ASHFIELD
SOLUTIONS GROUP

+44(0) 1443 803 540
info@ashfieldsolutions.com
ashfieldsolutions.com

Planning & Development

Flood Risk & Drainage Assessment

Greentech Projects GmbH (UK)

Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Document Control

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Executive Summary

Ashfield Flood Risk Solutions ("Ashfield") was commissioned by ITP Energised on behalf of Greentech Projects GmbH (UK) ("the client") to undertake a Flood Risk & Drainage Assessment ("FRDA"), in support of a planning application at Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT ("the site"). The proposed development at the site entails the erection of solar panels and a substation, in addition to new access roads.

The Environment Agency's (EA) Flood Map for Planning (Rivers and Sea) (FMFP) indicates that the site is located within Flood Zone 1 (<0.1% AEP). Based on the EA's Flood maps and there being no recorded historic fluvial or tidal flooding at the site, the risk of flooding from fluvial sources is considered Low, with tidal risk considered Negligible.

The EA surface water mapping highlights an overland flow path in the 'Medium' and 'Low' risk models. Furthermore, significant surface water flooding events have been recorded in the nearby areas of Swallowfield and Spencers Wood; however, there are no reportable instances of flooding at the site. The overall risk of flooding from this source is considered Low to Moderate.

All other sources of flooding (groundwater, reservoir failure and artificial sources) are considered to be Low or Negligible at the site.

The development is located in Flood Zone 1 and is therefore deemed acceptable in accordance with the National Planning Policy Framework. As seen within Table 3 of the Government Guidance on Flood Risk and Coastal Change, all developments located within Flood Zone 1 are deemed appropriate in a flood risk context.

An illustrative surface water drainage strategy has been produced for the proposed development which shows that the site can accommodate surface water attenuation for events, up to and including, the 1 in 100 year storm +20% allowance for climate change. This is based on utilising swales with an overall length of approximately 443m, to the east and to the south of the site which will provide attenuation for the minor increase in impermeable area of the site. The overall capacity of the swales amounts to approximately 66.5m^3. On this basis the proposed development would not increase flood risk onsite or elsewhere and would preserve the application site's natural drainage regime.

This report therefore demonstrates that the proposed development:

- Is suitable in the location proposed;
- Is unlikely to place additional persons at risk of flooding; and
- Is unlikely to increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water runoff.

1 Introduction

1.1 Authorisation and Context

Ashfield Flood Risk Solutions ("Ashfield") was commissioned by ITP Energised on behalf of Greentech Projects GmbH (UK) ("the client") to undertake a Flood Risk & Drainage Assessment ("FRDA"), in support of a planning application at Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT ("the site"). The site location can be seen on Drawing 01 for reference. This report has been prepared in support of a planning application at the site, for which the development proposal are discussed further in Section 1.6.

1.2 Aims and Objectives

This report will look to assess flooding from all potential sources, with the aim to address the requirements of the National Planning Policy Framework (NPPF), the Non-Statutory Technical Standards for Sustainable Drainage Systems and Wokingham Borough Council SuDS Strategy through meeting the following objectives:

- Assessing whether the site is likely to be affected by flooding from different sources.
- Providing an assessment of the vulnerability of the proposed development and its suitability in relation to the identified flood risks; and,
- Providing an opinion in relation to the likely impacts of the proposed development on flooding elsewhere.

1.3 Information Sources Used

In order to prepare this FRDA, the following information sources and general guidance documents have been used:

- National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice;
- Non-Statutory Technical Standards for Sustainable Drainage Systems – DEFRA, March 2015;
- Wokingham Borough Council SuDS Strategy – Wokingham Borough Council, April 2016;
- Site Layout Plan (Drawing No. – N/A) – ITP Energised, February 2023;
- Wokingham Borough Council Strategic Flood Risk Assessment (SFRA) – WSP, January 2020;
- Wokingham Borough Council Preliminary Flood Risk Assessment (PFRA) – Halcrow Group Limited, June 2011;
- Wokingham Borough Council PFRA Addendum – Wokingham Borough Council, December 2017;
- Wokingham Borough Council Local Flood Risk Management Strategy (LFRMS) – WSP, February 2015;
- Wokingham Borough Council Flood Investigation Reports: Winter 2013/2013 – WSP, January 2016;
- 1m resolution LiDAR data – downloaded online March 2023;
- Sewer Records – Thames Water, March 2023;
- Environment Agency interactive flood maps – accessed online March 2023; and,
- British Geological Survey (BGS) Drift & Geology Maps - accessed online March 2023.

1.4 Report Limitations

This assessment of flood risk has looked to use the most accurate and up to date flood mapping for the location. The site boundary has been supplied by the client and the assessment of risk is based on this. This report has been prepared with due care and diligence in accordance with industry best practice and guidance. The conclusions in this report are valid only to the extent that the information provided to Ashfield was accurate and complete at time of receipt.

1.5 Site Setting

The site is located at coordinates XY: 472116, 166013 (nearest post code: RG7 1PT), situated between the villages of Spencers Wood and Swallowfield, to the south of the town of Reading, occupying an overall area of approximately 24.4 hectares (ha). The site currently comprises two agricultural fields (entirely greenfield land), categorised within the Cranfield University Soilscapes mapping[1] as arable grassland and woodland with loamy soils and naturally high groundwater. The site is accessed via an unnamed road to the south from Sheepbridge Court Farm.

The site is bound by an existing solar farm to the south-east, residential property to the north-east, and by neighbouring arable and grassland fields to the north, south and west.

1.6 Development Proposals

The Site Layout Plan can be seen as Appendix A for reference. From review of this plan, the proposal at the site comprises the erection of solar panels and substation infrastructure, in addition to a new access road.

1.7 Topographic Mapping

In absence of a site-specific topographical survey, freely available 1m resolution Light Detection and Ranging (LiDAR) data has been downloaded for the site and local area. A visual illustration of the LiDAR is presented on Drawing 02.

From review of the LiDAR, the ground levels are shown to be higher in the west, with levels sloping down towards the east, and south. The highest ground level on-site is in the north at approximately 55.85mAOD, falling to 48.54mAOD in the south and 47.48mAOD in the north-east (lowest point on site).

1.8 Local Hydrology

The nearest Environment Agency (EA) designated Main River to the site is the River Loddon, located approximately 200m to the south-east (as seen within Drawing 03). This river flows in a north-easterly and discharges into the River Thames approximately 13.5km to the north-east.

There are three ordinary watercourses/drainage ditches located within the site boundary; one to the north-east, one to the south-west and one through the centre of the site. These watercourses are

[1] https://www.landis.org.uk/soilscapes/

unnamed and the watercourse to the north-east of the site is shown to drain in a south-easterly direction and discharge into the River Loddon.

1.9 Local Drainage

No private site drainage plans have been provided to Ashfield at the time of writing; however, Thames Water Sewer Records (ref: 1584334) were requested and are included as Appendix B for reference. From review of the plan seen in Appendix B, there is one foul water sewer (175mm in diameter) which flows north-easterly beneath the northern region of the site with three manholes (ref. 0101, 1201 and 2201 present).

There is also a public surface water sewer (525mm in diameter) that flows in an easterly direction located approximately 120m to the north of the site at its nearest location. Both the public surface water and foul sewers discussed above drain to the north from Sussex Lane to the north-east of the site. There are no combined sewers within the vicinity of the site.

1.10 Flood History

The EA recorded flood outlines open-source GIS dataset is a compilation of historical flood events that have occurred across England over the past century. The site is shown to be located outside of an area that has historically flooded, with the nearest extent located approximately 100m to the south-east. This event occurred in February 1991 and the River Loddon was identified as the source of flooding.

The Wokingham Borough Council Strategic Flood Risk Assessment (SFRA)[2] was published in January 2020 and states that the 'Character Area' of Shinfield and Swallowfield has experienced fluvial flooding on several occasions from the River Loddon, the Blackwater River and Foudry Brook. The most recent event was recorded in July 2007 and was a result of combined fluvial and surface water flooding. The Wokingham Borough Council Preliminary Flood Risk Assessment (PFRA)[3] indicated that approximately 300 properties were affected within the borough during this event; 140 of which were flooded internally.

Records also indicate that there have been a significant number of surface water flooding incidents in the Swallowfield and Spencers Wood area, with two significant incidents in 1993 affecting areas particularly around Clements Close (approximately 480m to the north-west of the site). It was noted that both of these incidents were sewer related. Significant flooding also occurred in Autumn 2000 and affected 605 locations across Wokingham including Swallowfield, leading to the closure of the A329 and the A327 (along with many other minor roads).

The Wokingham Borough Council PFRA Addendum was published in December 2017 and indicated that flooding had occurred since the original PFRA was published. This flooding occurred in Winter 2013/2014 and a Flood Investigation Report (FIR) was published in January 2016 stating that three properties in Swallowfield, and two properties in the Shinfield area (which includes Spencers Wood) were flooded internally.

The Wokingham Borough Council LFRMS was also reviewed but did not provide any additional details to the aforementioned events.

[2] https://www.wokingham.gov.uk/_resources/assets/attachment/full/0/508886.pdf
[3] https://www.wokingham.gov.uk/EasySiteWeb/GatewayLink.aspx?alId=196557

2 Flood Risk Evaluation

The following sections provide an evaluation of the risk posed by the key flood sources in relation to the site location. Consideration is given to the severity of flood risk to the site as a whole, making use of existing flood mapping, high-level local strategic studies and available topographic information.

2.1 Fluvial Flood Risk

Fluvial flood risk originates from a watercourse of any size that may affect a site when the channel capacity is exceeded. This type of flooding often occurs following an extreme rainstorm event or a prolonged period of wet weather.

EA Flood Mapping

The Environment Agency's Flood Map for Planning (Rivers and Sea) divides the floodplain into risk-based categories and provides an indication of flood risk for the site. The EA Flood Map for Planning (Rivers and Sea) (Drawing 03) indicates that the site is located within Flood Zone 1. Flood Zone 1 is defined as land assessed as having less than 0.1% annual probability of river flooding. The Flood Zones show the 'undefended' scenario, where any flood defences in the locality are not represented within the mapping.

The Risk of Flooding from Rivers and Sea (ROFRAS) mapping (Drawing 04) indicates that the site is located outside of all four ROFRAS extents. This mapping takes into account the representation of any flood defences that may exist in the local area.

Flood Defences

The nearest flood defences to the site are located approximately 200m to the south-east, along the northern bank of the River Loddon. From interrogation of the open-source layer for flood defences in a GIS viewer, this is identified to comprise natural high ground. The design standard of protection (SOP) for these defences was indicated to be up to a 1 in 5 year event (20% Annual Exceedance Probability (AEP) event). These are not considered to have any benefit to the site location.

> In summary, the overall risk to the site from fluvial flooding is considered to be **Low**. No further consideration is deemed necessary as part of this FRA.

2.2 Tidal Flood Risk

Tidal flood risk can affect the coastline as well as estuaries and rivers that are tidally influenced. Flood events often coincide with the tidal regime, high rainfall events or other natural phenomena, which can lead to water levels covering low-lying land or exceeding natural or man-made defences.

The site is located approximately 45km west of the nearest tidally influenced section of the River Thames at Teddington Lock, and has a ground elevation of over 45mAOD.

The overall risk of tidal flooding affecting the site is considered to be **Negligible**. No further consideration is deemed necessary as part of this FRDA.

2.3 Surface Water Flooding

Surface water flooding occurs when local drainage networks are overwhelmed during an extreme rainfall event, causing water to flow over the surface and follow gravity to the lowest point where it often pools. This flood source is increasingly becoming one of the major contributors of flood risk, due to changing weather patterns and increased extreme rainfall events occurring across the UK. This places more pressure than ever on drainage systems, which are often overwhelmed during flash flood events, normally only designed to take between a 1 in 20 and a 1 in 30 return period event.

When interpreting the surface water flood map information, it needs to be taken into account that surface water mapping is generated from information that is largely high-level. The flood mapping must be correctly interpreted in order to give a fair representation of the site's surface water flood risk and used only as a guide.

The EA Surface Water Flood Map (Drawing 05) indicates that the majority of the site boundary is located outside of a designated area of risk from surface water flooding. However, areas of high, medium and low risk do exist on-site. The risk definitions can be seen below for reference.

- **High Risk** – each year, this area has a chance of flooding of greater than 1 in 30 (3.3%);
- **Medium Risk** – each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%); and,
- **Low Risk** – each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).

