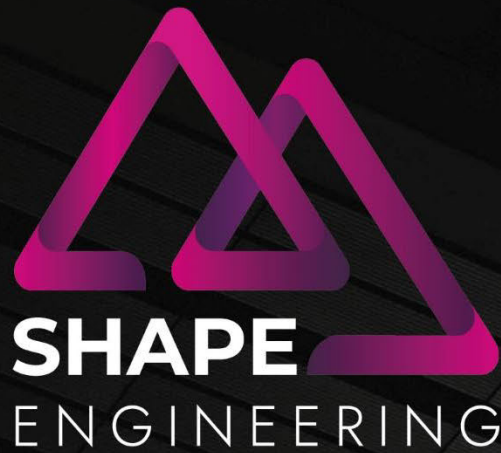




HIGHMOOR FARM, CLITHEROE

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Revision F
17th June 2026

HEAD OFFICE

LIVERPOOL INNOVATION PARK, EDGE LANE, LIVERPOOL L7 9NJ

T 0151 305 0700**E INFO@SHAPEENGINEERING.CO.UK****DOCUMENT HISTORY**

REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
A	16.01.2026	First Issue	Assistant Engineer	Director	Director
B	23.01.2026	Layout Updates	Assistant Engineer	Director	Director
C	03.02.2026	Amended To Suit Clients Comments	Civil Engineer	Director	Director
D	26.02.2026	Amended To Suit Latest Layout	Civil Engineer	Director	Director
E	31.03.2026	Amended To Suit Latest Discharge Rates	Civil Engineer	Director	Director
F	17.06.2026	Revised Runoff Rate	Assistant Engineer	Director	Director

CONTACT LIST

NAME	DESIGNATION	ORGANISATION	TEL NUMBER	EMAIL DESCRIPTION
Paige Blundell	Assistant Engineer	Shape Engineering		
Nick McGorry	Director	Shape Engineering		

SHAPEENGINEERING.CO.UKSHAPE ENGINEERING IS REGISTERED IN ENGLAND AND WALES
COMPANY NO. 10275307. VAT REGISTRATION NO. 268 7266 57

CONTENTS

1.0	INTRODUCTION	3
2.0	SITE DESCRIPTION	4
3.0	POLICY & GUIDANCE	8
4.0	EXISTING SITE CHARACTERISTICS	12
5.0	PHASE 2 GROUND INVESTIGATION	14
6.0	FLOOD RISK SOURCE	16
7.0	SURFACE WATER MANAGEMENT	22
8.0	SUDS ASSESSMENT	28
9.0	SURFACE WATER DRAINAGE STRATEGY	30
10.0	DESIGN PARAMETERS	34
11.0	DEFRA NATIONAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS (SUDS) – FIXED STANDARDS 2-7	38
12.0	FOUL WATER DRAINAGE STRATEGY	43
13.0	SUMMARY & RECOMMENDATIONS	44
14.0	APPENDIX A – SITE LOCATION PLAN	46
15.0	APPENDIX B – DEVELOPMENT MASTERPLAN	47
16.0	APPENDIX C – PREVIOUS LLFA CONSULATION	48
17.0	APPENDIX D – IMPERMEABLE AREAS / CATCHMENT PLAN	49
18.0	APPENDIX E – GREENFIELD RUNOFF RATES	50
19.0	APPENDIX F – PHASE 2 GROUND INVESTIGATION	51
20.0	APPENDIX G – EA FLOOD MAP FOR PLANNING	52
21.0	APPENDIX H – UNITED UTILITIES CORRESPONDENCE	53
22.0	APPENDIX I – PROPOSED DRAINAGE LAYOUT	54
23.0	APPENDIX J – PROPOSED HYDRO-BRAKE® DETAILS	55
24.0	APPENDIX K – SURFACE WATER CALCULATIONS	56
25.0	APPENDIX L – FLOOD EXCEEDANCE PLAN	57
26.0	APPENDIX M – TOPOGRAPHICAL SURVEY	58
27.0	APPENDIX N – UU SEWER RECORDS	59

1.0 INTRODUCTION

- 1.1 Shape Engineering have been commissioned by Morris Homes to provide a Flood Risk Assessment (FRA) and Drainage Strategy in respect of a Planning Application for a residential development providing 124 units at Highmoor Farm, Clitheroe, BB7 1PN.
- 1.2 In accordance with national planning policy, the site-specific Flood Risk Assessment will review all sources of flood risk to both the proposed development and to the adjacent areas as a result of the development proposals
- 1.3 The Flood Risk Assessment and Drainage Strategy will aim to mitigate any potential flood risk as a result of the development.

2.0 SITE DESCRIPTION

Existing Development

2.1 The site is located at Highmoor Farm, Clitheroe. An approximate postcode for the site is BB7 1PN and NGR SD751415. The location of the site is indicated in Appendix A.

Area	5.16 hectares or 50,160m ²
Existing Surfacing	The existing site is predominately greenfield. At the centre of the site is Highmoor Farm and associated buildings, these are located outside of the development boundary. There is an unnamed lane that runs through the centre of the site and appears to provide connectivity to surrounding agricultural fields.
General Topography	A topographical Survey has been completed by The Survey Association in September 2018. Levels at the site generally fall away from the existing buildings at the centre of the site, in a Northern, Eastern and South-Eastern direction. Within the vicinity of the existing buildings, levels are circa 97.7-99m AOD. To the north of the site, levels typically range from 88m-92m AOD and rise to circa 95m AOD at the north-west of the site and 98m AOD at the north-east. At the south-west of the site, levels are approximately 95m-96m AOD. Levels rise again at the south of the development to circa 103m AOD.
Current Use	The site is predominately agricultural land. To the centre of the site there is infrastructure associated with Highmoor Farm.
Previous Use	The Phase 2 ground investigation undertaken by Remada Geo Consultants in July 2025 indicates that the site has formerly been

		unoccupied fields. Buildings associated with Highmoor Farm were assumed to be erected circa 1965. There has previously been a Mill Pond / Reservoir to the south-west of the site which has been infilled / drained and is now Highmoor Car Park.
Watercourses		There are 2no. watercourses which flow adjacent to the northern and southern boundaries of the site flowing to Mearley Brook and Shaw Brook respectively. On the Environment Agency (EA) Flood Map for Planning, Shaw Brook is classified as a Main River.
Boundaries	North	Mearley Brook and greenfield land beyond.
	East	Greenfield land.
	South	Greenfield land and pond.
	West	Highways and residential development.
Access	Vehicular	Highmoor Park (highway) to the west of the site provides access to the unnamed lane which bisects the site.
	Pedestrian	Highmoor Park (highway) to the west of the site also provides pedestrian access to the unnamed lane which bisects the site. There are a series of paths located within the greenspace areas surrounding the development.

2.2 The total site area is 5.16 hectares and comprises of greenfield land. Highmoor Farm and associated buildings are located at the centre of the site but are not classified as being within the development boundary.

2.3 The site can be seen from an aerial photograph in Figure 1 below.



Figure 1 - Site Plan (Source: Google Earth Pro, 2025)

Proposed Development

- 2.4 The development proposals are to provide a residential development providing 124 units comprising of apartment blocks, bungalows, mews, semi-detached and detached dwellings.
- 2.5 As part of the development proposals there is to be associated highway infrastructure, parking and a mixture of hard and soft landscaping throughout the site.
- 2.6 The development masterplan is provided in Appendix B.
- 2.7 Vehicular access is proposed via the existing Highmoor Park (highway) located to the west of the site.
- 2.8 Pedestrian footpaths are located throughout the site.

3.0 POLICY & GUIDANCE

DEFRA 2025 National Standards for Sustainable Drainage Systems

- 3.1 The DEFRA guidance document National Standards for Sustainable Drainage Systems was published 30th June 2025. The national standards provide information for designers, property developers, local authorities and other interested parties, such as sewerage undertakers and the Environment Agency.
- 3.2 The principles for surface water drainage design explain the objectives and approach for applying the standards.
- 3.3 There are 2 types of standards:
 - 3.3.1 The hierarchy standard (standard 1) gives criteria for prioritising the choice of final runoff destination
 - 3.3.2 Fixed standards (standards 2 to 7) state the minimum design criteria that all surface water drainage systems should satisfy and how they should be built, maintained and operated
- 3.4 Both types of standards have accompanying requirements which provide detail on how to interpret, deliver and evaluate each standard.

National Planning Policy Framework

- 3.5 The National Planning Policy Framework (NPPF) was published in England in March 2012 and the latest re-issue on 12th December 2024.
- 3.6 The NPPF is to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.
- 3.7 This document has been prepared in accordance with the recommendations and the policies contained within the NPPF 2024.

Planning Policy Guidance

- 3.8 The Planning Policy Guidance for flood risk and coastal change advises how to take account of and address the risks associated with flooding and coastal change in the planning process.
- 3.9 Proposed developments are required to increase the promotion of Natural Flood Management (NFM) techniques in new developments with specific emphasis on de-culverting and re-naturalisation of watercourses.
- 3.10 More emphasis on SuDS providing the '4 pillars' of SuDS which are: water quantity, water quality, biodiversity and amenity is also required.

Flood and Water Management Act 2010

- 3.11 The Flood and Water Management Act 2010 received Royal Assent on 8th April 2010. This Act provides duties on the Environment Agency, Local Authorities, Developers and other bodies to manage flood risks.

LLFA Technical Requirements

- 3.12 The LLFA for the area is Lancashire County Council. An approach is to be made to the LLFA for pre-development enquiry advice. Once advice is received, this should be incorporated into the flood risk consideration and proposed drainage strategy for the development.
- 3.13 Lancashire County Council have previously been approached for a similar development at the site in 2020 during outline planning stage. At this stage, the LLFA provided the following conditions;

Condition 1 (final surface water drainage scheme):

No development shall commence until final details of the design and implementation of an appropriate surface water drainage scheme have been submitted to and approved in writing by the local planning authority. Those details shall include:

- a) Evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltrations rates;
- b) A final surface water drainage layout plan; appropriately labelled to include all pipe/structure references, dimensions, design levels, finished floor levels and external ground levels (in AOD);
- c) A full set of flow calculations for the surface water drainage network. The calculations must show the full network design criteria, pipeline schedules and simulation outputs for the 1 in 1 year, 1 in 30 year and 1 in 100 year return period, plus an additional 40% allowance for climate change and a 10% allowance for urban creep. The calculations must demonstrate that surface water runoff will not exceed the existing pre-development greenfield runoff rates and volumes for the corresponding rainfall event;
- d) A final site plan showing all on-site surface water catchment areas, i.e. areas that will contribute to the proposed surface water drainage network;
- e) Confirmation of how surface water is to be managed within any non-drained areas of the site, i.e. gardens and public open space;
- f) A final site plan showing all overland flow routes and flood water exceedance routes, both on and off site;
- g) Details of any measures taken to prevent flooding and pollution of the receiving groundwater and/or surface waters, including watercourses; and
- h) Details of an appropriate management and maintenance plan for the surface water drainage network over the lifetime of the development.

