

1. INTRODUCTION

Hydrock have been appointed by Reading Borough Council to provide a Drainage Strategy report for the approval of Reading Council Lead Local Flood Authority.

The proposed drainage strategy will be in accordance with both national guidelines and will incorporate a 'best practise' approach in reducing the impact of the flooding caused by the new development.

The report is based upon sewer asset information provided by the sewerage undertakers Thames Water in relation to assets within the vicinity of the development site.

The report highlights the key stakeholders in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can quickly be rectified thereby reducing the impact of potential damaged caused by flooding.

The information received is summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants Ltd accepts no responsibility for any direct and/or consequential loss that may occur as a result.

Appendices

Appendix A: Topographical Survey.

Appendix B: Architects Layout.

Appendix C: Sewer Asset Map.

Appendix D: Existing Drainage Strategy Layout - 26887 -HYD-00-ZZ-SK-C-7700_P01.

Appendix E: Pre / Post Development Catchments - 26887 -HYD-00-ZZ-SK-C-7710 & 7720_P01.

Appendix F: Calculations.

Appendix G: Overland Flow Routes - 26887-HYD-00-ZZ-SK-C-7730_P01.

Appendix H: Drainage Strategy Layout - 26887-HYD-00-ZZ-DR-C-7000_P01.

Post Development Surface and Foul Water Management Summary

The stormwater drainage system will be designed to accommodate a discharge rate of 5 l/s which has been deemed acceptable by Thames Water in preliminary discussions. This has been agreed in principle due to the nature of the existing development and its current arrangement. It has been considered unfeasible for this site to be restricted to Greenfield Run-off Rates (2l/s) as it will be extremely detrimental to the cost of the project given its spatial limitations. The chosen method for managing surface water run-off will involve directing it to a dedicated surface water sewer, as agreed with Thames Water.

The sustainable drainage system (SuDS) components in this design will incorporate Permeable Paving wherever feasible to improve water quality and reduce the need for below-ground crated solutions. Attenuation crates have also been specified to meet the requirements for permitted discharge rates. Lastly, a Swale will also be implemented providing attenuation for the housing.

For foul water, the design will accommodate a peak discharge rate of 4.9 l/s. Two methods of calculation were used, namely the Sewer Sector Guidance and the 'Estimated' Peak method. As a conservative estimate, the larger value from the two methods will be used, resulting in a design foul flow rate of 4.9 l/s as calculated by the 'Estimated' Peak method.

References / Design Codes

- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Building Regulations Approved Document Part H - Drainage and waste disposals.
- Sewers for Adoption (where applicable).
- Local Authority Guidance.
- CIRIA C753 - SuDS Manual.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.

2. SITE INFORMATION

2.1 Site Location

The site is located approximately 2km West of Reading centre in the Southcote ward, Berkshire. The Ordnance Survey National Grid Reference for the site is SU 69433 72582. The postcode to the site is RG30 2EZ.

Table 2.1: Site Referencing Information

Site Address	Amethyst Lane
	Amethyst Lane
	Postcode: RG30 2EZ
	National Grid Reference SU 69433 72582

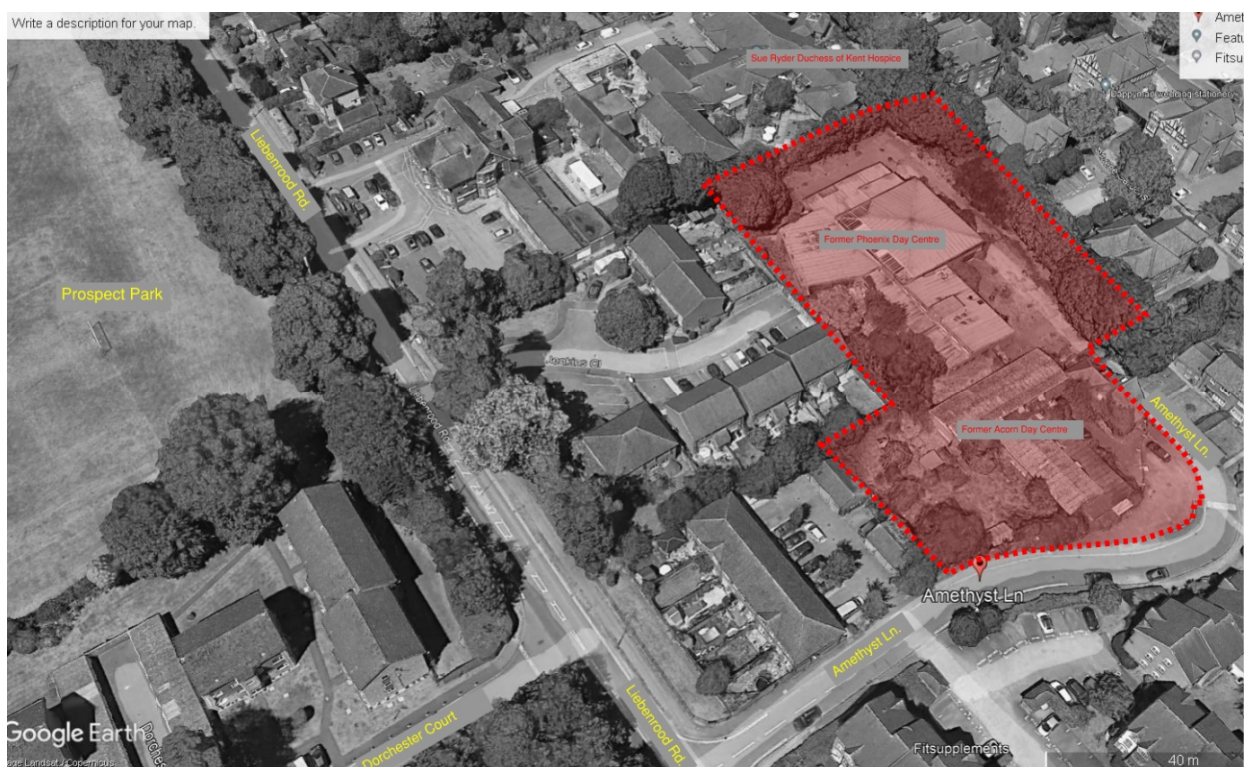


Figure 1: Site Location with Approximate Red Line Boundary

The site comprises an area of land of approximately 0.56 Ha in size. It is bound by low-rise residential properties to the South, East and West and the Sue Ryder Duchess of Kent Hospice to the North. The site is accessed from Amethyst Lane, connecting to Liebenrood Rd. to the West and Bath Road to the South.

