



Cottage Lane, Glossop

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT



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Cottage Lane, Glossop

Flood Risk Assessment & Drainage Strategy Report

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Cottage lane, Glossop

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Contents

1.0 INTRODUCTION	4
2.0 SITE DESCRIPTION	5
2.1 Geology.....	5
2.2 Hydrogeology	5
2.3 Hydrology	6
3.0 PROPOSED DEVELOPMENT	6
4.0 PLANNING POLICY.....	6
4.1 Sequential and Exception Test	7
4.2 Exception Test	7
5.0 FORMS OF FLOODING.....	7
5.1 Flooding from Rivers	7
5.2 Flooding from Sea	7
5.3 Flooding from Land	7
5.4 Flooding from Groundwater	7
5.5 Flooding from Sewers.....	8
5.6 Flooding from Reservoirs, Canals and Other Artificial Sources	8
6.0 PROPOSED DEVELOPMENT	8
6.1 Effect of Proposed Development	8
6.2 Existing Drainage Systems.....	9
6.3 Proposed Drainage Strategy.....	9
6.3.1 Surface Water Drainage	9
6.3.2 SuDS Summary.....	12
6.3.3 Water Quality Assessment	13
6.3.4 Foul Water Drainage.....	13
6.3.5 Public Combined Water Drainage Diversion	14

7.0 FUTURE MANAGEMENT & MAINTENANCE	15
7.1 General Maintenance & Inspection Requirements.....	15
7.2 Inspection Chambers, Manholes and Catchpits	16
7.3 Pipes	16
7.4 Drainage Channels and Gullies.....	17
7.5 Vortex Flow Control Device.....	17
7.6 Cellular Attenuation Tanks.....	18
7.7 Porous/Permeable Paving	19
8.0 CONCLUSIONS	20
9.0 RECOMMENDATIONS.....	21
Appendix A - Site Location Plan	22
Appendix B - Aerial Photograph	23
Appendix C - Topographic Survey	24
Appendix D - Proposed Site Plan.....	25
Appendix E - Flood Maps	26
Appendix F - United Utilities Sewer Map	27
Appendix G - Pre & Post Development Impermeable Areas Drawing	28
Appendix H - Greenfield Runoff Calculations	29
Appendix I - Preliminary Storage Estimate	30
Appendix J - Drainage Strategy Drawing & SW Calculations	31



Alan Johnston Partnership Ltd.

Company No. 13204766

Cottage Lane, Glossop

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1.0 INTRODUCTION

This Flood Risk Assessment (FRA) and Drainage Strategy Report has been prepared on behalf of Westshield Ltd in connection with the construction of a new residential development to the east of Cottage Lane, Glossop. Even though the site is located entirely within Flood Zone 1, the total area of the proposed development is over 1.0ha and therefore an FRA is required.

This FRA has been prepared in accordance with the general requirements of the National Planning Policy Framework and the associated Planning Practice Guidance, both published by the Department for Communities and Local Government. This involves the identification of flood risk to new development(s) on the site, the possible effect of this development on flood risk elsewhere and the investigation of the impact on the development as a result of increased sea levels, fluvial flows, and larger pluvial events due to increased impermeable areas and climate change.

The purpose of this report is to present a site-specific assessment of flood risk based on available information, to identify relevant flood levels affecting the site with respect to a particular probability of flooding. The flood levels identified are dependent on the correctness of the current conditions, as stated in this report and the prediction of future climatic conditions implicit in the National Planning Policy Framework.

For any size of storm event, the procedure will always yield a probability that the event will occur in any year, albeit the probability is smaller for larger events. The predicted storm event has a probability of occurrence in any year and the derived flood level has an associated probability of exceedance. This means that there is always a risk that property flooding could occur one or more times in any year.

Therefore, this report should not be interpreted or relied upon as providing a guarantee against flooding. There is always a residual risk that flooding will occur and it is not possible to predict a zero risk of flooding.

In accordance with National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance, flood risk must be assessed for all sources including tidal (from the sea), fluvial (from rivers), pluvial (from land), groundwater, sewer and artificial water bodies (e.g., reservoirs, canals, major water supply infrastructure etc.).

More specifically, the development of any site must be carried out in such a way as to mitigate any potential flood risk, both on and off site from all sources of flooding.

The other purpose of this report is to present the surface water and foul water outline drainage strategies for the site which have been developed by the Alan Johnston Partnership.

To demonstrate how the specific drainage requirements are to be met, the report should be read in conjunction with the relevant drawings and supporting information, included within the appendices.

The drainage strategies outlined within this report, have been prepared in accordance with BS EN 752:2017 (Drain and sewer systems outside buildings), Sewers for Adoption, Building Regulations Approved Document H (Drainage and waste disposal), the National Planning Policy Framework document (Department for Communities and Local Government, July 2021) and associated Planning Practice Guidance.