The scheme shall be implemented in accordance with the approved details prior to first occupation of any of the approved dwellings, or completion of the development, whichever is the sooner. Thereafter the drainage system shall be retained, managed and maintained in accordance with the approved details.

Reasons:

- 1) To ensure that the proposed development can be adequately drained;
- 2) To ensure that there is no flood risk on or off the site resulting from the proposed development;

- 3) To ensure that water quality is not detrimentally impacted by the development proposal; and
- 4) To ensure that appropriate maintenance mechanisms are put in place for the lifetime of the development.

Condition 3 (construction phase surface water management plan):

No development shall commence until details of how surface water and pollution prevention will be managed during each construction phase have been submitted to and approved in writing by the local planning authority.

Reasons:

- 1) To ensure that the construction phase(s) of development does not pose an undue flood risk on site or elsewhere;
- 2) To ensure that any pollution arising from the development as a result of the construction works does not adversely impact on existing or proposed ecological or geomorphic condition of water bodies.

3.14 The LLFAs full response can be found in Appendix C.

4.0 EXISTING SITE CHARACTERISTICS

- 4.1 To the centre of the site there is Highmoor Farm with associated buildings however, this is not considered to be within the development boundary.
- 4.2 The site is predominately greenspace with the exception of the unnamed lane which bisects the site and provides vehicular and pedestrian access.

Greenfield Runoff Rates – Impermeable Area

- 4.3 The total developable area of the site including the basin area, but excluding permeable POS, is 2.451ha.
- 4.4 An assessment of the existing greenfield runoff rates for the developable area has also been undertaken using Flow. Calculations are summarised in the table below.

Return Period (Yr.)	Existing Runoff Rate (l/s)
1 Year	20.10
30 Year	39.30
100 year	48.10
QBar	23.10

- 4.5 The greenfield runoff rate (QBar) for the 2.451ha developable area of the site has been calculated as 23.10l/s.
- 4.6 The greenfield runoff calculations are provided in Appendix E.

Existing Public Sewers

- 4.7 United Utilities are the sewer provider for the area. UU sewer records are attached in Appendix N.
- 4.8 Given that the site is greenfield, it is likely that there are no sewers within the development boundary. However, there are likely to be sewers serving Highmoor Farm located within the centre of the site.

- 4.9 To the east of the site, in Highmoor Park (highway), Google Earth (2025) shows the presence of manholes indicating that there is a sewer system present within the vicinity of the site.

Watercourses, Land Drainage and other Waterbodies

- 4.10 Mearley Brook is located to the north of the site. The watercourse flows west at this location before ultimately flowing towards the River Ribble south-west of the site.
- 4.11 Shaw Brook is located to the south of the site and flows west in this location. Shawbrook is culverted to the west of the site, outside of the site boundary.
- 4.12 Shaw Brook is classified by the EA as a main river.

5.0 PHASE 2 GROUND INVESTIGATION

- 5.1 A Phase 2 Ground Investigation was carried out by Remada Geo Consultants in 2025. A summary of the investigation can be found in Appendix F.

Historical Land Use

- 5.2 The Phase 2 Ground Investigation indicates that from 1847, when the earliest available mapping is dated, the site was unoccupied fields. The mapping indicates that the lane which runs through the site is present at this time.
- 5.3 In 1886, Highmoor Farm occupied the site.
- 5.4 Previously, there has been a Mill Pond / Reservoir which appears to have been infilled / drained and now comprises Highmoor Car Park.
- 5.5 The ground investigation also suggests that a small area of the site was recorded as being occupied by a refuse tip in 1965 but this is not confirmed.

Geology

- 5.6 As part of the Phase 2 Ground Investigation, window samples, trial pitting, soakaway testing and groundwater monitoring was conducted along with chemical and gas monitoring.
- 5.7 The investigation indicates that made ground was encountered at one location. Topsoil was encountered at all other locations and comprised slightly clayey sand.
- 5.8 Superficial deposits were encountered across the site and comprised gravel and clay. Gravel comprised of mudstone, sandstone and local limestone.
- 5.9 Bedrock was not encountered across the site.

BRE365 Soakaway Testing

- 5.10 3no. soakaway tests were undertaken in accordance with the BRE365 specification.
- 5.11 A reduction in water level from 75% to 50% of the pit volume was not achieved within a 24 hour period during soakaway testing.

5.12 The 3no. tests were therefore not sufficient to provide infiltration.

Groundwater

5.13 10no. of the trial pits were recorded as being damp at 0.6 metres below ground level (m.bgl) or lower.

5.14 Groundwater was encountered at WS1 at 3m.bgl.

5.15 Within all monitoring wells, groundwater levels were recorded at depths of between 0.2m.bgl and 2.6m.bgl.

6.0 FLOOD RISK SOURCE

- 6.1 Shape Engineering has considered all forms of flooding in accordance with National Planning Policy. Information has been obtained from the Government Website relating to flood risk and is summarised below.

Fluvial Flood Risk

- 6.2 Fluvial flooding (River Flooding) is defined as flooding resulting from a river overflowing its banks onto adjacent land. This can be caused by heavy rainfall, blocked channels, high tide levels, urbanisation or a combination of these.
- 6.3 Examination of flood maps from the EA shows that the site for the most part is located within an area classified as Flood Zone 1. The risk of flooding is classified as very low and having a 0.1% (1 in 1000) chance of flooding.
- 6.4 The Ribble Valley Strategic Flood Risk Assessment (2017) states the following regarding the Clitheroe area;

The Low Moor area of Clitheroe is at risk of flooding from the River Ribble, whereas other parts of Clitheroe are at risk of flooding from Mearley Brook.

- 6.5 A small extent of the site, to the west, is classified as being located within Flood Zones 2 and 3. Flood Zone 2 is classified as having between a 0.1% (1 in 1000) and 1% (1 in 100) chance of flooding. Flood Zone 3 is classified as having a 1% (1 in 100) or greater chance of flooding.
- 6.6 No new development is proposed within Flood Zones 2 or 3.
- 6.7 See the flood risk for the site in Figure 3 below and Appendix G.

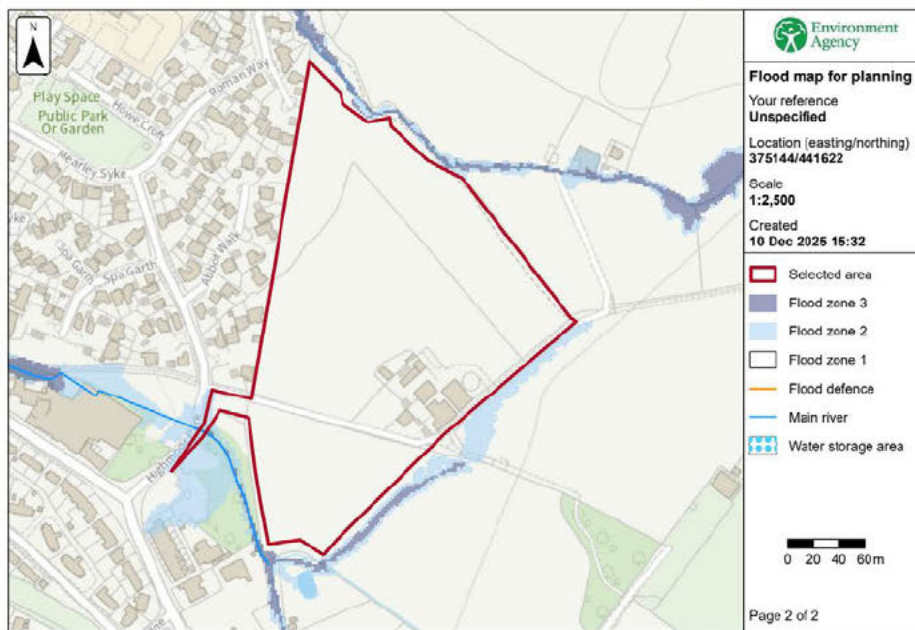


Figure 3 - Environment Agency's Flood Map for Planning (Source: EA Product 4 2025)

Pluvial Flood Risk

- 6.8 Pluvial flooding is defined as flooding resulting from rainfall-generated overland flow before runoff enters any watercourse or sewer.
- 6.9 The site is at risk of surface water flooding. The site is at risk of flooding from surface water during all events above and including the 3.3% AEP (1 in 30) event.
- 6.10 Figure 4 below shows the surface water flood risk during the 1 in 30 year (3.3%) AEP event.

