

PROPOSED RESIDENTIAL DEVELOPMENT AT
LAND AT FULWOOD DRIVE,
GOLCAR, HUDDERSFIELD
FLOOD RISK ASSESSMENT

Client:

Armitage Developments UK Ltd.
Burr Farm
Holt Head Road
Holt Head
Huddersfield
HD7 5TU

Consultant:

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Consulting Engineers
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REVISIONS

Issue	Date	Revision
First Issue	August 2021	

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1 INTRODUCTION

1.1 Appointment

1.1.1 Build Vision Consulting Engineers were appointed by Armitage Developments UK Ltd. to carry out a Flood Risk Assessment for the site.

1.2 Scope of Works

1.2.1 This assessment is based on the requirements of the National Planning Policy Framework (NPPF), Planning Policy Guidance ID7 Flood Risk and Coastal Change, The Strategic Flood Risk Assessment (SFRA) Reports for Kirklees Council, Local Plan and Adopted Unitary Development Plan (UDP) Part 2 Chapter 6 EN 5/1 New Development and Flood Risk.

1.3 Development Proposals

1.3.1 The proposed development comprises the construction of new residential properties with associated hard paved areas, driveways and gardens and soft landscaped areas. Details of the proposed development are shown on the plan enclosed in Appendix B.

1.4 Site Location

1.4.1 The site is located off Fulwood Drive in Golcar, Huddersfield as shown on the site plan enclosed in Appendix A.

1.5 Site Description

1.5.1 The site is an irregular shaped parcel of land occupying approximately 0.4 hectares. The site is an unoccupied field and is very overgrown and there are several trees on and adjacent to the site. The site slopes steeply from north to south from approx. 188 to 173m AOD. Access to the site is off Fulwood Drive to the northwest. There are timber fences to the north boundary of the gardens of properties to the north, bushes, post and wire and timber edgings to the east boundary with the public footpath and development site to the east and dry stone walls to the south boundary of the gardens of properties to the south and dry stone walls and timber fence to the west boundary of properties to the west.

- 1.5.2 There is a spring present on the site close to the north boundary that has a 100mm diameter pipe that overflows into a stone trough set into the ground. The water was running and the trough was full but there was no evidence of overflowing or significant water flow pathway indicating that the trough may have an outfall that was not identified. The desk study report referred to another spring in the northeast area of the site but this was not identified on site, possibly due to the site being so overgrown but there was no water present on the surface, wet ground or indication of any water flow pathways.
- 1.5.3 There are some areas where clay is present at the surface and an open excavation in the southeast area showing sandy clay present beneath the soil indicating that the soils are unlikely to be very permeable. The pipe and trough are shown on the topographical survey and the site photos enclosed in Appendix A.
- 1.5.4 The site is surrounded by residential properties and fields to the north, east, south and west of the site.

2 FLOOD RISK ASSESSMENT

2.1 Fluvial/Rivers

- 2.1.1 The EA Flood Risk Maps indicate that the site is in Flood Zone 1. Flood Zone 1 is classified as having a 'Very Low' risk of flooding with a flood risk of less than 1 in 1000.
- 2.1.2 As the site area is approximately 0.4 hectares, this is less than 1 hectare and for sites less than 1 hectare in Flood Zone 1, a Flood Risk Assessment is not required. However, in accordance with the local authorities planning requirements, a drainage strategy and SUDs assessment are required on all sites and these form part of the flood risk assessment.
- 2.1.3 If the Sequential Test is applied in accordance with NPPF and ID7, residential development is classified as 'more vulnerable' and is considered 'appropriate' in Flood Zone 1.
- 2.1.4 The sequential test, and if required the Exception Test are applied in the preparation of a Local Plan for the allocation of developments with reference to the SFRA. In accordance with Tables 2 and 3, residential development is classified as 'more vulnerable' and an Exception Test is not required in Flood Zone 1.

- 2.1.5 In accordance with NPPF, when determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:
- § within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
 - § development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems
- 2.1.6 The nearest surface water feature to the site is a spring present on the site close to the north boundary that has a 100mm diameter pipe that overflows into a stone trough set into the ground. The water was running and the trough was full but there was no evidence of overflowing or significant water flow pathway indicating that the trough may have an outfall that was not identified. The desk study report referred to another spring in the northeast area of the site but this was not identified on site, possibly due to the site being so overgrown but there was no water present on the surface, wet ground or indication of any water flow pathways.
- 2.1.7 The nearest watercourse is an ordinary watercourse approx. 50m south of the site that discharges to the River Colne approx. 1 km southeast of the site. The level of the watercourse is approx. 13m lower than the lowest level on the site in the southeast corner of the site, therefore the risk of flooding from the watercourse is considered very low.
- 2.1.8 There are no formal flood defences in the vicinity of the site. However, the site is defended by its significant elevation above the nearest watercourses.
- 2.1.9 The SFRA does not identify any historical incidents of flooding have occurred at the site.
- 2.1.10 The local authority were consulted on the outline planning application and confirmed:
- § There are no records of historical flooding on site.
 - § There are records of minor flooding incidents off site which appear to be related to water from the highway and not from the site.
 - § There is a land drainage system/watercourse recorded running to the rear of 5 Fulwood Drive heading towards Victoria Road.