2.0 SITE DESCRIPTION

The proposed development covers a total area of 1.10ha and is located on an existing greenfield site to the east of Cottage Lane, Glossop, at National Grid reference SK 01441 94532. The site location plan is attached in Appendix A and the extent of the area to which the application relates is shown on the enclosed aerial photo, attached in Appendix B.

The site generally falls from south to north, with levels falling from approximately 151.00mAOD in the south to approximately 147.00mAOD in the north. The topographic survey is attached in Appendix C. The proposed site levels are constrained by the surrounding properties and woodlands.

2.1 Geology

To date an intrusive site investigation is yet to be completed but a Phase 1 Geoenvironmental Site Assessment has been completed by e3p in July 2023, report reference 16-627-R1. The Phase 1 study indicates that the underlying strata consists of Glacial Till superficial deposits underlain by Huddersfield White Rock bedrock comprising of sandstone.

This is supported by the information taken from the British Geological Survey (BGS) 1:50,000 Bedrock geology maps which also show that the site has superficial deposits comprising of Devensian Till deposits, with the bedrock reported to be of the Huddersfield White Rock comprising of sandstone.

2.2 Hydrogeology

The Environment Agency groundwater maps show that the superficial deposits are classified as Secondary undifferentiated strata. These are defined as areas where it has not been possible to attribute either category A or B to a rock type, respectively. In most cases this is due to the variable characteristics of the rock type.

The bedrock is classified as a secondary A aquifer, comprising of permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

The Environment Agency groundwater maps also indicate that the development site is not situated within a groundwater Source Protection Zone (SPZ). They also indicate that the site is located within an area which has a low risk of groundwater flooding. This is supported by the results of the e3p Phase 1 Geoenvironmental Site Assessment, 16-627-R1, which indicates that groundwater was not encountered on site.

2.3 Hydrology

The site is located within Flood Zone 1 which is categorized by the Environment Agency as land assessed as having less than a 1 in 1,000 annual probability of river flooding (1% - 0.1%). Therefore, the site is an area identified by the Environment Agency as at low risk of flooding from rivers and streams.

3.0 PROPOSED DEVELOPMENT

The proposed development is to clear the existing woods and construct a housing estate with 54 associated properties. These are to be accompanied by gardens, parking spaces and an access road connected to Cottage Lane. 52 cottage lane is set to be demolished to make way for the new access road.

To enable a viable scheme, the proposed site levels are constrained by the existing developments and highways surrounding the site, therefore the site levels may be amended but are likely to remain similar to the existing in order to tie into the surrounding developments and highway.

4.0 PLANNING POLICY

The National Planning Policy Framework (NPPF) sets out the Government's policy on meeting the challenges of climate change, flooding and coastal change. The NPPF states that:

"Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impact of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development. Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change taking full account of flood risk, coastal change and water supply and demand consideration."

This Flood Risk Assessment proposes recommendations to facilitate the proposed development so that it considers flood risk at all stages of the development.

4.1 Sequential and Exception Test

Based on the site's location in Flood Zone 1, the development is deemed appropriate according to NPPF therefore the development is appropriately situated and the Sequential Test is not required.

4.2 Exception Test

NPPF classifies the development (residential) as 'More Vulnerable' but as the site is located within Flood Zone 1 the Exception Test is not required.



5.0 FORMS OF FLOODING

The National Planning Policy Framework requires all forms of flooding to be considered.

5.1 Flooding from Rivers

The Flood Risk map is included as Appendix E.

As can be seen from the Flood Risk map, the entire site is located within Flood Zone 1 and therefore, the site has a chance of flooding of less than 0.1% (or 1 in 1000).

The nearest designated main river is Pen Leach Brook, which is located 200m north-east of the site. Given the distance to the river and that the site is located in Flood Zone 1, the risk of flooding to the new development from rivers is considered to be low.

5.2 Flooding from Sea

The site is not at risk of flooding from the sea. The lowest level of the site is approximately 147.00mAOD, i.e., well above tidal flood levels.

5.3 Flooding from Land

Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. The surface water flooding map is included in Appendix E. It can be seen from the map that the entire site is classified as having a low or very low risk of surface water flooding.

Therefore, the risk of flooding from overland flows due to surface water flooding is considered to be low and as such the overall site is considered to be at low risk of flooding from surface water/surrounding land.

5.4 Flooding from Groundwater

As outlined in Section 2.2, the e3p Phase 1 Geoenvironmental Site Assessment, 16-627-R1, indicates that the site is not located within a groundwater source protection zone and as such no groundwater was encountered on site. It also shows that any shallow groundwater encountered will flow towards Glossop Road and into the Glossop Brook.

