

M & P Gadsden
Consulting Engineers Ltd



Drainage Strategy Report

Proposed housing development at
Accrington Road,
Whalley

on behalf of



Document Reference	CN 21315
Version	P03
Date Released	06th December 2022
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1 Introduction

1.1 Project Background

M & P Gadsden Consulting Engineers have been appointed by Oakmere Homes to undertake a Flood Risk Assessment in support of a full planning application for 17no family homes and 57no apartments at Accrington Road, Whalley, Lancashire.

The site will be accessed from two new junctions created on Accrington Road. One will be used to access 8 apartments and the other junction will give access to the remainder of the site. The new dwellings will be served by a mixture of tarmac and block paved highways. The site was previously used for agricultural purposes and there are no existing above ground structures on site.

The site currently has an extant planning approval (ref: 3/2012/0179) for 37 bungalows and 40 retirement apartments.

The purpose of this report is to discuss the proposed drainage strategy.

1.2 Surface Water Strategy

Current guidance commonly used for new development is the Local Authority SuDS Officer Organisation's (LASOO) "Non-statutory Technical Standards for Sustainable Drainage". This document is a best practice guidance document and covers the full spectrum of surface water drainage design from planning requirements, design criteria, flood risk and maintenance during the systems life.

The surface water drainage strategy for this site follows this guidance document wherever possible.

2 Existing Development Site

2.1 Site Characteristics

The site is located on the outskirts of Whalley and is currently vacant. To the north and west of the site are residential property, with agricultural land to the east. The River Calder borders the site to the south. The site is currently accessed off Accrington Road.

2.2 Existing Drainage Arrangements for the Site

There is currently no formal drainage network on most of the site itself.

United Utilities sewer records indicate that there are no existing sewers in Accrington Road to the north of the site. Further north along The Cloisters, there are both foul (150mm vitrified clay) and surface water (450mm concrete) sewers running from east to west. The foul then discharges into a combined sewer on Sydney Avenue.

The United Utilities sewer records can be seen in Appendix B.

2.3 Topography

The site is roughly square in shape and covers an area of approximately 2.87ha. The levels on site fall steeply from the north east corner to close to the middle of the site and then gently from east to west from that point. The high point of the site is at the north eastern corner at approximately 59.00m AOD and the low point is on the western boundary at 45.50m AOD.

The existing topographical survey can be viewed in Appendix A.

2.4 Hydrology

The River Calder runs from east to west directly to the south of the site. This forms part of the Ribble Catchment. The River Calder then discharges into the River Ribble further downstream. This river is classed as a main river and is the responsibility of the Environment Agency.

Mill Race watercourse is located approximately 85m to the west of the south western corner of the site. This runs from the River Calder upstream of Whalley Weir, through the Calder Vale area, and re-enters the River Calder again further downstream.

There is also an unnamed watercourse that runs from north to south along the eastern boundary of the site. The watercourse is culverted and discharges into the River Calder.

2.5 Contamination and Geology

Preliminary geological information has been sourced from bEk Enviro Preliminary Risk Assessment (Report Ref BEK-19545-1 April 2019) and the British Geological Survey website. A summary of this information is as follows:-

- Made Ground – no records of made ground on-site.
- Superficial geology – Glacio-fluvial deposits (sand & gravel), alluvium (clay, silt, sand & gravel) and Glacial Till (Boulder Clay).
- Bedrock – Bowland Shale formation in the north western corner of the site and the Pendle Grit Member in the south-east of the site.

3 Flood Risk Assessment

A Flood Risk Assessment was undertaken by JBA Consulting dated September 2022. The FRA states the following with regards to flooding:

- Fluvial: the site lies partially within Flood Zone 3 according to FMfP, however, updated modelling suggests that approximately 70% of the site is located Flood Zone 2 is a more appropriate classification (Medium Probability – land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding). The remainder of the site is within Flood Zone 1. The River Calder is shown to be the main risk of fluvial flooding according to hydraulic modelling
- Fluvial with climate change: with an allowance for climate change (+36% peak river flow), the predicted flood extent affects approximately 40% of the {} site (prior to proposed ground level changes);
- Surface water: Very low risk across the majority of the site. There is a localised area of low-high risk on the western boundary of the site which coincides with a topographic 'low'
- Reservoir breach: in the unlikely event that a breach of an upstream reservoir was to occur, the site could be at risk from reservoir flooding
- Groundwater: the results/observations reported following a ground investigation in 2019 suggest that the likelihood of groundwater emergence at the surface is low

4 Proposed Development & Future Flood Risk

4.1 Run Off Destination

Planning Policy guidance suggests the following hierarchy for surface water discharge: -

1. Into the ground (Infiltration)
2. To a surface water body;
3. To a surface water sewer;
4. To a combined sewer.

4.2 Runoff Assessment

The runoff rates have been calculated for the site for the pre-development and post development conditions at greenfield run off rate. The calculations have been undertaken for the 1 year, 30-year, 100 year and 100 year plus climate change events, which are based on the mean annual flood flow rate, QBAR (2.33-year event).

The total site area of the development is 2.90ha. Therefore, the site is less than 200ha and the greenfield calculations have been undertaken in accordance with methodology described in IoH 124 [11]. For catchments of less than 50ha the run-off rate is scaled according to the size of the catchment in relation to a 50ha site. As identified by reference to GEO Environmental Engineering PRA and BGS data, the site is expected to be underlain by low permeability clay. The soil index value has been estimated to reflect the expected in-situ ground conditions.

The runoff rate has been calculated using the area being proposed for development. Calculations can be seen in Appendix C and a summary of the results is included in Table 1 below:

Table 1 – Greenfield Runoff Rate Assessment

	Runoff Calculations - Pre-Development					
	Area (ha)	Qbar (l/s)	1year (l/s)	30year (l/s)	100year (l/s)	100year + cc (l/s)
Greenfield Pre-Development	1.80	15.36	13.36	26.11	31.95	47.93
Total	1.80	15.36	13.36	26.11	31.95	47.93

The post development runoff rates will be restricted to 1 year rate for the same return period and QBar for return periods up to 100 year plus 50% climate change with a 10% allowance for urban creep and a 35% allowance for the remaining greenfield areas. These measures will reduce flood risk downstream as the existing greenfield runoff rate will be matched for the 1 year event and Qbar will be matched for events up to the designed return period. This will provide an improvement for return periods above the 1 year event.

4.3 Proposed Scheme

It has been assumed that infiltration drainage is not suitable on this site as it is underlain by impermeable strata. The surface water from the development will be discharged into the River Calder. The discharge will be restricted to greenfield runoff rates.

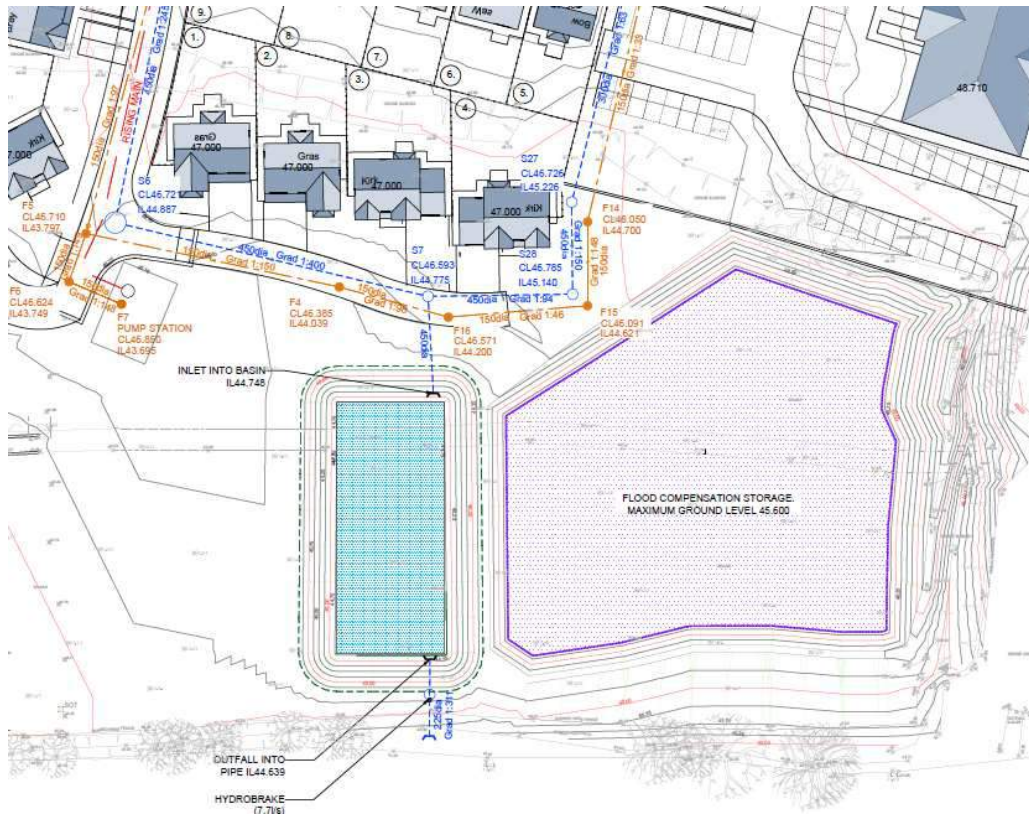
As part of the site falls within a functional floodplain, compensatory storage will be provided for the land raising within the 100 year + climate change allowance.

JBA Consulting modelled the compensatory storage with the information included in their report – Accrington Road, Whalley - FRA (Ref: OAKMERE-JBAU-XX-XX-RP-0002-S3-P05) dated September 2022. It states: *The proposed development causes no additional flood risk to other properties in the area. A sample of locations in adjacent residential areas were selected and comparisons were made for peak water levels before and after the proposed development. All locations showed either no change or reduced water levels following the proposed development.*

Modelled flood levels and flows for locations within watercourses downstream of the development site. The locations include downstream of Whalley Weir, Whalley Bridge and within the Mill Race near Calder Vale. There is no difference in water level between the existing/baseline and proposed development scenarios in the 1%AEP event plus 36% for climate change. The flows in the proposed scenario showed minor differences compared to the baseline but were within +/-0.1m³/s and do not affect flood levels, so flood risk remains unchanged.

The area for flood compensatory storage can be seen in the figure below (in purple), with the maximum ground level in this area being 45.600m AOD.

Figure 2 – Flood Compensatory Storage



The highways have been designed to follow the existing topography of the land where possible. All highway runoff will be collected by gullies and enter a piped network. Driveway runoff will be collected by aco (or similar) channel drains and enter a piped network.

The site will drain via a traditional gravity fed piped network with the flow restricted to the existing greenfield rate. The flow will be restricted via a Hydrobrake flow control unit and the storm water will be attenuated in the piped network and an attenuation basin. This basin has been designed for a 100 year return period + 50% climate change, a 10% allowance for urban creep and a 35% allowance for the remaining greenfield areas.

In addition to the SuDS treatments highlighted previously, back inlet gullies and silt trap manholes will also be provided to remove sediment/silt and therefore assisting with cleaning the water.

The foul drainage system will be a traditional gravity piped network to a low point to the east of the site, where there will be a pumping station that will pump the foul drainage to ultimately discharge into the existing combined sewer on Sydney Avenue.

The drainage design can be seen in Appendix D with plans and details in Appendix E.

4.4 Future Flood Risk & Exceedance Routes

Flood risk to the new dwellings will be low. All finished floor levels will be lifted out of flood zone 3. In addition, all drainage attenuation features will be designed to a return period of 100 years plus 50% climate change, a 10% allowance for urban creep and a 35% allowance for the remaining greenfield areas.

Existing property will need to be protected from both existing surface water flooding that may not be allowed to exceed as it currently does into the application site and also against runoff from the raised levels within the application site.

If a storm were to occur that is larger than the designed return period, flooding would first occur at the flow control manholes. Exceedance routes will need to be provided in order to guide the excess surface water away from new and existing property towards the River Calder.