2.2 Topography

The topographical survey indicates that the existing ground level within the development is generally flat and is approximately at 58m Above Ordnance Datum (AOD) sloping slightly North to South from 58.78 to 58.29. Being 110m the longest part of the site and 67m the widest part.

See **Appendix A** for Topographical Survey.

2.3 Development Proposals

The current development consists of the demolition of the existing now vacated day centre that use to provide services for older people and a family centre for children in care to meet with the birth parents in a safe environment. The subsequent redevelopment of the site provides 21 Dwellings (18 No. 3 beds and 3 No. 4 beds) and a Respite Centre with 526.4 total sqm. At this stage includes 21 car park spaces for the houses and 7 car park spaces for the Respite centre. The proposed houses are two and three storeys and single storey for the Respite Centre.

See **Appendix B** for Architect's Layout.

2.4 Geology

At the timing of this report, a Phase 1 Geo-Environmental Desk Study and a Geotechnical Scope and Specification are currently being carried out in order to validate the assumptions made in this report and to provide value engineering opportunities in the ground works package.

The Superficial Geology is Lynch Hill Gravel Member ranging from 1-12m with an average depth of 7m, underlain by the Lambeth Group with a thickness up to 39m.

There's a borehole information available on the British Geological Society website 200m to the East of the site approximately showing 1m depth of Made ground, Dark brown silty sandy topsoil over orange brown clayey silty sand over the Reading Beds finishing at 5.00m below ground level.

2.5 Hydrology & Hydrogeology

At the timing of this report, a Phase 1 Geo-Environmental Desk Study and a Geotechnical Scope and Specification are currently being carried out in order to validate the assumptions made in this report and to provide value engineering opportunities in the ground works package.

2.6 Flood Risk

The EA floodplain map indicates that the level of flood risk to the site corresponds to a Flood Zone 1 – Low Probability in Table 1 of NPPF Planning Practice Guidance. This zone has less than a 1 in 1000-year annual probability of flooding.

3. SURFACE WATER MANAGEMENT STRATEGY

3.1 Pre-Development Surface Water Drainage

Public Sewer asset maps have been obtained from Thames Water which show no surface water sewers within the site boundary. There is a 225mm dia sewers at the end of Amethyst Lane, which ultimately connects into a 225mm dia along Liebenrood Road. There is an existing sewer which is routed along amethyst lane which is not indicated by Thames water asset plans. The ownership of this sewer is assumed to belong to the highway authority however this should be confirmed by further investigations (as noted in appendix F).

See **Appendix D** for Sewer Asset Map.

Private: A utilities survey undertaken by Survey Solutions shows limited surface water drainage within the site boundary. A couple of soakaways are referenced and noted as heavily silted. There is a run at the southern boundary which looks to take drainage and connecting into Amethyst Lane. The drainage runs through and ultimately connects into the sewer towards the junction. The ownership of this pipe is not known but does not show up on Thames Map, therefore assumed private.

See **Appendix E** for Existing Drainage Layout.

3.2 Pre-Development Surface Water Catchments

The table below indicates each catchment type area, pre-development:

Table 3.1: Pre-Development Catchment Areas

Pre-Development Catchment	Area (m2)
Building / Roof	1803
Roads / Hardstanding	1821
Soft Landscaping	2033
Total Area	5657

See **Appendix F** for Pre-Development Catchment Plan.

3.3 Pre-Development Surface Water Run-Off

In order to determine the post-development surface water flows, an assessment has been carried out on the pre-development to ensure that the run-off from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.3.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 (Peak Flow Control):

It is a requirement that on new developments that consideration be given to limit discharge as close as reasonably practical to the equivalent 'Greenfield' rate for the corresponding storm event. The following table considers what the maximum surface water discharge from the site would be if the site was 'Greenfield' i.e., not developed:

Table 3.2: Pre-Development Run-Off Rates

Storm Event	Maximum discharge rate (l/s) Greenfield
1 in 1 Year	0.79
1 in 30 Year	2.14
1 in 100 Year	2.97
QBAR	0.93

3.3.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 (Peak Flow Control):

Should the site not be suitable to discharge as close as reasonably practical to the equivalent 'Greenfield' rate, Brownfield should be considered with a % betterment on the flow.

As the site is Greenfield this method has not been considered.

3.3.3 Capacity of Existing Drainage System

Further assessment has been carried out to determine the capacity of the connection point and its potential for re-use as part of the surface water drainage strategy for the new development:

Reference	Pipe Diameter (mm)	Length (m)	Gradient	Capacity (l/s)
Connection - MH2853	225	TBC by survey	TBC by survey	TBC by survey

- Capacity values taken from 'Tables for hydraulic design of pipes, sewers and channels' HR Wallingford and D.I.H Barr.
- Ks roughness value of 1.50 for existing clay pipes.

3.4 Pre-Development Flood Exceedance Flows

Topographical survey information indicates that prior to demolition surface water from the development would run-off north-south direct and overtop onto Dwyer Road footway and ultimately the carriageway.

3.5 Run-off Destinations

An appraisal should be undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Table 3.3: SuDS Hierarchy

Method	Reasoning	
Infiltration	As there are no superficial soils, the chalk is likely to be poor quality and dissolution present in Reading, soakaways have not been considered	X
Surface water body	There are no surface water bodies within the vicinity of the site.	X
To dedicated surface water sewer (public, highways or otherwise)	As there are potential connection point to the southern boundary this option will be considered.	✓
To a combined sewer	As there is a dedicated surface water system this has been discounted.	X
To a foul sewer	As there is a dedicated surface water system this has been discounted.	X

3.6 Suitability of SuDS Components

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity.

