THOMAS CONSULTING
STRUCTURAL & CIVIL DESIGN ENGINEERS

**T19360/FRA/02/JP**

# FLOOD RISK ASSESSMENT

**AT**

**Land Adjacent to Waters Edge**
**Whitehaven**
**CA28 9PD**

**FOR**

**Gleeson Homes**

# REPORT VERIFICATION

| | |
|---|---|
| Site Address | Land Adjacent to Waters Edge, Whitehaven, CA28 9PD |

| | |
|---|---|
| Document Reference | T19360/FRA/02/JP |
| Version | 02 |
| Date released | 30 September 2020 |
| Originator | Julian Pearson BSc (Hons) EngTech MICE |
| Checked | Kieron Hounslow BEng (Hons) CEng M.I.Struct.E |
| Verified | Steve Bridges BSc (Hons) CEng MICE |

| Issue no | Date | Status | Report version | Issued by |
|---|---|---|---|---|
| 02 | 30/09/2020 | Final | 02 | JP |

# CONTENTS



# APPENDICES

# 1 INTRODUCTION

## 1.1 Project Scope

1.1.1 Thomas Consulting has been commissioned by Gleeson Homes to carry out a flood risk assessment for a Housing Development, at Land Adjacent to Waters Edge, Whitehaven, CA28 9PD

1.1.2 It is understood that this assessment will be submitted to the Planning Authority as part of a planning application. Specifically, this assessment intends to:

- Give a brief background to the location, local geology and hydrogeology of the site in question.
- Assess the existing flood risk to the site, including the potential effects of Fluvial, Surface Water, Groundwater, Sewers and Other forms of flooding to the site.
- Give a brief overview of the surrounding services that could potentially affect the sites development such as existing watercourses, sewers and any ground condition information obtained from individual/third party studies.
- Outline any flood mitigation methods if required.
- Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated February 2019 and its accompanied Planning Practice Guidance (PPG). Other documents which have been consulted include:

- Defra/Environment Agency, The Town and Country Planning Order, 2015, No.596, Article 3.
- FSW Geological & Geo-Environmental Consultants, Phase 1 and Phase 2 Geo-Environmental Investigation Report No. 8190OR03/October 2019.

## 1.2 Data Collection

1.2.1 To assist with this report, the data collected included:

- OS Maps, 2020.
- Environment Agency Flood Maps for Planning, 2018, GOV.UK.
- British Geological Survey (BGS), Geoindex Onshore, Superficial Deposits and Bedrock Geology, 1: 50,000.
- Land Information Systems (LandIS) – Soilscapes Viewer, January 2016.
- Environment Agency Groundwater Vulnerability Maps, Defra Magic Map.
- Environment Agency Main River Map, 2019.
- Environment Agency Surface Water Flood Map, 2020, GOV.UK.

1.2.2 All third-party data used in this study has been checked and verified prior to use in accordance with Thomas Consulting Ltd Quality Assurance procedures.

## 2 SITE CHARACTERISTICS

### 2.1 Site Location & Topography

2.1.1 The site is located at Land Adjacent to Waters Edge, Whitehaven, CA28 9PD . The approximate Ordnance Survey (OS) grid reference for the site is 296680E 516290N and the location of the site is shown in Figure 1.