4.5 Future Management

The developer will establish a management company that will be responsible for the maintenance and upkeep of the highways, attenuation basin and surface water drainage system. See Appendix F for the management company maintenance pack.

A Section 104 agreement will be entered into with United Utilities for the adoption of the main foul drainage for the site.

Maintenance of driveways and roof water drainage will be the sole responsibility of the homeowners. A householder sustainable drainage maintenance plan will be included within the sales pack for each property making the homeowners aware of their responsibilities relating to surface water (see Appendix G).

5 Summary

This report provides a detailed strategy for the management of surface water from the proposed housing development at Accrington Road, Whalley. The strategy accounts for the following restrictions, measures and improvements:-

- Updated modelling suggests the site to be in flood zone 2 with the River Calder being the main risk to fluvial flooding
- Very low risk of surface water flooding for the majority of the site, with localised low-high risk
- In the unlikely event that a breach of an upstream reservoir was to occur, the site could be at risk from reservoir flooding
- Groundwater flooding is deemed to be a low risk
- Attenuation will be provided in the form of an attenuation basin.
- All attenuation features have been designed to attenuate flows up to the 100 year +50% climate change rainfall event with a 10% allowance for urban creep and a 35% allowance for the remaining greenfield areas.
- The proposed development run off rates will match or better the existing greenfield run off rates for all return periods, reducing flood risk.
- The proposed development run off rates are restricted to Q_{bar} for all return periods.
- A flood compensatory storage area will be provided
- The highway will remain private and maintained by a management company.
- Surface water drainage will remain private and maintained by a management company.
- The main foul drainage and pumping station will be put up for adoption with United Utilities under a S104 agreement.
- Individual plot drainage will be maintained by the homeowners.

Appendix A

Appendix B

TECHNICS GROUP
Technics House
Merrow Business Centre
Merrow Lane
Guildford
GU4 7WA

FAO:

Dear Sirs

Location: 1 WOODFIELD VIEW WHALLEY CLITHEROE BB7 9TB

I acknowledge with thanks your request for information on the location of our services.

Please find enclosed plans showing the approximate position of our 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 - Wastewater & Water Distribution Plans which are shown overleaf.

I also attach United Utilities' General Condition and Information sheets regarding United Utilities wastewater network and water distribution apparatus, which details contact numbers for additional services (i.e. new supplies, connections, diversions) which we are unable to deal with at this office. You should ensure that the Condition and Information sheets are made available to anyone carrying out any works which may affect our apparatus.

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 telephone us on 0370 7510101.

Yours Faithfully,



Sue McManus
Operations Manager
Property Searches

United Utilities Water Limited
Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
DX 715568 Warrington
Telephone 0370 751 0101

Property.searches@uu plc.co.uk

Your Ref: GRS00642
Our Ref: 14/ 1145619
Date: 8/10/2015

Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

United Utilities Water Limited 2014
The plan is based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office. Crown and United Utilities copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

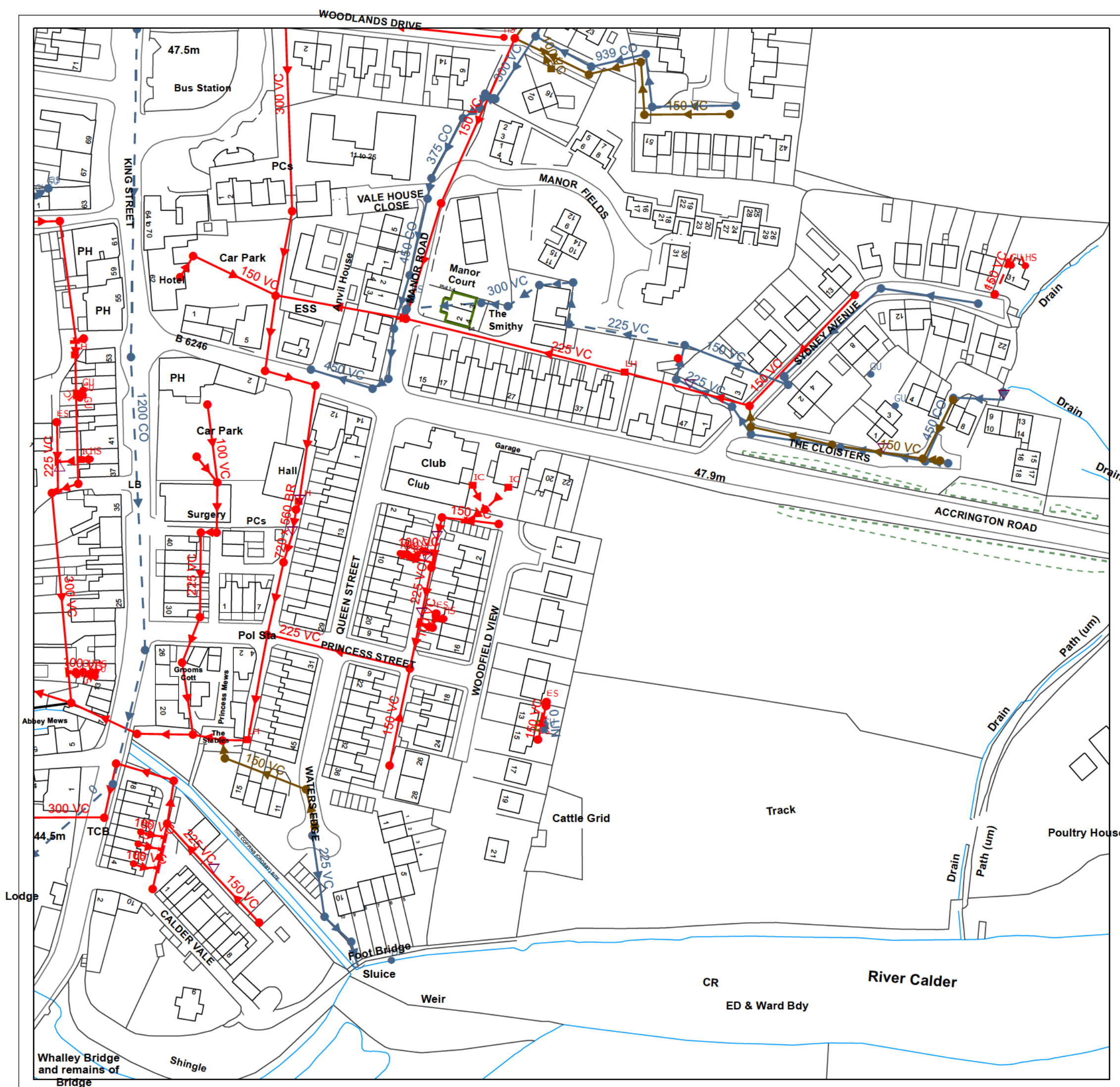
LEGEND

	Water Course
	Overflow Pipe
	Sludge Main
	Highway Drain
	Combined
	Surface Water
	Foul
	Abandoned
	Public Sewer
	Private Sewer
	Section 104
	Rising Main

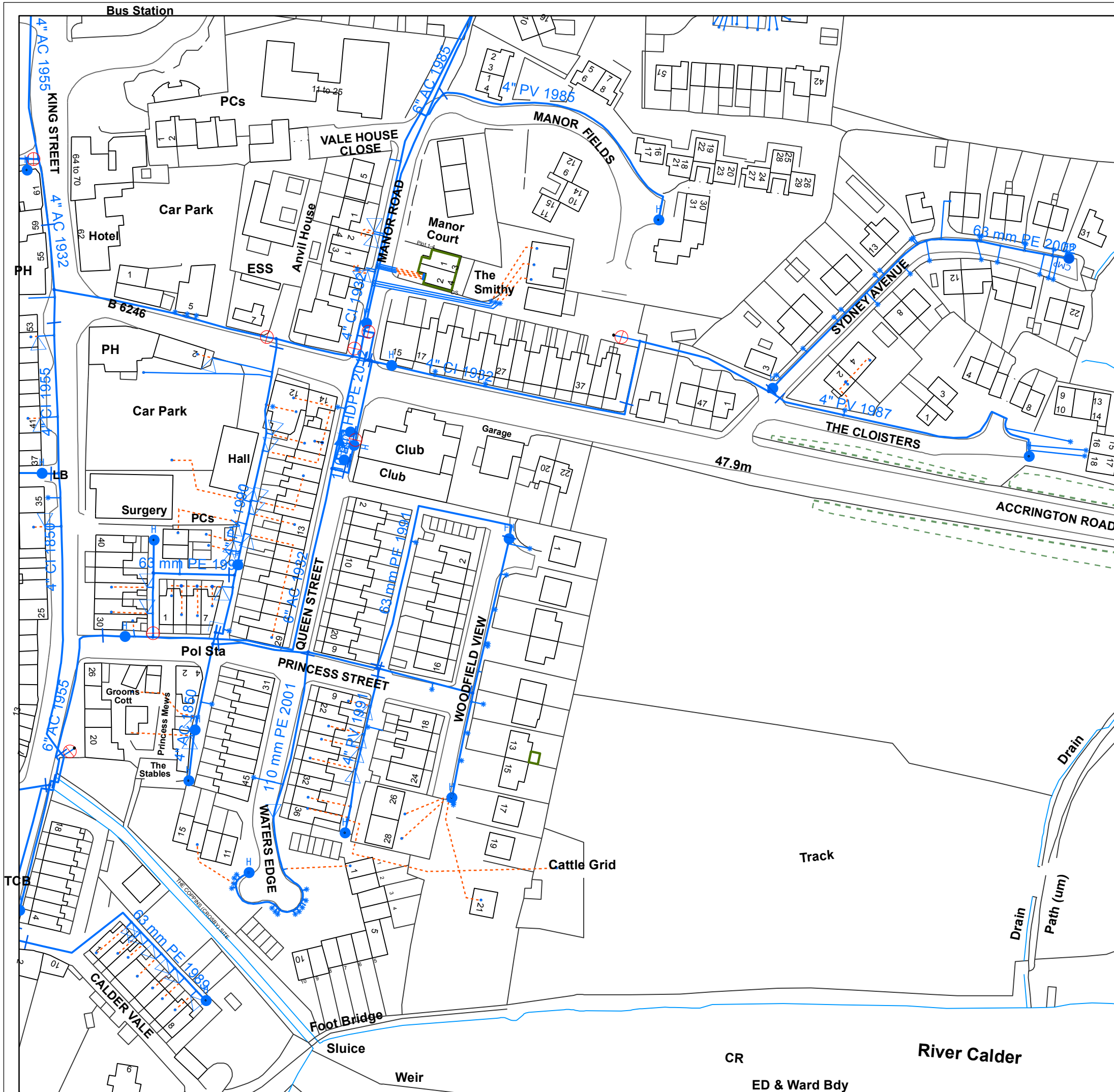
1 Woodfield View
Whalley
Clitheroe
BB7 9TB

Printed By : Property Searches Date: 08/10/2015

DO NOT SCALE
Approximate Scale: 1:1250



**United
Utilities**
helping life flow smoothly



Conditions and Information regarding wastewater network

These general conditions and precautions apply to the wastewater network of United Utilities

