

FLOOD RISK ASSESSMENT
HIGH STREET, HANGING HEATON
FOR
VISTRY PARTNERSHIP



45467-002

21 April 2021

FLOOD RISK ASSESSMENT
HIGH STREET, HANGING HEATON
FOR
VISTRY PARTNERSHIP

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EXECUTIVE SUMMARY

The project comprises the proposed development of a 1.72-hectare greenfield site for residential use.

The Environment Agency's Flood Map for Planning shows the site to lie within Zone 1. The site is not at significant risk of flooding from any source. In accordance with current Planning Practice Guidance 'Flood Risk and Coastal Change', sequential testing is not required.

The surface water flow route passing along the eastern border of the site is a likely water source to the unnamed watercourse north of the site. Surface water flow paths along the eastern border should be routed appropriately to prevent surface waters affecting neighbouring properties and the risk of removing feeder flow paths to the unnamed watercourses north of the site.

Surface water disposal is considered in accordance with the drainage hierarchy in Building Regulations Part H 2010 and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 80.

Infiltration type SuDS, such as soakaways, will not be viable on the site due to the presence of impermeable ground.

Surface water disposal will be to the Green Hill Beck, north west of the site attenuated to either greenfield rates or 3.5 l/s, subject to approval from the LLFA. Attenuation storage for rainfall events will be provided for up to the 1 in 100 year plus climate change event in proprietary below ground storage. The total estimated storage volume is to be confirmed following LLFA approval of the surface water discharge rate.

Foul effluent will discharge via gravity to the existing public combined sewer located in the western portion of the site.

Foul and surface water drainage systems will be offered for adoption to Yorkshire Water.

1.0 THE DEVELOPMENT AND NATIONAL PLANNING POLICY

1.1 Introduction

This Flood Risk Assessment has been prepared in accordance with current National Planning Policy Framework¹ and Planning Practice Guidance 'Flood Risk and Coastal Change'² on the instruction of Vistry Partnership. Any other parties using the information in this report do so at their own risk, unless previously approved in writing.

The project comprises the development of a 1.72-hectare greenfield site for residential use.

1.2 Site location and description

The site is located within Dewsbury and is centred on coordinates 426045, 423232 (Appendix 1).

The site is bounded by High Street to the west, residential gardens to the south-west and north west, with a petrol station located to the south. The northern boundary of the site is bounded with open farmland and the eastern boundary by mature trees.

The site is currently occupied by open farmland boarded by mature trees and hedgerows to the north and east, with the remains of two partitioning dry-stone walls and occasional tree across the central portions of the site.

The site falls from the south west to the north east from approximately 177.89 mAOD to 106.09 mAOD at an average gradient of 1 in 3 (Appendix 2).

Proposals are for 55 household properties with access from Challenge Way to the east of the site (Appendix 3).

¹ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

² <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

1.3 Environment Agency - Flood Map for Planning

The Environment Agency's Flood Map for Planning (Appendix 3) shows that the site lies within Zone 1 (low risk); land having a less than 1 in 1,000 annual probability of river flooding.



Figure 1 - Environment Agency's Flood Map for Planning

1.4 Kirklees Council Strategic Flood Risk Assessment

Kirklees Council's Strategic Flood Risk Assessment flood map records the site to be within Flood Zone 1 (Appendix 4).

1.5 National Planning Policy Framework

The National Planning Policy Framework (February 2019) sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process.

1.5.1 Sequential Test

Initially a Sequential Test is applied to the allocation of land suitable for development. The test is required for any development proposed in Flood Zone 2 or 3 (and occasionally also in Flood Zone 1 where there are flood risks present which are not identified on the Environment Agency's Flood Maps for Planning).

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites, appropriate for the proposed development, in areas with a lower probability of flooding.

The site lies within Zone 1 and this report confirms that the site is not at significant risk of potential flooding from any source, therefore the sequential test is not required.

1.5.2 Climate change

An issue emphasised in the Planning Policy Guidance is the requirement to take account of potential climate change effects. New development is generally accepted as having a 100 year design life for flood risk purposes. The Environment Agency's report 'Flood risk assessments: climate change allowances'³, published in February 2016, recommends a 20 to 40% increase in peak rainfall intensity is taken into account for small and urban catchments for design horizons up to 2115. For the purposes of this Flood Risk Assessment, a 30% increase in peak rainfall intensity has been used for assessing storage requirements; 30% being an average between the 'central' and 'upper end' of the data range given in the report. It is recommended that the potential effects of a peak rainfall increase of 40% are considered in detailed design.

³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

2.0 FLOOD RISK

2.1 Potential sources of flooding

The Environment Agency and Strategic Flood Risk Assessment maps are intended for general guidance on flood risk and it is also necessary to consider other, more detailed, sources in relation to local factors.

2.1.1 Fluvial

The nearest watercourses are two unnamed field drains located approximately 158 m north of the site, and another watercourse named Green Hill Beck is located 210m north-west of the site. There are no main rivers within the local vicinity of the site. Flood risk from this source is assessed as negligible.

2.1.2 Surface water

The Environment Agency surface water flood risk map (Figure 2) shows the majority of the site is at very low risk of surface water flooding. Very low risk corresponds to the unshaded areas of the map. There is a surface water flow route (Appendix 4), originating from High Street, south-west of the site identified as a low to medium risk area along the eastern boundary of the site orientated in a northern direction, originating on High Street to the south-west of the site.

Very low risk refers to land having less than a 1 in 1,000 annual exceedance probability of flooding (0.1% AEP). Low risk refers to land having between a 1 in 1,000 and 1 in 100 annual exceedance probability of flooding (0.1% - 1% AEP). Medium risk refers to land having between 1 in 100 and 1 in 30 annual exceedance probability of flooding (1% - 3.33% AEP).

The majority of surface water flooding is at risk of flood depths less than 300 with isolated patches in the eastern flow path at risk of flood depths between 600 and 900 mm indicative of localise low points.



Figure 2 - Environment Agency – Risk of surface water flooding map

2.1.3 Groundwater

Groundwater is a potential flood risk to areas which are low lying and on permeable ground or, occasionally, to areas of higher ground in the vicinity of springs. The Kirklees Council groundwater flooding susceptibility map shows the site to be at less than 25% (<25%) risk of groundwater emergence (Appendix 5).

2.1.4 Sewerage

The surrounding public sewer network is owned and maintained by Yorkshire Water. There is no public record of any flood risk to the site associated with these sewers.

2.2 Historic Flooding

The Kirklees Council SFRA historic flood map does not identify any historic flooding at the site (Appendix 5). The DEFRA historic flood map also records the site to be outside the historic flood extent (Appendix 7).

2.3 Residual flood risk

The site is not at significant risk of fluvial flooding.

There is a surface water flow route identified as a low to medium risk area along the eastern boundary of the site orientated in a northern direction, originating on High Street to the south-west of the site. This will be managed with the mitigation measures outlined below.

2.4 Flood Mitigation Measures

The ground levels on the site will be altered to raise depressions in the ground surfacing which will remove any surface water ponding.

The surface water flow route passing along the eastern border of the site is a likely water source to the unnamed watercourse north of the site. Surface water flow paths along the eastern border should be routed appropriately to prevent surface waters affecting neighbouring properties and the risk of removing feeder flow paths to the unnamed watercourses north of the site.

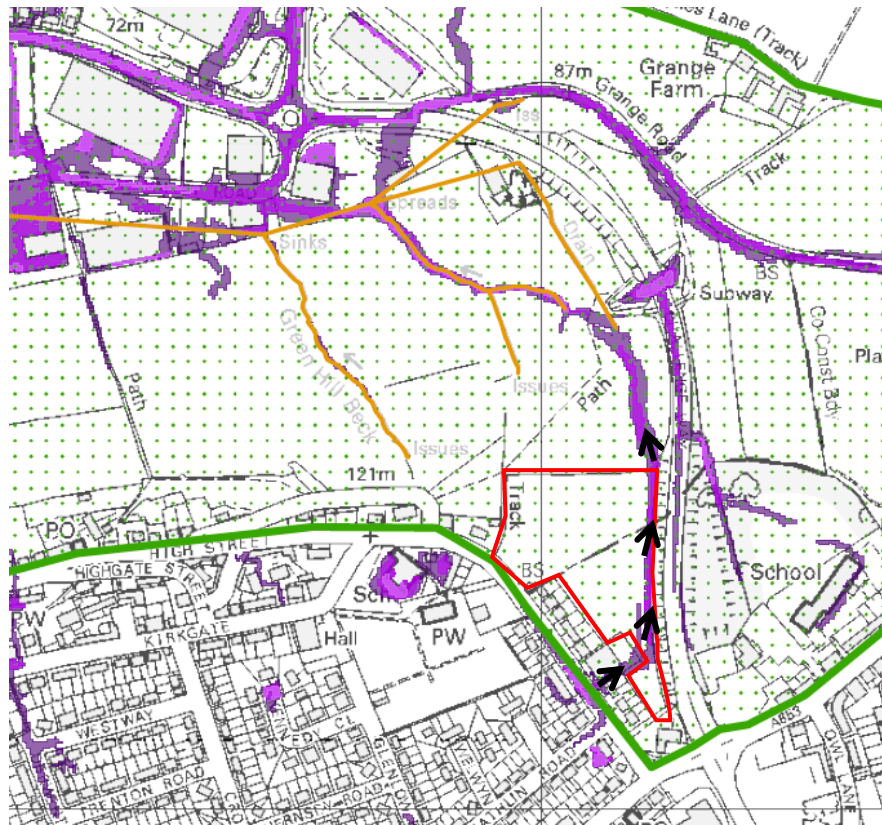


Figure 3 – Surface water flow path to northern watercourses

3.0 DRAINAGE STRATEGY

3.1 Existing drainage

Yorkshire Water sewer records (Appendix 7) show a 300 mm public combined sewer within the western boundary of the site. There is also a 225 mm public surface water sewer in High Street to the west of the site.

3.2 Yorkshire Water consultation

Pre-planning advice has been received from Yorkshire Water (Appendix 7); their letter reference W013951 dated 21st October 2020. The main points of the advice are summarised below.

- There is a 300 mm public combined sewer crossing and near to the site. No buildings or other obstructions are to be erected within 3 m, nor trees planted within 5 m of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer.
- Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extent to the points of discharge agreed.
- Foul water domestic waste can discharge to the 300 mm public combined sewer crossing the site.
- Following the surface water disposal hierarchy, surface water should look to drain either to soakaway or watercourse in the first instance.
- As a last resort, surface water may discharge to the 225 mm public surface water sewer located to the west of the site.
- Surface water discharge should be restricted to 3.5 l/s.

