10.6924	352.1



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File: 4339_proposed_r0.pfd
Network: Storm Network
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Lister Wilder
Spencers Wood
Proposed SuDS

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	4.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	999.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Basin	1.394	4.00	68.580	2100	-5.499	100.736	1.000	67.580
Ditch			58.000	1200	8.815	92.475	0.600	57.400
Tank Outfall			69.600	2400	0.613	94.356	4.020	65.580
PP	0.291	4.00	69.900	1200	-10.702	85.586	0.800	69.100

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Basin	Tank Outfall	200.000	0.600	67.580	65.580	2.000	100.0	375	5.84	178.7
1.001	Tank Outfall	Ditch	130.000	0.600	65.580	57.400	8.180	15.9	225	6.50	171.4
2.000	PP	Tank Outfall	5.000	0.600	69.100	68.080	1.020	4.9	150	4.02	188.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.812	200.1	1260.1	0.625	3.645	1.394	0.0	375	1.835
1.001	3.298	131.1	1461.3	3.795	0.375	1.685	0.0	225	3.359
2.000	4.582	81.0	277.9	0.650	1.370	0.291	0.0	150	4.668

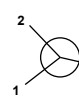
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	200.000	100.0	375	Circular	68.580	67.580	0.625	69.600	65.580	3.645
1.001	130.000	15.9	225	Circular	69.600	65.580	3.795	58.000	57.400	0.375
2.000	5.000	4.9	150	Circular	69.900	69.100	0.650	69.600	68.080	1.370

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Basin	2100	Manhole	Adoptable	Tank Outfall	2400	Manhole	Adoptable
1.001	Tank Outfall	2400	Manhole	Adoptable	Ditch	1200	Manhole	Adoptable
2.000	PP	1200	Manhole	Adoptable	Tank Outfall	2400	Manhole	Adoptable



Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Basin	-5.499	100.736	68.580	1.000	2100		0	1.000	67.580	375
Ditch	8.815	92.475	58.000	0.600	1200		1	1.001	57.400	225
Tank Outfall	0.613	94.356	69.600	4.020	2400		1 2 0	2.000 1.000 1.001	68.080 65.580 65.580	150 375 225
PP	-10.702	85.586	69.900	0.800	1200		0	2.000	69.100	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

30	120	240	480	720	1440	2880	5760	8640
60	180	360	600	960	2160	4320	7200	10080

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Node Tank Outfall Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	65.580	Product Number	CTL-SHE-0211-3000-2800-3000
Design Depth (m)	2.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	30.0	Min Node Diameter (mm)	2400

Node Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	67.580
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	284

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1039.0	0.0	1.000	1454.0	0.0



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109 Borough High Street
London, SE1 1NL

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Network: Storm Network
Hamza Askari
19/12/2025

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Lister Wilder
Spencers Wood
Proposed SuDS

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	69.100	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	15	Depth (m)	0.500
Safety Factor	2.0	Width (m)	23.345	Inf Depth (m)	
Porosity	0.30	Length (m)	23.345		

Node Tank Outfall Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	65.580
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	608

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	110.5	0.0	2.800	110.5	0.0	2.801	0.0	0.0



Results for 2 year Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Basin	108	67.703	0.123	96.9	130.9286	0.0000	OK
240 minute summer	Ditch	176	57.473	0.073	29.8	0.0000	0.0000	OK
240 minute summer	Tank Outfall	176	66.338	0.758	58.2	83.0100	0.0000	SURCHARGED
30 minute summer	PP	20	69.173	0.073	46.3	10.0634	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Basin	1.000	Tank Outfall	47.4	0.655	0.237	14.1562	
240 minute summer	Tank Outfall	1.001	Ditch	29.8	2.679	0.227	1.4465	353.4
30 minute summer	PP	2.000	Tank Outfall	30.3	3.876	0.374	0.0391	



Results for 30 year Critical Storm Duration. Lowest mass balance: 98.18%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Basin	168	67.858	0.278	237.4	305.5213	0.0000	OK
30 minute winter	Ditch	231	57.473	0.073	30.0	0.0000	0.0000	OK
180 minute winter	Tank Outfall	172	67.838	2.258	146.0	247.2941	0.0000	SURCHARGED
30 minute summer	PP	21	69.317	0.217	142.3	33.3929	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Basin	1.000	Tank Outfall	130.9	1.324	0.654	19.7814	
180 minute winter	Tank Outfall	1.001	Ditch	30.0	2.683	0.229	1.4523	795.8
30 minute summer	PP	2.000	Tank Outfall	64.1	4.313	0.792	0.0750	



Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 96.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Basin	180	68.057	0.477	320.6	544.0996	0.0000	SURCHARGED
30 minute summer	Ditch	346	57.473	0.073	30.0	0.0000	0.0000	OK
180 minute winter	Tank Outfall	176	68.032	2.452	165.6	268.5372	0.0000	SURCHARGED
30 minute summer	PP	22	69.426	0.326	192.1	51.1836	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Basin	1.000	Tank Outfall	138.5	1.348	0.692	22.0594	
180 minute winter	Tank Outfall	1.001	Ditch	30.0	2.683	0.229	1.4523	1076.2
30 minute summer	PP	2.000	Tank Outfall	66.9	4.321	0.826	0.0764	



Results for 100 year Critical Storm Duration. Lowest mass balance: 96.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Basin	180	68.011	0.431	301.1	487.3841	0.0000	SURCHARGED
30 minute winter	Ditch	329	57.473	0.073	30.0	0.0000	0.0000	OK
180 minute winter	Tank Outfall	176	67.986	2.406	163.3	263.4722	0.0000	SURCHARGED
30 minute summer	PP	21	69.411	0.311	185.4	48.7257	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Basin	1.000	Tank Outfall	140.1	1.384	0.700	22.0594	
180 minute winter	Tank Outfall	1.001	Ditch	30.0	2.683	0.228	1.4522	1010.6
30 minute summer	PP	2.000	Tank Outfall	66.4	4.307	0.821	0.0762	



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Basin	176	68.288	0.708	274.1	841.6081	0.0000	FLOOD RISK
30 minute winter	Ditch	489	57.473	0.073	30.0	0.0000	0.0000	OK
180 minute winter	Tank Outfall	176	68.263	2.683	174.9	293.8357	0.0000	SURCHARGED
30 minute summer	PP	22	69.586	0.486	259.5	77.6071	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Basin	1.000	Tank Outfall	131.5	1.328	0.657	22.0594	
180 minute winter	Tank Outfall	1.001	Ditch	30.0	2.683	0.228	1.4522	1416.2
30 minute summer	PP	2.000	Tank Outfall	71.7	4.314	0.886	0.0784	

Appendix A.5 – Maintenance Schedules

Operation and Maintenance Schedule – Detention Basins		
Maintenance Schedule	Required Action	Typical Frequency
Routine maintenance	Remove debris and litter from within and around the basin area.	Monthly
	Cut grass for landscaped areas within the basin	Monthly, although should be adjusted to be most frequent during the growing season.
	Cut grass around the basin	Half yearly (spring and autumn), should be undertaken before the start of the nesting season.
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required.
	Inspect siltation rates and establish program for silt removal.	Inspection should be at annually and adjusted based recorded siltation rates.
Occasional Maintenance	Reseed areas with poor vegetation growth or where scouring is detected	As required following the detection of an issue during inspection.
	Prune and manage trees and nuisance plants in and around the basin.	
	Remove sediment from pre-treatment system when it is 50% full.	
Remedial Actions (Following Storms or scheduled inspections)	Repair erosion of other damage by reseeding or turfing damaged areas.	As required following the detection of an issue during inspection.
	Realign rip rap on inlets and outlets.	
	Repair inlet, outlet, and overflow structures if damaged	
	Relevel areas which have settled or become eroded and ensure the land levels across the basin still match the design specifications.	
Monitoring and inspections	Inspect inlets, outlets and overflows for blockages. Clear blockages if detected.	At least monthly.
	Inspect pipework, and the base and banks of the feature for damage. Repair if detected	At least monthly.
	Inspect sediment traps, and the inlet structure for silt. Remove silt if necessary and adjust inspection frequencies to minimise the potential for a large build-up of silt to occur between inspections.	At least Half Yearly

General Operation and Maintenance Table for Detention Basins.