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

- 1 United Utilities provides the approximate locations of its sewers according to its records. These records are not necessarily accurate or complete nor do they normally show the positions of every sewer culvert or drain, private connections from properties to the public sewers or the particulars of any private system. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated. The records do indicate the position of the nearest known public sewer from which the likely length of private connections can be estimated together with the need for any off site drainage rights or easements.
- 2 Special requirements relative to our sewers may be indicated. United Utilities employees or its contractors will visit any site at reasonable notice to assist in the location of its underground sewers and advise any precautions that may be required to obviate any damage. To arrange a visit or for further information regarding new supplies, connections, diversions, costing, or any notification required under these General Conditions, please call us on **0345 602 0406**.
- 3 Where public sewers are within a site which is to be developed and do not take any drainage from outside the area, they are from an operational viewpoint redundant. The developer must identify all redundant sewers affected by the development and apply to United Utilities in writing for these sewers to be formally closed. The developer shall bear all related costs of the physical abandonment work.
- 4 Public sewers within the site that are still live outside the area will be subject to a "Restricted Building zone". This would normally be a surface area equivalent to the depth of the sewer measured from the centre line of the sewer on either side. No construction will be permitted within that zone. The developer should also note that deep and wide rooted trees must not be planted in close proximity to live sewers. Access to public sewers must be maintained at all times and no interference to manholes will be permitted during construction work.
5. Where there is a public sewer along the line of a proposed development/building, arrangements shall be made by the developer at his cost to divert the sewer around the development. Where this is not possible and as a last resort, a "Building Over Agreement" will need to be completed under section 18 of the Building Act 1984. The developer shall design building foundations to ensure that no additional loading is transferred to the sewer and submit such details both to the Local Authority's Building Control Officer and to United Utilities for approval/acceptance. United Utilities on a rechargeable basis would normally undertake all aspects of design work associated with the diversion of any part of the operational wastewater network. For further advice please email wastewaterdeveloperservices@uuplc.co.uk
6. Where there is a non-main river watercourse/culvert passing through the site, the landowner has the responsibility of a riparian owner for the watercourse/culvert and is responsible for the maintenance of the fabric of the culvert and for all works involved in maintaining the unrestricted flow through it. Building over the watercourse/culvert is not recommended. The developer must contact the local authority before any works are carried out on the watercourse/culvert. Where it is necessary to discharge surface water from the site into the watercourse/culvert the developer shall make an assessment of the available capacity of the watercourse/culvert (based on a 1 in 50 year event) and ensure that the additional flow to be discharged into the watercourse/culvert will not cause any flooding. In appropriate cases, flooding may be prevented by on-site storage. The developer shall submit the relevant details required to substantiate his development proposals. Details of any outfall proposed shall also be submitted to the Environment Agency, PO Box 12, Richard Fairclough House, Knutsford Road, Warrington, Cheshire, WA4 1HT for their approval.
7. Where there is a main river watercourse/culvert passing through the site, the developer shall submit all proposals affecting the river to the Environment Agency at the address stated in paragraph 6 for approval/acceptance.

8. Your attention is drawn also to the following:

Private drains or sewers which may be within the site.

On 1 October 2011 all privately owned sewers and lateral drains which communicate with (that is drain to) an existing public sewer as at 1 July 2011 will become the responsibility of the sewerage undertaker. This includes private sewers upstream of pumping stations that have yet to transfer, but excludes lengths of sewer or drain that are the subject of an on-going appeal or which have been excluded from transfer as a result of an appeal or which are on or under land opted-out by a Crown body. The transfer specifically excludes sewers and lateral drains owned by a railway undertaker. Sewers upstream of such assets, however, are transferred. Such assets may not be recorded on the public sewer record currently as it was not a requirement to keep records of previously private sewers and drains.

Applications to make connections to the public sewer.

The developer must write to United Utilities requesting an application form that must be duly completed and returned. No works on the public sewer shall be carried out until a letter of consent is received from United Utilities.

Sewers for adoption If an agreement for the adoption of sewers under Section 104 of the Water Industry Act 1991 is being contemplated, a submission in accordance with "Sewers for Adoption", Seventh Edition, published by the Water Research Centre (2001) Plc, Henley Road, Medmenham, PO Box 16, Marlow, Buckinghamshire, SL7 2HD will be required, taking into consideration any departures from the general guide stipulated by United Utilities.

Further consultation with United Utilities.

Developers wishing to seek advice or clarification regarding sewer record information provided should contact United Utilities to arrange an appointment. A consultation fee may be charged, details of which will be made available at the time of making an appointment.

9. Combined sewers, foul sewers, surface water sewers, and pumped mains. These are shown separately in a range of colours or markings to distinguish them on our drawings, which are extracts from the statutory regional sewer map. A legend and key is provided on each extract for general use, although not all types of sewer will be shown on every extract.

Combined sewers shown coloured red carries both surface water and foul sewage, especially in areas where there is no separate surface water sewerage system.

Foul sewers coloured brown may also carry surface water and there may be no separate surface water system indicated in the immediate area. Both combined and foul sewers carry wastewater to our treatment works before it can safely be returned to the environment.

Surface water sewers coloured blue on our drawings are intended only to carry uncontaminated surface water (e.g. rainfall from roofs, etc) and they usually discharge into local watercourses. It is important for the protection of the environment and water quality that only uncontaminated surface water is connected to the surface water sewers. Improper connections to surface water sewers from sink wastes, washing machines and other domestic use of water can cause significant pollution of watercourses.

Pumped mains, rising mains and sludge mains will all be subject to pumping pressures and are neither suitable nor available for making new connections.

Highway drains, when included, show as blue and black dashed lines. Highway drains are not assets belonging to United Utilities and are the responsibility of local authorities.

1. For information regarding future proposals for construction of company apparatus please write to United Utilities, PO Box 453, Warrington, WA5 3QN.
2. For information regarding easements, deeds, grants or wayleaves please write to United Utilities Property Solutions, Coniston Buildings, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3UU
Tel: 01925 731 365

Conditions and Information regarding water distribution apparatus

These general conditions and precautions apply to the water distribution system of United Utilities

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

1. United Utilities provides approximate locations of its water mains or apparatus according to its records. These records are not necessarily accurate or complete nor do they normally show the positions of private service pipes from the mains to properties. Where service pipes are shown, a blue broken line indicates their approximate position. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated.
2. Special requirements relative to our apparatus may be indicated. United Utilities employees will visit any site at reasonable notice to assist in the location of its underground water apparatus and advise any precautions that may be required to obviate any damage. To arrange a visit or for further information regarding new supplies, connections, diversions, costing, future proposals for construction of company apparatus or any notification required under these General Conditions, please telephone us on **0345 746 2200** or write to United Utilities, PO Box 453, Warrington, WA5 3QN.
3. In order to achieve safe working conditions adjacent to any water apparatus the following should be observed;
 - (a) All water apparatus should be located by hand digging prior to the use of mechanical excavation.
 - (b) During construction work where heavy plant may have to cross the line of a water main, and the main is not under a carriageway of adequate standard of construction, crossing points should be suitably reinforced with sleepers, steel plates or a specially constructed reinforced concrete raft as necessary. These crossing points should be clearly indicated and crossing the line of the water main at other places should be prevented. United Utilities employees will advise on the type of reinforcement necessary. This is particularly important on agricultural or open land, where tilling or erosion may have significantly reduced the original cover.

(c) No explosive should be used within 32 metres of any United Utilities apparatus without prior consultation with United Utilities.

(d) Where it is proposed to carry out piling within 15 metres of any water main United Utilities should be consulted so that the affected main may be surveyed.

4. During any excavation, it is important that measures should be taken to ensure continued support for any water main:

(a) Where excavation of trenches adjacent to any water main is likely to affect its support, the main must be supported to the satisfaction of United Utilities.

(b) Where a trench is excavated crossing or parallel to the line of a water main, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the main. In special cases it may be necessary to provide permanent support to a main which has been exposed over the length of the excavation before back-filling and reinstatement is carried out. No back-filled concrete should contact the main.

5. No other apparatus should be laid over and along the line of a water main irrespective of clearance. A minimum clearance of 450 millimetres should be allowed between any plant being installed and an existing main, to facilitate maintenance and repair, whether the adjacent plant is parallel to or crossing the main. No manhole, chamber, or other obstruction should be built over or around a water main.

6. Where a water main is coated with special wrapping and the wrapping is damaged, even to a minor extent, United Utilities must be notified, and the excavation must be left open for ready access so that repairs can be made. In case of any material damage to the main itself causing leakage, or weakening of the mechanical strength of the pipe, the person or body responsible should immediately notify United Utilities in order that the necessary remedial work can be carried out. The full cost of the necessary remedial work will be charged to the person or body responsible for the damage.

1. If you propose to change existing levels over water mains you will need to inform us. We will need specific locations to be identified together with precise details as to the scale of the proposed changes to existing ground levels. Changes to existing levels may require the diversion of our apparatus at your cost. However, in certain circumstances we may wish to leave our apparatus where it is. On these occasions you will usually be required to protect our apparatus by means of a concrete raft and either raise or lower any surface boxes affected.
2. Under no circumstances should our surface boxes be either buried or left in a situation where they are raised above finished ground levels. You should reuse and re-set any surface boxes affected by your works into the new surface so that they align over the water apparatus below. You will be responsible for the cost of repairing any damage to our apparatus as a result of your works.
3. Where proposals involve resurfacing, you must notify United Utilities if your excavation will be greater than 750mm in the highway and 300mm in a footpath, verge or other location.
4. For information regarding easements, deeds, grants, licences or wayleaves, please write to United Utilities Property Solutions, Coniston Buildings, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington WA5 3UU (Tel 01925 731 365).

Tree planting restrictions over water mains

a) Poplar and willow trees have extensive root systems and should not be planted within 10 metres of any water main.

b) The following trees and those of a similar size, whether they are deciduous or evergreen, should not be planted within six metres of any water main:

- Ash, beech, birch, elm, horse chestnut, lime, oak, sycamore;
- Apple trees and pear trees;
- Most conifers.

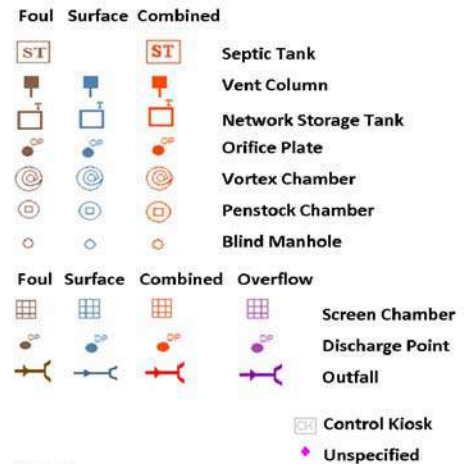
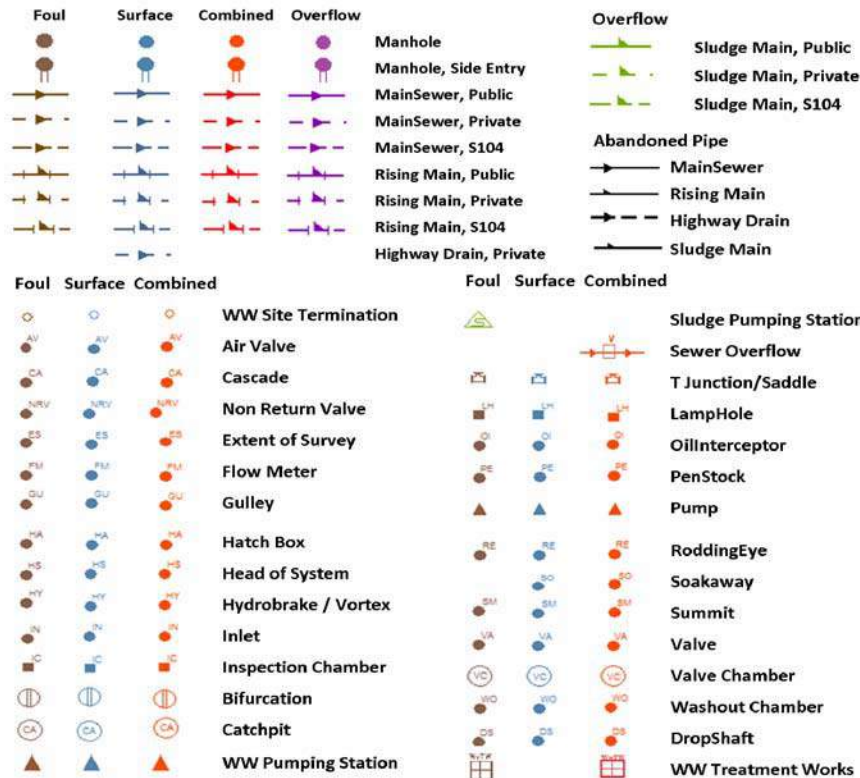
c) United Utilities requires access to the route of its mains at all times to inspect for leaks and carry out surveys. We recommend that no shrubs or bushes which might obstruct or interfere with our access should be planted within one metre of the centre line of any water main.

d) There may be instances when both United Utilities and the landowner will wish to plant shrubs or bushes close to the water main for screening or other purposes. The following shallow rooting shrubs would be suitable for this purpose:

- Blackthorn, broom, cotoneaster, elder;
- Hazel, laurel, privet, quickthorn, snowberry;
- Most ornamental flowering shrubs.

e) In areas where soft fruit is grown, blackcurrant, raspberries and gooseberries may be planted close to the main, provided that a path is left clear for inspection access and surveys. United Utilities can give additional advice where required in particular circumstances.

