ABLEY LETCHFORD PARTNERSHIP
Consulting Engineers

LAND EAST OF KNOWLE LANE, CRANLEIGH

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

GLEESON LAND

04 JANUARY 2023

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1.0 Introduction

Context

1.1. This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP), on behalf of Gleeson Land Ltd to support an Outline planning permission for approximately 160 residential properties at the land at Knowle Lane in Cranleigh, Surrey.

Development Proposals

1.2. The proposals are for *up to 3 phases of residential development of up to 162 dwellings (including 30% affordable dwellings) including the creation of new vehicular access, pedestrian and cycle accesses, parking spaces, public open space, biodiversity enhancement, landscape planting, surface water attenuation, associated infrastructure and other associated works* as depicted on the Illustrative Masterplan within **Appendix 1**.

Requirement for a Flood Risk Assessment (FRA)

1.3. The requirement for a Flood Risk Assessment is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in August 2022.

1.4. The footnote accompanying Paragraph 167 states:

'A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use..'

1.5. The site is a greenfield site that comprises of fields with established hedges and tree lined boundaries. There are two existing properties within the site boundary. The area of the site is approximately 11.7 hectares. As the site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

Report Aim and Formation

1.6. The principal aim of this report is to demonstrate the provision of a suitable drainage strategy will be achieved at the development.

1.7. This report will also outline the impacts the development could have on flood risk to the surrounding area and outlines the mitigation systems that will be implemented to minimise this risk.

1.8. The drainage design ensures that the guiding principles of Sustainable Drainage Systems (SuDS) are central to the design of the surface water drainage strategy for the proposed development.

Report Structure

1.9. This report addresses the requirements of revised NPPF and considers the following aspects:

- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information.
- Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
- Section 4: Overview of Flood Risk – the effect of flooding within the existing site layout from all sources.
- Section 5: Proposed Development and Sequential Test – an overview of the flood risk vulnerability.
- Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the residual risk to the development.
- Sections 7 and 8: Drainage Strategy – offer appropriate mitigation measures to protect the site in the post development scenarios for surface and foul water drainage strategies.
- Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.

2.0 Policy and Sources of Information

Introduction

2.1. This chapter provides a review of policy relevant to the assessment and sources of information.

National Planning Policy

2.2. National Planning Policy in relation to Flood Risk is set out in Section 14 of the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) ID: 7 for Flood Risk and Coastal Change. Flood Risk is discussed in Paragraphs 159-169 of the NPPF.

2.3. Paragraphs 159-162 discuss the sequential approach. Paragraph 160 refers to a Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate development, whilst Paragraphs 163-164 relates to the Exception Test.

2.4. Paragraph 167 discusses the determination of planning applications stating:

> *'When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
>
> *a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
>
> *b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
>
> *d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.'*

2.5. The development would be classed as Major development providing more than 10 homes and the site is greater than 0.5 hectares. Paragraph 169 states:

> *'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*
>
> *a) Take account of advice from the lead local flood authority;*
>
> *b) Have appropriate proposed minimum operational standards;*
>
> *c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
>
> *d) Where possible, provide multifunctional benefits.'*

Environment Agency

2.6. The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.

2.7. The EA Standing Advice has been consulted and reviewed within this FRA.

2.8. The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk extents and sources.

Local Authorities

2.9. The site lies within the administrative area of Waverley Borough Council (WBC) and Surrey County Council (SCC).

2.10. Planning guidance published by WBC and SCC regarding the flood risk was referred to in order to assess the methodology best suited to suit the local area. The following key documents were reviewed:

- Waverley Borough Local Plan (dated 2018), with specific reference to policy CC1 'Climate Change' and CC4 'Flood Risk Management',
- Surrey Local Flood Risk Management Strategy 2017-2032,
- Surrey County Council Preliminary Flood Risk Assessment (PFRA) (dated June 2011) and PFRA addendum (dated 2017), and
- Waverley Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) (dated November 2018).

2.11. WBC became the Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010. WBC provide guidance to assess, manage and inform flood risk.

2.12. As LLFA, WBC's Flood and Water Management Team provide a template to assist developers seeking planning permission for new sites by posing questions on the chosen drainage strategy and associated Flood Risk Assessment. A completed template is included within **Appendix 2**.

2.13. WBC has permissive rights over any Ordinary Watercourses and land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Flood and Water Management Act 1991.

Local Water Authority

2.14. Thames Water (TW) is responsible for the supply of clean water and disposal of wastewater for the Cranleigh area.

2.15. Information with regards to sewer and water main flooding contained within the SFRA has been consulted as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

Other Sources of Information

2.16. A desktop study of the site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:

- DEFRA's MAGIC portal,
- British Geological Survey (BGS) and
- Cranfield University Soilscape portal.

2.17. Guidance with respect to Sustainable Drainage Systems (SuDS) is contained within DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, CIRIA C753 The SuDS Manual and within the NPPF Planning Practice Guidance (PPG) – 'Flood Risk and Coastal Change'.

2.18. Additional guidance on development and flood risk is contained within CIRIA C624 Development and Flood Risk – Guidance for the Construction Industry which identifies several key aims for a development to ensure it is sustainable in flood risk terms.

3.0 Site Setting

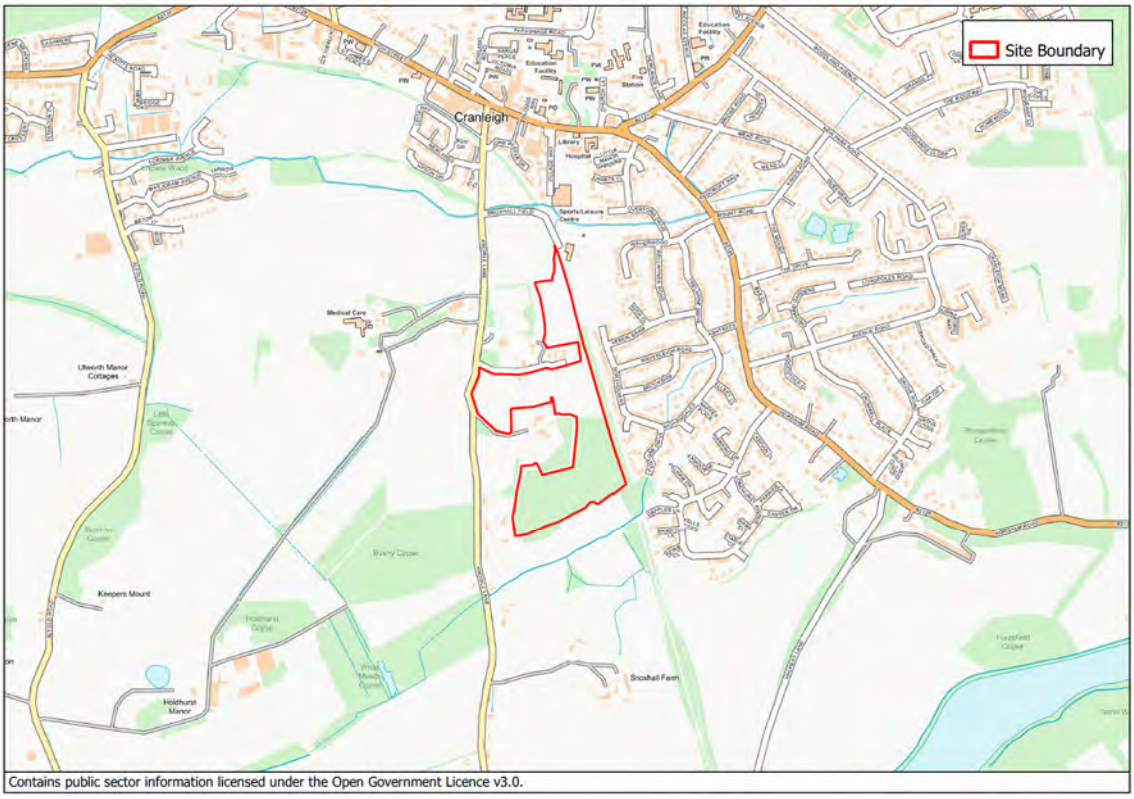
Introduction

3.1. This chapter provides a description of the site location, its topography, geology and hydrology.

Site Location

3.2. The site is located at the land to the east of Knowle Lane in Cranleigh in Surrey. The nearest postcode is GU6 8JN. The site centre grid reference is 505,940E, 138,310N. The site location is shown in **Figure 1**.

Figure 1 – Site Location



3.3. The site is bounded to the north by a leisure centre and sports fields. Agricultural fields are located to the west and south of the site. A residential area is located to the east of the site.

3.4. The site consists predominantly of large agricultural fields, enclosed by mature hedgerow and tree boundaries. A couple of residential properties are located within the site.

3.5. The site covers an area of approximately 11.5 hectares.

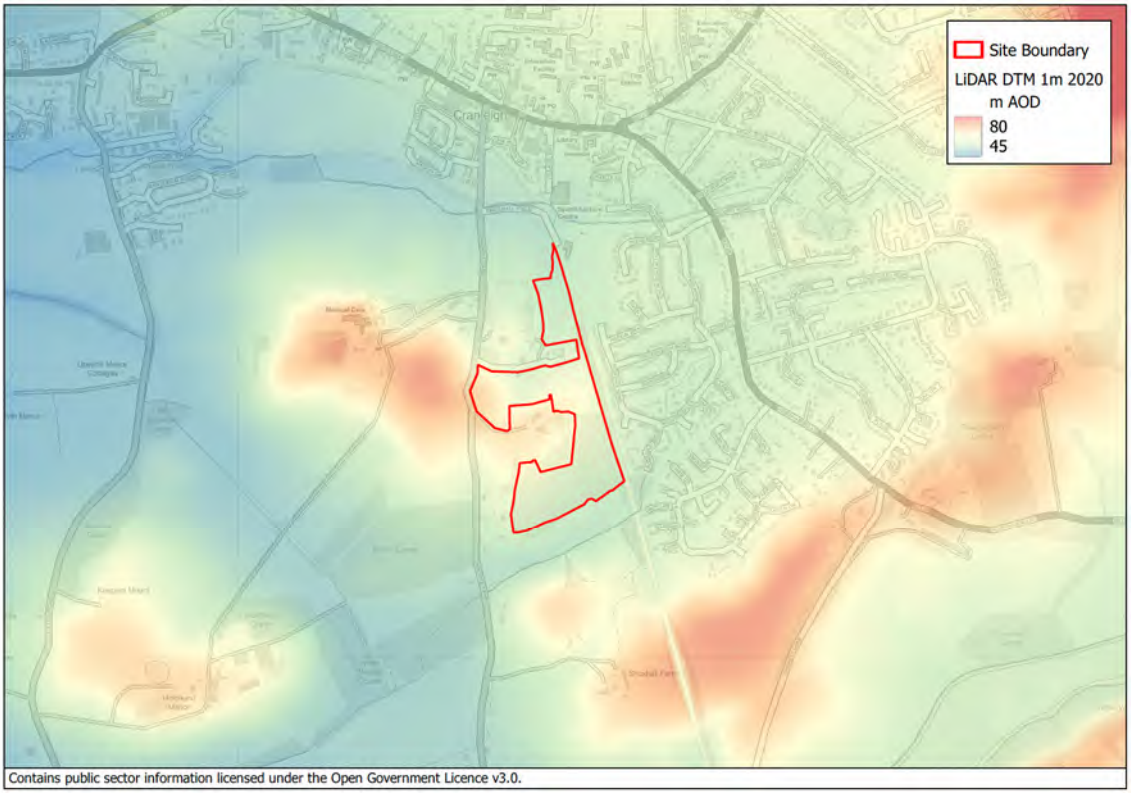
Topography

3.6. The LiDAR elevations across the site are shown in **Figure 2**.

3.7. The LiDAR indicates that the highest part of the site is along the western boundary, adjacent to Knowle Lane. The western boundary has an elevation of between 65m AOD and 70m AOD. The lowest point of the site is along the site's northern boundary, adjacent to Snoxhall Field. Elevations along the site's northern boundary are between 52m AOD and 53m AOD.

3.8. A topographic survey of the site was carried out in August 2022 by Gleeson Land surveyors. A copy of the topographic survey is included within **Appendix 1**. The topographic survey shows that the site is highest along the western part of the site adjacent to Knowle Lane. Elevations along the western boundary are between 68m AOD and 70m AOD. The site is lowest adjacent to the ditch along the northern boundary of the site. Elevations along the northern boundary of the site are between 52.4m AOD and 54m AOD.

Figure 2 – Site Topography



Watercourses and Ditches

3.9. A review of the Ordnance Survey (OS) mapping did not indicate any formal watercourses onsite.

3.10. Cranleigh Waters watercourse is located approximately 90m to the south of the site. It flows in a south westerly direction towards its confluence with the River Wey to the west of Shalford. Cranleigh Waters is classed as an EA Main River. An unnamed drainage ditch is located approximately 100m to the north of the site, on the opposite side of Snoxhall Field road. This ditch flows in a westerly direction where it has it joins with Cranleigh Waters to the south of Elmbridge Road. The drainage ditch is classed as Ordinary Watercourses.

Surface and Foul Water Sewers

3.11. A site walkover identified an open field ditch adjacent to the playing fields within the northern part of the site with a shallow ditch in the southeast corner of the site. It is currently unclear how the existing properties dispose of their surface water. Ditch outfall points and general longitudinal falls were less obvious due to heavy vegetation and restricted access.

3.12. Sewer Asset Records obtained from Thames Water indicate an adopted foul water sewer within the site. The nearest Surface Water public asset is located in the residential development to the east of the site boundary.

3.13. Thames Water have been contacted to establish available capacity within the foul sewer.

3.14. Details of the highway drainage network within Knowle Lane along the western boundary of the site are unknown.

3.15. A copy of Thames Waters Asset Record is included within **Appendix 1**.

Geology and Hydrogeology

3.16. British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the site predominantly Weald Clay Formation. There are no records of superficial deposits across the site.

3.17. The Cranfield University 'Soilscapes' online viewer indicates the majority of the site overlies slowly permeable seasonally wet slightly acidic but base rich loamy and clayey soils. The southwestern corner of the site has loamy soils with naturally high groundwater.

3.18. The DEFRA Magic Map online viewer indicates that the majority of the site lies outside of any Groundwater Source Protection Zone (SPZ). There is a 50m band of Secondary A bedrock aquifer that underlays the central part of the site. This band has a groundwater vulnerability classification of 'Medium'. The rest of the site is classified as unproductive. An unproductive aquifer is defined by the EA as *'these rocks have negligible significance for water supply or baseflow to rivers, lakes and wetlands. They consist of bedrock and superficial deposits with low permeability that naturally offer protection to any aquifers that may be present beneath'.*

3.19. Minor secondary aquifers are associated with the underlying bedrock and superficial drift layers. These rocks can provide modest amounts of water, but the nature of the rock or the aquifer's structure limits their use. They support water supplies at local rather than strategic scale.

3.20. The DEFRA Magic Map indicates that the site lies within a Drinking Water Safeguard Zone for surface water.

4.0 Overview of Flood Risk

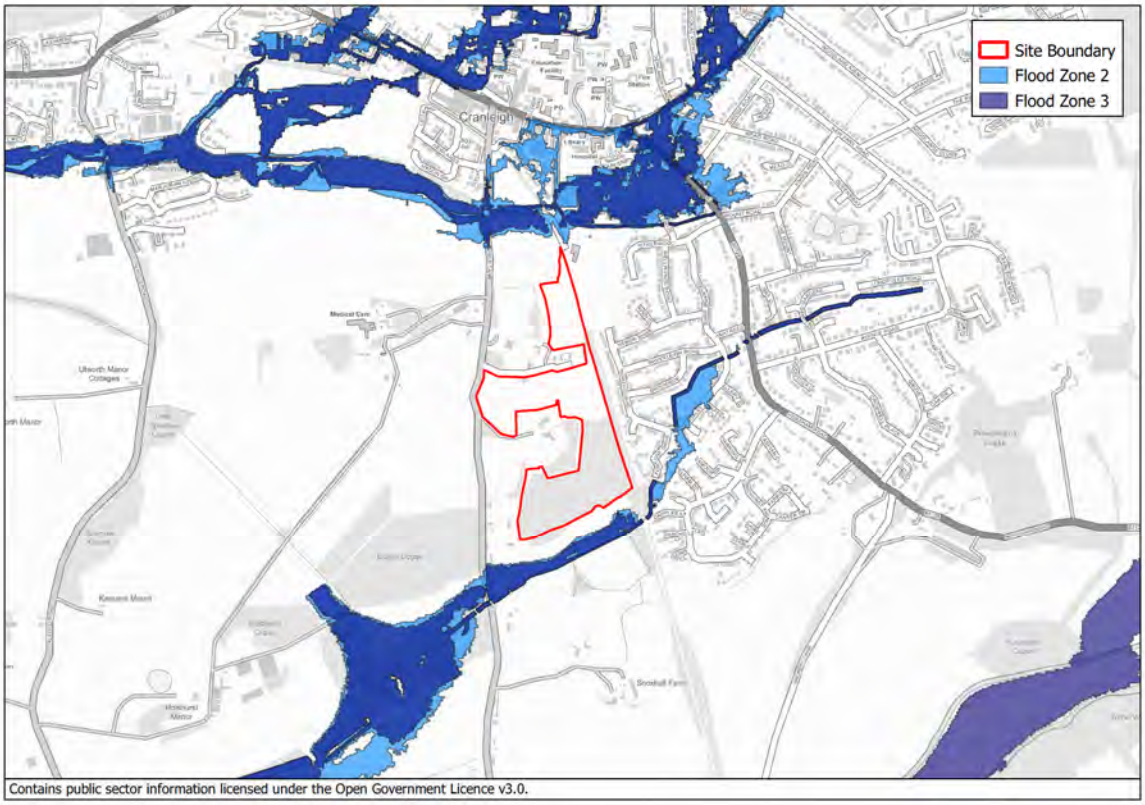
EA Flood Zone Map

4.1. The EA Flood Map for Planning provides an initial indication of the extent of Flood Zones. Flood Zones are defined as follows:

- Flood Zone 1 'Low Probability' – Land less than 1 in 1000 (0.1%) annual probability of river of sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability or river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.2. **Figure 4** shows the EA Flood Zone mapping. It indicates that the entire site is located within Flood Zone 1 'Low Probability' of fluvial flooding.