As such, due to the lack of groundwater encountered by the intrusive site investigation and the sites topography, the site is considered to be at low risk of flooding from groundwater.

5.5 Flooding from Sewers

A record of public sewers surrounding and serving the development site has been obtained from United Utilities and this is included in Appendix F. As can be seen from the United Utilities sewer map there is a public combined water sewer passing through the south side of the site before out falling into the public sewer along Cottage Lane. There is no indication of any private water sewers within the site boundary.

Therefore, the lack of private sewers within the proposed site, the proposed drainage networks for the site being suitably designed and the fact that the public sewers are maintained by United Utilities, leads to the conclusion that the site itself is considered to have a low risk of flooding from sewers.

5.6 Flooding from Reservoirs, Canals and Other Artificial Sources

The Reservoir Flood Risk map is included in Appendix E and the closest artificial waterbody and reservoir is the Swineshaw Reservoir, which is located approximately 3.02km west of the site.

As such, it can be seen from the map that the site is not at risk of flooding from reservoirs, canals or other artificial sources.

6.0 PROPOSED DEVELOPMENT

6.1 Effect of Proposed Development

The pre and post development impermeable areas for the 1.103ha development area have been assessed and are indicated on the attached drawing in Appendix G. The comparison between the pre and post development impermeable areas is also summarised below;

Total Development Site Area (ha)	Existing Impermeable Area (ha)	Proposed Impermeable Area (ha)
1.103	0.000	0.661

Therefore, the changes to the existing site will increase the volume of impermeable areas and as such, the proposed development will lead to an increase in the;

- ◆ Volume of surface water ponding on the site
- ◆ Volume of surface water runoff leaving the site or discharging into surrounding areas
- ◆ Peak discharge rate from the site

Accordingly, drainage systems are needed to drain the foul and surface water flows arising from the proposed development. Where possible, any existing drainage networks should be utilised. Appropriate design and construction of these systems, as set out in Section 6.3, should ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

6.2 Existing Drainage Systems

As previously mentioned in section 5.5, there is a 150mm public combined water sewer which transitions into a 225mm sewer on the south side of the proposed site; entering the site via the south boundary and out falling into the 300mm public combined water sewer along Cottage Lane. Although not within the site boundary, there is also a 300x450mm public surface water sewer along Cottage Lane. This is shown in the United Utilities public sewer map, attached in Appendix F.

Given that the 150mm section of the public combined water sewer is currently situated beneath the footprint of proposed houses, a diversion of the public sewer will be required. This is discussed further in section 6.3.5

As the area of proposed development is currently greenfield with no indication of any previous works, it is anticipated that there is no existing private drainage located within the development site area. The topo survey attached in Appendix C, also indicates a number of existing services with no existing drainage or services located within the proposed development site area.

Despite this, should any existing drainage be found on site, a CCTV survey should be undertaken to determine the exact details of the drainage and the possibility of utilising the existing drainage as an outfall should be explored throughout the detailed drainage design process.

Given that the aforementioned public combined water sewer is beneath the footprint of the proposed properties, it is envisioned that this sewer will have to be diverted. This is discussed further in Section 6.3.5.

6.3 Proposed Drainage Strategy

As outlined above in Section 6.1, site-wide drainage systems are required to drain the foul and surface water flows arising from the proposed development. The proposed drainage systems must ensure that there is no increase in offsite flood risk that would otherwise impact downstream areas.

6.3.1 Surface Water Drainage

The Planning Policy Guidance and the CIRIA SuDS Manual detail that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

- ◆ into the ground (infiltration);
- ◆ to a surface water body;

- ◆ to a surface water sewer, highway drain, or another drainage system;
- ◆ to a combined sewer.

Considering the hierarchy above, the surface water network should infiltrate where possible. A desktop site investigation was completed by e3p in July 2023 and is contained within report “Phase 1 Geoenvironmental Site Assessment, Cottage Lane Glossop, 16-627-R1”.

As the investigation was just a desktop one, it did not include any BRE365 complaint infiltration tests however, it did indicate that the ground was made up of sandstone and clay. Given the impermeable nature of these soils it can be concluded that infiltration is not suitable for this development.

As the possibility of infiltration has been ruled out by the site investigation, the intention for the development would be to discharge to watercourse. As indicated in Section 5.1, the nearest watercourse is Glossop Brook, which is located 200m north-east of the site. Given the distance between the site and the brook as well as the A57 road and industrial estate between the site and the brook, it has been deemed impractical to discharge to a watercourse.

As such, the only practical solution for discharge of the surface water is discharge to public sewer. As indicated within Section 6.2, there is a public 300x450mm surface water sewer along cottage Lane. As such, it is envisaged that the surface water runoff from the proposed development will discharge to the surrounding public surface water sewer.