WASTE WATER SYMBOLOGY



Legend	
MANHOLE FUNCTION	SEWER SHAPE
FO Foul	CI Circular
SW Surface Water	EG Egg
CO Combined	OV Oval
OV Overflow	FT Flat Top
	RE Rectangular
	SQ Square
	TR Trapezoidal
	AR Arch
	BA Barrel
	HO HorseShoe
	UN Unspecified
SEWER MATERIAL	
AC Asbestos Cement	DI Ductile Iron
BR Brick	VC Vitrified Clay
CO Concrete	PP Polypropylene
CSB Concrete Segment	PF Pitched Fibre
CSU Concrete Segment	MA Masonry, Coursed
CC Concrete Box Culverted	MA Masonry, Random
PSC Plastic / Steel	RP Reinforced Plastic
GR Glass Reinforced	CI Cast Iron
GRP Glass Reinforced	SI Spun Iron
PVC Polyvinyl Chloride	ST Steel
PE Polyethylene	U Unspecified

CLEAN WATER SYMBOLOGY

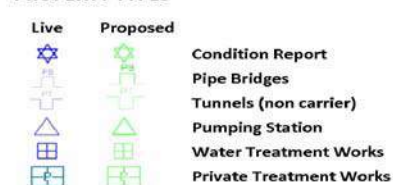
PIPE WORK



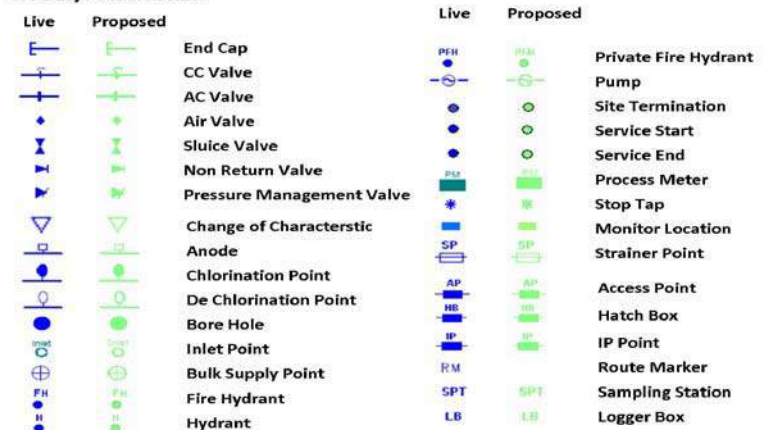
ABANDONED PIPE



PROPERTY TYPES



NODES/FURNITURES



Legend	
MATERIAL TYPES	LINING TYPES
AC ASBESTOS CEMENT	CL CEMENT LINING
CI CAST IRON	TB TAR OR BITUMEN
CU COPPER	ERL EPOXY RESIN
CO CONCRETE	
DI DUCTILE IRON	INSERTION TYPES
GI GALVANISED IRON	DD DIE DRAWN
GR GREY IRON	DR DIRECTIONAL DRILLING
OT OTHERS	MO MOLING
PB LEAD	PI PIPELINE
PV UPVC	SL SLIP LINED
SI SPUN IRON	
ST STEEL	
UN UNKNOWN	
PE POLYETHYLENE	

TERMS AND CONDITIONS - WASTERWATER & 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:

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.

Appendix C

Calculated by: Rob Bruce

Site name: ACCRINGTON ROAD

Site location: WHALLEY

Site Details

Latitude: 53.81972° N

Longitude: 2.40268° W

Reference: 3863048619

Date: Oct 28 2022 09:30

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 1.8

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1139	1139
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	15.36	15.36
1 in 1 year (l/s):	13.36	13.36
1 in 30 years (l/s):	26.11	26.11
1 in 100 year (l/s):	31.95	31.95
1 in 200 years (l/s):	36.4	36.4

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix D

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.500
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.033	5.00	48.646	1200	373579.669	436076.937	1.350
2	0.101	5.00	47.857	1200	373574.622	436055.014	1.507
3	0.049	5.00	47.579	1200	373553.423	436059.839	1.509
11	0.091	5.00	46.958	3000	373520.460	436079.453	1.575
12	0.098	5.00	47.961	3000	373542.195	436074.493	2.727
4	0.036	5.00	47.438	3000	373543.490	436056.464	2.325
5	0.034	5.00	47.304	3000	373538.335	436048.243	2.234
6	0.134	5.00	46.721	3000	373529.205	436004.399	1.834
21	0.055	5.00	49.152	600	373670.037	436061.629	1.392
22	0.055	5.00	48.775	600	373646.660	436068.505	1.421
23	0.055	5.00	48.896	600	373598.948	436082.537	2.039
24	0.055	5.00	48.340	600	373592.317	436059.992	1.718
25	0.055	5.00	48.440	600	373605.633	436056.076	2.232
26	0.055	5.00	48.103	1500	373603.498	436048.328	2.050
27	0.204	5.00	46.726	1500	373593.076	436007.270	1.500
28	0.000		46.785	1500	373593.195	435994.385	1.645
7	0.154	5.00	46.593	1500	373572.955	435994.085	1.818
8	0.000		46.134	1500	373573.762	435983.414	1.386
9	0.000		46.168	1500	373573.199	435939.668	1.529
10			46.168	1500	373573.032	435932.522	1.552

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	22.496	0.600	47.296	46.507	0.789	28.5	150	5.20	50.0
1.001	2	3	21.741	0.600	46.350	46.070	0.280	77.6	300	5.40	50.0
1.002	3	4	10.491	0.600	46.070	45.895	0.175	60.0	300	5.49	50.0
2.000	11	12	22.294	0.600	45.383	45.234	0.149	150.0	450	5.22	50.0
2.001	12	4	18.075	0.600	45.234	45.113	0.121	150.0	450	5.41	50.0
1.003	4	5	9.704	0.600	45.113	45.070	0.043	225.0	450	5.61	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.892	33.4	4.5	1.200	1.200	0.033	0.0
1.001	1.786	126.2	18.2	1.207	1.209	0.134	0.0
1.002	2.033	143.7	24.8	1.209	1.243	0.183	0.0
2.000	1.657	263.6	12.3	1.125	2.277	0.091	0.0
2.001	1.657	263.6	25.6	2.277	1.875	0.189	0.0
1.003	1.351	214.9	55.3	1.875	1.784	0.408	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	5	6	44.785	0.600	45.070	44.887	0.183	244.7	450	6.18	50.0
1.005	6	7	44.949	0.600	44.887	44.775	0.112	400.0	450	6.92	50.0
3.000	21	22	24.367	0.600	47.760	47.429	0.331	73.6	225	5.27	50.0
3.001	22	23	49.733	0.600	47.354	46.857	0.497	100.1	300	5.79	50.0
3.002	23	24	23.500	0.600	46.857	46.622	0.235	100.0	300	6.04	50.0
3.003	24	25	13.880	0.600	46.622	46.208	0.414	33.5	300	6.13	50.0
3.004	25	26	8.037	0.600	46.208	46.053	0.155	51.9	300	6.19	50.0
3.005	26	27	42.360	0.600	46.053	45.376	0.677	62.6	300	6.54	50.0
3.006	27	28	12.886	0.600	45.226	45.140	0.086	150.0	450	6.67	50.0
3.007	28	7	20.242	0.600	45.140	44.925	0.215	94.1	450	6.83	50.0
1.006	7	8	10.701	0.600	44.775	44.748	0.027	400.0	450	7.10	50.0
1.007	8	9	43.750	0.600	44.748	44.639	0.109	400.0	450	7.82	50.0
1.008	9	10	7.148	0.600	44.639	44.616	0.023	310.8	225	7.99	49.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.004	1.295	205.9	59.9	1.784	1.384	0.442	0.0
1.005	1.010	160.7	78.1	1.384	1.368	0.576	0.0
3.000	1.526	60.7	7.5	1.167	1.121	0.055	0.0
3.001	1.571	111.1	14.9	1.121	1.739	0.110	0.0
3.002	1.572	111.1	22.4	1.739	1.418	0.165	0.0
3.003	2.724	192.6	29.8	1.418	1.932	0.220	0.0
3.004	2.188	154.7	37.3	1.932	1.750	0.275	0.0
3.005	1.991	140.7	44.7	1.750	1.050	0.330	0.0
3.006	1.657	263.6	72.4	1.050	1.195	0.534	0.0
3.007	2.095	333.2	72.4	1.195	1.218	0.534	0.0
1.006	1.010	160.7	171.3	1.368	0.936	1.264	0.0
1.007	1.010	160.7	171.3	0.936	1.079	1.264	0.0
1.008	0.736	29.3	170.6	1.304	1.327	1.264	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	22.496	28.5	150	Circular_Default Sewer Type	48.646	47.296	1.200	47.857	46.507	1.200
1.001	21.741	77.6	300	Circular_Default Sewer Type	47.857	46.350	1.207	47.579	46.070	1.209
1.002	10.491	60.0	300	Circular_Default Sewer Type	47.579	46.070	1.209	47.438	45.895	1.243
2.000	22.294	150.0	450	Circular_Default Sewer Type	46.958	45.383	1.125	47.961	45.234	2.277
2.001	18.075	150.0	450	Circular_Default Sewer Type	47.961	45.234	2.277	47.438	45.113	1.875
1.003	9.704	225.0	450	Circular_Default Sewer Type	47.438	45.113	1.875	47.304	45.070	1.784
1.004	44.785	244.7	450	Circular_Default Sewer Type	47.304	45.070	1.784	46.721	44.887	1.384

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	3000	Manhole	Adoptable
2.000	11	3000	Manhole	Adoptable	12	3000	Manhole	Adoptable
2.001	12	3000	Manhole	Adoptable	4	3000	Manhole	Adoptable
1.003	4	3000	Manhole	Adoptable	5	3000	Manhole	Adoptable
1.004	5	3000	Manhole	Adoptable	6	3000	Manhole	Adoptable

Pipeline Schedule

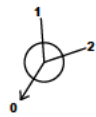
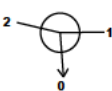
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.005	44.949	400.0	450	Circular_Default Sewer Type	46.721	44.887	1.384	46.593	44.775	1.368
3.000	24.367	73.6	225	Circular_Default Sewer Type	49.152	47.760	1.167	48.775	47.429	1.121
3.001	49.733	100.1	300	Circular_Default Sewer Type	48.775	47.354	1.121	48.896	46.857	1.739
3.002	23.500	100.0	300	Circular_Default Sewer Type	48.896	46.857	1.739	48.340	46.622	1.418
3.003	13.880	33.5	300	Circular_Default Sewer Type	48.340	46.622	1.418	48.440	46.208	1.932
3.004	8.037	51.9	300	Circular_Default Sewer Type	48.440	46.208	1.932	48.103	46.053	1.750
3.005	42.360	62.6	300	Circular_Default Sewer Type	48.103	46.053	1.750	46.726	45.376	1.050
3.006	12.886	150.0	450	Circular_Default Sewer Type	46.726	45.226	1.050	46.785	45.140	1.195
3.007	20.242	94.1	450	Circular_Default Sewer Type	46.785	45.140	1.195	46.593	44.925	1.218
1.006	10.701	400.0	450	Circular_Default Sewer Type	46.593	44.775	1.368	46.134	44.748	0.936
1.007	43.750	400.0	450	Circular_Default Sewer Type	46.134	44.748	0.936	46.168	44.639	1.079
1.008	7.148	310.8	225	Circular_Default Sewer Type	46.168	44.639	1.304	46.168	44.616	1.327