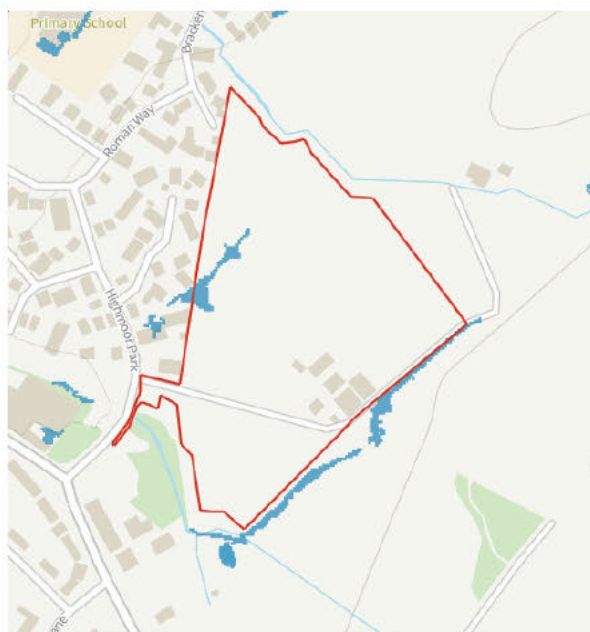


Figure 4 - Environment Agency's flooding from surface water 1 in 30 AEP
(Source: EA online maps 2025)

6.11 Figure 5 below shows the surface water flood risk during the 1 in 100 year (1%) AEP event.

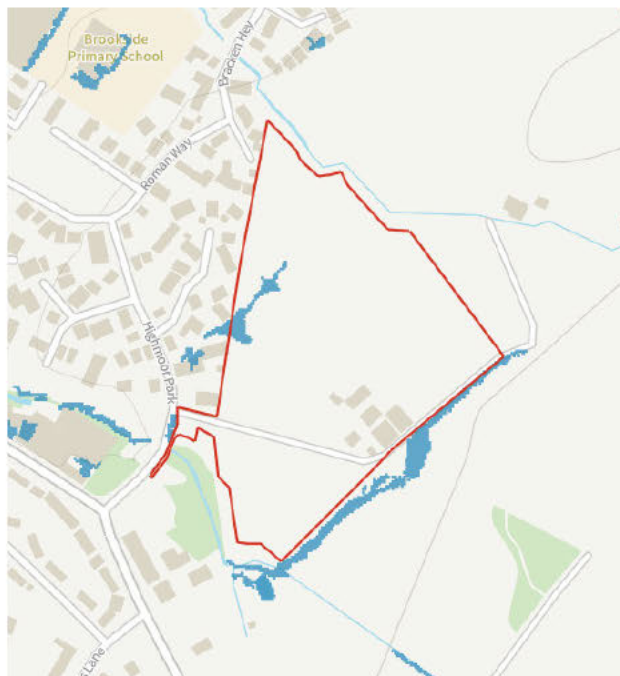


Figure 5 - Environment Agency's flooding from surface water 1 in 100 AEP
(Source: EA online maps 2025)

- 6.12 Areas at risk of surface water flooding at the site during the 1 in 1000 year (0.1% AEP) event are shown in Figure 6.

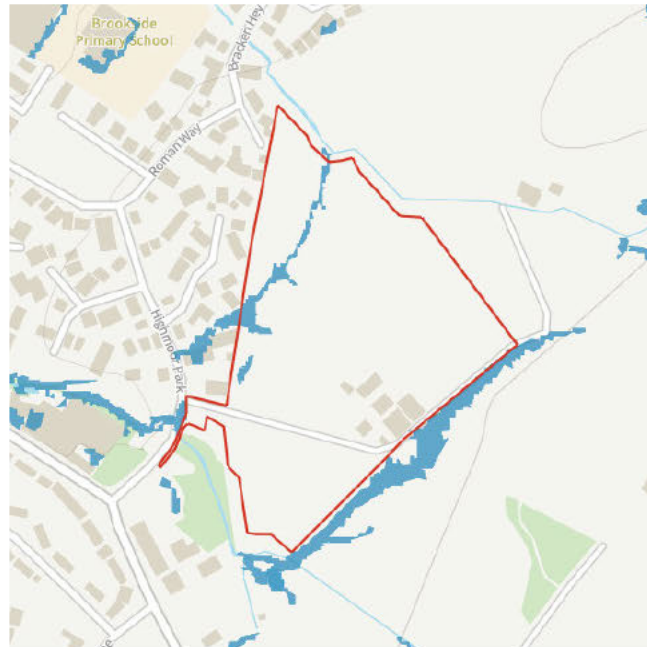


Figure 6 - Environment Agency's flooding from surface water 1 in 1000 AEP

- 6.13 Surface water flooding is mostly shown at the northern extent of the site.
- 6.14 Surface water flooding is also shown to be located at the south-eastern extent of the site, outside of the development boundary. Surface water in this area is shown to encroach on the existing unnamed lane and not beyond towards the site.
- 6.15 The areas highlighted at being at risk of surface water flooding to the north are to be a mixture of dwellings and highways. FFLs of dwellings in this region are circa 96.8m – 95.6m AOD. Levels fall either north towards the basin or west towards ditches adjacent to private highways.
- 6.16 Therefore, any surface water in this area would be directed away from dwellings towards ditches or ponds as part of the development proposals.

Environment Agency Reservoir or Canal Failure Flood Map

- 6.17 The Environment Agency website shows that the development site is not at risk of flooding from reservoirs or canal failures.

Groundwater Flood Risk

- 6.18 The Environment Agency define ground as: 'water that is usually held in rocks and soil underground. Groundwater flooding happens when this water rises and flows above the surface.'
- 6.19 Groundwater flooding can occur from, raised water tables, seepage and percolation, and groundwater recovery or rebound.
- 6.20 The Ribble Valley Strategic Flood Risk Assessment (2017) states that;
- Following consultation with the EA, no evidence of groundwater flooding in the area has been identified.*
- 6.21 During the intrusive site investigations, completed as part of the Phase 2 Ground Investigation, groundwater was encountered across the site and damp ground was also indicated at numerous excavation locations.
- 6.22 The Phase 2 Ground Investigations indicates that the site is not located within a groundwater source protection zone.
- 6.23 MagicMaps online indicates that the site is located within a medium-low groundwater vulnerability area.
- 6.24 When natural groundwater levels are close to the surface, an increased risk of flooding can occur during intense rainfall.

Sewer Flood Risk

- 6.25 The Ribble Valley Strategic Flood Risk Assessment (2017) states the following regarding the Clitheroe area;
- This area does not have a significant sewer flooding (DG5) problem, although actual theoretical risk of such flooding is unclear.*

Summary of Flood Risk

Source	Definition	Likelihood
Fluvial	River Flood	Low
Pluvial	Surface Water Flooding	Low to Medium
Coastal - Sea	Tidal Surge	Not Applicable
Coastal - Estuarine	Tidal Surge	Not Applicable
SWS, FWS, CS, CSO	Sewer Flooding	Low
Groundwater	Emergence from ground	Medium

7.0 SURFACE WATER MANAGEMENT

Standard 1: Runoff Destinations

- 7.1 As set out in the DEFRA guidance document National Standards for Sustainable Drainage Systems, Standard 1: Runoff Destinations;
- 7.2 A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.
- 7.3 Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:
- 7.3.1 Priority 1: collected for non-potable use
 - 7.3.2 Priority 2: infiltrated to ground
 - 7.3.3 Priority 3: discharged to an above ground surface water body
 - 7.3.4 Priority 4: discharged to a surface water sewer, or another piped surface water drainage system
 - 7.3.5 Priority 5: discharged to a combined sewer

Priority 1: Collected for Non-potable Use

- 7.4 Rainwater harvesting shall be considered in all circumstances where any of the following apply:
- 7.4.1 There is a demand for non-potable water and available contributing catchment area that will deliver safe and efficient water savings.
 - 7.4.2 There is a need for landscape irrigation.
 - 7.4.3 The development is in an area identified as seriously water stressed.

- 7.5 There is no demand for non-potable water identified through pre-development applications with planners, the lead local flood authority or through the developers own viability assessments for the site.
- 7.6 There is very limited landscaping on the site, with the vast majority comprising of private gardens and remaining public open space areas with low-maintenance landscaping.
- 7.7 As noted in the Environment Agency Report: Water Stressed Areas - 2021 classification published 1st July 2021. The site is not located in an area determined to be not seriously stressed for metering.
- 7.8 Therefore, rainwater harvesting does not need to be considered under this standard. However, the developer has proposed to utilise Water Butts to selected properties throughout the development, to provide an element of non-potable use.

Priority 2: Infiltration to Ground

- 7.9 The DEFRA standard states:

7.9.1 The use of infiltration drainage shall be dependent on the ground conditions being suitable and adequate infiltration rates being identified using the assessment methods detailed in standard 3.

7.9.2 The approving body may consider appropriate industry mapping to form an initial evidence base on the appropriateness of infiltration and whether further ground investigations are necessary.

- 7.10 The Phase 2 Ground Investigation carried out by Remada Geo Consultants involved 3no. soakaway tests being undertaken in accordance with the BRE365 specification.
- 7.11 A reduction in water level from 75% to 50% of the pit volume was not achieved within a 24 hour period during soakaway testing.
- 7.12 The 3no. tests were therefore not sufficient to provide infiltration and infiltration is therefore not considered a feasible method for the disposal of surface water runoff from the site.

- 7.13 However, as part of the proposed drainage strategy, ditches are proposed adjacent to private highways at the north-western extent of the site to collect water from adjacent impermeable areas and direct flows towards the basin to the north. The ditches will support infiltration where possible, to mitigate surface-level ponding to permeable areas.
- 7.14 To remaining private highway areas, a permeable surfacing is proposed to collect surface water before ultimately providing connectivity to the proposed surface water system.

Priority 3: Discharge to an above ground surface water body

- 7.15 There are 2no. watercourses which flow adjacent to the northern and southern boundaries of the site. These watercourses flow to Mearley Brook and Shaw Brook respectively.
- 7.16 On the Environment Agency (EA) Flood Map for Planning, Shaw Brook is classified as a Main River.
- 7.17 The topographical survey indicates that levels at the site generally fall away from the existing buildings at the centre of the site in Northern, Eastern and South-Eastern direction.
- 7.18 Therefore, discharge of surface water by watercourse to the north is considered feasible for the development site.
- 7.19 The LLFA are to be consulted with regards to discharging into the existing watercourses at the site.

Priority 4: Discharge to a surface water sewer or another piped surface water drainage system

- 7.20 United Utilities Asset maps have not been obtained.
- 7.21 Given that the site is predominantly greenfield, it is considered unlikely that there is a surface water network within the development site.

- 7.22 United Utilities were consulted with similar development proposals for a development at the site in 2020. In their response, United Utilities stated;

Condition 1 – Surface water

The drainage for the development hereby approved, shall be carried out in accordance with principles set out in the submitted Flood Risk Assessment (Ref No.: 18522, Dated: Jan 2021) which was prepared by Topping Engineers. No surface water will be permitted to drain directly or indirectly into the public sewer. Any variation to the discharge of foul shall be agreed in writing by the Local Planning Authority prior to the commencement of the development. The development shall be completed in accordance with the approved details.

- 7.23 United Utilities full response can be found in Appendix H.
- 7.24 Therefore, it is considered unlikely that connectivity to a surface water sewer system will be feasible at the site for the main surface water network
- 7.25 A small length of highway drainage at the site entrance is proposed to discharge into existing surface water system in Highmoor park road, at a restricted rate

Priority 5: Discharge to a combined sewer

- 7.26 United Utilities Asset maps have not been obtained.
- 7.27 As discussed in priority 4 above, UU have previously been consulted with similar development proposals in 2020.
- 7.28 In their response, United Utilities also stated;

Condition 2 – Foul water

*Foul and surface water shall be drained on separate systems.
Reason: To secure proper drainage and to manage the risk of flooding and pollution.*

- 7.29 It is therefore unlikely that connectivity into a combined system, even if present within the vicinity of the site, would be accepted by United Utilities.