While every effort to use the existing systems should be made, the drainage systems should be designed to suit the proposed site layout and topography which aims to provide an efficient design.

In line with Sewers for Adoption (8th Edition), the requirements for the design of a new surface water drainage systems are as follows:

- ◆ Below ground piped drainage to be sized to accommodate the 1 in 2 year (50% AEP) design storm without surcharge.
- ◆ System to be designed not to flood any part of the site in a 1 in 30 year (3% AEP) design storm.
- ◆ For events in exceedance of the 1 in 30 year design storm and up to and including the 1 in 100 year event, site drainage and topography should be designed where practicable to route surface water run-off away from buildings to safe above-ground storage areas on site, thereby preventing this run-off from leaving the site and increasing flood risk elsewhere.

For each design case described above, the design storm is the critical storm duration for the site conditions. In the case of the 1 in 100 year design storm, a 40% increase in the peak rainfall intensity is applied to allow for the estimated worst-case impacts of climate change. This is in accordance with advice, issued by the Environment Agency, which updates previous climate change allowances outlined in the National Planning Policy Framework.

Suitable systems of below ground drainage will be required to contain as a minimum requirement, the 1 in 30 year event. Additionally, any surface water run-off from events that exceed the design capacity of the new drainage system, up to and including the 1 in 100 year (+40%) event, will be retained on-site in safe storage areas.

In line with common practice, it is proposed the surface water discharge from the proposed development should mimic that from the existing site. It is envisaged that as the existing site is greenfield, High Peak Borough Council will require the proposed surface water runoff rates to be restricted to match the existing greenfield run off rates.

Therefore, an assessment of the existing surface water run-off from the greenfield site has been completed using the ICP SuDS method within Micro Drainage. For the existing 1.103ha site, the existing greenfield run-off rates were calculated. The greenfield runoff assessment is attached in Appendix H and the results are summarized within the table below.

Rainfall Return Period (years)	Existing Greenfield Runoff Rate (L/s)
1 Year	5.8
(2 year)	6.2
Qbar	6.7
30 year	11.4
100 year	13.9

Using the total post development impermeable area of 0.661ha at the restricted discharge Qbar rate, for the 1 in 100 year + 40% return period design storm, a storage volume of 114.1m³ is required. The preliminary attenuation storage assessment is attached in Appendix I.

As seen in from the Drainage Strategy Drawing attached in Appendix J, it is anticipated that the surface water runoff from the proposed building and surrounding hard standing areas will be collected and conveyed to the west of the site. Here it will discharge into the existing public surface water 300x450mm sewer (UU manhole 3501) along Cottage Lane, with flow being restricted to the aforementioned greenfield rates via a flow control chamber for all rainfall events up to and including the 1 in 100 year +40% climate change event.

Attenuation will be provided via oversized pipes and manholes throughout the network as well as 2 offline cellular attenuation tanks located beneath the car park on the north side of the proposed site and parking bays on the east side of the proposed site.

The surface water drainage calculations have also been included within Appendix J and as can be seen the proposed surface water drainage and attenuation storage prevent any

flooding for all rainfall events up to and including the 1 in 100 year + 40% climate change event.

It is envisioned that the oversized pipes, manholes and outfall into the existing public surface water sewer will all be adopted by United Utilities via a Section 104 application. Road gullies and inspection chambers within property boundaries will remain private.

The surface water drainage strategy should be confirmed via more detailed discussions with the High Peak Borough Council (LLFA) and the Environment Agency prior to the commencement of any works.

6.3.2 SuDS Summary

As outlined within the summary table below, all SuDS techniques have been considered for this development;

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Not suitable due to minimal roof area available.
Rainwater Harvesting	✓	Rainwater butts are practical and have been included for each home.
Basins, Ponds & Swales	✗	Unsuitable due to lack of available space and impermeable strata.
Filter Strips	✗	Unsuitable due to lack of available areas
Bio-retention Areas	✗	Unsuitable due to lack of available areas
Infiltration Techniques	✗	Unsuitable due to impermeable strata.
Permeable Surfaces	✓	Suitable and incorporated
Tanked/Piped Systems	✓	Suitable and incorporated where necessary.

Green roof areas have been considered but due to the minimal roof area available the use of a green roof has been discounted.

Rainwater harvesting was also considered but due to a lack of greywater demand and the cost associated with tanks and pumping of the separate system, it has been deemed as impractical. However, it is feasible to include a rainwater butt for each property and as such have been included for each house.

Due to a lack of available, suitable space across the site, the use of basins, ponds or swales have been deemed as impractical. The lack of available areas and impermeable strata have also resulted in the use of any filter strips or infiltration techniques being impractical for the proposed site. Given the number of parking spaces, permeable paving in the parking spaces with an impermeable geomembrane has been deemed practical as it provides additional storage and as such has included.