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.005	6	3000	Manhole	Adoptable	7	1500	Manhole	Adoptable
3.000	21	600	Manhole	Adoptable	22	600	Manhole	Adoptable
3.001	22	600	Manhole	Adoptable	23	600	Manhole	Adoptable
3.002	23	600	Manhole	Adoptable	24	600	Manhole	Adoptable
3.003	24	600	Manhole	Adoptable	25	600	Manhole	Adoptable
3.004	25	600	Manhole	Adoptable	26	1500	Manhole	Adoptable
3.005	26	1500	Manhole	Adoptable	27	1500	Manhole	Adoptable
3.006	27	1500	Manhole	Adoptable	28	1500	Manhole	Adoptable
3.007	28	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.006	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.007	8	1500	Manhole	Adoptable	9	1500	Manhole	Adoptable
1.008	9	1500	Manhole	Adoptable	10	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	373579.669	436076.937	48.646	1.350	1200				
						0	1.000	47.296	150
2	373574.622	436055.014	47.857	1.507	1200		1	1.000	46.507
						0	1.001	46.350	300
3	373553.423	436059.839	47.579	1.509	1200		1	1.001	46.070
						0	1.002	46.070	300
11	373520.460	436079.453	46.958	1.575	3000				
						0	2.000	45.383	450
12	373542.195	436074.493	47.961	2.727	3000		1	2.000	45.234
						0	2.001	45.234	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
4	373543.490	436056.464	47.438	2.325	3000		1	2.001	45.113	450
							2	1.002	45.895	300
							0	1.003	45.113	450
5	373538.335	436048.243	47.304	2.234	3000		1	1.003	45.070	450
							0	1.004	45.070	450
6	373529.205	436004.399	46.721	1.834	3000		1	1.004	44.887	450
							0	1.005	44.887	450
21	373670.037	436061.629	49.152	1.392	600					
							0	3.000	47.760	225
22	373646.660	436068.505	48.775	1.421	600		1	3.000	47.429	225
							0	3.001	47.354	300
23	373598.948	436082.537	48.896	2.039	600		1	3.001	46.857	300
							0	3.002	46.857	300
24	373592.317	436059.992	48.340	1.718	600		1	3.002	46.622	300
							0	3.003	46.622	300
25	373605.633	436056.076	48.440	2.232	600		1	3.003	46.208	300
							0	3.004	46.208	300
26	373603.498	436048.328	48.103	2.050	1500		1	3.004	46.053	300
							0	3.005	46.053	300
27	373593.076	436007.270	46.726	1.500	1500		1	3.005	45.376	300
							0	3.006	45.226	450
28	373593.195	435994.385	46.785	1.645	1500		1	3.006	45.140	450
							0	3.007	45.140	450
7	373572.955	435994.085	46.593	1.818	1500		1	3.007	44.925	450
							2	1.005	44.775	450
							0	1.006	44.775	450
8	373573.762	435983.414	46.134	1.386	1500		1	1.006	44.748	450
							0	1.007	44.748	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
9	373573.199	435939.668	46.168	1.529	1500	1  0	1	1.007	44.639	450
10	373573.032	435932.522	46.168	1.552	1500	1 	1	1.008	44.616	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.300	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	44.639	Product Number	CTL-SHE-0172-1500-1200-1500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1500

Node 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	44.748
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	525.0	0.0	1.384	1115.0	0.0	1.385	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	47.332	0.036	4.2	0.0587	0.0000	OK
15 minute winter	2	10	46.425	0.075	17.0	0.1852	0.0000	OK
15 minute winter	3	10	46.157	0.087	23.1	0.1555	0.0000	OK
15 minute winter	11	13	45.449	0.066	11.7	0.5464	0.0000	OK
15 minute winter	12	12	45.453	0.219	43.8	1.7092	0.0000	OK
15 minute winter	4	12	45.464	0.351	51.7	2.5918	0.0000	OK
15 minute winter	5	12	45.441	0.371	74.1	2.7332	0.0000	OK
15 minute winter	6	11	45.398	0.511	105.0	4.3593	0.0000	SURCHARGED
15 minute winter	21	10	47.812	0.052	7.1	0.0562	0.0000	OK
15 minute winter	22	10	47.424	0.070	14.0	0.0744	0.0000	OK
15 minute winter	23	11	46.948	0.091	20.7	0.0752	0.0000	OK
15 minute winter	24	11	46.699	0.077	27.1	0.0707	0.0000	OK
15 minute winter	25	11	46.315	0.107	33.9	0.0831	0.0000	OK
15 minute winter	26	11	46.167	0.114	40.6	0.2616	0.0000	OK
15 minute winter	27	11	45.410	0.184	65.4	0.8251	0.0000	OK
15 minute summer	28	12	45.372	0.232	62.1	0.4098	0.0000	OK
15 minute winter	7	11	45.373	0.598	185.7	2.0699	0.0000	SURCHARGED
180 minute winter	8	136	44.950	0.202	48.0	114.8242	0.0000	OK
180 minute winter	9	136	44.948	0.309	16.2	0.5458	0.0000	SURCHARGED
15 minute summer	10	1	44.616	0.000	14.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	4.1	1.275	0.123	0.0728	
15 minute winter	2	1.001	3	16.8	1.097	0.133	0.3343	
15 minute winter	3	1.002	4	22.8	1.423	0.158	0.1683	
15 minute winter	11	2.000	12	12.9	0.647	0.049	1.0101	
15 minute winter	12	2.001	4	32.3	0.631	0.122	1.8936	
15 minute winter	4	1.003	5	71.6	0.992	0.333	1.3220	
15 minute winter	5	1.004	6	98.2	0.813	0.477	6.6760	
15 minute winter	6	1.005	7	137.8	1.001	0.858	7.1219	
15 minute winter	21	3.000	22	6.9	1.006	0.114	0.1673	
15 minute winter	22	3.001	23	13.6	0.900	0.123	0.7630	
15 minute winter	23	3.002	24	20.6	1.275	0.185	0.3795	
15 minute winter	24	3.003	25	27.3	1.495	0.142	0.2549	
15 minute winter	25	3.004	26	34.0	1.450	0.220	0.1888	
15 minute winter	26	3.005	27	40.8	1.712	0.290	1.0101	
15 minute winter	27	3.006	28	64.5	1.366	0.245	0.8946	
15 minute summer	28	3.007	7	57.3	1.082	0.172	2.4135	
15 minute winter	7	1.006	8	208.2	2.594	1.296	0.8908	
180 minute winter	8	1.007	9	16.2	0.382	0.101	4.0406	
180 minute winter	9	Hydro-Brake®	10	14.9				195.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	47.355	0.059	10.4	0.0952	0.0000	OK
15 minute winter	2	10	46.474	0.124	41.9	0.3070	0.0000	OK
15 minute winter	3	10	46.218	0.148	56.9	0.2630	0.0000	OK
15 minute winter	11	12	46.029	0.646	75.6	5.3102	0.0000	SURCHARGED
15 minute winter	12	11	46.020	0.786	70.2	6.1236	0.0000	SURCHARGED
15 minute winter	4	12	46.002	0.889	116.5	6.5594	0.0000	SURCHARGED
15 minute winter	5	12	45.972	0.902	143.1	6.6485	0.0000	SURCHARGED
15 minute winter	6	11	45.906	1.019	183.5	8.6942	0.0000	SURCHARGED
15 minute winter	21	10	47.844	0.084	17.3	0.0907	0.0000	OK
15 minute winter	22	10	47.466	0.112	34.3	0.1187	0.0000	OK
15 minute winter	23	11	47.008	0.151	51.1	0.1239	0.0000	OK
15 minute winter	24	11	46.752	0.130	67.1	0.1198	0.0000	OK
15 minute winter	25	11	46.405	0.197	83.7	0.1527	0.0000	OK
15 minute winter	26	11	46.262	0.209	100.0	0.4806	0.0000	OK
15 minute winter	27	11	45.906	0.680	159.6	3.0495	0.0000	SURCHARGED
15 minute winter	28	11	45.850	0.710	165.8	1.2541	0.0000	SURCHARGED
15 minute winter	7	11	45.774	0.999	392.1	3.4581	0.0000	SURCHARGED
240 minute winter	8	228	45.256	0.508	85.3	322.5302	0.0000	SURCHARGED
240 minute winter	9	228	45.255	0.616	16.0	1.0881	0.0000	SURCHARGED
15 minute summer	10	1	44.616	0.000	15.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	10.2	1.636	0.306	0.1409	
15 minute winter	2	1.001	3	41.5	1.338	0.329	0.6749	
15 minute winter	3	1.002	4	56.2	1.773	0.391	0.3329	
15 minute winter	11	2.000	12	-48.7	0.754	-0.185	3.5323	
15 minute winter	12	2.001	4	93.1	0.725	0.353	2.8639	
15 minute winter	4	1.003	5	140.2	1.071	0.653	1.5375	
15 minute winter	5	1.004	6	162.9	1.064	0.791	7.0959	
15 minute winter	6	1.005	7	206.7	1.305	1.287	7.1219	
15 minute winter	21	3.000	22	17.0	1.286	0.280	0.3222	
15 minute winter	22	3.001	23	33.8	1.137	0.304	1.4796	
15 minute winter	23	3.002	24	50.5	1.563	0.454	0.7593	
15 minute winter	24	3.003	25	67.2	1.724	0.349	0.5423	
15 minute winter	25	3.004	26	83.7	1.740	0.541	0.4069	
15 minute winter	26	3.005	27	98.5	1.880	0.700	2.5989	
15 minute winter	27	3.006	28	165.8	1.478	0.629	2.0417	
15 minute winter	28	3.007	7	170.5	1.150	0.512	3.2072	
15 minute winter	7	1.006	8	404.2	3.621	2.516	1.1951	
240 minute winter	8	1.007	9	16.0	0.371	0.100	6.9319	
240 minute winter	9	Hydro-Brake®	10	15.0				370.4

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	47.392	0.096	20.1	0.1558	0.0000	OK
15 minute winter	2	12	47.111	0.761	80.8	1.8814	0.0000	SURCHARGED
15 minute winter	3	12	47.011	0.941	103.0	1.6744	0.0000	SURCHARGED
15 minute winter	11	12	46.931	1.548	83.1	12.7288	0.0000	FLOOD RISK
15 minute winter	12	12	46.924	1.690	157.5	13.1599	0.0000	SURCHARGED
15 minute winter	4	12	46.899	1.786	192.3	13.1796	0.0000	SURCHARGED
15 minute winter	5	12	46.825	1.755	215.3	12.9427	0.0000	SURCHARGED
15 minute winter	6	11	46.589	1.702	276.9	14.5198	0.0000	FLOOD RISK
15 minute winter	21	12	48.426	0.666	33.5	0.7150	0.0000	SURCHARGED
15 minute winter	22	12	48.346	0.992	67.1	1.0485	0.0000	SURCHARGED
15 minute winter	23	12	48.208	1.351	93.1	1.1109	0.0000	SURCHARGED
15 minute winter	24	12	48.045	1.423	106.7	1.3139	0.0000	FLOOD RISK
15 minute winter	25	12	47.849	1.641	133.9	1.2735	0.0000	SURCHARGED
15 minute winter	26	12	47.632	1.579	161.1	3.6373	0.0000	SURCHARGED
15 minute winter	27	11	46.631	1.405	265.8	6.3046	0.0000	FLOOD RISK
15 minute winter	28	10	46.480	1.340	271.4	2.3676	0.0000	SURCHARGED
15 minute winter	7	10	46.296	1.521	629.9	5.2637	0.0000	FLOOD RISK
480 minute winter	8	456	45.788	1.040	96.8	778.2432	0.0000	SURCHARGED
480 minute winter	9	456	45.787	1.148	15.7	2.0280	0.0000	SURCHARGED
15 minute summer	10	1	44.616	0.000	15.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	19.3	1.879	0.577	0.3322	
15 minute winter	2	1.001	3	74.9	1.428	0.593	1.5310	
15 minute winter	3	1.002	4	92.8	1.890	0.646	0.7388	
15 minute winter	11	2.000	12	51.5	0.744	0.196	3.5323	
15 minute winter	12	2.001	4	-106.2	0.730	-0.403	2.8639	
15 minute winter	4	1.003	5	203.6	1.285	0.948	1.5375	
15 minute winter	5	1.004	6	237.5	1.499	1.153	7.0959	
15 minute winter	6	1.005	7	298.9	1.887	1.861	7.1219	
15 minute winter	21	3.000	22	33.6	1.475	0.554	0.9691	
15 minute winter	22	3.001	23	61.6	1.219	0.555	3.5022	
15 minute winter	23	3.002	24	84.4	1.574	0.760	1.6549	
15 minute winter	24	3.003	25	107.7	1.673	0.559	0.9774	
15 minute winter	25	3.004	26	134.9	1.915	0.872	0.5660	
15 minute winter	26	3.005	27	163.9	2.328	1.165	2.9830	
15 minute winter	27	3.006	28	271.4	1.713	1.030	2.0417	
15 minute winter	28	3.007	7	275.4	1.738	0.826	3.2072	
15 minute winter	7	1.006	8	639.1	5.010	3.978	1.6955	
480 minute winter	8	1.007	9	15.7	0.361	0.098	6.9319	
480 minute winter	9	Hydro-Brake®	10	15.0				558.3