Drawing 06 indicates that an area of 'High' risk exists within a drainage ditch located along the hedgerow between the western and eastern fields. This 'High' risk area is shown to be contained within the drainage ditch itself to depths of up to 900mm. Surface waters in the 'Medium' risk scenario are shown to affect areas external to the ditch to depths of between 150-300mm (as seen within Drawing 07). Drawing 08 indicates that depths in this area may reach up to 600mm in the 'Low' risk scenario. An overland flow route has also been identified in the 'Medium' and 'Low' risk scenario from this ditch and across the western field, into the far western corner of the site to depths of up to 600mm.

There are several reports of severe surface water flooding in the Swallowfield and Spencers Wood area within the Wokingham Borough Council documentation outlined in Section 1.3. Notable events were recorded in 1993, Autumn 2000, July 2007, and Winter 2013/2014. However, it could not be confirmed whether the site was impacted by any of these events.

The overall risk of surface water flooding affecting the site is considered to be **Low to Moderate**. Further considerations are made within Section 3 to help mitigate against this identified risk in the long-term.

2.4 Reservoir Failure

Assessment of risk of a reservoir failure may be interpreted as the extent of flooding that would occur, should any reservoir that has a capacity larger than 25,000m^3, suffer a catastrophic failure. Mapping of this nature is described by the Environment Agency as a very worst-case scenario, with a flood event of this type being extremely unlikely to occur.

The EA Risk of Flooding from Reservoir Failure mapping (Drawing 09) is based on two extents:

- Wet Day (National) - This data shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a "wet day" when local rivers had already overflowed their banks.
- Dry Day (National) - This data shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels.

The EA Risk of Flooding from Reservoir Failure mapping shows that the site is located approximately 160m north-west of the nearest wet day reservoir extent, and 200m north-west of the nearest dry day reservoir extent. Current legislation ensures that reservoirs are inspected regularly and essential safety work is carried out as required.

The SFRA indicates that there are seven reservoirs within the borough of Wokingham including: Bearwood Lake, Black Swan Lake Dinton Pasture, Longmoor Lake, Maiden Erleigh Lake (no. 1), Queensmere, South-lake, and Whiteknights Lake. However, there are no reportable instances of reservoir failure located at or within the vicinity of the site from review the Wokingham Borough Council documentation outlined in Section 1.3 of this report.

> The risk of flooding from reservoir failure is therefore considered to be **Negligible** and no further consideration from this risk source is deemed necessary as part of this report.

2.5 Groundwater

Flooding from a groundwater source often occurs during or following a period of prolonged wet weather within areas that are low lying underlain by permeable rocks (aquifers). When aquifers are at their maximum holding potential, flooding at surface level can occur from beneath the ground.

Groundwater as a sole flooding mechanism is often regarded as low risk as it often relies on a coinciding rainfall, or flood event from an additional source to become a flood risk. The main contributory factor that will enhance the risk of groundwater flooding, is prolonged periods of high rainfall, which result in the groundwater saturation level rising to the point where it reaches the surface.

Online BGS mapping shows the majority of the bedrock geology beneath the site to comprise London Clay Formation - Clay, Silt and Sand. This bedrock geology type is classified by the EA as 'Unproductive Strata', which is defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The bedrock geology of the site is overlain by River Terrace Deposits, 3 - Sand and Gravel. This is designated by the EA as a 'Secondary A' aquifer. This is defined as permeable layers capable of

supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

A borehole record (ref: SU76NW35) exists within the eastern region of the site and has a depth of approximately 3m below ground level (bgl). Groundwater is shown to have been struck at a depth of 0.5m bgl. However, this borehole was recorded in December 1974 (during the winter) suggesting that groundwater levels may be higher than usual.

Appendix A.9 within the Wokingham Borough Council SFRA includes an array of groundwater mapping. Drawing number 3905-SFRA-009(4) indicates that the far eastern side of the site is located within an area with potential for groundwater flooding to subsurface assets; however, the majority of the site is not considered to be prone to groundwater flooding. Drawing number 3905-SFRA-009(3) indicates that the groundwater is more than 5m below ground level, indicating that the risk from groundwater flooding is low. The SFRA also states that there are no incidents of groundwater flooding recorded for the 'Character Area' in which the site is located (Shinfield and Swallowfield).

> The risk of flooding from groundwater flooding is therefore considered to be **Low**. No further consideration is deemed necessary as part of this FRDA.

2.6 Artificial Flood Sources

Flood risk from artificial sources would include the failure of man-made drainage or water supply network. Although the likelihood of such an occurrence is highly unpredictable, it is recommended that any proposed designs for the site take into account the location of any existing below ground services, in order to avoid any inadvertent flooding taking place during the construction phase and in the future.

As previously discussed in Section 1.9, two significant surface water flooding occurred in 1993 in the Swallowfield and Spencers Wood area, affecting areas particularly around Clements Close (approximately 480m to the north-west of the site). It was noted that both of these incidents were sewer related. However, the site is situated on agricultural land away from urbanised areas and is therefore unlikely to be at risk from sewer flooding.

No DG5 data has been provided from review of the Wokingham Borough Council documents outlined in Section 1.3 of this report.

> In summary, the overall risk to the site from artificial sources is considered to be **Low.** No further consideration is deemed necessary as part of this FRA.

2.7 Summary

Table 1 provides a summary of the classification of risk to the site from all flood sources and indicates where further considerations are required in the context of the proposed development.

Table 1 - Flood Risk Summary

Flood Source	Overall Risk Classification	Additional Considerations
Fluvial	Low	None.
Tidal	Negligible	None.
Surface Water	Low to Moderate	See Section 3.
Reservoir Failure	Negligible	None.
Groundwater	Low	None.
Artificial Sources	Low	None.

3 Flood Risk in Planning Context

This report has so far evaluated all potential flood risk sources that may affect the site. The following sections describe the identified flood risks in the context of the proposed development and provide recommendations, where required, for the mitigation or reduction of those risks to enable safe development.

3.1 Flood Risk Status

The EA's Flood Map for Planning shows that the site is located within Flood Zone 1, land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) – Low risk.

Surface water is shown indicated to pose a Low to Moderate risk to the site following a review of the EA surface water flood mapping. From review of all other potential flood sources, as outlined in Section 2, groundwater and artificial sources are all considered to pose a Low risk to the site, with tidal and reservoir failure considered to pose a Negligible risk.

3.2 Development Viability

The Environment Agency classifies different types of development according to their perceived vulnerability to flood risk. The proposed development is understood to comprise the erection of solar panels and a substation as well as a new access roads.

Based on the EA vulnerability classification system outlined in Table 3 of the Planning Practice Flood Risk and Coastal Change Guidance, the proposed development is considered 'Essential Infrastructure'. Based on the vulnerability classification and the proposed development's location within Flood Zone 1, this is therefore considered acceptable in terms of planning policy.

3.3 Impact on Flooding Elsewhere

The site is not within an area at risk of flooding from rivers or sea and therefore not remove or reduce flood storage from these sources. Surface water drainage is discussed below.

Drainage – Surface Water

As mentioned within Section 1.9, from review of the Thames Water Sewer Records (Appendix B), there is a public surface water sewer located 120m to the north of the site, which flows in an easterly direction beneath the adjacent field.

As part of the development design, it should be ensured that any modification of any private external surface water drainage systems, does not increase surface water flooding elsewhere. This should be done by minimising hard surfacing where possible and by adopting the use of permeable surface materials. Further information on the drainage strategy for the proposed development is provided within Section 4.

4 Drainage Strategy

4.1 Introduction

This section looks to identify means of managing future flood risk on site, which would be attributed to surface water and drainage. The FRDA has thus far identified that the site is currently at Low to Moderate risk of surface water flooding. The principles for the future management of drainage on site have been outlined within this section to ensure that risk can be sustainably managed for the lifetime of the development.

4.2 SuDS Summary

New developments are required to ensure that the discharge of surface water can be sustainably managed, and not increase the risk of flooding on site or elsewhere. Wokingham Borough Council as the Lead Local Flood Authority (LLFA) require drainage strategies for developments to follow the national (DEFRA, 2015) and local[4] (Wokingham Borough Council, 2016) guidance documents for SuDS. A greenfield development should utilise sustainable urban drainage systems and should never exceed the greenfield run-off rates. The development should also ensure that surface water run-off is managed as close to its source as possible in line with a specific drainage hierarchy. The Runoff Destination drainage hierarchy (set out in Part H of the Buildings Regulations 2010) will be used as the basis for designing the proposed surface water drainage strategy for this development site.

The proposed development is understood to have a lifespan of 25 years. As per the Flood Risk Assessments: Climate Change Allowances guidance[5], for developments with a lifetime up to 2060, the central allowance for the 2050's epoch should be applied. This accounts for a 20% CC allowance for the Loddon and tributaries Management Catchment which has been included within the calculations. MicroDrainage version 2020.1 has been used for undertaking surface water calculations within this section.

4.3 Site Conditions

As discussed in Section 1.5, the whole site comprises an area of approximately 24.4ha, which currently consists of two agricultural fields. Thames Water sewer records (seen as Appendix B) indicates that a foul water sewer flows beneath the northern region of the site, with the nearest surface water sewer located approximately 120m to the north of the site.

Run-off from the panels and the substation will discharge directly onto the ground adjacent to and beneath the structures where it will soak into the ground at the same rate that it presently does in its existing greenfield state. Similarly, any rainwater falling onto the permeable access tracks will soak into the ground beneath at the same rate that it presently does. Thus, the existing hydrological regime will be maintained without resulting in any increased volume or rate of run-off.

[4] https://www.wokingham.gov.uk/_resources/assets/attachment/full/0/399029.pdf
[5] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-rainfall-intensity-allowance

4.4 Greenfield Runoff

The proposed development will have a very limited extent of impermeable ground cover. The area beneath the solar panels will remain grassland and the post development site infiltration rate will not change.

Rainwater falling onto each panel will drain freely onto the ground beneath the panel and infiltrate into the ground at the same rate as it does in the site's existing greenfield state. Thus, the total surface area of the photovoltaic array will not be considered an impermeable area in this assessment.

The extent of impermeable area created as a result of the proposed development (the substation) is considered to be minor. A nominal 0.15% (circa. 366m²) of the total site area is estimated to be impermeable.

QBAR has been calculated for an entirely greenfield site and one with 0.15% impermeable area using the ICP SUDS calculation within MicroDrainage (the latter classified as the Urban value seen in Table 2 below). Copies of the MicroDrainage greenfield runoff calculations are included in Appendix C. A summary of the greenfield runoff rates is shown in Table 2.

Table 2 - Greenfield Site Runoff Rates

Return Period (Yrs)	Greenfield Area Runoff Rate (l/s)
1	106.6
QBAR Rural	119.9
QBAR Urban	125.4
30	281.2
100	392.2

The mean annual peak rate of runoff, referred to as QBAR in ICP SUDS Method, for a greenfield site is 119.9l/s. Whereas the urban representation of the 0.15% impermeable area is calculated as 125.4l/s. These calculations show that this effect of the Solar site on QBAR is minimal and only equates to an increase of 5.5l/s across the whole site, or 4.6% of the greenfield runoff rate. This is not deemed significant.

The Quick Storage Estimate function of MicroDrainage has been used to calculate the approximate volume of rainfall for the 366m² area of proposed impermeable area on site (0.15% of total site area), as seen in Figure 2 below. At the design event (1 in 100 year storm with a 20% allowance for CC on rainfall intensity), as seen in Figure 3 below the FEH results indicate a volume of 45m³.