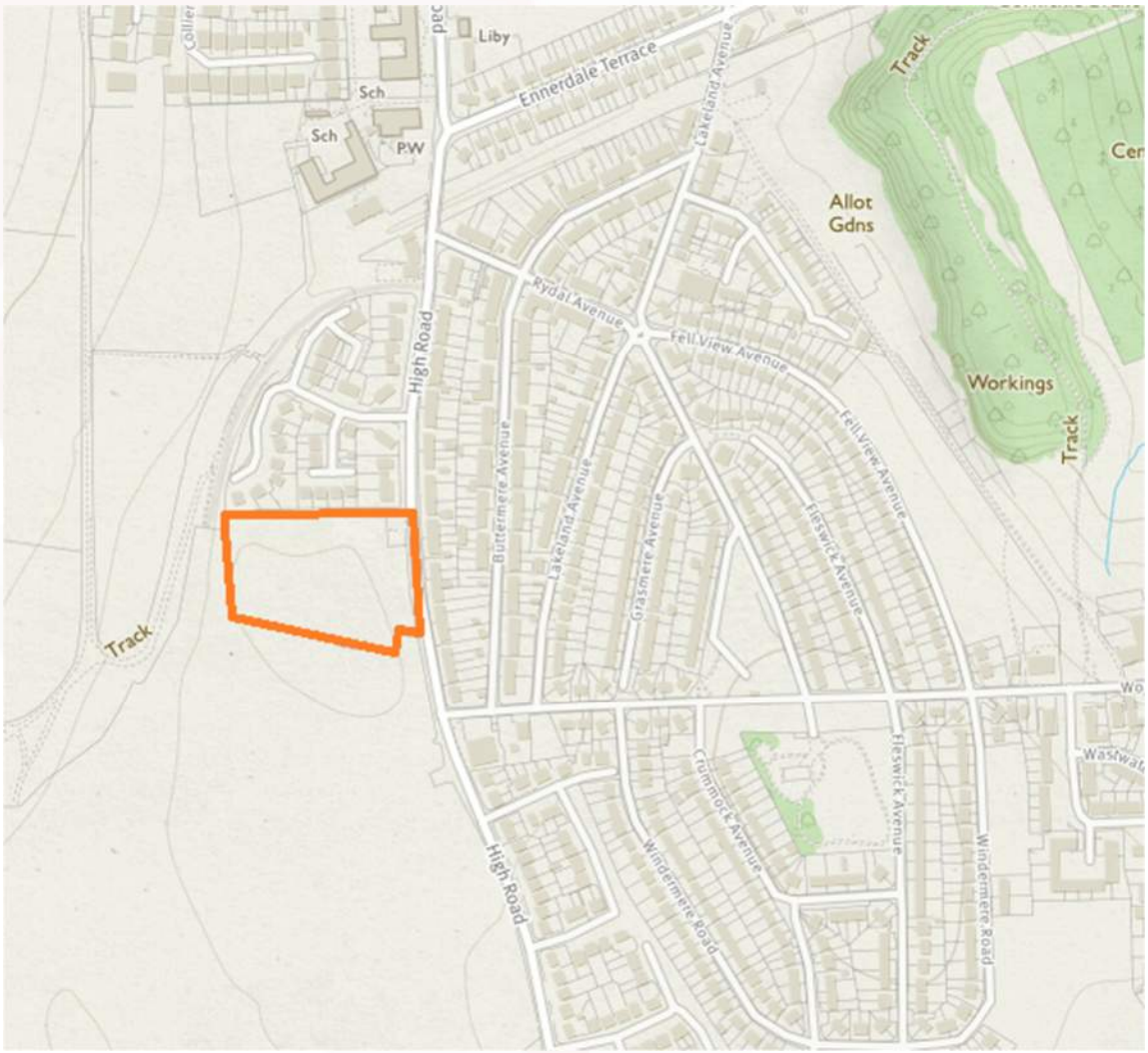



**Figure 1: Site location plan (Source: OS Maps, 2020)**

2.1.2 The site covers a total area of approximately 1.37 ha and comprises derelict land belonging to the former Rhodia Chemical Works.

2.1.3 The site is located approximately 1.8 miles south of the town of Whitehaven. The site is generally flat with average elevations of around 95 m AOD and is currently made up of fill comprising demolition material and hardstanding material to the southeast.

2.1.4 The site is bound to the north by existing residential dwellings, to the east by High Road and more residential dwellings. The south and west are currently unused derelict land most likely also part of the old Chemical Works.

2.1.5 A topographical survey to Ordanance Datum has been provided by Gibson Surveying & Mapping Ltd and can be seen on Drawing Number GH/WE/TS01. The topographical survey shows that

there is little variation in ground levels across the site other than the highlighted stockpiles. It is understood the client proposes to remove the stockpiles off site prior to any development works.

2.2 Brief on Site Proposals

2.2.1 It is the Client's intention to build 40 new residential dwellings over the entire site area with associated highways, driveways and pedestrian access into the site.

2.2.2 Drawing Number 1839/FP001/b by Ashwood Design Associates Ltd shows access to the proposed site being provided via 1 main access road, with 3 additional roads providing access to dwellings across the site. Both the main access road and associated pedestrian access points will be offered for adoption to Cumbria County Council (CCC) along with any main drainage features serving the site to United Utilities (UU).

2.3 Environment Agency Flood Map for Planning

2.3.1 National Planning Policy Framework (NPPF) Flood Zones comprise Flood Zone 1, Flood Zone 2 and Flood Zone 3. The Environment Agency's Indicative Flood Map for Planning (Figure 2) shows that the site is located within the NPPF defined Flood Zone 1.

2.3.2 The Flood Zone 1 'Low Probability' comprises land as having less than a 1 in 1000 year annual probability of fluvial flooding (i.e. 0.1% probability of occurring in any one year). The extent of the flood zones do not take into account the presence of any formal flood defences, or other features which also act as informal flood defences.