Figure 4 – EA Flood Zone Map



Flood Risk from Surface Water

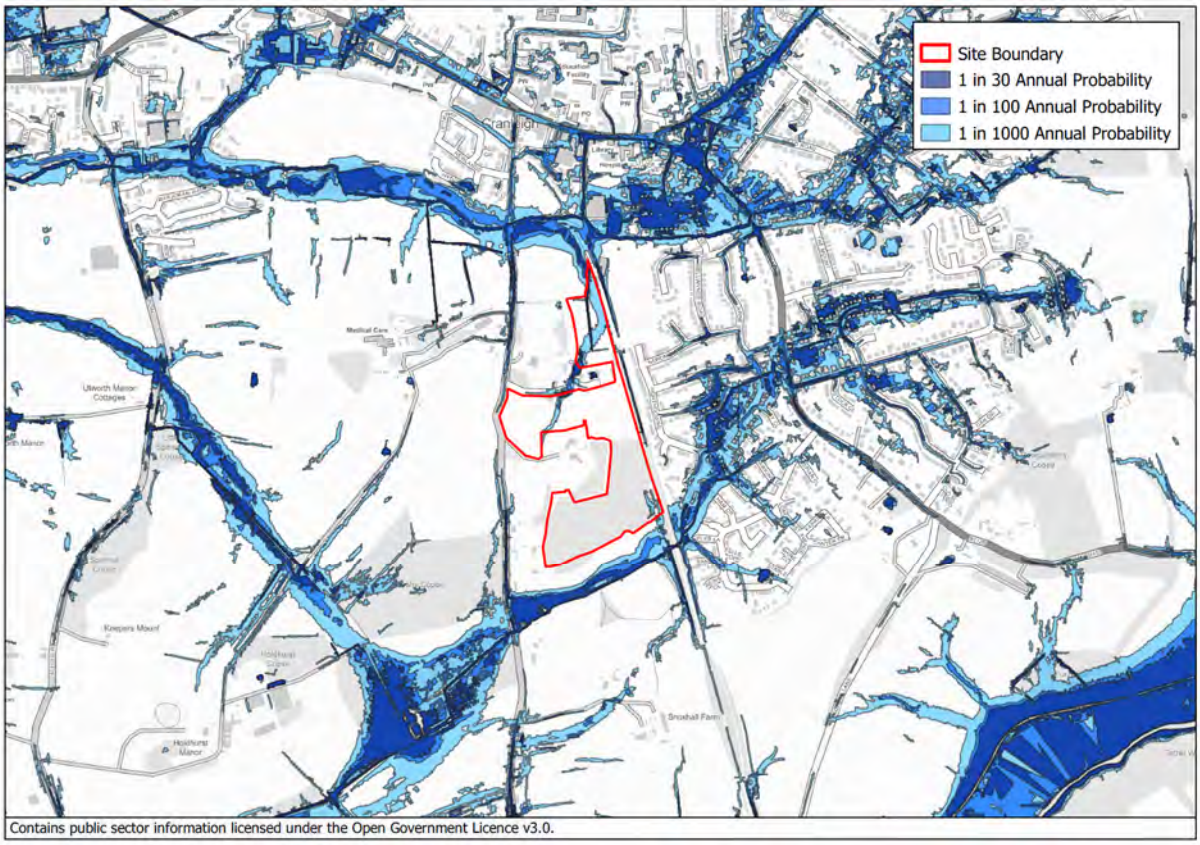
4.3. The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:

- 1 in 30 (3.3%) annual probability 'High Risk'
- 1 in 100 (1%) annual probability 'Medium Risk'
- 1 in 1000 (0.1%) annual probability 'Low Risk'
- Lower than 1 in 1000 (0.1%) annual probability 'Very Low Risk'.

4.4. The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood event (including climate change) within the definition of the design event.

4.5. **Figure 5** shows the flood risk from surface water. The EA Flood Risk from Surface Water mapping indicates that the majority of the site is at a Very Low' (less than 0.1% annual probability) of surface water flooding. There is a surface water flow route through the northern part of the site which has a 'High' risk of surface water flooding. There is a second area of low risk to the south eastern corner of the site.

Figure 5 – EA Flood Risk from Surface Water



4.6. The EA surface water mapping is based on a national scale surface water ground surface model. The model does not consider any site-specific local information on below ground drainage infrastructure. The mapping therefore provides a guide to vulnerable areas based on the topography of the area.

4.7. The WBC SFRA does not have any records that there have not been any surface water incidents within the site boundary.

Flood Risk from Groundwater

4.8. Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.

4.9. The Magic Map online viewer shows that the groundwater vulnerability of a site. It shows that the majority of the site is classed as being 'unproductive'. There is an area of 'High' vulnerability that runs through the centre of the site.

4.10. The groundwater flooding susceptibility map in the WBC SFRA indicates that the northern and eastern parts of the site have a groundwater susceptibility of less than 25%. It indicates that the rest of the site has a susceptibility of between 25% and 50%. The SFRA does not contain any records of groundwater flooding to the site. The risk of flooding from groundwater sources is therefore considered to be low.

Flood Risk from Sewers

4.11. When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.

4.12. The WBC SFRA indicates that there has been 12 incidents of external sewer flooding and 7 incidents of internal sewer flooding within the GU6 8 postcode area. The SFRA does not provide the exact locations of these sewer flooding incidents however, there are limited sewers across the site due to its greenfield land use.

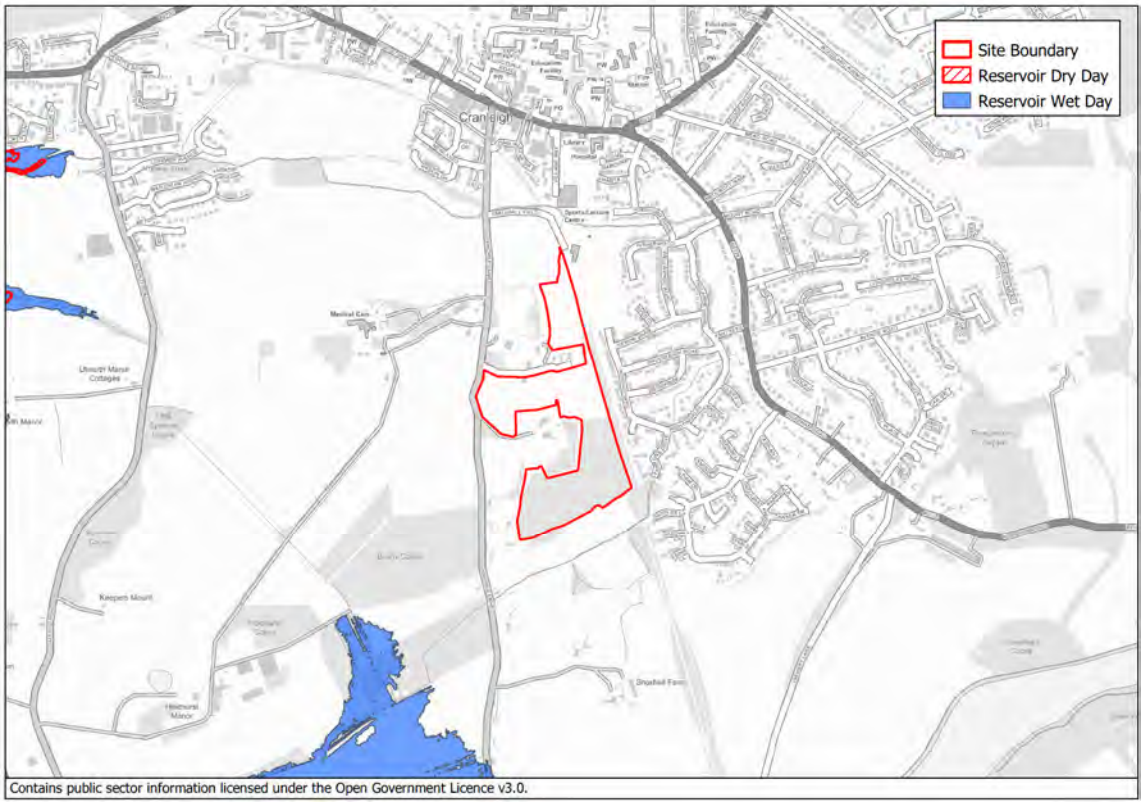
4.13. The risk of flooding from sewers is therefore considered to be low.

Flood Risk from Reservoirs

4.14. The EA flood risk from reservoirs mapping indicates areas that would be at risk of flooding in the event of a reservoir breach.

4.15. **Figure 6** shows the flood risk from reservoirs. The mapping indicates that the site is not at risk of flooding in the event of a reservoir breach. The site is therefore at low risk of flooding from reservoirs.

Figure 6 – EA Flood Risk from Reservoirs



Flood Risk from Other Sources

4.16. The Wey and Arun Junction Canal is located 1.5km to the west of the site. The risk of flooding from artificial sources mapping within the WBC SFRA indicates that the site is not at risk of flooding in the event of a canal breach.

Historic Flood Events

4.17. The EA Historic Flood Map shows the maximum extent of recorded flood events. The site is not shown to have been impacted by a historic flood event.

4.18. A summary from flooding from all sources is shown in **Table 1**.

4.19. Based upon the above information, the site is deemed to be at low risk of flooding. The Illustrative Masterplan is therefore in accordance with National and local planning policy concerning flood risk and as such is suitable for the proposed development.

Table 1 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Tidal			✓	The site is inland.
Fluvial			✓	The site is located within Flood Zone 1.
Pluvial			✓	The majority of the site is at a 'Very Low' or 'Low' risk of surface water flooding. There is a small area of 'High' risk in the northern part of the site. Built development should avoid the area of 'High' and 'Medium' risk.
Groundwater			✓	SFRA mapping indicates that the site is at <50% susceptibility to groundwater flooding.
Sewers			✓	Limited sewers across the site and the SFRA does not indicate the site to be at risk.
Reservoirs, canals and other artificial sources			✓	EA and SFRA mapping do not indicate the site to be at risk.
Design flood			✓	The site is located outside of the 1 in 1000 annual probability flood extent.

5.0 Proposed Development and the Sequential Test

Proposed Development

5.1. Details of the proposed development are included in **Appendix 1**.

Flood Risk Vulnerability

5.2. Annex 3 of the NPPF sets out the flood risk vulnerability classification of a site. This is based upon its proposed usage. Table 3 of the NPPF PPG 'Flood Risk and Coastal Change' is used to determine whether the proposed development is suitable for the Flood Zone that the site is located within and whether the Exception Test is required for the proposed development.

5.3. The proposed residential development is classed as 'More Vulnerable' development.

5.4. The location of the 'More Vulnerable' development is located within Flood Zone 1 and within areas with a 'Low' or 'Very Low' risk of surface water flooding.

NPPF Sequential Test

5.5. NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

5.6. PPG ID: 7 (Table 1) appropriate uses have been identified for the Flood Zones. By applying the Flood Risk Vulnerability Classification in Table 2 and 3 of PPG ID: 7.

5.7. The proposed development is classed as 'More Vulnerable' development. These uses are considered appropriate within Flood Zone 1 and areas with a 'Low' and 'Very Low' risk of surface water flooding without the need for the Sequential Test or the Exception Test to be undertaken.

5.8. A site-specific FRA is required for all development in Flood Zones 2 and 3, and for all developments over 1ha in Flood Zone 1 under the NPPF.

6.0 Flood Mitigation Strategy

Sequential Approach

6.1. The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk. As shown in **Figure 7** all of the built development is located within Flood Zone 1. As shown in **Figure 8** all of the built development is located within an area with a 'Low' or 'Very Low' risk of flooding from surface water.

Figure 7 – Masterplan Overlain on the EA Flood Zone Map

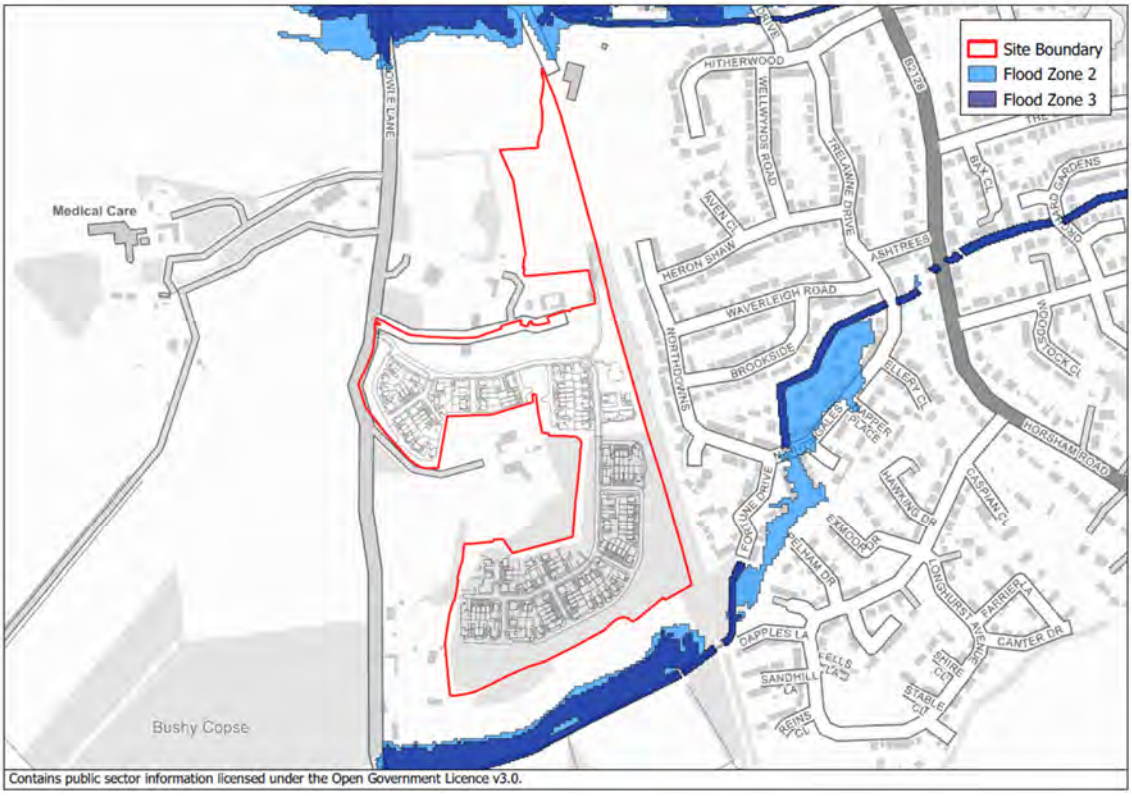
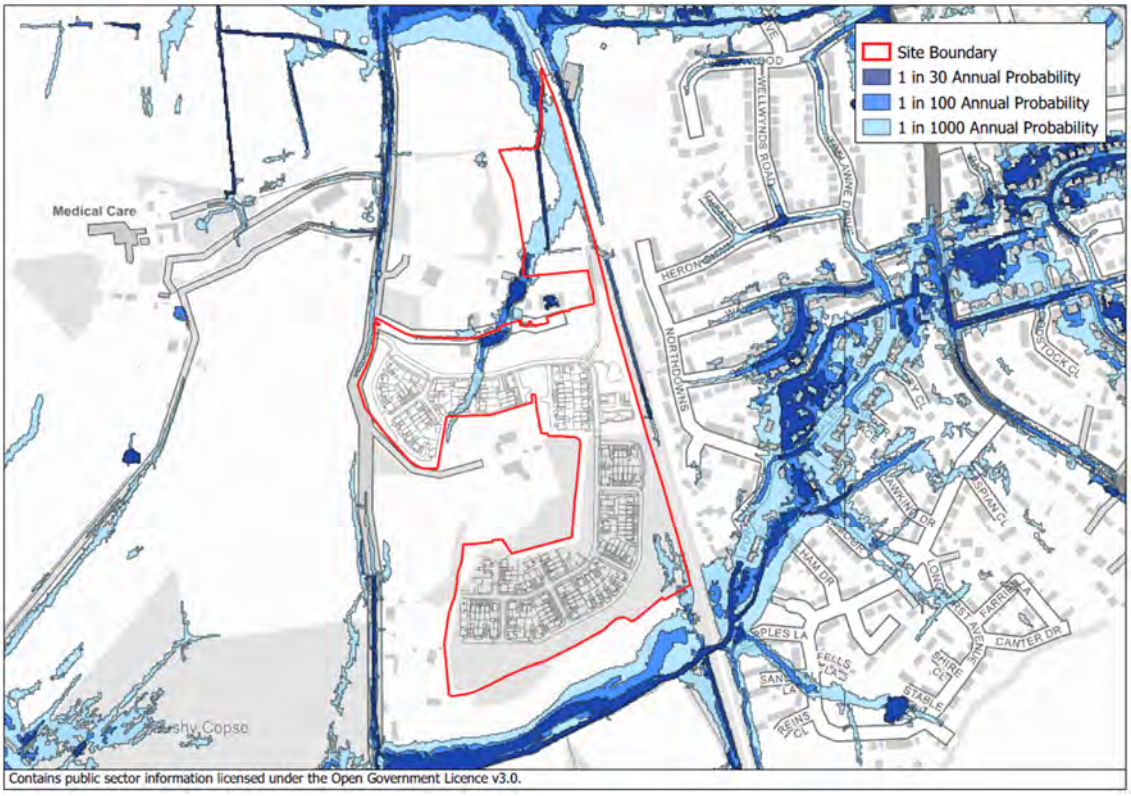


Figure 8 – Masterplan Overlain on the EA Flood Risk from Surface Water Map



Building Design

Ground Floor Levels

6.2. The requirements for setting ground floor levels for new developments are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Developments – Code of Practice'. A finished floor level of at least 300mm above the 1 in 100 annual probability plus climate change allowance is recommended.

6.3. The WBC SFRA states *'All More Vulnerable and Highly Vulnerable development within Flood Zones 2 and 3 should set Finished Floor Levels 300mm above the known or modelled 1 in 100 annual probability (1%) flood level including an allowance for climate change'*.

6.4. Where the site is located outside of the fluvial flood extents, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from the development.

Floodplain Storage

6.5. The site is located outside of the fluvial flood extent. There is therefore no impact on fluvial floodplain storage or flow routes. There is a surface water flow through the northern part of the site. Development should be located outside of the area shown on the EA flood risk from surface water flooding as at 'Medium' and 'High' risk of flooding to avoid detrimentally impacting surface water storage areas or flow routes.

Safe Access

6.6. The site is located outside of the fluvial flood extent. Continuous safe access is therefore available during a flood event.

Residual Risk

6.7. The NPPF PPG – 'Flood Risk and Coastal Change' defined residual risk as coming from 'flood risk management infrastructure' and the 'residual risk to a development once any site-specific flood mitigation measures are taken into account'.

6.8. Residual risk to the site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.

6.9. The residual risk to the site is low. The EA AIMS dataset which contains information of flood defences indicates that the site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the site is not located within an area at risk of flooding in the event of a reservoir. The site is located outside of the 1 in 1000 annual probability flood extent.

7.0 Surface Water Drainage

Introduction

7.1. This chapter provides details on the surface drainage strategy and includes measures to drain the proposed development site.

Overall Strategy

7.2. The proposed drainage strategy has been designed to exceed the requirements of the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principals. The utilisation of Sustainable Drainage Systems (SuDS) not only provides the benefit of controlling waters at source and online treatment of collected surface water but also allows enhanced aesthetics through improved landscaping, biodiversity, and ecological opportunities.

7.3. These features offer a holistic treatment train and management system to the benefit of new residents, members of the wider community, downstream receptors and the environment.

7.4. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. Changes of land uses can have significant downstream impacts where existing drainage systems may not have sufficient capacity for any additional surface water flow.

7.5. A surface water management strategy is therefore required to manage and reduce the flood risk posed by the surface water runoff from the site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates to the pre-development scenario, unless specific off-site arrangements are made and result in the same net effect.

7.6. Sustainable water management measures (SuDS) should be introduced to control the surface water runoff from the proposed development site therefore, managing the flood risk to the site and surrounding areas from the surface water runoff.

7.7. The Construction Industry Research and Information Association, CIRIA's C690 states the following:

- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing surfaces)
- **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting)
- **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways for the entire site)
- **Regional Control** – management of runoff from several sites, typically in a detention basin or wetland.

7.8. The SuDS Manual 2015 (C753) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS. This document provides guidance to ensure that SuDS are planned and designed to maximise the opportunities and benefits of surface water management.

7.9. The four main categories of benefits that can be achieved by SuDS, referred to as the four pillars of SuDS design, are:

- **Water quantity** – control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle;
- **Water quality** – manage the quality of the runoff to prevent pollution
- **Amenity** – create and sustain better places for people
- **Biodiversity** – create and sustain better places for nature.

7.10. Supplemental to CIRIA guidance, Document H of the Building Regulations 2015 sets out three possible options to discharge surface water runoff. Rainwater shall discharge to one of the following, listed in order of priority:

- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
- A watercourse; or where that is not reasonably practicable
- A sewer.

7.11. As infiltration is unlikely to be a viable method of disposal (Ref: Para 3.16 above), the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses i.e. the existing open field ditch on site which would be feasible point of discharge.

7.12. Implementation of SuDS will ensure that flood risk downstream is not increased due to the proposed development. These features will also provide positive improvements to the quality of surface water runoff.

7.13. The following SuDS components are deemed applicable to the site:

- Pervious surfacing systems – structural surfaces that allow water to penetrate into a granular layer thus providing storage and treatment, e.g. pervious paving.
- Conveyance systems – components that convey flows to downstream storage systems, e.g. swales and filter drains.
- Storage systems – components that control flow, and possibly volumes, by storing water and releasing it slowly, e.g. geocellular units, attenuation basins and wetlands.
- Treatment systems – components that remove or facilitate the degradation of contaminants present in runoff, e.g. filter strips and proprietary treatment systems.

LLFA Recommendations

7.14. Any surface water discharged from the site should be limited to the existing greenfield run-off rate applied to the proposed positively drained area only.

7.15. Evidence must be provided to establish the greenfield run-off rate for the site.

7.16. On site attenuation should be provided for the 1 in 100 year + climate change rainfall event.

7.17. It is suggested that some areas of the site may be suitable for infiltration based SUDS.

Pre and Post Development Areas/Rates

7.18. To quantify any potential increase in surface water runoff, the existing Greenfield/Pre-Development runoff rate from the site must be determined. The rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS. The recommended methodology for sites up to 50 hectares in area is the ICP SuDS method.

7.19. An assessment of existing surface water runoff has been undertaken, to determine the potential surface water options and attenuation requirements for the site utilising the following parameters.

- Average Annual Rainfall (SAAR): 778mm
- Soil: 0.470
- Region No.: 6

7.20. With an overall site area of 11.5 hectares (ha), the calculated Greenfield run off discharge rates and volumes are as presented in **Figure 8**. The corresponding runoff outputs created within MicroDrainage can be found within **Appendix 3**.

Figure 8 – Pre-Development Runoff Rates/Volumes

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s)	Greenfield/Pre-Development Runoff Rate for 11.5ha (l/s)	Greenfield/Pre-Development Volume 360 minute storm
1 in 1 year event	4.64	53.36	1213
QBar	5.46	62.79	1611
1 in 30 year event	12.57	144.56	2783
1 in 100 year event	17.43	200.45	3746

7.21. Based on the Illustrative Masterplan, it has been conservatively estimated that the impermeable surfaces will be approximately 65% of the developable area. Depending upon how future Reserved Matters Site Layouts evolve, this percentage typically reduces slightly to around 55-60%.

7.22. The use of 65% therefore provides for a robust assessment which allows for fluctuations in residential density and future urban creep of up to 10% in accordance with The SuDS Manual (CIRIA 753).

7.23. The overall Post developed area amounts to 5.9 hectares (ha), of which 3.8ha has been calculated as being impermeable.

7.24. In order to comply with best practice as stipulated in EA Report SC030219 'Rainfall Runoff Management for Developments', proposed discharge rates should be restricted to one of two methods for all storms up to and including the 1 in a 100 year storm event plus a 45% allowance for climate change.

1. Variable Greenfield discharge rates

7.25. This would require traditional on-site attenuation to hold back flows controlled by a complex control device, such as multiple vortex control devices. Discharge rates would be set so as not to exceed the pre-development 1in1, 1in30 and 1in100 year runoff rates set out in **Figure 8** based upon the appropriate catchment area.

7.26. In addition to this onsite attenuation, consideration of Long Term Storage would also be necessary given the increase in discharge volume generated by the proposed development, over and above that pre-development. This storage would need to be release into the surrounding watercourses at a low rate of 2.0 l/s/ha. This would normally be controlled by a secondary attenuation area and supplemental control device.

7.27. The Long Term Storage (LTS) requirement under this scenario would be based upon the EA/DEFRA Report SC030219: Rainfall Runoff Management for Development, which provides for the following approximation for the site.

LTVol100yr6hr = Rainfall Depth x Long Term Storage Factor x Impermeable Area
Whole Site LTVol100yr6hr = 70 mm x 3.2 x AREA ha = STORAGE REQUIREMENT m^3

Additional LTS Volume = 70 x 3.2 x 3.61 = <u>808m^3</u>

2. QBar Greenfield discharge rate

7.28. Alternatively, all discharge flows could be restricted to QBar. This would negate the requirement for Long Term Storage and again flows would be attenuated on site and discharged utilising an onsite control device, such as a vortex control device. This normally requires a greater volume of attenuation.

7.29. For the purposes of this report and to provide a robust analysis, all attenuation requirements have been calculated utilising all discharge flows restricted to QBar, as this is normally the worst case scenario. **Appendix 3** establishes the 'per hectare' calculation of QBar as being 5.46 litres/second.

7.30. The use of QBar gives a value for the average annual peak runoff rate, this provides a comprehensive SuDS scheme with the volume runoff being reduced for intense storms. However, either method described above is viable and will be investigated further during detailed design.

7.31. With the above in mind, and having assessed limiting the offsite discharge rate to QBar, the anticipated attenuation volumes for a 100 year storm with a 40% allowance for climate change are as follows:

Figure 9 – Calculated Attenuation Volumes based upon QBar

Catchment	Catchment Area (ha)	Impermeable Area (ha)	QBAR (l/s)	Approximate Attenuation Volume Required (m^3)
1	2.67	1.54	8.4	1650

2	3.95	2.07	11.3	2100
Totals	**6.32**	**3.61**		

Surface Water Proposals

7.32. It is proposed to provide a network of trapped gullies, pipes and Sustainable Drainage (SuDS) features to collect the surface water runoff from impermeable areas such as roads, roofs and driveways. The traditional system will work in combination with such features as permeable paving, roadside swales and basins to provide attenuation storage and high-quality water benefits.

7.33. The layout of boundary ditches are unaffected and therefore existing outfall points will remain as is, with new headwalls being constructed within the site as required. The topography of the site effectively bisects the site in half, This has created two separate sub-catchments (Catchment 1 and 2).

7.34. Each sub-catchment benefits from its own principal attenuation basin and outfall point into nearby ditches.

7.35. Drawing A423-001 Overall Site Drainage Strategy provides an overview to the proposals and sub-catchments, a copy of which is included within **Appendix 3**.

7.36. The banks of the SuDS basins will be designed in accordance with the SuDS Manual C753 in respect to having a maximum gradient of 1 in 4 and an appropriate freeboard above the maximum water level. This allows landscaping of both wetland and wildflower mixes to provide an appropriate landscape context in the vicinity of the features through the provision of an aquatic shelf.

7.37. Open SuDS features will be designed so as not to compromise the safety of residents, visitors and their property. Generally open boundaries are provided, and perimeter planting could be utilised to define the extents of the features.

7.38. Proposed discharge rates will be restricted to QBAR for all storm events up to and including the 1 in 100 year storm event plus 45% allowance for climate change. This would negate the requirement for Long Term Storage and flows would be attenuated on site and discharged utilising an on-site flow control device such as a Hydrobrake.

7.39. All conveyance systems will be designed to cater for the 1:30 year storm event, in accordance with industry standard, with all attenuation features designed to allow for the 1 in 100 year storm event plus 45% climate change allowance.

7.40. The proposals draw reference to the DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, as well as CIRIA C753 The SuDS Manual.

7.41. Current uncontrolled pluvial runoff exhibited onsite during high rainfall events (Ref: Figure 5 above) will be mitigated as a result of the Development. This will occur by virtue of the change in surface from greenfield to positively drained impermeable areas, which will serve to capture, attenuate and delay surface water runoff northwards towards the playing fields. This will be a benefit to downstream receptors.

7.42. This proposal identifies the principal components of the surface water strategy and is subject to further detailed localised investigations as part of the subsequent Reserved Matters applications. These assumptions are subject to evolution as the design develops and the individual parcels are further realised.

7.43. There is scope to utilise source control techniques (such as swales, granular strips and permeable paving) which will assist with the reduction of larger attenuation storage features. This should be embraced and investigated as the project progresses.

7.44. Subject to the provision of additional geotechnical information, the attenuation basins may require partial lining to protect against the ingress of natural groundwater. Such lining provides the ability to create localised, small permanent bodies of water which adds landscaping and biodiversity opportunities to the scheme.

Exceedance Flood Routing

7.45. Flows in excess of the above design storms, which may flood from the network for storms in excess of the 1 in 100 year storm plus 45% climate change, will be kept within the internal road network, until such time as they can be directed into adjacent landscaping areas or existing vegetation/woodland. This ensures that no onsite or offsite residential units are afforded an increased level of protection from flood waters until such time as the rain events become significant.

7.46. The attenuation basins are designed to provide 400mm freeboard and therefore can accept additional flood water from manholes upstream.

Water Quality Improvements

7.47. CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new development. This is a simple index approach which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.

7.48. This process identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.

7.49. Surfaces generating runoff are ‘graded’ on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out overleaf.

Figure 10 – Extract from Table 26.2 SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs	Low	0.3	0.2-0.8	0.05
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard, parking with frequent change, other roads,	Medium	0.7	0.6	0.7
Sites with heavy pollution	High	0.8	0.8	0.9

7.51. Historically, PPG3 documentation would recommend that pollutants were removed utilising oil separators, but since its superseding, more recent guidance has shifted to the use of SuDS features to remove pollutants; thereby providing significant improvements in treatment.

7.52. The use of non-mechanical features decreases the requirements for maintenance and increase natural biodiversity. That said, the SuDS Manual does not remove the possibility of utilising separators, so long as they are considered in partnership with a comprehensive overall SuDS regime.

7.53. Without adequate treatment, the pollutants would cause damage if they were to enter the watercourse or water table in large volumes. The use of SuDS features to slow down and degrade these pollutants is critical to the provision of an acceptable discharge.

7.54. The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below.

Figure 11 – Extract from Table 26.3 SuDS Manual

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

7.55. The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.

7.56. In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

SuDS Maintenance Strategy

7.57. For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented.

7.58. During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the Management Company, statutory authority, or community group commissioned to maintain the features in perpetuity.

7.59. As part of the strategy, a regular maintenance regime will be created, which consists of several primary measures required to ensure the longevity of the system. These should be undertaken on a regular basis to ensure consistent performance. Typical maintenance activities consist of:

- Inspecting and reporting; relatively regular review of the condition identifying issues and providing resolutions. Periodic review from the maintenance contractor;
- Litter and debris removal;
- Grass trimming, overall cutting and localised strimming preventing blockages;
- Weed and evasive plant control;

- Shrub management;
- Aquatic and shoreline vegetation management;
- Sweeping pervious surfaces; and
- Oil removal from proprietary systems.

7.60. A remedial maintenance schedule would be recommended as part of the handover of the SuDS features, remedial maintenance is required to provide repairs to the system and monitor long term damage ensuring the system remains consistently productive. the schedule could consist of;

- Structure rehabilitation and repair;
- Infiltration surface rehabilitation;
- Scarifying to remove “Thatch”;
- Spiking or Tining the soil;
- Air pressure treatment.

7.61. The maintenance schedule contents and timing will depend upon multiple factors including usage, contents of water utilising the system, location and biology. To this end, it is suggested that the schedule be finalised as part of detailed design; ensuring the most comprehensive maintenance schedule is incorporated for the phase in hand.

7.62. Community outreach can be undertaken as part of the development, which will raise awareness on the importance of SuDS to both flood risk and water quality in the local area. Imparting the new residents with knowledge on the risks associated with pollution to the surface water drainage system is key, as is the direct effect their actions may have on water quality and biodiversity in the area.

Adoption and Ownership

7.63. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and the requirement of the National Planning Policy Framework

7.64. The intention of adoption and ownership of drainage and SuDS is as follows:

- Surface water sewers within development parcels to be offered for adoption to Southern Water under the Section 104 process of the Water Industry Act.
- Surface water highway drains, gullies and leads within adopted roads to be maintained by the Highway Authority.
- Above ground attenuation (i.e. swales and basins) to be maintained by a private maintenance company funded by residential properties or subject to agreement with the Local Authority.
- SuDS features serving single properties, for example, permeable paved driveways to single dwellings, will be owned and maintained by the owner of that property.

7.65. Suitable adoption and maintenance regimes for SuDS should be submitted in support of the Reserved Matters application.

8.0 Foul Water Drainage

Introduction

8.1. This chapter provides details on the proposed foul water drainage strategy and measures to convey effluent.

Overall Strategy

8.2. Due to the topography of the site and location of the existing foul sewer point of connection, wastewater from the northern part of the site can flow entirely by gravity to the receiving public sewer. The southern part of the site will need to be pumped into the northern system.

8.3. Thames Water have assessed the available capacity within the existing network and established that reinforcement and improvement works will be necessary, however it is envisaged that a new 150mm diameter foul sewer will be connected to existing manhole 9401 .

8.4. The delivery of the sewer connection will be possible via Section 106 of the Water Industry Act. Downstream improvement works will be undertaken by Thames Water as outlined in their letter dated 26th October 2022 contained within **Appendix 2**.

8.5. The proposed foul water sewers will be designed in collaboration with Thames Water as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Thames Water for adoption under Section 104 Agreement of the Water Industry Act.

Adoption and Ownership

8.6. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.

8.7. Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to Thames Water under the Section 104 process of the Water Industry Act.

9.0 Conclusion

Flood Risk

9.1. The EA Flood Risk mapping was reviewed alongside the Surrey County Council (SCC) Preliminary Flood Risk Assessment (PFRA) and Waverley Borough Council (WBC) Strategic Flood Risk Assessment (SFRA).

9.2. This Flood Risk Assessment (FRA) concludes that:

- The entire site is located within Flood Zone 1 'Low Probability' (land at less than 1 in 1000 (0.1%) annual probability of river or sea flooding').
- The site is at low risk of tidal flooding due to its inland location.
- The majority of the site is located in an area with a 'Very Low' (land lower than 1 in 1000 (0.1%) annual probability) risk of flooding from surface water. There is a surface water flow route in the northern part of the site that is at a 'High' (land greater than 1 in 30 (3.3% annual probability) risk of flooding from surface water.
- There are no records of groundwater flooding at the site. The site is therefore considered to be at a low risk of flooding from groundwater.
- Given the lack of sewers at the site, the site is considered to be at low risk of flooding from sewers.
- The site is not at risk of flooding in the event of a reservoir breach or canal breach.

Vulnerability and the Sequential Test

9.3. The proposed development is classed as 'More Vulnerable' development. These uses are considered appropriate within Flood Zone 1 and areas with a 'Low' or 'Very Low' risk of surface water flooding without the need for the Sequential Test to be undertaken.

Mitigation Strategy

9.4. Where the site is located outside of the fluvial flood extents, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from houses.

9.5. The proposed surface water drainage strategy will manage the flood risk posed by uncontrolled surface water runoff from the site. Any increase in surface water run-off can be managed using SuDS source control techniques as well as attenuation features to provide storage in extreme storm events. This provides the minimum of two treatment storage stages which is in accordance with the recommendations of CIRIA C753.

9.6. All surface water drainage systems will be designed to restrict drainage discharge rates to QBAR runoff rates and store the balance of water for all events up to and including the 1 in 100 year event including allowance for a 40% increase in rainfall intensities as a result of climate change and urban creep.

Summary

9.7. This FRA demonstrates that the proposed development complies with national and local planning policy in response to flood risk and drainage. The risk of flooding is adequately managed, and the offsite flood risk is not increased.

Appendices

Appendix 1 - Plans

Illustrative Masterplan

Topographic Survey

Thames Water Sewer Asset Plan

KEY

Site boundary

richards urban design

Site

LAND EAST OF KNOWLE LANE, CRANLEIGH

Drawing

Illustrative masterplan

Scale

1:1250@A1

0 10 20 30 40 50m

Date

09.12.22

Drawing ref

1321.**02**

Tree Schedule

Pt No	Spread	Bole	Height	Species
85137	9.0	0.30	13.0	OAK
85140	13.0	0.50	15.0	OAK
85141	13.0	0.50	15.0	OAK
85203	6.0	0.40	17.0	PINE
85204	22.0	1.00	22.0	OAK
85205	22.0	1.00	22.0	OAK
85207	22.0	1.00	22.0	OAK
85208	22.0	1.00	22.0	OAK
85255	15.0	1.20	16.0	OAK
85256	14.0	0.50	13.0	OAK
85257	9.0	0.30	11.0	OAK
800025	6.0	0.30	10.0	MAPLE
800026	6.0	0.30	10.0	MAPLE
800027	6.0	0.40	10.0	TREE UNKNOWN
800028	5.0	0.30	10.0	TREE UNKNOWN
800029	7.0	0.30	14.0	TREE UNKNOWN
800030	9.0	0.50	15.0	TREE UNKNOWN
800036	8.0	0.30	14.0	TREE UNKNOWN
800042	7.0	0.40	16.0	PINE
800107	7.0	0.40	15.0	PINE
800108	7.0	0.50	11.0	TREE UNKOWN
800109	7.0	0.30	11.0	TREE UNKOWN
800114	7.0	0.40	16.0	PINE
800115	7.0	0.40	16.0	PINE
800116	10.0	0.40	15.0	TREE UNKOWN
800117	6.0	0.70	13.0	TREE UNKOWN
800121	7.0	0.50	16.0	PINE
800122	5.0	0.30	11.0	PINE
800123	5.0	0.30	16.0	PINE
800124	10.0	0.60	16.0	TREE UNKNOWN
800130	5.0	0.40	16.0	PINE
800140	5.0	0.30	17.0	PINE
800141	5.0	0.40	17.0	PINE
800142	5.0	0.50	17.0	PINE
800143	6.0	0.70	17.0	PINE
800145	6.0	0.30	14.0	TREE UNKNOWN
800146	5.0	0.30	14.0	TREE UNKNOWN
800148	7.0	0.70	17.0	PINE
800155	8.0	0.80	15.0	OAK
800156	6.0	0.50	15.5	PINE
800158	6.0	0.60	15.0	TREE UNKNOWN
800187	8.0	0.30	15.0	TREE UNKNOWN
800188	7.0	0.50	13.0	TREE UNKNOWN
800189	7.0	0.50	13.0	TREE UNKNOWN
800190	6.0	0.30	13.0	TREE UNKNOWN
800191	6.0	0.70	12.0	PINE
800193	6.0	0.30	14.0	OAK
800194	6.0	0.30	14.0	OAK
800195	7.0	0.40	15.0	OAK
800196	8.0	0.70	17.0	PINE
800202	7.0	0.30	14.0	OAK
800209	5.0	0.60	17.0	PINE
800210	5.0	0.60	17.0	PINE
800211	7.0	0.60	14.0	OAK
800212	4.0	0.30	8.0	TREE UNKNOWN
800213	4.0	0.40	12.0	PINE
800214	6.0	0.30	15.0	TREE UNKNOWN
800215	7.0	0.50	15.0	TREE UNKNOWN
800216	5.0	0.30	12.0	TREE UNKNOWN
800222	11.0	0.80	15.0	OAK
800223	5.0	0.30	10.0	TREE UNKNOWN
800229	5.0	0.40	12.0	TREE UNKNOWN
800230	8.0	0.60	14.5	TREE UNKNOWN
800231	7.0	0.40	13.0	TREE UNKNOWN
800232	7.0	0.30	13.0	TREE UNKNOWN
800233	6.0	0.30	13.0	TREE UNKNOWN
800234	6.0	0.30	13.0	TREE UNKNOWN
800235	6.0	0.30	10.0	TREE UNKNOWN
800236	7.0	0.30	10.0	TREE UNKNOWN
800242	10.0	0.70	16.0	OAK
800246	7.0	0.40	12.0	TREE UNKNOWN
800247	8.0	0.40	13.0	TREE UNKNOWN
800248	6.0	0.30	10.0	TREE UNKNOWN
800249	6.0	0.30	12.0	TREE UNKNOWN
800254	6.0	0.30	12.0	TREE UNKNOWN
800255	10.0	0.30	8.0	TREE UNKNOWN
800264	6.0	0.30	11.0	TREE UNKNOWN
800289	6.0	0.30	14.0	PINE
800290	9.0	0.70	15.0	OAK
800291	8.0	0.30	14.0	OAK
800292	8.0	0.30	14.0	OAK
800293	6.0	0.30	14.0	TREE UNKNOWN
800294	8.0	0.40	14.0	OAK
800295	8.0	0.40	14.0	OAK
800302	9.0	0.40	15.0	OAK
800303	8.0	0.50	15.0	OAK
800313	8.0	0.30	15.0	OAK
800314	8.0	0.30	15.0	OAK
800315	8.0	0.30	15.0	OAK
800323	10.0	0.60	15.0	OAK
800324	10.0	0.60	15.0	OAK
800325	8.0	0.40	15.0	TREE UNKNOWN
800326	8.0	0.40	17.0	PINE
800335	7.0	0.50	13.0	TREE UNKNOWN
800336	8.0	0.50	16.0	TREE UNKNOWN
800337	7.0	0.30	15.0	TREE UNKNOWN
800338	7.0	0.50	15.0	TREE UNKNOWN