Figure 2 – MicroDrainage Variable Inputs for Quick Storage Estimate

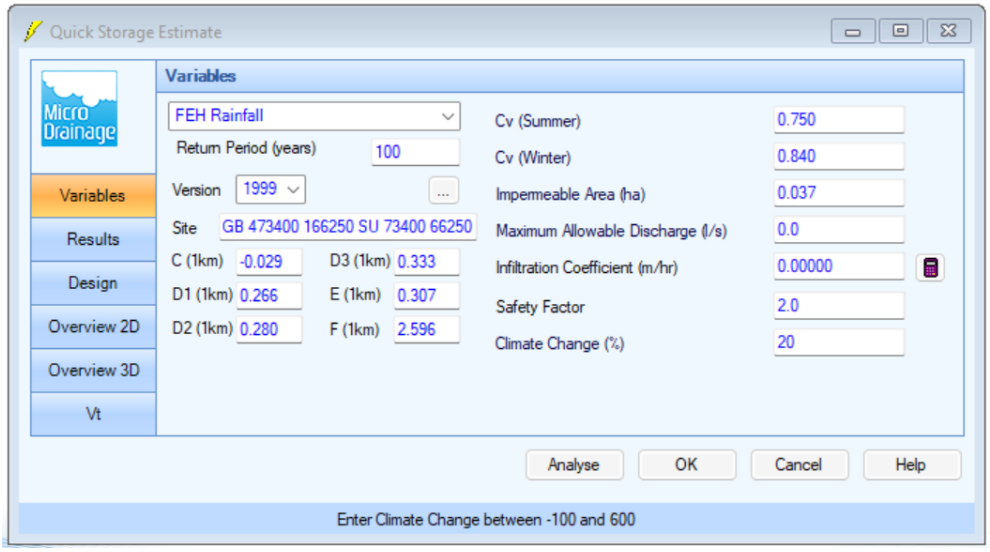
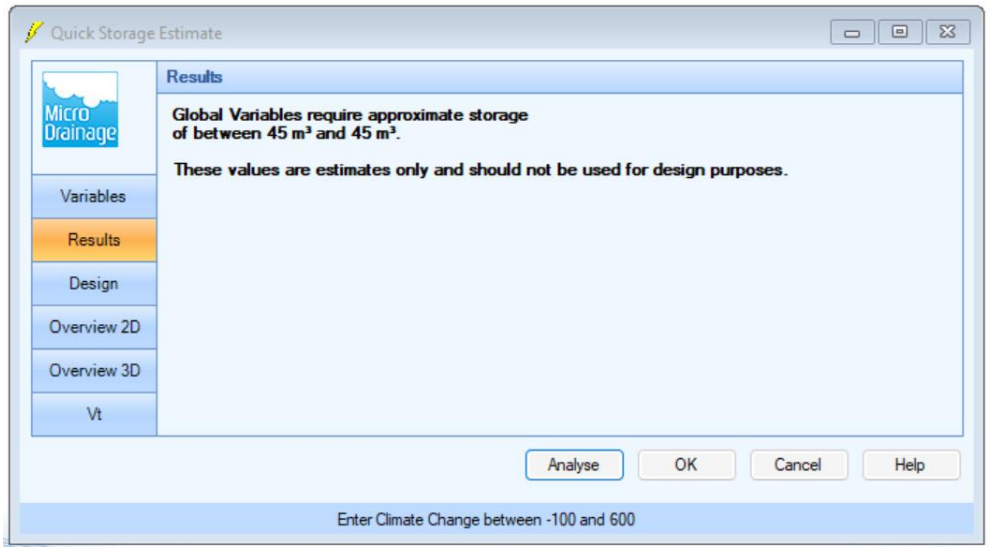


Figure 3 – Storage volume calculation for design event



It can therefore be concluded that the additional runoff at the design event (1 in 100 year storm +20%CC) amounts to approximately 45m^3.

4.5 Surface Water Drainage Strategy

Whilst it is considered that the photovoltaic panels will not result in an increase in surface water run-off flow rates, it is recommended that swales are implemented in the lower areas of the site to intercept extreme flows which may already run offsite. It is emphasised that the swales do not form part of a formal drainage scheme for the development (as no such scheme is required) but are provided as a form of 'betterment'.

For the purpose of this planning application, an illustrative surface water strategy has been prepared as seen within Drawing 07, which indicates the presence of the proposed swales, which are considered the best possible solution to help mitigate against any potential surface water on site.

The proposed swales will have a minimum depth of 0.3m and a base width of 0.5m. The swales have a combined length of 443m and provide a total storage volume of approximately 66.5m^3. This is greater than the Quick Storage Estimate volume of additional runoff generated as a result of the minor increase in impermeable area on site (45m^3).

The proposed access road should be permeable in nature (e.g – gravel), which would continue to allow infiltration through this area.

The provision of swales has a minor benefit in reducing overland flows during extreme rainfall events. On this basis the proposed development would not increase flood risk onsite or elsewhere and would preserve the application site's natural drainage regime.

4.6 Maintenance

Table 3 below indicates likely maintenance requirements for the swale storage proposed. The following information has been derived from Table 17.1 of the SUDS Manual guidance.[6]

Table 3 - Swale Maintenance Requirements

Maintenance	Action	Frequency
Regular maintenance	Remove litter and debris.	Monthly, or as required.
	Cut grass – to retain grass height within specified design range.	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly at start, then as required.
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect vegetation coverage.	Monthly for 6 months, quarterly for 2 years, then half yearly.
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.	Half yearly.
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Relevel uneven surfaces and reinstate design levels.	

[6] http://www.scotsnet.org.uk/documents/NRDG/CIRIA-report-C753-the-SuDS-manual-v6.pdf

Maintenance	Action	Frequency
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	
	Remove and dispose of oils or petrol residues using safe standard practices	

4.7 Foul Discharge

The proposed development is for a solar panel site and therefore will not require a foul sewer or consideration of foul discharge.

4.8 Summary

Based on the above findings, an appropriate drainage strategy has been outlined which incorporates the use of permeable materials to construct the proposed access roads, and swales along the eastern and southern site boundaries. Maintenance of the swales should follow Table 3 of this report, to help provide mitigation against any residual surface water risk.

5 Conclusion

The site has been assessed for flood risk from a variety of flood sources. The combination of the site being located within the EA designated Flood Zone 1 and there being no identified reported incidents of nearby flooding, equates to fluvial risk being Low and tidal risk being considered Negligible.

Flood risk from surface water is currently considered to be Low to Moderate based on the modelled overland flow route projected in the EA surface water mapping. Incidents of surface water flooding have been reported in the areas of Spencers Wood and Swallowfield; however, there are no reported incidents of flooding located at the site.

All other sources of flooding are considered Low or Negligible at the site.

This report has outlined recommendations for the development to incorporate during the design stage which will seeks to mitigate agaisnt the risk of surface water flooding on site. To ensure the positive drainage of the site, swales should be incorporated to the east and to the south of the site. An illustrative outline drainage strategy has been designed so as to manage surface water on site, and ensure that no flooding shall occur up to and including the 1 in 100 year +20% CC storm event.

This report therefore demonstrates that the proposed development:

- Is suitable in the location proposed;
- Is unlikely to place additional persons at risk of flooding; and,
- Is unlikely to increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water runoff.

Limitations of this report

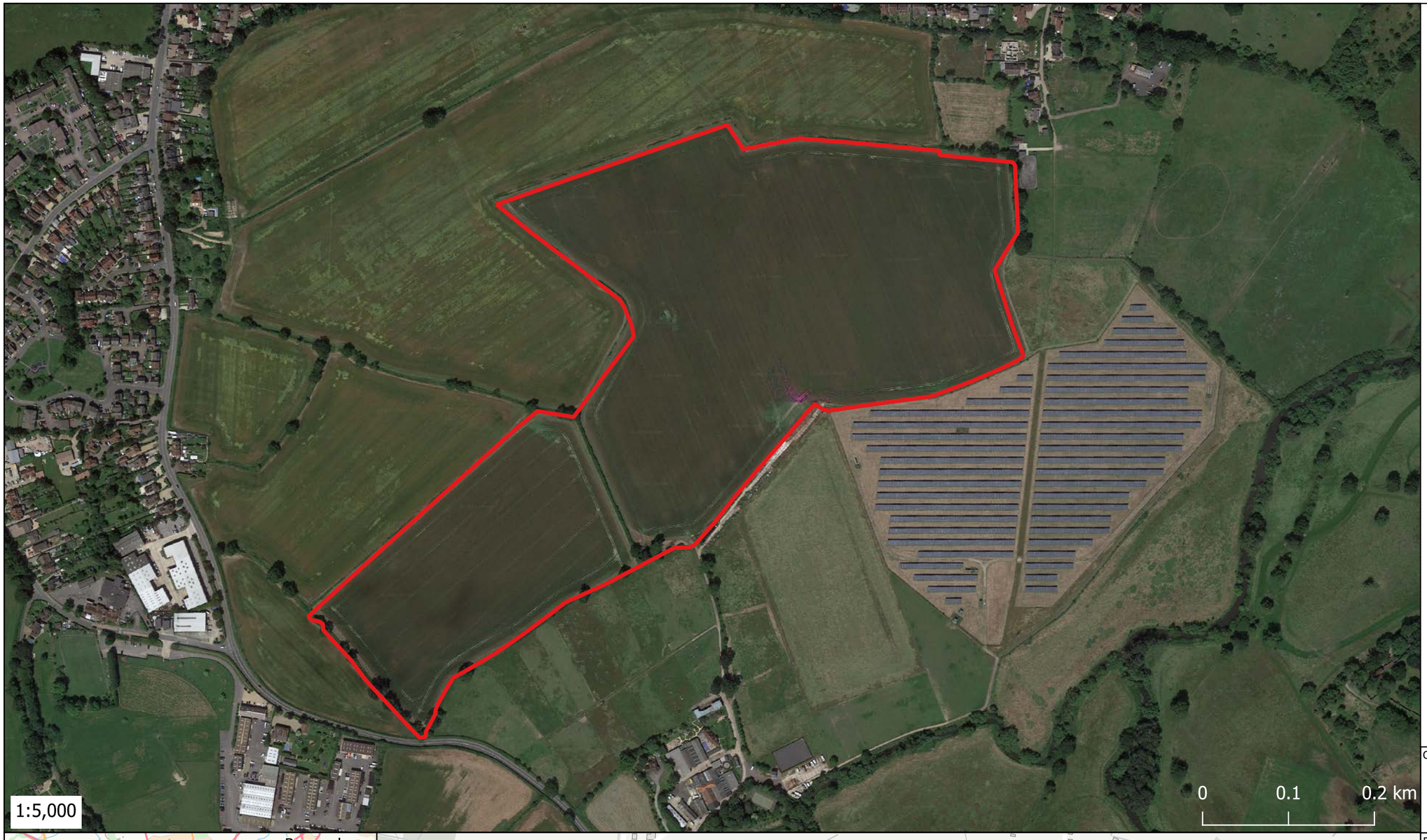
This report has been prepared by Ashfield Flood Risk Solutions Limited (Ashfield) for the sole benefit of the client.

This report has been prepared solely for the benefit of Greentech Projects GmbH (UK) (the "Client") and has not been assigned to any other third parties. If reliance on this report was required by a third party, this could be arranged for an agreed fee. This report should not be used by the client in relation to any other matters not covered specifically by the scope of the report. If this report does not contain a signature in the Document Control window, then this is an uncontrolled electronic copy and should not be relied upon by the client or any other recipient, as Ashfield cannot give assurances on the source or content of the document. Ashfield has used all reasonable skill, care and diligence in the preparation of this report.

The Flood Risk and Drainage Assessment report has been designed to satisfy planning requirements, as outlined in Section 1. It is a desktop review of information provided by the client and from selected private and public databases. It only includes a site investigation where specifically referenced. This report does not make a detailed site-specific assessment of the suitability of the existing drainage on the Site. Ashfield accepts no responsibility for the accuracy or completeness of third party data reviewed within this assessment.

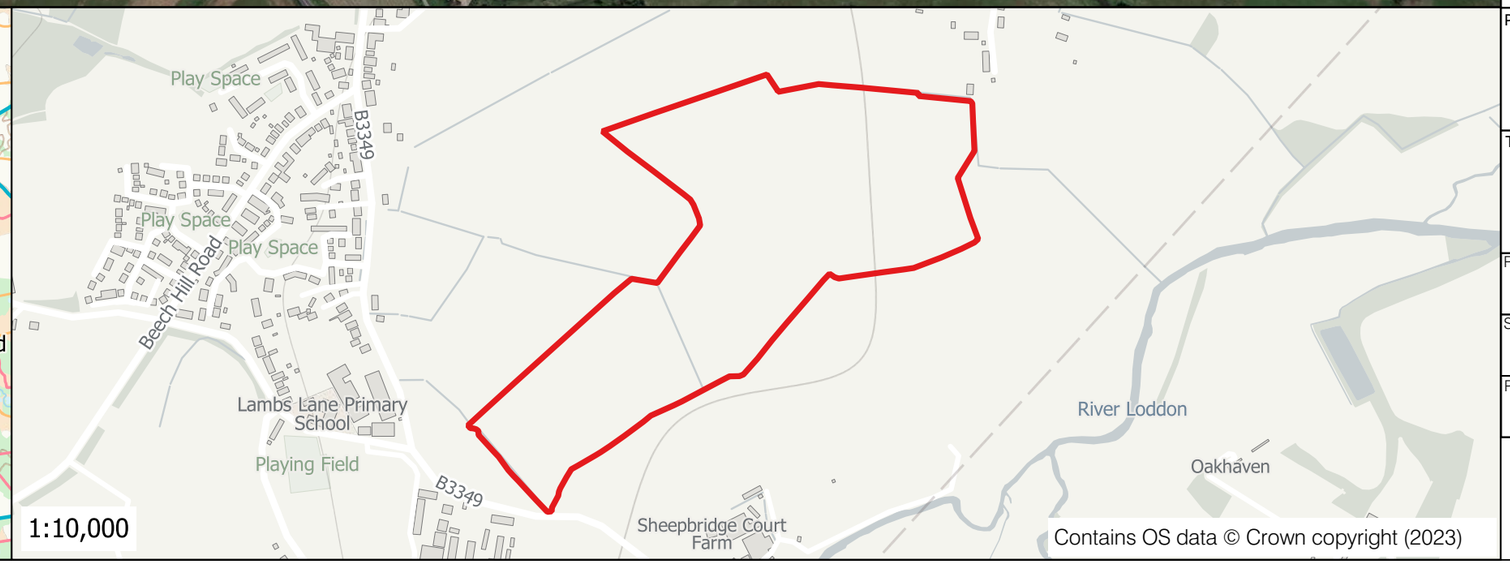
This report is provided under Ashfield Solutions Limited Standard Terms and Conditions.