- § There is a trough to the northern boundary of the site with a 100mm diameter pipe existing, further investigation for this system is required. It is unlikely that these systems would be suitable for connection.
- § Soakaways on a steep sided slope are not advisable due to problems of re-emergence.
- § A surface water sewer exists in Fulwood Drive but levels may not allow a gravity connection. There would be a presumption against pumping surface water
- § A direct connection to the open watercourse to the south would be the most appropriate solution.
- § Flood routing needs to be considered at the site.

2.2 Sea

2.2.1 No tidal influence.

2.3 Surface Water

2.3.1 The EA surface water flood risk map indicate very low to low risk of surface water flooding at the site with flood risks of 1 in 100 to 1 in 1000.

2.4 Groundwater

2.4.1 The BGS areas susceptible to groundwater flooding maps indicate that the area is not considered to be prone to groundwater flooding due to the rock type.

2.4.2 Geology maps indicate the geology generally to be no drift deposits over the Millstone Grit Formation comprising of sandstone with mudstone and siltstone which generally weathers to clay at shallow depths. The ground investigation has confirmed soil and made ground over clay drift deposits over the Millstone Grit Formation as mudstone. No groundwater was identified to depths of 3m.

2.4.3 The bedrock is classified as a Secondary A Aquifer.

2.4.4 It is likely that any shallow groundwater will flow to the south in line with the local topography. However, the migration of groundwater is likely to be confined to any permeable horizons within the predominantly cohesive Millstone Grit mudstone deposits identified beneath the site.

2.5 Sewers

2.5.1 There are no sewers within the site.

- 2.5.2 The nearest sewer is a 225mm diameter public surface water sewer in Fulwood Drive to the west of the site and there is a 225mm diameter pipe coming from the direction of the site, this could be from a nearby gully but it could be from the stone trough on the site and will need to be investigated. The sewer is not deep enough for a surface water gravity connection from the majority of the site due to the levels on the site. The nearest foul sewer is a public combined sewer in Brook Lane approx. 40m south of the site. There is also a public combined sewer approx. 50m east of the site and the developer on the adjacent site has recently installed foul and surface water sewers for adoption that discharge into the public combined sewer.
- 2.5.3 The sewers should be investigated further and details confirmed on site and Yorkshire Water and the local authority should be consulted regarding proposed new foul and surface water discharge connections.
- 2.5.4 Sewers are usually designed for 1 in 30 year events and they are assumed to be at capacity, blocked or failed in 1 in 100 year events. SFRA flood modelling assumes that they are surcharged and picks up overland flows from the surcharged sewers in the models. No records of historical incidents of flooding have been reported on the site in the SFRA and there are no sewers within the site. The risk of flooding from sewers at the site is therefore considered very low.
- 2.6 Canals
- 2.6.1 The Huddersfield Narrow Canal is approx. 1 km southeast of the site.
- 2.6.2 Canals do not pose a direct flood risk as they are a controlled water body. The SFRA identifies residual risks from canals from breaching or overtopping of the canal and produced a direct canal hazard zone to identify areas at geographical risk from breaching or overtopping. The site is not within these areas.

2.7 Reservoirs

- 2.7.1 The nearest reservoir is Longwood reservoirs approx. 1.2 km north of the site.
- 2.7.2 Reservoirs do not pose a direct flood risk as they are a controlled water body. Residual risk is associated with lower probability events such as breaching of embankments. Reservoir inundation mapping under the 1975 Reservoirs Act is covered by the Civil Contingencies Act and the information has a national security status and is not available for public release. For this reason, the SFRA was unable to analyse reservoir breach flood risk.
- 2.7.3 The EA Risk of flooding from reservoir maps indicate that the site is not in an area that could be flooded if a large reservoir were to fail and release the water it holds. A large reservoir is one that holds over 25,000 cubic metres of water. Since this is a worst-case scenario, it's unlikely that any actual flood would be this large and the EA consider reservoir flooding is extremely unlikely to happen.

3 SURFACE WATER MANAGEMENT

3.1 Existing Drainage and Surface Water Run Off

- 3.1.1 The site is an unoccupied overgrown field with several trees on and adjacent to the site as shown on the topographical survey and the site photos.
- 3.1.2 The Greenfield run off rates from the site have been calculated using the micro drainage software and are enclosed in Appendix A. Greenfield run off QBAR rural is 1.4 l/s. For 1 year storm events Q1 is 1.2 l/s, for 30 year storm events Q30 is 2.3 l/s and for a 100 year storm events Q100 is 2.8 l/s.
- 3.1.3 The nearest sewer is a 225mm diameter public surface water sewer in Fulwood Drive to the west of the site and there is a 225mm diameter pipe coming from the direction of the site, this could be from a nearby gully but it could be from the stone trough on the site and will need to be investigated. The sewer is not deep enough for a surface water gravity connection from the majority of the site due to the levels on the site. The nearest foul sewer is a public combined sewer in Brook Lane approx. 40m south of the site. There is also a public combined sewer approx. 50m east of the site and the developer on the adjacent site has recently installed foul and surface water sewers for adoption that discharge into the public combined sewer.