The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Table 3.4: Suitability of SuDS Components

Hierarchy	Description	Setting	Required area	Implemented	
Green roofs 	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.	No. Not withing architects keeping with the building proposals	X
Rainwater harvesting 	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (Underground or above ground).	No. Lack of space on site has meant that this was not feasible to be included within SUDS for this site.	X
Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependent on runoff volumes, water table and soils.	No. Ground Investigation report has confirmed that infiltration rates are too poor to consider this as an option.	X
Filter strip 	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5m.	No. Lack of space on site has meant that this was not feasible to be included within SUDS for this site.	X
Permeable paving 	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / open space	Can typically drain double its area.	Yes. This has been implemented wherever possible to improve water quality and reduce requirement for below ground crated solutions.	✓
Bioretention area 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be	Street / open space	Typically, surface area is 5-10% of drained area with storage below.	No. Ground Investigation report has confirmed that infiltration rates are too poor to consider this as an option.	X

	integrated with tree-pits or gardens.				
Swale 	Swales are shallow depressions designed to convoy and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / open space	Account for width to allow safe maintenance typically 2–3 metres wide.	Yes. Will provide attenuation for the housing. Storage will be private and accommodate between the 30yr and 100yr	✓
Hardscape storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Street / open space	Could be above or below ground and sized to storage need.	No. Other more sustainable forms of SUDS have been identified.	X
Pond / Basin 	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependent on runoff volumes and soils.	No. This has not been implemented on this site as there is insufficient space	X
Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically, 5–15% drainage area to provide good treatment.	No. This has not been implemented on this site as there is insufficient space	X
Underground storage 	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependent on runoff volumes and soils.	Yes. Attenuation crates have been specified to satisfy excess requirement to meet permitted discharge rates.	✓

3.7 Post-Development Surface Water Drainage

The below ground surface drainage system will connect all new rainwater pipes, channels and gullies at ground floor level and discharge at the southern boundary to the nearest Thames Water asset to which the site levels are feasible.

Due to requirements to have the road adopted, the drainage will need to be either a Highways or Thames Water asset. As the site also needs to accommodate private housing, it is proposed to adopt the road drainage under a Section 104 (Thames) and keep the houses drainage private, as there will need to be a separate system to take the run off from these areas.

The surface water strategy for this site has been formed by limiting the amount of attenuation crates beneath adoptable areas. This has been done by exploiting the site flat nature and introducing high level SuDS features to be used for attenuation purposes. Due to the addition of these features the below ground storage beneath the proposed highway has been minimised. Private external areas have been fully utilised by introducing permeable paving where possible, adding a proposed swale and maximising cellular storage installation in the private road to the south, hence reducing storage requirements beneath the proposed highway.

In summary:

- Discharge location will be south, within Amethyst Lane into EXSW-02. The run is shown as private therefore may need upgrading to a Thames asset (subject to agreement with Thames).
- SuDS will be in the form off permeable paving and a swale. As the space is limited this is the only suitable sustainable system for the site.
- Attenuation will be provided in the form of attenuation tanks located beneath the adoptable highway to the north and within the private road to the south of the site. Cellular storage will attenuate storms up to and including the 100yr+ 40CC% storm.
- Due to limited locations a standard cellular tank has been proposed, Thames Water / Local Highway will need to agree the type of storage structure and where it is cited if not in agreement.

It will be a gravity system without the need for pumping.

Where applicable, the surface water management strategy has incorporated the recommendations of the 'Non-Technical Standards for Sustainable Drainage' and general 'good practice' in terms of providing a Sustainable Drainage System (SuDS) which does not adversely impact on flood risk either within the site or beyond the development boundary.

3.8 Post-Development Surface Water Catchments

The table below indicates each catchment type area, post-development:

Table 3.5: Post-Development Catchment Areas

Post-Development Catchment	Area (m2)
Building / Roof	1813
Roads / Hardstanding - Permeable	398
Roads / Hardstanding – Impermeable	1762
Soft Landscaping	1684
Total Area	5657

See **Appendix F** for Post-Development Catchment Plan.

3.9 Post-Development Surface Water Run-Off

In order to determine the post-development surface water flows an assessment has been carried out to ensure that the flows from the new development will not adversely affect flood risk either within the site boundary, offsite adjacent properties, or the downstream network:

3.9.1 Greenfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S2 Cont. (Peak Flow Control):

Due to the nature of the existing development and its current arrangement, it is considered unfeasible for this site to reduce to Greenfield Run-off Rates as restricting to 2l/s will be extremely detrimental to the cost of the project along with spatial limitations; therefore, Brownfield analysis will need to be outlined to confirm what rate is considered close as reasonably practical to the current constraints.

3.9.2 Brownfield Run-Off Rates

In line with the Non-Statutory Technical Standard for Sustainable Drainage S3 Cont. (Peak Flow Control):

“Previously developed Brownfield sites should:

1. Aim to reduce the discharge to as close to the greenfield rate as possible.
 2. Seek improvement on pre-development rate.
 3. Peak rate of runoff reduced by 50% of value of pre-development rate.
 4. Discharged volume minimised.”
- As previously stated, it has been considered unfeasible to restrict the site to 2 l/s due to financial reasons and spatial limitations. However, a 5 l/s discharge rate has been proposed after Thames water had deemed this rate acceptable. Please see below for betterments on existing brownfield runoff rates.

Storm Event	Brownfield Run-off Rate (l/s)	Proposed Discharge rate (l/s)
1 in 1 Year	32.16	5
1 in 30 Year	78.81	5
1 in 100 Year	102.02	5

3.9.3 Capacity of Existing Drainage System

The proposed flows have then been checked against the anticipated capacity of the existing downstream pipe:

Reference	Catchment Area (m2)	Storm Event	Post-development rate	Capacity of pipe (l/s)	Check OK
Connection Point - MH2853	3349	1 in 1 Year	TBC by CCTV	TBC	✓
		1 in 30 Year	TBC by CCTV		
		1 in 100 Year	TBC by CCTV		

3.9.4 Summary of Post-Development Flows

It has been determined that the post-development surface water flow rates have been restricted to 5l/s for the development. This is in accordance with national guidelines and non-statutory technical standards so as to not adversely impact downstream flooding of the site as a result of the new development.