Climate Change

- 7.30 The updated EA allowances have now been directly linked to River Basin Catchments. The climate change allowance has been reviewed using the Environment Agency's website to locate the River Basin Catchment for the site's location.
- 7.31 The site is in the Ribble Management Catchment. The below Figure 7, an extract from the Environment Agency's website, indicates the climate change considerations for this catchment.

Ribble Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	35%	50%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

Figure 7 - Environment Agency's climate change considerations (Source: EA website 2025)

- 7.32 As recommended by the EA, both the central and upper end allowances have been considered for the purpose of surface water drainage strategy and assessment of exceedance flow pathways.

7.33 Therefore, the climate change allowance for the site has been identified at 40%.

8.0 SUDS ASSESSMENT

8.1 A SUDS assessment for the proposed development site has been completed. SUDS techniques for the development site have been considered in the table below:

SuDS Technique	Suitable for This Development?	Reasoning
Green Roof	✗	Impractical due to the residential nature of development.
Rainwater Harvesting	✓	Water butts will be used at some of the dwellings.
Basins or Ponds	✓	Suitable as a form of attenuation storage without infiltration.
Filter Strips	✗ & ✓	The Phase 2 ground investigation indicates that infiltration is not a feasible method for the disposal of surface water runoff from the site. However, filter strips could be utilised in soft landscaped areas to aid filtration of permeable areas, mitigating overland flows during exceedance events.
Swales/Ditches	✓	Small conveyance ditches may be suitable adjacent to private driveways to the north of the development to collect and convey surface water run off.
Soakaways	✗	The Phase 2 ground investigation indicates that infiltration is not a feasible method for the disposal of surface water runoff from the site.
Rain Gardens	✗ & ✓	The Phase 2 ground investigation indicates that infiltration is not a feasible method for the disposal of surface water runoff from the site. However, rain gardens could be utilised in soft landscaped areas to aid infiltration of permeable areas, mitigating overland flows during exceedance events
Permeable Surfaces	✗ & ✓	The Phase 2 ground investigation indicates that infiltration is not a feasible method for the disposal of surface water runoff from the site. However, lined permeable surfaces with positive discharges to the sewer could be utilised in private areas, to improve water

		quality and accommodate for interception while providing a form of source control.
Tank / Oversized Pipe Systems	✓	Suitable.

- 8.2 The SUDS assessment suggests that several options are available for SUDS techniques on the site.
- 8.3 The topography of the site is likely to limit the ability of above ground SUDS features. The features used are therefore restricted to methods not involving infiltrating to the ground and above ground methods providing wider benefits such as ditches, water butts and permeable surfacing.

9.0 SURFACE WATER DRAINAGE STRATEGY

- 9.1 A proposed Drainage Strategy drawing has been provided in Appendix I. The drainage strategy is subject to detailed design and coordination with other design elements of the proposed development.
- 9.2 The main drainage network is to be adopted under a S104 agreement and will comprise 3no. online and offline storage tanks, oversized pipes, ditches, permeable surfacing and a basin.
- 9.3 A smaller highway drainage network at the site entrance will remain private and is subject to approval from the Local Highway Authority.
- 9.4 The proposed developable impermeable area for the site is estimated to be 2.451 ha (subject to detailed design) which consists of houses, private access, footpaths and highways. All these areas will generate surface runoff.
- 9.5 The discharge rate is based on the existing 40% AEP greenfield runoff (QBar) rate for the developable area of the full site as noted in Section 4. The QBar rate for this area has been calculated as 23.1l/s (Appendix E).
- 9.6 A rate of 23.1l/s is proposed for the flow control downstream of the detention basin and will provide betterment on the existing rate.
- 9.7 A rate of 2.5l/s is proposed for the flow control unit on the highway drainage network
- 9.8 Therefore, discharge rates for the developed site will mimic betterment the existing, undeveloped conditions.
- 9.9 Additional flow controls are to be used throughout the site, downstream of oversized pipes and the attenuation tanks within the surface water system network.
- 9.10 Flow control details can be found in Appendix J.
- 9.11 Due to the nature of the proposed development, urban creep is to be considered to allow for future urban expansion within the development. An increase in paved surface area of 10% has been incorporated into the detailed surface water calculations.

- 9.12 As noted above in the hierarchy review, discharge of surface water runoff to the existing watercourse to the north of the site is the preferred method for the purpose of this report.
- 9.13 Due to the natural topography of the site, it will be possible to discharge into the watercourse via gravity.
- 9.14 The surface water drainage strategy for the development will be to collect and convey the surface water runoff and mitigate flood risk to the site, surrounding areas and downstream, by restricting the discharge rate into the culverted watercourse/existing surface water network and provide suitable attenuation within the development boundary.
- 9.15 Ditches are to be utilised adjacent to private highways to capture surface water runoff from impermeable areas during exceedance events, mitigating the risk of overland flooding. Ditches will be utilised to convey surface water runoff from these areas towards the basin at the north.
- 9.16 Water butts are proposed at some dwellings throughout the site to collect rainfall and minimise flows entering the surface water system.
- 9.17 A permeable surfacing is proposed in shared drive areas to intercept rainfall. The permeable tarmac will also provide a form of source control prior to water entering the surface water network and being directed towards the basin.
- 9.18 Land drains are utilised to capture surface water runoff from permeable soft landscaped areas including rear gardens during exceedance events, mitigating the risk of overland flooding and surface level ponding. The land drains will also support interception of rainfall during low intensity rainfall events.
- 9.19 The land drains have been routed through the development site in a direction to maintain, as close as reasonably practicable, a route for surface water runoff to mimic the existing condition and prevent exceedance flows, that are not captured for interception or infiltration, eventually discharging to the watercourse to the eastern boundary.

- 9.20 4no. Rain gardens have been proposed to land drains to further support with interception and limited infiltration prior to surface water continuing overland towards the watercourse as per the existing undeveloped site condition.
- 9.21 Surface water flows at the site are to be restricted, therefore attenuation will be required for the site. The attenuation volume for the development site has been calculated based on an impermeable area of 2.451ha and will cater for up to the 1 in 100-year storm + 40% climate change.
- 9.22 Surface water pipes are to be used across the site to convey the surface water and where oversized will provide attenuation for all storm events up to and including the 1 in 30 year plus 40% climate change event.
- 9.23 Flows from the site, up to and including, 1 in 100 years plus 40% climate change event will be attenuated within 3no. offline and online tanks. The location of the tanks can be seen in Appendix I.
- 9.24 The detention basin located to the north of the site has been sized to accommodate storms up to and including the 1 in 100 year plus 40% climate change event and provides approximately 636m³ of storage.
- 9.25 The basin will discharge into the watercourse at the northern extent of the site.
- 9.26 The small length of highway drainage at the site entrance will be attenuated within the surface water pipe up to and including the 1 in 100 year plus 40% climate change event.
- 9.27 The calculations provided in Appendix K prove that the proposed drainage apparatus can sufficiently control and attenuate surface water runoff to meet this criteria.
- 9.28 A storage estimate for the development site has concluded that a total storage of between 1,477m³ and 2,413m³ of storage will be required for the 30-year plus 40% climate change storm event, as Figure 8 below.

Storage Estimate	
Return Period (years)	30
Climate Change (%)	40
Impermeable Area (ha)	2.451
Peak Discharge (l/s)	23.100
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m ³)	Calc
from	1477
to	2413

Figure 8 - Quick Storage Estimate for 30yr+40% Storm event (Flow

- 9.29 A storage estimate for the development site has concluded that between 2,080m³ and 3,115m³ of total storage will be required for the 100-years plus 40% climate change storm event, as Figure 9 below.

Storage Estimate	
Return Period (years)	100
Climate Change (%)	40
Impermeable Area (ha)	2.451
Peak Discharge (l/s)	23.100
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m ³)	Calc
from	2080
to	3115

Figure 9 - Quick Storage Estimate for 100yr+40% Storm event (Flow 2025)

- 9.30 Attenuation will be provided in the form of oversized pipes, a basin and online and offline cellular storage tanks.
- 9.31 The storage tanks at the site will also ultimately discharge into the watercourse at the northern extent of the development site.

10.0 DESIGN PARAMETERS

Urban Creep

- 10.1 A 10% urban creep allowance has been included added as 'additional area' in simulation calculations for the 30 year and 100 year storm events plus climate change.
- 10.2 The impermeable area for the site is estimated to be 2.451ha. When accounting for 10% urban creep, the impermeable area of the site is 2.696ha.
- 10.3 The surface water calculations are provided in Appendix K.

Impermeable Areas

- 10.4 A surface water catchment plan has been provided in Appendix D.
- 10.5 The surface water catchment plan has been utilised to inform the contributing areas within the surface water calculations.
- 10.6 The drainage system has been designed based on the impermeable areas of the site only.

'Non-drained' Areas

- 10.7 As shown on the surface water catchment plan, Appendix D, there are areas which have not been considered to contribute towards the impermeable area within the surface water drainage calculations.
- 10.8 These areas may include; roadside verges, private gardens and areas of public open space.
- 10.9 These areas are not shown on the catchment plan as they are either permeable, drain onto a permeable surface or the water shedding from these areas is considered to be negligible and therefore will not significantly contribute to the surface water drainage system.
- 10.10 However, a volumetric runoff coefficient value of 1.0 has been applied to the design to make an allowance for runoff from these areas.

- 10.11 Ditches have been provided at the western extent of the site adjacent to private highways to capture surface water runoff from adjacent impermeable areas during exceedance events to improve infiltration locally while mitigating overland flooding.
- 10.12 The greenfield discharge rate for the development has not considered the non-drained areas within the calculation. Therefore, allowing non-drained areas to infiltrate or providing ditches to direct these flows towards the existing northern basin, the post-developed site will mimic the existing condition surface water discharge.

Surrounding Flow Routes

- 10.13 Surface water flows from outside of the development boundary should be considered where applicable, when applying contributing area to the proposed SUDs at the site.
- 10.14 The EA surface water flood mapping shows that there are areas at risk of surface water flooding at the northern extent of the site.
- 10.15 As part of the adjacent development proposals, the site will fall towards this area and beyond to the basin located in the north. Therefore any surface water in this area will also be directed towards the basin.
- 10.16 Drainage channels / gullies have been proposed to the new highways / shared parking areas adjacent to the highways to prevent surface water runoff from the site entering the existing highway.