- 3.1.4 The nearest surface water feature to the site is a spring present on the site close to the north boundary that has a 100mm diameter pipe that overflows into a stone trough set into the ground. The water was running and the trough was full but there was no evidence of overflowing or significant water flow pathway indicating that the trough may have an outfall that was not identified. The desk study report referred to another spring in the northeast area of the site but this was not identified, possibly due to the site being so overgrown but there was no water present on the surface, wet ground or indication of any water flow pathways. Further investigation of the springs is required.
- 3.1.5 The nearest watercourse is an ordinary watercourse approx. 50m south of the site that discharges to the River Colne approx. 1 km southeast of the site.
- 3.1.6 The sewers and watercourses should be investigated further and details confirmed on site and Yorkshire Water and the local authority should be consulted regarding proposed new foul and surface water discharge connections.

3.2 Consideration of SUDs

- 3.2.1 In accordance with the Governments written statement on Sustainable Urban Drainage Systems (SUDs) and the council's Local Plan, a SUDs assessment is required.
- 3.2.2 NPPF and PPG ID7 recognises that Flood Risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites through the use of sustainable urban drainage systems (SUDS). SUDS will not alleviate flooding in an area prone to flooding; however, properly designed SUDS have the potential to prevent the surface water runoff from new development worsening the flood risk.
- 3.2.3 Geology maps indicate the geology generally to be no drift deposits over the Millstone Grit Formation comprising of sandstone with mudstone and siltstone which generally weathers to clay at shallow depths. The ground investigation has confirmed soil and made ground over clay drift deposits over the Millstone Grit Formation as mudstone. No groundwater was identified to depths of 3m.

3.2.4 The use of sustainable drainage systems (SUDS) such as soakaways, permeable pavements, infiltration basins, ponds and swales should be incorporated where possible into the surface water drainage design to reduce surface water runoff from the development. The clay drift deposits and the Millstone Grit Formation mudstone are unlikely to have adequate infiltration co-efficients for soakaways and permeable pavements and soakaways on a steep sided slope are not advisable due to problems of re-emergence. There may be insufficient green space on the site for basins, ponds or swales when considering proximity to existing and proposed dwellings. Soakaway tests should be carried out in accordance with BRE365 to determine infiltration co-efficients and confirm whether the site is suitable for infiltration methods of SUDS. Should these prove inadequate, permeable pavements should still be considered as attenuation and to slow down flows and flow control and attenuation are feasible within the site.

3.3 Climate Change

3.3.1 The EA guidance on Climate Change was updated on the 12th April 2016 in the NPPF and ID7 guidance. For flood risk assessments, central and upper end peak rainfall intensity climate change allowances should be considered for the 'lifetime' of the development, which for residential development is considered to be 100 years, therefore allowances of 20% and 40% should be used.

3.4 Proposed Drainage and Surface Water Run Off

3.4.1 From the proposed site layout plan provided, the post-development impermeable area is approx. 0.2 hectares.

3.4.2 In accordance with NPPF, PPG ID7 and Local Authority SFRA Reports and planning policies and SUDs hierarchy, surface water run-off from new developments should not exceed existing run-off rates and should provide a 50% reduction in flows and SUDs and greenfield run-off rates should be implemented where possible.

3.4.3 Foul drainage should discharge to a public foul or combined sewer and surface water drainage should discharge to SUDs systems, if these are not suitable to a nearby watercourse, if not present to a surface water sewer and only if none of these options are proven to be feasible should surface water discharge to a public combined sewer.

3.4.4 The foul drainage from the site should therefore discharge to the public combined sewers to the south or the east of the site.

- 3.4.5 The surface water from the site should discharge to soakaways, permeable pavements, basins, ponds or swales SUDs systems subject to ground conditions and adequate infiltration co-efficients. However, as ground conditions are unlikely to be suitable and soakaways on a steep sided slope are not advisable due to problems of re-emergence, the surface water should discharge to the nearest available watercourse, which in this case is the ordinary watercourse approx. 50m south of the site adjacent to Brook Lane.
- 3.4.6 The foul sewer connection to the combined sewer in Brook Lane and the surface water sewer connection to the watercourse adjacent to Brook Lane would require off site sewers through land owned by others or sewer requisition and there are numerous trees present with TPO's.
- 3.4.7 There is also a public combined sewer approx. 50m east of the site and the developer on the adjacent site had similar issues regarding off site sewers through land owned by others and numerous trees with TPO's on the land and has received agreement and approval from the local authority and Yorkshire Water to discharge foul and restricted surface water flows to the combined sewer. They are proposing to install foul and surface water sewers that discharge into the public combined sewer with surface water flows restricted to 5 l/s and attenuation provided within the drainage system.
- 3.4.8 The developer on the adjacent site has agreed that subject to local authority and Yorkshire Water agreement and approval they will provide connections for the proposed development to connect and discharge to the foul and surface water sewers that are to be constructed on the adjacent site provided the surface water flows are restricted to 5 l/s.
- 3.4.9 The local authority and Yorkshire Water should be consulted regarding proposed new foul and surface water discharge connections.
- 3.4.10 Surface water flows should be limited to Greenfield runoff rates or 50% of pre development flows or the minimum flow rate from a minimum size flow control device to prevent blockages considered to be 5 l/s.
- 3.4.11 For this site as greenfield rates are less than 5 l/s, the surface water flows should be limited to the minimum size flow control device to prevent blockages considered to be 5 l/s.