Drawings



Legend

- Site Boundary
- Site Location



Contains OS data © Crown copyright (2023)

Client

Greentech Projects GmbH (UK)

Project

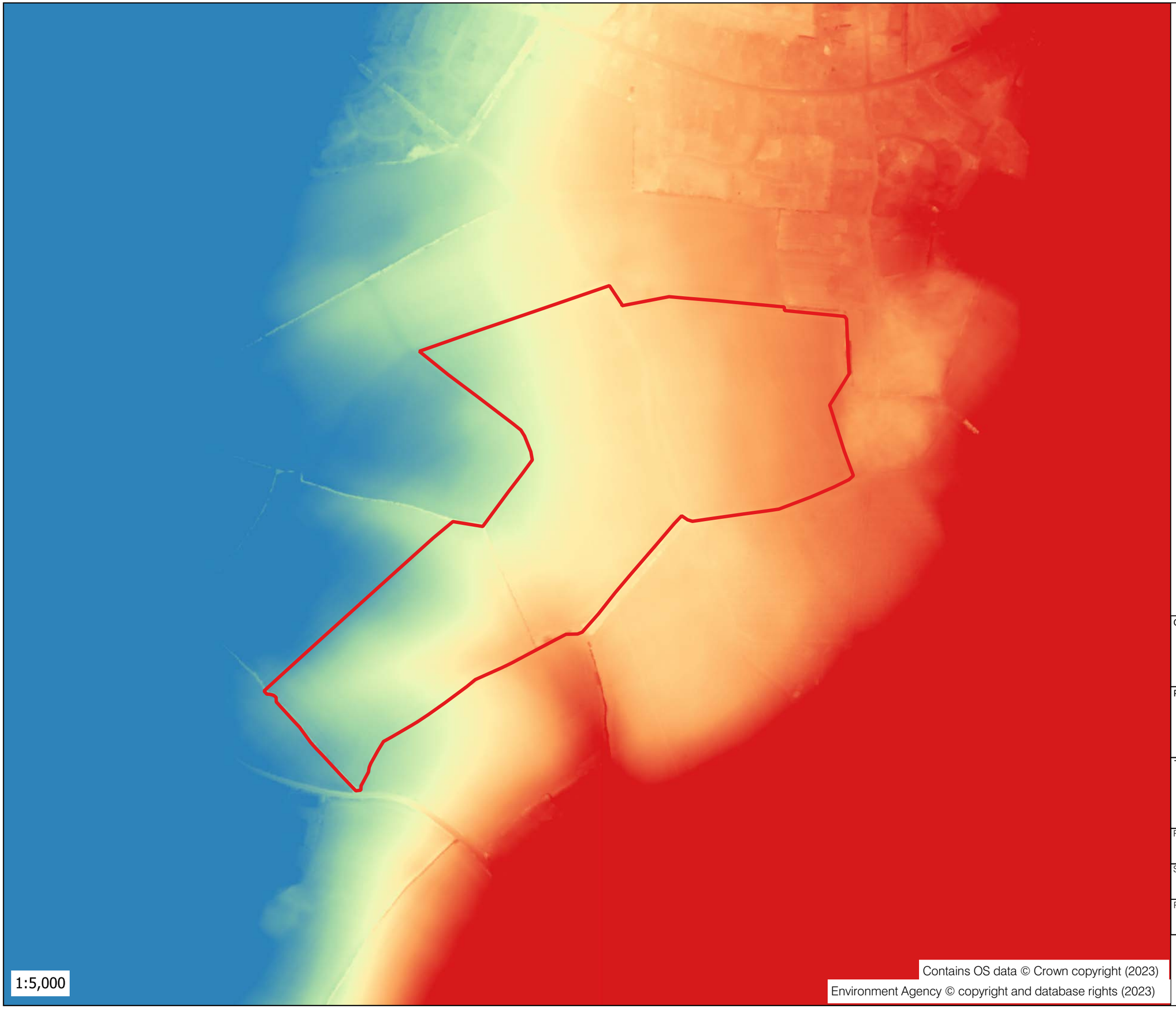
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

Site Location Plan

Report No.	Drawing No.	Revision
155622-F01	01	-
Scale	**Date**	**Frame Size**
As Shown	03/03/2023	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	CD

ASHFIELD — SOLUTIONS GROUP —



Client

Greentech Projects GmbH (UK)

Project

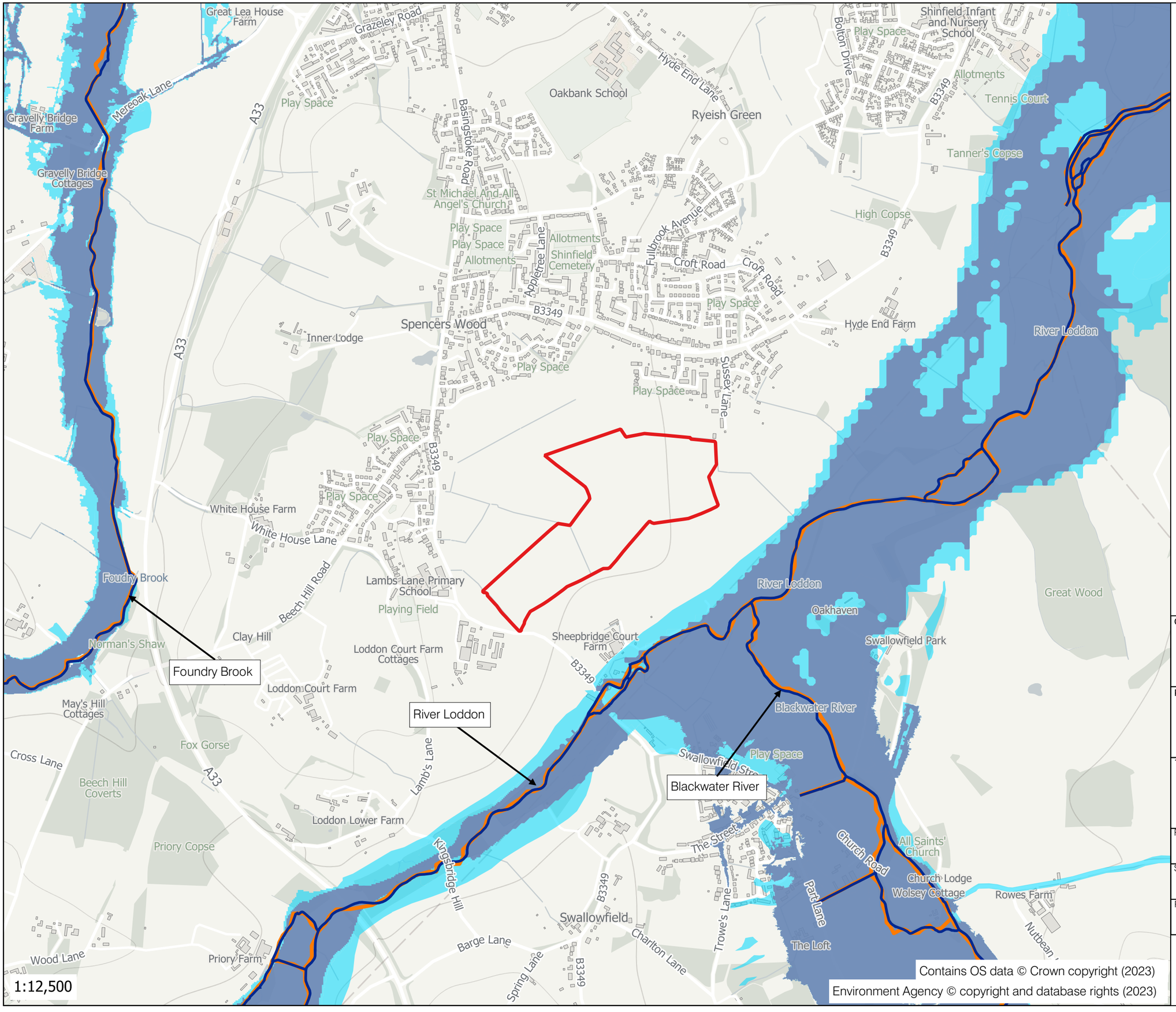
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

LiDAR Derived Ground Levels Plan

Report No.	Drawing No.	Revision
155622-F01	02	-
Scale	Date	Frame Size
As Shown	03/03/2023	A3
Produced By	Drawn By	Approved By
LC	LC	CD

ASHFIELD
SOLUTIONS GROUP



Legend

- Site Boundary
- Main Rivers
- Flood Defences
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

Client

Greentech Projects GmbH (UK)

Project

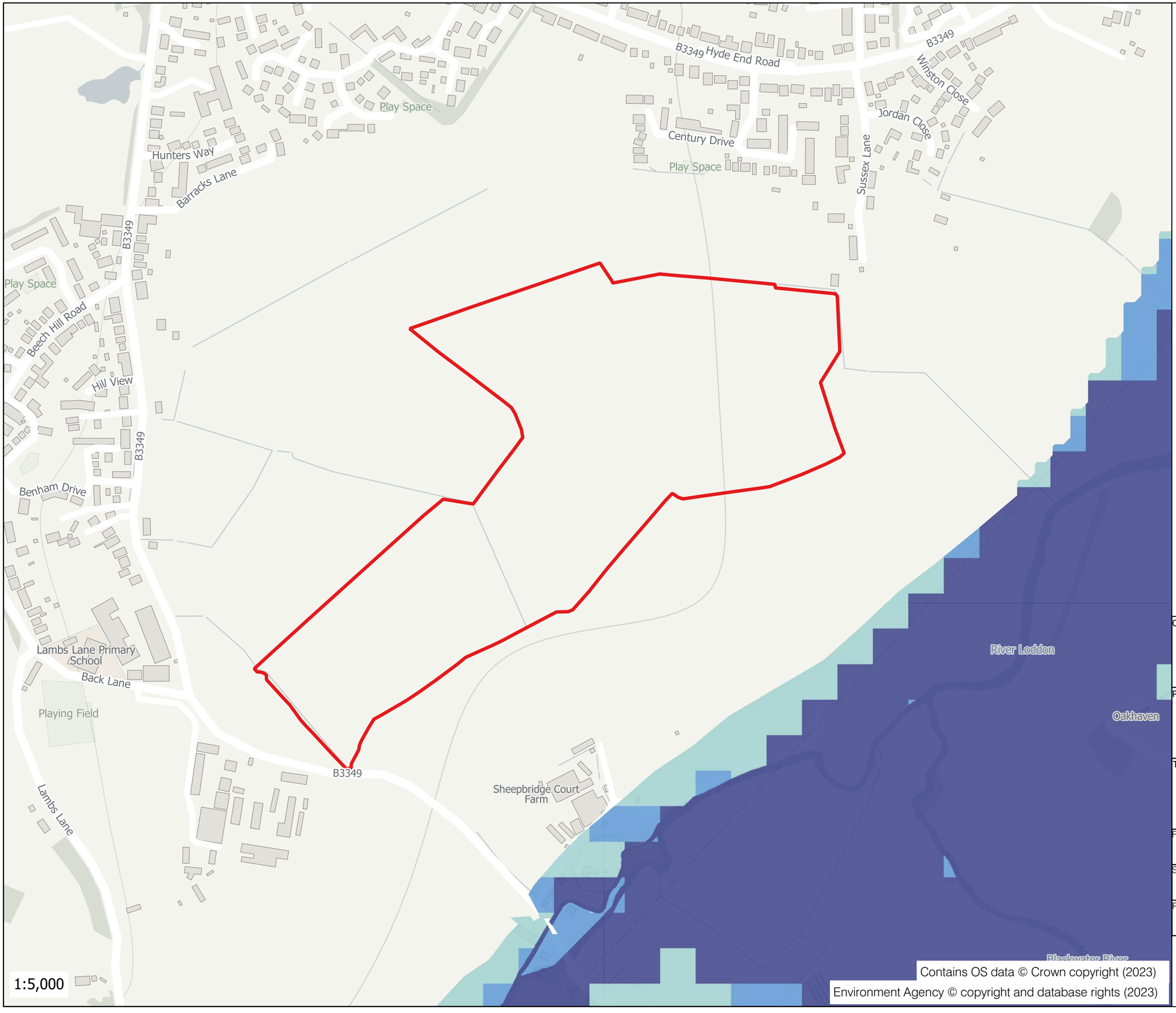
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