Mitigation of Surface Water Runoff

- 10.17 There is the potential for increased surface water runoff to be generated from the development boundary.
- 10.18 Surface water flood exceedance routes have therefore been considered, and a flood exceedance plan has been provided in Appendix L.
- 10.19 Water butts are proposed at selected dwellings to improve local infiltration of permeable areas and mitigate overland flooding during exceedance events.

10.20 All finished floor levels at the development site are to be set 150mm above external levels to minimise the likelihood of surface water flows entering properties.

Surcharged Outfall

10.21 Within the surface water calculations, a surcharged outfall has been applied.

10.22 The surcharged outfall has been provided at 1.0m above the soffit level of the receiving watercourse in the drainage calculations.

10.23 This surcharge has been applied at all times to all storm intensities and durations that have been simulated.

Natural Flow Routes

10.24 In line with the National Planning Policy Framework and Planning Practice Guidance, developments should be designed so that natural flow routes are not disrupted and that any surface water that enters the site from off-site sources is conveyed safely around or through the site.

10.25 The existing natural flows have been considered within the development proposals.

10.26 All surface water runoff from site is to be directed towards the existing watercourse to the north as per the existing arrangement.

10.27 This will direct surface water runoff away from proposed dwellings at the site and/or existing properties offsite.

Modelling Parameters

10.28 Within the surface water runoff calculations, the following modelling parameters have been used for a conservative approach to the drainage network of the site.

10.29 The FSR rainfall runoff method has been used for surface water calculations.

10.30 As stated in Ciria 753 (2015) Page 509 Design Rainfall: Although FEH can be used for durations as short as 30 minutes, flood estimation guidance from the EA (2015) currently recommends that, for shorter durations, FSR rainfall statistics should be used to scale down the corresponding FEH 1-hour rainfall.

- 10.31 The FSR data utilises sub-hourly rainfall information to accurately analyse shorter storm events. The simulation calculations indicate that the 15 minute storm duration is critical, supporting the rational that FSR method is practical to this site.
- 10.32 Run-off coefficient value (C_v) has been updated to 1.0 as per LLFA requirements.
- 10.33 Maximum Rainfall has been set to 150mm/hr. However, this value is only used within the software for preliminary pipe sizing and not in simulation.
- 10.34 Madd Factor has been set to 0 on all calculations. Note that this is referenced as "Additional Storage (m^3/ha) within the software used (Causeway Flow).
- 10.35 A 1.0m surcharged outfall has been applied to all storm event simulations.
- 10.36 A 40% climate change allowance has been applied to the 30-year storm event simulation.
- 10.37 A 40% climate change allowance has been applied to the 100-year storm event simulation.
- 10.38 10% Urban Creep allowance has been applied to all storm event simulations.

11.0 DEFRA NATIONAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS (SUDS) – FIXED STANDARDS 2-7

Standard 2: Management of Everyday Rainfall (Interception)

2.1 Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems.

2.2 Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6).

Figure 10 – Standard 2 wording

Rainwater Harvesting

- 11.1 This standard is applied where there is consistent daily demand for non-potable water. Which, as discussed in Chapter 7, is not a requirement for this development.
- 11.2 However, water butts are proposed at selected dwellings across the site to provide an element of non-potable use.
- 11.3 Therefore, it is considered that the rainwater harvesting proposals exceed the requirement for the site.

Permeable Surfaces

- 11.4 The guidance states: *All permeable surfaces, whether lined or not, shall be assumed to comply, provided there is no additional area drained to the permeable pavement.*
- 11.5 Therefore, all landscaped areas, including rear gardens comply with this standard.
- 11.6 Due to the nature of the development containing adoptable highways, compliance with local highway authority standards is required, which do not allow for permeable finishes. Therefore, it is not possible to provide interception, at source, to these areas.

- 11.7 Permeable surfacing is proposed to shared drive areas to collect surface water runoff before ultimately contributing to the surface water network.
- 11.8 Ditches are proposed adjacent to private access roads to collect runoff and convey flows to the basin, while supporting interception and infiltration where possible.
- 11.9 The area of ditches is approximately 120m² in total. In accordance with the standards, this will provide suitable interception for 600m² impermeable areas (5 x Area).

Detention Basin

- 11.10 A detention basin with a surface area of 336m² will serve the entire surface water network.
- 11.11 In accordance with the standards, this will provide suitable interception for 1,680m² impermeable areas (5 x Area), which is greater than the entire site impermeable catchment area.
- 11.12 Therefore, this standard has been fully considered and interception in excess of the requirements has been provided.

Standard 3: Management of Extreme Rainfall and Flooding

3.1 A 'SuDS approach' shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep to:

- protect people and property on the development from flooding of the surface water drainage system
- mitigate any increased flood risk to people and property adjacent to or downstream of the development
- protect the receiving water body from morphological damage or minimise the impact on sewer capacity

3.2 When discharging to an infiltration feature, the system shall be appropriately sized to accommodate the design event based on ground conditions and contributing areas.

3.3 When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff (rate and volume) for the 1% annual exceedance probability (AEP) event shall be controlled to ensure the runoff from the development does not increase flood risk elsewhere.

3.4 When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff rate for the 50% AEP event shall be controlled to ensure development runoff from an event of this magnitude has no negative impact.

3.5 Any flooding from the surface water drainage system for events up to the 1% AEP event shall be managed within the development.

3.6 Any flooding from off-site sources for the 1% AEP event should be managed on site or safely routed through the site, ensuring any downstream risks are not increased compared to the pre-development scenario.

3.7 The risks (both on and off the development) associated with flooding from the surface water drainage system for exceedance events greater than the 1% AEP event shall be appropriately managed.

Figure 11 – Standard 3 wording

- 11.13 As noted in Chapter 4 and reference to Appendix E, the greenfield run off calculations have been based on the developable area to advise a discharge rate for the 40% AEP (Qbar) required for item 3.4 in Figure 11 above.
- 11.14 As set out in the Design Parameters in Chapter 10 and the hydraulic calculations provided in Appendix I, the design strategy and details comply with items 3.1, 3.3, 3.4, 3.5 & 3.6 in Figure 11 above.
- 11.15 The Flood Exceedance Plan provided in Appendix L complies with item 3.7 in figure 11 above.
- 11.16 Therefore, the drainage strategy fully complies with standard 3 of the DEFRA National standards for sustainable drainage systems (SuDS).

Standard 4: Water Quality

4.1 Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development.

4.2 The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance^[footnote 21] or other quantitative assessment as agreed with the approving body and permitting requirements^[footnote 22].

Figure 12 – Standard 4 wording

- 11.17 The Simple Index Approach as described in Ciria C753 The SUDS Manual, has been applied to demonstrate the pollutant risk assessment.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change eg schools, offices ie - traffic movements/day	Low	0.5	0.4	0.4

	Mitigation Indices		
Types of SuDS component	TSS	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6

11.18 The use of permeable paving to the private highways provides mitigation in excess of the expected generation from the development.

11.19 Residential roofs have a very low pollution hazard level and it is therefore not considered necessary to provide additional pollution control to these areas.

11.20 Standard 4 has therefore been considered and implement where reasonably practicable and necessary.

12.0 FOUL WATER DRAINAGE STRATEGY

Foul Water Capacity and Point of Connection

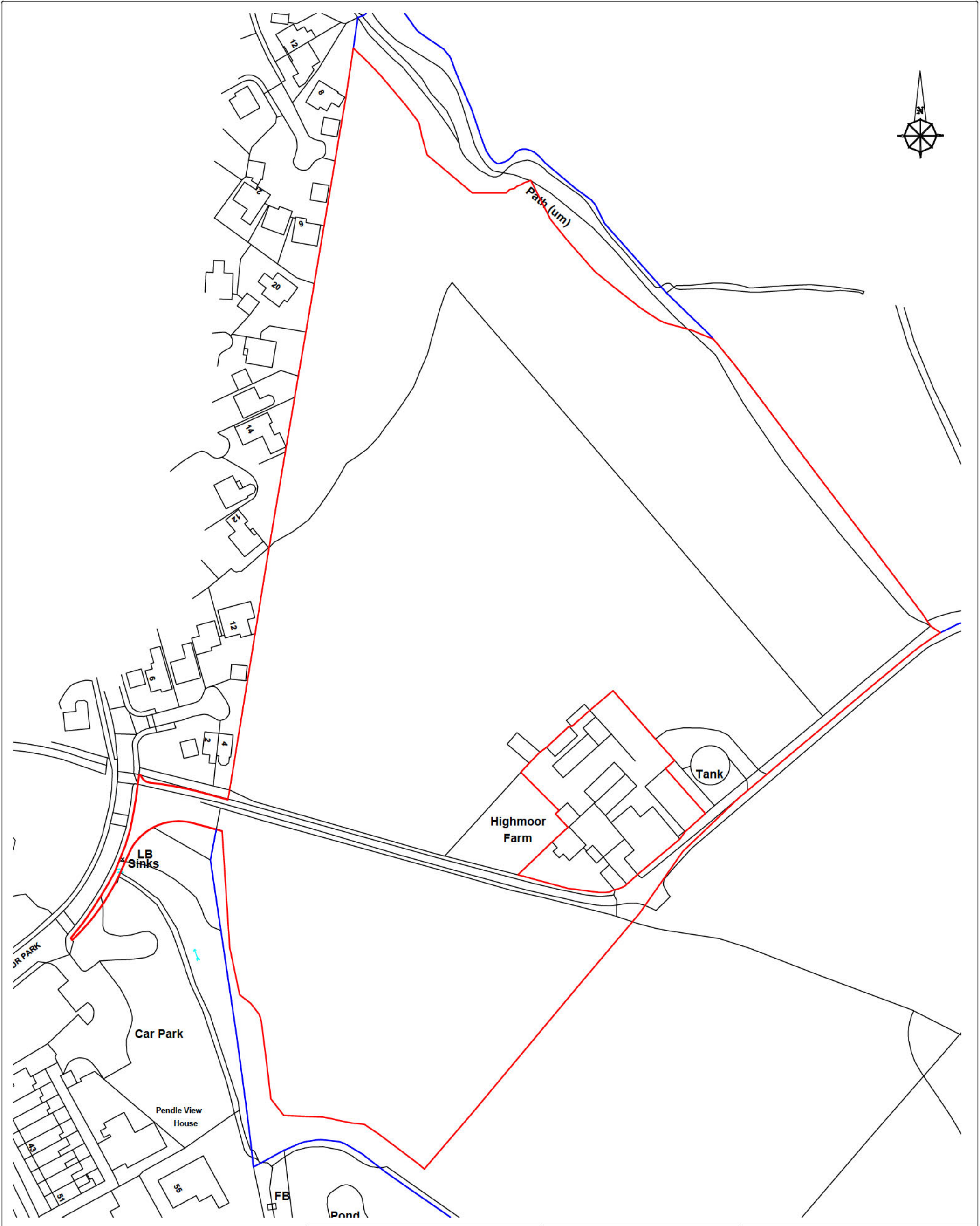
- 12.1 The proposed foul network is outlined within the proposed drainage strategy in Appendix I.
- 12.2 Foul water from dwellings will be collected via a traditional piped network.
- 12.3 The foul water drainage from the dwellings is proposed to connect via a traditional piped network into an existing sewer at the west of the site, outside of the development boundary in Highmoor Park (highway).
- 12.4 The exact outfall locations are to be confirmed during detailed design once drainage surveys can confirm the existing sewer locations outfalls to the public sewer are agreed with the sewerage undertaker.
- 12.5 The proposed foul flows have been calculated using 4000 litres per dwelling per day as per the DCG, and therefore the proposed foul peak flow is 5.74l/s.