3.10 Interception Storage

Interception can be defined as the capture and retention on site of the first 5mm of the majority of all rainfall events. Interception mechanisms have been assessed to show the site is compliant for zero run-off from the first 5mm for 80% of events during the summer and 50% in winter. (Ciria)

Systems	Reasoning	
Green roofs	All surfaces that have green / blue roofs	X
Rainwater harvesting	All surfaces drained to RWH systems designed whether for surface water management or just water supply, provided the RWH system design is based on regular daily demand for non-potable water	X
Soakaways / infiltration	Areas of the site drained to systems that are designed to infiltrate run-off for events greater than a 1 month return period.	X
Permeable pavements	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.	✓
Filter strips / swales	Roads drained by filters strips / swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for interception delivery for impermeable areas up to 5 times the base of the vegetated surface area receiving the runoff.	✓
Infiltration trenches	Roads drained by infiltration trenches can be considered to provide interception	X
Detention basins	Areas of the site drainage to detention basin with a flat base can be assumed to comply. The area of the basin that is assumed to contribute to interception of run-off should be below the outlet of the basin.	X
Bioretention / rain gardens	Areas of the site drainage to unlined bioretention components can be assume to comply where the impermeable area is less than 5 times the vegetated surface area receiving run-off/ They can be designed to deliver interception for larger areas, where suitable infiltration capacity is available.	X
Ponds	Areas drained by ponds (with a permanent water pool that is effectively maintained by the outlet structure) are not assumed to deliver interception	X

3.11 Urban Creep

Urban Creep Factor (UCF) is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, such as the construction of patios, small extensions, etc.

As the footprint of the site has been set which includes patios etc, this factor is not applied.

3.12 Post-Development Surface Water Volume

In line with the Non-Statutory Technical Standard for Sustainable Drainage S4 & S5 (Volume Control):

In accordance with current guidance where reasonably practicable, for Greenfield developments the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6-hour rainfall event should never exceed the Greenfield Run-Off Volume for the same event.

Where there is an increase in the volume of run-off as a result of the development, infiltration or other SuDS techniques should be considered to mitigate volume run-off. However due to the soil type onsite, minimal infiltration will occur therefore infiltration techniques are considered unsuitable for the site.

In line with the Non-Statutory Technical Standard for Sustainable Drainage S6 (Flood Risk):

Where it has not been possible to reduce all of the additional volume by infiltration or other SuDS techniques, the volume of run-off should be discharged in accordance with one of the following rates of run-off, whichever is the higher.

Volume requirements	
The peak discharge rate has been reduced to pre-development 1-year peak flow rate	X
The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar). OR	✓
The peak discharge rate has been reduced to 2l/s/ha.	
The limiting discharge rate requires a flow rate of less than 5l/s at a discharge point, therefore up to 5l/s	X

The proposed SUD's treatment train for the site includes a swale and permeable paving which further assists in reducing the peak volume of runoff discharging from the site. Decrease in impermeable area as indicated below:

See **Appendix G** for Calculations.

3.13 Post-Development Surface Water Storage

In line with the Non-Statutory Technical Standard for Sustainable Drainage S7 & S8 (Flood Risk):

Attenuation flood storage will be distributed across the development with filter strips, permeable paving and crates attenuating at source. In the event that one part of the system fails through blockage the remainder of the system will still be able to function effectively.

3.14 Post-Development Flood Exceedance Flows

In line with the Non-Statutory Technical Standard for Sustainable Drainage S9 (Flood Risk):

In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away buildings and/or critical infrastructure.

See **Appendix H** for Overland Flow Routes.

3.15 Water Quality Treatment

The simple index approach has been used as the approach to water quality risk management on this project.

The pollution hazard indices identified for land use classifications within this project (as identified in table 26.2 of Ciria C753 - The SuDS Manual) are as follows;

Table 3.6: Pollution hazard indices

Pollution hazard indices for different land use classifications in accordance with CIRIA C753 - The SuDS Manual. Table 26.2				
Land Usage	Level	TSS	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads / motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

The indicative SuDS mitigation indices for discharges to surface for this project (as identified in table 26.3 of The SuDS Manual), are as follows;

Table 3.7: SuDS pollution mitigation for discharge to surface waters

Indicative SuDS mitigation indices for discharge of surface water			
Type of SuDS component	Mitigation indices		
	TSS	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 pavement	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
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately 1 in 1 year return period event, for inflow concentration relevant to the contributing drainage area		

Refer to below tables for a summary comparing the mitigation and pollution indices for each identified land usage classification.

Residential Roofs	TSS	Metals	Hydrocarbons
Pollution Index	0.2	0.2	0.05
Mitigation Index	0	0	0
Net Pollution	0.2	0.2	0.05
Comments	Due to very low risk of pollution from residential roofs, no mitigation solution proposed.		

Low Traffic Road	TSS	Metals	Hydrocarbons
Pollution Index	0.5	0.4	0.4
Mitigation Index (Permeable Paving / swale)	0.7	0.6	0.7
Net Pollution	-0.7	-0.8	-0.8
Comments	Permeable paving effectively mitigates the pollution risk from the low traffic road.		

Residential Carpark	TSS	Metals	Hydrocarbons
Pollution Index	0.5	0.4	0.4
Mitigation Index (Permeable Paving / swale)	1.2	1.2	1.3
Net Pollution	-0.7	-0.8	-0.9
Comments	Permeable paving effectively mitigates the pollution risk from the residential car park.		

Based on the above tables the water quality criteria of document Ciria C753 - The SuDS Manual is satisfied.