3.3 Kirklees Council (LLFA) consultation

Advice was received from Kirklees Council on 14th April 2021 regarding surface water discharge requirements and restrictions (Appendix 5). A summary of the response is below:

- Soakaways are discouraged to avoid re-emergence issues on slopes steeper than 1 in 20.
- There are three watercourses/ field drains north of the site. Further investigations would be needed to assess the suitability of a watercourse connection.
- The Green Hill Beck (western watercourse) has a surface water public sewer connected to it which borders the site for part of its route. Contours suggest that a gravity connection to this would not be possible.
- There is a history of the Green Hill Beck flooding at the entry of the culvert on the industrial estate.
- There is a possibility that the watercourses extend up into the site, therefore further investigations are needed. Surface water flood maps show a risk along the sites eastern boundary leading to the central and eastern watercourse. This area should have trial holes to find possible enclosed section and must be kept clear of property.
- A discharge rate of 3.5 l/s presents a realistic scenario therefore which may be revised upwards on presentation of further information.

Additional emails were sent to Kirklees Council on 19th April 2021 to determine whether a greenfield runoff rate of 5 l/s will be accepted by the LLFA. A response is pending.

The Kirklees Council SFRA surface water flood map also shows the site to lie within an indicative Critical Drainage Area (Appendix 5).

3.4 Environment Agency consultation

The Environment Agency have been contacted on 19th March 2021 to determine if the watercourses near the site are suitable for surface water discharge and to establish any surface water discharge restrictions that may apply. A response is pending.

3.5 Ground conditions

The British Geological Survey maps record bedrock geology Pennine Middle Coal Measures Formation - Mudstone, Siltstone and Sandstone.

A borehole log (SE22SE812) located approximately 100 m south of the site records 1.5 m of made ground overlying clay, sandstone and shale.

A site investigation has been conducted by Arc Environmental (Phase 2 ground investigation report: 20-431). This records the site as having between 0.2 to 1.6 m of made ground overlying 0.2 to 2.7 m of clay.

3.6 Greenfield Calculations

Greenfield runoff for the site is calculated using the ReFH2.3 statistical rainfall-runoff method with FEH 2013 rainfall data using the default catchment characteristics (Appendix 8).

Table 1 shows flow rates for varying return periods for the site as whole (l/s) and per unit area (l/s/ha).

Greenfield runoff				
Catchment	Return period			
	1 in 1 yr	1 in 2 yr	1 in 30 yr	1 in 100 yr
Lower Calder	4.995 l/s	5.693 l/s	12.872 l/s	17.178 l/s
	2.983 l/s/ha	3.349 l/s/ha	7.572 l/s/ha	10.104 l/s/ha

Table 1: Greenfield runoff rates

3.7 Drainage hierarchy

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2010⁴ and Planning Practice Guidance 'Reducing the causes and impacts of flooding', paragraph 80 reference ID 7-080-20150323. Disposal via SuDS methods should be considered as the first option. Disposal to the public sewer should be considered only when SuDS methods and disposal to the watercourse are shown to be unsuitable.

3.7.1 Sustainable Drainage Systems (SuDS)

SuDS methods include water infiltration systems such as soakaways, basins and filter strips, together with swales, pervious pavements, detention basins, ponds and other wetland solutions. The various methods are considered in detail in The SuDS Manual (CIRIA C753).

Infiltration type SuDS such as soakaways are not possible due to the impermeable ground conditions.

Other SuDS methods may be applicable and their use is summarised in the appended SuDS checklist (Appendix 8).

3.7.2 Watercourse

The nearest watercourses are two unnamed field drains located approximately 158 m north of the site, and another watercourse named Green Hill Beck located 210 m north-west of the site. The watercourse depths are required to determine whether discharging to a watercourse is a viable option. Approval from the LLFA is also required.

3.7.3 Public sewer

There is a 300 mm public combined sewer within the western boundary of the site. There is also a 225 mm public surface water sewer in High Street to the west of the site. Discharge to the sewer will require a request for new connection.

⁴ <https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h>

3.8 Proposals for surface water disposal

The final design will need the approval of the relevant statutory bodies but will broadly follow these principles:

- Surface water disposal will be via gravity to the Green Hill Beck north west of the site, subject to approval from the LLFA.
- Surface water discharge will be attenuated to either greenfield rates or 3.5 l/s as a minimum practicable rate, subject to approval from the LLFA.
- Attenuation storage for rainfall events will be provided for up to the 1 in 100 year plus climate change event in proprietary below ground storage. The total estimated storage volume is to be confirmed following LLFA approval of the surface water discharge rate.
- The surface water drainage system will be offered for adoption to Yorkshire Water.

3.9 SuDS Maintenance

Maintenance of the SuDS systems proposed for this site will be in accordance with the recommendations within The SuDS Manual (CIRIA C753, 2015) as stipulated in Table 2, along with any recommendations provided by suppliers and product specifications.

<u>SuDS System</u>	<u>ACTION</u>	<u>FREQUENCY</u>
Sub-surface storage	Remove debris from catchment surface where it may affect performance	Monthly
	If the system allows rainfall infiltration from above, check filter surface for blockages. Remove and replace infiltration material if deemed necessary.	Annually
	Remove sediment from pre-treatment structures	Annually or as required
	Inspect inlets, outlets, vents and overflows to ensure they are operating as designed	Annually
	Remedial work to repair inlets, outlets, overflows and vents	As required
	Survey inside of storage area for sediment build up. Remove sediment if required.	As required

Table 2: SuDS Maintenance

3.10 Proposals for foul disposal

Foul effluent will discharge via gravity to the existing public combined sewer located in the western portion of the site.

3.11 Residual flood risk

There is a potential flood risk to site occupiers and to others from surface water runoff as a result of developing the site. The residual risk can be managed by the general flood mitigation measures outlined below.

3.12 Mitigation measures

The proposed surface water drainage system is designed to current best practice and to the standards laid out in the publication 'Design and Construction Guidance for foul and surface water sewers' and Building Regulations Part H 2010.

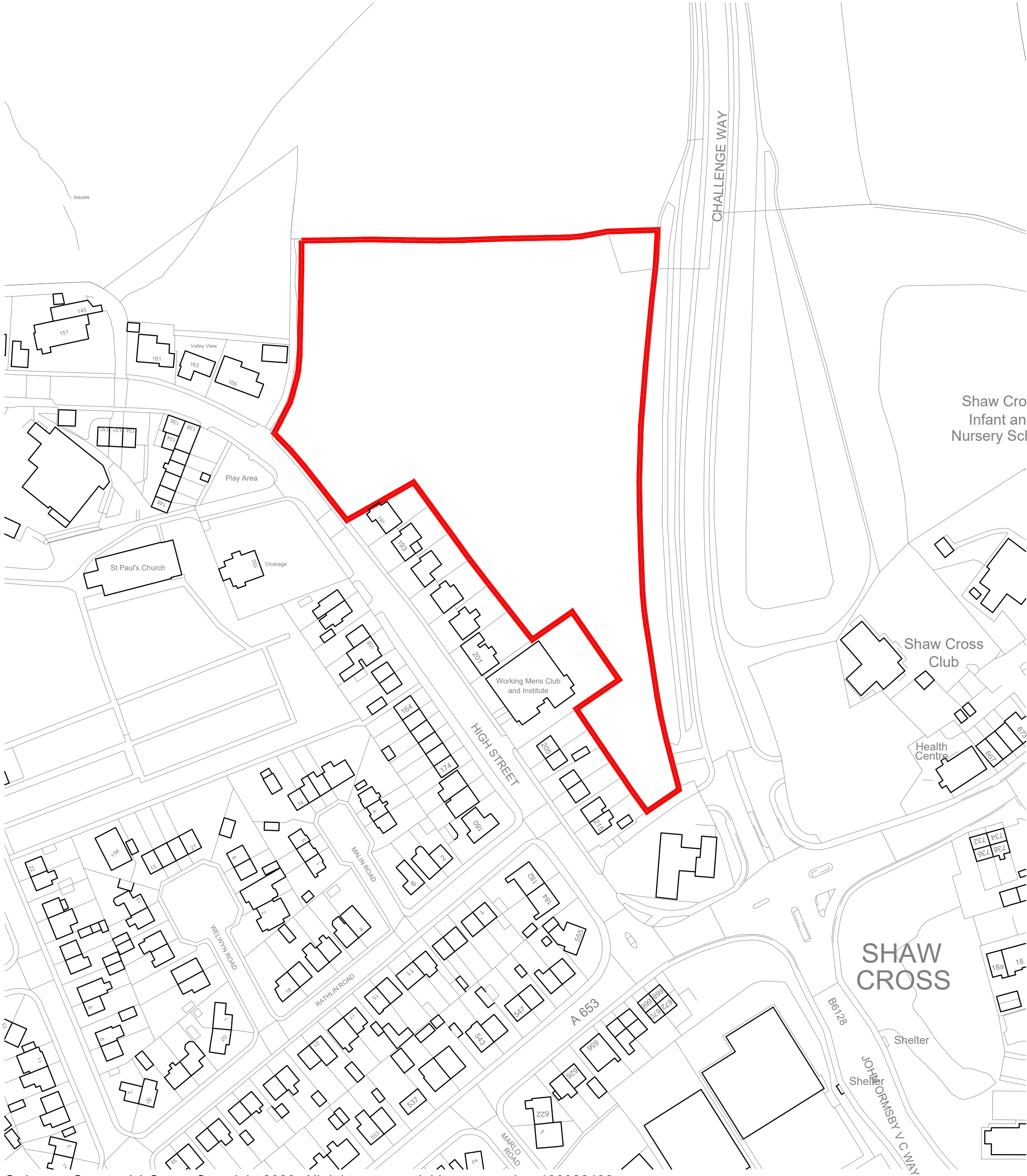
In the event of surface water exceedance during extreme rainfall events the site is laid out so that surface water runoff is directed away from houses, including those on neighbouring streets.

4.0 CONCLUSIONS

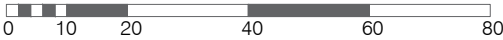
1. The site is within Flood Zone 1 and is not at significant risk of flooding from any source.
2. The surface water flow route passing along the eastern border of the site is a likely water source to the unnamed watercourse north of the site. Surface water flow paths along the eastern border should be routed appropriately to prevent surface waters affecting neighbouring properties and the risk of removing feeder flow paths to the unnamed watercourses north of the site.
3. Surface water disposal will be via gravity to the Green Hill Beck north west of the site, subject to approval from the LLFA.
4. Surface water discharge will be attenuated to either greenfield rates or 3.5 l/s as a minimum practicable rate, subject to approval from the LLFA.
5. Attenuation storage for rainfall events will be provided for up to the 1 in 100 year plus climate change event in proprietary below ground storage. The total estimated storage volume is to be confirmed following LLFA approval of the surface water discharge rate.
6. Foul effluent will discharge via gravity to the existing public combined sewer located in the western portion of the site.
7. Foul and surface water drainage systems will be offered for adoption to Yorkshire Water.
8. The level of risk and safeguards available are considered appropriate to this class of development.