Tree Schedule

Pt No	Spread	Bole	Height	Species
6099	8.0	0.30	12.0	OAK
6100	6.0	0.30	12.0	OAK
6101	12.0	0.40	15.0	OAK
6102	12.0	0.30	15.0	OAK
6103	10.0	0.30	13.0	OAK
6104	13.0	0.50	16.0	OAK
6105	10.0	0.30	12.0	OAK
6106	12.0	0.30	12.0	OAK
6107	12.0	0.30	12.0	OAK
6108	12.0	0.30	12.0	OAK
6109	12.0	0.30	12.0	OAK
6110	8.0	0.30	14.0	PINE
6111	8.0	0.50	14.0	PINE
6112	20.0	1.10	18.0	OAK
6119	8.0	0.30	12.0	OAK
6120	12.0	0.80	15.0	ASH
6121	12.0	0.80	16.0	ASH
6122	8.0	0.30	16.0	ASH
6123	8.0	0.30	12.0	ASH
6124	11.0	0.30	16.0	ASH
6125	12.0	0.50	14.0	ASH
6136	5.0	0.30	10.0	TREE UNKOWN
6141	8.0	0.30	11.0	OAK
6142	9.0	0.30	11.0	OAK
6169	9.0	0.50	11.0	OAK
6170	18.0	1.00	15.0	OAK
6171	18.0	1.40	15.0	OAK
6172	8.0	0.30	8.0	SYCAMORE
6173	10.0	0.30	12.0	BEECH
6177	8.0	0.30	12.0	BEECH
6178	8.0	0.30	12.0	OAK
6179	8.0	0.30	12.0	OAK
6180	8.0	0.30	12.0	OAK
6184	4.0	0.20	8.0	HOLLY
6185	18.0	1.20	18.0	OAK
6186	10.0	0.30	12.0	BIRCH
60042	9.0	0.50	13.0	ASH
60043	7.0	0.30	9.0	TREE UNKOWN
60045	10.0	0.50	12.0	ASH
60046	11.0	0.50	13.0	OAK
60050	11.0	0.60	12.0	OAK
60051	8.0	0.60	9.0	OAK
60052	11.0	0.40	12.0	OAK
60053	12.0	0.70	15.0	ASH
60057	8.0	0.30	11.0	ASH
60059	13.0	0.70	15.0	OAK
60100	13.0	0.80	13.0	OAK
60101	10.0	0.50	10.0	OAK
60102	9.0	0.40	11.0	OAK
60103	13.0	0.80	13.0	OAK
60142	12.0	0.50	15.0	ASH
60143	12.0	0.50	11.0	OAK
60144	7.0	0.30	7.0	CHERRY
60145	12.0	0.50	12.0	OAK
60147	10.0	0.50	12.0	OAK
60192	12.0	0.50	13.0	OAK
60193	9.0	0.40	13.0	OAK
60226	13.0	0.60	13.0	OAK
60227	8.0	0.30	11.0	OAK
60228	8.0	0.30	10.0	OAK
60229	10.0	0.40	12.0	OAK
60232	12.0	0.40	14.0	MAPLE
60292	11.0	0.50	12.0	OAK
60296	8.0	0.30	10.0	ASH

Notes:

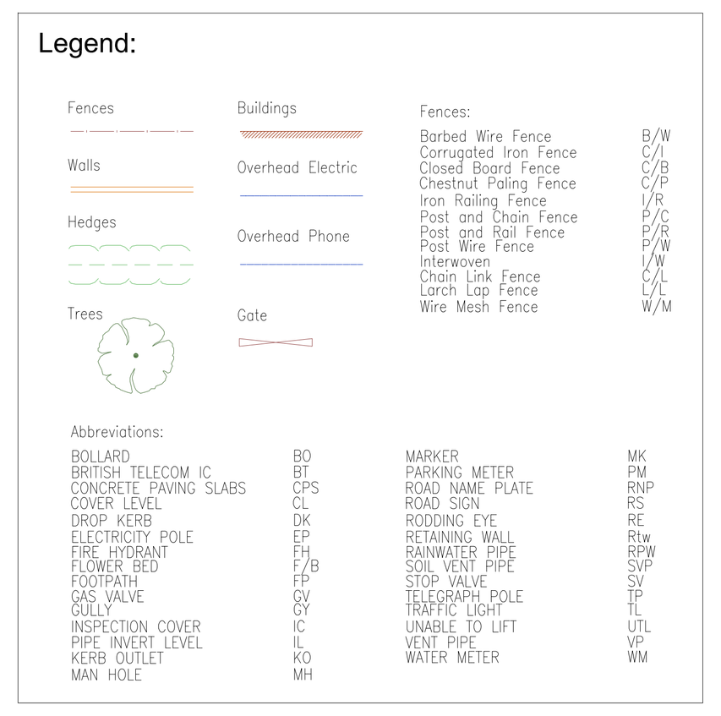
Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

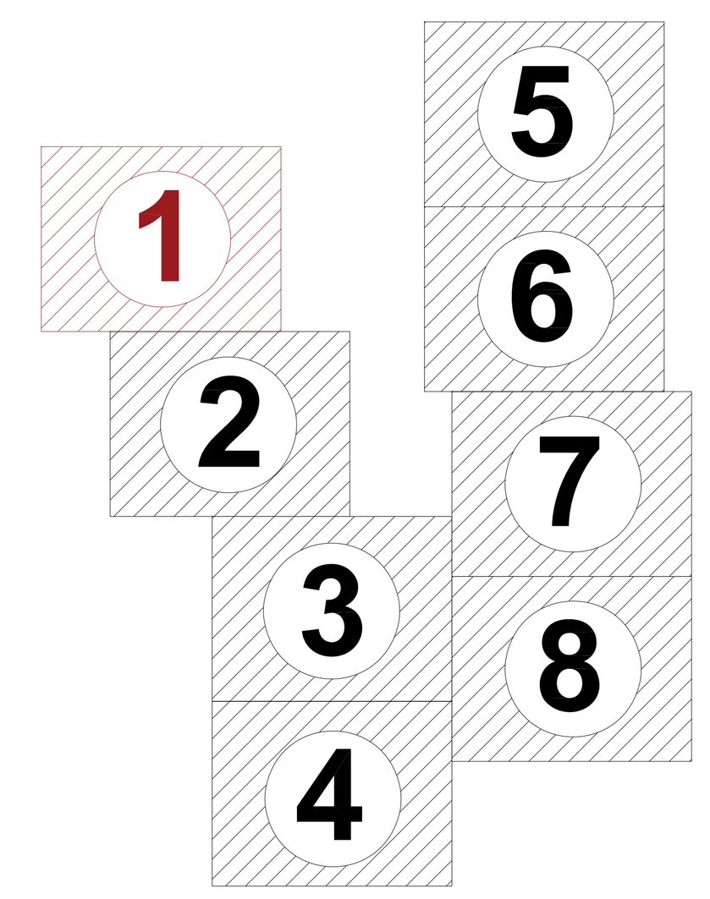
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:



Sheet Layout



Sheet Layout

Stn	Easting	Northing	Level
STNBZ1	505635.925	138292.204	66.546
STNBZ2	505655.601	138245.093	68.511
STNBZ3	505695.748	138211.243	66.932
STNBZ4	505757.995	138257.999	61.397
STNL1	505935.369	138350.612	60.137
STNL10	506040.289	138009.456	54.212
STNL11	506024.123	138027.866	55.023
STNL12	505935.093	137974.839	55.137
STNL13	505829.662	137927.198	55.837
STNL14	505773.576	137905.395	56.073
STNL15	505767.227	137952.489	58.031
STNL16	505781.236	138034.861	61.405
STNL17	505821.175	138077.905	62.502
STNL18	505844.213	138063.873	61.346
STNL19	505934.417	138089.639	58.403
STNL2	505992.916	138305.248	60.558
STNL20	505942.505	138165.375	61.036
STNL4	506006.924	138239.600	59.527
STNL5	505943.630	138232.952	62.817
STNL6	506029.215	138239.749	57.839
STNL7	506056.829	138131.728	58.168
STNL7A	506037.067	138245.507	58.284
STNL8	506073.062	138075.987	58.044
STNL9	506057.507	138046.447	55.016
STNLH1	506007.816	138306.495	57.340
STNM1	505895.400	138257.444	64.280
STNP4	505804.369	138360.516	57.560
STNP4	505804.369	138360.516	57.560
STNP5	505874.202	138372.788	57.966
STNP5	505874.202	138372.788	57.966
STNS5	505664.272	138379.528	60.578

Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

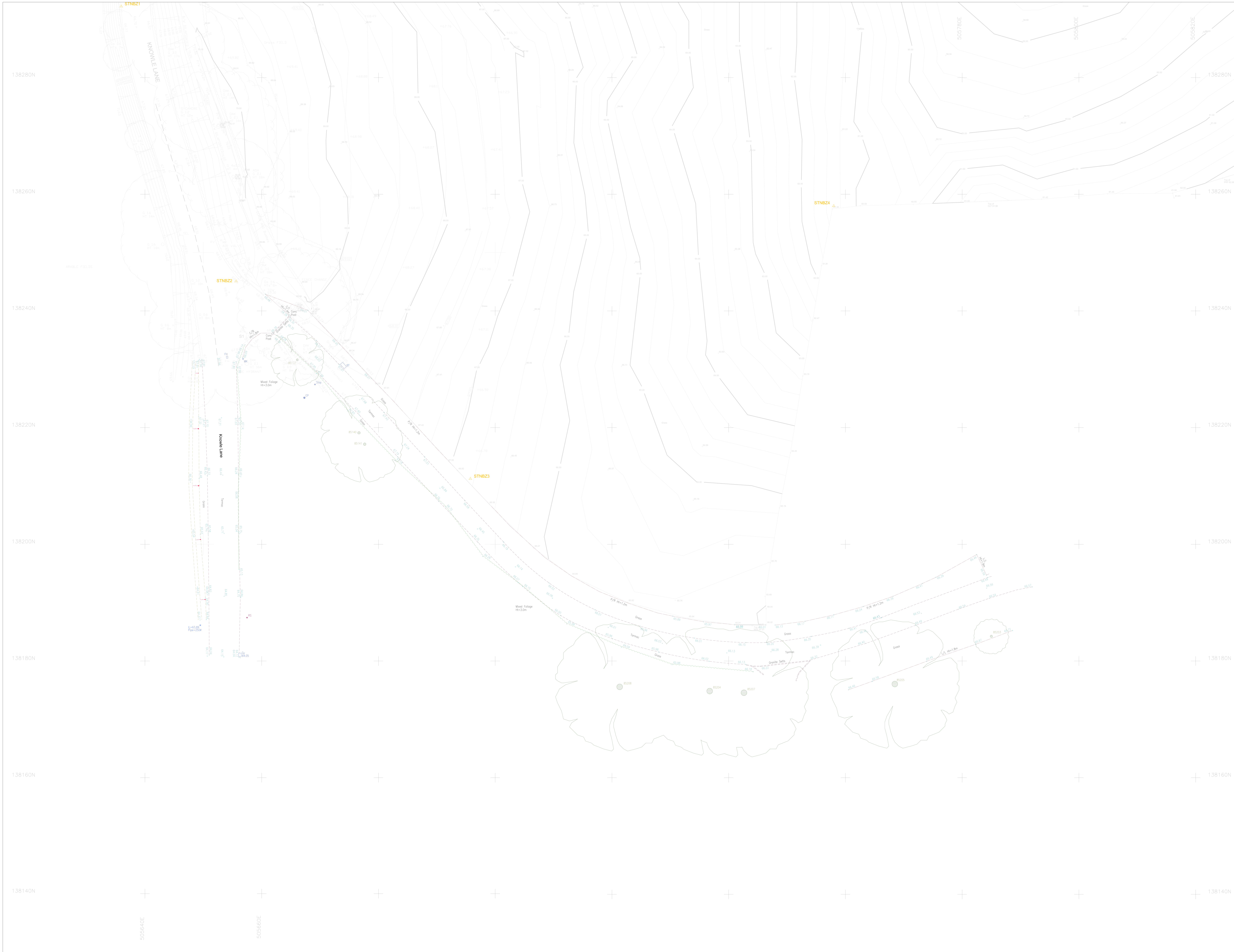
Knowle Green
Cranleigh

Drawing Title

Topographical Survey
Sheet 1 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/1	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

CD SURVEYS LTD
LAND, BUILDING & SITE ENGINEERING
PENTIRE - STABLE 1
FORDBRIDGE ROAD,
SUNBURY-ON-THAMES
MIDDLESEX, TW16 6AX
Tel (01932) 761196
Fax (01932) 786419
Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com



Notes:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Sheet Layout

1 2 3 4 5 6 7 8

Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey
Sheet 2 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/2	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

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LAND, BUILDING & SITE ENGINEERING
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MIDDLESEX, TW16 6AX
Tel (01932) 761196
Fax (01932) 786419
Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com

Notes:

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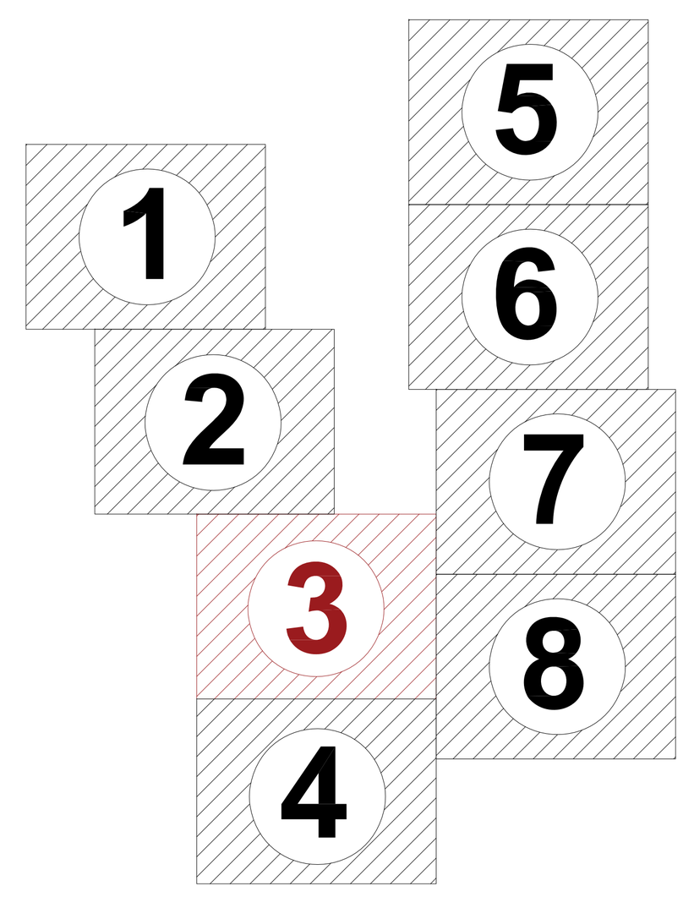
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey
Sheet 3 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/3	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

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Fax (01932) 786419
Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com

Notes:

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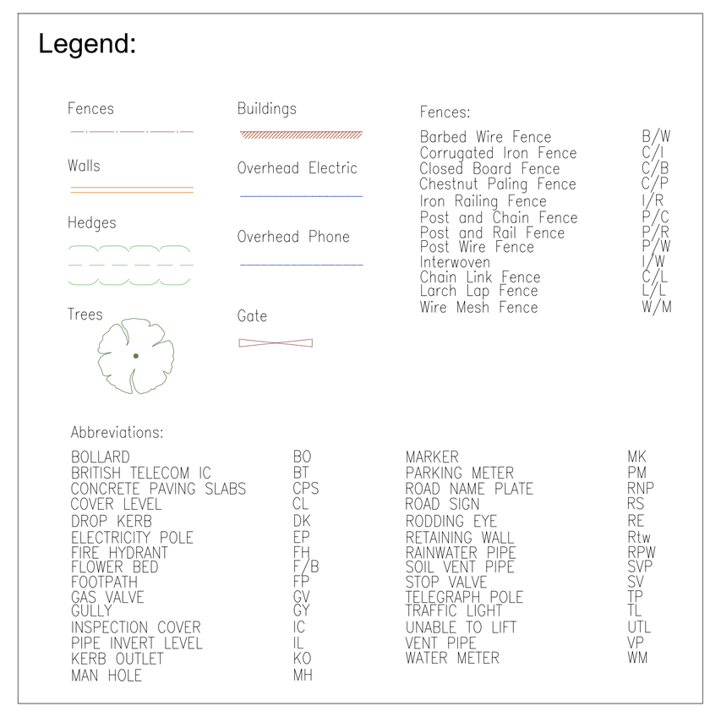
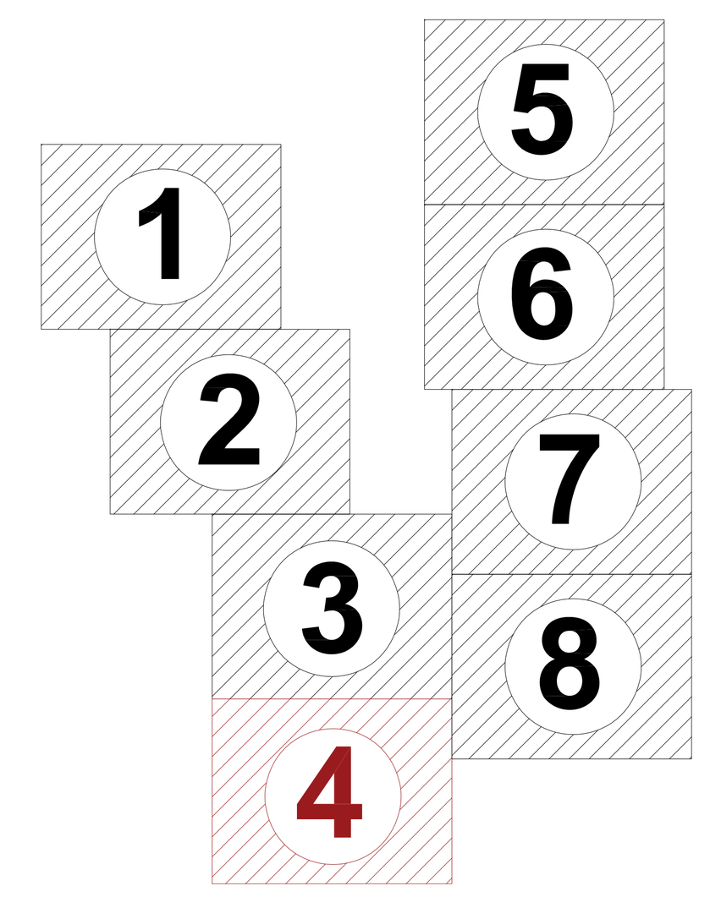
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:



Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey Sheet 4 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/4	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

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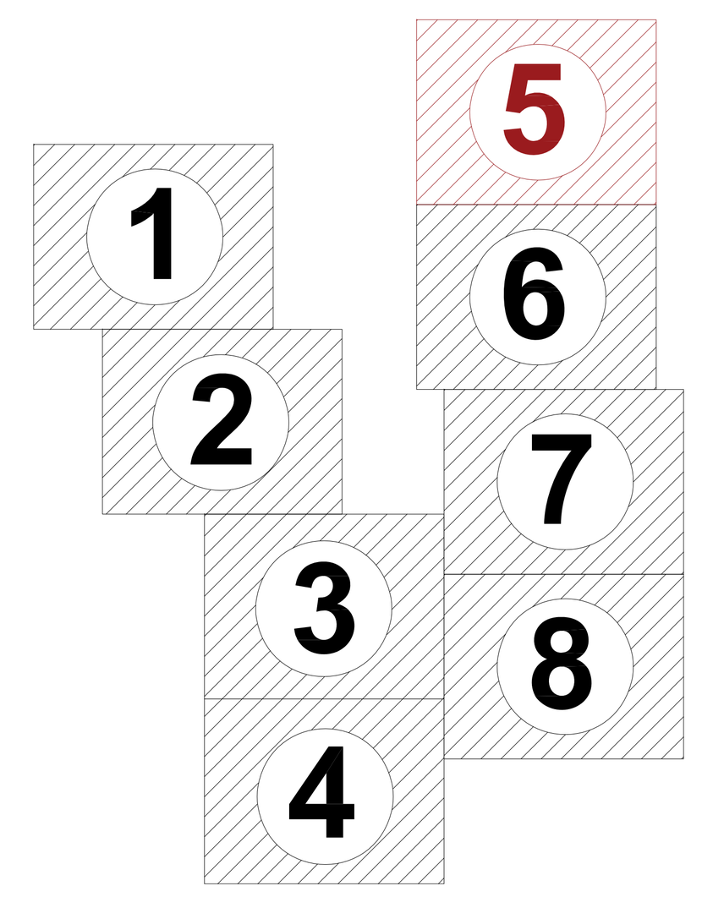
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green Cranleigh

Drawing Title

Topographical Survey Sheet 5 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/5	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

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Fax (01932) 786419
Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com

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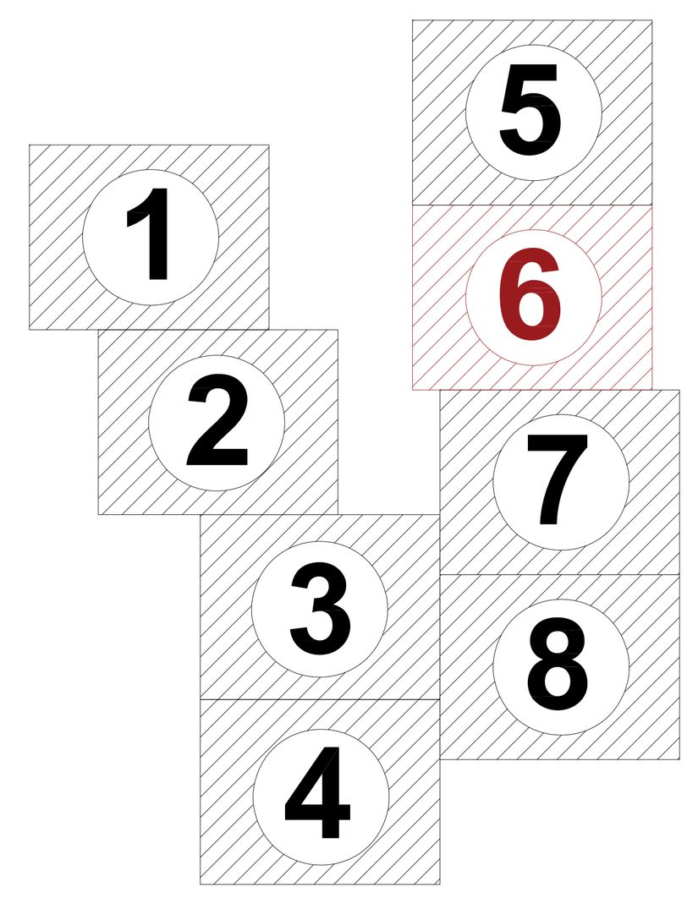
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey Sheet 6 of 8

Job No. 2207052

Old Job No.

Drawing Number GSL/2207052/6

Revision Suffix A

Scale 1:200m (A0)

Date August 2022

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Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com

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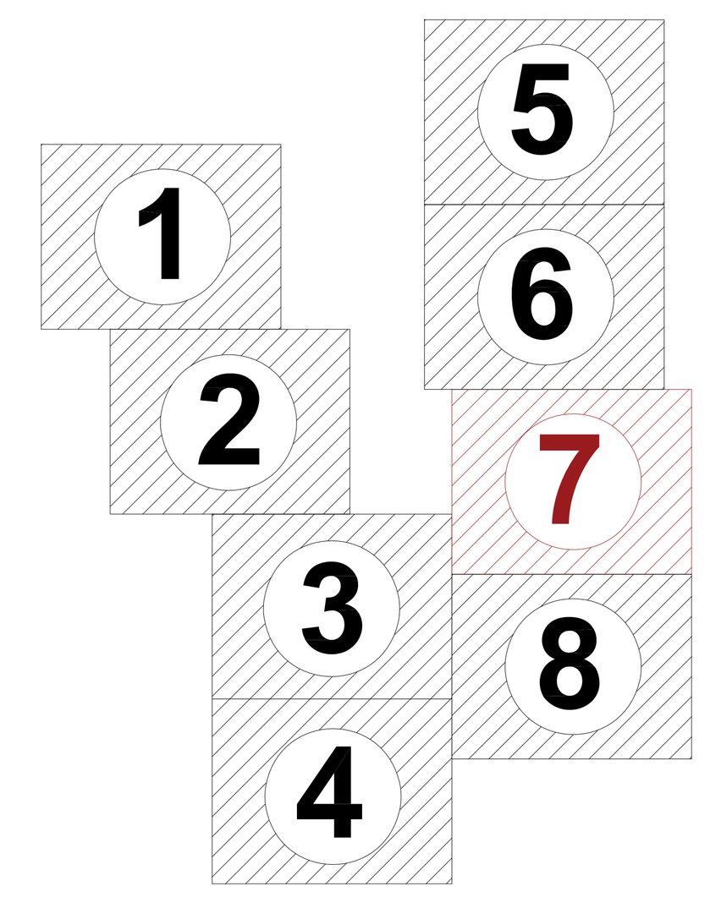
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey
Sheet 7 of 8

Job No. 2207052

Old Job No.

Drawing Number: GSL/2207052/7

Revision Suffix: A

Scale: 1:200m (A0)

Date: August 2022

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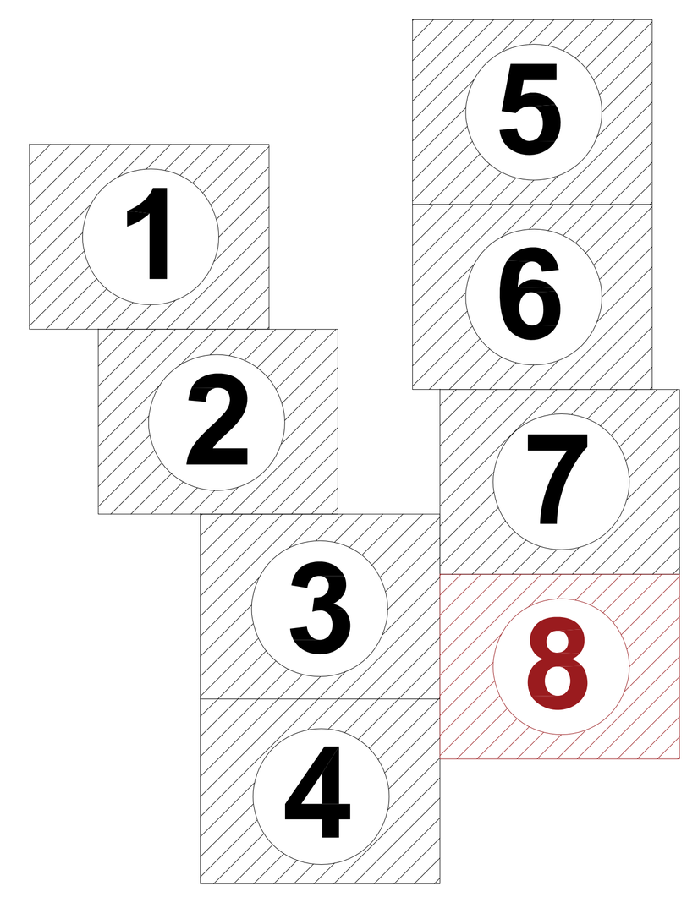
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details
A	13.09.22	TJH	Additonal survey added

Surveyor	MB/LH	Verified By	MB/LH	CAD Operator	AP	Approved By	AL	Date	31.08.22

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

gleeson land

Location

Knowle Green
Cranleigh

Drawing Title

Topographical Survey Sheet 8 of 8

Job No. 2207052	Old Job No.
Drawing Number GSL/2207052/8	Revision Suffix A
Scale 1:200m (A0)	Date August 2022

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MIDDLESEX, TW16 6AX
Tel (01932) 761196
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Email: mail@cdsurveys.com
Visit us at: www.cdsurveys.com

Asset location search

Thames Water Property Searches

Abley Letchford Partnership Ltd
3 Tealgate 3 Tealgate

HUNGERFORD
RG17 0YT

Search address supplied 35
Northdowns
Cranleigh
GU6 8BX

Your reference A423: Cranleigh

Our reference ALS/ALS Standard/2022_4715210

Search date 9 September 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

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: 35, Northdowns, Cranleigh, GU6 8BX

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:

TQ0637NW
TQ0538NE
TQ0538SE
TQ0638SW

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

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

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

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

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

TQ0537NE

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:

TQ0637NW
TQ0538NE
TQ0538SE
TQ0537NE
TQ0638SW

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.

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

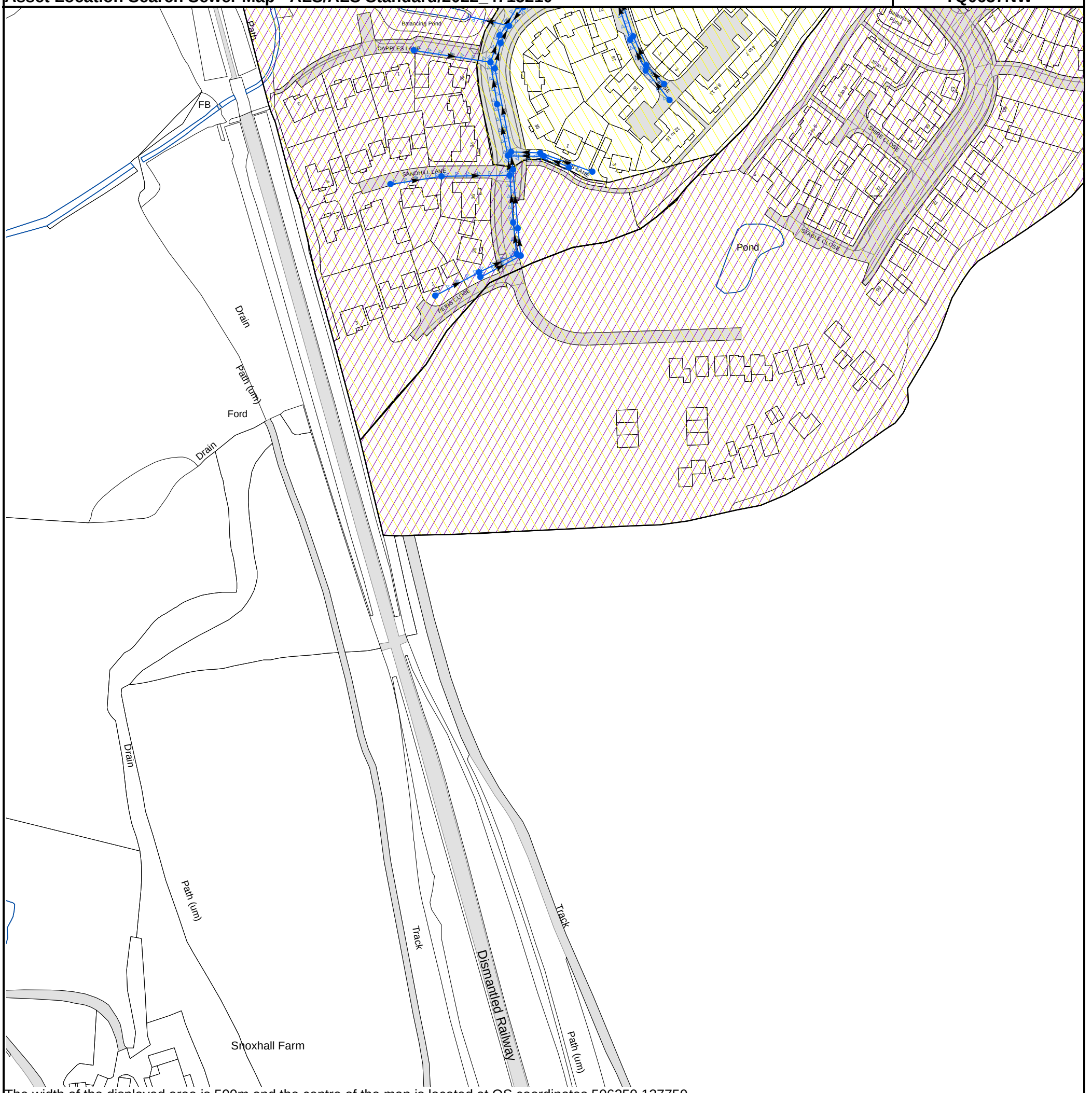
Clean Water queries

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/2022_4715210 | TQ0637NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 506250,137750

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**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
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n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**
n/a	**n/a**	**n/a**

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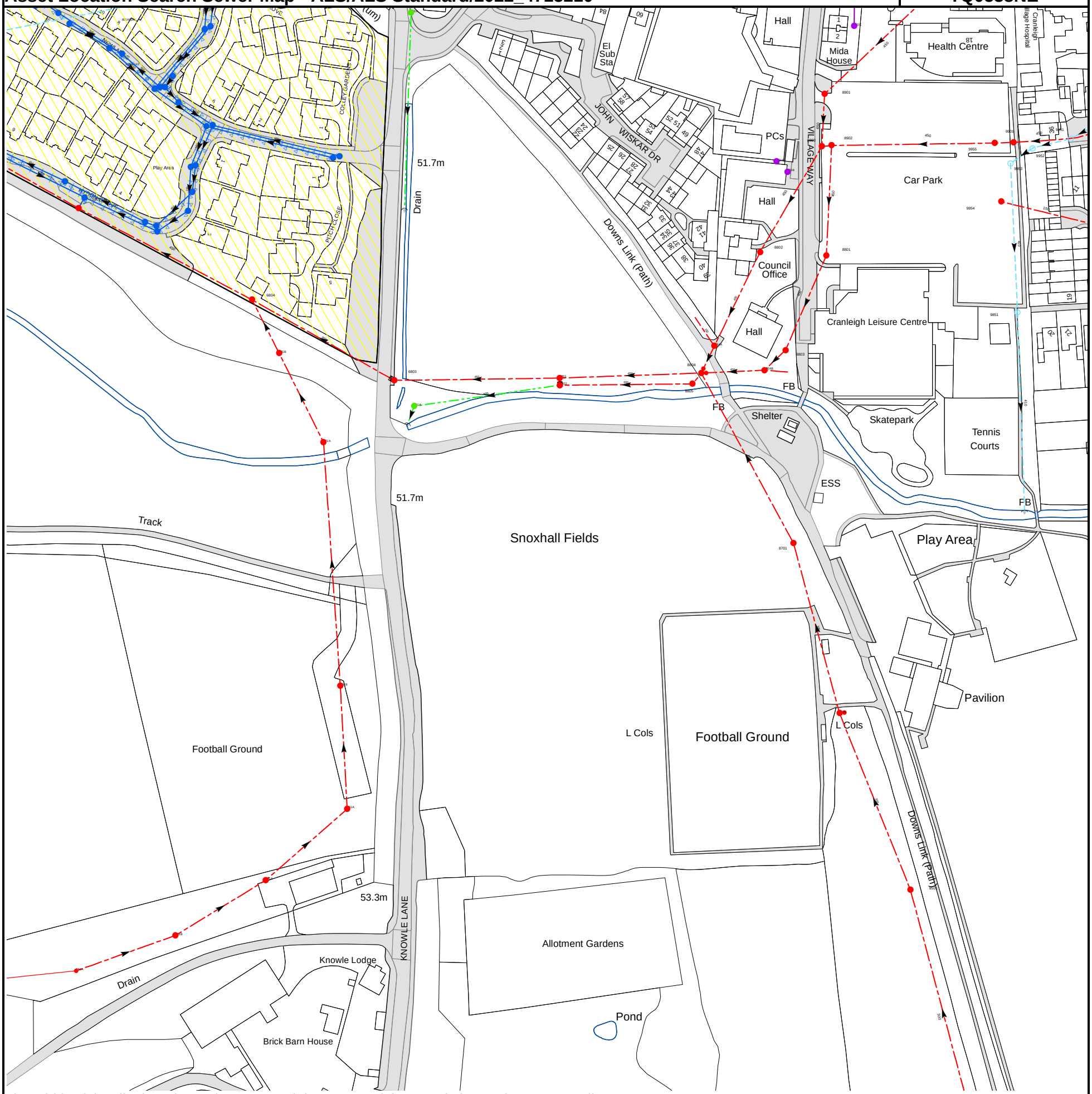
Asset Location Search Sewer Map - ALS/ALS Standard/2022_4715210

TQ0538NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 505750,138750

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
9851	53.26	51.66
9953	53.99	52.98
9952	54.32	52.37
9901	54.2	51.04
9951	54.19	52.72
991B	n/a	n/a
8804A	53	50.32
8802	53.26	50.68
8804B	52.97	50.31
891A	n/a	n/a
8803	52.94	n/a
891B	n/a	n/a
8903	53.65	50.87
8901	53.86	50.97
8801	53.02	50.54
8902	53.68	50.8
891C	n/a	n/a
991A	n/a	n/a
9955	54.3	51.3
9954	54.15	51.49
671A	n/a	n/a
661B	n/a	n/a
661A	n/a	n/a
8701	51.868	49.878
8601	52.712	50.332
9501	n/a	n/a
681A	n/a	n/a
7802	51.98	50.19
8805	52.71	50.42
6803	51.69	48.86
7801	51.96	49.15
8804	52.85	49.38
n/a	n/a	n/a
n/a	n/a	n/a
691A	n/a	n/a
n/a	n/a	n/a
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n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
551A	n/a	n/a
551B	n/a	n/a
651A	n/a	n/a
681B	n/a	n/a
6804	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
5901	50.96	48.38
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

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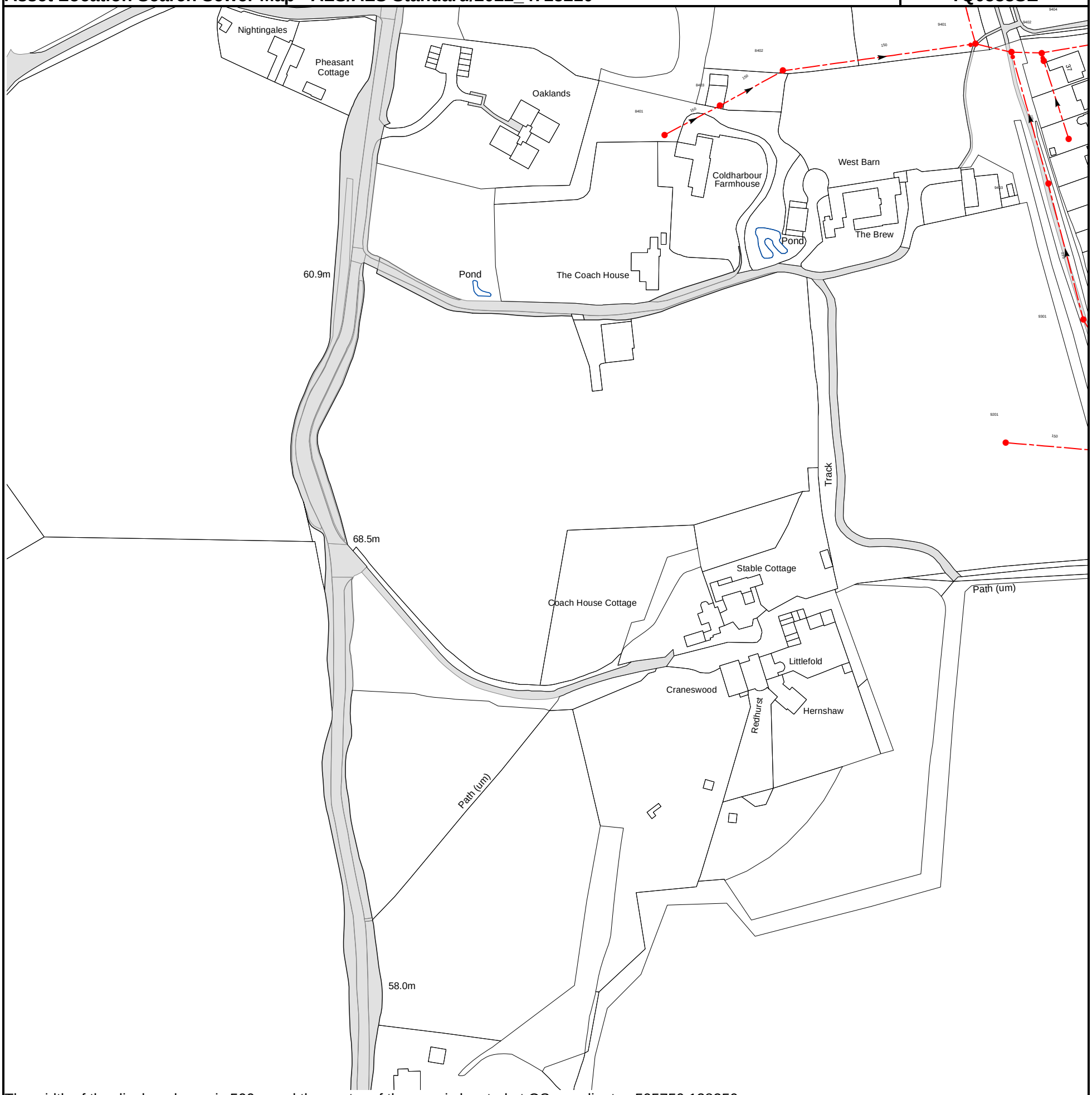
Asset Location Search Sewer Map - ALS/ALS Standard/2022_4715210

TQ0538SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 505750,138250

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.

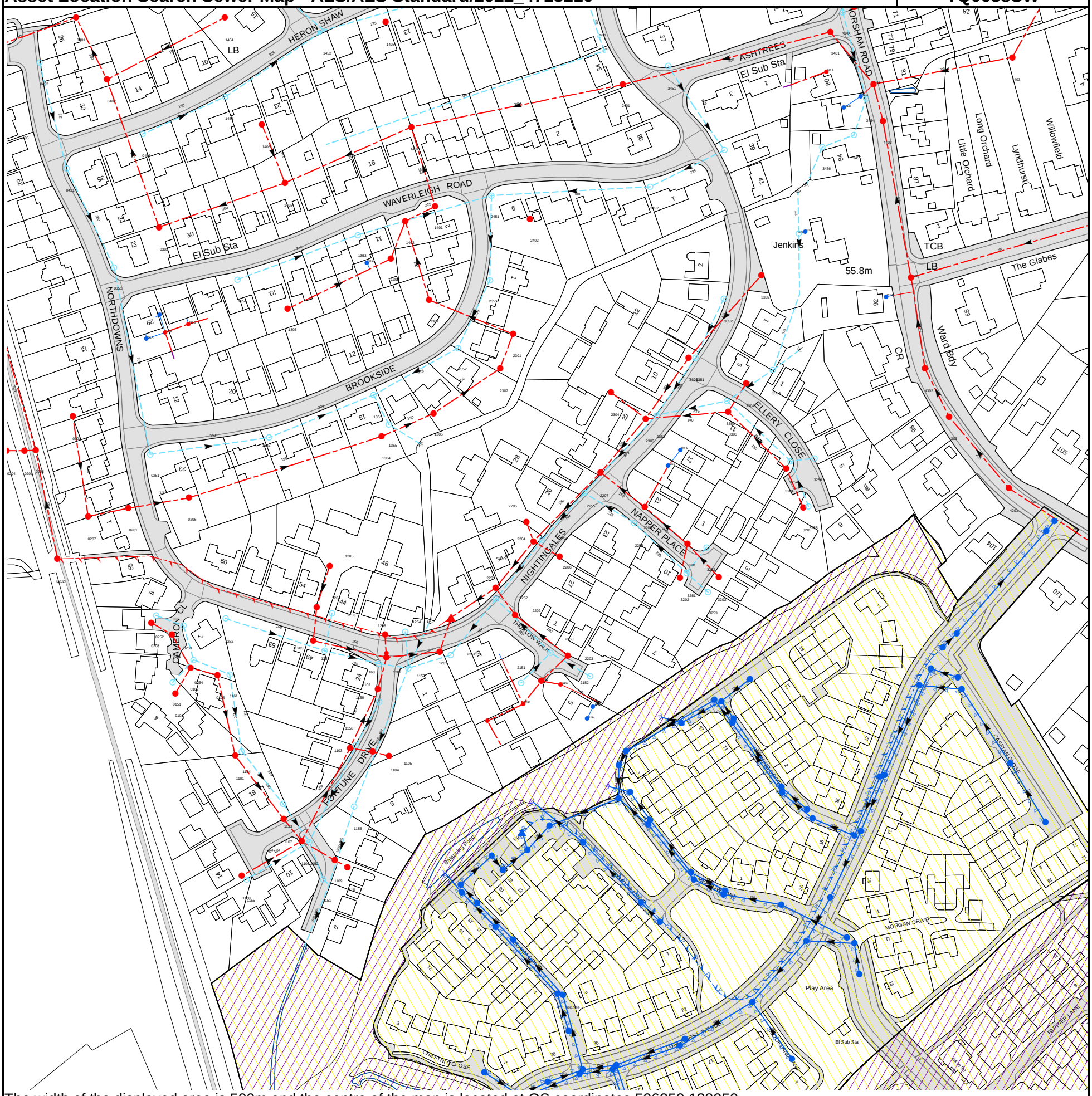
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
9201	62.36	61.18
9301	57.35	55.51
9403	56.88	55.03
9405	n/a	n/a
8401	n/a	n/a
8403	n/a	n/a
8402	55.5	54.47
9406	n/a	n/a
9404	55.78	51.58
9402	55.715	51.435
9401	55.29	51.44

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/2022_4715210

TQ0638SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 506250,138250

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
3455	n/a	n/a
4402	55.83	54.32
3454	55.86	54.89
341C	n/a	n/a
4401	55.85	53.79
4403	56.23	54.1
3503	55.81	54.31
3452	55.42	54.67
3456	55.71	54.49
1407	n/a	n/a
341B	n/a	n/a
2401	55.8	53.52
341A	n/a	n/a
3451	55.88	54.96
241B	n/a	n/a
2453	56	54.97
3401	55.88	53.67
3453	55.94	55.04
1552	56.46	53.74
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
4201	56.76	54.98
3256	n/a	n/a
4303	56.31	54.8
4302	56.25	54.75
431A	n/a	n/a
4301	55.96	54.57
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
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n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
3302	55.25	54.33
3354	55.56	54.21
n/a	n/a	n/a
n/a	n/a	n/a
3204	55.77	53.75
3254	55.77	54.57
331B	n/a	n/a
3205	55.94	53.99
331A	n/a	n/a
n/a	n/a	n/a
3255	55.95	54.65
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
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n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
2303	55.13	53.05
2452	55.32	54.54
2353	55.21	53.8
321B	n/a	n/a
321A	n/a	n/a
3301	55.38	53.78
3351	55.36	54.09
3352	55.57	54.26
3353	n/a	n/a
3303	n/a	n/a
3304	n/a	n/a
211D	n/a	n/a
211A	n/a	n/a
211B	n/a	n/a
211E	n/a	n/a
211C	n/a	n/a
2151	54.97	53.93
2101	55.22	53.65
2152	55.29	53.95
1157	55.11	53.15
2203	55.31	53.21
2251	54.61	53.27
2253	55.28	53.73
1201	54.97	51.27
1254	55.25	53.8
2202	54.92	52.48
2252	55.04	53.44
3253	55.64	54.11
2201	54.97	52.39
3202	55.61	53.57
3203	55.84	53.8
3251	55.54	53.93
2206	55.24	52.86
3252	55.69	54.06
3201	55.4	53.43
2204	55.11	52.58
2254	55.26	53.56
2256	5.21	3.73
1302	55.45	53.56
1402	55.37	53.23
1301	55.35	53.32
1305	n/a	n/a
1401	55.25	53.07
2352	55.01	54.04
2351	54.99	54.19
2451	55.3	54.3
2302	55.25	53.83
2301	55.12	53.44
2205	55.01	53.23
2402	55.42	n/a
2255	n/a	n/a
2207	55.12	52.81
2304	54.97	53.54
2208	55.22	53.2
1404	56.79	54.94
1151	54.54	53.37
1155	55.49	54.29
1108	55.54	53.08
1110	54.73	52.46
1109	54.75	52.39
1152	55.25	53.55
1106	55.37	n/a
1107	55.72	52.87
1156	54.96	53.12
1153	55.67	53.66
1105	55.11	52.45
1101	56.21	53.48
1104	55.07	52.31
1154	56.18	54.34
1103	55.2	51.84
1158	55.13	53.67
1159	55.13	53.91
0101	56.86	55.25
1102	55.17	51.64
0151	56.84	55.59
0103	n/a	n/a
1161	n/a	n/a
0102	56.9	54.82
1160	55.11	53.48
0254	56.92	55.49
1202	55.1	51.5
1251	55.76	54.36
1203	55.96	53.11
1206	55.25	53.27
0209	57.04	55.32

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0253	57.08	55.63
0208	57.32	55.45
1252	56.66	55.29
0252	57.35	55.79
1253	55.45	54.49
1204	55.85	53.3
1205	55.42	53.59
0202	57.807	56.747
0207	n/a	n/a
0201	57.27	55.75
0206	n/a	n/a
0251	56.99	54.17
0203	57.94	56.62
0204	60.36	59
0205	57.53	56.13
1352	55.68	54.05
1304	55.31	54.54
1355	55.26	54.03
0301	57.95	56.78
1351	n/a	n/a
031A	n/a	n/a
031B	n/a	n/a
031D	n/a	n/a
031C	n/a	n/a
1303	55.97	54.07
1354	55.98	54.94
0351	57.44	54.56
131A	n/a	n/a
1353	55.51	54.56
0302	56.77	52.07
1405	n/a	n/a
0451	57.5	54.76
0453	57.15	55.5
1406	n/a	n/a
1451	56.86	54.64
0402	56.83	51.9
0452	56.19	54.98
1452	56.65	53.39
1403	56.41	n/a
0401	56.31	51.78

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 divects 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

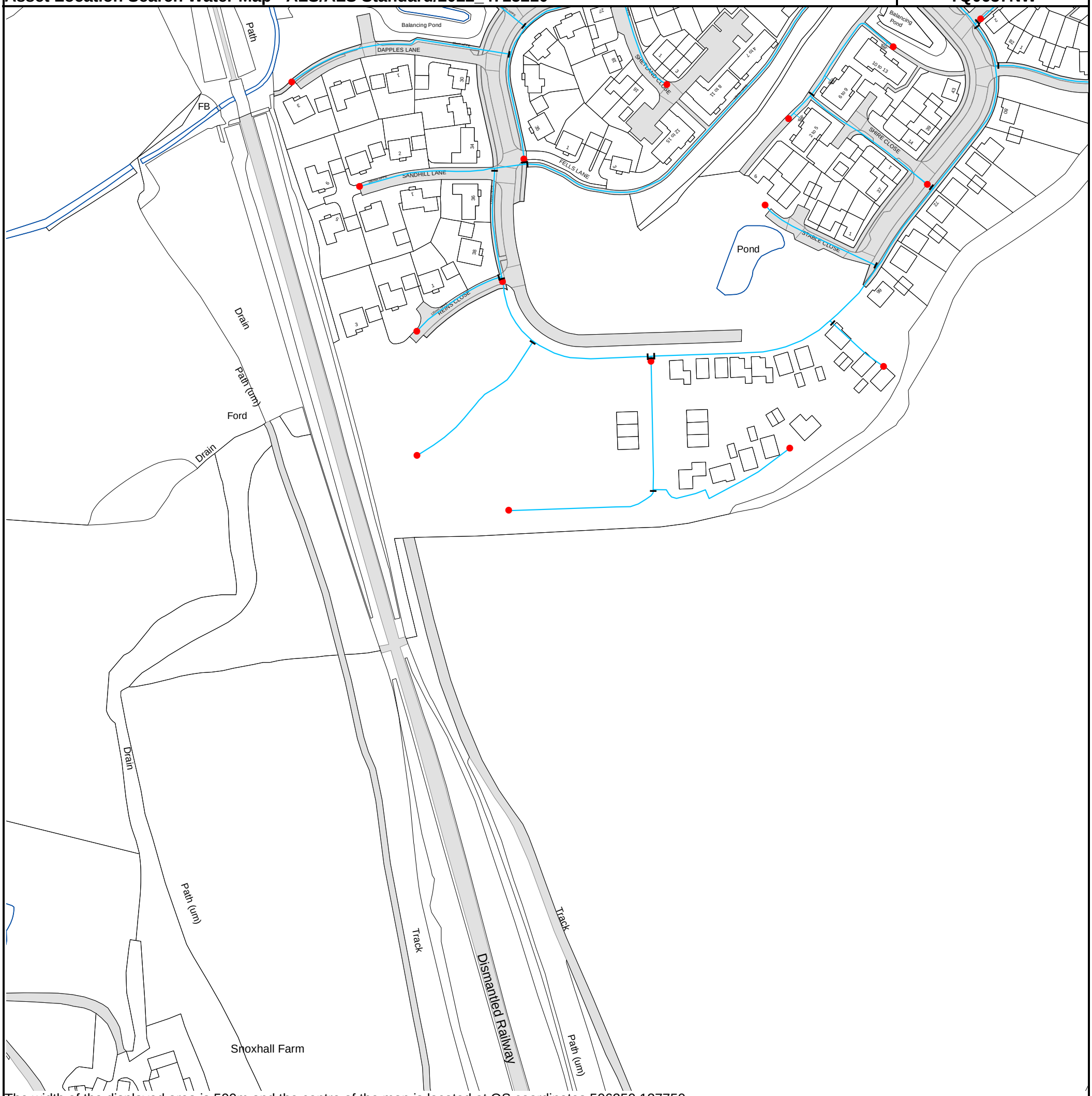
Notes:

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/2022_4715210

TQ0637NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 506250,137750

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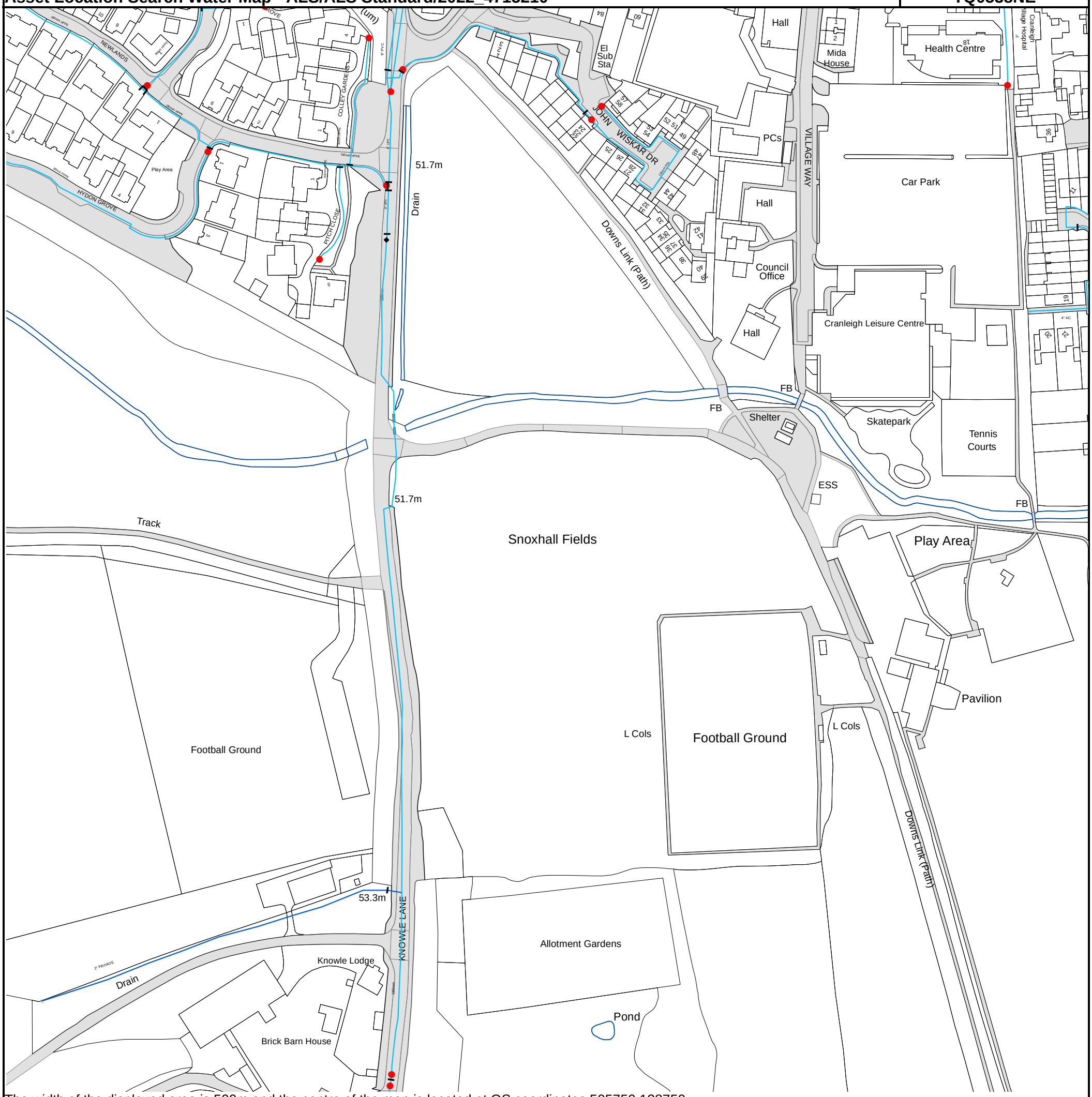
Asset Location Search Water Map - ALS/ALS Standard/2022_4715210

TQ0538NE



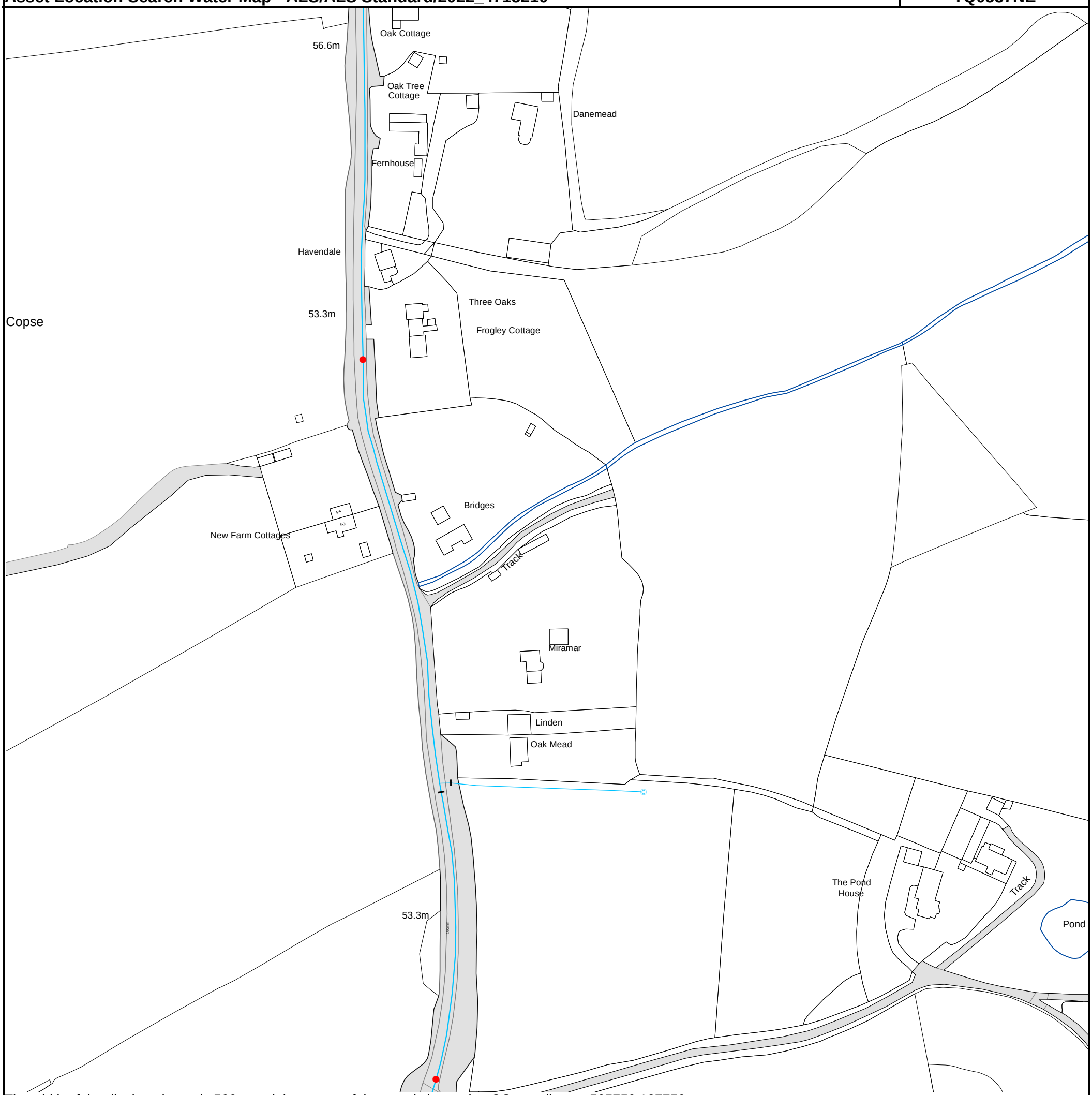
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 505750,138750

Asset Location Search Water Map - ALS/ALS Standard/2022_4715210

TQ0538SE

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 505750,138250

Asset Location Search Water Map - ALS/ALS Standard/2022_4715210	TQ0537NE



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Asset Location Search Water Map - ALS/ALS Standard/2022_4715210

TQ0638SW

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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: 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.

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 2 - Correspondence

LLFA Flood Risk Report

Thames Water Pre-Development Enquiry Response

Detailed Flood Risk Report Land East of Knowle Lane, Cranleigh

10 November 2022

SURREY

Detailed Flood Risk Report

Purpose of Report

This document has been prepared for the purpose of providing flood risk information for a specific site; either to aid in the development of a planning application or for flood risk management. The information provided is that which is available to Surrey County Council at the time and may include specific guidance for Planners and Developers about Sustainable Drainage. Surrey County Council gives no guarantee that any flood risk information provided is100% accurate, or exhaustive; it is solely the information we currently hold.

The applicant is advised that there will need to be additional discussions with the County Council as Highway Authority in respect of any drainage proposals for proposed highway works under Section 278 or proposed adoption of new roads under Section 38 of the 1980 Highway Act. Consenting for the discharge of surface water to Ordinary Watercourses should also be directed to the County Council under the Land Drainage Act (1991).

Document History

This report relates to the following enquiry/pre-application request/planning application as:

SCC Application ID	Other ref if applicable	Version	Originator	Date	Reviewer	Date
VLLFA-PAA-WA-22-047	0	0.1	JR	04/11/2022	MB	10/11/2022

Glossary

The table below defines some of the frequently used terminology for your general information.

Acronym/Term	Definition
Annual Probability	Flood events are defined according to their likelihood of occurrence. The term ‘annual probability of flooding’ is used, meaning the chance of a particular flood occurring in any one year. This can be expressed as a percentage. For example, a flood with an annual probability of 1 in 100 can also be referred to as a flood with a 1% annual probability. This means that every year there is a 1% chance that this magnitude flood could occur.
Flood Zone 1	Area with a low probability of flooding from rivers (< 1 in 1,000 annual chance of flooding).
Flood Zone 2	Area with a medium probability of flooding from rivers (1 in 100 – 1 in 1,000 annual chance of flooding).
Flood Zone 3	Area with a high probability of flooding from rivers (> 1 in 100 annual chance of flooding).
Fluvial flooding	Exceedance of the flow capacity of river channels (whether this is a Main River or an Ordinary Watercourse), leading to overtopping of the river banks and inundation of the surrounding land. Climate change is expected to increase the risk of fluvial flooding in the future.
Infiltration SuDS	These are sustainable drainage systems which facilitate the infiltration of surface water into the ground. Once in the ground, the water percolates through the subsurface to the groundwater.
Groundwater flooding	Emergence of groundwater at the surface (and subsequent overland flows) or into subsurface voids as a result of abnormally high groundwater flows, the introduction of an obstruction to groundwater flow and / or the rebound of previously depressed groundwater levels.
Main River	Main rivers are usually larger streams and rivers, but some of them are smaller watercourses of local significance. Main Rivers indicate those watercourses for which the Environment Agency is the relevant risk management authority.

Ordinary Watercourse	Ordinary Watercourses are displayed in the mapping as the detailed river network. An ordinary watercourse is any watercourse (excluding public sewers) that is not a Main River, and the Lead Local Flood Authority or Internal Drainage Board are the relevant risk management authority.
Other sources of flood risk	Flooding from canals, reservoirs (breach or overtopping) and failure of flood defences.
Sewer flooding	Flooding from sewers is caused by exceedance of sewer capacity and / or a blockage in the sewer network. In areas with a combined sewer network system there is a risk that land and infrastructure could be flooded with contaminated water. In cases where a separate sewer network is in place, sites are not sensitive to flooding from the foul sewer system.
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan
SuDS	Sustainable Drainage Systems
Surface water flooding	Intense rainfall exceeds the available infiltration capacity and / or the drainage capacity leading to overland flows and surface water flooding. Climate change is expected to increase the risk of surface water flooding in the future. This source is also referred to as pluvial flooding.
Tidal flooding	Propagation of high tides and storm surges up tidal river channels, leading to overtopping of the river banks and inundation of the surrounding land.
RoFSW	Risk of Flooding from Surface Water. The data shows areas at risk of flooding from surface water, for three flooding return periods (1 in 30, 1 in 100 and 1 in 1000), and the depth, velocity, hazard and flow direction associated with that flooding. It also includes; data on the models used to develop the maps and information that describes the suitable uses of the data.

Data Sources

The following sources of data have been used in preparing this report and its associated mapping:

- Geology- Bedrock and Superficial Deposits (British Geological Survey- 50,000 scale digital)
- Soilscapes (Cranfield University- http://www.landis.org.uk/soilscapes/)
- SuDS Suitability (British Geological Survey)
- Surface Water Flood Risk
    - Risk of Flooding from Surface Water (RoFSW) (Environment Agency)
- Groundwater
    - Susceptibility to Groundwater Flooding (British Geological Survey)
- Historic Flood Evidence
    - Historic Flood Map (Environment Agency)
    - Wetspots (Surrey County Council)
    - Property Flooding Database (Surrey County Council)
    - Historic Flooding Incidents Database (Surrey County Council)

Site Flood Risk Information

Groundwater

Risk & Evidence

Due to the nature of the underlying geology, this area is considered not to be susceptible to groundwater flooding.

Implications/Considerations for Planning

It is considered that there are no significant implications for surface water management on the site, relating to the site's susceptibility to groundwater flooding. However, this dataset is based on a conceptual understanding at a regional level. It is suggested that appropriate scale site based investigations are conducted to understand the groundwater regime on site.

Surface Water

Risk & Evidence

The area of interest is shown to be at risk of surface water flooding in the following return period events; 1 in 30,1 in 100, 1 in 1000 year. The surface water flood extents are not appropriate to be used in assessing flood risk at an individual property level. In addition, the methods used to derive the flood extents are based on modelled design rainfall (i.e. not observed patterns of rainfall) and consequently this information cannot definitively show that an area of land or property is, or is not, at risk of flooding.
The RoFSW have been created from the Environment Agency's nationally produced surface water flood mapping, and appropriate locally produced mapping from Lead Local Flood Authorities such as Surrey County Council. This means that in different areas, the flood extents have varying levels of suitability scales for viewing or assessing. This area's information is only suitable for assessing flood risk at a 'county to town' scale. This scale is suitable for identifying which parts of counties or towns are at risk, or which counties or towns have the most risk. It is unlikely to be reliable for assessing risk in a more localised area.

Implications/Considerations for Planning

In areas at risk of surface water flooding, the following sections outline considerations for the appropriate management of surface water, based on the information provided to Surrey County Council.

Historical Flooding

Risk & Evidence

The Historic Flood Map shows that there is no record of this area being previously flooded by rivers, groundwater or a combination of these sources. However this does not necessarily mean

that flooding has not occurred, just that it has not been reported and/or recorded within the Historical Flood Map dataset.

Wetspots indicate the approximate location of known previous flooding on the highway. There is a wetspot near to the area of interest and this highlights that there has been historic flooding in the vicinity. If you would like to find out more about these local wetspots, please visit the Surrey County Council Wetspots Interactive Map: http://new.surreycc.gov.uk/maps/surrey-interactive-map. You can find the wetspots under the 'Roads and Transport' drop down to the right hand side of the map.
According to Surrey County Council's Property Flooding Database, there have been previous instances of property flooding nearby, either internally or externally. The instances of property flooding occurred Winter 2013/2014. Property flooding is sensitive information and this is why more specific details on the location of flooding cannot be provided. Whilst this dataset is the most comprehensive record of property flooding in Surrey, there may be instances of property flooding which were not reported and therefore are not recorded in this dataset.
Surrey County Council's Historic Flooding Incident Database highlights all reported, non point location specific, flooding incidents e.g. example road was flooded. The data indicates that there is a nearby location which has previously reported flooding.

Implications/Considerations for Planning

In areas which have been previously affected by flooding, the following should be considered:
• Is there a safe access/egress route demonstrated?
• Is there an evacuation plan in place?
• Have resilience/resistance measures been considered in the design?

SuDS Suitability

The selection of SuDS should be considered in the early stages of design. The selection criteria, as set out by The SuDS manual (CIRIA C753, 2015), provides a good framework for doing this.

Potential for Infiltration SuDS

Surrey County Council is licensed to use the Infiltration SuDS Data produced by the British Geological Survey. This data was produced after the Pitt Review (2007) and aims to encourage the appropriate use of SuDS. By utilising SuDS, the reliance on traditional piped systems is reduced, and the sustainable management of water is encouraged.
The Infiltration SuDS data is used to make a preliminary assessment of the suitability of the subsurface for infiltration SuDS. This data is not a replacement for a soakaway test or site investigation.

The suitability of utilising infiltration SuDS techniques has been summarised for the application site below.

Source Protection Zones

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Constraints to Infiltration

There are no significant constraints to using infiltration SuDS techniques at this site.

Drainage Potential

The subsurface for the majority of the site is potentially suitable for infiltration SuDS although the design will be influenced by the ground conditions. It is recommended to quantify the infiltration rate via an infiltration/soakage test and consider whether infiltration can be used as a SuDS technique alongside water storage (in ponds/chambers) and re-use.
The subsurface in the centre of the site is likely to be suitable for free-draining infiltration SuDS. It is recommended to quantify the infiltration rate via an infiltration/soakaway test.

Stability of Ground

Ground instability problems may be present or anticipated. Increased infiltration is unlikely to result in ground instability. Before installing infiltration SuDS consider the potential for or the consequences of infiltration on ground stability.

Groundwater Vulnerability

The groundwater may be vulnerable to contamination. Where surface water is being infiltrated into the ground, this water should be free of contaminants. Before installing infiltration SuDS,

consider the risks associated with the transport of contaminants to the groundwater. Check previous land use and potential for the presence of contaminated ground.

Superficial Deposit Permeability

There is no information on superficial deposits for the site.

Bedrock Permeability

Bedrock for the majority of the site is likely to be poorly draining. It is recommended that the infiltration rate is quantified via an infiltration/soakaway test and consider whether infiltration can be used as a SuDS technique alongside water storage (in ponds/chambers) and re-use. Bedrock is likely to be free-draining in the centre of the site. It is recommended that the infiltration rate is quantified via an infiltration/soakaway test.

Proposed Approach

Drainage and Discharge Methods

Some areas of the site may be suitable for infiltration-based SuDS techniques however ground conditions and groundwater levels should be fully investigated through intrusive ground investigations and should be provided to support any Planning Application made in respect of the site.

A hierarchical approach should be taken to the discharge of surface water from the site.

- Option 1 - to ground;
- Option 2 - attenuation and discharge to adjacent watercourse;
- Option 3 - attenuation and discharge to surface water sewer.

Any surface water discharged from the site should be restricted to the existing greenfield run-off rate applied to the impermeable area of the site only. Qbar is considered acceptable (applied to the proposed impermeable area only) or a staged discharge approach with greenfield run-off rates applied to the 1 in 1 year, 1 in 30 year and 1 in 100 year events accordingly.

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event. The upper end allowance should be applied for climate change for residential development. A lower % for climate change may be considered acceptable for commercial property dependent upon the life span of the development, however sensitivity testing will be required up to the upper end allowance event. Where appropriate, a 10% allowance for urban creep should be included in the drainage designs.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

SuDS Components

Many schemes deliver the management of water quantity but do not fulfil the four pillars of SuDS design as defined by the SuDS Manual. The manual seeks to encourage schemes that manage the quantity and quality of surface water runoff, provide an amenity that integrates surface water as an attractive part of public space and also enhance biodiversity. Schemes based around the management of quantity alone are purely drainage schemes not SuDS.

As required by the NPPF all development should incorporate sustainable drainage systems, unless there is clear evidence that this would be inappropriate.

The following proposals for SuDS have been put forward as part of the drainage design: Infiltration should be considered in the first instance however due to the likelihood of a high water table near to the Watercourses, infiltration may not be suitable. Intrusive ground investigations should be completed to determine ground conditions and assess groundwater levels. All SuDS principles could be affected if groundwater levels are high, and therefore this information should be gathered to inform the drainage strategy.

If soakaways are unsuitable, above ground attenuation of surface water should be considered in the first instance before below ground storage is proposed. If above ground attenuation of surface water is not considered feasible full justification should be provided.

The Applicant should consider the management and maintenance of the proposed SuDS elements and this information should be presented as part of any Planning Application.

Site Development Details: Cross-check

The table below cross-checks the information provided with the planning application, with information easily available to Surrey County Council and provides recommendations on the suitability of the proposed drainage.

Site Details	Description
Bedrock	Sandstone and Mudstone (Weald clay formation)
Superficial Deposits	Unspecified
Soils	"Soilscapes conveys a summary of the broad regional differences in the soil landscapes of England and Wales. Soilscapes is not intended as a means for supporting detailed assessments, such as land planning applications or site investigations; nor should it be used to support commercial activities. For such applications, a parallel service Soils Site Reporter provides comprehensive reporting for specific locations. Ground investigations should also be evidenced when considering infiltration SuDS. " Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
Depth to Water Table (m)	Groundwater is likely to be more than 5 m below the ground surface throughout the year for the majority of the site. Observations of seasonal variations in groundwater level are recommended. The scale of site specific assessments and evidence of groundwater levels should be appropriate to the size and nature of the proposed development site. Groundwater is likely to be less than 3 m below the ground surface for at least part of the year in the North of the site. It is recommended that the seasonal variation in groundwater levels are determined. The scale of site specific assessments and evidence of groundwater levels should be appropriate to the size and nature of the proposed development site. This site may not be suitable for infiltration SuDS if the groundwater level reaches <1m below the ground surface.

Discharge method- Sewer (if applicable)	The nearest sewer is more than 50m from the proposed development. This indicates that discharging to the sewer may be feasible. Infiltration SuDs are mandatory unless where evidenced that they are not appropriate (e.g. contaminated land, high ground water levels or land subsidence). If SuDS are not appropriate, then evidence that connecting to the sewer network is appropriate and has been permitted by the water utility company should be provided along with any third part land permissions.
Discharge method- Watercourse (if applicable)	The nearest watercourse is more than 50m from the proposed development. This indicates that discharging to the watercourse may not be feasible unless evidence has been provided to demonstrate the feasibility.

Recommendations and Summary

Any surface water discharged from the site should be limited to the existing greenfield run-off rate applied to the proposed positively drained area of the site only.

Evidence must be provided to establish the greenfield runoff rate for the site. For previously developed sites, evidence must be provided where the greenfield runoff rate cannot be reasonably practicably achieved.

On site attenuation should be provided for the 1 in 100 year + climate change rainfall event, with a sensitivity check up to the 1 in 100 year upper end allowance event if not used already.
SCC Surface water drainage pro-forma should be completed to accompany any future Planning Applications with supporting evidence provided.

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website.

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Flood Risk

Please refer to the Environment Agency's Standing Guidance for Flood Risk.

SuDS Suitability and Methods

Please refer to the Sustainable Drainage System Design Guidance - Surrey County Council (surreycc.gov.uk) on Surrey County Council's website to assist in directing developers and designers to the most appropriate guidance and technical standards.

A non-exhaustive list of references is provided at the end of this document to further assist Planners in informing the planning decision.

Ordinary Watercourse Consent

If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent. More details are available on our website Ordinary watercourse consents - Surrey County Council (surreycc.gov.uk).

References

BRE365. Soakaway Design

Surrey County Council SuDS Design Guidance

CIRIA. 2015. The SuDS Manual (C753).

CIRIA. 2006. Designing for exceedance in urban drainage-good practice (C635).

CIRIA.1996. Infiltration Drainage: Manual of Good Practice (C156)

Defra. 2015. Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

Mr Kris Willis

Abley Letchford Partnership
3 Tealgate,
Charnham Park,
Hungerford,
RG17 0YT

Wastewater pre-planning
Our ref DS6099029, DTS-73575

26 October 2022

Pre-planning enquiry: Capacity concerns

Dear Kris,

Thank you for providing information on your development.

Site: LAND EAST OF KNOWLE LANE, CRANLEIGH, WAVERLEY, SURREY, GU6 8JN

Existing site: Shopping Centre, Sainsbury, Bus Garage: 26,812.90m2.

Proposed site: Housing (250 units).

Proposed foul water discharge by gravity for 100 units and pump discharge for 150 residential units at rate of 6.0 l/s into onsite network which discharges into Thames Water existing manhole TQ05389501.

Proposed surface water to nearby ditch and not into Thames Water sewer network.

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

Foul Water

We've assessed your **foul water** proposals and concluded that our sewerage network will not have enough capacity for your **full** development at this time.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: **8 months**
Design: **6 months**
Construction: **8 months**
Total: **22 months**

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

Surface Water

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

The disposal hierarchy being:

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

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

What do you need to tell us before we start modelling?

We will only carry out modelling once we're confident that your development will proceed. In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If the modelling shows we need to carry out reinforcement work, then before we start construction, we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

What do I need to do next?

If you've satisfied the points above, then you should compare your own timeline with the typical timescales we've suggested for our activities. If the time you're likely to take from planning and construction through to first occupancy is **more** than the total time we're likely to take, we'll be able to carry out the necessary upgrades in time for your development.

If you've any further questions, please contact me on 07747647155.

Many Thanks

Kind Regards

Zaid Kazi
Developer Services – Adoptions Engineer
Mob: 07747647155
zaid.kazi@thameswater.co.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

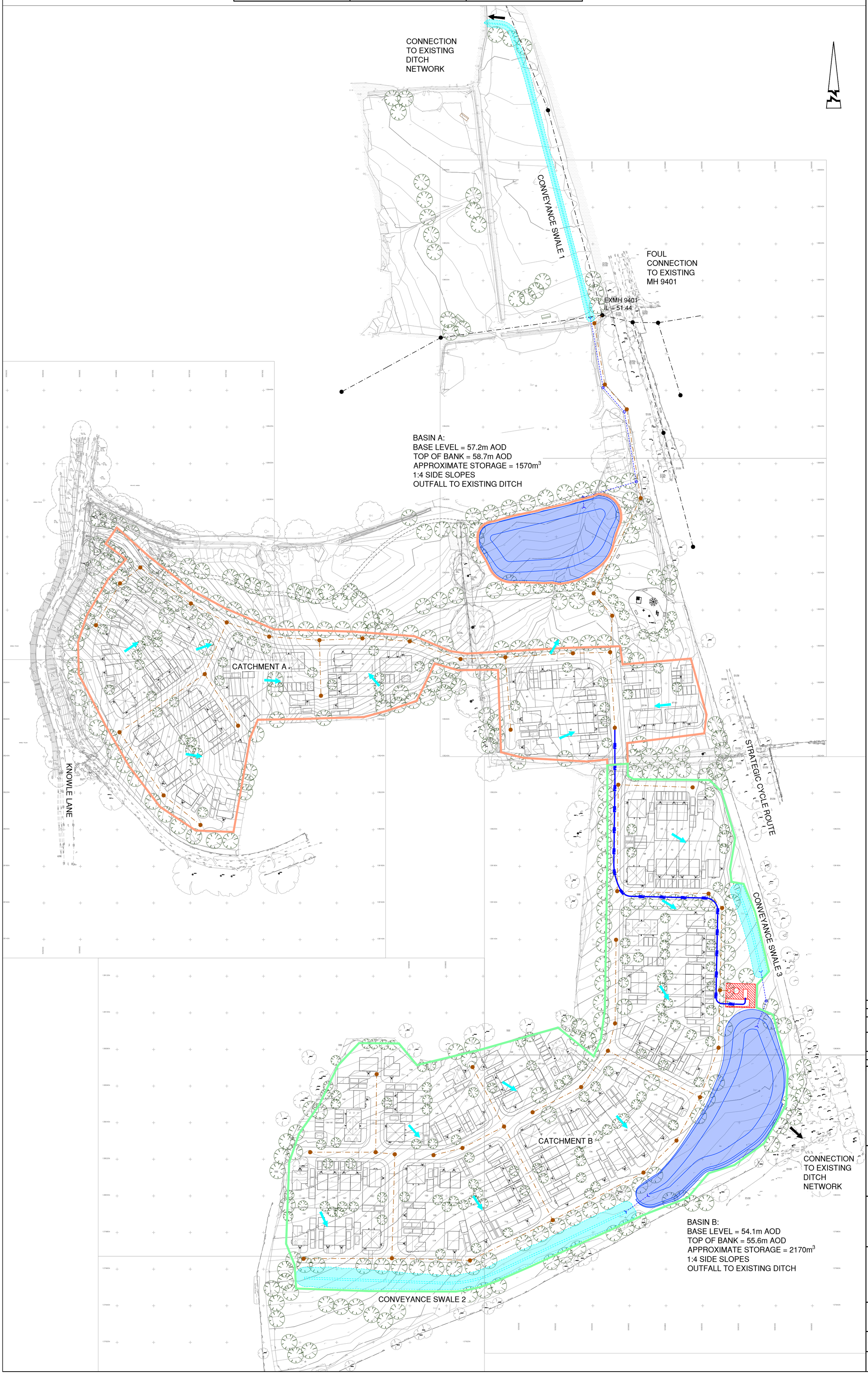
Appendix 3 - Drainage Strategy

Drainage Strategy Plan

Microdrainage Calculations

SURFACE WATER CATCHMENT DETAILS

	CATCHMENT A	CATCHMENT B
TOTAL AREA	2.37 Ha	3.95 Ha
65% IMPERMEABLE	1.54 Ha	2.07 Ha
DISCHARGE RATE	8.4 l/s	11.3 l/s
QUICK STORAGE ESTIMATE	1274m^3 to 1919m^3	1713m^3 to 2578m^3
VOLUME PROVIDED	1573m^3	2177m^3



Site Layout based on:	Richards Urban Design 1321.02
Topo Survey based on:	CD Surveys GSL/2207052/1 A

NOTES:
1. QBAR Greenfield Runoff rate = 5.46 l/s/Ha.
2. CV Value of 1 used for storage estimates.
3. 65% impermeable area excludes SUDS features

SURFACE WATER KEY:

- Catchment Boundaries
- Direction of flow
- Attenuation basin
- Conveyance swale
- Basin Discharge location

FOUL WATER KEY:

- Indicative Network
- Pumping Station
- Rising Main
- Existing Foul Network

Rev	Date	Description	Drawn	Checked
P5	01.23	MINOR UPDATES TO MASTERPLAN	KLW	PJ
P4	11.22	NORTHERN DITCH OUTFALL RELOCATED	KLW	PJ
P3	11.22	MINOR UPDATES TO CATCHMENTS AND FOUL STRATEGY	KLW	PJ
P2	11.22	AMENDED IN LINE WITH UPDATED MASTERPLAN AND ROOT PROTECTION ZONES	KLW	PJ
P1	09.22	FIRST ISSUE	KLW	PJ

ABLEY LETCHFORD PARTNERSHIP
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Client
GLEESON LAND

Project
KNOWLE LANE
CRANLEIGH

Title
INDICATIVE
DRAINAGE STRATEGY

Status

Scale	Date	Drawn	Checked
1:1000 @ A1	SEPT 2022	KLW	PJ

Project No	Drawing No	Revision
A423	001	P5

Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	57.630	0.430	8.4	0.0	8.4	518.5	O K
30 min Summer	57.757	0.557	8.4	0.0	8.4	694.1	O K
60 min Summer	57.887	0.687	8.4	0.0	8.4	883.5	O K
120 min Summer	57.965	0.765	8.4	0.0	8.4	1002.4	O K
180 min Summer	58.008	0.808	8.4	0.0	8.4	1071.2	O K
240 min Summer	58.038	0.838	8.4	0.0	8.4	1117.7	O K
360 min Summer	58.074	0.874	8.4	0.0	8.4	1176.8	O K
480 min Summer	58.096	0.896	8.4	0.0	8.4	1212.3	O K
600 min Summer	58.109	0.909	8.4	0.0	8.4	1234.7	O K
720 min Summer	58.118	0.918	8.4	0.0	8.4	1248.7	O K
960 min Summer	58.125	0.925	8.4	0.0	8.4	1261.3	O K
1440 min Summer	58.120	0.920	8.4	0.0	8.4	1252.6	O K
2160 min Summer	58.108	0.908	8.4	0.0	8.4	1232.1	O K
2880 min Summer	58.090	0.890	8.4	0.0	8.4	1203.1	O K
4320 min Summer	58.043	0.843	8.4	0.0	8.4	1126.6	O K
5760 min Summer	57.993	0.793	8.4	0.0	8.4	1046.4	O K
7200 min Summer	57.940	0.740	8.4	0.0	8.4	964.3	O K
8640 min Summer	57.878	0.678	8.4	0.0	8.4	870.7	O K
10080 min Summer	57.820	0.620	8.4	0.0	8.4	784.8	O K
15 min Winter	57.630	0.430	8.4	0.0	8.4	518.7	O K
30 min Winter	57.757	0.557	8.4	0.0	8.4	694.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	136.976	0.0	486.8	0.0	27
30 min Summer	91.920	0.0	634.1	0.0	41
60 min Summer	58.923	0.0	885.0	0.0	72
120 min Summer	33.980	0.0	1016.8	0.0	130
180 min Summer	24.612	0.0	1099.5	0.0	190
240 min Summer	19.576	0.0	1159.4	0.0	248
360 min Summer	14.179	0.0	1239.4	0.0	368
480 min Summer	11.294	0.0	1280.5	0.0	486
600 min Summer	9.480	0.0	1285.3	0.0	606
720 min Summer	8.225	0.0	1274.2	0.0	724
960 min Summer	6.595	0.0	1246.4	0.0	962
1440 min Summer	4.854	0.0	1191.3	0.0	1292
2160 min Summer	3.597	0.0	1973.5	0.0	1672
2880 min Summer	2.910	0.0	2119.1	0.0	2056
4320 min Summer	2.149	0.0	2206.5	0.0	2900
5760 min Summer	1.734	0.0	2557.2	0.0	3744
7200 min Summer	1.470	0.0	2709.9	0.0	4552
8640 min Summer	1.287	0.0	2844.5	0.0	5360
10080 min Summer	1.151	0.0	2962.9	0.0	6056
15 min Winter	136.976	0.0	486.8	0.0	26
30 min Winter	91.920	0.0	634.2	0.0	41

Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	57.887	0.687	8.4	0.0	8.4	883.7	O K
120 min Winter	57.965	0.765	8.4	0.0	8.4	1002.5	O K
180 min Winter	58.009	0.809	8.4	0.0	8.4	1071.6	O K
240 min Winter	58.038	0.838	8.4	0.0	8.4	1118.4	O K
360 min Winter	58.075	0.875	8.4	0.0	8.4	1178.2	O K
480 min Winter	58.097	0.897	8.4	0.0	8.4	1214.4	O K
600 min Winter	58.111	0.911	8.4	0.0	8.4	1237.8	O K
720 min Winter	58.120	0.920	8.4	0.0	8.4	1252.8	O K
960 min Winter	58.129	0.929	8.4	0.0	8.4	1267.7	O K
1440 min Winter	58.125	0.925	8.4	0.0	8.4	1261.2	O K
2160 min Winter	58.103	0.903	8.4	0.0	8.4	1224.0	O K
2880 min Winter	58.076	0.876	8.4	0.0	8.4	1179.6	O K
4320 min Winter	57.999	0.799	8.4	0.0	8.4	1056.8	O K
5760 min Winter	57.906	0.706	8.4	0.0	8.4	911.7	O K
7200 min Winter	57.801	0.601	8.4	0.0	8.4	757.1	O K
8640 min Winter	57.709	0.509	8.4	0.0	8.4	626.6	O K
10080 min Winter	57.627	0.427	8.4	0.0	8.4	514.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	58.923	0.0	885.0	0.0	70
120 min Winter	33.980	0.0	1016.8	0.0	128
180 min Winter	24.612	0.0	1099.6	0.0	186
240 min Winter	19.576	0.0	1159.5	0.0	244
360 min Winter	14.179	0.0	1239.7	0.0	360
480 min Winter	11.294	0.0	1281.1	0.0	476
600 min Winter	9.480	0.0	1286.3	0.0	592
720 min Winter	8.225	0.0	1275.4	0.0	706
960 min Winter	6.595	0.0	1247.9	0.0	932
1440 min Winter	4.854	0.0	1194.3	0.0	1362
2160 min Winter	3.597	0.0	1973.7	0.0	1712
2880 min Winter	2.910	0.0	2120.2	0.0	2172
4320 min Winter	2.149	0.0	2242.6	0.0	3116
5760 min Winter	1.734	0.0	2557.5	0.0	4032
7200 min Winter	1.470	0.0	2710.4	0.0	4760
8640 min Winter	1.287	0.0	2845.0	0.0	5528
10080 min Winter	1.151	0.0	2964.2	0.0	6168

Model Details

Storage is Online Cover Level (m) 58.700

Tank or Pond Structure

Invert Level (m) 57.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1082.0	1.500	2089.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0133-8400-1100-8400
Design Head (m)	1.100
Design Flow (l/s)	8.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	133
Invert Level (m)	57.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	8.4	Kick-Flo®	0.715	6.9
Flush-Flo™	0.327	8.4	Mean Flow over Head Range	-	7.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	8.7	3.000	13.5	7.000	20.2
0.200	8.1	1.400	9.4	3.500	14.5	7.500	20.9
0.300	8.4	1.600	10.0	4.000	15.5	8.000	21.6
0.400	8.3	1.800	10.6	4.500	16.4	8.500	22.2
0.500	8.2	2.000	11.1	5.000	17.2	9.000	22.8
0.600	7.8	2.200	11.6	5.500	18.0	9.500	23.4
0.800	7.2	2.400	12.1	6.000	18.8		
1.000	8.0	2.600	12.6	6.500	19.5		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 2.000 Invert Level (m) 58.700

Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	54.530	0.430	11.3	0.0	11.3	697.1	O K
30 min Summer	54.655	0.555	11.3	0.0	11.3	933.2	O K
60 min Summer	54.782	0.682	11.3	0.0	11.3	1187.7	O K
120 min Summer	54.858	0.758	11.3	0.0	11.3	1347.9	O K
180 min Summer	54.901	0.801	11.3	0.0	11.3	1441.1	O K
240 min Summer	54.930	0.830	11.3	0.0	11.3	1504.3	O K
360 min Summer	54.966	0.866	11.3	0.0	11.3	1584.7	O K
480 min Summer	54.987	0.887	11.3	0.0	11.3	1633.4	O K
600 min Summer	55.001	0.901	11.3	0.0	11.3	1664.5	O K
720 min Summer	55.009	0.909	11.3	0.0	11.3	1684.1	O K
960 min Summer	55.017	0.917	11.3	0.0	11.3	1702.6	O K
1440 min Summer	55.013	0.913	11.3	0.0	11.3	1693.2	O K
2160 min Summer	55.002	0.902	11.3	0.0	11.3	1667.7	O K
2880 min Summer	54.986	0.886	11.3	0.0	11.3	1629.8	O K
4320 min Summer	54.940	0.840	11.3	0.0	11.3	1526.6	O K
5760 min Summer	54.890	0.790	11.3	0.0	11.3	1417.4	O K
7200 min Summer	54.837	0.737	11.3	0.0	11.3	1303.0	O K
8640 min Summer	54.777	0.677	11.3	0.0	11.3	1176.4	O K
10080 min Summer	54.722	0.622	11.3	0.0	11.3	1065.2	O K
15 min Winter	54.530	0.430	11.3	0.0	11.3	697.3	O K
30 min Winter	54.655	0.555	11.3	0.0	11.3	933.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	136.976	0.0	646.3	0.0	26
30 min Summer	91.920	0.0	843.5	0.0	41
60 min Summer	58.923	0.0	1184.4	0.0	70
120 min Summer	33.980	0.0	1360.7	0.0	130
180 min Summer	24.612	0.0	1471.0	0.0	190
240 min Summer	19.576	0.0	1550.8	0.0	248
360 min Summer	14.179	0.0	1658.1	0.0	368
480 min Summer	11.294	0.0	1716.5	0.0	486
600 min Summer	9.480	0.0	1729.4	0.0	604
720 min Summer	8.225	0.0	1714.2	0.0	724
960 min Summer	6.595	0.0	1675.0	0.0	962
1440 min Summer	4.854	0.0	1597.9	0.0	1292
2160 min Summer	3.597	0.0	2647.3	0.0	1672
2880 min Summer	2.910	0.0	2841.0	0.0	2072
4320 min Summer	2.149	0.0	2962.8	0.0	2900
5760 min Summer	1.734	0.0	3435.6	0.0	3744
7200 min Summer	1.470	0.0	3640.6	0.0	4552
8640 min Summer	1.287	0.0	3821.0	0.0	5288
10080 min Summer	1.151	0.0	3978.6	0.0	6056
15 min Winter	136.976	0.0	646.3	0.0	26
30 min Winter	91.920	0.0	843.6	0.0	41

Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	54.782	0.682	11.3	0.0	11.3	1187.9	O K
120 min Winter	54.858	0.758	11.3	0.0	11.3	1348.0	O K
180 min Winter	54.901	0.801	11.3	0.0	11.3	1441.4	O K
240 min Winter	54.930	0.830	11.3	0.0	11.3	1504.9	O K
360 min Winter	54.966	0.866	11.3	0.0	11.3	1586.1	O K
480 min Winter	54.988	0.888	11.3	0.0	11.3	1635.7	O K
600 min Winter	55.002	0.902	11.3	0.0	11.3	1667.8	O K
720 min Winter	55.011	0.911	11.3	0.0	11.3	1688.6	O K
960 min Winter	55.021	0.921	11.3	0.0	11.3	1710.1	O K
1440 min Winter	55.018	0.918	11.3	0.0	11.3	1703.5	O K
2160 min Winter	54.997	0.897	11.3	0.0	11.3	1655.2	O K
2880 min Winter	54.971	0.871	11.3	0.0	11.3	1596.4	O K
4320 min Winter	54.896	0.796	11.3	0.0	11.3	1430.4	O K
5760 min Winter	54.802	0.702	11.3	0.0	11.3	1228.5	O K
7200 min Winter	54.704	0.604	11.3	0.0	11.3	1028.3	O K
8640 min Winter	54.615	0.515	11.3	0.0	11.3	855.1	O K
10080 min Winter	54.534	0.434	11.3	0.0	11.3	705.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	58.923	0.0	1184.5	0.0	70
120 min Winter	33.980	0.0	1360.7	0.0	128
180 min Winter	24.612	0.0	1471.1	0.0	186
240 min Winter	19.576	0.0	1551.0	0.0	244
360 min Winter	14.179	0.0	1658.7	0.0	360
480 min Winter	11.294	0.0	1717.6	0.0	476
600 min Winter	9.480	0.0	1731.4	0.0	592
720 min Winter	8.225	0.0	1716.6	0.0	706
960 min Winter	6.595	0.0	1678.2	0.0	932
1440 min Winter	4.854	0.0	1603.4	0.0	1362
2160 min Winter	3.597	0.0	2647.8	0.0	1712
2880 min Winter	2.910	0.0	2842.7	0.0	2188
4320 min Winter	2.149	0.0	3011.3	0.0	3116
5760 min Winter	1.734	0.0	3436.1	0.0	3984
7200 min Winter	1.470	0.0	3641.4	0.0	4760
8640 min Winter	1.287	0.0	3821.7	0.0	5528
10080 min Winter	1.151	0.0	3980.6	0.0	6168

Model Details

Storage is Online Cover Level (m) 55.600

Tank or Pond Structure

Invert Level (m) 54.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1432.0	1.500	2986.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0153-1130-1100-1130
Design Head (m)	1.100
Design Flow (l/s)	11.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	153
Invert Level (m)	54.100
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	11.3	Kick-Flo®	0.732	9.3
Flush-Flo™	0.330	11.3	Mean Flow over Head Range	-	9.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.5	1.200	11.8	3.000	18.2	7.000	27.3
0.200	10.8	1.400	12.7	3.500	19.6	7.500	28.2
0.300	11.3	1.600	13.5	4.000	20.9	8.000	29.1
0.400	11.2	1.800	14.3	4.500	22.1	8.500	30.0
0.500	11.0	2.000	15.0	5.000	23.2	9.000	30.8
0.600	10.6	2.200	15.7	5.500	24.3	9.500	31.7
0.800	9.7	2.400	16.4	6.000	25.4		
1.000	10.8	2.600	17.0	6.500	26.4		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 2.000 Invert Level (m) 55.600

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