Finally, the use of oversized pipe networks has been included as well as the use of 2 below ground cellular attenuation tanks, to store the surcharged surface water runoff from the site.

The use of SuDS solutions across the site is subject to change and is dependent upon the final site layout, detailed drainage design and the results of additional surveys. However, the drainage strategy and proposed SuDS solutions should adhere as close as possible to the above outline drainage strategy and SuDS solutions.

6.3.3 Water Quality Assessment

Managing the water quality of the surface water runoff from the proposed development is important to ensure that the receiving surface waters or groundwater are well protected. Generally, this can be achieved through the use of well-designed SuDS systems which provide treatment and pollution removal to the surface water runoff.

Standard S3 of the Statutory National Standards for Sustainable Drainage Systems (2018) details the water quality management and addresses the drainage design requirements to minimise the potential pollution risk.

As the proposed development consists of roof areas, car park areas and low traffic roads, in accordance within Table G3.2 of the Statutory National Standards for Sustainable Drainage Systems (2018) the pollution hazard level is low and as such the simple index approach can be used to assess the treatment requirements for the low risk of pollution.

The simple index approach is outlined within Chapter 26 of CIRIA Report C753 - The SuDS Manual. Therefore, using Table 26.2 and applying the proposed site description above, results in a low pollution hazard level, with the pollution hazard indices being; TSS - 0.5, Metals - 0.4 and Hydrocarbons - 0.4.

Assessing this against Table 26.3 of CIRIA Report C753 - The SuDS Manual using the SuDS treatment train of permeable paving results in the mitigation indices outweighing the pollution hazard indices identified above. The use of a permeable paving would result in mitigation indices of; TSS - 0.7, Metals - 0.6 and Hydrocarbons - 0.7.

Therefore, as the mitigation indices are equal to or greater than each of the pollution hazard indices the use of a permeable paving is deemed acceptable from a pollution mitigation perspective and as such complies with the water quality requirements of Standard S3 of the Statutory National Standards for Sustainable Drainage Systems (2018).

6.3.4 Foul Water Drainage

Foul water drainage disposal is set out in Part H of the Building Regulations in order of priority the preferred methods are;

1. Public sewer
2. Septic tank
3. Cesspool

The foul water system shall be designed in accordance with;

- ◆ BS EN 752:2017 (Drain and sewer systems outside buildings)
- ◆ Sewers for Adoption (8th Edition)
- ◆ Planning Practice Guidance and the National Planning Policy Framework document (Department for Communities and Local Government, July 2021).
- ◆ BS EN 12056-2:2000 (Drainage systems inside buildings)
- ◆ Building Regulations Approved Document H, Drainage and waste disposal. (Office of the Deputy Prime Minister, December 2015).

As can be seen from the Drainage Strategy Drawing attached in Appendix J, it is anticipated that the foul water drainage will collect run off from the proposed building via access chambers and convey the foul water to the west of the proposed site.

As the proposed diversion it set to run through the proposed site via the new access road, this provides multiple points for the foul discharge to outfall into. As such the foul network is to outfall into the proposed diversion at multiple points to reduce the length of pipe needed within the network. This also means no section 106 application is required as the foul network is not discharging directly into the existing public sewer.

It is envisioned that the foul manholes and 150mm pipes within the proposed road are to be adopted by United Utilities via a Section 104 application. Inspection chambers within property boundaries will remain private.

The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with the High Peak Borough Council (LLFA) and United Utilities prior to the commencement of any works.

6.3.5 Public Combined Water Drainage Diversion

As can be seen on the public sewer maps and the proposed drainage strategy, a combined 150mm sewer runs through the site from the south to the west site boundary. Given the new layout of the proposed development, this pipe will need to be displaced in order to make room for the new foundations.

Therefore, it is envisioned that the existing 150mm pipe underneath the new houses will be abandoned and a new 225mm combined water diversion will be installed. The new sewer will follow the path of the of the proposed road; starting at public combined manhole UUMH4401 and finishing at public combined manhole UUMH4502 before continuing the existing path. The location of the diversion can be seen on the outline drainage strategy in Appendix J.

In order for this diversion to be approved, a section 185 agreement as well as the necessary drawings will need to be filed. Further discussions with united utilities will need to be carried out prior to any works.

7.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SUDS techniques in accordance with the CIRIA SUDS Manual C753. The surface water run-off from the proposed development is to infiltrate into the ground with the attenuated run-off stored using below ground cellular attenuation tanks.

It is envisaged that the following components have been or will be included within the drainage strategy for the proposed development:

- ◆ Inspection chambers, manholes and catchpits.
- ◆ Pipes.
- ◆ Drainage channels and gullies.
- ◆ Vortex flow control device.
- ◆ Cellular attenuation tanks.
- ◆ Porous/permeable paving.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

It is assumed that the proposed drainage will remain private and therefore maintenance of the surface and foul water drainage systems will be the responsibility of Westshield Ltd or an on-site facilities management team and therefore a copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

As such, the maintenance of the specified SuDS should be included within the developments Operation and Maintenance Manual and should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

7.1 General Maintenance & Inspection Requirements

- ◆ No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.
- ◆ Maintenance/inspection work shall be carried out in a safe/planned manner.
- ◆ All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.
- ◆ Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped persons working in accordance with current statutory safe working policies.
- ◆ Drainage systems shall be inspected on a regular basis or should any problems be suspected. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.
- ◆ It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- ◆ Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;
 - Rodding - Manual/Mechanical with flexible rods.
 - Jetting - High pressure water jetting.
 - Plunging.

7.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually.

- ◆ Covers of inspection chambers and manholes shall be removed and the sides, benchings and channels cleared.
- ◆ Accumulated deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall.
- ◆ Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- ◆ Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable grease or other sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

7.3 Pipes

Regular inspection and maintenance are important to identify areas which may have become obstructed/clogged and may not be draining correctly, as failure to do so would expose the development to a greater level of flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, where used the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes. The below table sets out the maintenance schedule for the pipe components of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for evidence of poor operation via water levels. If required take remedial action.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection should be provided as post construction CCTV survey.	N/A
	Inspect/check all inlets, outlets and overflows to ensure they are in good condition and operating as designed.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

7.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gullies components of

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial Inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six-monthly intervals. Also, 48 hours after large storms.

the proposed drainage systems.

7.5 Vortex Flow Control Device

Regular inspection and maintenance is important to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, where used the manufacturer's recommendations should be followed.

- ◆ Normally, little maintenance is required as there are generally a vortex flow control device has no moving parts.
- ◆ If blockages occur, they tend to do so at the intake of the vortex flow control device.
- ◆ Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

- ◆ The smaller type conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.
- ◆ Following installation of the vortex flow control device it is vitally important that any extraneous material i.e., Building materials are removed from the unit and the chamber.
- ◆ After the system is made live, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

7.6 Cellular Attenuation Tanks

Regular inspection and maintenance is important to identify if the inlets/outlets have become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a greater level of flood risk.

The maintenance requirements for cellular attenuation tanks are outlined within Table 21.3 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenance schedule for the cellular attenuation tank component of the proposed drainage systems.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of 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

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should as be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

7.7 Porous/Permeable Paving

The maintenance requirements for permeable/porous paving is covered under the pervious pavements section within the CIRIA SUDS Manual C753. As such, the maintenance requirements for permeable/porous tarmac are outlined within Table 20.15 of the CIRIA SUDS Manual C753. An extract of that table is given below to set out the maintenance schedule for the permeable/porous tarmac component of the proposed drainage systems.

TABLE 20.15 Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical 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 surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using 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

It should be noted that the Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should be supplied by the Main Contractor, where the construction of the drainage varies from the design construction status drawings.

8.0 CONCLUSIONS

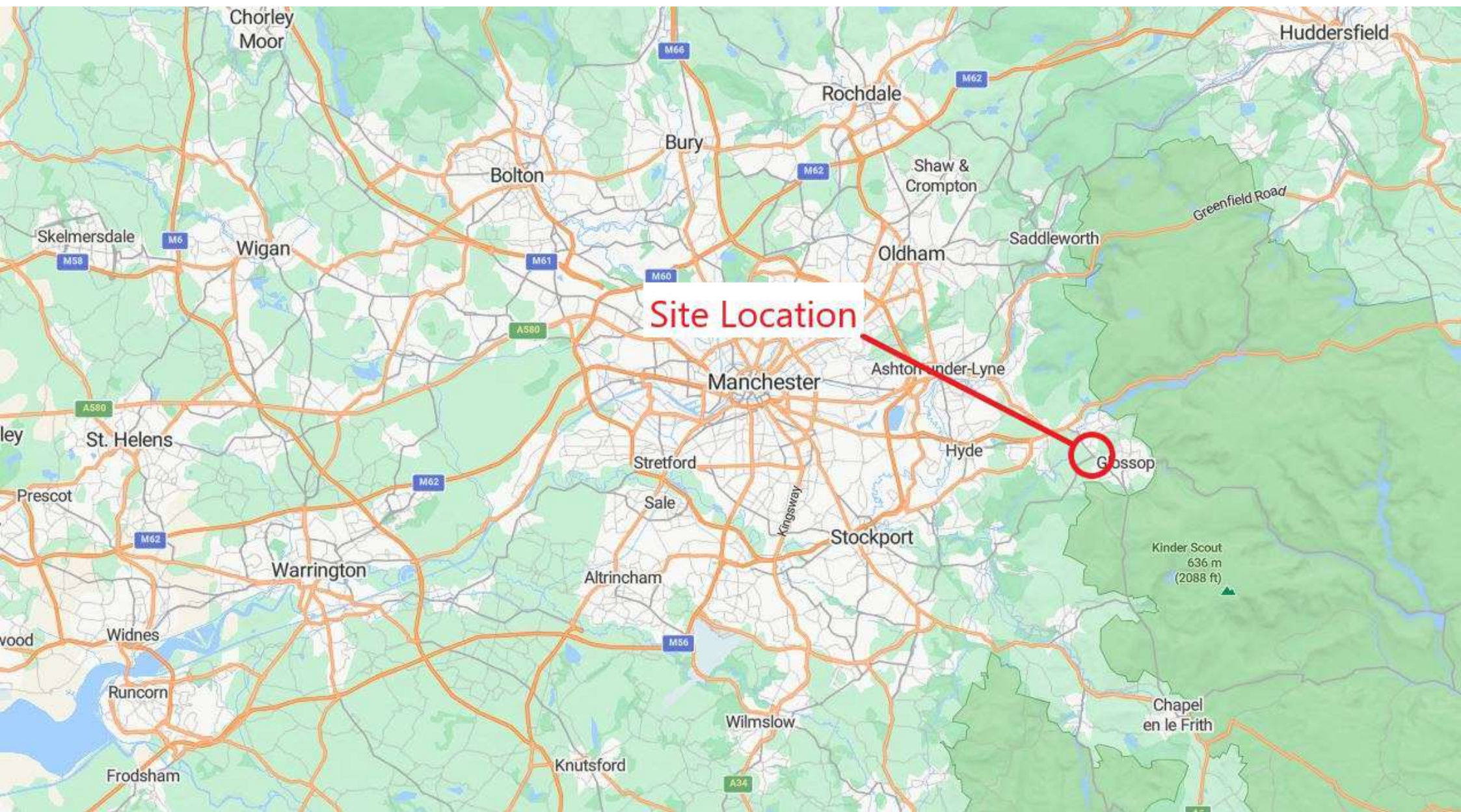
- ◆ The site is located within Flood Zone 1 and has a low risk of flooding from rivers & sea, surface water, reservoirs and all other sources. Therefore, due to the low risk of flooding from all sources, no flood risk mitigation measures are required for the proposed development.
- ◆ There is no existing private drainage within the site boundary. There is an existing public combined water sewer travelling through the site from the southern border to the eastern border. This should be confirmed via a CCTV survey prior to the commencement of construction.
- ◆ A phase 1 site assessment was completed and although the site investigation did not include any BRE365 complaint infiltration tests, it did indicate that the ground was made up of sandstone and clay. Given the impermeable nature of these soils it can be concluded that infiltration is not suitable for this development.
- ◆ As such, the surface water drainage will collect the runoff from the proposed building and surrounding hard standing areas and convey it to the west of the site, where it discharges into the existing public surface water 300x450mm sewer (UU manhole 3501). This is prior to passing through a bypass separator and vortex control chamber where flow will be restricted to the existing greenfield rates.
- ◆ The two below ground cellular soakaway tanks have been utilised to attenuate the surcharged surface water runoff from the site and together with the proposed surface water network itself provide sufficient storage to prevent any flooding for all rainfall events up to and including the 1 in 100 year +40% climate change event.
- ◆ The foul water drainage will collect run off from the proposed building and convey the foul water to the proposed road running through the proposed site. Here it will discharge into the proposed combined water sewer diversion at multiple points. It is anticipated that the foul will be able to discharge at unrestricted rates.
- ◆ As the existing public combined surface water sewer is located beneath proposed houses, it will need to be diverted. The diversion is to pass between UUMH4401 and UUMH4502 and is to follow the path of the proposed road.
- ◆ Surface and foul water manholes and pipes within the proposed road are to be adopted by United Utilities via a Section 104 agreement. Access chambers and subsequent pipes within the property boundaries are to remain private.
- ◆ The external ground levels around proposed buildings shall fall away from the proposed buildings with any new levels being designed to ensure any overland flood routes, for events in excess of the 1 in 100 Year + 40% CC, exit towards the surrounding highways and greenfield areas, for use in exceptional circumstances.