APPENDICES

APPENDIX 1



Scale Bar (Meters)



This layout is based on Ordnance Survey data

The red line boundary indicates the land to which the Pre-Application Enquiry relates and is based on information provided by Vistry Partnerships Yorkshire.

This plan shall not be used to define legal boundaries.

All legal boundaries shall be confirmed by the Applicant / land-owner.

REV	DATE	NOTES	CHK	
Client				
VISTRY PARTNERSHIPS (YORKSHIRE)				
Project				
HANGING HEATON, DEWSBURY				
Drawing Title				
LOCATION PLAN				
Drawn	Checked	Paper Size	Scale	Date
TS	LL	A2	1:1250	SEPT 2020
Project No.			Drawing No.	Revision
20520			0002	00

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APPENDIX 2

APPENDIX 3



Type	N°	Area (sqft)	Area (sqm)	Total sqft
Open Market Units				
CARTWRIGHT - 2 BED 3 PERSON	7	769	71.4	5,383
WYATT - 2 BED (plus study) 4 PERSON	10	872	81.0	8,720
ELMSLIE - 3 BED 5 PERSON	14	933	86.8	13,062
BECKET - 3 BED 5 PERSON	9	1025	95.2	9,225
GOODRIDGE - 4 BED 6 PERSON	2	1111	103.2	2,222
MYLNE - 4 BED 5 PERSON	2	1136	105.5	2,272
Total	44			40,884

Affordable Units *				
ATKINS - 2 BED 3 PERSON	5	763	70.9	3,815
WORSLEY - 1 BED (GF) 2 PERSON	2	538	50.0	1,076
WORSLEY - 1 BED (1st) 2 PERSON	2	667	61.9	1,334
ELMSLIE - 3 BED 5 PERSON	2	933	86.8	1,866
Total	11			8,091

Grand Total	55			48,975
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Site Area:		Hectares	Acres
Site Area (gross):		1.72	4.25
Site Area (net):		1.30	3.21
Site Area - POS & attenuation area:		0.20	0.49
Site Area - Other non-developable:		0.22	0.54
Density excluding all non-dev areas (plots/net area):		42.31	17.13
Coverage (ft²/net area):		37,673	15,257

Site boundary (Based on Information provided by Vistry Partnerships)

Site boundary (net)

Sewer Easement

Water Mains Easement

Easements shown are subject to the approval of the statutory undertaker

This layout is based on a Topographical Survey provided by Vistry Partnerships (Yorkshire)

1.8m High Close Boarded Fence

1.8m High Open Panel Fence

Scale Bar (Meters)

0 1 2 3 4 5 10 20 30 40

04	14.04.21	Plots 37 & 38 revised	TS
03	13.04.21	Plots 37 & 38 revised	TS
02	08.04.21	Revised to client sketch 01.04.21	TS
01	26.03.21	Revised to updated engineering proposals	TS

REV	DATE	NOTES	CHK
Client			

VISTRY PARTNERSHIPS (YORKSHIRE)

Project

HANGING HEATON, DEWSBURY

Drawing Title

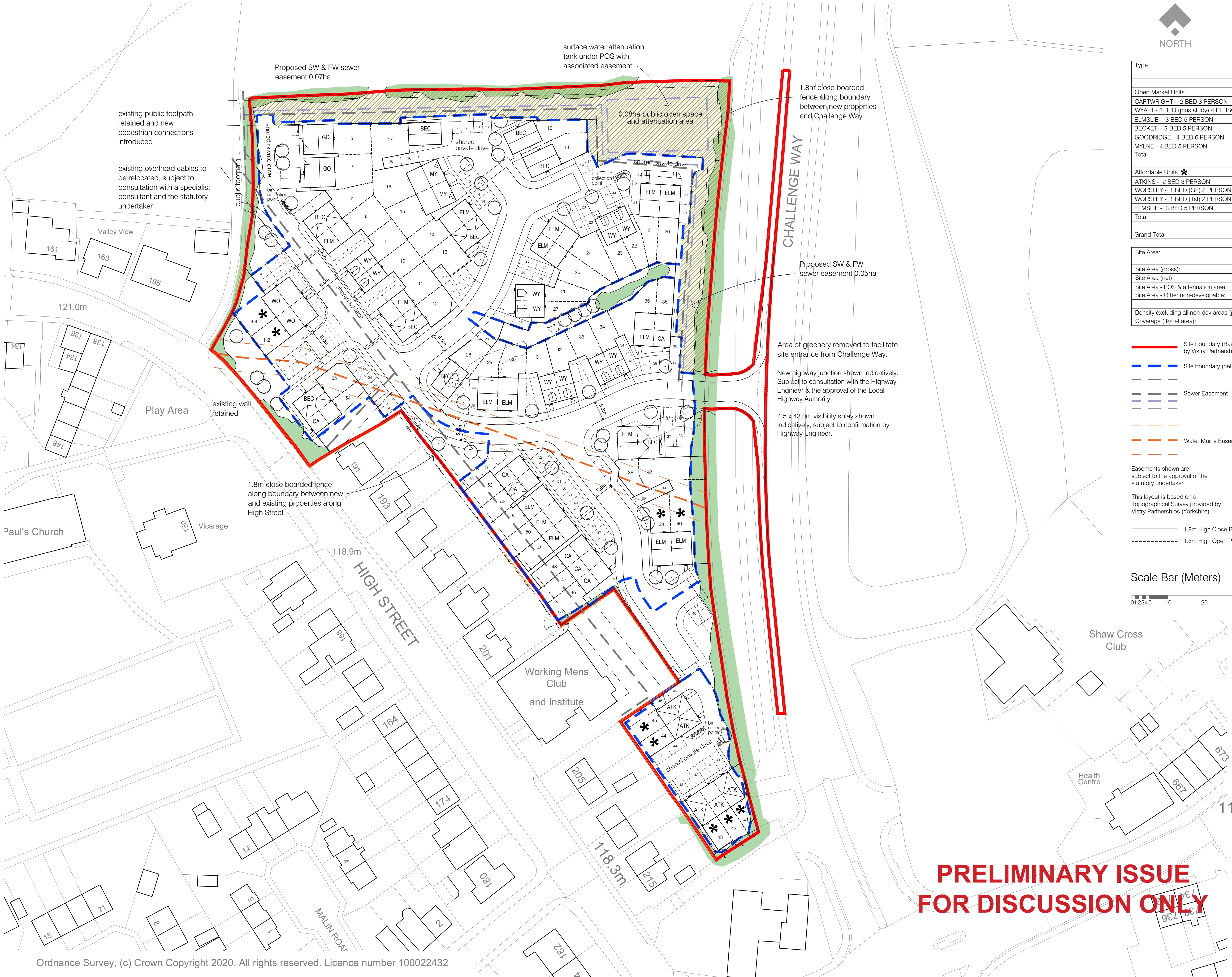
SITE PLAN

Drawn	Checked	Paper Size	Scale	Date
TS	LL	A1	1:500	MARCH 2020
Project No.	Drawing No.	Revision		
20520	301	04		

CORSTORPHINE + WRIGHT
ARCHITECTS

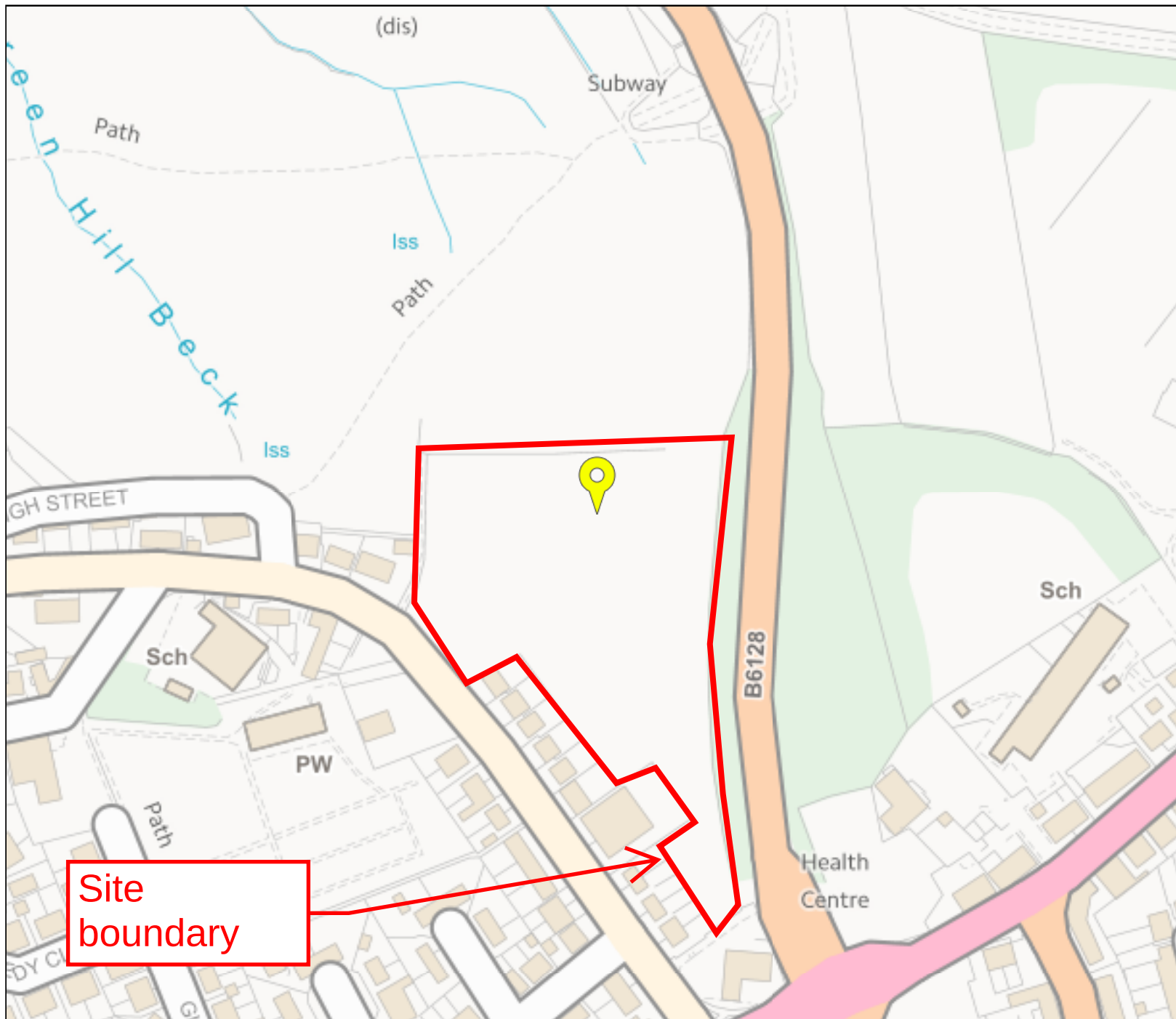
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**PRELIMINARY ISSUE
FOR DISCUSSION ONLY**