Consideration will be given to both during construction and post-development water quality treatment to ensure that water quality is not impacted during the construction works:

3.15.1 Quality of Surface Water Run-off: Post-Development

In accordance with Environment Agency Document PPG3 (now withdrawn but considered best practice guidance) the proposed as the car park is less than 50 spaces or 800m² it is considered to be 'low risk' in terms of pollution to the surface water network and as such an oil interceptor is deemed to be required.

Gullies and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network.

3.15.2 Quality of Surface Water Run-off: During Construction

It is anticipated that the during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

3.16 Design Standards

All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

In accordance with best practice storm drainage will be designed to the following performance criteria:

Pipes running under full conditions with no surcharge	-	1 in 2-year storm return period
No flooding	-	1 in 30-year storm return period
Extreme flooding to be retained on site	-	1 in 100-year storm return period.

See **Appendix J** for Drainage Strategy.

4. FOUL WATER MANAGEMENT STRATEGY

4.1 Pre-Development Foul Water Drainage

Public: Sewer asset maps have been obtained from Thames Water which show no foul water sewers within the site boundary. There is a sewer halfway down Amethyst Lane, which ultimately connects into a 225mm dia along Liebenrood Road.

Private: A utilities survey undertaken by Survey Solutions shows limited foul water drainage within the site boundary. A couple of manholes are referenced but it is unclear where they discharge to. It is assumed they head south towards the sewer in the road.

It is recommended a full drainage CCTV survey is undertaken to determine accurate routes of the existing drainage so the proposed network can be suitably coordinated

4.2 Post-Development Foul Water Drainage

The below-ground foul drainage system will connect all new soil, waste and ventilating pipes, sanitary appliances and gullies at ground level and discharge to a chamber outside each plot. The drainage will then fall south of the site and discharge into the foul network, within Amethyst Lane.

It is intended that only waste flows considered to be 'Domestic' shall be discharged into the foul drainage system. If the site wishes to discharge 'Trade Effluent' into the foul drainage system then will be required to make a formal application to the Sewerage Undertaker accordingly.

It will be a gravity system without the need for pumping.

The design of all foul sewers and lateral drains must conform to BS EN 752, BS EN 16933, Building Regulations 2010 Part H, planning policy and best practice guidelines (such as Sewers for Adoption 7th Edition) wherever applicable. Sanitary systems within building should be designed in accordance with BS EN 12056-2.

4.3 Post-Development Foul Water Flow Rates

The assessment of the proposed foul flow rates takes into account both daily average volumes and estimated peak flow rates.

4.3.1 Average daily flow volume

The estimate daily average foul flows have been estimated from the advice given in Loads and Flows, published by British Water.

Site Usage = Residential

Population = 126 approx.

Daily usage = $126 \times 150 = 18900$ litres/day = 0.218 litres/second

4.3.2 Peak flow rate

The peak design flow rates should be calculated using one of the below methods

Method 1 – Sewerage Sector Guidance

In the Sewerage Sector Guidance, Appendix C, B3.1 the below values are given to calculate the development peak flow rate:

Flow per dwelling = 0.05 litres per second per dwelling. (4000 litres/day)

Number of dwellings on site = 21 dwellings plus 6 respites

Design Flow rate = $0.05 \times 27 = 1.35$ litres/s

Method 2 – 'Estimated' Peak

It is widely used practice to estimate the peak flows by concentrating the average daily usage over an 8-hour period (i.e., assuming total daily flows from a school only happen during the day), and applying an additional multiplier.

Daily usage (as above) = 18900 litres/day

Flow rate over 8 hours = $18900 / (8 \times 60 \times 60) = 0.656$ litres/s

Additional multiplier = 6

Design Flow rate = $0.656 \times 6 = 3.9$ litres/s

Proposed peak rate

For conservatism, the larger of the values above will be used. Therefore, design foul flows = 3.9 l/s.

Further assessment will have to be carried out by the offsite consultant to determine the capacity of the connection point and its potential for connection as part of the foul water drainage strategy for the new development.

5. OWNERSHIP AND MAINTENANCE

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies who is responsible and the frequency of maintenance.

The proposed SuDS features will require maintenance including litter and debris removal, sediment removal, vegetation maintenance and remediation to any damaged structures.

The maintenance requirements will be the responsibility of a private maintenance company.

Table 5.1: Proposed Schedule of Maintenance for Below Ground Drainage

Permeable Paving - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most Sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Reference should be made to the manufacturer recommendations where applicable		

Underground Cellular Tanks - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually.
	Remove sediment from pre-treatment structures and / or internal forebays.	Annually, or as required.
Remedial actions	Repair / rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.
Reference should be made to the manufacturer recommendations where applicable		

Swale - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half early.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Filter Strip - Operation and maintenance requirements in accordance with CIRIA C753 - The SuDS Manual		
<u>Maintenance Schedule</u>	<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	Remove litter and debris	Monthly, (or as required).
	Cut grass - to retain height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils).	Monthly (at start, then half yearly).
	Check flow spreader and filter strip surface for evens gradients.	Monthly (at start, then half yearly).
	Inspect gravel flow spreader upstream of filter strip for clogging.	Monthly (at start, then half yearly).
	Inspect silt accumulation rate and establish appropriate removal frequencies.	Monthly (at start, then half yearly).
Occasional maintenance	Re-seed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseed.	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

Other Drainage Items - Ownership & Maintenance Responsibility Matrix		
<u>Feature</u>	<u>Maintenance</u>	<u>Frequency</u>
Private Drains	Inspection	CCTV survey every 5-10 years.
	Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey is)
	Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
Discharge orifice manholes/flow control devices	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.
Gully / Drainage Channels	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis:

Table 5.2: Proposed Operational Schedule for Below Ground Drainage

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

6. CONSENT / PLANNING

Summary of expected consents required:

- Ordinary Watercourse Consent – Not required.
- Sewerage Undertaker Consent – Required.
- Section 104 / 106 Drainage Adoption - Required.
- Section 102 – Required.
- Build Over / Build Near - Required (Existing Water main crosses site North to South).

In addition to the above it is anticipated that details of the drainage scheme will need to be approved by Reading Borough Council Lead Local Flood Authority (LLFA) through a formal planning application.