13.0 SUMMARY & RECOMMENDATIONS

- 13.1 Shape Engineering have been commissioned by Morris Homes to provide a Flood Risk Assessment and Drainage Strategy in respect of a planning application for a residential development comprising of 124 units including associated landscaping, access road, highways and private parking at Highmoor Farm, Clitheroe, BB7 1PN.
- 13.2 The existing site is currently a greenfield site with a total area of 5.16ha.
- 13.3 The site is mostly located in an area with less than 0.1% risk of fluvial flooding (Flood Zone 1). Small areas of the site are considered to be located within Flood Zones 2 and 3.
- 13.4 The private drainage network will be designed for up to 1 in 100 year plus an allowance of 40% climate change storm events and consideration will be given to the use of sustainable urban drainage (SuDS) techniques.
- 13.5 A Phase 2 ground investigation has been carried out for the site. 3no. soakaway tests were undertaken in accordance with the BRE365 specification. The 3no. tests were therefore not sufficient to provide infiltration. Groundwater was encountered at one of the trial pits during infiltration testing.
- 13.6 There is a watercourse located at the northern boundary of the site. It is therefore proposed to discharge the majority of surface water runoff from the site to the existing watercourse.
- 13.7 A small section of highway drainage at the site entrance is proposed to discharge into existing surface water network in Highmoor Park Road and will need to be accepted and confirmed by Local Highway Authority
- 13.8 The proposed surface water discharge rate for the development is to be restricted to the 40% AEP greenfield runoff rate (QBar) calculated for the developable area of the site.
- 13.9 The total discharge rate for surface water at the site has therefore been calculated at 23.1l/s and will need to be accepted and confirmed by the LLFA. The discharge from the site will be controlled by flow control units.

- 13.10 This total discharge rate is split between the two proposed networks. 23.1l/s is proposed to discharge to existing watercourse to the north of the site via the main surface water network. 2.5l/s is proposed to discharge via highway drainage network at the site entrance into existing surface water network in Highmoor Park Road.
- 13.11 Attenuation will be primarily provided in the form of a detention basin and online and offline attenuation tanks. Additional storage will be provided in the form of oversized pipes located beneath private highways.
- 13.12 A detention basin is to be located at the northern extent of the site and will provide storage prior to flows entering the watercourse to the north of the site.
- 13.13 The basin will provide approximately 636m³ of storage for storms in excess of the 100-year plus 40% climate change flood event.
- 13.14 Ditches are proposed to the west of the site to collect surface water from impermeable areas and convey flows towards the basin at the north.
- 13.15 Water butts are proposed at selected dwellings across the site to provide an element of non-potable use.
- 13.16 SuDs features are to be used on site with being implemented in the strategy to improve interception throughout site. These include permeable surface, ditches, land drains and rain gardens.
- 13.17 The foul water drainage from the dwellings is proposed to connect via a traditional piped network into an existing sewer at the west of the site, outside of the development boundary in Highmoor Park (highway).
- 13.18 Surface water and foul water proposals are subject to approval and agreement with the EA, LLFA, Local Highway Authority and Sewerage Undertaker (United Utilities).
- 13.19 The flood risk and drainage strategy proposals will not increase flood risk to the site and surrounding areas.

14.0 APPENDIX A – SITE LOCATION PLAN



Gary Hoerty Associates Chartered Surveyors
Suite 9 - Grindleton Business Centre
The Spinney
Grindleton
Clitheroe
Lancashire BB7 4DH

T: 01200 449700
Email: info@ghaonline.co.uk

Drawing No: VHLP/778/2576/02

Project: (No: VHLP.778.2576)

Proposed Development of Land at

Highmoor Farm
Clitheroe

Title: Site Plan

Notes:
All work is to be carried out to the latest current British standard Codes of Practice and recognised working practices. All work and materials should comply with Health and Safety legislation. All dimensions are in millimetres except where explicitly shown otherwise. The contractor should check and certify all dimensions as work proceeds and notify the architect of any discrepancies. Do not scale off the drawings, if in doubt ask.

Client: VH Land Partnerships Ltd +
The Clitheroe Royal Grammar School Foundation

Drawn: PF

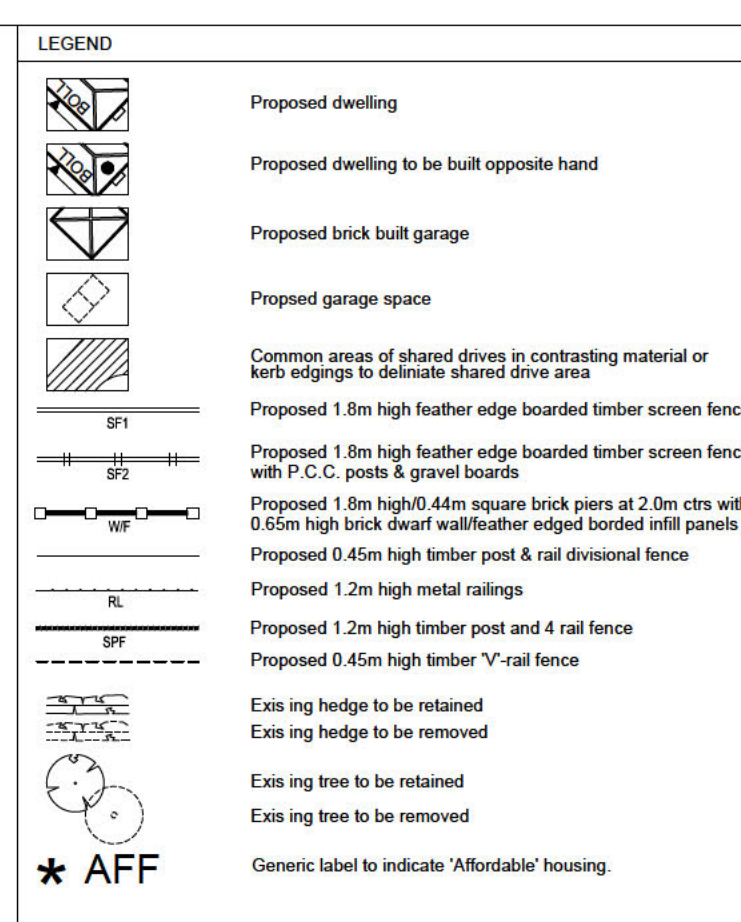
Date: 23.07.2020

Scale: 1:1250 @ A3

Amendments:

--	--	--	--	--	--

15.0 APPENDIX B – DEVELOPMENT MASTERPLAN



NAME	DESCRIPTION	SIZE (sqft)	Units	TOTAL (sqft)	Percentage
WALTON	1 BED APARTMENT	635	4	2540	
GRANTHAM	1 BED APARTMENT	550	2	1100	
ALDEBURY	1 BED APARTMENT	653	2	1306	
PATERDALE	2 BED MEWS/SEMI	825	1	825	
ESKDALE	2 BED MEWS/SEMI	843	1	843	
DARWIN	2 BED BUNGALOW	688	7	4816	
DETFORD	3 BED BUNGALOW	1174	1	1174	
BUXTON	3 BED MEWS/SEMI	863	9	8667	
BRANLEY	3 BED MEWS/SEMI	986	2	1972	
CALDBECK	4 BED MEWS/SEMI	1062	8	8496	30%
OSLEY	3 BED SEMI	934	9	8406	
DALTON	3 BED DETACHED	938	4	3752	
CAPESTHORPE	3 BED SEMI	947	4	3788	14%
COTSWOLD	3 BED DETACHED	947	2	1894	
DAVENHAM	3 BED DETACHED	857	5	4285	
DALTON	3 BED DETACHED	938	3	2814	8%
ADLINGTON	4 BED DETACHED	1119	9	10071	
DILLINGTON	4 BED SEMI	1128	6	6768	
COTSWOLD PLUS	4 BED DETACHED	1141	4	4564	
DAVENHAM PLUS	4 BED DETACHED	1151	1	1151	
BRANCASTER	4 BED DETACHED	1169	2	2338	
HOUGHTON	4 BED DETACHED	1325	4	5300	
MORETON	4 BED DETACHED	1326	1	1326	
CRANLEIGH	4 BED DETACHED	1358	2	2716	
HENLEY	4 BED DETACHED	1462	2	2924	
OXFORD	4 BED DETACHED	1498	3	4494	
ABINGDON	4 BED DETACHED	1469	3	4407	
NORFOLK	4 BED DETACHED	1502	3	4506	
BURFORD	4 BED DETACHED	1552	1	1552	
POKEMORE	4 BED DETACHED	1780	1	1780	
WINSTER	4 BED DETACHED	1796	1	1796	
SEVERN	4/5 BED DETACHED	1867	3	5601	
WINCHESTER	5 BED DETACHED	2085	4	8340	
PAILTON	5 BED DETACHED	2128	3	6384	48%
	GRAND TOTAL		124	144060	100%

Total Site Area	(Acres)	12.76
Nett Site Area	(Acres)	9.64
Total Site Area	(Hectares)	5.16
Nett Site Area	(Hectares)	3.90
SQFT/Acre		14939.18

F	Point size reduced and layout amended to get back to 124 units, PROW added to Open space calculation, Access RD reduced from 7.3m wide to 4.5m following highway comments.	05/12/25	HS
E	Open Space area increased to allow for SUD features, Reducing total by 8 units.	03/12/25	HS
D	Plot types with non over carportage added, 7.3m wide entrance road length reduced.	18/11/25	HS
C	Layout reviewed and updated to increase footage where possible, Schedule updated.	11/11/25	HS
B	Plots on additional land (Highmore Farm) reduced to 7no.	30/06/25	HS
A	Plots 1-24 & 112-114 added	29/06/25	HS
REV	DESCRIPTION	DATE	INT


Morris Homes (North) Limited
Morland House
Altrincham Road
Wilmslow
Cheshire SK9 5NW
Tel: (01625) 544 444
Fax: (0845) 833 1845

Job Title: **HIGHMOOR FARM
CLITHEROE**

Design: **SKETCH 04**

16.0 APPENDIX C – PREVIOUS LLFA CONSULATION

Phone:

Email:

Date: 14 September 2020

Dear Sir/Madam

APPLICATION CONSULTATION RESPONSE

Application Number:	3/2020/0601
Location:	Land at Highmoor Farm Clitheroe BB7 1PN
Proposal:	Outline planning for the construction of up to 125 dwellings with public open space, landscaping and sustainable drainage system and vehicular access point from Highmoor Park. All matters reserved except for means of access.