2.3.3 The site is located within Flood Zone 1 but is classed as a Major Development due to being over 1ha in size and more than 10 dwellings in accordance with the Town and Country Planning Order in 2015 by Defra and the EA. As this is the case a brief flood risk assessment is required with more emphasis based on the drainage strategy.

2.3.4 The NPPF is accompanied by the Planning Practice Guidance (PPG) documents which classifies each development into a vulnerability class, depending on the type of development, which are outlined in Figure 3. According to the PPG residential developments are classed as "More Vulnerable". "More Vulnerable" developments are acceptable in Flood Zone 1 as shown in Figure 3.

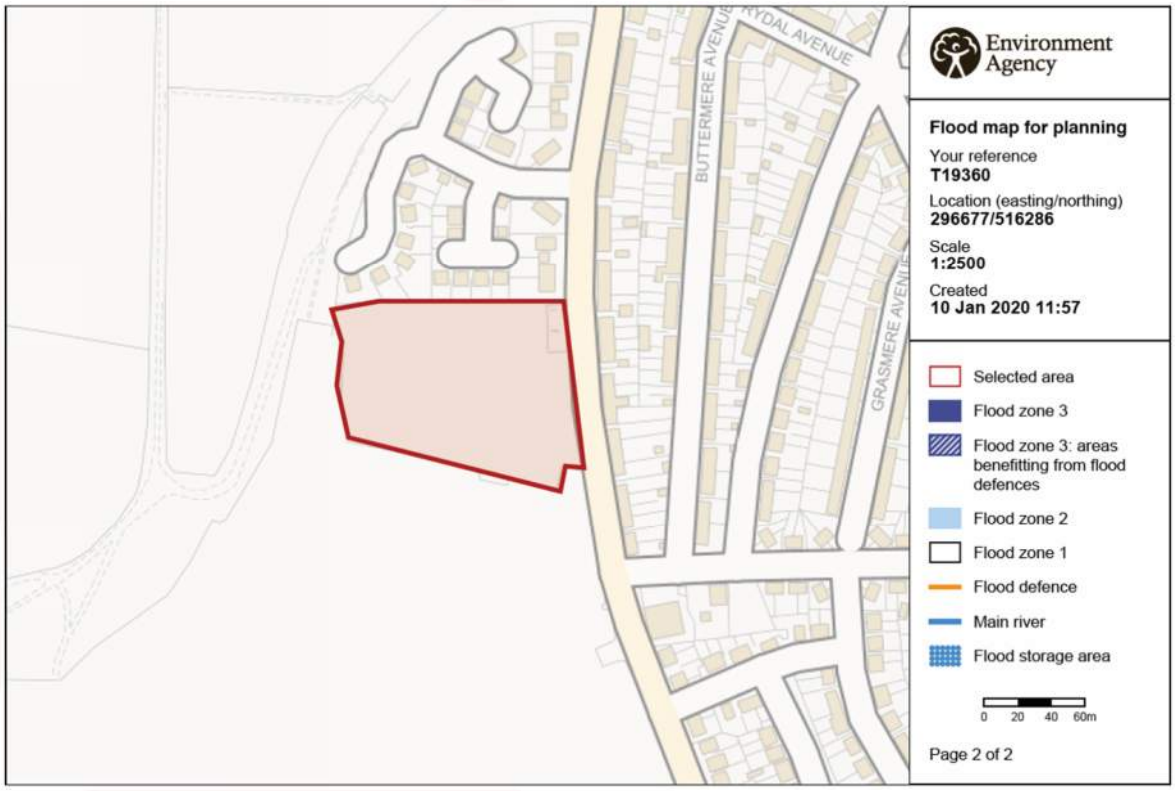



**Figure 2: Environment Agency Flood Zone Map (Source: Environment Agency, 2018, GOV.UK)**

| Flood Zones | Flood Risk Vulnerability Classification | | | | |
|---|---|---|---|---|---|
| | Essential infrastructure | Highly vulnerable | More vulnerable | Less vulnerable | Water compatible |
| Zone 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Zone 2 | ✓ | Exception Test required | ✓ | ✓ | ✓ |
| Zone 3a † | Exception Test required † | ✗ | Exception Test required | ✓ | ✓ |
| Zone 3b * | Exception Test required * | ✗ | ✗ | ✗ | ✓* |

Key:

✓ Development is appropriate

✗ Development should not be permitted.

**Figure 3: NPPF Flood Risk Vulnerability Classification (Source: National Planning Practice Guidance, 2014)**

## 2.4 Site Geology & Hydrogeology

2.4.1 British Geological Survey (BGS) and Land Information Systems (LandIS) mapping indicates the site is underlain by the geology sequences outlined in Table 1. The EA Groundwater Vulnerability Map indicates there are no Groundwater Source Protection Zones or Groundwater Abstraction Licenses within 5 km of the site. The development site overlies a productive aquifer with "Medium – High" vulnerability.

| Geological Layer | Classification | Description | Aquifer Class |
|---|---|---|---|
| **Soil** | Soilscape 6 | Freely draining to local groundwater and rivers | N/A |
| **Drift** | Till | Devensian – Diamicton | Secondary Undifferentiated |
| **Solid** | Whitehaven Sandstone Formation | Sandstone | Secondary A |

**Table 1: Site Geological Summary**

2.5 Existing Watercourses

2.5.1 According to the EA Main River Maps the closest known watercourse is 1.2km east from the site. This watercourse is called Pow Beck and is 3.01km in length running south from the town of Whitehaven.

2.6 Existing Sewers

2.6.1 Reference to the UU sewer records (included in Appendix A), indicates that there as numerous sewers surrounding the site, with no sewers directly crossing the site boundary.

- 100mm Surface Water Sewer – Located to the front of 24 Snaefell Terrace heading north.
- 100mm Combined Sewer – Located to the rear of 28 Snaefell Terrace heading north.
- 100mm Combined Sewer – Located to the rear of 29 Snaefell Terrace heading south.
- 100mm Surface Water Sewer – Located to the front of 31 Snaefell Terrace heading south.
- 225mm Foul Water Sewer – Located approximately 200m to the west of the site heading north.

It is clear that the existing UU records are incomplete, as the development located to the north of the proposed site is shown as having no sewers available. A drainage survey will be required to gain further understanding of the surrounding services available and determine the levels of the nearby sewers to confirm that a positive gravity fed connection is achievable.

2.7 Ground Conditions

2.7.1 FWS Geological & Geo-Environmental Consultants (FWS) undertook a Phase 1 and Phase 2 Geoenvironmental investigation (Report No. 8190OR03/October 2019). Intrusive investigations were carried out across the site between 22 and 23 of August 2019, which consisted of 10 trial pits being dug to a depth of between 1.4 – 3m deep to examine the natural strata make-up and any buried obstructions, 5 mini-percussion boreholes for SPT tests to be carried out at a depth between 2 – 4.45m, 7 machine excavated inspections pits in the stockpiles, chemical and geotechnical testing and monitoring well for groundwater and has measurements.

2.7.2 General ground conditions consisted of made ground to be at depths between 0.3 and >1.5m deep across the site, underlain by glacial till extending to depths of up to 4.45m bgl. Weathered sandstone bedrock was recovered at a depth between 0.4 and 2.3m bgl to the south east of the site.

2.7.3 Groundwater seepages were encountered in the boreholes or trial pits at depths between 0.3 and 1.2m bgl. Further monitoring reports can be found in FWS's report and any more recent visits can be obtained by contacting FWS.

2.7.4 The site is not in an area affected by shallow coal mining.

# 3 ASSESSMENT OF FLOOD RISK

## 3.1 Flood Risk Terminology

3.1.1 Flood risk considers both the probability and consequence of flooding. Flood events are often described in terms of their probability of recurrence or probability of occurring in any one year. The threshold between a medium flood and a large flood is often regarded as the 1 in 100-year event. This is an event which statistical analysis suggests will occur on average once every hundred years. However, this does not mean that such an event will not occur more than once every hundred years. Table 2 shows the event return periods expressed in years and annual expectance probabilities as a fraction and a percentage. For example, a 1 in 100-year event has a 1% probability of occurring in any one year, i.e. a 1 in 100 probability. A 1000-year event has a 0.1% probability of occurring in any one year, i.e. a 1 in 1000 probability.

| Return Period (Years) | Annual Exceedance Probability (AEP) | |
|---|---|---|
| | Fraction | Percentage |
| 2 | 0.5 | 50% |
| 10 | 0.1 | 10% |
| 25 | 0.04 | 4% |
| 50 | 0.02 | 2% |
| 100 | 0.01 | 1% |
| 200 | 0.005 | 0.5% |
| 500 | 0.002 | 0.2% |
| 1000 | 0.001 | 0.1% |

**Table 2: Flood return periods and exceedance probabilities**

## 3.2 Fluvial Flood Risk

3.2.1 The site is not located in proximity to a main river. The nearest main river/watercourse is Pow Beck located 1.2km east of the site and is 3.01km in length running south from the town of Whitehaven. This possesses no flood risk to the site. The Flood Zone 1 outline in Figure 2 indicates the site is not at risk of fluvial flooding.

## 3.3 Surface Water Flood Risk

3.3.1 The EA have mapped areas prone to surface water flooding based on historic flooding information received from the lead local flood authorities and modelling based on a LiDAR/IfSAR digital terrain model, Ordanance Survey information on urban areas and a direct rainfall approach using Flood Estimation Handbook (FEH) methodology. The critical (worst case) of the 1,3 and 6-hour storm

durations have been mapped with no areal reduction factor applied. No allowance is made for climate change, the mapping therefore indicates the current predicted flood risk.

3.3.2 The maps do not account for culverts/underground drainage and due to digital terrain model resolutions may also underestimate or omit small drainage channels/ditches. Figure 4 shows the resulting predicted flood risk from surface water.

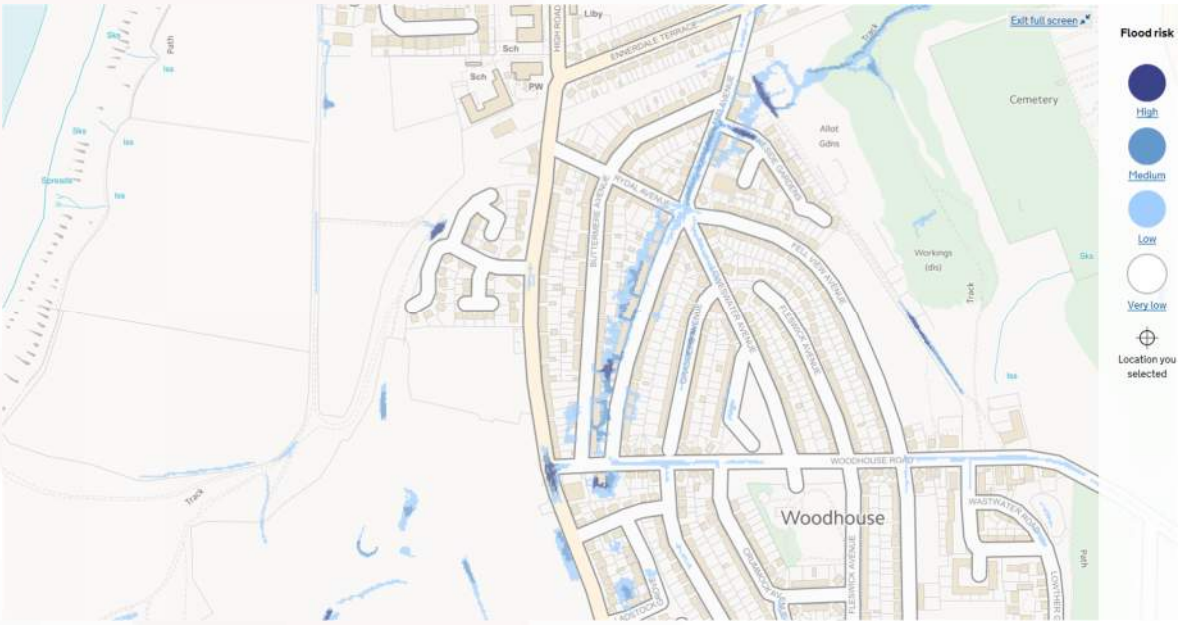



**Figure 4: Environment Agency Surface Water Flood Map (Source: Environment Agency, 2020, GOV.UK)**

3.3.3 The EA surface water map indicates the site is predominantly not at risk of surface water flooding.

3.4 Groundwater Flood Risk

3.4.1 BGS records were not included in the ground investigation report but intrusive investigations did discover evidence of shallow groundwater. As the monitoring was taken during the season considered to be the "wettest" part of the year it would be reasonable to assume groundwater issues would not worsen to cause any flooding issues. However, careful consideration to the SuDS provided across the site must be assessed, most likely ruling out any open space storage where groundwater could positively ingress and compromise storage provisions.

3.5 Flooding from Sewers

3.5.1 UU do not provide information on flood risk from their assets. As discussed in Section 2.6, UU Sewers records (included in Appendix A) indicate that there are no sewers crossing the site.

# 4 FLOOD MITIGATION

## 4.1 Summary of Flood Risk

4.1.1 The risk of flooding from fluvial sources, surface water, sewers, artificial sources and reservoirs is considered to be extremely low and therefore it is recommended that mitigation measures are not necessary in this respect for the proposed dwellings. However, it there is evidence of shallow groundwater therefore infiltration methods are not suitable to the site and careful consideration of the use of SuDS across the site is recommended such as the avoidance of open space storage.

| Source of Flood Risk | Predicted Flood Risk (AEP, %) | Interpreted Risk Classification | Justification |
|---|---|---|---|
| Fluvial | <0.1% | Very Low | As predicted by EA |
| Tidal | N/A | N/A | N/A |
| Surface Water | <0.1% | Very Low | As predicted by EA |
| Groundwater | N/A | Medium | Ground Investigation |
| Artificial Sources | N/A | N/A | N/A |
| Sewer | N/A | Very Low | Engineering review based on Sewer Records |

**Table 3: Flood return periods and exceedance probabilities**

## 5 CONCLUSIONS

5.1.1 The site is located within Flood Zone 1.

5.1.2 The proposed development is classed as a major development and according to the NPPF's PPG as a residential development the site is classed as more vulnerable to flood risk. More vulnerable developments are deemed acceptable in Flood Zone 1.

5.1.3 There is no evidence or record of historic coal mining on the site.

5.1.4 Groundwater was encountered during intrusive ground investigations at levels between 0.3 and 1.2m bgl. It has been recommended careful considerations of SuDS is made for the proposed development, avoiding any open space storage structures and infiltration methods that could worsen the existing natural ground water table.

5.1.5 The site is at very low risk of flooding from fluvial sources, tidal sources, surface water, sewer flooding and artificial sources.

**BIBLIOGRAPHY**

i. Ministry of Housing, Communities and Local Government, National Planning Policy Framework, February 2019.

ii. Ministry of Housing, Communities and Local Government, Planning Practice Guidance to the National Planning Policy Framework, September 2014.

iii. Defra/Environment Agency, The Town and Country Planning Order 2015, No. 596, Article 3.

iv. FWS Geological & Geo-Environmental Consultants, Phase 1 and Phase 2 Geo-Environmental Investigation Report No. 8190OR03/October 2019.

v. Environment Agency Flood Maps for Planning, 2018, GOV.UK.

vi. British Geological Survey (BGS), Geoindex Onshore, Superficial Deposits and Bedrock Geology, 1:50 000.

vii. Land Information System (LandIS) – Soilscapes viewer, January 2016.

viii. Environment Agency Groundwater Vulnerability Maps, Defra Magic Map.

ix. Environment Agency Main River Map, 2019.

x. Environment Agency Surface Water Flood Map, 2020, GOV.UK.

# APPENDIX A

## UU Sewer Records

**How to contact us:**

**United Utilities Water Limited**
**Property Searches**
**Haweswater House**
**Lingley Mere Business Park**
**Great Sankey**
**Warrington**
**WA5 3LP**

**Telephone: 0370 7510101**

**E-mail: propertysearches@uuplc.co.uk**

**Thomas Consulting Ltd**

**3**
**Friar Street,**
**Lancaster, Lancashire**
**LA1 1PZ**

**FAO:**

**Your Ref: T19360 - Waters Edge**
**Our Ref: UUPS-ORD-144839**
**Date: 10/01/2020**

**Dear Sirs**

## Location: Waters Edge Whitehaven

I acknowledge with thanks your request dated 09/01/2020 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager



*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
*Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP*

# TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

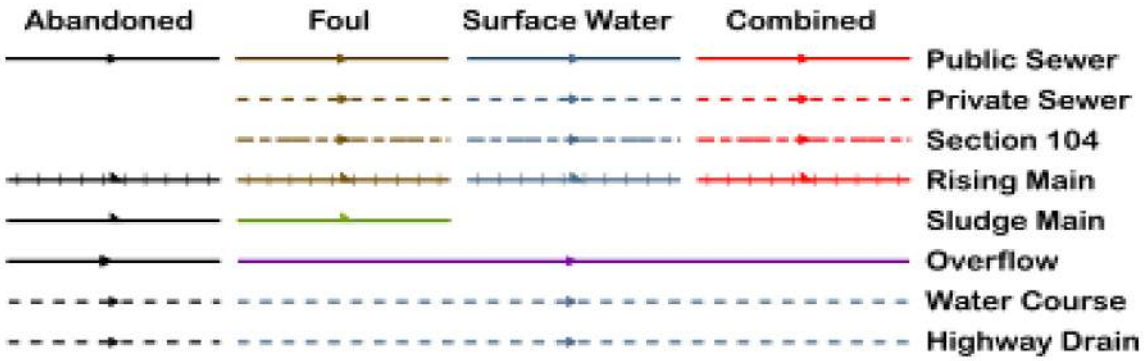
**TERMS AND CONDITIONS:**

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



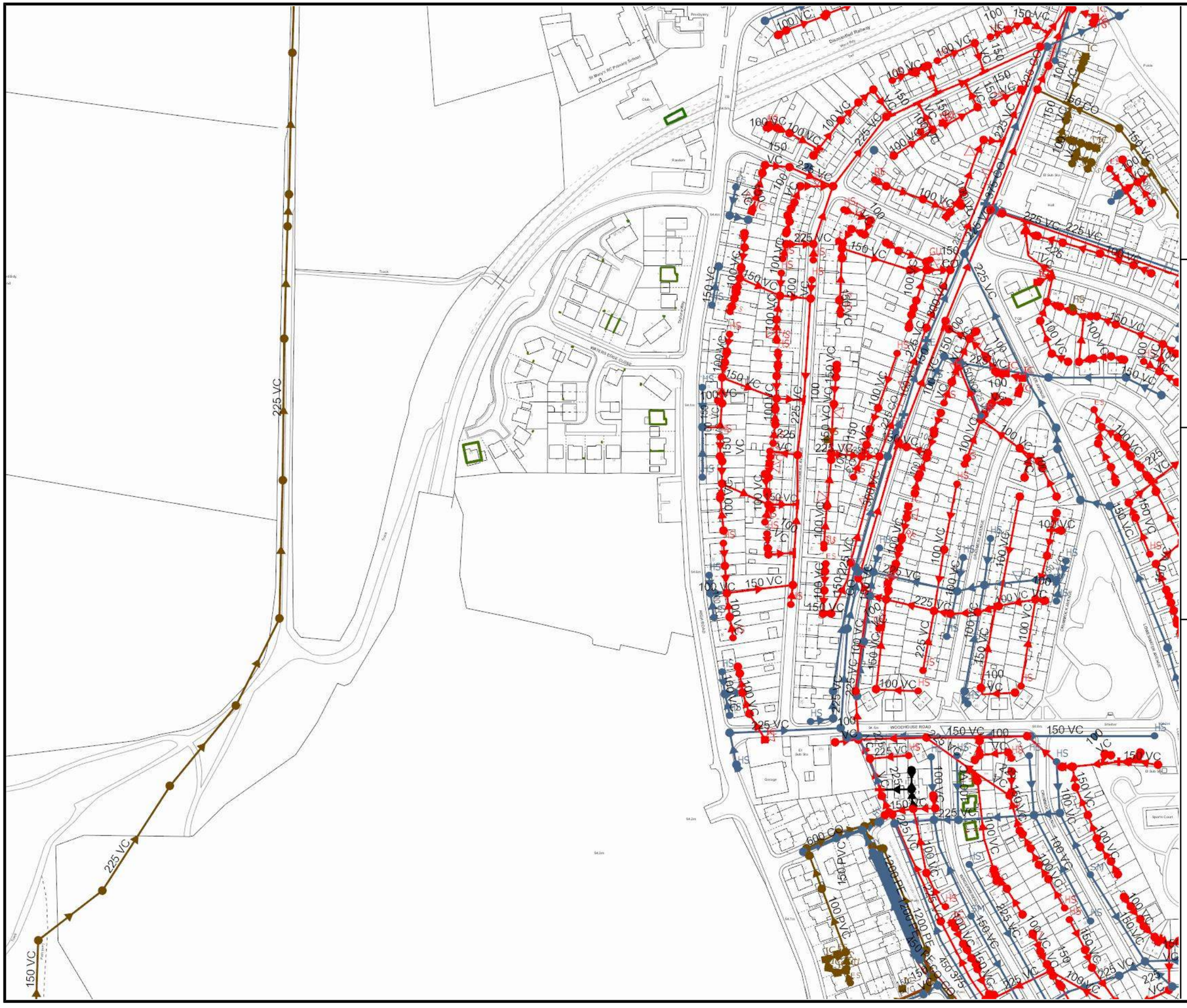
*United Utilities Water Limited*
*Registered In England & Wales No. 2366678*
*Registered Office Haweswater House, Lingley Mere Business Park,*
*Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP*

# Wastewater Symbology




| All point assets follow the standard colour convention: | red – combined | brown - foul |
|---|---|---|
| | blue – surface water | purple - overflow |

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- CK Control Kiosk
- Change of Characteristic