Appendix E



- GENERAL NOTES**
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
 2. ALL RELEVANT DIMENSIONS TO BE OBTAINED/CHECKED AGAINST ARCHITECT'S DRAWINGS AND BY SITE MEASUREMENT PRIOR TO THE COMMENCEMENT OF WORKS OR ORDERING OF MATERIALS. DISCREPANCIES BETWEEN THE DRAWINGS AND SITE CONDITIONS TO BE NOTIFIED TO THE ENGINEER.
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REV	DATE	DESCRIPTION	BY	CHK	APP
P04	06-12-2022	ADDITION OF FLOOD COMPENSATION DRAIN DOWN PIPES	RG	RG	MG
P03	28-10-2022	AMENDED HYDROBRAKE INFORMATION	RG	RG	MG
P02	26-10-2022	AMENDED LAYOUT AND DRAINAGE STRATEGY	RG	RG	MG
P01	18-11-2021	PRELIMINARY ISSUE	RG	RG	MG

DRAWING STATUS: **PLANNING**

CLIENT: **OAKMERE HOMES LTD**

ARCHITECT: **-**

PROJECT: **NEW HOUSING DEVELOPMENT
ACCRINGTON ROAD
WHALLEY**

TITLE: **PHASE 1
DRAINAGE LAYOUT**

STATUS:	PROJECT No.	ORIG NATOR	PHASE	LEVEL	TYPE	ROLE	DRAW NG No.	REV:
S2	21315	- GAD -	01	- ZZ -	DR - C -	1001	P04	

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	RG	RG	MG	MG	SEPT 2021

M & P Gadsden
Consulting Engineers Ltd

Unit 20
Meetings Industrial Estate
Park Road, LA14 4TL
Tel: 01229 813333
www.mpg-consulting.co.uk



Key:

→ Exceedance route

Notes:

No flooding occurs in the 100yr +50%CC +10% urban creep simulations

Where exceedance route flows over plot boundaries, boundary fence to be minimum 100mm above ground

PG3	06-12-2022	ADDITION OF FLOOD COMPENSATION DRAIN DOWN P PES						RG	RG	MG
PG2	28-10-2022	AMENDED HYDROBRAKE INFORMATION						RG	RG	MG
PG1	26-10-2022	PLANNING ISSUE						RG	RG	MG
REV	DATE	DESCRIPTION						BY	CHK	APP

DRAWING STATUS:

PLANNING

CLIENT:

OAKMERE HOMES LTD

ARCHITECT:

-

PROJECT:

NEW HOUSING DEVELOPMENT
ACCRINGTON ROAD
WHALLEY

TITLE:

EXCEEDANCE ROUTE

STATUS:	PROJECT No.	ORIG NATOR	PHASE	LEVEL	TYPE	ROLE	DRAWING No.	REV:
S2	21315	- GAD -	01	- ZZ -	DR - C -	1005	P03	

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	RG	RB	RG	MG	OCT 2022

M & P Gadsden
Consulting Engineers Ltd

Unit 20
Meetings Industrial Estate
Park Road, LA14 4TL
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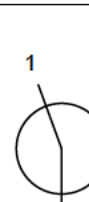
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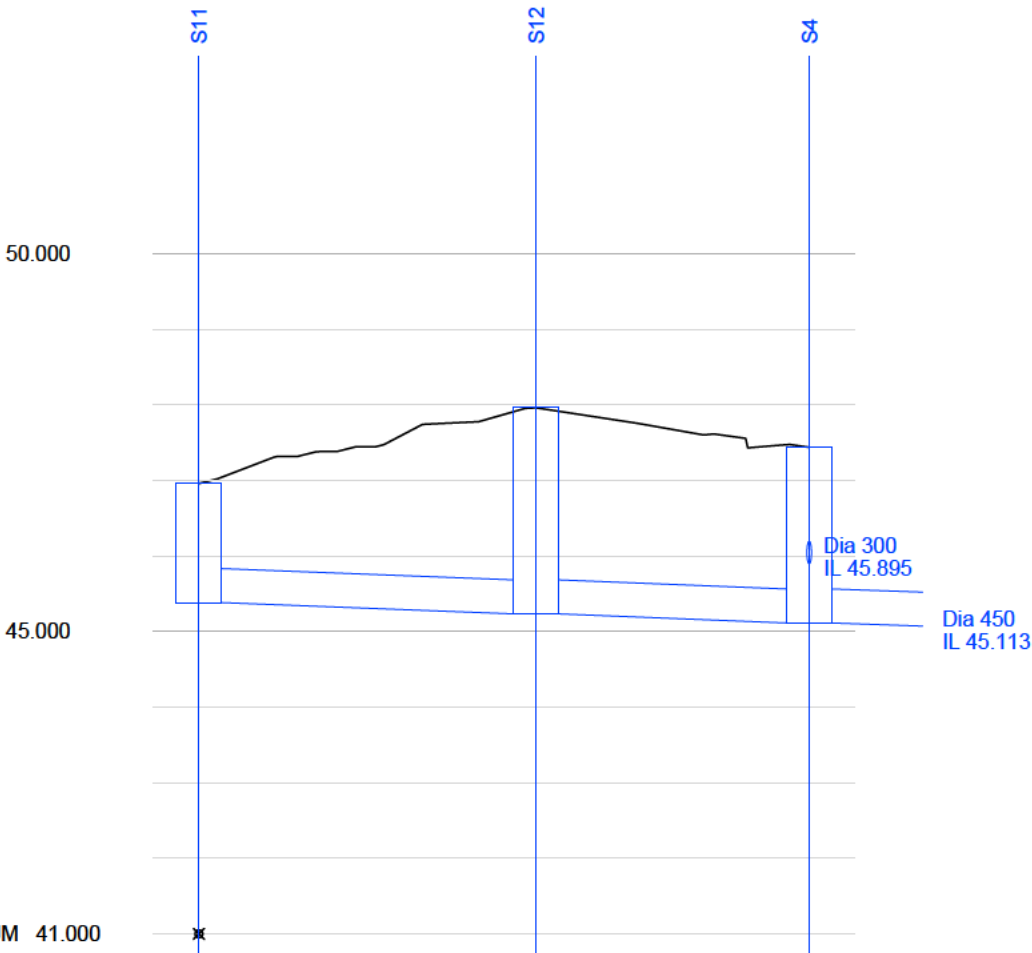
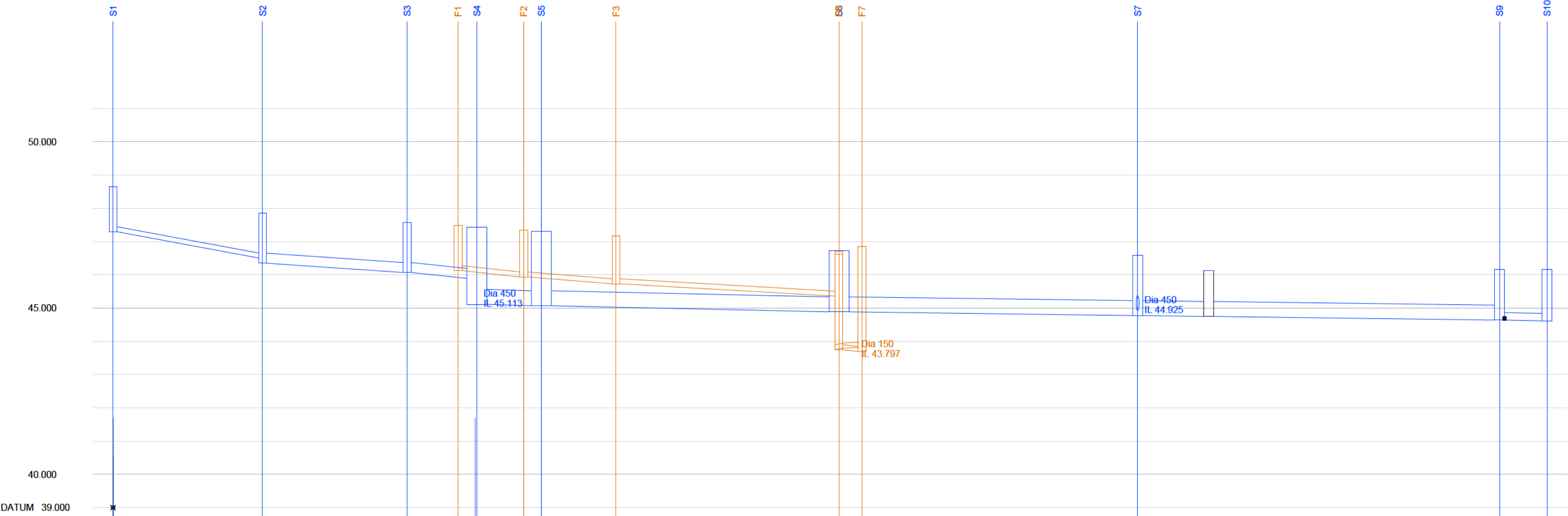
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Manhole Number	Cover Level	Connections	Pipe			Manhole Size	Types	
Coordinates	Depth To Soffit		Code	Inverts	Diams		Manhole	Cover
F1	47.478							
E. 373545.173	1.200							
N. 436060.299			0	2.000	46.128	150	1200	3
F2	47.338		1	2.000	45.936	150		
E. 373537.044	1.252							
N. 436052.165			0	2.001	45.936	150	1200	3
F3	47.170		1	2.001	45.731	150		
E. 373534.368	1.289							
N. 436037.577			0	2.002	45.731	150	1200	3
F4	46.385		1	1.008	44.039	150		
E. 373560.556	2.196							
N. 435995.395			0	1.009	44.039	150	1200	3
F5	46.710		1	1.009	43.797	150		
E. 373525.108	2.763		2	2.002	45.360	150		
N. 436002.871			0	1.010	43.797	150	1200	2
F6	46.624		1	1.010	43.749	150		
E. 373522.714	2.725							
N. 435996.128			0	1.011	43.749	150	1200	3
F7	46.850		1	1.011	43.695	150		
E. 373530.060	3.005							
N. 435992.994							1200	1
F13	48.020							
E. 373605.275	1.885							
N. 436046.079			0	1.005	45.985	150	1200	3
F14	46.050		1	1.005	44.700	150		
E. 373595.294	1.200							
N. 436004.503			0	1.006	44.700	150	1200	2
F15	46.091		1	1.006	44.621	150		
E. 373595.294	1.320							
N. 435992.775			0	1.007	44.621	150	1200	3
F16	46.571		1	1.007	44.200	150		
E. 373575.809	2.221							
N. 435991.186			0	1.008	44.200	150	1200	3