Thank you for consulting the Lead Local Flood Authority (LLFA) on the above application. The Flood and Water Management Act 2010 sets out the requirement for LLFAs to manage 'local' flood risk within their area. 'Local' flood risk refers to flooding or flood risk from surface water, groundwater or from ordinary watercourses.

Comments provided in this representation, including conditions, are advisory and it is the decision of the Local Planning Authority (LPA) whether any such recommendations are acted upon. It is ultimately the responsibility of the Local Planning Authority to approve, or otherwise, any drainage strategy for the associated development proposal. The comments given have been composed based on the current extent of the knowledge of the LLFA and information provided with the application at the time of this response.

Lead Local Flood Authority (LLFA) Position:

The Lead Local Flood Authority has **no objection** to the proposed development, subject to the inclusion of the following conditions:

Condition 1 (final surface water drainage scheme):

No development shall commence until final details of the design and implementation of an appropriate surface water drainage scheme have been submitted to and approved in writing by the local planning authority. Those details shall include:

- a) Evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltrations rates;
- b) A final surface water drainage layout plan; appropriately labelled to include all pipe/structure references, dimensions, design levels, finished floor levels and external ground levels (in AOD);
- c) A full set of flow calculations for the surface water drainage network. The calculations must show the full network design criteria, pipeline schedules and simulation outputs for the 1 in 1 year, 1 in 30 year and 1 in 100 year return period, plus an additional 40% allowance for climate change and a 10% allowance for urban creep. The calculations must demonstrate that surface water runoff will not exceed the existing pre-development greenfield runoff rates and volumes for the corresponding rainfall event;
- d) A final site plan showing all on-site surface water catchment areas, i.e. areas that will contribute to the proposed surface water drainage network;
- e) Confirmation of how surface water is to be managed within any non-drained areas of the site, i.e. gardens and public open space;
- f) A final site plan showing all overland flow routes and flood water exceedance routes, both on and off site;
- g) Details of any measures taken to prevent flooding and pollution of the receiving groundwater and/or surface waters, including watercourses; and
- h) Details of an appropriate management and maintenance plan for the surface water drainage network over the lifetime of the development.

The scheme shall be implemented in accordance with the approved details prior to first occupation of any of the approved dwellings, or completion of the development, whichever is the sooner. Thereafter the drainage system shall be retained, managed and maintained in accordance with the approved details.

Reasons:

- 1) To ensure that the proposed development can be adequately drained;
- 2) To ensure that there is no flood risk on or off the site resulting from the proposed development;
- 3) To ensure that water quality is not detrimentally impacted by the development proposal; and
- 4) To ensure that appropriate maintenance mechanisms are put in place for the lifetime of the development.

Condition 3 (construction phase surface water management plan):

No development shall commence until details of how surface water and pollution prevention will be managed during each construction phase have been submitted to and approved in writing by the local planning authority.

Reasons:

1. To ensure that the construction phase(s) of development does not pose an undue flood risk on site or elsewhere;
2. To ensure that any pollution arising from the development as a result of the construction works does not adversely impact on existing or proposed ecological or geomorphic condition of water bodies.

Lead Local Flood Authority Advice:

Surface water drainage:

The surface water drainage proposals outlined within the applicant's flood risk assessment (ref: 18522, dated: August 2019) are only preliminary and may change following further detailed design and investigation. The applicant will therefore be expected to provide a final surface water drainage scheme for the site once all detailed design and investigation work has been completed. The final scheme will need to be submitted to and approved by the LPA prior to the commencement of any development, and must comply with the requirements of the National Planning Policy Framework and the non-statutory technical standards for sustainable drainage systems; March 2015. The strategy must also be accompanied by an appropriate management and maintenance plan that details how the surface water drainage network will be managed and maintained over the lifetime of the development. The LLFA is satisfied that these details can be secured through the inclusion of the above recommended planning condition.

For the avoidance of doubt, the LLFA is not able to assess or comment on the suitability of the proposed surface water runoff rates or volumes at this time. That is because the final surface water runoff rates and volumes are directly influenced by the amount of impermeable area within the proposed development site. An agreement on this can only be reached once the final site layout has been agreed with the LPA.

The applicant is reminded that the final surface water drainage scheme must comply with the drainage hierarchy established under planning practice guidance. Before a drainage connection to the watercourse can be agreed, the applicant will need to provide further evidence and justification to show why disposal via infiltration is not possible. This should include an assessment of the site conditions to confirm infiltrations rates.

Sustainable Drainage Systems:

The applicant is encouraged to maximise the use of sustainable drainage systems (SuDS) when designing the surface water drainage scheme for the development site. That is because sustainable drainage systems offer significant advantages over conventional piped drainage systems in reducing flood risk.

Sustainable drainage systems can attenuate the rate and quantity of surface water run-off from a site, and they can also absorb diffuse pollutants and promote groundwater recharge. Ponds, reed beds and seasonally flooded grasslands are also particularly attractive features within public open space. The wide variety of available sustainable drainage techniques means that virtually any development should be able to include a scheme based around these principles and provide multiple benefits, reducing costs and maintenance needs.

Some SuDS features, for example rainwater harvesting and permeable paving used on roads and driveways, must not be included as part of the hydrological calculations for the site. This is because occupants may change or remove these features in the future and this could have the potential to increase surface water runoff from the site. Where SuDS features such as rainwater harvesting and permeable paving are included in the hydrological calculations, the local planning authority would be advised to consider the removal of permitted development rights.

Land Drainage Consent:

The LLFA are the consenting body for works on Ordinary Watercourses. Under Section 23 of the Land Drainage Act 1991 (the “LDA”) (as amended by paragraph 32 of Schedule 2 of the FWMA 2010) anyone who intends to carry out works which may obstruct or affect the flow of an ordinary watercourse needs written consent from Lancashire County Council.

It is important to note that Land Drainage Consent is a separate application process that lies outside the planning legislation. It should not be assumed therefore the grant of planning permission means that Land Drainage Consent will automatically be given. Parallel processing of Land Drainage Consent applications is advised, as any land drainage consenting issues could directly impact the suitability of the proposed site layout.

Land Drainage Consent applications can take up to eight weeks to process following receipt of all required information and payment (£50 per structure). Retrospective consent cannot be issued.

Construction Phase including enabling works:

It is critical that flood risk is appropriately managed during the construction phase(s) of the development. Compaction of the soil is likely to speed up the run-off rate whilst the site is cleared and the permanent drainage systems and/or attenuation systems are constructed and brought into use.

The developer should identify the flood risk associated with this phase of the development and provide details of how surface water will be managed during construction, including any mitigation. The LLFA is satisfied that these details can be secured through the inclusion of the above recommended planning condition.

Highway Drainage / Highway Adoption:

This response does not cover highway drainage, matters pertaining to highway adoption (s38 Highways Act 1980) and/or off-site highway works (s278 Highways Act 1980). Should the applicant intend to install any sustainable drainage systems under or within close proximity to a public road network (existing or proposed), then they would need to separately discuss the use and suitability of those systems with the local highway authority.

The applicant is also encouraged to discuss the suitability of any overland flow routes and/or flood water exceedance with the local highway authority should they have the potential to impact the public highway network and/or public highway drainage infrastructure (either existing or proposed).

Material changes:

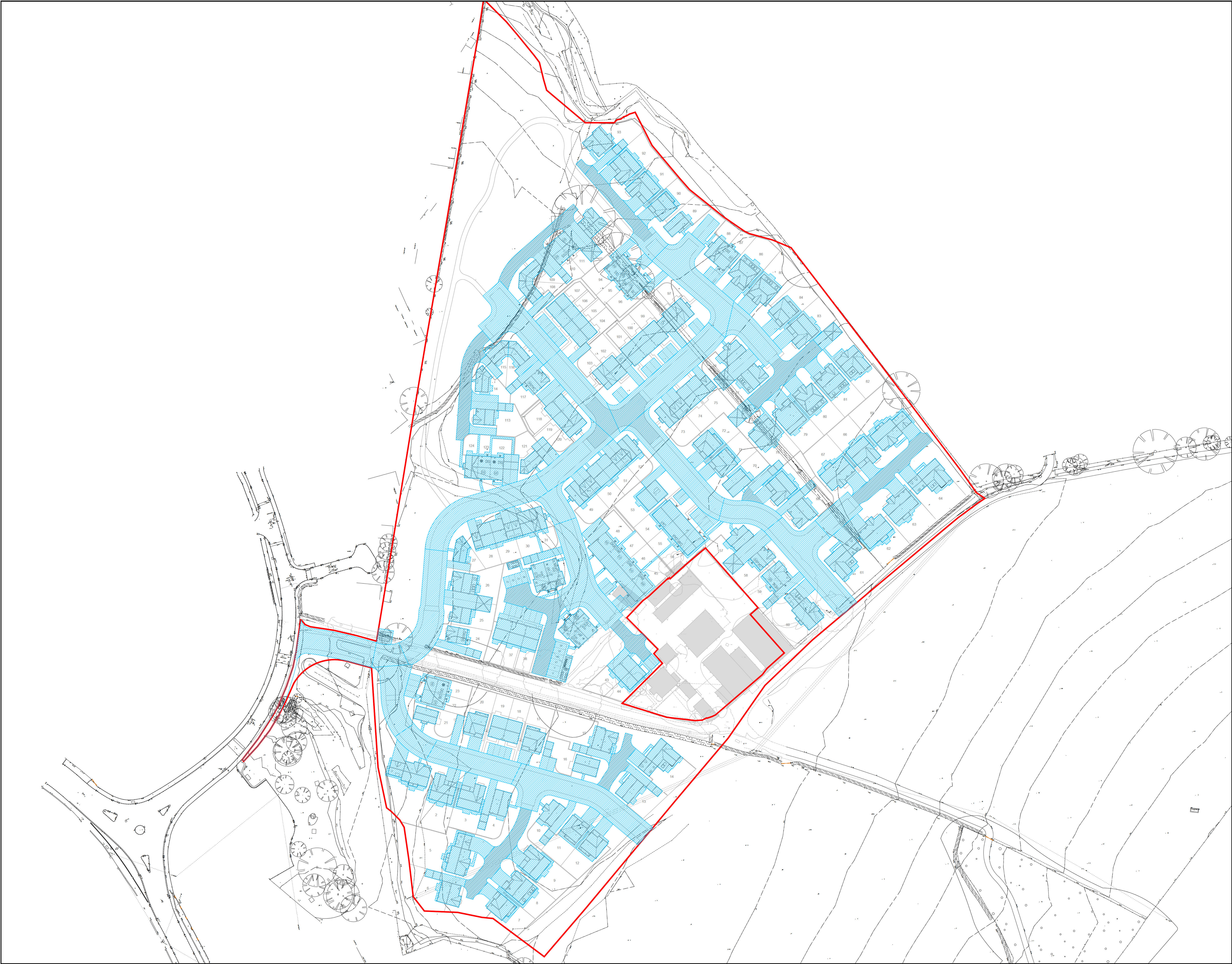
If there are any material changes to the submitted information which impact on surface water, the local planning authority is advised to consider re-consulting the LLFA. The LLFA also wishes to be formally consulted on all subsequent drainage strategies for this proposed development.