EA Flood Map for Planning

Report No.	Drawing No.	Revision
155622-F01	03	-
Scale	**Date**	**Frame Size**
As Shown	03/03/2023	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	CD

ASHFIELD — SOLUTIONS GROUP —



Legend

- Site Boundary

Risk of Flooding from Rivers and Sea

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

Client

Greentech Projects GmbH (UK)

Project

Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

Risk of Flooding from Rivers and Sea Mapping (ROFRAS)

Report No.	Drawing No.	Revision
155622-F01	04	-
Scale	Date	Frame Size
As Shown	03/03/2023	A3
Produced By	Drawn By	Approved By
LC	LC	CD

ASHFIELD — SOLUTIONS GROUP —

Legend

- Site Boundary
- High Risk - 1 in 30 Year Extent
- Medium Risk - 1 in 100 Year Extent
- Low Risk - 1 in 1000 Year Extent

Client

Greentech Projects GmbH (UK)

Project

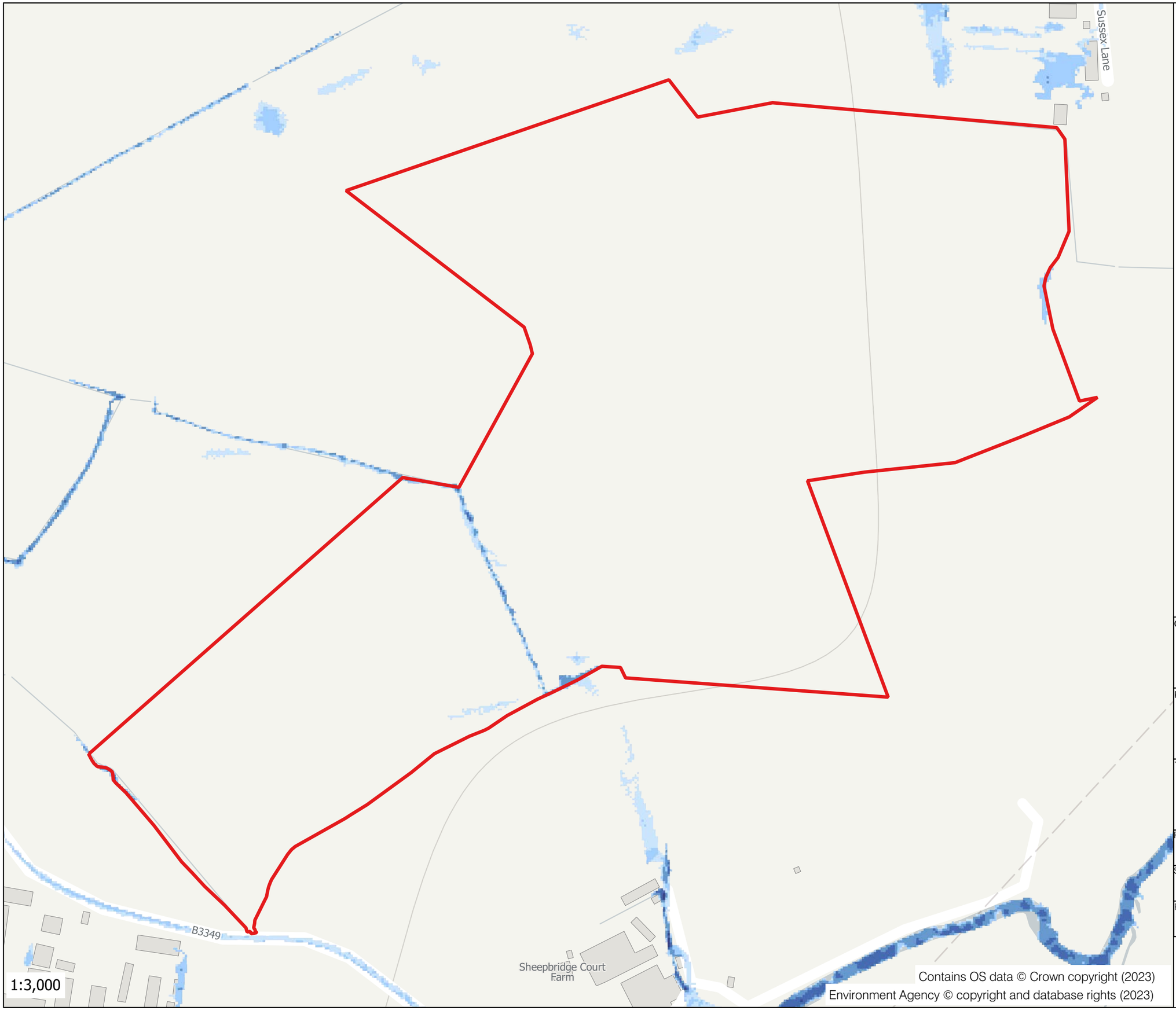
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

EA Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
155622-F01	05	-
Scale	**Date**	**Frame Size**
As Shown	03/03/2023	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	CD

ASHFIELD — SOLUTIONS GROUP —



Legend

- Site Boundary

High Risk Depths (m)

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Greentech Projects GmbH (UK)

Project

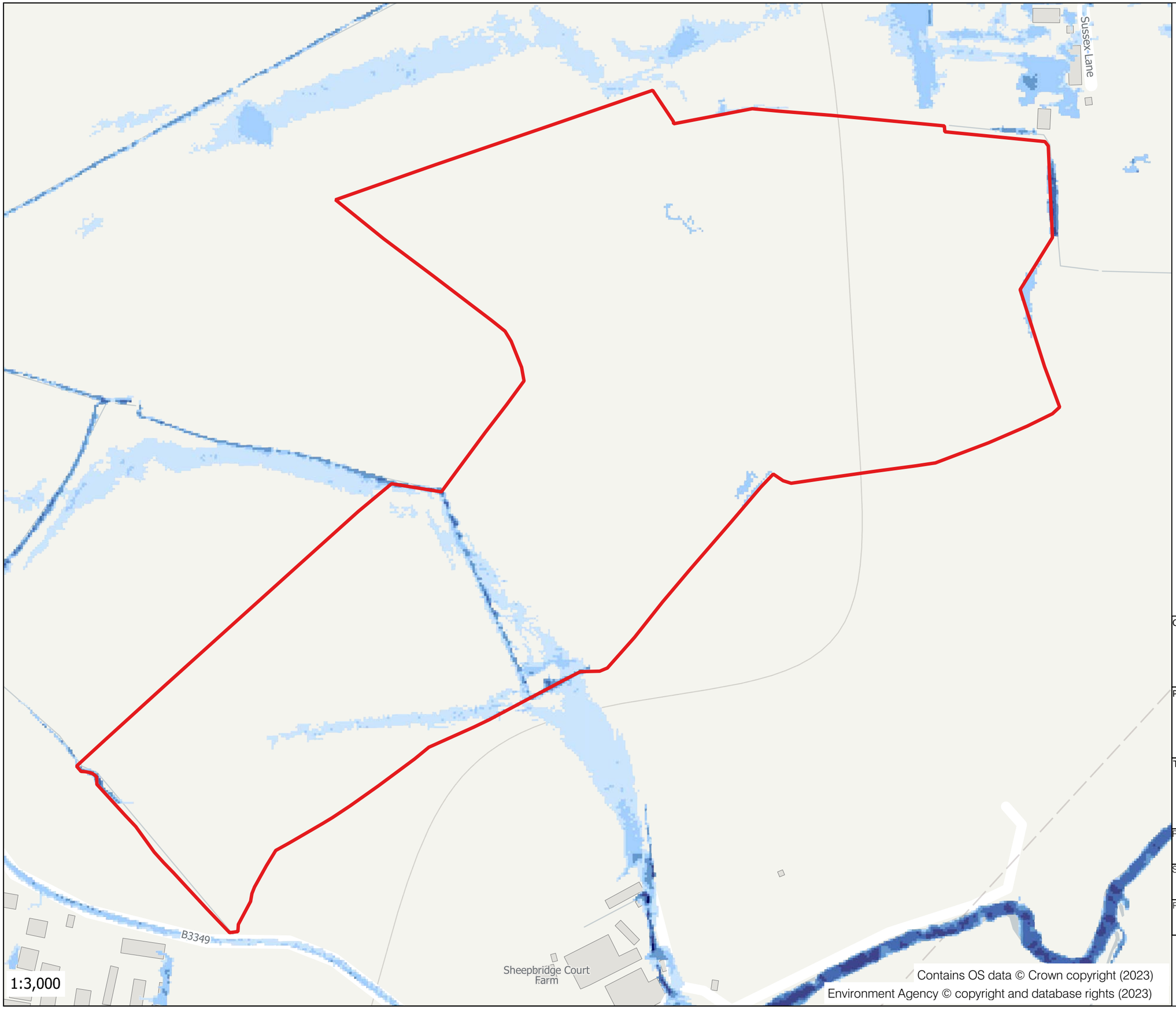
Sheepbridge Court Farm, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

High Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
155622-F01	06	-
Scale	**Date**	**Frame Size**
As Shown	21/02/2023	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	CD

ASHFIELD — SOLUTIONS GROUP —



Legend

Site Boundary

Medium Risk Depths (m)

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Greentech Projects GmbH (UK)

Project

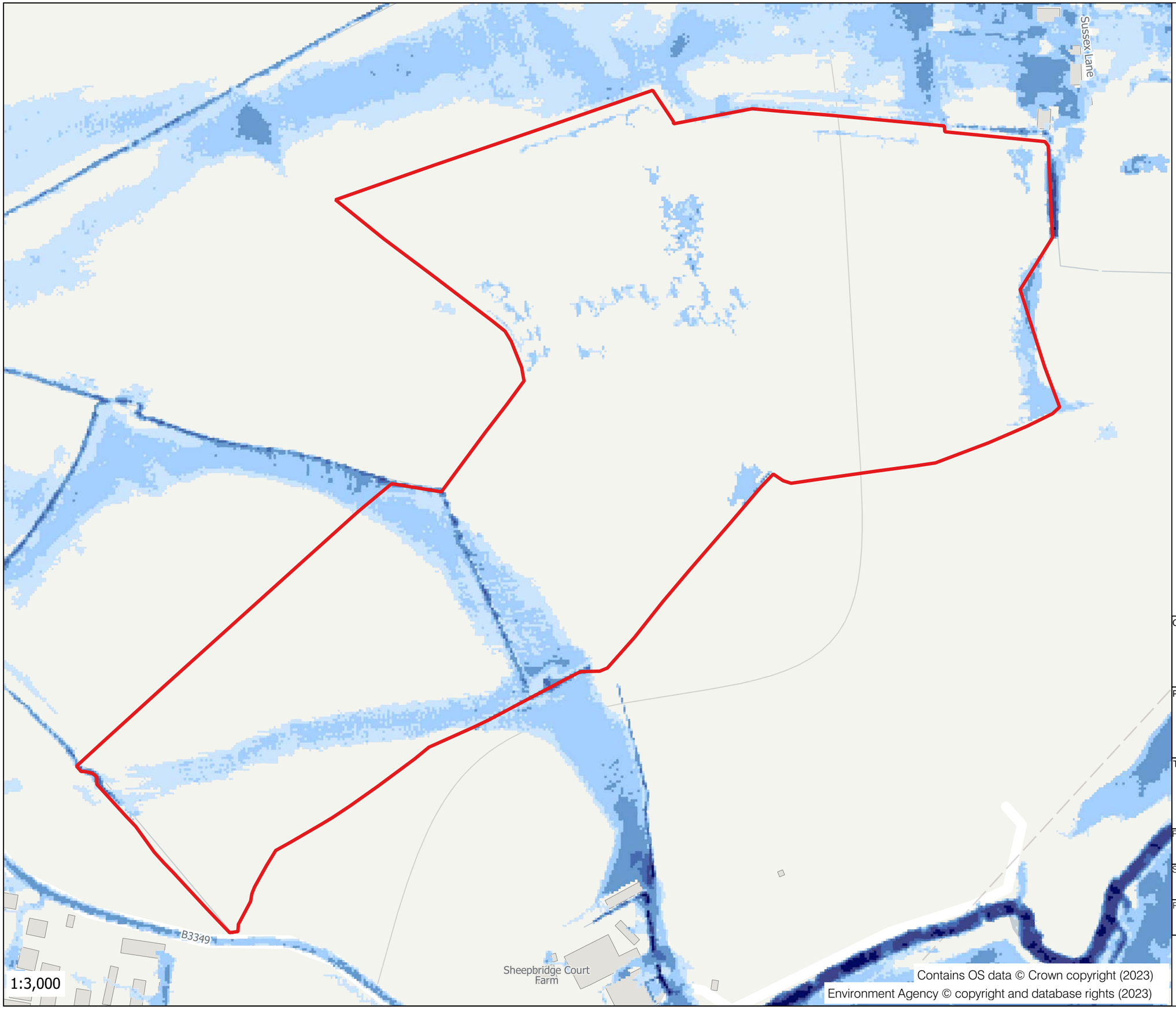
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

Medium Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
155622-F01	07	-
Scale	Date	Frame Size
As Shown	03/03/2023	A3
Produced By	Drawn By	Approved By
LC	LC	CD

ASHFIELD SOLUTIONS GROUP



Legend

- Site Boundary

Low Risk Depths (m)

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Greentech Projects GmbH (UK)

Project

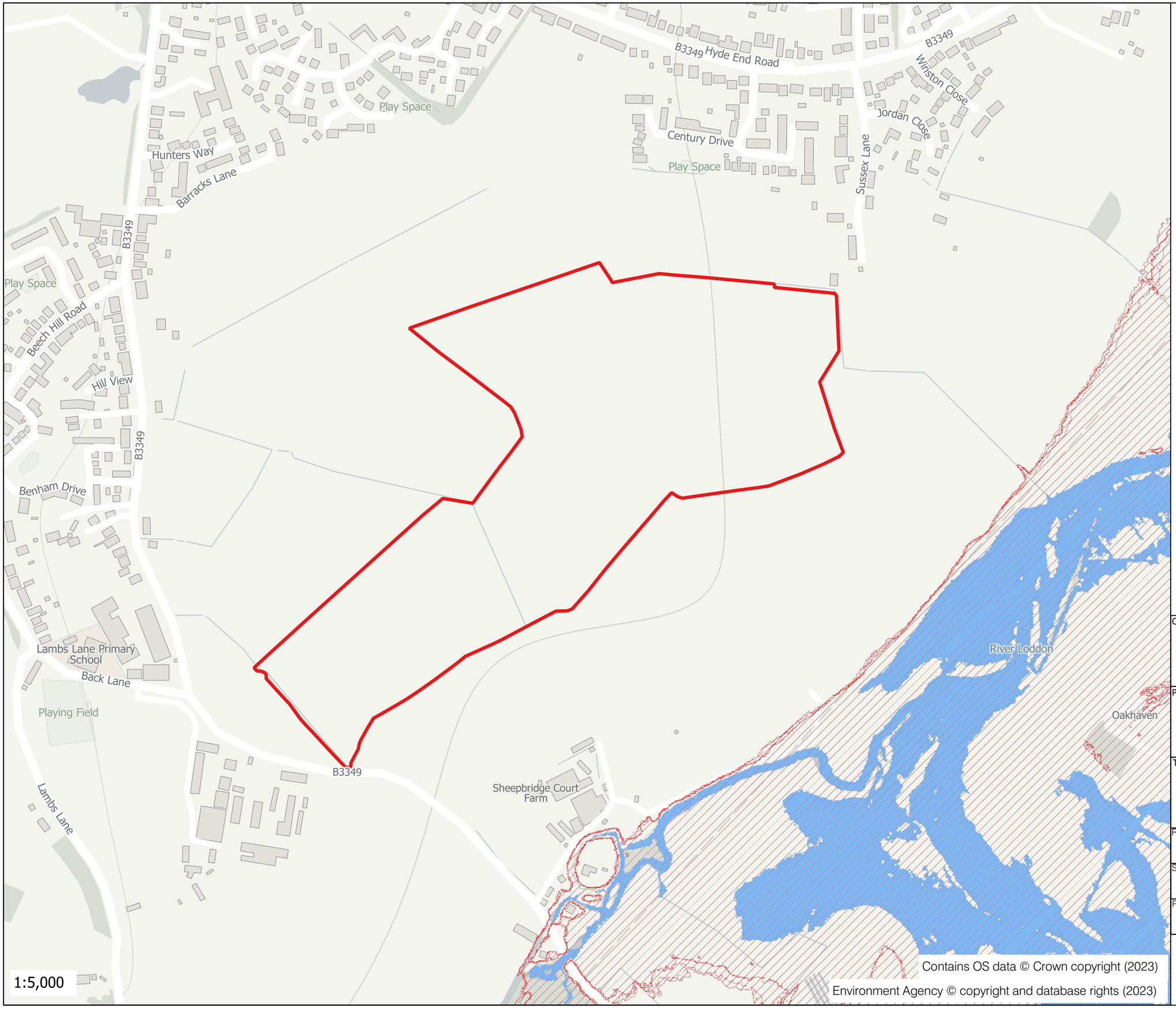
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

Low Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
155622-F01	08	-
Scale	Date	Frame Size
As Shown	03/03/2023	A3
Produced By	Drawn By	Approved By
LC	LC	CD

ASHFIELD SOLUTIONS GROUP



Legend

- Site Boundary
- Dry Day Reservoir Extent
- Wet Day Reservoir Extent

Client

Greentech Projects GmbH (UK)

Project

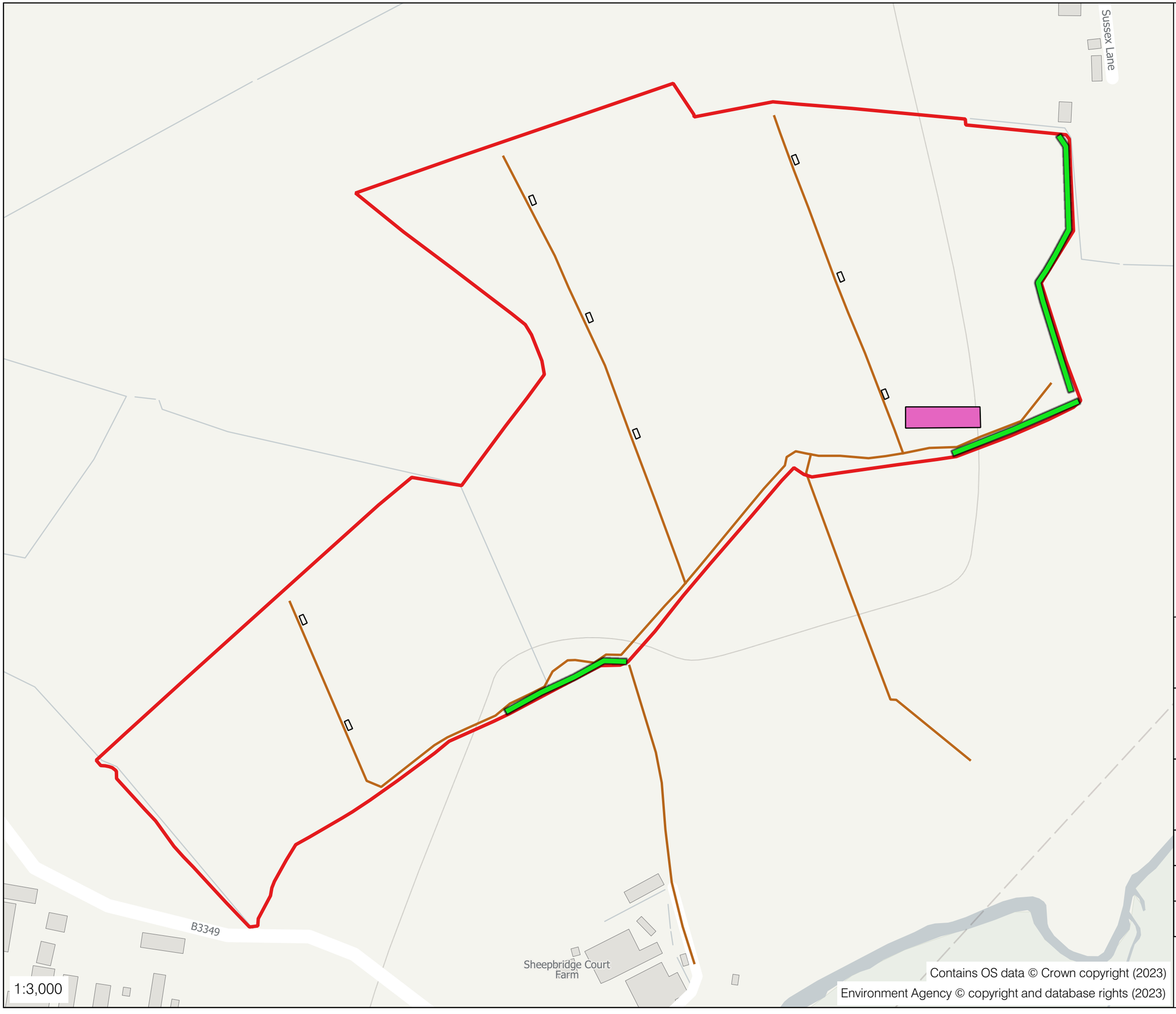
Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

EA Risk of Flooding from Reservoir Failure

Report No.	Drawing No.	Revision
155622-F01	09	-
Scale	**Date**	**Frame Size**
As Shown	03/03/2023	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	CD

ASHFIELD SOLUTIONS GROUP



Legend

- Site Boundary
- Swales
- Roads
- Substation
- Infrastructure

Client

Greentech Projects GmbH (UK)

Project

Spencers Wood Solar, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Title

Surface Water Drainage Strategy

Report No.	Drawing No.	Revision
155622-F01	10	-
Scale	**Date**	**Frame Size**
As Shown	02/03/2023	A3
Produced By	**Drawn By**	**Approved By**
CD	CD	JR

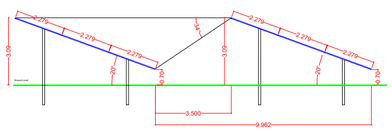
ASHFIELD — SOLUTIONS GROUP —

Appendices

Appendix A

Site Plan

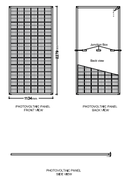
CROSS SECTION



ELECTRICAL DETAILS

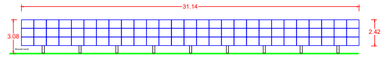
STRING SIZING DETAILS Strings of 27 PV modules per string		TECHNICAL DETAILS JAM72S30-545/MR	
Vmpp @60oC:	986.94V	Voc:	49.75V
Vmpp @55oC:	1035.49V	Isc:	13.93A
Vmpp @50oC:	1051.01V	Vmpp:	41.80V
Vmpp @25oC:	1128.80V	Impp:	13.04A
Vmpp @-10oC:	1237.22V	Pmpp:	545Wp
Voc @70oC:	1177.02V	Dimensions:	2279x1134x35mm
Voc @-10oC:	1472.54V	Operating temperature	-40~+85oC

PHOTOVOLTAIC PANEL DETAILS

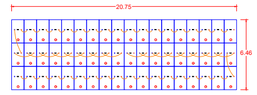


TOP VIEW (Tables 3x27)

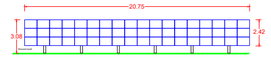
FRONT VIEW (Tables 3x27)



TOP VIEW (Tables 3x18)

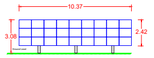


FRONT VIEW (Tables 3x18)



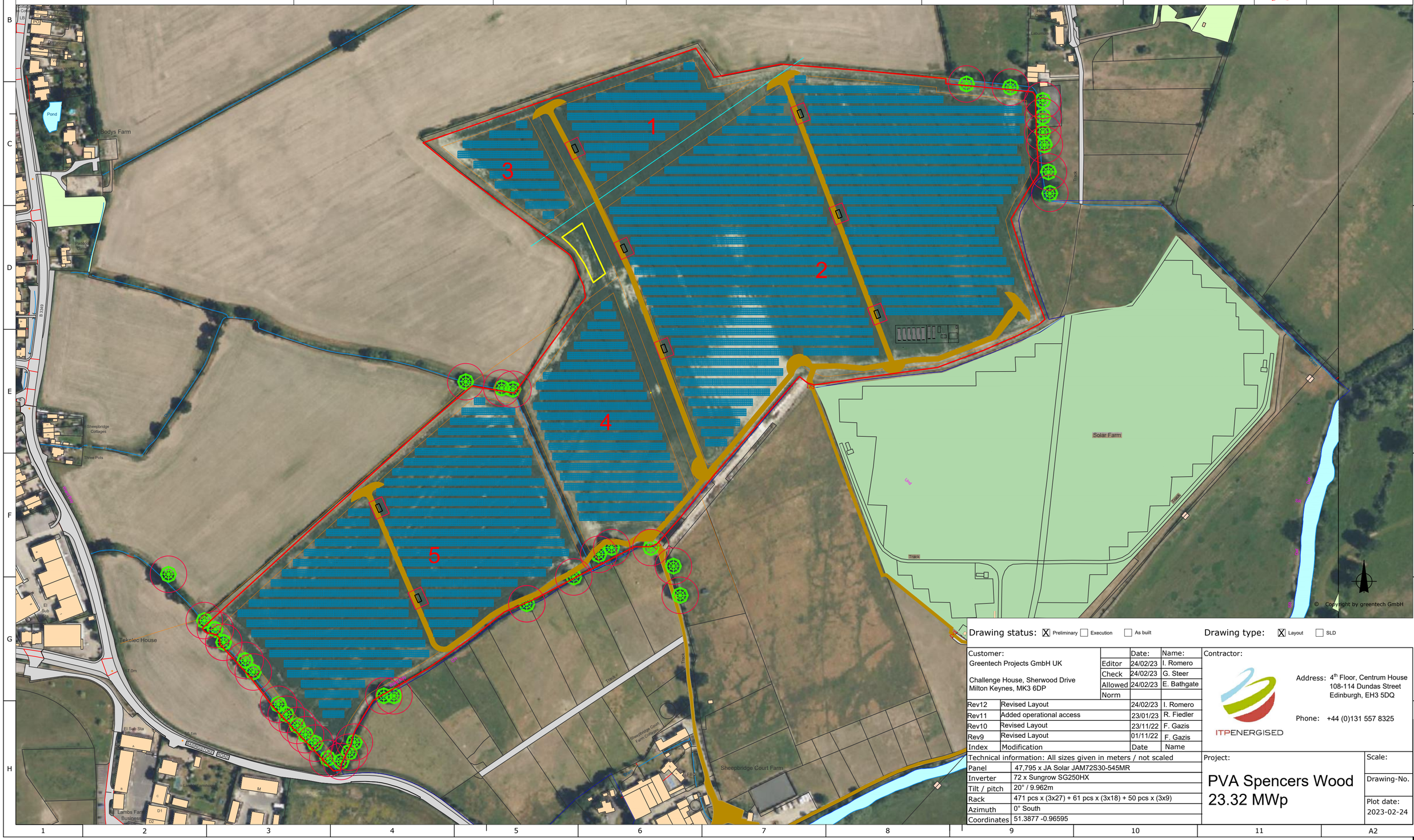
TOP VIEW (Tables 3x9)

FRONT VIEW (Tables 3x9)



Legend

	PV Module
	Fence
	Allowed Area to install PV Modules
	Road
	Substation
	Green Areas
	Tree with shading analysis
	Gate



Drawing status: [X] Preliminary [ ] Execution [ ] As built

Drawing type: [X] Layout [ ] SLD

Customer:		Date:	Name:
Greentech Projects GmbH UK	Editor	24/02/23	I. Romero
	Check	24/02/23	G. Steer
Challenge House, Sherwood Drive Milton Keynes, MK3 6DP	Allowed	24/02/23	E. Bathgate
	Norm		

Rev12	Revised Layout	24/02/23	I. Romero
Rev11	Added operational access	23/01/23	R. Fiedler
Rev10	Revised Layout	23/11/22	F. Gazis
Rev9	Revised Layout	01/11/22	F. Gazis
Index	Modification	Date	Name

Contractor:

ITPENERGISED

Address: 4th Floor, Centrum House
108-114 Dundas Street
Edinburgh, EH3 5DQ

Phone: +44 (0)131 557 8325

Technical information: All sizes given in meters / not scaled	
Panel	47,795 x JA Solar JAM72S30-545MR
Inverter	72 x Sungrow SG250HX
Tilt / pitch	20° / 9.962m
Rack	471 pcs x (3x27) + 61 pcs x (3x18) + 50 pcs x (3x9)
Azimuth	0° South
Coordinates	51.3877 -0.96595

Project:

PVA Spencers Wood
23.32 MWp

Scale:

Drawing-No.

Plot date: 2023-02-24

A2

Appendix B

Thames Water Sewer Records

Asset location search

Thames Water Property Searches

Ashfield Solutions
ABERCYNON
CF45 4SN

Search address supplied Sheepbridge Court Farm
Basingstoke Road
Swallowfield
Reading
RG7 1PT

Your reference 155622

Our reference ALS/ALS Standard/2023_4790714

Search date 7 March 2023

Notification of Price Changes

From 1st April 2023 Thames water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches. Historically costs would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%.

Customers will be emailed with the new prices by January 1st 2023.

Any orders received with a higher payment prior to the 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk

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

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

0800 009 4540

Search address supplied: Sheepbridge Court Farm, Basingstoke Road, Swallowfield, Reading, RG7 1PT

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

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

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

Waste Water Services

Please provide a copy extract from the public sewer map.

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

SU7165NE
SU7266SW
SU7166SE
SU7265NW

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

SU7165NE
SU7266SW
SU7166SE

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

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

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

SU7265NW

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4790714

SU7165NE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,165750

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

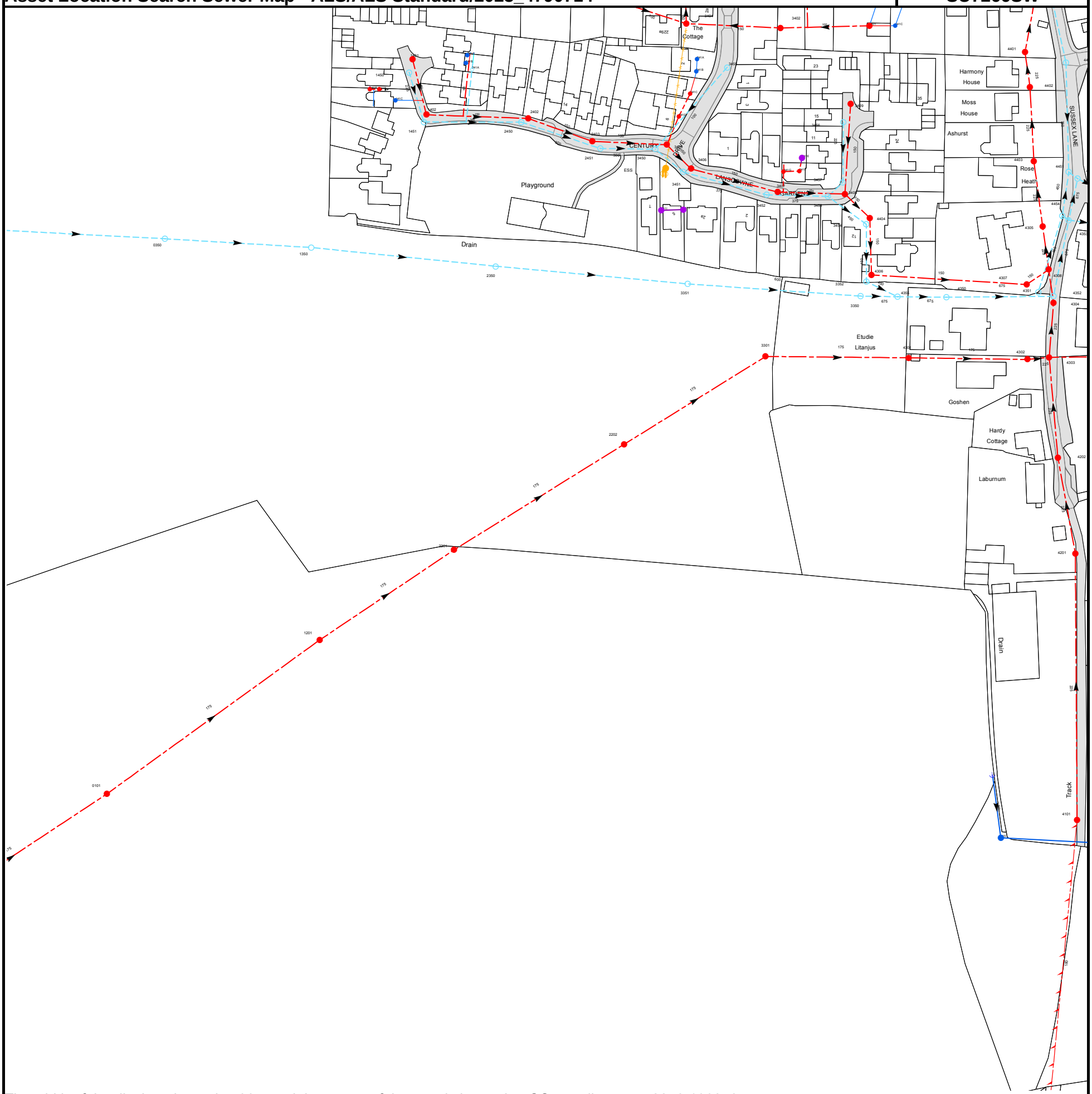
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7901 7902	54.92 n/a	52.76 n/a