- 3.4.12 A conservative quick storage design has been carried out using micro drainage for 30 year and 100 year storm events with an allowance of 40% for climate change, with no infiltration and applying a hydrobrake flow control device to limit the flow to 5 l/s and this confirms that for an impermeable area of 0.2 hectares, 900mm diameter oversized pipes would be required for 30 year storms and 52 cu.m of cellular storage would be required above this level for 100 year + 40%CC storms. The outline drainage proposals and micro drainage results are enclosed in Appendix B.
- 3.4.13 Consultations should be carried out with the local authority and Yorkshire Water regarding the foul and surface water discharges and consents to discharge to the public combined sewer.

4 FLOOD RISK MITIGATION MEASURES

- 4.1.1 There is a spring present on the site close to the north boundary that has a 100mm diameter pipe that overflows into a stone trough set into the ground. The water was running and the trough was full but there was no evidence of overflowing or significant water flow pathway indicating that the trough may have an outfall that was not identified. The desk study report referred to another spring in the northeast area of the site but this was not identified, possibly due to the site being so overgrown but there was no water present on the surface, wet ground or indication of any water flow pathways. Further investigation of the springs is required.
- 4.1.2 A preliminary assessment of residual overland flood routes and emergency access and egress routes has been carried out and these are indicated on the flood route plan enclosed in appendix B.
- 4.1.3 Emergency access and egress routes should be provided and these and the floor levels of the proposed properties should be set above residual flood levels to reduce the risk to homeowners and prevent flooding of the properties.

APPENDIX A

PRE DEVELOPMENT INFORMATION

- § Site Location Plan
- § Existing Site Plan/Topographical Survey
- § Aerial photograph of the site
- § Site Photos
- § Flood Risk Maps
- § YW Extract from map of sewers
- § Micro drainage Greenfield Run Off Rates



Only figured dimensions should be used.

Scaled dimensions should be checked with the Architect.

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rev	description	drwn	auth	date

Client
ARMITAGE DEVELOPMENTS

Project
**LAND OFF FULLWOOD DRIVE
GOLCAR, HUDDERSFIELD**

Description
LOCATION PLAN

Project No 2673	Drawing No LOC	Rev /	Scale 1:1250@ A4	Date Drawn OCT'20	Drawn By JF	Authorised By JC	Purpose of Issue Planning <input checked="" type="radio"/> Building Regs <input type="radio"/> Tender <input type="radio"/> Construction <input type="radio"/> Comment <input type="radio"/> info <input type="radio"/>
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ACUMEN
DESIGNERS & ARCHITECTS