Yours faithfully,

A solid black rectangular box used to redact the signature of the Lead Local Flood Authority.

Lead Local Flood Authority

17.0 APPENDIX D – IMPERMEABLE AREAS / CATCHMENT PLAN



- NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
 2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.
 3. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
 4. LOCATION AND LEVELS OF EXISTING PUBLIC SEWERS BASED ON WATER AUTHORITY SEWER RECORDS. SEWERS TO BE FULLY SURVEYED, ALL LOCATIONS TO BE CONFIRMED.
 5. SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN.
 6. ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION GUIDANCE AND WHERE APPLICABLE UNITED UTILITIES DETAILS
 7. THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm
 8. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE CONTRACTOR SHALL ADHERE TO THE CDM REGULATIONS AT ALL TIMES
 9. EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES
 10. ALL MATERIALS TO BEAR THE RELEVANT B.S. KITEMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS
 11. ALL OPENING NOTICES ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY L.A., NHBC OR THE NETWORK OPERATOR AS APPLICABLE.
 12. WHERE "ULTRA RIB" UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND LAID IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
 13. A CLASS S BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1m OF HIGHWAY SHALL, AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL. ALL IN ACCORDANCE WITH SEWERS FOR ADOPTION CL. 4.3.4.
 14. DOMESTIC DRAINAGE SHALL BE TO BUILDING REGULATIONS APPROVED DOCUMENT H. 100mm U.P.V.C. PIPES LAID TO THE FOLLOWING MINIMUM FALLS UNLESS OTHERWISE SHOWN.
 15.

	FOUL	S.W.
HEAD RUN	1 IN 40	1 IN 50
ELSEWHERE	1 IN 80	1 IN 100
 16. ALL LATERAL CONNECTIONS FROM THE PRIVATE NETWORK TO BE 150mm U.P.V.C PIPES UNLESS STATED OTHERWISE
 17. ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED CLAY UNLESS NOTED OTHERWISE
 18.

MINIMUM COVER TO DRAINAGE SOFFIT LEVEL:		
LANDSCAPING	TRAFFICKED AREAS	HIGHWAYS
0.600m	0.900m	1.200m
 19. CLASS 'S' BEDDING AND SURROUND TO BE USED WHERE MINIMUM COVER IS ACHIEVED.
 20. WHERE MINIMUM COVER IS NOT ACHIEVED CLASS 'Z' BEDDING AND SURROUND (CONCRETE ENCASEMENT) IS TO BE USED.
 21. ANY DAMAGE TO THE EXISTING SEWER NETWORK BECAUSE OF THE DEVELOPMENT SITES ACTIVITIES WILL NEED TO BE RECTIFIED AT THE DEVELOPERS EXPENSE.
- DRAINAGE NOTES:
- TOTAL IMPERMEABLE AREA = 2.348ha

POS	31.03.26	KF	REVISED TO SUE DRAINAGE STRATEGY
P01	16.01.26	PB	FIRST ISSUE
Rev	Date	By	Description



Liverpool Innovation Park | Edge Lane | Liverpool | L7 9PL
T: 0151 305 0700 www.shapeengineering.co.uk

Client
MORRIS HOMES

Project
HIGHMOOR FARM, CLITHEROE

Title
IMPERMEABLE AREAS PLAN

Status	Subsidiary Description	Structural Stage	Date
PLANNING			16.01.26

Designed By	Drawn By	Scale @ A0	Project No.
PB		1:500	2936

Sheet No.	Revision
2936-SCE-00-00-DR-C-0010	P02

This drawing remains the copyright of Shape Consulting Engineers Ltd.

18.0 APPENDIX E – GREENFIELD RUNOFF RATES

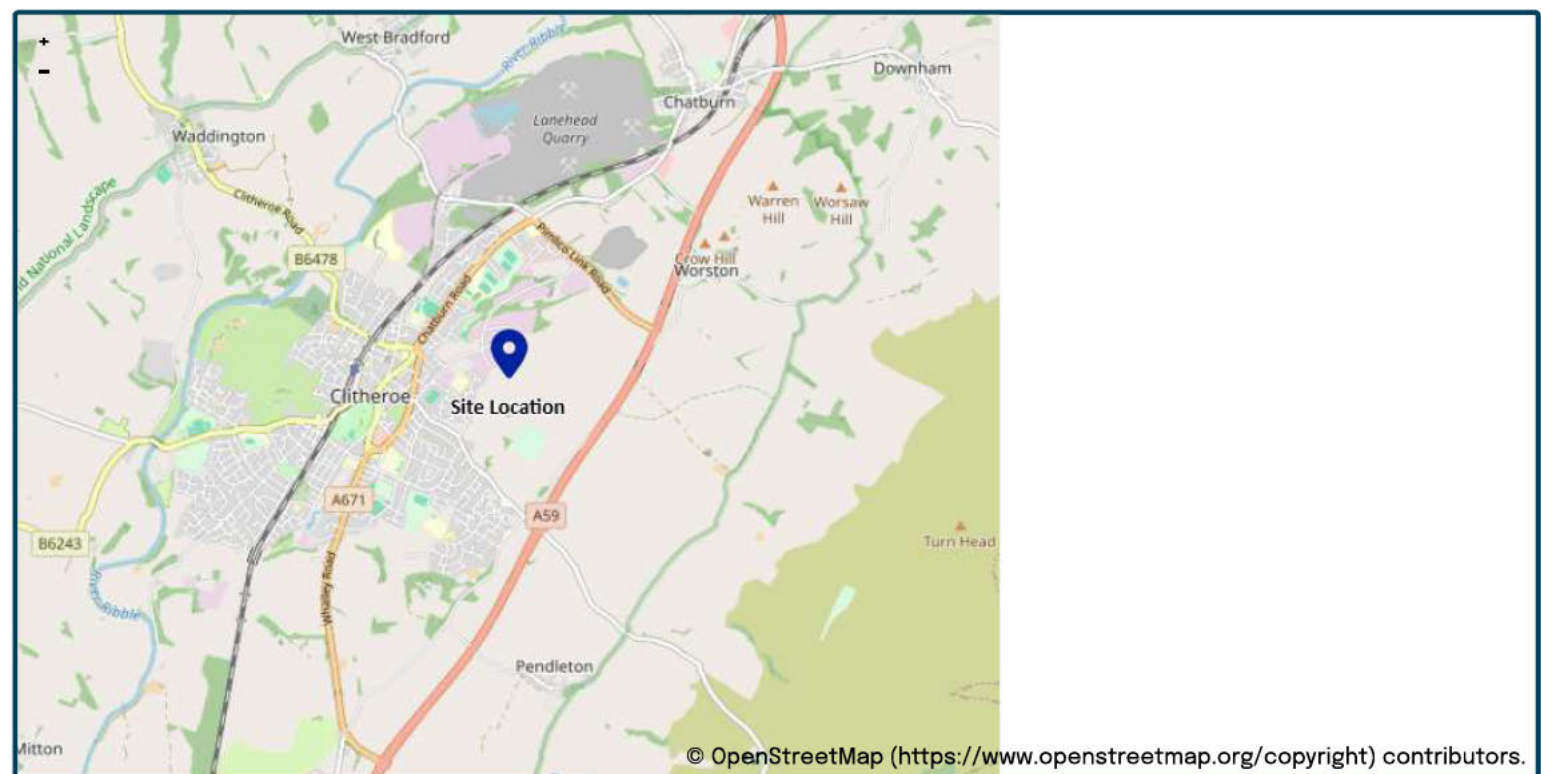
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	17/06/2026
Calculated by	PB
Reference	2936
Model version	2.2.3

Location

Site name	Highmoor Farm
Site location	Clitheroe



Site easting (British National Grid)	375332
Site northing (British National Grid)	441753

Site details

Total site area (ha)	2.451	ha
----------------------	------------------------------------	----

Greenfield runoff

Method

Method	IH124	
IH124		
	<u>My value</u>	<u>Map value</u>
SAAR (mm)	1241 mm	☐ 1241
How should SPR be derived?	WRAP soil type	
WRAP soil type	4	☐ 4
SPR	0.47	
QBar (IH124) (l/s)	23.1 l/s	

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	10	☐ 10
1 year growth factor	0.87	
2 year growth factor	0.93	
10 year growth factor	1.38	
30 year growth factor	1.7	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	IH124	
Flow rate 1 year (l/s)	20.1 l/s	
Flow rate 2 year (l/s)	21.5 l/s	
Flow rate 10 years (l/s)	31.9 l/s	
Flow rate 30 years (l/s)	39.3 l/s	
Flow rate 100 years (l/s)	48.1 l/s	
Flow rate 200 years (l/s)	54.8 l/s	

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://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 [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

19.0 APPENDIX F – PHASE 2 GROUND INVESTIGATION