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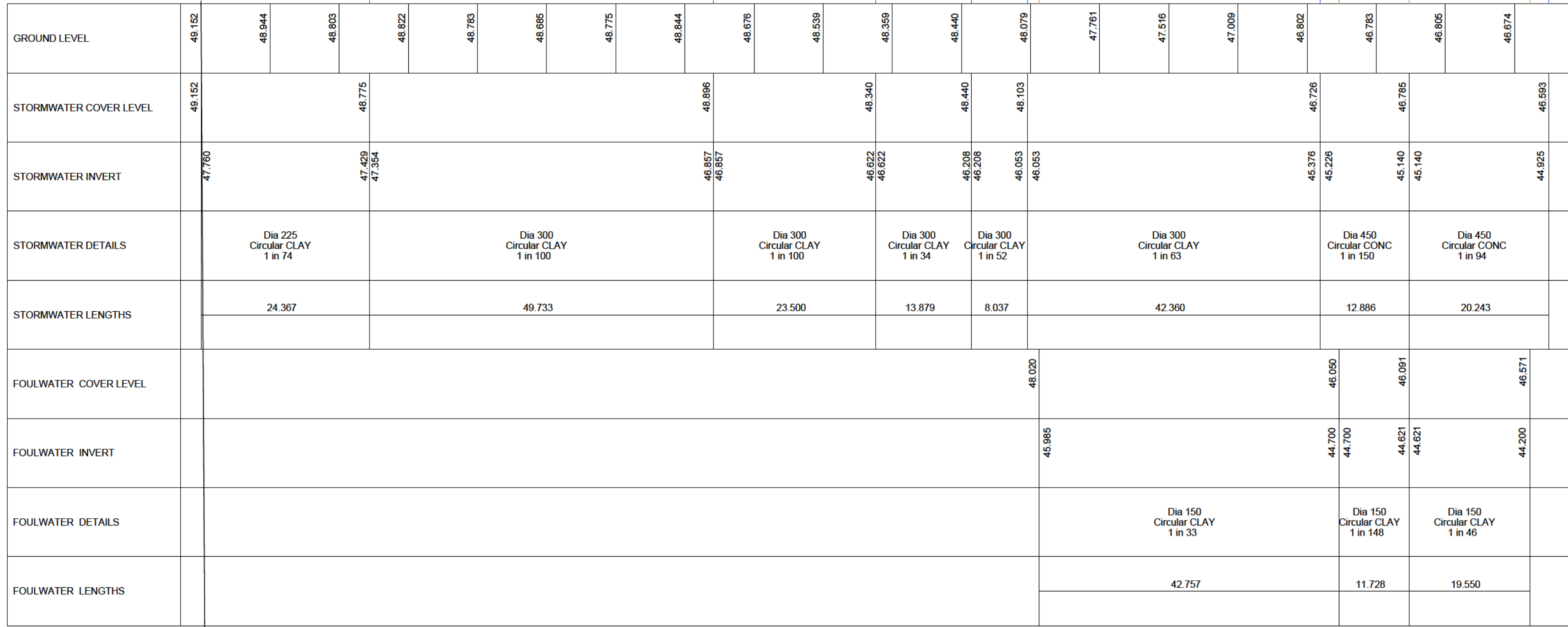
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GROUND LEVEL	48.646	48.142	47.848	47.759	47.628	47.579	47.478	47.346	47.237	47.120	46.995	46.858	46.708	46.580	46.440	46.410	46.537	46.580	44.745	44.714	44.683	44.652	46.353	
STORMWATER COVER LEVEL	48.646		47.857			47.579		47.438					46.721				46.593						46.168	46.168
STORMWATER INVERT	47.296		46.507 46.350			46.070 46.070		46.895 45.113	46.070 46.070				44.887 44.887				44.775 44.775	44.748 44.748				44.639 44.639	44.616	
STORMWATER DETAILS		Dia 150 Circular CLAY 1 in 29		Dia 300 Circular CLAY 1 in 78		Dia 300 Circular CLAY 1 in 60	Dia 450 Circular CONC 1 in 225			Dia 450 Circular CONC 1 in 245				Dia 450 Circular CONC 1 in 400			Dia 450 Circular CONC 1 in 400			Dia 450 Circular CONC 1 in 400		Dia 225 Circular CLAY 1 in 311		
STORMWATER LENGTHS		22.497		21.741		10.491	9.703			44.785				44.949			10.701		43.751			7.147		
FOULWATER COVER LEVEL						47.478		47.338		47.170			46.828 46.850											
FOULWATER INVERT						46.128	45.936 45.936		45.731 45.731			45.350 45.350												
FOULWATER DETAILS						Dia 150 Circular CLAY 1 in 60	Dia 150 Circular CLAY 1 in 72			Dia 150 Circular CLAY 1 in 97		Dia 150 Circular CLAY 1 in 119.48												
FOULWATER LENGTHS						11.500	14.831			35.920		7.119 7.119												

PROJECT No.	26-10-2022	PLANNING ISSUE	RG	RG	MG
REV	DATE	DESCRIPTION	BY	CHK	APP
DRAWING STATUS:					
PLANNING					
CLIENT:					
OAKMERE HOMES LTD					
ARCHITECT:					
-					
PROJECT:					
NEW HOUSING DEVELOPMENT ACCRINGTON ROAD WHALLEY					
TITLE:					
DRAINAGE LONGSECTIONS SHEET 1					
STATUS:	PROJECT No.	ORIG NATOR	PHASE	LEVEL	TYPE
S2	21315	- GAD -	01	- ZZ -	DR - C -
SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	RG	RB	MG	MG	OCT 2022
Unit 20 M & P Gadsden Consulting Engineers Ltd Meetings Industrial Estate Park Road, LA14 4TL Tel: 01229 813333 www.mpg-consulting.co.uk					



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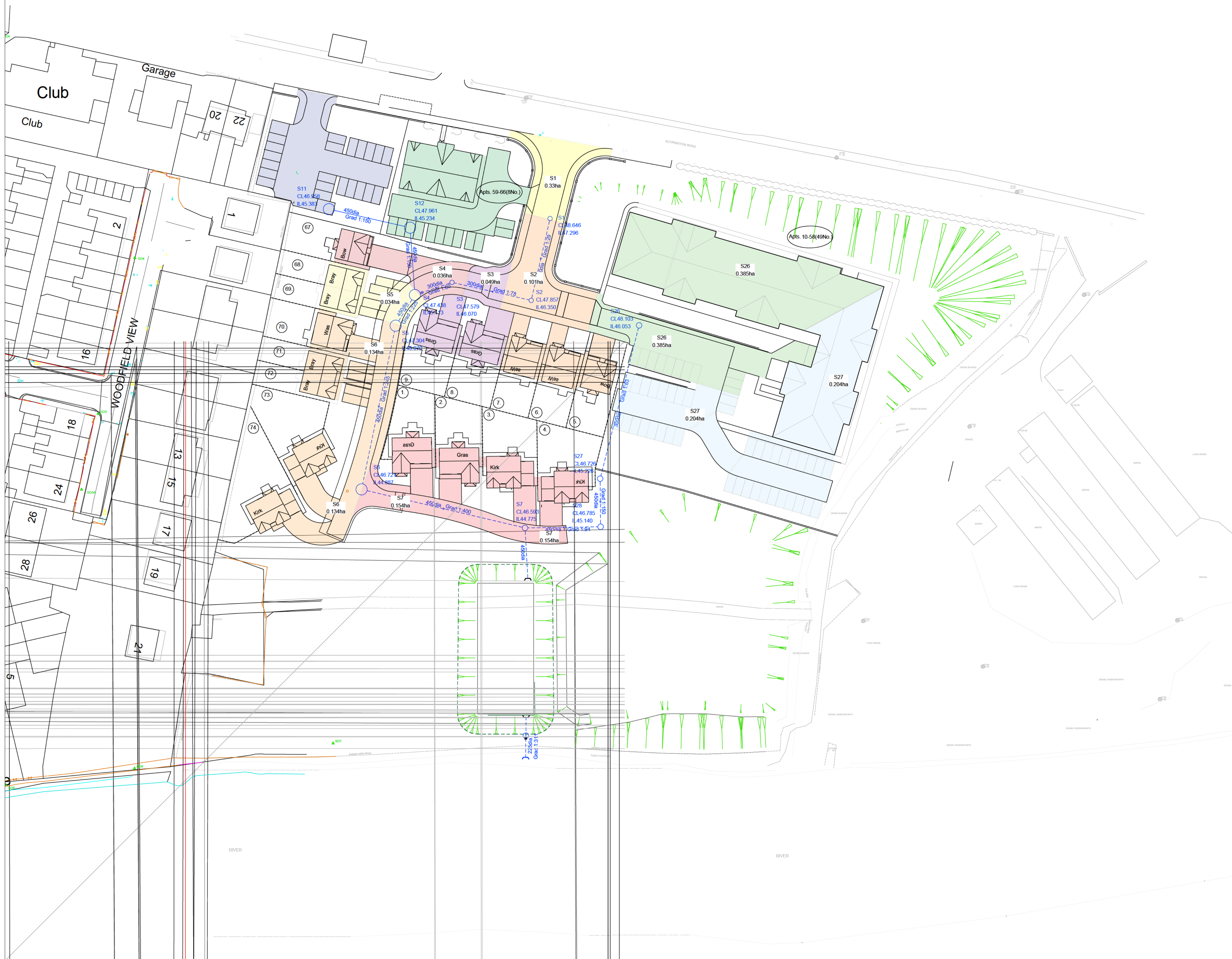
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OAKMERE HOMES LTD									
ARCHITECT:									
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PROJECT:									
NEW HOUSING DEVELOPMENT ACCRINGTON ROAD WHALLEY									
TITLE:									
DRAINAGE LONGSECTIONS SHEET 2									
STATUS:	PROJECT No.	ORIGINATOR	PHASE	LEVEL	TYPE	ROLE	DRAWING No.	REV.	
S2	21315	GAD	01	ZZ	DR	C	1022	P01	
SCALE @ A1 1:500	DESIGNED: RG	DRAWN: RB	CHECKED: MG	APPROVED: MG	DATE: OCT 2022				

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1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
2. ALL RELEVANT DIMENSIONS TO BE OBTAINED/CHECKED AGAINST ARCHITECT'S DRAWINGS AND BY SITE MEASUREMENT PRIOR TO THE COMMENCEMENT OF WORKS OR ORDERING OF MATERIALS. DISCREPANCIES BETWEEN THE DRAWINGS AND SITE CONDITIONS TO BE NOTIFIED TO THE ENGINEER.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DPMs & DPCs AND WATERPROOFING/ WEATHERING DETAILS TO BE IN ACCORDANCE WITH ARCHITECTS DETAILS.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION OF ALL UNDERGROUND SERVICES THAT MAY EXIST AND TO DIVERT THEM IF NECESSARY PRIOR TO THE COMMENCEMENT OF THE WORKS.
6. ALL STRUCTURAL WORKS TO BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE DETAILS GIVEN BY THE ENGINEER. THE ENGINEER IS TO BE ADVISED OF ANY SIGNIFICANT VARIATION PRIOR TO ITS IMPLEMENTATION.
7. SETTING-OUT OF WALLS TO BE IN ACCORDANCE WITH LATEST RELEVANT ARCHITECT'S DRAWING.
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[illegible]

GENERAL NOTES

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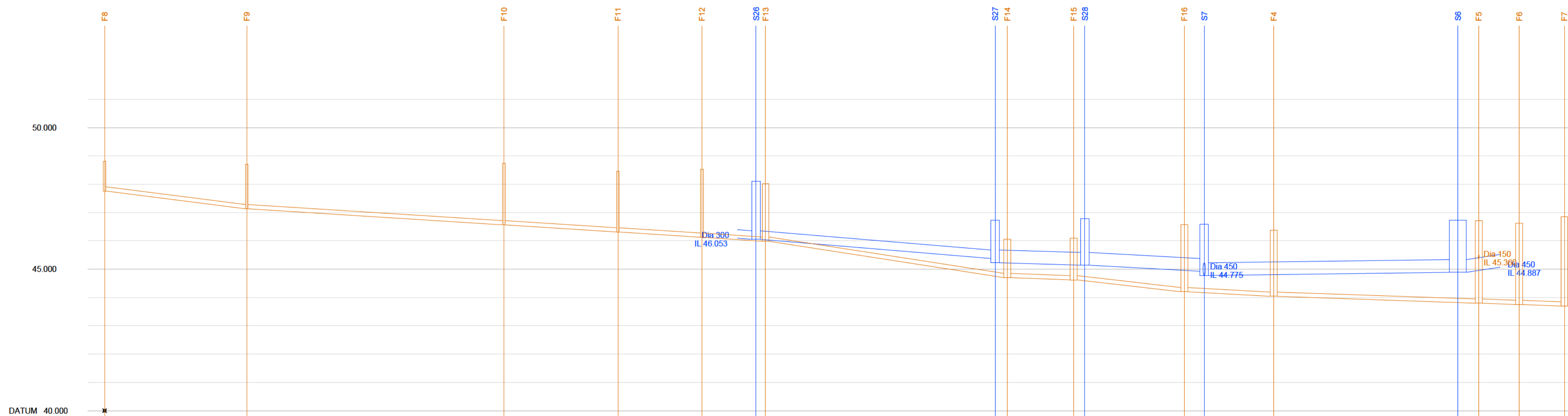
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GROUND LEVEL	48.817	48.803	48.891	48.899	48.890	48.874	48.720	48.737	48.810	48.463	48.509	48.554	47.900	47.854	47.544	48.965	48.051	48.086	48.147	48.865	48.472	48.592	48.413	48.550	48.702	48.625
STORMWATER COVER LEVEL												48.103					48.728		48.785		48.593				48.721	
STORMWATER INVERT													48.053				45.376 45.226		45.140 45.140		44.925 44.775				44.887	
STORMWATER DETAILS														Dia 300 Circular CONC 1 in 63			Dia 450 Circular CONC 1 in 150		Dia 450 Circular CONC 1 in 94				Dia 450 Circular CONC 1 in 400			
STORMWATER LENGTHS														42.360			12.886		20.243				44.949			
FOULWATER COVER LEVEL	48.817		48.711				48.748			48.463		48.554	48.020				48.050		48.091		48.571		48.385		48.710	48.650
FOULWATER INVERT	47.760		47.132 47.132				46.554 46.554			46.312 46.312		46.126 46.126	46.365 46.365				44.700 44.700		44.621 44.621		44.200 44.200		44.039 44.039		43.797 43.797	43.695
FOULWATER DETAILS		Dia 150 Circular CLAY 1 in 40				Dia 150 Circular CLAY 1 in 80			Dia 150 Circular CLAY 1 in 80		Dia 150 Circular CLAY 1 in 80	Dia 150 Circular CLAY 1 in 80		Dia 150 Circular CLAY 1 in 33			Dia 150 Circular CLAY 1 in 148		Dia 150 Circular CLAY 1 in 46		Dia 150 Circular CLAY 1 in 98		Dia 150 Circular CLAY 1 in 150	Dia 150 Circular CLAY 1 in 149	Dia 150 Circular CLAY 1 in 148	
FOULWATER LENGTHS		25.133				45.462			20.163		14.848	11.240		42.757			11.728		19.550		15.823		36.228		7.155	7.987

P01	26-10-2022	PLANNING ISSUE					RG	RG	MG
REV	DATE	DESCRIPTION					BY	CHK	APP
DRAWING STATUS:									
PLANNING									
CLIENT:									
OAKMERE HOMES LTD									
ARCHITECT:									
-									
PROJECT:									
NEW HOUSING DEVELOPMENT ACCRINGTON ROAD WHALLEY									
TITLE:									
DRAINAGE LONGSECTIONS SHEET 3									
STATUS:	PROJECT No.	ORIGINATOR	PHASE	LEVEL	TYPE	ROLE	DRAWING No.	REV:	
S2	21315	- GAD -	01	- ZZ	- DR	- C -	1023	P01	
SCALE: A1: 1:500	DESIGNED: RG	DRAWN: RB	CHECKED: MG	APPROVED: MG	DATE: OCT 2022				
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1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

ALL DRAINAGE IS TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH UNITED UTILITIES PLC 'A DEVELOPERS GUIDE TO WASTEWATER ADOPTIONS' AND 'SEWERS FOR ADOPTION 6TH EDITION' - (MARCH 2006)

Min 150mm bed and surround to
pipe-cast integrally with headwall

Precast concrete headwall

500mm gabion mattress

Geotextile membrane.

200mm Topsoil

200mm Clay subsoil

200mm Puddled Clay

— 1.0mm Thick butyl rubber pond liner installed to manufacturers Instructions

— 50mm Sand bed

The diagram illustrates a cross-section of a drainage system. At the top, there is a layer of paving stones. Below this is a 100mm concrete bed and surround. The main drainage layer is a 150mm concrete bed and surround, which contains a circular opening. This opening is filled with a 100mm concrete bed and surround. The central part of the opening is a 100mm concrete bed and surround, which is surrounded by a 150mm concrete bed and surround. The entire assembly is supported by a 100mm concrete bed and surround. Labels with arrows point to the 'UPVC Pipe' and the '150mm Concrete Bed & Surround'.

Type 1 Pipe Detail
($<1.2\text{m}$ deep in vehicle areas)
($<0.6\text{m}$ deep in grassed areas)

UPVC Pipe

150mm Concrete Bed & Surround

Diagram illustrating the cross-section of a trench installation. The layers shown are:

- Topsoil
- 150mm Class S Pipe Bed & Surround
- 150mm Class S Pipe

A detail view shows the 150mm Class S Pipe with a central hole and a crosshair.

Type 2 Pipe Detail
(>1.2m deep in vehicle areas)
(>0.6m deep in grassed areas)

— UPVC Pipe

150mm Class S Pipe Bed & Surround

P01	26-10-2022	ISSUED FOR PLANNING					RB	RG	M
REV	DATE	DESCRIPTION					BY	CHK	AP
DRAWING STATUS:									
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CLIENT:									
OAKMERE HOMES LTD									
ARCHITECT:									
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PROJECT:									
NEW HOUSING DEVELOPMENT ACCRINGTON ROAD WHALLEY									
TITLE:									
S104 SUDS DETAILS									
STATUS:	PROJECT No.	ORIGINATOR	PHASE	LEVEL	TYPE	ROLE	DRAWING No.	REV:	
S2	21115	- GAD -	01 -	ZZ -	DR -	C -	1070	P01	
SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:		DATE:			
1:10	RG	RG	MG	MG		OCT 2022			
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Unit 2									
Meetings Industrial Estate									
Park Road, LA19 4TT									
Tel: 01229 813333									
www.mpg-consulting.co.uk									

Appendix F



Sustainable Drainage Maintenance & Management Plan

Housing Development Accrington Road, Whalley

1.0 Introduction

Sustainable drainage systems or SuDS are an environmentally friendly approach to managing rainfall that uses the landscape. SuDS aim to: -

- Control the flow, volume and frequency of water leaving a development site
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2.0 SuDS at Accrington Road, Whalley

The SuDS are designed to prevent flooding of the housing development and control the flow of water from the site. This site utilises attenuation in the form of an attenuation basin, along with a vortex flow control unit to slowly discharge surface water into the existing watercourse. The maintenance of the drainage network and attenuation features will be the responsibility of the management company.

The highway serving the site is constructed using a mixture of bituminous macadam and impermeable pavements. The maintenance of the main carriageways will be the responsibility of the management company.

Private shared access driveways are also constructed using impermeable pavements. The maintenance of these private shared access driveways will be the responsibility of the management company.

3.0 Managing the SuDS

The day-to-day surface water drainage and SuDS requiring management and maintenance for this site are summarised in Table 1 with the basin management in Table 2: -

Table 1 – Maintenance Schedule

	Maintenance Item	Action	Regularity
1	Monitoring Generally	Initial inspection of everything below to ensure the system is working effectively	After large storms and quarterly during first year
2	Impermeable Pavements	Brushing/sweeping of surface area to clear litter, grass cuttings, leaves and other debris	Once per year after Autumn leaf fall and as required
3	Impermeable Pavements	Removal of weeds using glyphosphate applied directly into weeds using an applicator	Annually and/or as required
4	Impermeable Pavements	Remedial work to depressions and cracked or broken block pavers. Replace blocks and replace jointing material	As required
5	Manholes, Geocellular Tanks, Pipes etc	Lift manhole covers, visual inspection. If debris/silt has built up arrange jetting. Arrange CCTV survey if performance deteriorates.	Annually and/or as required
6	Flow Control (Hydro-Brake)	Lift manhole cover, clear silt from silt trap, inspect Hydro-brake for blockages	Annually
8	Inlets and Outlets	Inspect and remove silt, litter and debris. Strim for 1m around	Monthly

Table 2 – Attenuation Basin Maintenance Schedule

	Maintenance Item	Action	Regularity
1	Litter Management	Pick up all litter in SuDS and landscape areas and remove from site	Monthly
2	Grass Maintenance	Cut grass to side slopes and surrounding areas at 100mm	As required or monthly
3	Basin Vegetation Maintenance	Monitor basin vegetation and cut 30% of edge at 100mm each year if necessary in September-November	Annually
4	Inlet & Outlets	Inspect and remove silt, litter and debris. Strim for 1m around	Monthly
5	Silt Management	a)Inspect base of basin for silt accumulation	Annually
		b)Excavate silt taking care not to damage basin integrity. Set a side silt and allow to dry within 10m of SuDS feature. Spread, rake and overseed.	As necessary
6	Basin Monitoring	Check and reinstate design levels. Check for ponding and inspect for structural issues, repairing as required.	Within first 12 months and then as necessary
7	Outlets	Inspect and remove silt, litter and debris. Strim for 1m around	Monthly

Appendix G



Householder Sustainable Drainage Maintenance Plan

Housing Development Accrington Road, Whalley

1.0 Introduction

Sustainable drainage systems or SuDS are aimed to: -

- Control the flow, volume and frequency of water leaving a development site
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces

2.0 Surface water drainage & SuDS serving this property

House roof and impermeable driveway surfaces are served by an attenuation basin. A management company is responsible for the maintenance and upkeep of this basin.

As the property owner you are responsible for maintenance and upkeep of the system serving your house and impermeable driveways until it discharges into the public sewer. Silt traps and trapped gullies protect the system from silting and blocking up as well as enhancing water quality. These features are key to ensuring the systems longevity.

SuDS features should not be interfered with in any fashion without the prior approval of the Lead Local Flood Authority (Lancashire County Council).

3.0 Management & Maintenance

The surface water drainage and SuDs requiring management and maintenance for this property are summarised in Table 1 below: -

Table 1 – Householder Maintenance Schedule

Maintenance Item	Regularity	Action	Purpose	Diagram
ACO or similar channel to driveway	Monthly	Remove litter, grass cuttings and other vegetation from the surface of the grills	Prevent grills becoming blocked allowing water to get away	
ACO or similar channel to driveway	Annually	Remove debris, grass cuttings etc from inside the channel itself. This can be easily done by lifting the lid to the corner unit and cleaning out the sump by hand wearing a suitable pair of gloves	Prevent the silt trap filling up and debris entering the tank	 Corner unit Sump unit
Gullies to downspouts	Monthly	Remove litter, grass cuttings and other vegetation from the gulley grate	Prevent grate/cover becoming blocked allowing water to get away	
Gullies to downspouts	Annually	Remove debris, grass cuttings etc from inside the gulley itself. This can be easily done by lifting the cover and cleaning out the gulley by hand wearing a suitable pair of gloves	Prevent the trap filling up and debris entering the tank	
Inspection Chambers	Annually	-Remove silt from base of silt trap manhole	Prevent inspection chamber blocking up and affecting the performance of the system	