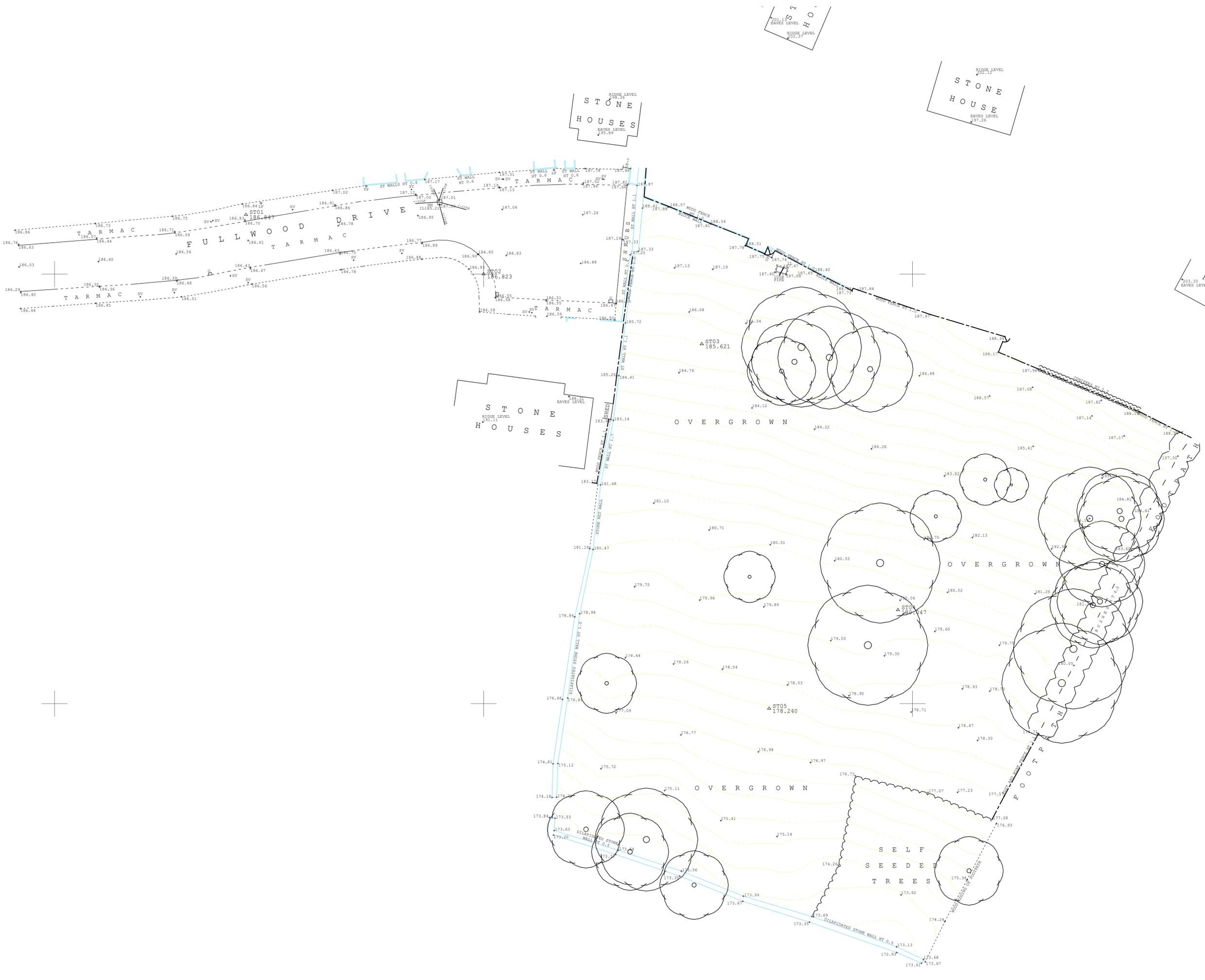
acumenarchitects.co.uk 01484 546 000
Headrow House, Old Leeds Road, Huddersfield, HD1 1SG

S 1
201.11
EAVES LEVEL
RIDGE LEVEL
202.12

RIDGE LEVEL
202.12
STONE
HOUSE
EAVES LEVEL
197.26

RIDGE LEVEL
195.96
STONE
HOUSES
EAVES LEVEL
195.89

RIDGE LEVEL
202.33
STONE
HOUSE
EAVES LEVEL
202.06



500N

450N









Flood map for planning

Your reference
Fulwood Drive

Location (easting/northing)
409601/415676

Created
19 Aug 2021 15:13

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

Your reference
Fulwood Drive

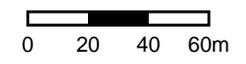
Location (easting/northing)
409601/415676