APPENDIX 4



Flood map for planning

Your reference
Hanging Heaton

Location (easting/northing)
426045/423271

Scale
1:2500

Created
16 Mar 2021 11:03

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

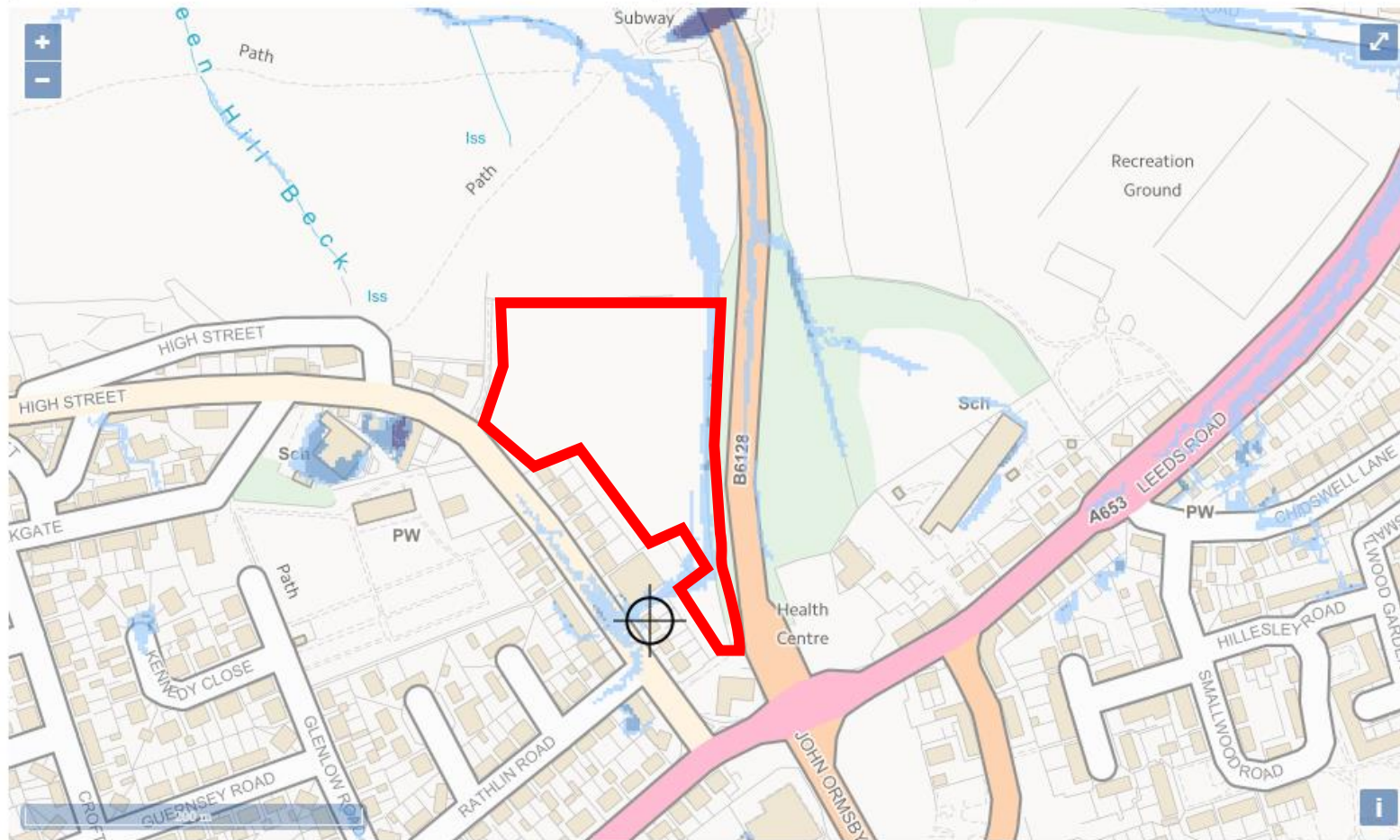
0 20 40 60m

Flood risk

Low risk: depth

Location

Enter a place or postcode



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

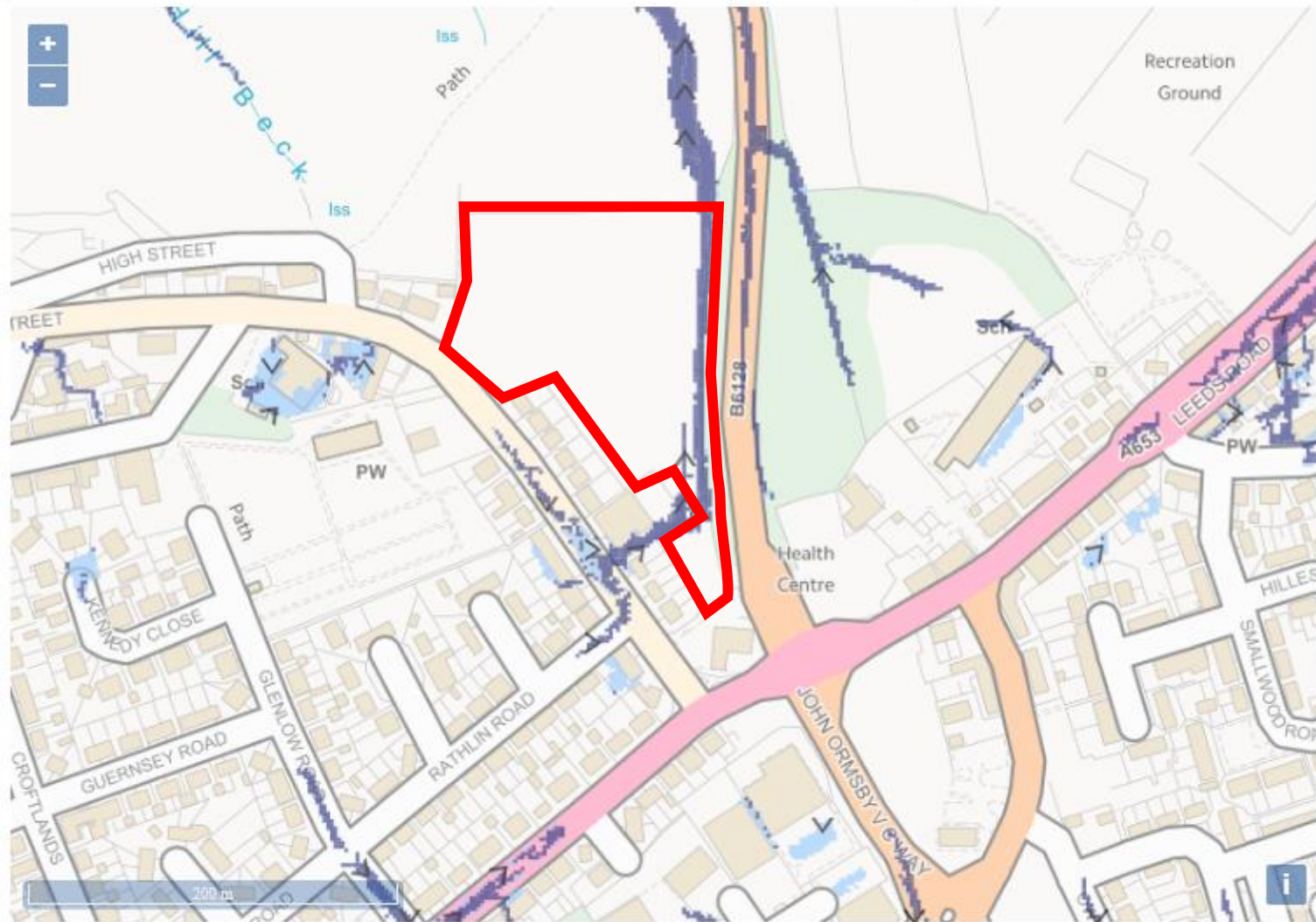
Flood risk

Low risk: velocity



Location

WF17 6LP



Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

Over 0.25 m/s Less than 0.25 m/s Direction of water flow

APPENDIX 5

Jessica Stevenson-Steels

From: Paul Farndale <Paul.Farndale@kirklees.gov.uk> on behalf of Paul Farndale
Sent: 14 April 2021 13:21
To: Jessica Stevenson-Steels
Subject: FW: 45467-High Street- Hanging Heaton- FRA and Drainage Strategy [Filed 14 Apr 2021 13:45]
Attachments: 45467-EA SW flood map.pdf; 45467- Location Plan.pdf
Follow Up Flag: Follow up
Flag Status: Flagged

Hello Jessica,

Land falls south to north and looks to be steeper than 1 in 20 in places. We tend to discourage soakaway as a rule of thumb due to re-emergence issues which cannot be readily predicted in our experience.

There are 3 watercourses/field drains shown to the north. It is unclear and would need investigation as to the suitability of connection to these. The downstream culverted sections under the Grange Road Industrial Estate are incompletely mapped and would need further investigation.

The western of the three watercourse does have a surface water public sewer connected to it which borders the site for part of its route. It is not clear whether you have permission to cross 3rd party land to these watercourse, can requisition to the surface water sewer to guarantee a gravity connection. Where the sewer borders the site, contours suggest a gravity connection will not be possible.

The wester watercourse is named as Green Hill Beck and there is a history of flooding as it enters culvert on the named industrial estate.

There is a possibility that these watercourses extend up into site and this must be investigated. Surface water flood risk maps show a risk along the site's eastern section leading north to the central watercourse and eastern drain. This area should have trial holes to find possible enclosed sections and must be kept clear of property and curtilage. A decision on other uses can be taken once the constraints are known.

In terms of discharge rates, I would assume a minimum of 3.5l/s at this moment in time pending investigation on suitability. If one part of the land naturally does not fall to one of the three watercourse, that area will not be included in a greenfield calculation. It is quite possible therefore that most suitable of the three watercourse may not have this area naturally drain to it. All three are likely to converge further north. 3.5l/s presents are realistic scenario therefore which may be revised upward on presentation of further information.