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

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4790714

SU7266SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,166250

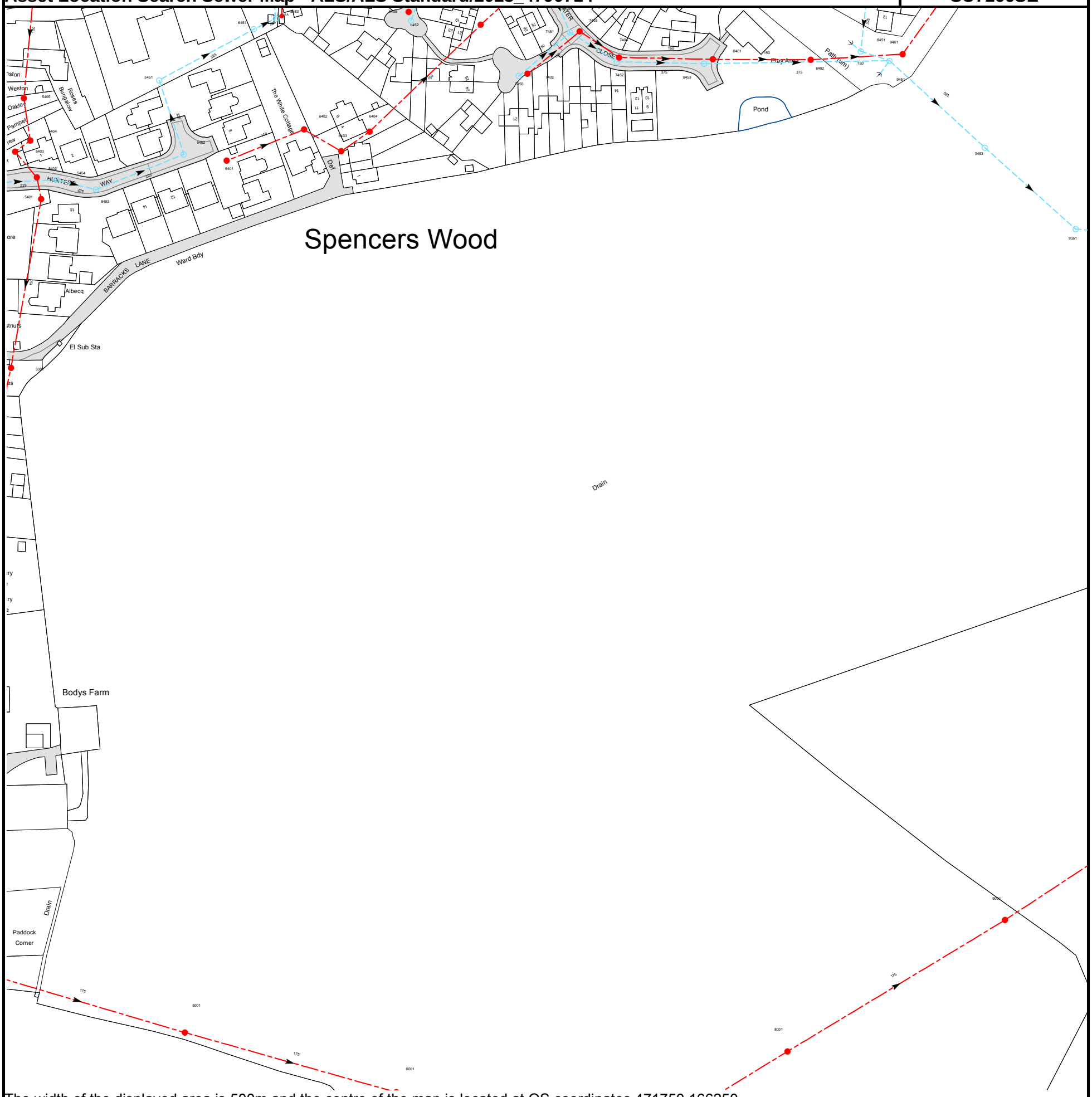
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3409	n/a	n/a
3455	48.8	47.61
341A	n/a	n/a
3402	48.6	47.54
3401	48.71	47.86
441C	n/a	n/a
441B	n/a	n/a
1402	49.84	48.78
341C	n/a	n/a
341B	n/a	n/a
241A	n/a	n/a
241B	n/a	n/a
241C	n/a	n/a
3404	49.32	47.25
4403	48.17	46.19
4402	48.24	46.04
4452	n/a	n/a
4401	48.3	45.93
441A	n/a	n/a
3301	48.83	47.48
3452	n/a	37.22
3407	48.59	47.62
341G	n/a	n/a
341F	n/a	n/a
341E	n/a	n/a
3453	48.41	47.13
3457	n/a	n/a
3456	n/a	n/a
3408	48.41	47.44
3350	48.35	46.85
3454	48.5	47.01
3352	n/a	46.6
4404	48.41	47.34
4306	48.5	47.16
4355	48.31	46.81
1451	49.84	48.22
2201	50.03	48.69
2350	n/a	n/a
2450	49.23	47.9
2402	49.23	48.48
2403	49.29	48.26
2451	n/a	47.7
2202	n/a	n/a
3450	49.27	47.5
341I	n/a	n/a
3405	49.25	47.99
341D	n/a	n/a
3451	49.26	37.38
341J	n/a	n/a
3351	n/a	n/a
3406	49.26	47.9
0101	n/a	n/a
1201	50.86	49.25
1350	n/a	n/a
0350	n/a	n/a
141C	n/a	n/a
141B	n/a	n/a
141A	n/a	n/a
1450	49.9	48.33
1401	49.92	48.94
4151	48.73	46.77
4101	49.13	47.92
4201	48.53	47.31
4202	48.29	46.96
4302	48.52	46.71
4301	48.39	n/a
4303	48.2	46.65
4304	48.09	46.53
4350	48.29	46.59
4352	48.09	46.23
4351	47.98	47
4307	48.2	46.6
4308	48.1	46.57
4305	48.04	46.3
4353	47.95	46.09
4454	47.98	46.41
4450	48.02	45.77
4451	48.04	45.84

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4790714

SU7166SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,166250

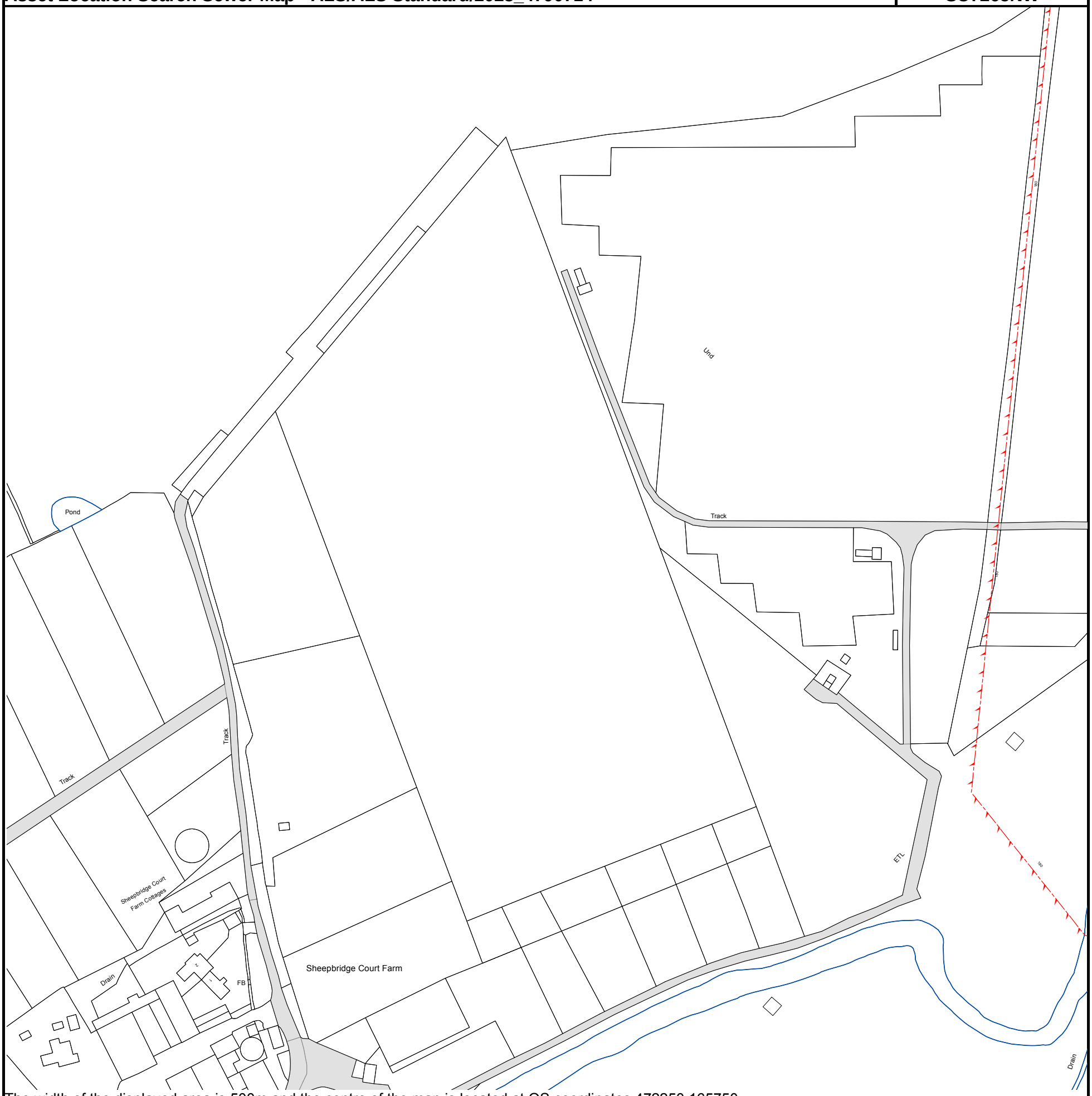
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6453	n/a	n/a
641A	n/a	n/a
6405	56.76	55.07
6452	56.74	55.26
7401	55.75	54.33
6401	59.52	57.79
5452	58.99	58.18
6403	57.12	55.72
9453	n/a	n/a
6404	57.06	55.49
6402	57.78	56.01
5451	59.73	58.04
7450	55.19	53.59
7402	55.14	53.86
8453	54.34	52
7452	54.79	52.44
9451	52.82	50.97
8402	53.95	52.24
8401	54.36	52.93
7404	54.78	53.26
9401	53.15	51.75
8451	53.41	51.15
7451	54.98	52.62
7403	54.99	53.44
6451	n/a	n/a
5454	60	58.8
5402	60.19	58.71
5403	60.84	58.79
5404	60.73	58.83
5405	60.95	59
5301	58.3	57.11
5401	60	58.58
5453	59.53	58.51
6001	55.99	53.43
8001	n/a	n/a
5001	n/a	n/a
9001	53.33	50.97
9351	n/a	n/a

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

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4790714	SU7265NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,165750

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

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

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

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

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

- Conduit Bridge
- Subway
- Tunnel

Notes:

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

Asset Location Search Water Map - ALS/ALS Standard/2023_4790714

SU7165NE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,165750

Asset Location Search Water Map - ALS/ALS Standard/2023_4790714

SU7266SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,166250

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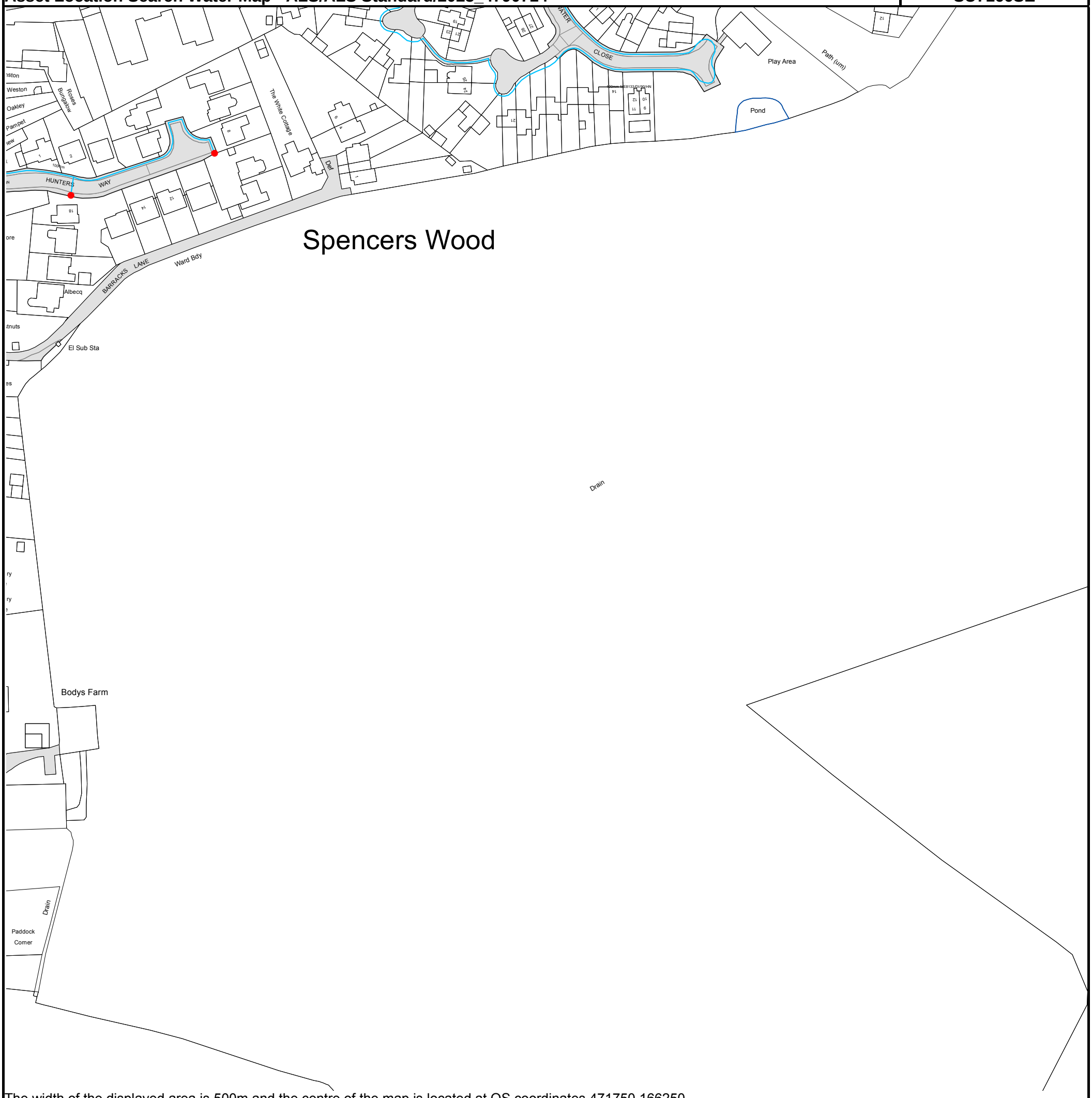
Asset Location Search Water Map - ALS/ALS Standard/2023_4790714

SU7166SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,166250

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

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

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.

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

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

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

Terms and Conditions

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

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

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

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix C

MicroDrainage Information

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	700	Urban	0.026
Area (ha)	27.300	Soil	0.450	Region Number	Region 6

Results l/s

QBAR Rural	119.9
QBAR Urban	125.4
Q100 years	392.2
Q1 year	106.6
Q30 years	281.2
Q100 years	392.2