Scale
1:2500

Created
19 Aug 2021 15:13



-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



Flood risk

Extent of flooding

Location

Golcar



Extent of flooding from surface water

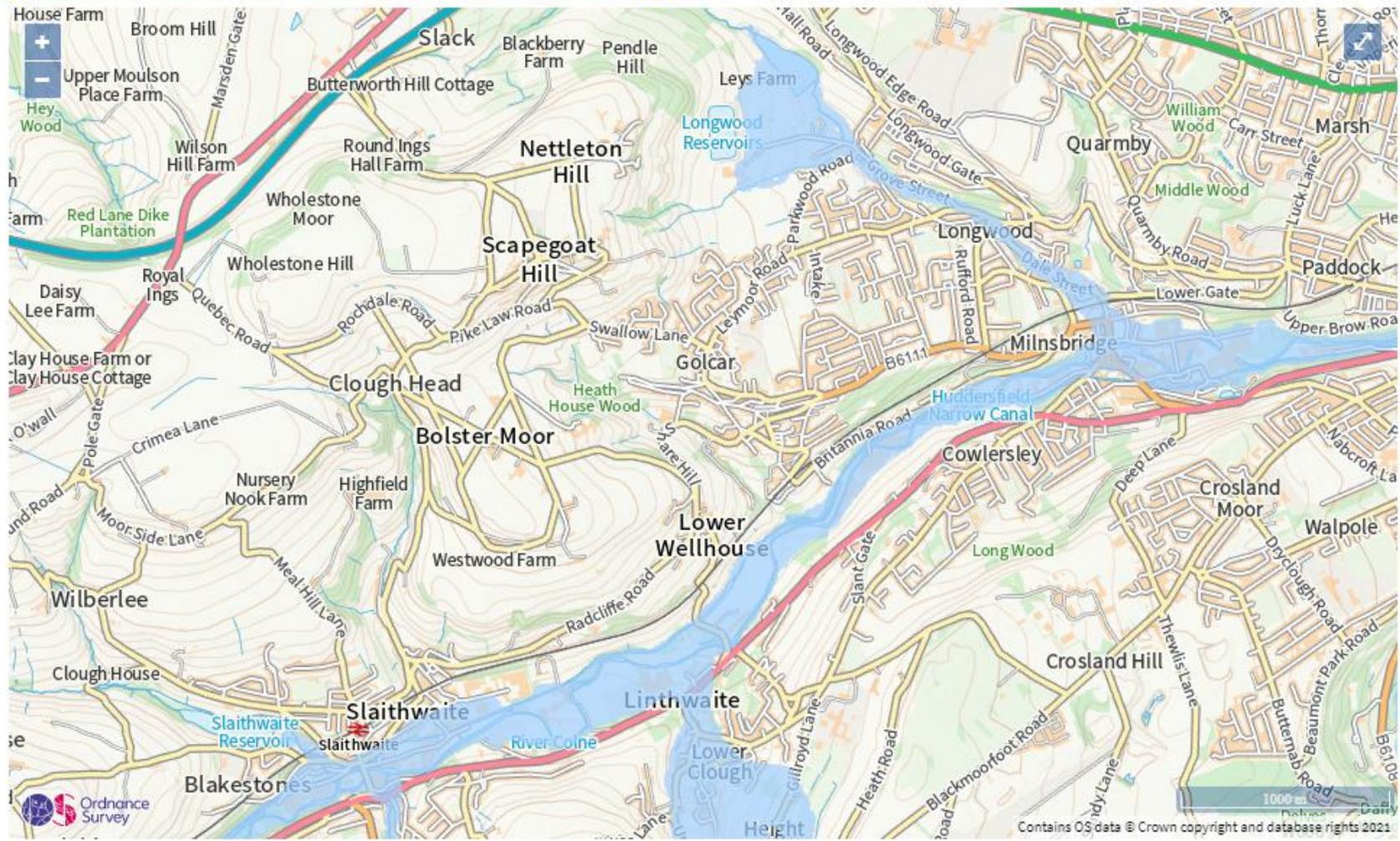
- High
- Medium
- Low
- Very low
- Location you selected

Flood risk

Location

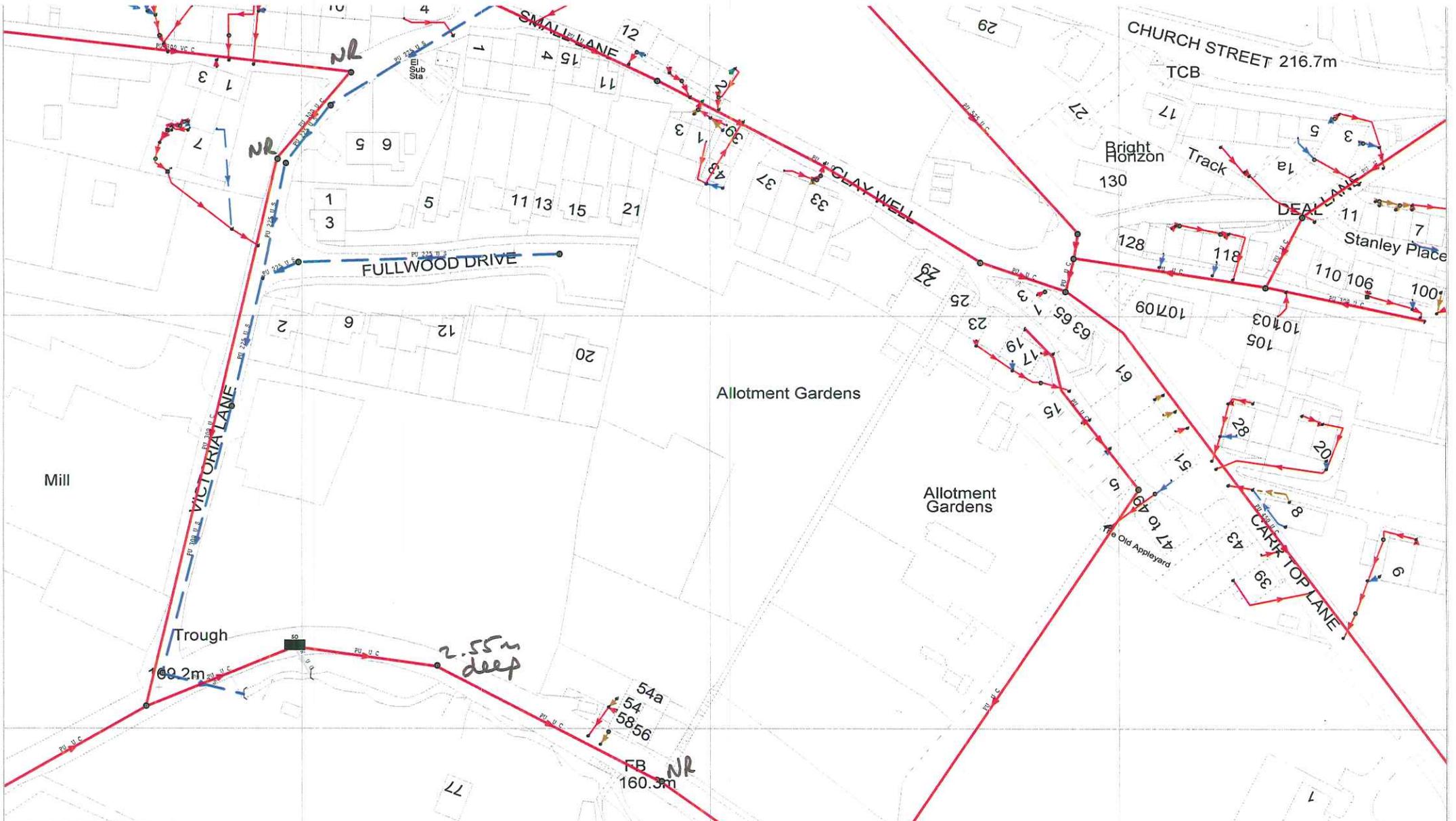
Extent of flooding

Golcar



Extent of flooding from reservoirs

- Maximum extent of flooding
- ⊕ Location you selected



409395 : 415558

Map Name : SE0915NW

Title

Partial Key

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.



Yorkshire Water,
 PO Box 500,
 Halifax Road,
 Bradford BD6 2LZ
 Contact Name :
 K KHAN
 Contact Tel :

Notes

NR : No recorded depth .

- Foul Sewer = F
- Combined Sewer = C
- Surface Water Sewer = SW
- Trade Sewer = TD
- Partially Separate = PS

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Date Req : 14/03/2014, 11:12:01

Date Gen : 14/03/2014, 11:12:02

Source : Sewer Network Enquiry

8 Westleigh House
Denby Dale
Huddersfield



Date 20/08/2021 11:04
File

Designed by User
Checked by

Micro Drainage Source Control 2019.1

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.400	Urban	0.000
SAAR (mm)	1200	Region Number	Region 10

Results 1/s

QBAR Rural 1.4
QBAR Urban 1.4

Q100 years 2.8

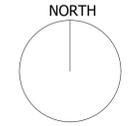
Q1 year 1.2
Q30 years 2.3
Q100 years 2.8

APPENDIX B

POST DEVELOPMENT INFORMATION

- § Proposed Site Plan
- § Outline Drainage Layout
- § Flood Routes Plan
- § Micro Drainage Quick Storage Estimate

Only figured dimensions should be used.
 Scaled dimensions should be checked with the Architect.
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- Visitor parking
- Landscaped area
- 1.8m close boarded fencing to all rear boundaries
- Bin collection point
- Rockery retaining wall to boundary

PROPOSED SITE PLAN

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rev	description	drawn	auth	date



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 Headrow House, Old Leeds Road, Huddersfield, HD1 1SG

Client
 ARMITAGE DEVELOPMENTS

Project
 LAND OFF FULLWOOD DRIVE
 GOLCAR, HUDDERSFIELD

Project No	Drawing No	Rev
2673	03	/

Description
 PROPOSED SITE PLAN

Scale	Date Drawn	Drawn By	Authorised By
1:200@ A1	AUG'21	JF	JC

Purpose of Issue
 Planning Building Regs Tender Construction Comment Info



Visitor parking
 Landscaped area
 3m close boarded fencing to all rear boundaries
 Bin collection point
 Rockery retaining wall to boundary

S2 CONTROL MANHOLE
 CL 181.500
 IL 179.300
 SUMP 400MM
 WITH HYDRO-BRAKE OPTIMUM REF:
 MD-SHE-0091-5000-2050-5000
 SIZE: 910MM
 HEAD: 2.050M
 FLOW: 5.0 L/S

150mm SURFACE WATER SEWER CONNECTION TO SURFACE WATER SEWER ON ADJACENT SITE

NOTES

- Do not scale from this drawing.
- This drawing is to be read in conjunction with all relevant Architects and Engineers drawings and specifications.
- All works and materials to be in accordance with current British Standards and Building Regulations.
- The Architects site plan has been used as a base for this drawing. Please refer to the latest site plan.
- Pipes with <300mm cover under non-vehicle areas and <900mm cover under vehicle areas are to be encased in concrete as shown on the pipe bedding drawing. A protection slab may be required for shallower pipes and will be indicated on the drawing. Please refer to manufacturers details for pipe material specific requirements. Adoptable sewers will require a minimum of 1200mm cover in accordance with sewerage undertakers requirements.
- For any works on Public Sewers refer to Statutory Undertakers Drawings.
- For drainage details refer to Build Vision 900 Series drawings.
- All exg drains indicated ~~~~~ to be removed or grouted with PFA/Cement:Grout minimum ratio of 12:1.
- RWP, SVP & Syphonic locations and sizes to be confirmed by the Architect.
- Foul air traps to be provided on all gullies and aco channels.
- Access fittings to be provided on all internal drainage.

Drain Connection	Access Fitting
0-12m	Type 1 (min 150x100mm)
12-22m (Junction)	Type 2 (min 225x100mm)
12-45m (Into Manhole)	Type 2 (min 225x100mm)
- All below ground slab foul drainage to be minimum 100mm diameter unless otherwise noted.
- MOC indicates 300# mini access chamber.
- PPIC indicates 475# Polypropylene Inspection Chamber.
- All sewers to have concrete or class "S" bed and surround in accordance with pipe bedding details drawing.
- All pipes to be WIS 4-35-01 and to be kate marked structural walled plastic, clay or concrete pipes suitable for use in Highways

ALL OUTLETS AND FITTINGS TO BE RODDABLE IN ACCORDANCE WITH BUILDING REGULATIONS

EXISTING DRAINAGE ON SITE TO BE INVESTIGATED/SURVEYED

PRELIMINARY
 NOT FOR CONSTRUCTION.

Rev	Date	By	Checked	Remarks
P1	23.08.21	SJG		Preliminary Issue

Project
 Fulwood Drive
 Galcar

Client
 Armitage Developments UK Ltd.

Drawing
 Outline Drainage Layout

Number	1296-900	Rev	P1
Scale	1:200@A1	Drawn	SJG
		Checked	
		Date	Aug 2021

Build Vision
 Consulting Engineers

Suite 1, Westleigh House, Wakefield Road,
 Denby Dale, Huddersfield HD8 8QJ
 Tel. 01484 868257 email: mail@bvconsulting.co.uk

NOTES

1. Do not scale from this drawing.
2. This drawing is to be read in conjunction with all relevant Architects and Engineers drawings and specifications.
3. The Architect's drawing has been used as a base for this plan. Please refer to the latest Site layout.

-  Indicates first flooding for events above 1 in 100 year and Overland Flood Route.
-  Indicates Emergency Access and Egress Route.



P1	23.08.21	SJC		Preliminary Issue
Rev	Date	By	Checked	Remarks

Project
Fulwood Drive
Golcar

Client
Armitage Developments UK Ltd.

Drawing
Overland Flood Routes and
Emergency Access and Egress
Routes

Number	1296-702	Rev	P1
Scale	1:200@A1	Drawn	SJC
Checked		Date	Aug 2021

INFORMATION
NOT FOR CONSTRUCTION.

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Fulwood Drive		Designed by Sarah Griggs Checked by
Micro Drainage		Network 2019.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.300	Add Flow / Climate Change (%)	0
Ratio R	0.250	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.300
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.173	4-8	0.027

Total Area Contributing (ha) = 0.200

Total Pipe Volume (m³) = 23.047

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	36.000	0.200	180.0	0.100	5.00	0.0	0.600	o	900	Pipe/Conduit	
1.001	8.200	0.950	8.6	0.100	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.26	179.500	0.100	0.0	0.0	0.0	2.33	1483.8	13.5
1.001	50.00	5.30	179.300	0.200	0.0	0.0	0.0	3.45	61.0	27.1

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	184.300	4.800	Open Manhole	2400	1.000	179.500	900				
S2	181.500	2.200	Open Manhole	2400	1.001	179.300	150	1.000	179.300	900	
EXG	179.700	1.350	Open Manhole	2400		OUTFALL		1.001	178.350	150	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	900	S1	184.300	179.500	3.900	Open Manhole	2400
1.001	o	150	S2	181.500	179.300	2.050	Open Manhole	2400

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	36.000	180.0	S2	181.500	179.300	1.300	Open Manhole	2400
1.001	8.200	8.6	EXG	179.700	178.350	1.200	Open Manhole	2400

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001	EXG	179.700	178.350	0.000	2400	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.300	Storm Duration (mins)	30
Ratio R	0.250		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S2, DS/PN: 1.001, Volume (m³): 31.3

Unit Reference	MD-SHE-0091-5000-2050-5000
Design Head (m)	2.050
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	179.300
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	5.0
Flush-Flo™	0.402	4.1
Kick-Flo®	0.813	3.3
Mean Flow over Head Range	-	3.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)						
0.100	2.9	1.200	3.9	3.000	6.0	7.000	8.9
0.200	3.8	1.400	4.2	3.500	6.4	7.500	9.2
0.300	4.0	1.600	4.5	4.000	6.8	8.000	9.5
0.400	4.1	1.800	4.7	4.500	7.2	8.500	9.8
0.500	4.0	2.000	4.9	5.000	7.6	9.000	10.0
0.600	3.9	2.200	5.2	5.500	7.9	9.500	10.3
0.800	3.3	2.400	5.4	6.000	8.3		
1.000	3.6	2.600	5.6	6.500	8.6		

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Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: 1.001

Invert Level (m) 181.100 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	130.0	130.0	0.500	0.0	154.8
0.400	130.0	154.8			

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.250
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.300 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	120 Winter	30	+0%	30/60 Summer				181.101
1.001	S2	120 Winter	30	+0%	1/15 Summer				181.101

PN	US/MH Name	Surcharged Flooded			Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Flow (l/s)	Flow (l/s)		
1.000	S1	0.701	0.000	0.01	8.7	SURCHARGED		
1.001	S2	1.651	0.000	0.09	4.7	SURCHARGED		