Operation and Maintenance Schedule – Pervious paving / surfacing		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (for driveways this can be a standard cosmetic sweep over whole surface).	At minimum once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – particular attention must be paid to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using a suitable weed killer which will not adversely affect water quality. Weed killer should be 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 / surfacing.	As required when damage or erosion is detected following inspection. For block paving systems jointing material to be replaced shortly after installation and subsequently when required.
	Remedial work to any depressions. Rutting and cracked or broken blocks and replace lost jointing material (where block paving is used).	
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

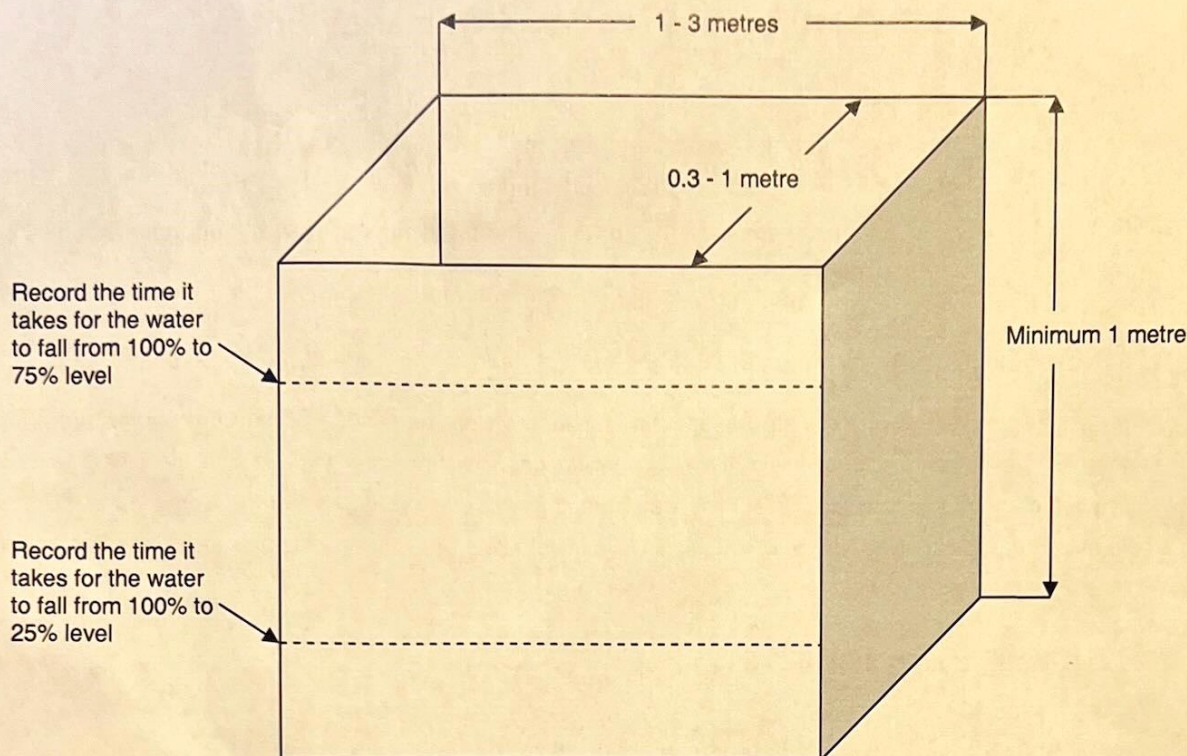
General Maintenance Requirements for Permeable Surfacing (additional requirements may apply depending on type of surfacing material used).

Operation and Maintenance Schedule – Geo-Cellular Storage System

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
	Remove debris and sediment from the catchment surface, wherever it presents a risk to the performance of the drainage system,	Monthly, or as required based on inspection frequencies.
	Remove sediment from pre-treatment structures (e.g. sediment traps) and from internal forebays	Annually or as required based on inspection frequencies
Remedial Actions	Repair; inlets, outlets, overflow pipes, and vent mechanisms	As required, based on inspections
	Replace tank or geotextile if significant damage is observed or geotextile is torn.	As required
Monitoring	Inspect and check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed.	Following installation, and annually hereafter
	Survey inside of tank, and at any sediment trap mechanisms, for sediment build-up and remove sediment if necessary. Use inspections to develop a regular maintenance and inspection procedure for sediment removal.	Every 5 years, or as required if inspections show high siltation rates.

General Operation and Maintenance Table for Geo-Cellular Storage Systems

Appendix A.6 – Site Infiltration Testing Results



	Width (in the range of 0.3 to 1m)	Length (range of 1 to 3m)	Depth (similar to proposed soakaway)
Trial pit dimensions	<u>1</u> m	<u>1</u> m	<u>1</u> m

Test number	(A) Time taken to drop from 100% to 75% level (minutes)	(B) Time taken to drop from 100% to 25% level (minutes)	(B) - (A)
1	1,862	3,789	1,927
2	1,724	3,669	1,945
3	1,810	3,712	1,902

Signature of person undertaking the test

Henry Cockburn

Date

3/10/25