United Utilities
helping life flow smoothly

# SEWER RECORDS

**Address or Site Reference**

Waters Edge Whitehaven,

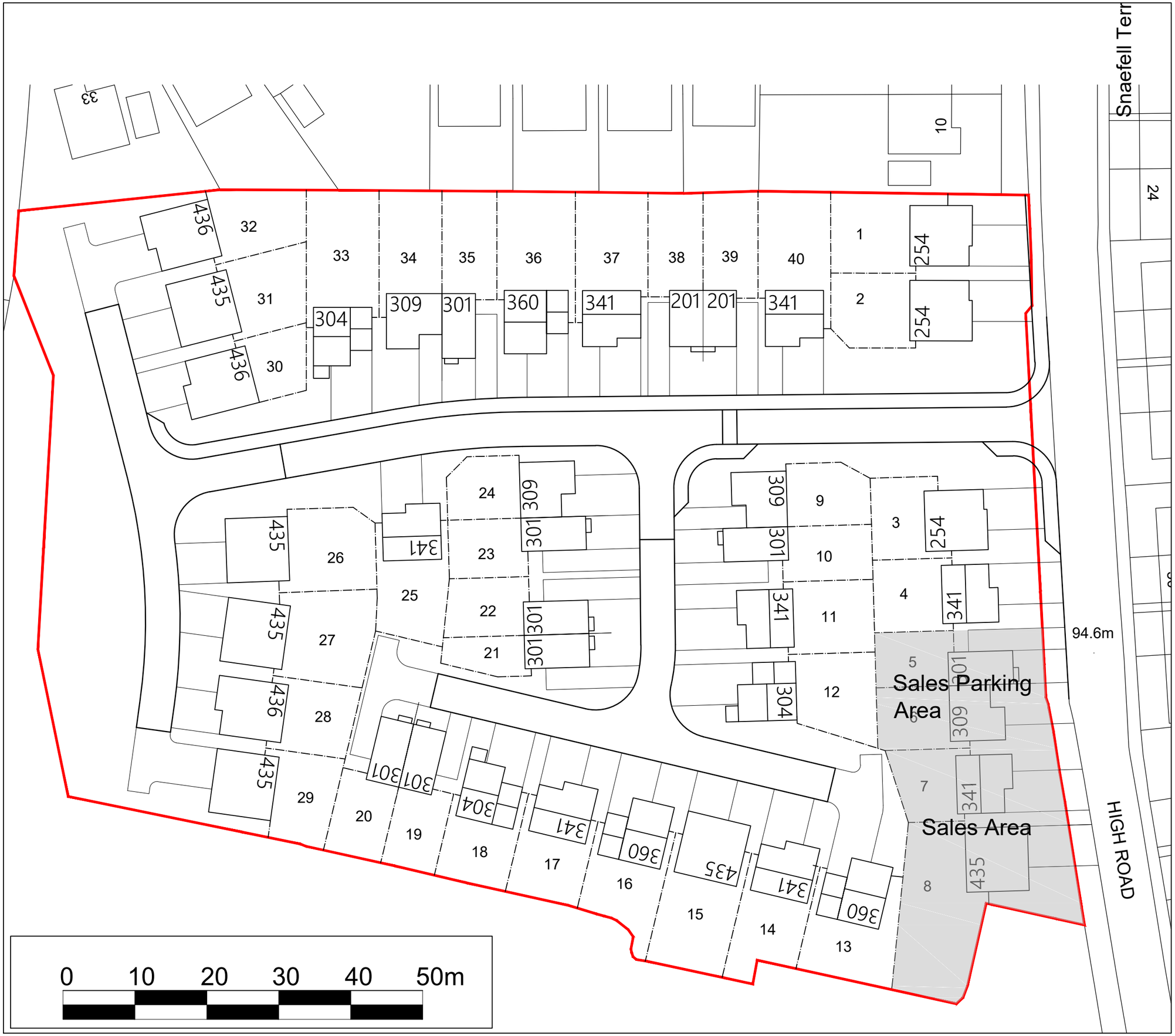
**Scale:** 1:2500
**Date:** 10/01/2020

**Printed by:** Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

# APPENDIX B

# DRAWINGS




NOTES AND AMENDMENTS



REVISIONS

| Rev | Description | Drawn | Date |
|---|---|---|---|

| House Type | Quantity |
|---|---|
| 201 | 2 |
| 254 | 3 |
| 301 | 8 |
| 309 | 4 |
| 304 | 3 |
| 341 | 8 |
| 360 | 3 |
| 435 | 6 |
| 436 | 3 |
| Total# | 40 |

ASHWOOD DESIGN ASSOCIATES LTD
12A Clifford Court, Parkhouse Business Park, Carlisle CA3 0JG
t 01228 510616 e admin@ashwooddesign.co.uk
f 01228 520861 w www.ashwooddesign.co.uk

Purpose: Concept

Client: Gleeson Homes

Project: Waters Edge

Title: Block Plan

| Scale: | Sheet Size: | Drawn: | Date: |
|---|---|---|---|
| 1:500 | A3 | jc | 03/2019 |

| Project No: | Drawing No: | Revision: |
|---|---|---|
| 1839 | BP001 | a |