9.0 RECOMMENDATIONS

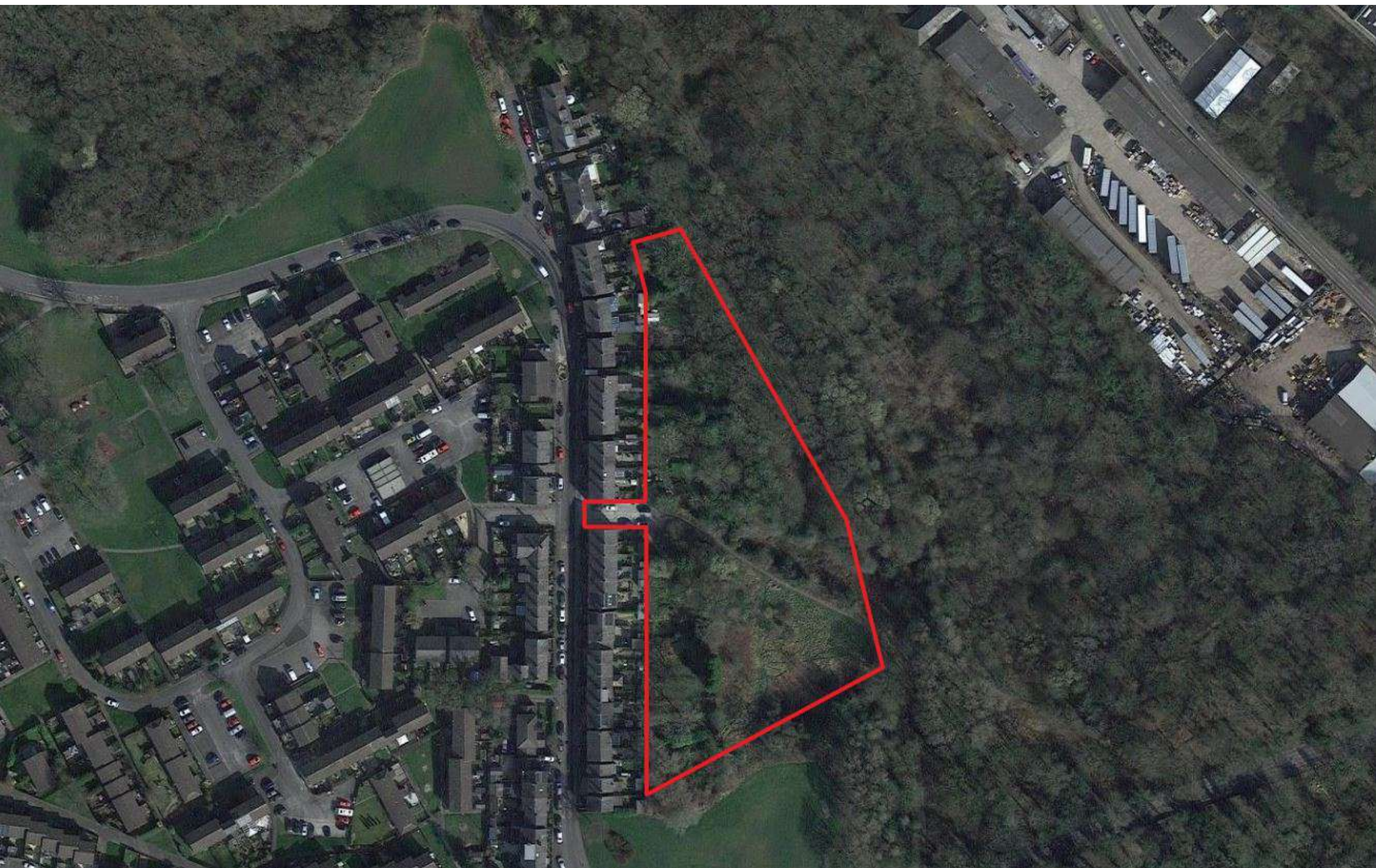
- ◆ The surface water drainage strategy should be confirmed via more detailed discussions with the High Peak Borough Council (LLFA) and the Environment Agency prior to the commencement of any works.
- ◆ The foul water drainage strategy and unrestricted discharge rate should be confirmed via more detailed discussions with the High Peak Borough Council (LLFA) and United Utilities prior to the commencement of any works.
- ◆ The use of specific SuDS techniques across the site should be determined during the detailed design process but where possible, the SuDS summary should be adhered to as close as reasonably possible with SuDS techniques incorporated, where possible, across the site.
- ◆ Further discussions with United Utilities should be conducted in regards to the diversion of the combined water sewer. A section 185 agreement as well as the accompanying drawings should be submitted and agreed prior to the commencement of any works.
- ◆ Further discussions with United Utilities should be conducted in regards to the adoption of potential new public sewers within the proposed road. A section 104 agreement as well as the accompanying drawings should be submitted and agreed prior to the commencement of any works.



Appendix A – Site Location Plan



Appendix B – Aerial Photograph



Appendix C – Topographic Survey