Kind regards,

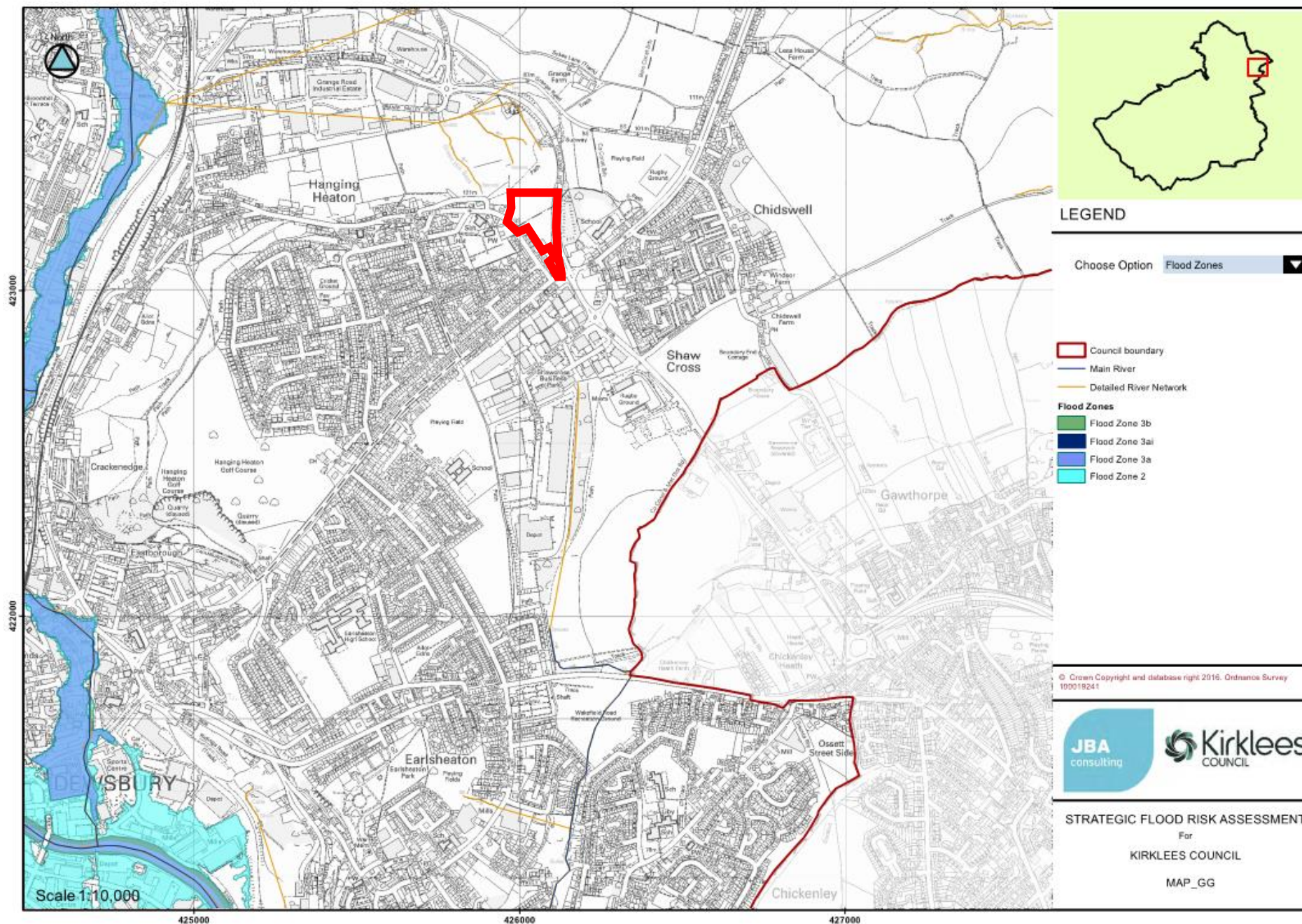
Paul Farndale

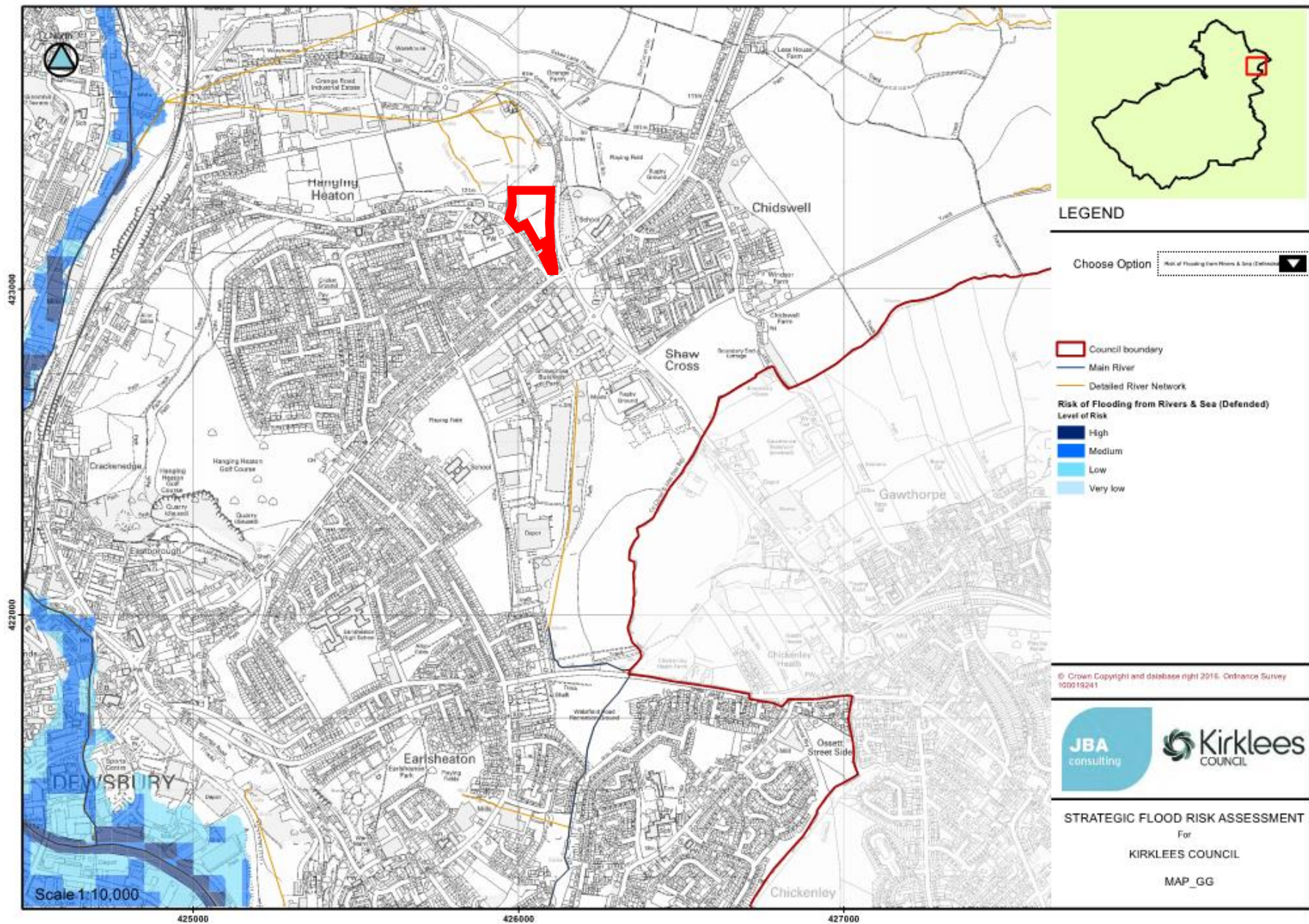
From: Jessica Stevenson-Steels <jessica.stevenson-steels@eastwoodandpartners.com>
Sent: 18 March 2021 17:11
To: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Subject: 45467-High Street- Hanging Heaton- FRA and Drainage Strategy