7. CONCLUSION

This report concludes that the foul and surface water drainage strategy for the development will be designed in accordance with both national and local standards and best practice. The following key items have been summarised below:

- The foul and surface water drainage systems for the new development will be designed to accommodate the required flows for the lifetime of the development.
- All surface water run-off from storm events up to and including the 100-year plus 40% climate change will be retained within the overall site.
- Attenuation provided 'at source' by way of permeable paving, swales and crates prior to discharging into the main drainage system in the road to meet the required flow rates for the whole site.
- Ownership and maintenance liabilities for the foul and surface water drainage system will be clearly defined so that in the event of failure the drainage system appropriate action can be taken to ensure that the drainage system continues to work efficiently.
- The use of permeable paving and swales for rainwater run-off mitigation, satisfies the water quality criteria of document Ciria C753 - The SuDS Manual.
- In the event that flows from rainfall exceed the 1 in 100-year rainfall event or system failure through lack of maintenance, surface water run-off will be directed via exceedance routes away from buildings and/or critical infrastructure.

Appendix A

Topographical Survey

PAS 128: 2014 QUALITY LEVEL GUIDE

Q-LEVEL	DESCRIPTION	ACC.	Q-LEVEL	DESCRIPTION
QL-D	Service positions taken from records.	Disallowed	QL-B2	Horizontal & vertical location using only one geophysical technique.
QL-C	Visual evidence of service existence but undetectable by geophysical technology.	Disallowed	QL-B1	Horizontal & vertical location using multiple geophysical techniques.
QL-B4	Undetectable service present shown as an assumed route. (AR)	AR - shown by N/A	QL-A	Horizontal & vertical position verification by open excavation, manholes and/or inspection chambers.
QL-B3	Horizontal location by one geophysical technique but with some or poor depth information.			

DETECTION METHOD IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE B

DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/types and service data recorded from ground level. All connections from DPs, Gullies, Drains, VPs, RE's and manholes have been proven wherever possible using audible connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

CCTV DRAINAGE SURVEY

All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. Pipework has been traced, accessed and collected for post processing. Drainage layout, including manhole covers not located by topographical survey, may be taken from CCTV chainage and will be shown as indicative only.

Electricity

Elec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

British Telecoms

BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against record information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual duct positions. For further information regarding Telecoms apparatus, please contact Openreach directly.

Cable TV & Communications

Cable TV and/or Com cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Fibre Optic

FO cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductible non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

Lighting, Traffic Signal & Security Cables

LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Gas & Water Inc. Fuel Pipes and Hot Water Pipes

GM/GS and/or VMWS pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter. When the Gas/Water pipe work is constructed using conductible materials, then we are able to employ multiple geophysical techniques to identify service network and achieve greater quality levels. When a non conductible material is used, GPR methodology will be employed to locate and plot the final service layout.

Ground Penetrating Radar

GPR methodology is used to identify and locate all non metallic, non conductible piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater success rate on pipe or service diameter upward of Ø63mm, Ø63mm, as size increments increase, so does the chance of detection. The GPR can produce varying results and as such, wouldn't be used as an independent utility surveying instrument.

Unidentified Traces

All UTs will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, is not achievable. We recommend excavation work to determine identity and depth where applicable.

Scarring (Q1-C)

Scarring has been identified on site with a potential of an undetectable service present.

Assumed Routes & Taken from Records (Q1-B4/D)

Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans or previous survey information and overlaid onto our drawings.

SURVEY RECOMMENDATIONS

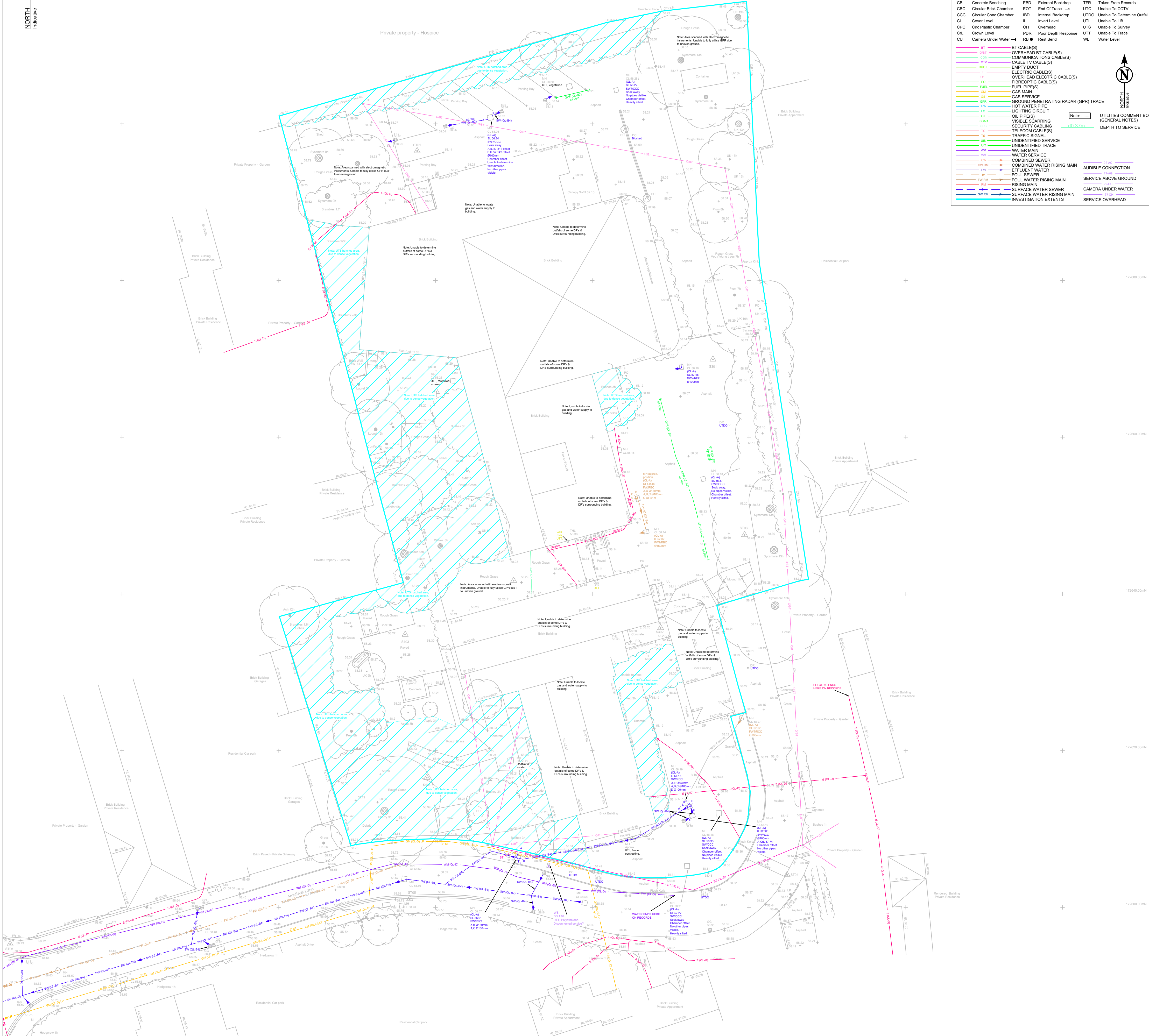
The areas of dense vegetation to be cleared to allow access if any of these areas are deemed critical or of high importance.

To undertake a CCTV drainage survey of the entire site area to establish a more comprehensive drainage network, and asset condition of the pipework.

The sewers with high levels of silt or blockages to be jetted to extend the CCTV drainage survey, if any of these areas are deemed critical or of high importance.

We recommend full statutory record information be obtained to confirm site findings and to position undetectable which may be present.

Due to the geophysical nature of subsurface technology, we always recommend excavation works to be carried out within critical areas for verification and to eliminate the possibility of undetectable services present.



UTILITIES & UNDERGROUND INVESTIGATIONS

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature. GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

© Land Survey Solutions Limited hold the copyright to all the information contained within this document and their written consent must be obtained before copying or using the data other than for the purpose it was originally supplied.

Do not scale from this drawing.

GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 43954BWUG from Gleds Management Services Ltd. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/DWG DRAWING INFORMATION

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	Survey Solutions	None
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS

ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS

DESKTOP UTILITY RECORDS (PAS 128: 2014 SURVEY TYPE D)

PREREQUISITE FOR PAS 128: 2014 SURVEY TYPE B
COMMISSIONED: NO

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	N/A
WATER MAIN	NO	N/A
GAS MAIN	NO	PUBLIC
TELECOM	NO	N/A
CABLE TV	NO	N/A
ELECTRICITY	NO	N/A
OIL PIPES	NO	N/A
OTHER	NO	N/A

A	UTILITY RECORDS ADDED.	RJB	JAB	GSB	31/10/2022
REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORMICH NOTTINGHAM YEOVIL

PROJECT TITLE
AMETHYST LANE, READING, BERKSHIRE, RG30 2EZ.

DRAWING DETAIL
UTILITIES AND DRAINAGE SURVEY.
SHEET 1 OF 2

CLIENT GLEEDS MANAGEMENT SERVICES LTD	SCALE 1:250
SURVEYOR RJB	SURVEY DATE 26/09/2022
CHECKED BY AJM	APPROVED BY GSB
DRAWING NUMBER 43954BWUG-01	REVISION A
	ISSUE DATE 26/09/2022



PAS 128: 2014 QUALITY LEVEL GUIDE

Q-LEVEL	DESCRIPTION	ACC	Q-LEVEL	DESCRIPTION
Q1-D	Service providers taken from records	Assumed	Q1-B2	Internal & external location using only one
Q1-C	Assumed to be a standard service	Assumed	Q1-B1	Assumed to be a standard service
Q1-B4	Assumed to be a standard service	Assumed	Q1-A	Assumed to be a standard service
Q1-B3	Assumed to be a standard service	Assumed		

DETECTION METHOD

IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE B

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UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

10 SC	10 x 5 Cables	DI	Depth To Crown	RBC	Rectangular Brick Chamber
AC	Audible Connection	DS	Depth To Silt	RCC	Rectangular Conc Chamber
AG	Above Ground	DTB	Depth To Base	RE	Roading Eye
AR	Assumed Route	DTW	Depth To Water	SA	Survey Abandoned
BL	Base Level	DTS	Depth To Surcharge	SL	Still Level
CB	Concrete Brenching	EDB	External Backdrop	SL	Still Level
CBC	Circular Brick Chamber	EDT	East Of Trace	THR	Taken From Records
CCC	Circular Conc Chamber	IBD	Internal Backdrop	UTDO	Unable To Determine Outfall
CL	Cover Level	IL	Invert Level	UTL	Unable To LR
CPC	Circ Plastic Chamber	OH	Overhead	UTS	Unable To Survey
CL	Crown Level	PDR	Poor Depth Response	UTT	Unable To Trace
CU	Camera Under Water	RB	Rest Bend	WL	Water Level
BT	BT CABLE(S)				
OVERHEAD BT CABLE(S)					
COMMUNICATIONS CABLE(S)					
CABLE TV CABLE(S)					
EMPTY DUCT					
ELECTRIC CABLE(S)					
OVERHEAD ELECTRIC CABLE(S)					
FIBRE OPTIC CABLE(S)					
FUEL PIPE(S)					
GAS MAIN					
GAS SERVICE					
GROUND PENETRATING RADAR (GPR) TRACE					
HOT WATER PIPE					
LIGHTING CIRCUIT					
OIL PIPES					
VISIBLE SCARRING					
SECURITY CABLE(S)					
TELECOM CABLE(S)					
TRAFFIC SIGNAL					
UNIDENTIFIED SERVICE					
UNIDENTIFIED TRACE					
WATER MAIN					
WATER SERVICE					
COMBINED SEWER					
COMBINED WATER RISING MAIN					
EFFLUENT WATER					
FOUL SEWER					
FOUL WATER RISING MAIN					
SURFACE WATER SEWER					
SURFACE WATER RISING MAIN					
INVESTIGATION EXTENTS					

UTILITIES COMMENT BOX (GENERAL NOTES)

DEPTH TO SERVICE

AUDIBLE CONNECTION

SERVICE ABOVE GROUND

CAMERA UNDER WATER

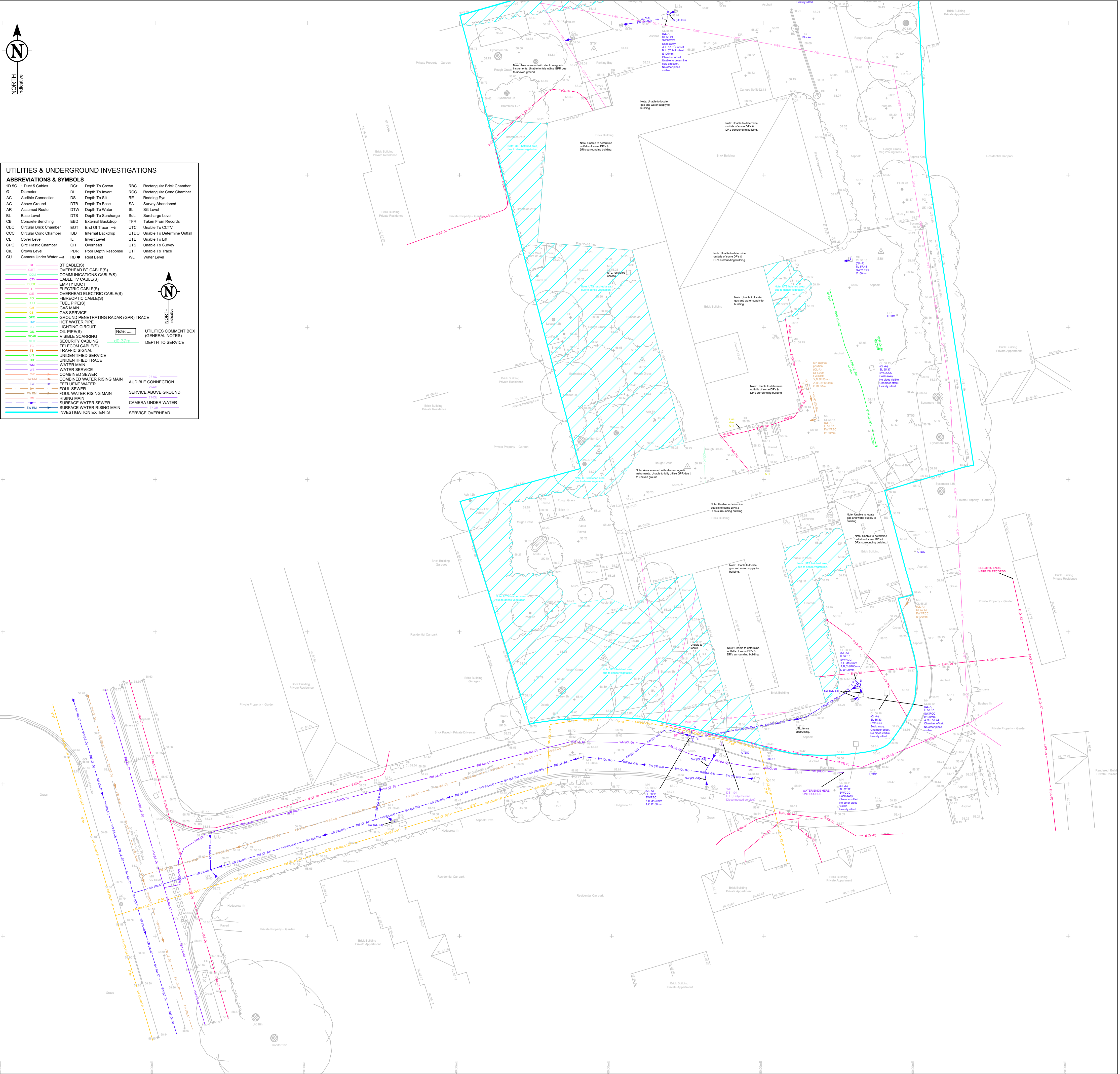
SERVICE OVERHEAD

North

Indicative

North

Indicative



UTILITIES & UNDERGROUND INVESTIGATIONS

DRAWING NOTES

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All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

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Do not scale from this drawing.

GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 43954BWUG from Gleds Management Services Ltd. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/DWG DRAWING INFORMATION

TOPOGRAPHICAL SURVEY DATE 19/08/2022

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	Survey Solutions	None
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS

ADDITIONAL INFORMATION	AVERAGE	EFFECT ON SURVEY RESULTS

DESKTOP UTILITY RECORDS (PAS 128: 2014 SURVEY TYPE D)

PREREQUISITE FOR PAS 128: 2014 SURVEY TYPE B

COMMISSIONED: NO

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	N/A
WATER MAIN	NO	N/A
GAS MAIN	NO	N/A
TELECOM	NO	N/A
CABLE TV	NO	N/A
ELECTRICITY	NO	N/A
OIL PIPES	NO	N/A
OTHER	NO	N/A

A	UTILITY RECORDS ADDED.	RUB	JAB	GSB	31/10/2022
REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORMICH NOTTINGHAM YEOUL

PROJECT TITLE AMETHYST LANE, READING, BERKSHIRE, RG30 2EZ.					
DRAWING DETAIL UTILITIES AND DRAINAGE SURVEY. SHEET 2 OF 2					
CLIENT GLEEDS MANAGEMENT SERVICES LTD	SCALE 1:250				
SURVEYOR RJB	SURVEY DATE SURVDATE	CHECKED BY AJM	APPROVED BY GSB	DWG STATUS FINAL	
DRAWING NUMBER 43954BWUG-01	REVISION A			ISSUE DATE 26/09/2022	