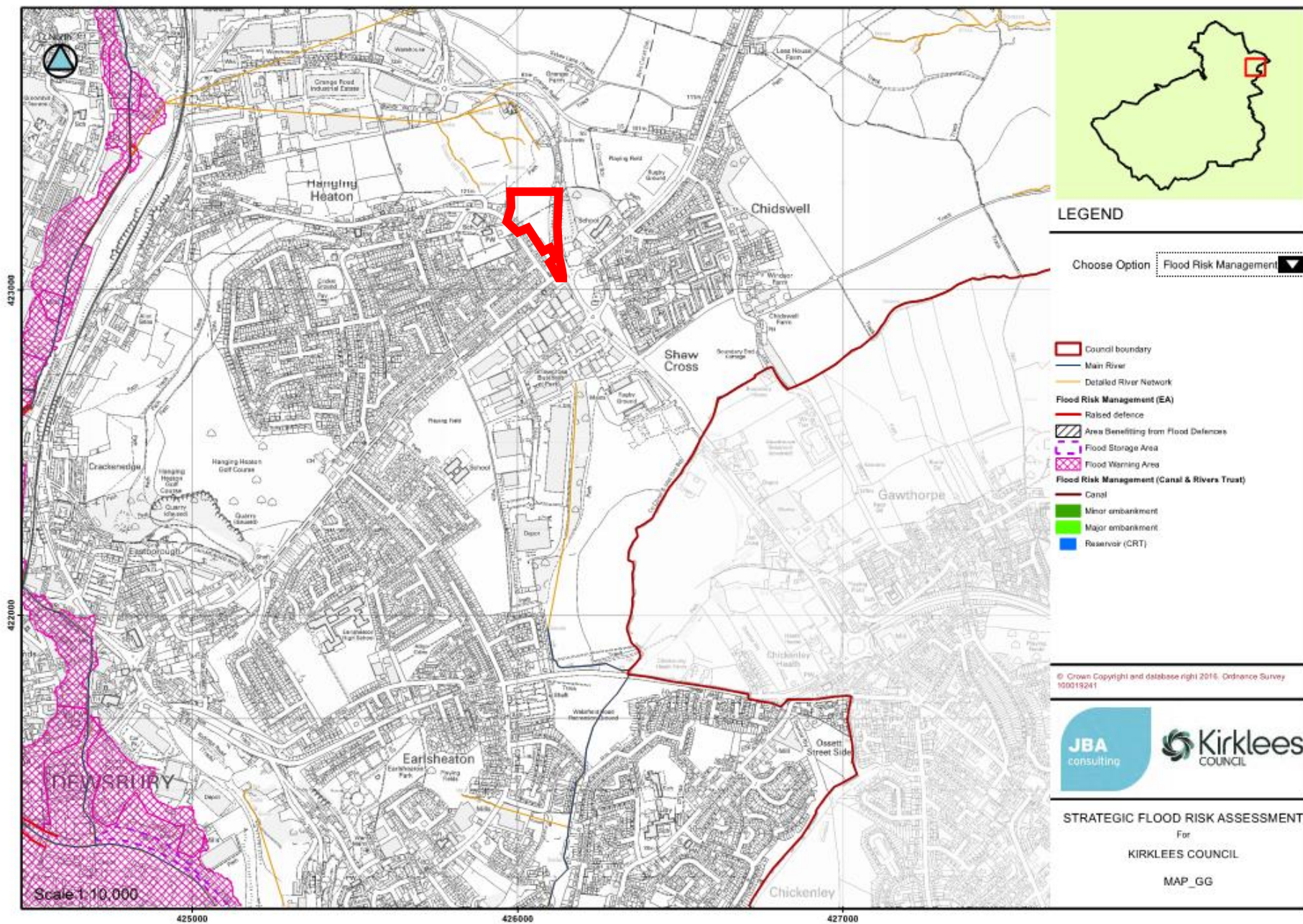
Dear Paul,

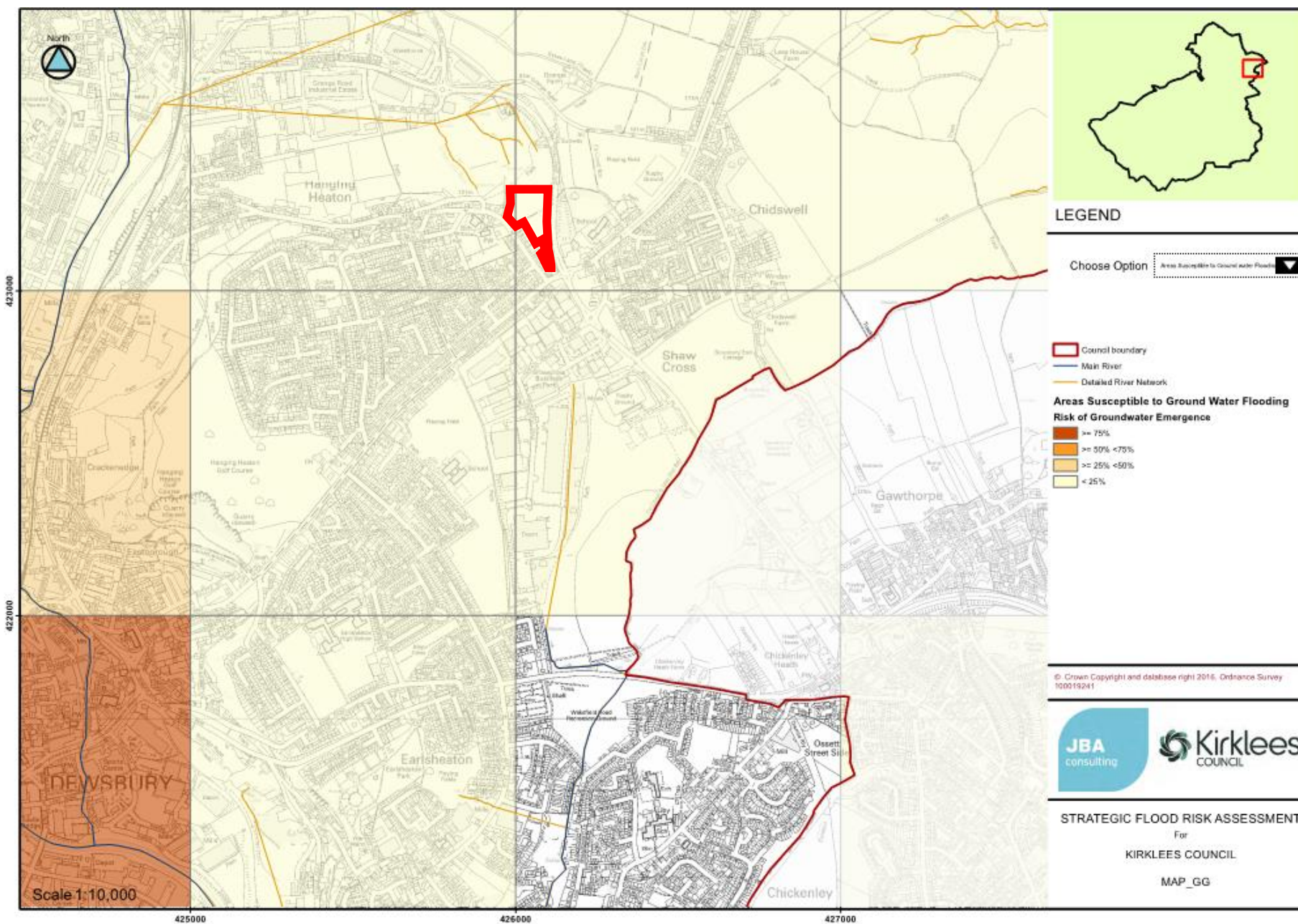
I'm producing a Flood Risk Assessment and Drainage Strategy for a site off High Street, Hanging Heaton, WF17 6LP (grid ref: 426045, 423271). Please see attached location plan.

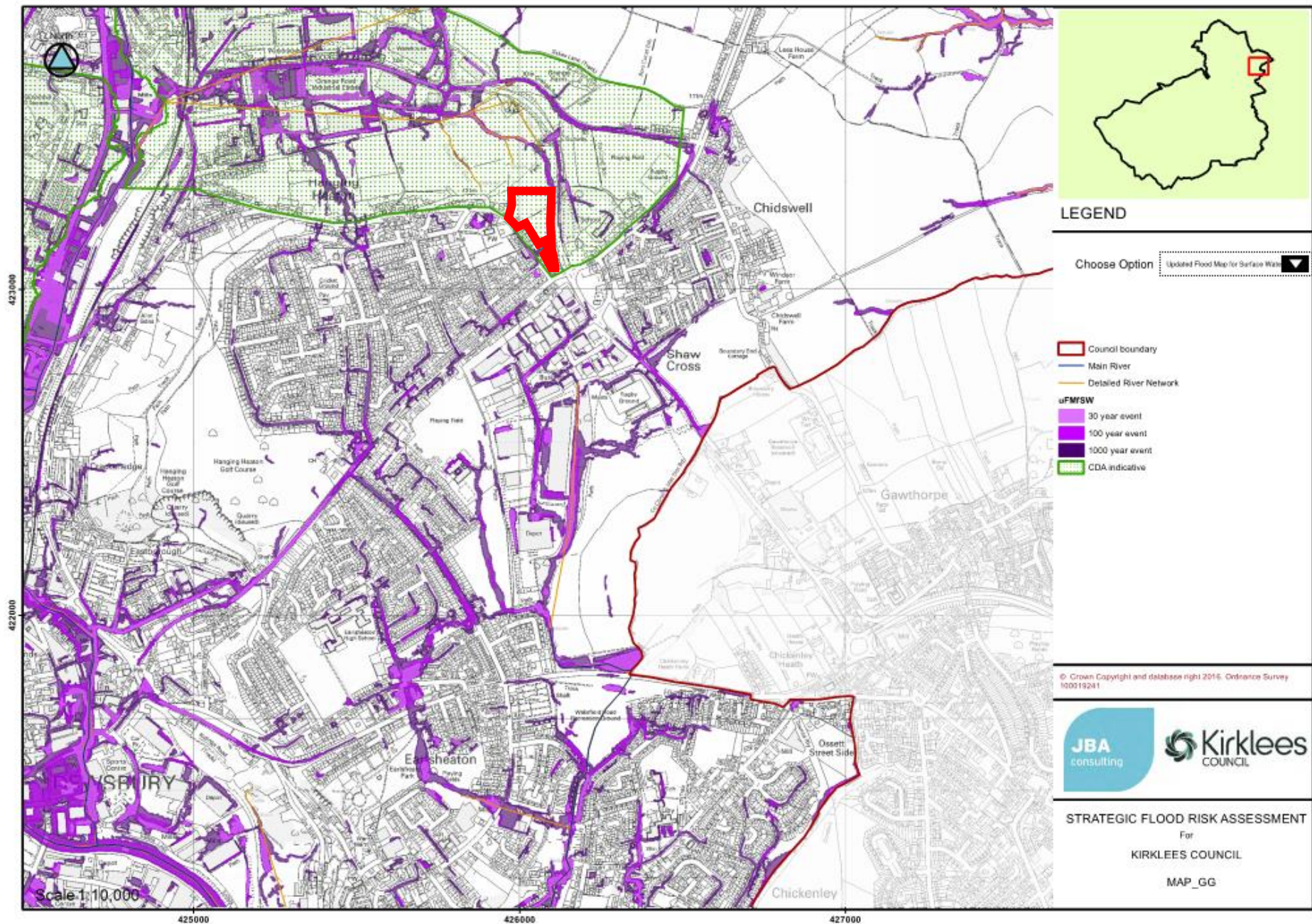
Please can you advise on any surface water discharge requirements or restrictions that the LLFA have. In addition, please can you provide details of any historic flooding and surface water flow routes through the site.











APPENDIX 6



Layer List

Operational layers

▼ ☒ HistoricFloodMap

▼ ☒ Historic_Flood_Map



APPENDIX 7



YorkshireWater

**Ms J Stevenson-Steels
Eastwood & Partners
St Andrew's House
23 Kingfield Road
Sheffield
S11 9AS**

**Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY**

Tel: 0345 120 8482

Fax:

**Your Ref:
Our Ref: W013951**

**Email:
technical.sewerage@yorkshirewater.co.uk**

**For telephone enquiries ring:
Chris Roberts on 0345 120 8482**

21st October 2020

Dear Ms Stevenson-Steels,

High Street, Hanging Heaton, WF17 6DT – Pre-Planning Sewerage Enquiry U007794

Thank you for your recent enquiry. Our charge of £157.00 will be added to your account with us, reference EPL039. You will receive an invoice for your account in due course.

Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Existing Infrastructure

There is a 300 mm diameter public combined water sewers recorded crossing and near to the site. No buildings, or other obstructions, are to be erected within 3 (three) metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 300 mm diameter public combined sewer recorded crossing the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.



YorkshireWater

As a last resort and subject to providing satisfactory evidence as to why the other methods of surface water disposal have been discounted, curtilage surface water may discharge to the 225 mm diameter public surface water recorded to the west of the site.

The surface water discharge from the site to be restricted to not greater than 3.5 (three point five) litres/second. This permission is not an acceptance in respect to any planning conditions imposed under the Grant of Planning Permission.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

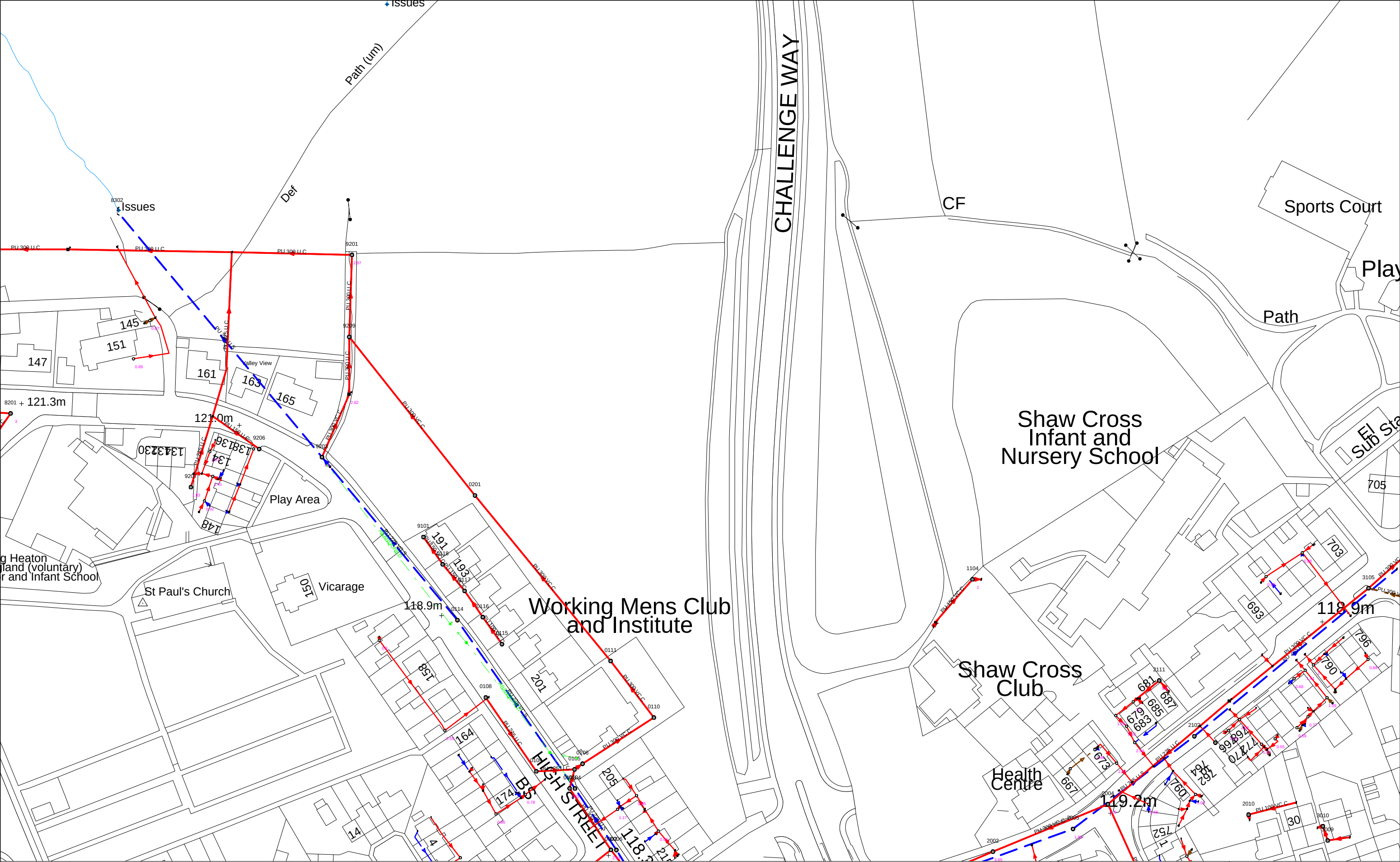
An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Development Services Technician



425927 : 423131	 Yorkshire Water Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582	Map Name : SE2523SE	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.	
			Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS			
			(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432	Date Req : 21/10/2020, 14:32:31			Date Gen : 21/10/2020, 14:33:09
				Source : Sewer Network Enquiry			

APPENDIX 8

SUDS Type	SUDS Technique	Description	Suitable	Comments
Source Control	Green roof	Vegetated roof that reduces runoff volume and rate	No	Expected planning requirement for traditional pitched roofs to match neighbouring housing.
	Rainwater harvesting/rainwater butts	Rainwater is stored and re-used	No	Individual storage tank capacity unlikely to meet volume required. Individual water butts can be used for garden watering.
	Permeable paving	Paving which allows inflow of rainwater into underlying construction/soil	Possible	May be suitable for private drives. Private permeable paving areas could provide limited infiltration within the underlying construction material.
Infiltration	Soakaway	Pit or trench which stores and disposes of water to the ground	No	Presence of impermeable ground (clay).
	Filter Drain	Trench which conveys and/or disposes of water to the ground.	No	Presence of impermeable ground (clay).
	Infiltration Basin	Shallow basin which stores and disposes of water to the ground	No	Presence of impermeable ground (clay). Lack of suitable open space.
Conveyance	Swale	Shallow vegetated depression which conducts and retains water	No	Difficulties of adoption and lack of space.
Detention	Subsurface storage	Traditional underground pipes, tank storage, or modular systems	Yes	Area available on site for an attenuation tank.
	Detention Basin	Normally dry but may have small permanent water pools at the inlet and outlet. They can function as POS	No	Poor infiltration rate due to clay resulting in residual water and siltation in the basin. Inefficient use of POS.
	Pond	Permanent body of water	No	Lack of suitable public open space.
	Wetland	Permanent body of shallow water or marsh	No	

UK Design Flood Estimation

Generated on Friday, April 16, 2021 9:25:53 AM by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 30AE-9DFC

Site name: FEH_Point_Descriptors_426043_423271

Easting: 426043

Northing: 423271

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH 2013 model (mm):	16.37	Total runoff (ML):	0.06
Total Rainfall (mm):	10.71	Total flow (ML):	0.18
Peak Rainfall (mm):	3.62	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	108.35	No
Cmax (mm)	349.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.04 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	36.87 [28.52]	Yes
BR	2.07	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.4355	0.0000	0.1353	0.0000	0.000524	0.000524
00:30:00	0.9746	0.0000	0.3048	0.0000	0.000518	0.000543
01:00:00	2.1370	0.0000	0.6777	0.0001	0.000513	0.000644
01:30:00	3.6194	0.0000	1.1777	0.0004	0.000514	0.000931
02:00:00	2.1370	0.0000	0.7129	0.0010	0.000527	0.00157
02:30:00	0.9746	0.0000	0.3295	0.0020	0.000562	0.00255
03:00:00	0.4355	0.0000	0.1481	0.0030	0.000625	0.00363
03:30:00	0.0000	0.0000	0.0000	0.0038	0.000712	0.00455
04:00:00	0.0000	0.0000	0.0000	0.0042	0.000814	0.005
04:30:00	0.0000	0.0000	0.0000	0.0040	0.000917	0.00488
05:00:00	0.0000	0.0000	0.0000	0.0034	0.00101	0.00444
05:30:00	0.0000	0.0000	0.0000	0.0028	0.00108	0.0039
06:00:00	0.0000	0.0000	0.0000	0.0022	0.00114	0.00338
06:30:00	0.0000	0.0000	0.0000	0.0018	0.00118	0.00298
07:00:00	0.0000	0.0000	0.0000	0.0014	0.00121	0.00263
07:30:00	0.0000	0.0000	0.0000	0.0011	0.00123	0.0023
08:00:00	0.0000	0.0000	0.0000	0.0008	0.00124	0.00199
08:30:00	0.0000	0.0000	0.0000	0.0005	0.00124	0.00169
09:00:00	0.0000	0.0000	0.0000	0.0002	0.00123	0.00145
09:30:00	0.0000	0.0000	0.0000	0.0001	0.00122	0.0013
10:00:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.00123
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000994	0.000994

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00098	0.00098
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000967	0.000967
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000954	0.000954
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000941	0.000941
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000929	0.000929
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000916	0.000916
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000904	0.000904
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000892	0.000892
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00088	0.00088
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000868	0.000868
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000856	0.000856
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000833	0.000833
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000822	0.000822
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000811	0.000811
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0008	0.0008
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000779	0.000779
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000768	0.000768
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000758	0.000758
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000748	0.000748
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000728	0.000728
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000718	0.000718
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000708	0.000708
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000699	0.000699
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000689	0.000689
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00068	0.00068
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000671	0.000671
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000662	0.000662
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000653	0.000653
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000644	0.000644
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000635	0.000635
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000627	0.000627
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000618	0.000618
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00061	0.00061

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000602	0.000602
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000586	0.000586
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000578	0.000578
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00057	0.00057
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000562	0.000562
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000555	0.000555
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000547	0.000547
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00054	0.00054
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000533	0.000533

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.41	No
BFIHOST19	0.44	No
PROPWET (mm)	0.32	No
SAAR (mm)	700	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, April 16, 2021 9:25:22 AM by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 30AE-9DFC

Site name: FEH_Point_Descriptors_426043_423271

Easting: 426043

Northing: 423271

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 model (mm):	18.78	Total runoff (ML):	0.07
Total Rainfall (mm):	12.29	Total flow (ML):	0.21
Peak Rainfall (mm):	4.15	Peak flow (m ³ /s):	0.01

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	108.35	No
Cmax (mm)	349.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.04 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	36.87 [28.52]	Yes
BR	2.05	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.4996	0.0000	0.1553	0.0000	0.000524	0.000524
00:30:00	1.1183	0.0000	0.3501	0.0000	0.000518	0.000546
01:00:00	2.4519	0.0000	0.7802	0.0002	0.000513	0.000663
01:30:00	4.1528	0.0000	1.3607	0.0005	0.000515	0.000995
02:00:00	2.4519	0.0000	0.8265	0.0012	0.000531	0.00173
02:30:00	1.1183	0.0000	0.3827	0.0023	0.000573	0.00286
03:00:00	0.4996	0.0000	0.1721	0.0035	0.000644	0.00411
03:30:00	0.0000	0.0000	0.0000	0.0044	0.000745	0.00517
04:00:00	0.0000	0.0000	0.0000	0.0048	0.000863	0.00569
04:30:00	0.0000	0.0000	0.0000	0.0046	0.000981	0.00556
05:00:00	0.0000	0.0000	0.0000	0.0040	0.00109	0.00506
05:30:00	0.0000	0.0000	0.0000	0.0033	0.00117	0.00443
06:00:00	0.0000	0.0000	0.0000	0.0026	0.00124	0.00384
06:30:00	0.0000	0.0000	0.0000	0.0021	0.00128	0.00336
07:00:00	0.0000	0.0000	0.0000	0.0016	0.00132	0.00296
07:30:00	0.0000	0.0000	0.0000	0.0012	0.00134	0.00258
08:00:00	0.0000	0.0000	0.0000	0.0009	0.00135	0.00222
08:30:00	0.0000	0.0000	0.0000	0.0005	0.00135	0.00188
09:00:00	0.0000	0.0000	0.0000	0.0003	0.00135	0.0016
09:30:00	0.0000	0.0000	0.0000	0.0001	0.00133	0.00143
10:00:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00134
10:30:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
13:30:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
16:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
20:00:00	0.0000	0.0000	0.0000	0.0000	0.001	0.001
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00099	0.00099
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000977	0.000977
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000964	0.000964
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000951	0.000951
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000938	0.000938
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000926	0.000926
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000913	0.000913
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000901	0.000901
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000889	0.000889
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000877	0.000877
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000865	0.000865
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000842	0.000842
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00083	0.00083
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000819	0.000819
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000808	0.000808
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000797	0.000797
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000787	0.000787
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000776	0.000776
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000765	0.000765
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000755	0.000755
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000745	0.000745
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000735	0.000735
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000725	0.000725
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000715	0.000715
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000706	0.000706
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000696	0.000696
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000687	0.000687
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000678	0.000678
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000659	0.000659
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00065	0.00065
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000642	0.000642
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000633	0.000633
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000625	0.000625
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000616	0.000616
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000608	0.000608
39:00:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000592	0.000592
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000584	0.000584
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000576	0.000576
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000568	0.000568
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00056	0.00056
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000553	0.000553
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000545	0.000545
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000538	0.000538
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000531	0.000531

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.41	No
BFIHOST19	0.44	No
PROPWET (mm)	0.32	No
SAAR (mm)	700	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, April 16, 2021 9:26:14 AM by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 30AE-9DFC

Site name: FEH_Point_Descriptors_426043_423271

Easting: 426043

Northing: 423271

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 10 year

Summary of results

Rainfall - FEH 2013 model (mm):	32.48	Total runoff (ML):	0.12
Total Rainfall (mm):	21.25	Total flow (ML):	0.35
Peak Rainfall (mm):	7.18	Peak flow (m ³ /s):	0.01

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	108.35	No
Cmax (mm)	349.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.04 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	36.87 [28.52]	Yes
BR	1.94	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.8639	0.0000	0.2689	0.0000	0.000524	0.000524
00:30:00	1.9336	0.0000	0.6097	0.0000	0.000518	0.000567
01:00:00	4.2396	0.0000	1.3742	0.0003	0.000515	0.000776
01:30:00	7.1806	0.0000	2.4448	0.0008	0.000522	0.00136
02:00:00	4.2396	0.0000	1.5127	0.0021	0.000554	0.00267
02:30:00	1.9336	0.0000	0.7070	0.0041	0.000627	0.00468
03:00:00	0.8639	0.0000	0.3193	0.0062	0.000752	0.00692
03:30:00	0.0000	0.0000	0.0000	0.0079	0.000926	0.00885
04:00:00	0.0000	0.0000	0.0000	0.0087	0.00113	0.00981
04:30:00	0.0000	0.0000	0.0000	0.0082	0.00134	0.00958
05:00:00	0.0000	0.0000	0.0000	0.0072	0.00152	0.00869
05:30:00	0.0000	0.0000	0.0000	0.0059	0.00167	0.00756
06:00:00	0.0000	0.0000	0.0000	0.0047	0.00178	0.00648
06:30:00	0.0000	0.0000	0.0000	0.0038	0.00187	0.00563
07:00:00	0.0000	0.0000	0.0000	0.0030	0.00193	0.0049
07:30:00	0.0000	0.0000	0.0000	0.0023	0.00198	0.00423
08:00:00	0.0000	0.0000	0.0000	0.0016	0.002	0.00358
08:30:00	0.0000	0.0000	0.0000	0.0010	0.00201	0.00297
09:00:00	0.0000	0.0000	0.0000	0.0005	0.002	0.00247
09:30:00	0.0000	0.0000	0.0000	0.0002	0.00198	0.00216
10:00:00	0.0000	0.0000	0.0000	0.0001	0.00195	0.00201
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00194
11:00:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00188	0.00188
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
13:00:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00139	0.00139
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00137	0.00137
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000993	0.000993

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000979	0.000979
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000966	0.000966
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000953	0.000953
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00094	0.00094
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000928	0.000928
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000915	0.000915
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000903	0.000903
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000891	0.000891
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000879	0.000879
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000867	0.000867
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000855	0.000855
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000844	0.000844
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000832	0.000832
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000821	0.000821
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00081	0.00081
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000799	0.000799
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000788	0.000788
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000778	0.000778
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000767	0.000767
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000757	0.000757
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000747	0.000747
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000717	0.000717
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000707	0.000707
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000698	0.000698
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000679	0.000679
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00067	0.00067
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000661	0.000661
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000652	0.000652
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000643	0.000643
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000635	0.000635
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000626	0.000626
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000618	0.000618

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.41	No
BFIHOST19	0.44	No
PROPWET (mm)	0.32	No
SAAR (mm)	700	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, April 16, 2021 9:26:34 AM by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 30AE-9DFC

Site name: FEH_Point_Descriptors_426043_423271

Easting: 426043

Northing: 423271

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 2013 model (mm):	42.15	Total runoff (ML):	0.16
Total Rainfall (mm):	27.59	Total flow (ML):	0.44
Peak Rainfall (mm):	9.32	Peak flow (m ³ /s):	0.01

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	108.35	No
Cmax (mm)	349.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.04 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	36.87 [28.52]	Yes
BR	1.86	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	1.1212	0.0000	0.3494	0.0000	0.000524	0.000524
00:30:00	2.5095	0.0000	0.7952	0.0001	0.000518	0.000582
01:00:00	5.5024	0.0000	1.8065	0.0003	0.000516	0.000855
01:30:00	9.3193	0.0000	3.2574	0.0011	0.000527	0.00162
02:00:00	5.5024	0.0000	2.0399	0.0028	0.000569	0.00335
02:30:00	2.5095	0.0000	0.9591	0.0054	0.000663	0.00602
03:00:00	1.1212	0.0000	0.4343	0.0082	0.000824	0.00899
03:30:00	0.0000	0.0000	0.0000	0.0105	0.00105	0.0116
04:00:00	0.0000	0.0000	0.0000	0.0116	0.00131	0.0129
04:30:00	0.0000	0.0000	0.0000	0.0110	0.00158	0.0126
05:00:00	0.0000	0.0000	0.0000	0.0096	0.00181	0.0114
05:30:00	0.0000	0.0000	0.0000	0.0079	0.00201	0.00988
06:00:00	0.0000	0.0000	0.0000	0.0063	0.00216	0.00844
06:30:00	0.0000	0.0000	0.0000	0.0050	0.00227	0.0073
07:00:00	0.0000	0.0000	0.0000	0.0040	0.00235	0.00633
07:30:00	0.0000	0.0000	0.0000	0.0030	0.00241	0.00543
08:00:00	0.0000	0.0000	0.0000	0.0021	0.00244	0.00457
08:30:00	0.0000	0.0000	0.0000	0.0013	0.00245	0.00375
09:00:00	0.0000	0.0000	0.0000	0.0006	0.00244	0.00308
09:30:00	0.0000	0.0000	0.0000	0.0002	0.00242	0.00267
10:00:00	0.0000	0.0000	0.0000	0.0001	0.00239	0.00246
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00236	0.00237
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00233	0.00233
11:30:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00227	0.00227
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00224	0.00224
13:00:00	0.0000	0.0000	0.0000	0.0000	0.0022	0.0022
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00218	0.00218
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00215	0.00215
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00212	0.00212
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00209	0.00209
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00203	0.00203
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00201	0.00201
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00195	0.00195
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00193
18:30:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00187	0.00187
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00182
20:30:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173
22:30:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00139	0.00139
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00137	0.00137
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00135	0.00135
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
32:30:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
38:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
42:00:00	0.0000	0.0000	0.0000	0.0000	0.001	0.001
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000991	0.000991
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000977	0.000977
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000964	0.000964
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000951	0.000951
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000938	0.000938
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000926	0.000926
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000913	0.000913
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000901	0.000901
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000889	0.000889
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000877	0.000877
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000865	0.000865
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000842	0.000842
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00083	0.00083
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000819	0.000819
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000808	0.000808
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000797	0.000797
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000787	0.000787
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000776	0.000776
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000766	0.000766
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000755	0.000755

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.41	No
BFIHOST19	0.44	No
PROPWET (mm)	0.32	No
SAAR (mm)	700	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, April 16, 2021 9:26:48 AM by ihopkinson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7591.25584

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 30AE-9DFC

Site name: FEH_Point_Descriptors_426043_423271

Easting: 426043

Northing: 423271

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	55.10	Total runoff (ML):	0.22
Total Rainfall (mm):	36.06	Total flow (ML):	0.56
Peak Rainfall (mm):	12.18	Peak flow (m ³ /s):	0.02

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	108.35	No
Cmax (mm)	349.45	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.04 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	36.87 [28.52]	Yes
BR	1.77	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km ²)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km ²)	0.00	Yes
Sewer capacity (m ³ /s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	1.4658	0.0000	0.4575	0.0000	0.000524	0.000524
00:30:00	3.2807	0.0000	1.0464	0.0001	0.000518	0.000602
01:00:00	7.1933	0.0000	2.4021	0.0004	0.000518	0.000963
01:30:00	12.1832	0.0000	4.4061	0.0014	0.000533	0.00197
02:00:00	7.1933	0.0000	2.8009	0.0037	0.000587	0.00428
02:30:00	3.2807	0.0000	1.3266	0.0072	0.000708	0.00786
03:00:00	1.4658	0.0000	0.6027	0.0110	0.000914	0.0119
03:30:00	0.0000	0.0000	0.0000	0.0142	0.0012	0.0154
04:00:00	0.0000	0.0000	0.0000	0.0156	0.00154	0.0172
04:30:00	0.0000	0.0000	0.0000	0.0149	0.00188	0.0168
05:00:00	0.0000	0.0000	0.0000	0.0130	0.00219	0.0152
05:30:00	0.0000	0.0000	0.0000	0.0107	0.00244	0.0131
06:00:00	0.0000	0.0000	0.0000	0.0085	0.00264	0.0112
06:30:00	0.0000	0.0000	0.0000	0.0068	0.00278	0.00962
07:00:00	0.0000	0.0000	0.0000	0.0054	0.00289	0.0083
07:30:00	0.0000	0.0000	0.0000	0.0041	0.00297	0.00708
08:00:00	0.0000	0.0000	0.0000	0.0029	0.00301	0.00591
08:30:00	0.0000	0.0000	0.0000	0.0018	0.00303	0.00481
09:00:00	0.0000	0.0000	0.0000	0.0009	0.00302	0.00389
09:30:00	0.0000	0.0000	0.0000	0.0003	0.00299	0.00333
10:00:00	0.0000	0.0000	0.0000	0.0001	0.00295	0.00305
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00292	0.00293
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00288	0.00288
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00284	0.00284
12:00:00	0.0000	0.0000	0.0000	0.0000	0.0028	0.0028
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00276	0.00276
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00273	0.00273
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00269	0.00269
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00265	0.00265
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00262	0.00262
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00258	0.00258
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00255	0.00255
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00251	0.00251
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00248	0.00248
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00245	0.00245

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00241	0.00241
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00238	0.00238
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00235	0.00235
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00232	0.00232
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00228	0.00228
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00225	0.00225
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00222	0.00222
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00219	0.00219
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00216	0.00216
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00211	0.00211
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00208	0.00208
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00205	0.00205
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00202
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00199	0.00199
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00194	0.00194
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00189	0.00189
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00184	0.00184
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00181	0.00181
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
30:30:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
35:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
37:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00135	0.00135
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
46:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000999	0.000999
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000986	0.000986
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000972	0.000972
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000959	0.000959
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000946	0.000946
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000933	0.000933

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.41	No
BFIHOST19	0.44	No
PROPWET (mm)	0.32	No
SAAR (mm)	700	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM