

15<sup>th</sup> January 2019

Mr. N. Kelly  
 Engineering Manager  
 Bloor Homes North West  
 2 - 4 Whiteside Business Park  
 Station Road  
 Holmes Chapel  
 Cheshire  
 CW4 8AA

Dear Norman,

### **HOLLINGWORTH ROAD, LITTLEBOROUGH FLOOD RISK SCOPING & DRAINAGE MANAGEMENT STRATEGY**

This letter summaries the findings of the flood risk scoping exercise undertaken for the site, to determine whether there are any significant flood risk concerns that need to be accounted for within the development proposals. This letter also considers the potential options for managing both surface and foul water in a sustainable manner in accordance with planning policy and guidance. This letter is not suitable to support a full planning application and should be used to steer the development proposals at this stage only. A full Flood Risk Assessment and Drainage Management Strategy will be required to support a full application once additional information requested is obtained.

#### **Site Context**

The proposed development area is located on land off Hollingworth Road in Littleborough. The Ordnance Survey National Grid Reference (OS NGR) for the site is E: 393361, N: 415522 and the nearest postcode is OL15 0AE (see Location Plan in **Appendix A**). The total area being considered for development covers 17.336ha (coloured in green in **Figure 1**).

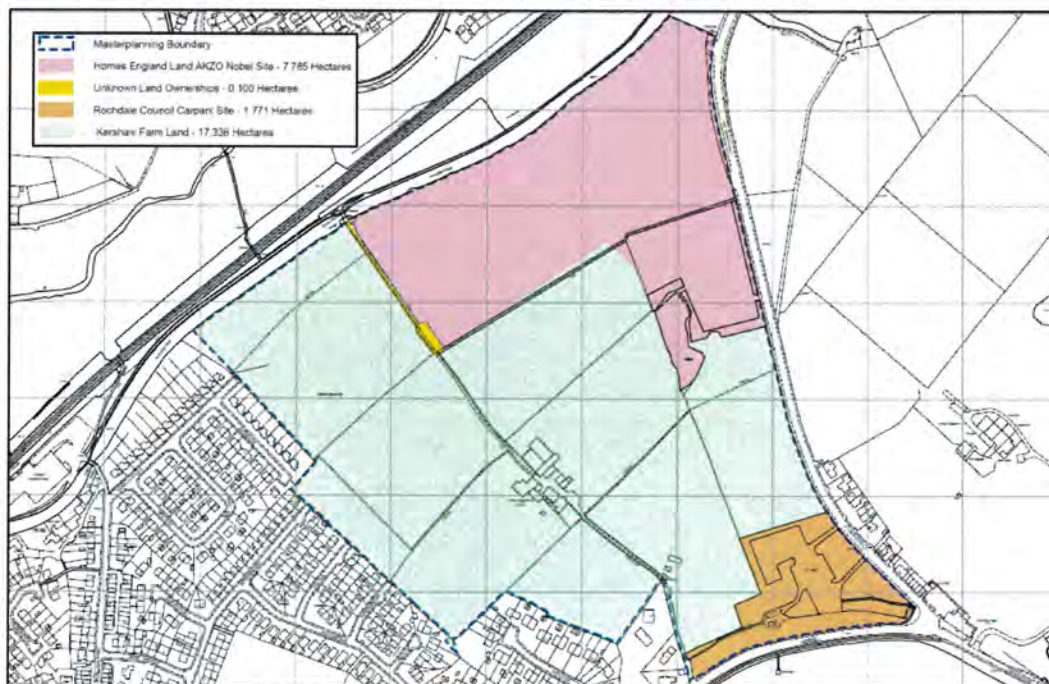


Figure 1: Landownership Masterplan (Homes England, 2018)

[1]

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 Welsh Road, Sealand  
 Flintshire CH5 2LY  
 Telephone: 01244 289 041

The masterplan boundary however covers an overall 26.992ha, and this boundary is also shown within **Figure 1** by the blue dashed line. The other land within the wider masterplan boundary is under different land ownership and may already be subject to separate planning applications.

Review of the topographic survey (included in **Appendix B**) has identified that the existing ground levels vary across the site, although there is a general fall from the south-east (179.36mAOD) to the north-west (157.65mAOD). The mapping reviewed has also identified the Rochdale Canal adjacent to the northern site boundary and beyond is a railway and the River Roch (Main River).

### Development Proposals

It is understood that the development will mainly be used for residential development which is classified as 'more vulnerable' in nature in accordance within the Planning Practice Guidance (PPG). This document supports the revised National Planning Policy Framework Guidance which confirms that 'more vulnerable' development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

### Flood Risk Scoping

The key potential sources of flood risk have been reviewed as part of this scoping exercise and a summary table has been included below (**Table 1**) to confirm the findings of this initial assessment. This is not a detailed assessment but a starting point to develop an understanding of possible further work required when preparing a full flood risk assessment to support a planning application.

Table 1 – Sources of potential flood risk

| Source of potential flood risk | Risk Rating |        | Comment                                                                                                                                         |
|--------------------------------|-------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Tidal                          | ●           | Low    | Over 60km to Fylde Coastline (west).<br>Over 50km to Ribble Estuary (west).                                                                     |
| Fluvial (watercourse)          | ●           | Low    | 450m to the River Roch (north).<br>500m to Featherstall Brook(north).                                                                           |
| Groundwater                    | ●           | Low    | No data or records of groundwater flood risk has been identified.                                                                               |
| Surface water run-off          | ●           | Medium | EA mapping shows varying risk from surface water run-off within the wider site.                                                                 |
| Reservoirs                     | ●           | High   | Hollingworth Lake is located 100m to the south and the EA mapping shows high risk of reservoir flooding to site in a potential breach scenario. |
| Canals                         | ●           | Low    | Rochdale Canal is located adjacent to the northern boundary of the site.                                                                        |
| Sewers                         | ●           | Medium | UU have identified onsite sewers but have records of sewer flooding within the vicinity of site.                                                |

Legend: ● Very low / Low ● Medium ● High

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### Surface Water Flood Risk

From review of the potential flood risk sources identified in **Table 1**, it is considered that the site is at 'low' flood risk from fluvial/tidal sources, groundwater and canal flooding, due to the site's proximity from the original source and/or the existing onsite ground levels in comparison to the flood risk source. The development site is considered to have a higher potential of flooding associated with surface water sources and reservoirs. When surface water flood risks are considered the risk varies across the site with those areas at highest risk coinciding with natural low points within the site and/or natural conveyance routes through the site, at those areas where surface water risk is greatest the potential depths of flooding range from 300mm to 900mm based on the online mapping with velocities at worst 0.25m/s.

### Reservoir Flood Risks

Consultations with the EA on review of the long-term flood risk maps show part of the site lies within the potential flow route associated with the failure of Hollingworth Lake Reservoir Dam. The reservoir is located less than 100m from the site and is elevated in comparison to the existing ground levels onsite. The flood risk mapping shows that part of the site would be susceptible to receiving significant flood depths and velocities of reservoir flood water should a failure occur in the structure due to its ground levels and proximity in relation to the body of water.

The maps provided by the EA (included in **Appendix C**) were created for emergency planning purposes only as noted by the EA during consultation, this therefore shows the worst-case scenario should a reservoir failure occur and release all its water at that point. In reality if a reservoir failure were to occur it would most likely be less severe than the scenario shown on the maps. Reservoirs are regularly inspected and maintained by the asset owners and confirm to the guidelines set out in the Reservoirs Act (1975).

In the case of emergency planning the Lead Local Flood Authority are responsible for ensuring the community is well prepared. Initial enquiries with Rochdale Borough Council (RBC) and review of the Preliminary Flood Risk Assessment/Strategic Flood Risk Assessment did not identify any historic flooding of the development site related to reservoir flooding (**Appendix D**).

Furthermore, RBC have advised that Hollingworth Lake is a UU asset and that future consultation should be with them for further details. Consultations with UU have been carried out to ascertain what information on Hollingworth Lake they hold including details of maintenance schedules.

### Sewer Flood Risk

Consultations with UU have identified that they are aware of historical flood issues with the existing sewer length crossing the wider site from Hollingworth Lake reservoir outfalling into Rochdale Canal. Further information has been requested on the nature and extent of flooding although at this time no response has been received (**Appendix E**). UU have however confirmed that they will require the length of sewer from the reservoir to the canal to be protected from development in the form of a 5-6m easement from either side of the centreline.

### Mitigation Measures

The site is located within Flood Zone 1 and is classified as 'more vulnerable' development, it is typical to set the Finished Floor Levels (FFL) of residential dwellings in Flood Zone 1, 150mm above the existing ground levels (where practical). As some areas of the site are shown to have had a high susceptibility to other sources of flooding (surface water and reservoir), it may be beneficial

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to increase the FFL freeboard to 300mm to offer additional resilience. The proposed FFL of the dwellings onsite should also consider the potential impacts of Climate Change (CC).

Risk from surface water can be appropriately managed through development by ensuring space is made for water within the development so conveyance can be incorporated into the scheme to provide routes for surface water as close to the natural conveyance where practical. Furthermore, external areas should fall away from any proposed dwellings to assist in directing overland flows away from more vulnerable development. Finally, as part of all new development a sustainable surface water management regime is required to be implemented. This will assist in managing surface water flood risk onsite and ensure no increased flood risk will result elsewhere as a result of the development.

Additionally, for future residents to be prepared, each property should be made aware of the potential residual flood risk associated with reservoir flooding. It is advised that residents prepare a personalised Flood Plan, detailing the procedures and important measures to take in the event of a flood incident which could potentially impact the site. The flood plan might include details of important contacts such as the utility companies and insurance. It would also note procedures to be undertaken such as when to move items to safety, when to apply any temporary internal flood resilience measures and mechanisms of evacuation/ water levels monitoring.

To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).

#### Summary

Based on the information obtained to date and the initial enquiry responses it has been identified the site is at 'low' risk from the majority of flood sources reviewed. Surface water flooding and reservoir flooding are highlighted to be the likely sources of flooding to impact the site. It is therefore recommended that FFL are raised 300mm where practical for dwellings proposed in higher flood risk areas to offer additional resilience. The risk from these potential flood sources can be mitigated. To ensure that the proposals don't increase flood risk elsewhere the focus of the development is on the sustainable management of surface water run-off to ensure no increased run-off results from the development.

#### Drainage Management Strategy

A sustainable drainage management regime is required to ensure that the proposals will not increase flood risks as a result of increasing run-off generated. This section has considered the existing mechanisms and proposals for managing surface water run-off from the development in accordance with planning policy.

#### Pre-Development Surface Water Run-Off Rates

In the absence of a detailed drainage investigation, the pre-development drainage situation has been assumed from a desk-based study of the available information. From review of the mapping and existing topographic survey, it is understood that run-off naturally generated onsite currently runs overland with the topography and eventually outfalls into the adjacent canal to the north. The site is mostly undeveloped apart from the presence of several existing farm buildings and therefore the site is 95% permeable at present.

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The peak rates and volumes of run-off generated by the existing site have been calculated using the FEH catchment data. As a result, the greenfield rate (QBar) for the total site has been calculated to be 256.1l/s by using the FEH Statistical Method (see **Appendix F**). This method conforms with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015).

#### Post-Development Surface Water Run-Off Rates

Due to the nature of the development proposed, there will be an increase in the rate and volume of run-off generated onsite compared to the existing regime. The focus for new development is to ensure that run-off post-development does not exceed that of the existing regime as this can increase flood risks elsewhere. As the site is located within a Critical Drainage Area (as identified within the SFRA); there is more of a focus on this and where practical betterment to the existing regime should be aimed for. The proposals for surface water management post-development will be to restrict the discharge from site to mimic the pre-development greenfield situation (QBar); unless a more stringent rate is identified. This approach conforms with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015).

#### Sustainable Drainage Hierarchy

In accordance with national and local planning policy surface water management required to consider the three key methods for managing surface water run-off generated by new development. These methods have been reviewed below in order of priority.

#### Suitability for infiltration drainage solutions

The Cranfield Soil and AgriFood Institute (CSAI), Soilscape viewer identifies the soils to be slowly permeable, seasonally wet, acid, loamy and clayey soils. The British Geology Survey (BGS) mapping data indicates the main ground conditions are composed of a bedrock of Pennine Lower Coal Measures Formation with superficial deposits of till, diamicton and sandstone. Given the presence of underlying coal measures in the sub geology and the areas mining history, an infiltration-based solution is not likely to be practical due to the high potential for leaching of contaminants from the underlying coal measures.

Furthermore, given the mining history there is potential for further engineering constraints to be present onsite, restricting the location of Soakaway features within the site boundaries. The adjacent site's (11/D55085) planning permission furthermore supports that infiltration is unlikely to be practical on this site. Soakaway Testing on the adjacent site showed infiltration not to be feasible due to the underlying strata. Soakaway Testing on the development site may still be required in due course to evidence that infiltration will not work. Although, this is typically something that can be conditioned as part of a planning permission providing there are alternative.

#### Suitability of a surface water connection to watercourse

Assuming infiltration will not be feasible based on the information reviewed, then in accordance with the drainage hierarchy the next method to be explored is to discharge surface water run-off to a watercourse. The nearest watercourse to site is the River Roch (Main River) located approximately 450m to the north of site beyond the canal and railway.

Given the engineering constraints associated with routing to the Main River it is unlikely that a direct discharge from site to the River Roch will be achievable. The Rochdale Canal and Rochdale Railway Line form the two primary constraints to achieve this direct connection,

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routing would need to span across 450m beneath a canal structure and railway line. Due to these constraints we have considered the potential alternatives.

#### Suitability of a surface water connection to a canal

Given that infiltration and a connection into the River Roch is unlikely to offer a surface water management solution for the site, it is proposed that the development mimics the existing regime and continues to discharge into the canal. The Rochdale Canal is located adjacent to the northern boundary of site and as previously discussed it is understood that the site naturally drains via overland run-off into the canal. It is therefore proposed the development site mimics the existing situation and discharges at the restricted pre-development greenfield rate of 256.1l/s (QBar) to the canal (**Appendix G**).

The canal is considered to be a private asset as such consent for works to this asset will be required from the asset owners. Early consultation with the CRT has been undertaken to ascertain ownership and terms for a potential new formal connection to the canal direct from site (**Appendix H**). A response is at this time outstanding. It is understood that the CRT can accept formal surface water discharges on competitive commercial terms and they will charge accordingly for the benefits provided. An agreement for discharging into a canal usually takes the form of an initial premium and a licence with an annual commercial payment, subject to periodic review. Furthermore, as the CRT are not a statutory drainage authority, they are not obliged to accept discharges into their network, therefore it is important at this early stage to evidence all other methods of handling surface water are not feasible we have therefore reviewed other options available.

#### Suitability of a surface water connection into the public sewer network

If a new formal outfall into the Rochdale Canal cannot be agreed, then the alternative would be to consider discharging into the public sewer network. As previously discussed UU have identified a surface water piped network crossing the development site which feeds the canal with water from Hollingworth Lake. This piped network could provide an alternative method for discharging surface water from the development site, subject to discussion with UU at an early stage. It is likely that gravity systems could be achieved although more detailed information of the existing levels associated with this surface water pipe length will be needed to confirm.

It is not clear whether this existing pipe length has sufficient capacity to cater for the flows discharging from the development as the site naturally discharges into the canal via overland run-off at present; not within this UU surface water pipe length. Early pre-development discussion should be undertaken with UU to determine whether this UU asset crossing site would be suitable to cater for the site.

UU sewer records also identify a public combined water sewer (225mm dia.) located within Hollingworth Road to the east of site. If all other surface water outfall options are evidenced as not feasible then UU may agree to a surface water connection into their combined sewer although this is likely to be heavily restricted in terms of discharge rates (5l/s) and therefore will require significant onsite attenuation.

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### Stormwater Storage Estimates

If we consider discharging to the watercourse we would likely propose a discharge rate mimicking the pre-development greenfield rate (256.1l/s); this is subject to formal consents being obtained. Restricting the rate of discharge will generate a volume of onsite attenuation required to cater for the additional stormwater storage. Based on a discharge rate of 256.1l/s and the estimated post development impermeable areas the stormwater storage figures quoted in **Table 2** will need to be catered for onsite.

| Impermeable Area (7.80ha)                  | 1 In 1 Year     | 1 In 30 Year      | 1 In 100 Year + 40% CC |
|--------------------------------------------|-----------------|-------------------|------------------------|
| <b>Restricted Run-Off Rate</b>             | 256.1l/s        | 256.1l/s          | 256.1l/s               |
| <b>Estimated Stormwater Storage Volume</b> | 248cu.m-687cu.m | 1203cu.m-2002cu.m | 2909cu.m-4691cu.m      |

Table 2: Estimated Stormwater Storage Requirements (Betts Hydro, 2018)

If a more stringent rate is applied, then the volume of attenuation will increase for example if a connection to the public combined sewer is explored and UU were to agree to a rate of discharge of 5l/s the stormwater storage estimates in **Table 3** would need to be catered for within the site. It is therefore important that rates and points of connection are agreed as early as possible in the planning process.

| Impermeable Area (7.80ha)                  | 1 In 1 Year       | 1 In 30 Year      | 1 In 100 Year + 40% CC |
|--------------------------------------------|-------------------|-------------------|------------------------|
| <b>Restricted Run-Off Rate</b>             | 5l/s              | 5l/s              | 5l/s                   |
| <b>Estimated Stormwater Storage Volume</b> | 4132cu.m-6063cu.m | 7741cu.m-9755cu.m | 14836cu.m-16903cu.m    |

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2018)

### Sustainable Drainage Solutions (SuDS)

Given the scale and nature of the proposed development, there may be the opportunity to incorporate SuDS methods such as swales and ponds to provide a degree of treatment before flows are carried offsite. It would also be recommended that permeable paving and bio-filtration be considered in non-adopted areas where at all feasible. The opportunity should also be taken to provide soft landscaping within the scheme to assist in minimising surface water run-off and to assist locally with surface water management (subject to optimum ground conditions). If infiltration is not feasible then a connection into the main drainage systems for any infiltration-based method would be needed.

There may also be the potential to utilise some SuDS features for conveyance/attenuation of surface water flows within the proposed surface water drainage strategy, opposed to the traditional below ground storage methods. Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

### Foul water

UU sewer records show the nearest foul water compatible sewer to be the public combined sewer (225mm dia.) within Hollingworth Road. As there are no existing foul water connections from site a new formal surface water connection will be required. It is proposed that a new connection to the combined sewer be made, subject to formal approval and consents in due course.

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Detailed design needs to confirm whether a gravity connection from site can be achieved once a layout is drafted to consider levels and routing. It is recommended that a pre-development enquiry to UU be submitted early in the application to get their thoughts on the proposals and identify any constraints.

### Summary

Overall, the site has been identified to be at 'low' risk from the majority of fluvial flood risk sources reviewed. The site is however at higher risk from surface water flooding and reservoir flooding as identified by the EA mapping. Some mitigation measures have been discussed within to reduce/mitigate the potential risks from surface water flooding and the residual risk associated with reservoir flooding should a failure occur.

The focus of the development is on the sustainable management of surface water run-off to ensure no increased run-off results from the development and to adhere to the sustainable drainage hierarchy in accordance with national and local planning policy. Given that infiltration and a connection into the River Roch are unlikely to offer a suitable surface water management solution for the site, it is proposed that the development mimics the existing regime and discharges into Rochdale Canal either via a new connection subject to consent or via the existing through connection from Hollingworth Lake. A pre-development enquiry has been sent to the Canals and Rivers Trust to discuss points of connection and rates of discharge, however a response is currently outstanding.

I trust that the above information identifies the key flood risk information and the drainage considerations for the development site, however if you have any further queries, please do not hesitate to contact us.

Yours sincerely,



Megan Berry BSc(Hons) GradCIWEM  
Graduate Flood Risk Analyst

**BETTS HYDRO LIMITED**

Appendix A – Location Plan  
Appendix B – Topographic Survey  
Appendix C – Environment Agency  
Appendix D – Rochdale Borough Council  
Appendix E – United Utilities  
Appendix F – Surface Water Run-Off Calculations  
Appendix G – Existing & Proposed Drainage Plans  
Appendix H – Canal & Rivers Trust  
Appendix I – Stormwater Storage Estimates

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## APPENDIX A – LOCATION PLAN

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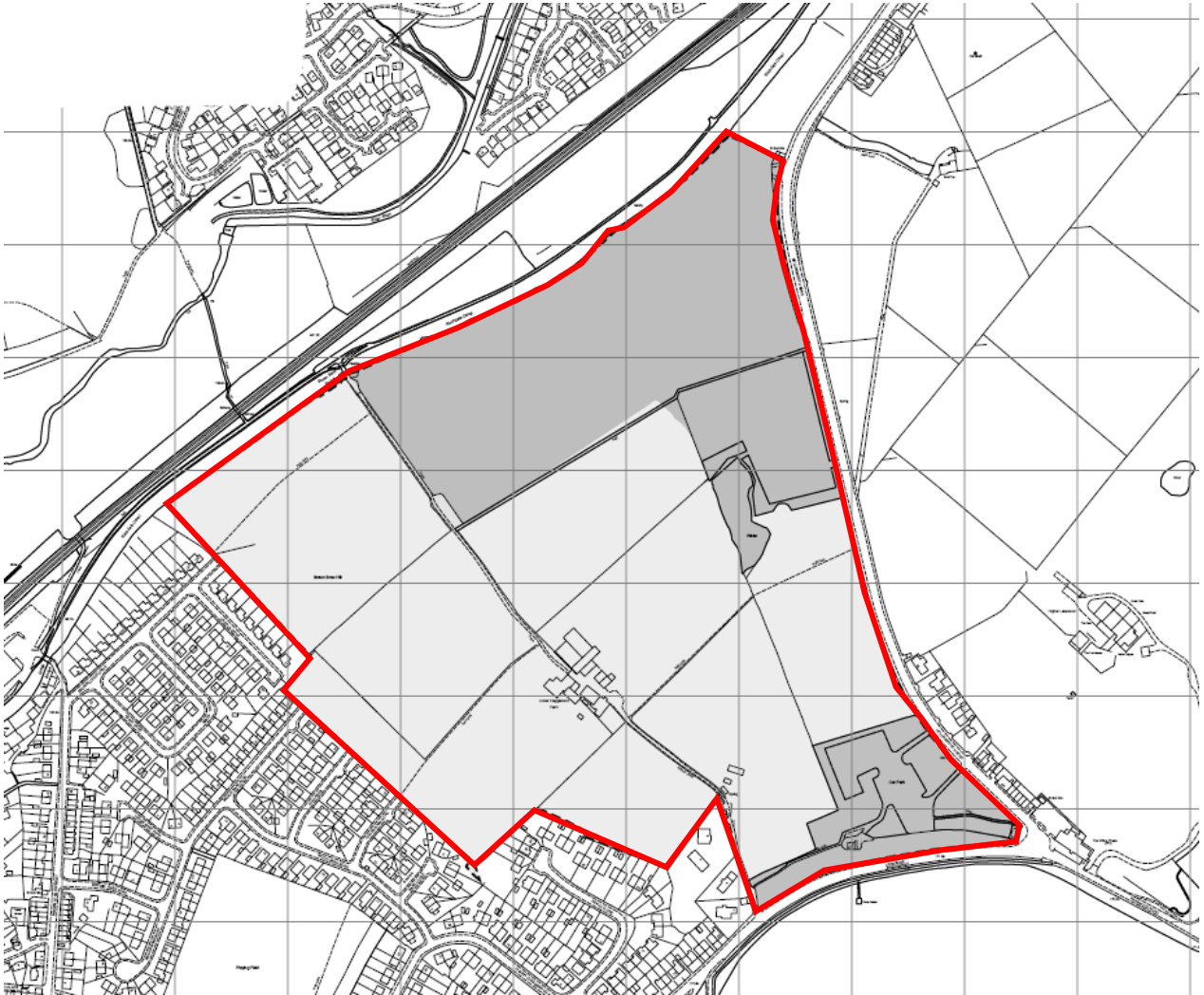
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# LOCATION PLAN

Hollingworth Road, Littleborough



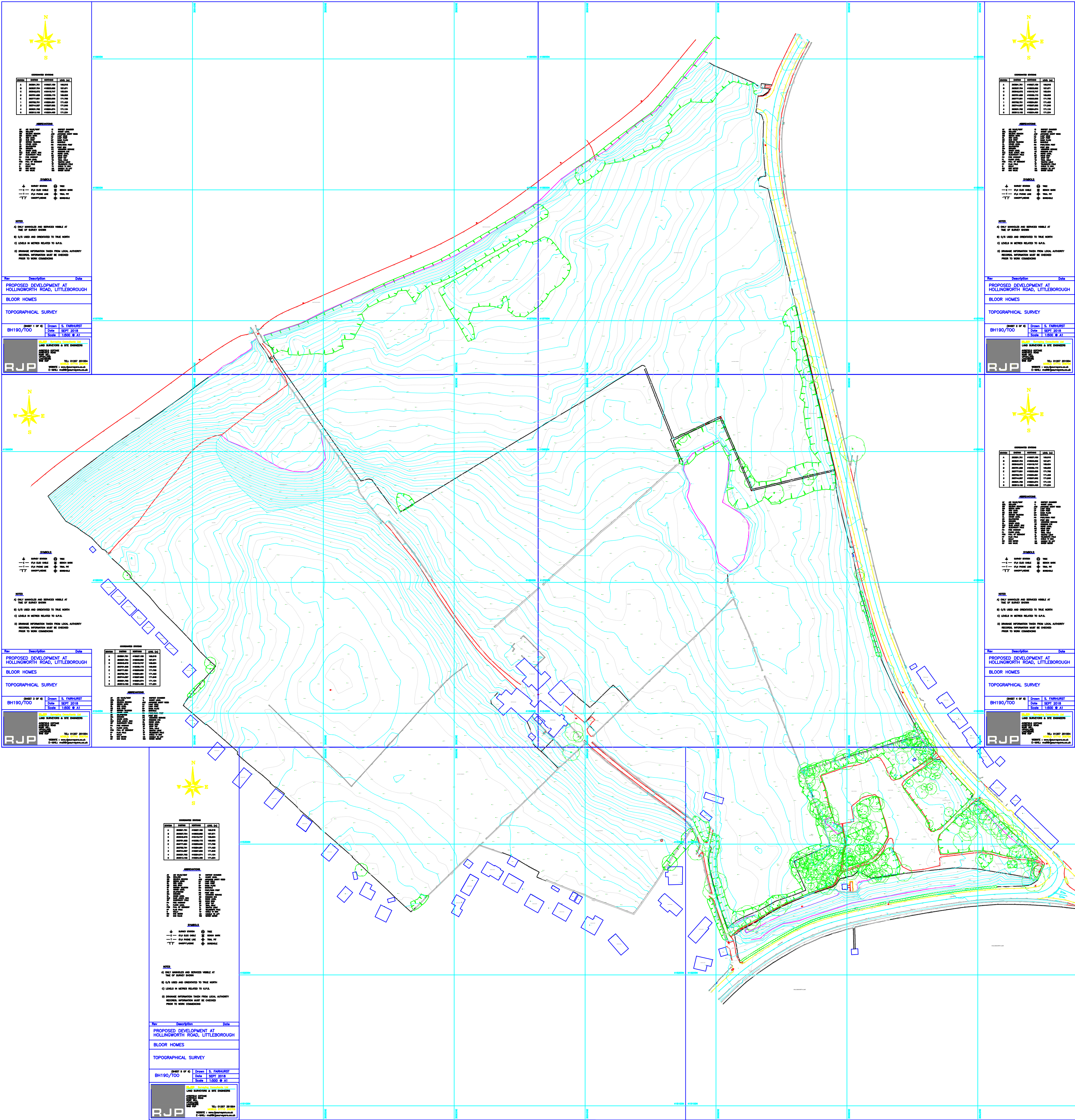
|                   |                         |
|-------------------|-------------------------|
| OS X (Eastings)   | 393361                  |
| OS Y (Northings)  | 415522                  |
| Nearest Post Code | OL15 0AE                |
| Lat (WGS84)       | N53:38:10 (53.636175)   |
| Long (WGS84)      | W2:06:07 (-2.101880)    |
| Lat, Long         | 53.636175, -2.101880    |
| Nat Grid          | SD933155 / SD9336115522 |
| mX                | -233980                 |
| mY                | 7067118                 |

## APPENDIX B – TOPOGRAPHIC SURVEY

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## APPENDIX C – ENVIRONMENT AGENCY

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## Megan Berry

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**From:** GMMC Info Requests <Inforequests.gmmc@environment-agency.gov.uk>  
**Sent:** 20 December 2018 09:44  
**To:** Megan Berry  
**Subject:** GMMC110642AB Response attached from the Environment Agency  
**Attachments:** GMMC110642AB\_DFM.PDF; GMMC110642AB\_Res.pdf; GMMC110642AB\_table\_P4.pdf; Reservoir Flood Map Attachment.pdf; CCA - Area External Guidance v5.pdf

Dear Megan,

Thank you for your enquiry which was received on 18/12/18.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

I enclose the data requested. We have no record of flooding affecting this site. However, this does not mean flooding has not occurred in the past or that it will not flood in future. We recommend that you also contact United Utilities and Rochdale Metropolitan District Authority who may hold additional information (the former especially in relation to sewer flooding).

There are no flood defences within the vicinity of the site.

Please be aware you can check your risk of flooding on our external website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Please also note that all current EA flood risk strategy documents can be found on our external website <https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities> and <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Anne Ball  
Customer and Engagement Officer  
**Greater Manchester, Merseyside and Cheshire**  
**External:** 020 302 51232  
**Mobile:** 07769285094  
**Email:** [Inforequests.gmmc@environment-agency.gov.uk](mailto:Inforequests.gmmc@environment-agency.gov.uk)

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## Megan Berry

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**From:** Megan Berry  
**Sent:** 18 December 2018 09:07  
**To:** 'GMMC Info Requests'  
**Subject:** Flood Risk Information - Product 4  
**Attachments:** LOCATION PLAN.pdf

To whom it may concern,

### ***Hollingworth Road, Littleborough.***

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues (Product 4); this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is surrounded by a canal, main river and a reservoir. The site is shown on the online mapping to be at risk from reservoir flooding, we are therefore seeking further information regarding the risk and what would be required when coming to prepare a full FRA in the near future and what would the EA require to be included?

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

**Megan Berry** BSc(Hons) GradCIWEM  
*Graduate Flood Risk Analyst*

### **BETTS HYDRO**

#### ***Engineering Consultants***

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

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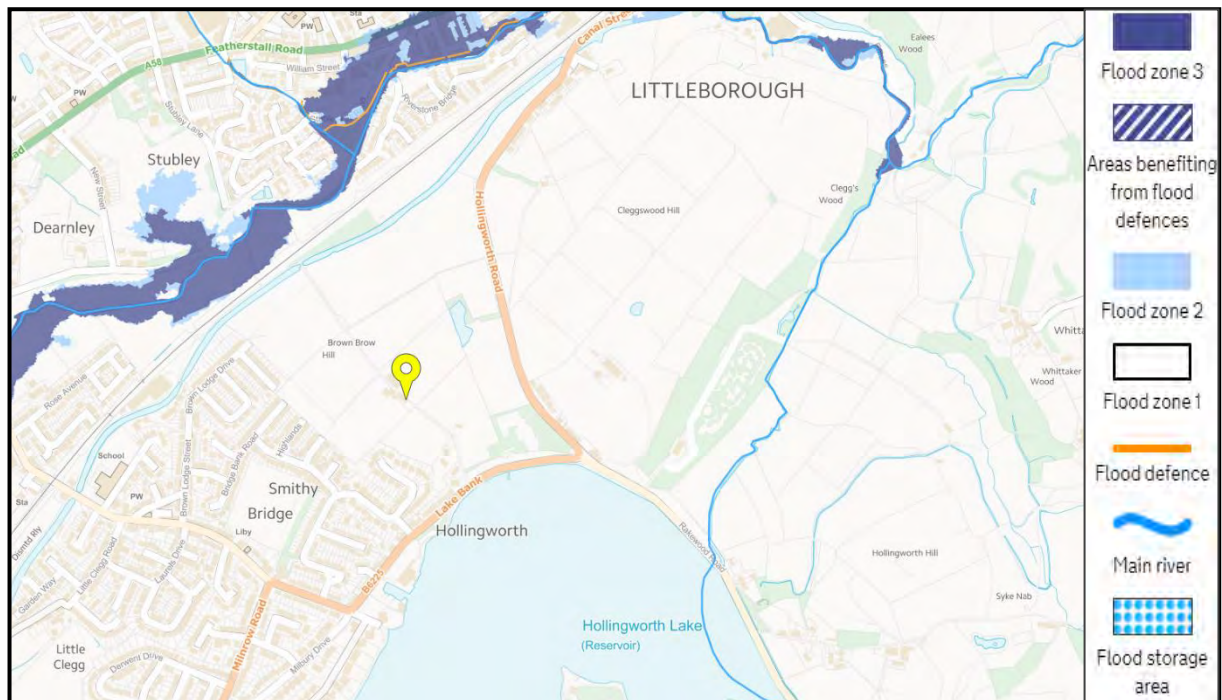
CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT  
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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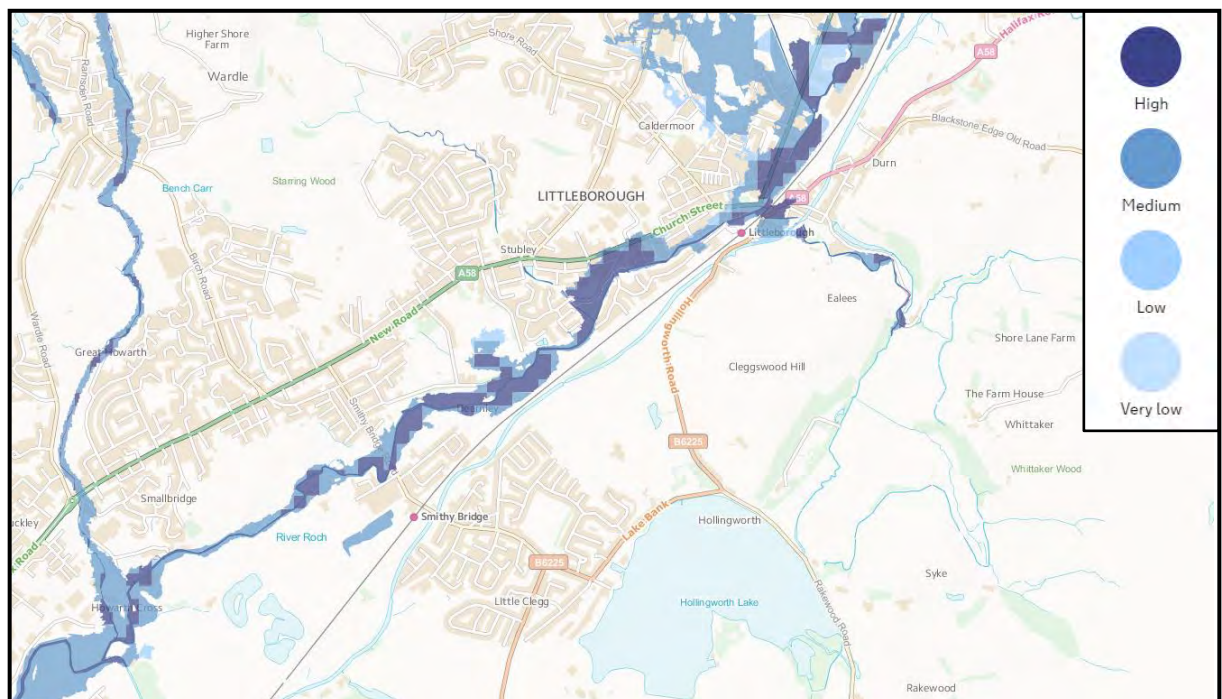
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## Flood Map for Planning

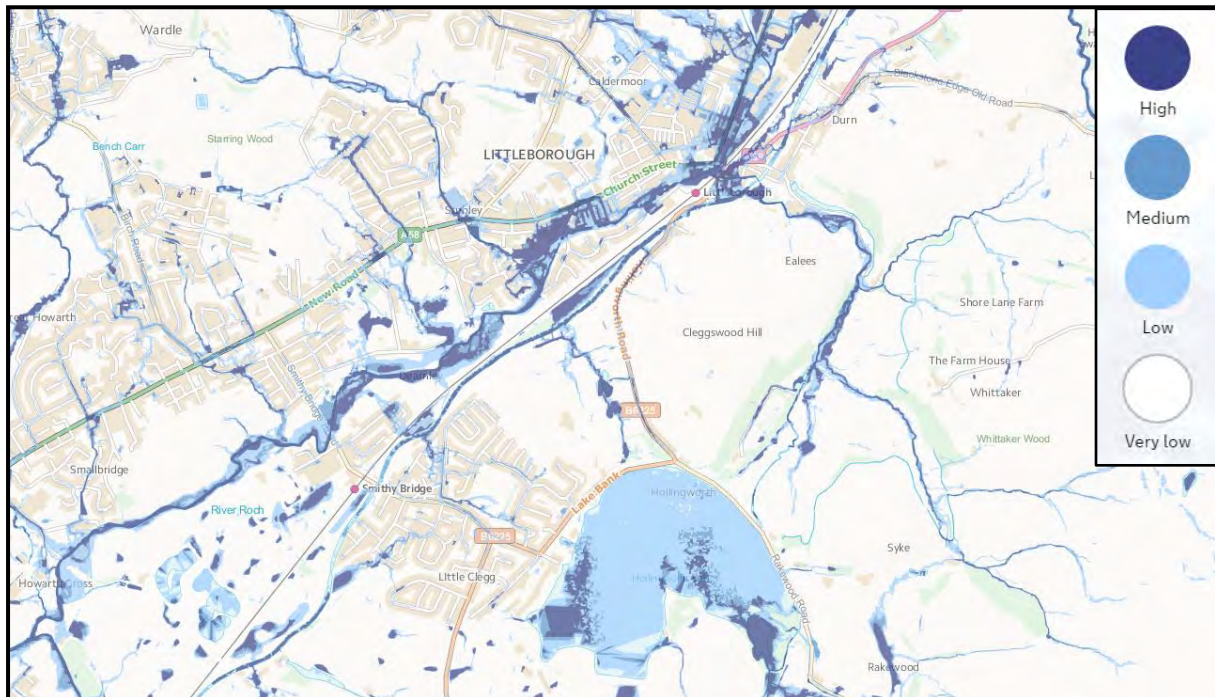


## Long Term Flood Risk – Rivers or Sea

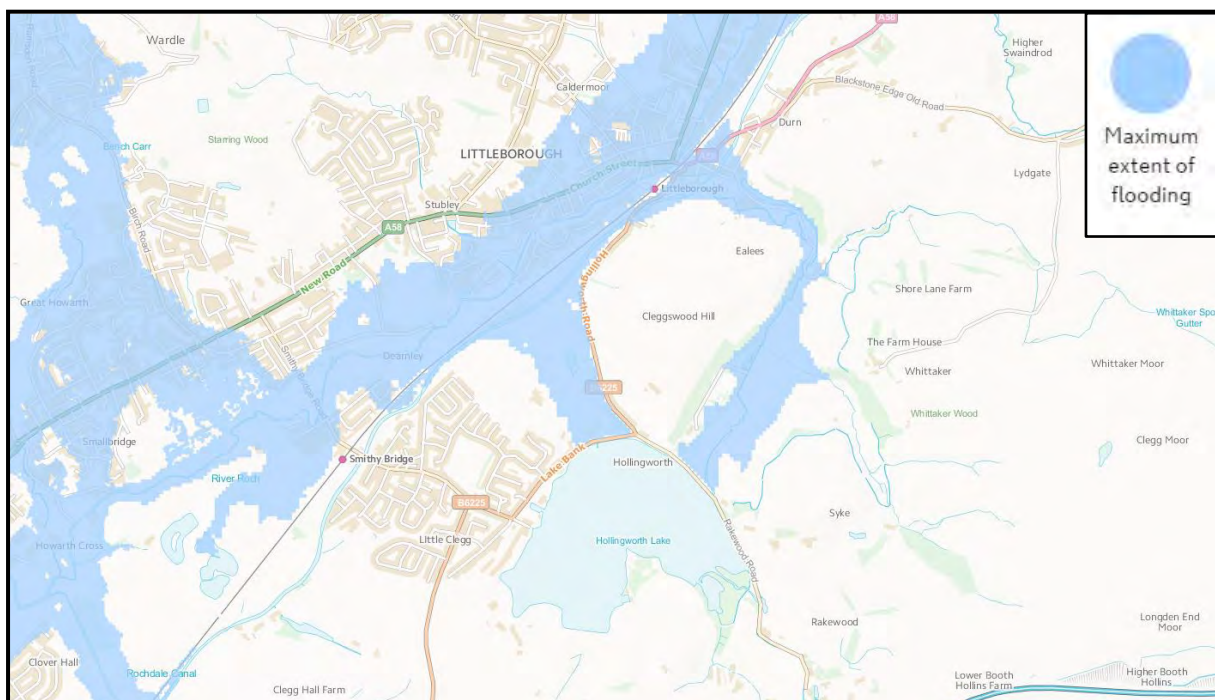


# NATIONAL FLOOD MAPPING

## Long Term Flood Risk – Surface Water



## Long Term Flood Risk - Reservoirs



# Flood map for planning

Your reference  
**LITTLEBOROUGH**

Location (easting/northing)  
**393369/415360**

Created  
**14 Dec 2018 11:56**

**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.

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

**Flood map for planning**

Your reference

**LITTLEBOROUGH**

Location (easting/northing)

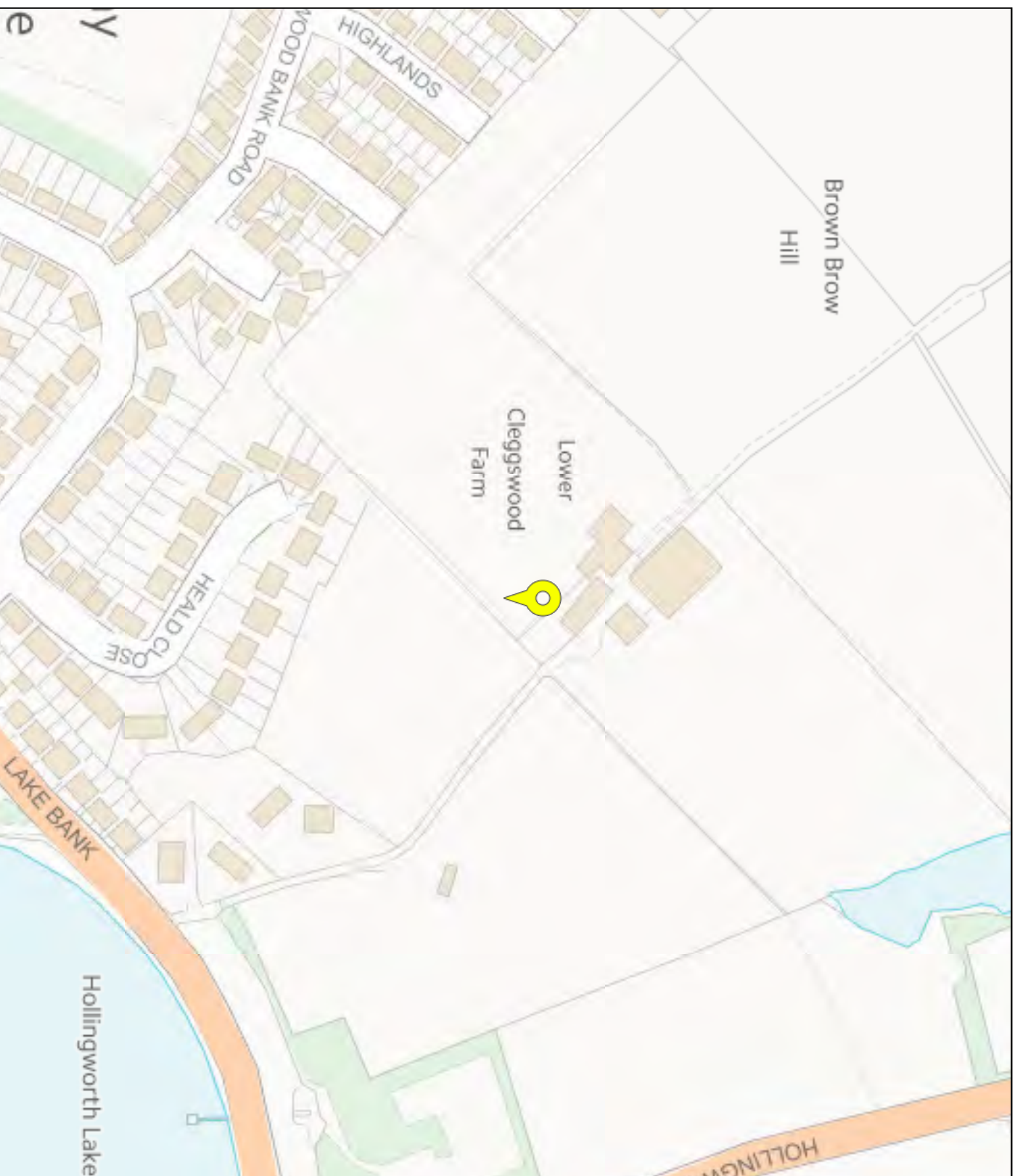
**393369/415360**

Scale

**1:2500**

Created

**14 Dec 2018 11:56**



 Selected point

 Flood zone 3

 Flood zone 3: areas  
benefitting from flood  
defences

 Flood zone 2

 Flood zone 1

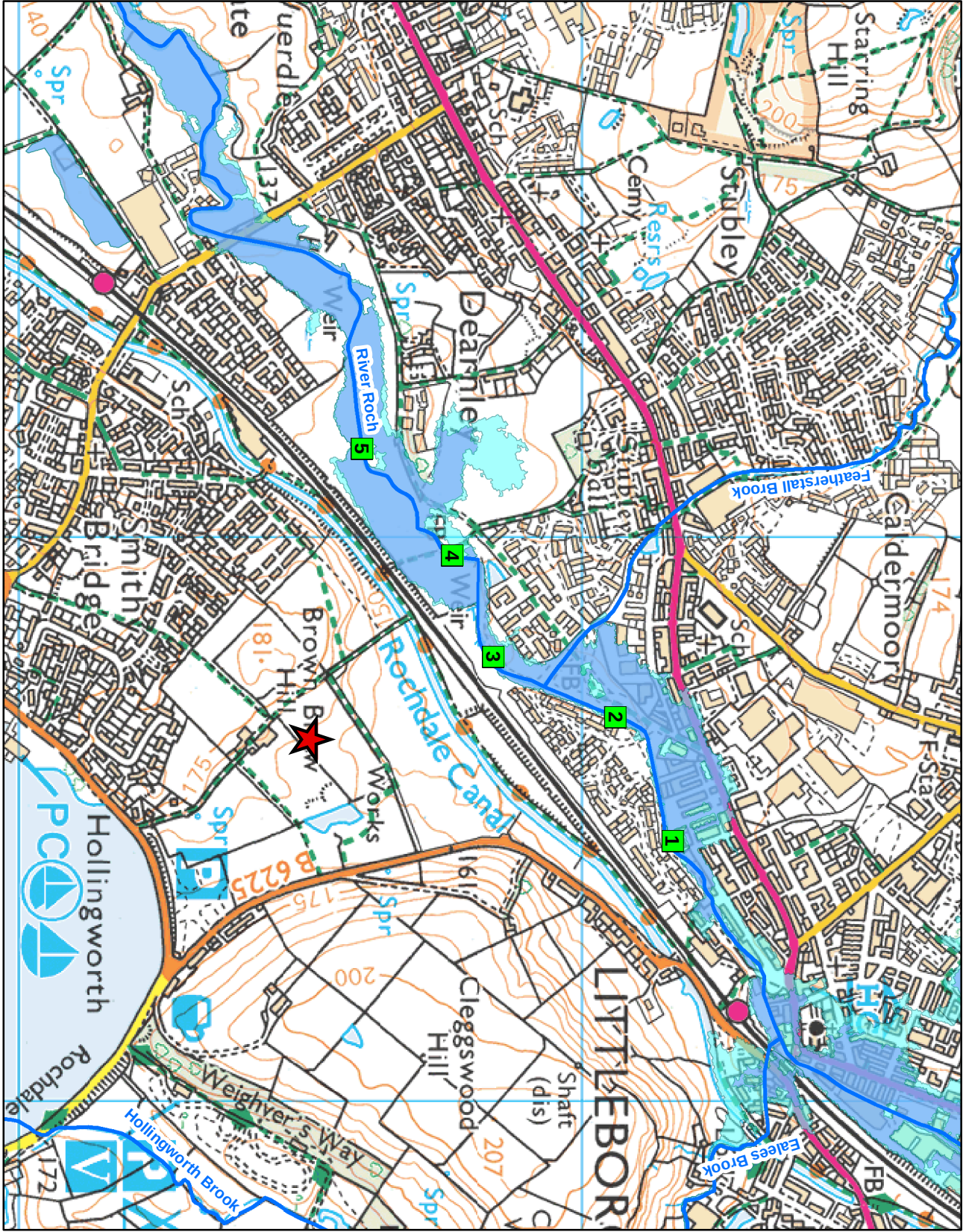
 Flood defence

 Main river

 Flood storage area



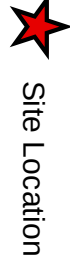
Detailed Flood Map centred on land off Hollingworth Road, OL15 0AE. Created on 19/12/2018 [GMMC110642AB]



1:10,001



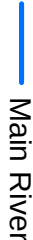
Legend



Site Location



Model Measurements



Main River

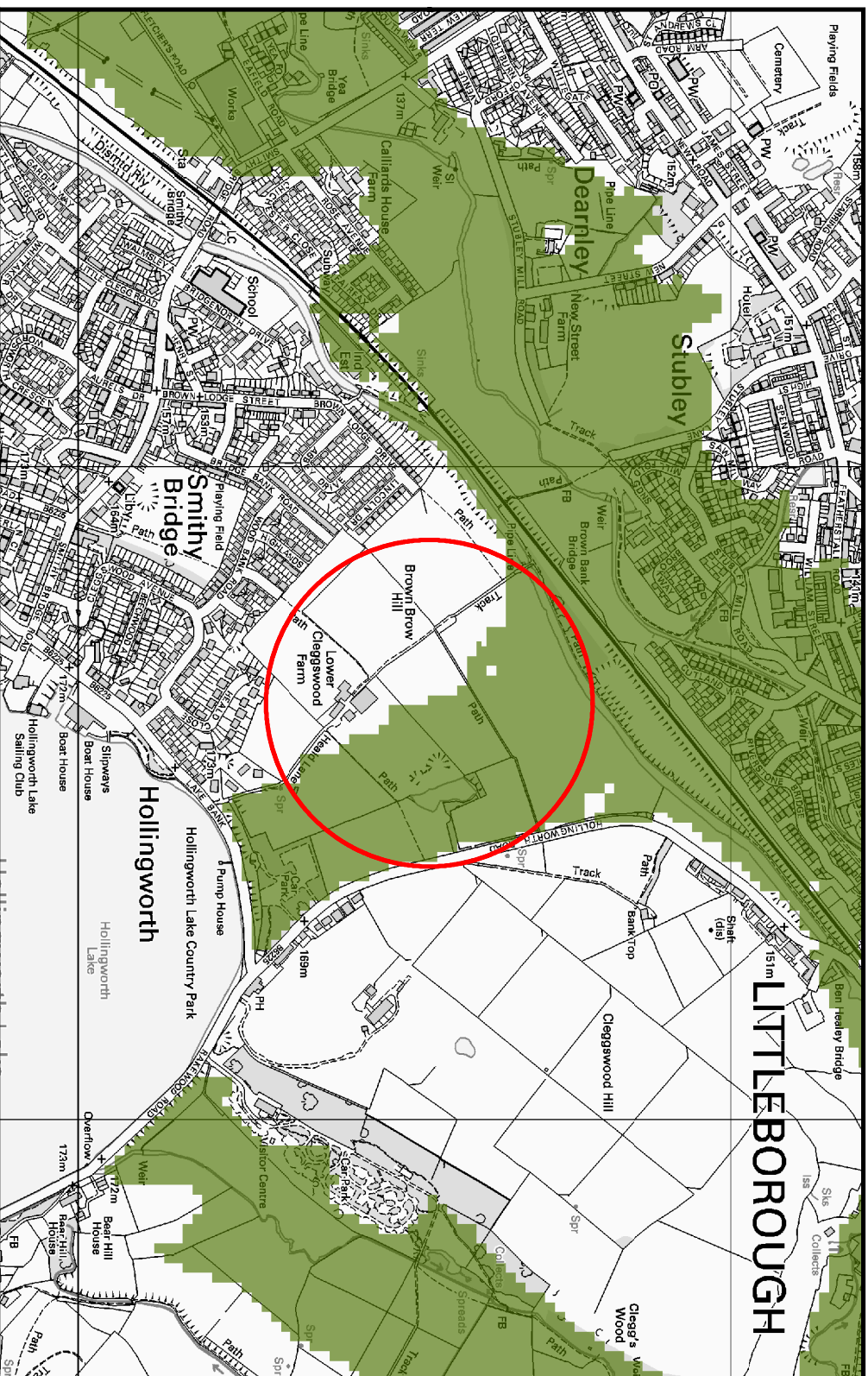


Flood Zone 3



Flood Zone 2

# Reservoir Flood Map



The area within the red circle could be at risk of flooding from the following reservoirs:

| Reservoir Name    | Reservoir Owner            | Location                | Local Authority | Environment Agency Office                         |
|-------------------|----------------------------|-------------------------|-----------------|---------------------------------------------------|
| Hollingworth Lake | United Utilities Water plc | 394020, 415140 Rochdale |                 | Environment Agency - Greater Manchester, Mersesid |

**Note** - this map provides a general indication of the largest area that might be flooded if a reservoir were to fail and release the water it holds. It is taken from a national assessment and displays a worst case scenario. The map is only intended as a guide and is not a prediction of what will happen.

## Important

- This map has been produced for emergency planning purposes and displays a worst case scenario.
- It is not suitable for use at an individual property scale due to the method used.
- This map does not give any information on the likelihood of reservoir flooding or on the depth or speed of floodwaters. It also does not include any smaller reservoirs (which hold less than 25,000 cubic metres of water) or reservoirs commissioned or registered after Spring 2009.
- The information should not be interpreted as stating that the location you are interested in will or won't actually flood, but simply that it is in or not in an area that could be affected by reservoir flooding as shown on the maps.

 Maximum extent of flood

**1:10,000**

| Map Reference | Model/Model Reference    | Easting | Northing | Data                           | Urbanised               |                            |                             |                          |                            |                             |                                                 |                                                 |                         |                            | Downland                    |                          |                            |                             |                                                 |                                                 |  |  |  |  |
|---------------|--------------------------|---------|----------|--------------------------------|-------------------------|----------------------------|-----------------------------|--------------------------|----------------------------|-----------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------|----------------------------|-----------------------------|--------------------------|----------------------------|-----------------------------|-------------------------------------------------|-------------------------------------------------|--|--|--|--|
|               |                          |         |          |                                | 5 % AEP (1 in 20 years) | 33.3 % AEP (1 in 30 years) | 13.3 % AEP (1 in 7.5 years) | 1 % AEP (1 in 100 years) | 0.5 % AEP (1 in 200 years) | 0.1 % AEP (1 in 1000 years) | 1 % AEP (1 in 100 years) + 25% increase in flow | 1 % AEP (1 in 100 years) + 20% increase in flow | 5 % AEP (1 in 20 years) | 3.33 % AEP (1 in 30 years) | 1.33 % AEP (1 in 7.5 years) | 1 % AEP (1 in 100 years) | 0.5 % AEP (1 in 200 years) | 0.1 % AEP (1 in 1000 years) | 1 % AEP (1 in 100 years) + 25% increase in flow | 1 % AEP (1 in 100 years) + 20% increase in flow |  |  |  |  |
| 1             | ea011_model_RCOCH05_8095 | 393841  | 418180   | Modelled Water Level (in mAHN) | 141.44                  | 141.45                     | 141.50                      | 141.50                   | 141.53                     | 141.68                      | 141.62                                          | 141.63                                          | 141.48                  | 141.53                     | 141.86                      | 141.90                   | 141.90                     | 141.90                      | 142.03                                          | 142.03                                          |  |  |  |  |
|               |                          |         |          | Modelled Flow (cumecs)         | 26.20                   | 26.26                      | 34.77                       | 36.00                    | 39.60                      | 48.26                       | 46.48                                           | 53.77                                           | 24.16                   | 25.26                      | 33.93                       | 35.21                    | 36.36                      | 40.82                       | 46.89                                           | 50.95                                           |  |  |  |  |
|               | ea011_model_RCOCH05_8010 | 393321  | 418099   | Modelled Water Level (in mAHN) | 139.87                  | 139.72                     | 139.95                      | 139.99                   | 140.08                     | 140.26                      | 140.23                                          | 140.34                                          | 139.65                  | 139.68                     | 139.89                      | 139.94                   | 139.94                     | 140.13                      | 140.13                                          | 140.29                                          |  |  |  |  |
|               |                          |         |          | Modelled Flow (cumecs)         | 26.86                   | 26.59                      | 31.01                       | 31.41                    | 32.70                      | 32.09                       | 32.17                                           | 32.59                                           | 24.18                   | 25.26                      | 32.21                       | 33.01                    | 34.51                      | 37.14                       | 36.40                                           | 46.89                                           |  |  |  |  |
| 2             | ea011_model_RCOCH05_8555 | 393215  | 415662   | Modelled Water Level (in mAHN) | 139.80                  | 139.85                     | 139.96                      | 139.95                   | 139.92                     | 139.74                      | 139.66                                          | 139.71                                          | 138.86                  | 138.91                     | 139.12                      | 139.19                   | 139.21                     | 139.40                      | 139.54                                          | 139.64                                          |  |  |  |  |
|               |                          |         |          | Modelled Flow (cumecs)         | 15.83                   | 15.86                      | 19.15                       | 19.68                    | 21.13                      | 29.46                       | 27.68                                           | 33.45                                           | 15.55                   | 16.01                      | 16.72                       | 18.60                    | 20.72                      | 30.75                       | 29.25                                           | 36.76                                           |  |  |  |  |
| 3             | ea011_model_RCOCH05_8595 | 393835  | 413799   | Modelled Water Level (in mAHN) | 138.81                  | 138.83                     | 138.92                      | 138.84                   | 137.00                     | 138.64                      | 137.11                                          | 137.23                                          | 136.81                  | 136.82                     | 136.83                      | 136.96                   | 137.02                     | 137.18                      | 137.15                                          | 137.32                                          |  |  |  |  |
|               |                          |         |          | Modelled Flow (cumecs)         | 17.00                   | 17.41                      | 20.70                       | 21.26                    | 22.78                      | 25.51                       | 25.51                                           | 27.59                                           | 18.74                   | 17.22                      | 20.09                       | 21.98                    | 22.69                      | 26.78                       | 26.42                                           | 28.44                                           |  |  |  |  |
| 4             | ea011_model_RCOCH05_8595 | 392946  | 415509   | Modelled Water Level (in mAHN) | 136.07                  | 136.09                     | 136.24                      | 136.27                   | 136.33                     | 136.46                      | 136.44                                          | 136.56                                          | 136.29                  | 136.32                     | 136.47                      | 136.50                   | 136.54                     | 136.67                      | 136.83                                          | 136.80                                          |  |  |  |  |
|               |                          |         |          | Modelled Flow (cumecs)         | 21.85                   | 21.03                      | 20.68                       | 21.56                    | 20.93                      | 18.81                       | 13.03                                           | 30.79                                           | 136.93                  | 136.57                     | 136.90                      | 136.48                   | 136.80                     | 136.87                      | 136.83                                          | 136.84                                          |  |  |  |  |

Model data taken from Rectitude & Limbongah 2013  
AEP - Annual Exceedence Probability  
m aHN - meters above ordnance datum Nanjing  
cumecs - cubic metres per second

Notes: "Climate Change Scenario - 30% and 70% increases in flow calculated for the 2080's (2070 - 2119). Please see <https://www.gov.hk/agriculture/food-risk-assessments/climate-change/advance-for-more-information-regarding-the-new-climate-change-guidance>. The location of the site and the type (vulnerability) of development determine the climate change allowance to consider in any food risk assessment.

## **Reservoir Flood Map**

**This text must be read with the extract from the Reservoir Flood Map which we have sent to you**

### **How to use the maps**

Reservoir flood maps are available to help you find out if you could be affected by reservoir flooding. Even though reservoir flooding is very unlikely it may be helpful to you to find out if you live or work in an area that could be affected. If you do, you might want to think about what you would do if an emergency did happen.

For more information on what to do if you live or work near a reservoir, including some frequently asked questions, visit our website at <http://www.environment-agency.gov.uk/flood>.

The maps have been prepared for emergency planning purposes and for this reason they reflect a credible worst case scenario – this means that if a reservoir failure did occur it would most likely be far less severe than the scenario shown in the maps. We've mapped a credible worst case scenario so that emergency planners have all the information they might need to increase public safety.

### **Reservoir safety**

Reservoirs in the UK have an extremely good safety record with no failures resulting in the loss of life since 1925. Reservoirs are more carefully maintained now. This means reservoir flooding is very unlikely to happen.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England. All large reservoirs that we think could endanger human life must be inspected and supervised by reservoir engineers. We ensure that reservoirs are regularly inspected and essential safety work is carried out.

For more information on reservoir safety visit our website at:

<https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements>.

### **Emergency planning**

Lead Local flood authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. Lead Local flood authorities work with other members of the Local Resilience Forum (LRF) to develop generic and site-specific emergency plans, depending on local circumstances and priorities.

If you want to find out about local emergency plans you should contact the responsible lead local flood authority as identified on the map.

## APPENDIX D – ROCHDALE BOROUGH COUNCIL

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[12]

Old Marsh Farm Barns  
Welsh Road, Sealand  
Flintshire CH5 2LY  
Telephone: 01244 289 041

## Megan Berry

---

**From:** Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>  
**Sent:** 19 December 2018 16:33  
**To:** Megan Berry  
**Subject:** RE: Hollingworth devl. site - Flood Risk Background Information  
**Attachments:** Drainage Feasibility Plan 2.pdf; Rochdale Borough Council Drainage Guidance.docx

Dear Megan,

Your site plan seems to incorporate land for which another Planning Application was made: 17/01188/VRCON Former Akzo Noble Site, which in turn is a variation on an earlier application 11/D55085 (year 2011). I attach the Drainage Designer's Prelim plan. If you want to look at documents, this is available on the Planning Website. I notice that this application didn't include an FRA and a very limited Drainage Strategy. The Decision Notice requires a detailed design to be submitted for approval to RBC prior to starting work on the site.

Answering your queries:-

- historical flooding: *Andrew Eadie represents RBC's Lead Local Flood Authority and has any records – he will respond to you.*
- predicted flood water levels: *this information, if available is obtained by request to the Environment Agency.*
- current drainage issues – *this is a mix of brownfield (former Akzo site) and greenfield; I would assume that any such drainage that may have been present is no longer viable.*

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event:- *United Utilities have information on their reservoirs; the EA also provides mapping information on reservoir flood risks.*

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage – *I attach a standard info sheet.*

regards

**Stephen McCann**

Drainage & Flooding Engineer  
Highways, Property & Strategic Housing



☎ 01706 924606

✉ [stephen.mccann@rochdale.gov.uk](mailto:stephen.mccann@rochdale.gov.uk)

Rochdale Borough Council  
Floor 2, Number One Riverside  
Smith Street, Rochdale, OL16 1XU

---

**From:** Megan Berry [mailto:[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)]  
**Sent:** 17 December 2018 17:32  
**To:** Stephen McCann  
**Subject:** Flood Risk Background Information

**F.A.O Flood Risk, Drainage and/or Planning department**

***Please forward to the correct department/ office***

Good Afternoon Stephen,

***Hollingworth Road, Littleborough.***

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event.

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

**Megan Berry** BSc(Hons) GradCIWEM  
*Graduate Flood Risk Analyst*

**BETTS HYDRO**

*Engineering Consultants*

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)

[www.betts-associates.co.uk](http://www.betts-associates.co.uk)

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## Megan Berry

---

**From:** Stephen McCann <Stephen.McCann@Rochdale.Gov.UK>  
**Sent:** 19 December 2018 17:05  
**To:** Megan Berry  
**Subject:** FW: Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Megan:- for your ref:

---

**From:** Andrew Eadie  
**Sent:** 19 December 2018 16:55  
**To:** Stephen McCann  
**Subject:** RE: Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Hi Stephen –

I've checked our database, and we don't have any record of historic flooding on this site. As far as the Boxing Day 2015 flooding is concerned, there is no record of flooding on this site but the records only really relate to properties rather than areas of land so it is possible that there was flooding on this site but it wouldn't necessarily have been recorded.

Cheers

**Andrew Eadie**  
Principal Planning Officer  
Planning



01706 924371



andrew.eadie@rochdale.gov.uk

Rochdale Borough Council  
Floor 3, Number One Riverside  
Smith Street, Rochdale, OL16 1XU

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**From:** Stephen McCann  
**Sent:** 19 December 2018 16:06  
**To:** Andrew Eadie  
**Cc:** meganberry@betts-associates.co.uk  
**Subject:** Pre Planning - Historical Flood Risk (Hollingworh Lake) request

Hello Andrew,

I received a request (see below) for any historical records of flooding to the immediate north of Hollingworth Lake. The location plan is attached.

Do you have any records?

Do you know if this area had any flooding in Dec 2015?

The EA flood risk map shows none.

regards

**Stephen McCann**

Drainage & Flooding Engineer

Highways, Property & Strategic Housing



☎ 01706 924606

✉ [stephen.mccann@rochdale.gov.uk](mailto:stephen.mccann@rochdale.gov.uk)

---

**From:** Megan Berry [<mailto:meganberry@betts-associates.co.uk>]

**Sent:** 17 December 2018 17:32

**To:** Stephen McCann

**Subject:** Flood Risk Background Information

***F.A.O Flood Risk, Drainage and/or Planning department***

***Please forward to the correct department/ office***

Good Afternoon Stephen,

***Hollingworth Road, Littleborough.***

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated.

It is understood that the site is located within Flood Zone 1 but is at risk from reservoir flooding, we are therefore seeking further information into what would be required to be included within an FRA to show the development proposals are not at risk during an event.

If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

**Megan Berry** BSc(Hons) GradCIWEM

*Graduate Flood Risk Analyst*

**BETTS HYDRO**

*Engineering Consultants*

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)

[www.betts-associates.co.uk](http://www.betts-associates.co.uk)

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## APPENDIX E – UNITED UTILITIES

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[13]

Old Marsh Farm Barns  
Welsh Road, Sealand  
Flintshire CH5 2LY  
Telephone: 01244 289 041

## Megan Berry

---

**From:** Dodd, Matthew <Matthew.Dodd@uuplc.co.uk>  
**Sent:** 03 January 2019 11:31  
**To:** Megan Berry  
**Cc:** Wastewater Developer Services  
**Subject:** RE: UU Historical Sewer Flooding - UU Ref 4200023559

Good Afternoon

I can confirm that we do have a current record of sewer flooding on our DG5 register within the vicinity of the proposed development. The DG5 register is a register of properties that have flooded as a result of hydraulic inadequacy of the public sewer network.

Please note that United Utilities Water Limited (Uuw) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which Uuw has no control and not a facet of sewer capacity; or
- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

<https://www.unitedutilities.com/services/builders-developers/>

Should you require any further information please do not hesitate to contact me.'

Kind regards

**Matthew Dodd**  
Assistant Developer Engineer  
Developer Services and Planning  
Network Delivery  
United Utilities  
T: 01925 679369 (internal 79369)  
[unitedutilities.com](https://www.unitedutilities.com)

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**From:** Megan Berry [mailto:[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)]  
**Sent:** 17 December 2018 17:33  
**To:** Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>  
**Subject:** UU Historical Sewer Flooding

**F.A.O Flood Risk, Drainage and/or Planning department**

**Please forward to the correct department/ office**

Good Afternoon Stephen,

**Hollingworth Road, Littleborough.**

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

**Megan Berry** BSc(Hons) GradCIWEM  
*Graduate Flood Risk Analyst*

**BETTS HYDRO**  
**Engineering Consultants**  
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# Extract from Map of Water Mains

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

The actual positions may be different from those shown on the plan, private service pipes may be shown where a known record is available.

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United Utilities Water Limited 2014

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OL15 0DW

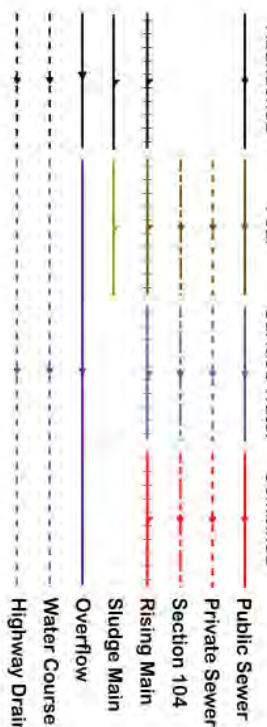
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**DO NOT SCALE**  
Approximate Scale: 1:5000





LEGEND



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

- Manhole
- Head of System
- Extent of Survey
- Redding Eye
- Inlet
- Ducting Point
- Valve
- Parade
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Scaleway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Office Plate
- Change of Characteristic
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vertical Chamber
- Parade Chamber
- Network Storage Tank
- Sewer Overflow
- WW Treatment Works
- Septic Tank
- Control Kiosk

MANHOLE FUNCTION

- FO Foul
- SW Surface Water
- CO Combined
- OV Overflow

SEWER SHAPE

- CI Circular
- TR Tripartite
- EG Egg
- AE Arch
- OV Oval
- BA Barrel
- FT Flat Top
- NO Horseshoe
- RE Rectangular
- UN Unspecified
- SO Square

SEWER MATERIAL

- AC Adiabatic Cement
- BR Brick
- PE Polyethylene
- RP Reinforced Plastic Matrix
- CO Concrete
- CSB Concrete Segment Bored
- CSU Concrete Segment Unbored
- CC Concrete Box Culvert
- PSC Plastic Steel Composite
- GRC Glass Reinforced Plastic
- DI Ductile Iron
- PVC Polyvinyl Chloride
- CI Cast Iron
- SI Spun Iron
- ST Steel
- VC Vitrified Clay
- PP Polypropylene
- PF Pitch Fibre
- MAC Masonry Coursed
- MAR Masonry Random
- U Unspecified

Address or Site Reference:

4 HEAD LANE,  
LITTLEBOROUGH,  
OL15 0DW

OS sheet SD9315SE

Number:

Scale: 1:1250 Date: 04/09/2018

Nodes: 20

Sheet: 3 of 7

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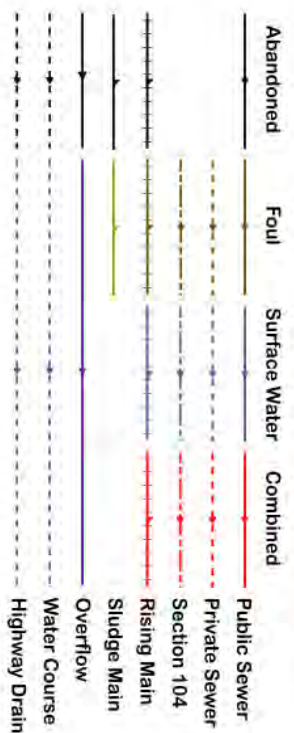


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Hollingworth Lake Country Park

LEGEND



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

- Manhole
- Head of Survey
- Roading Eye
- Inlet
- Discharge Point
- Parade
- Valve
- Water Chamber
- Non Return Valve
- Air Valve
- Sewerage
- Gully
- Cascade
- Flow Meter
- Septic Tank
- Oil Interceptor
- Summit
- Drop Shaft
- Office Plate

MANHOLE FUNCTION

- FO Foul
- SW Surface Water
- CO Combined
- OV Overflow
- CI Circular
- TR Tripartite
- AE Arch
- OV Oval
- BA Barrel
- FT Flat Top
- NO Horseshoe
- RE Rectangular
- UN Unspecified
- SO Square

SEWER SHAPE

- AC Adhesive Cement
- BR Brick
- PE Polyethylene
- RP Reinforced Plastic Matrix
- CO Concrete
- CSB Concrete Segment Balled
- CSU Concrete Segment Unballed
- CC Concrete Box Culverted
- PPC Plastic Steel Composite
- GRG Glass Reinforced Plastic
- DI Ductile Iron
- PVC Polyvinyl Chloride
- CI Cast Iron
- SI Spun Iron
- ST Steel
- VC Vitrified Clay
- PP Polypropylene
- PF Pitch Fibre
- MMC Masonry, Curved
- MAR Masonry, Random
- U Unspecified

Address or Site Reference:

4 HEADLANE,  
LITTLEBOROUGH,  
OL15 0DW

OS sheet SD9315NW  
Number: 238  
Scale: 1:1250  
Date: 04/09/2018  
Nodes: 5 of 7  
Sheet: 5 of 7

Printed by: Property Searches

SEWER RECORDS

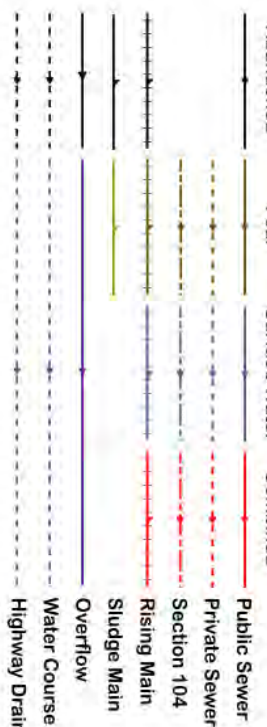


The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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LEGEND



- All point assets follow the standard colour convention:  
red combined  
brown foul  
blue surface water  
purple overflow
- Manhole
  - Head of System
  - Extent of Survey
  - Roading Eye
  - Inlet
  - Discharge Point
  - Valve
  - Paradeock
  - Without Chamber
  - Valve
  - Air Valve
  - Non Return Valve
  - Seakeway
  - Gully
  - Cascade
  - Flow Meter
  - Hatch Box
  - Oil Interceptor
  - Summit
  - Drop Shaft
  - Control Kiosk
  - Change of Characteristic
  - Side Entry Manhole
  - Outfall
  - Screen Chamber
  - Inspection Chamber
  - Bifurcation Chamber
  - Lamp Hole
  - T Junction / Saddle
  - Catchpit
  - Valve Chamber
  - Valve
  - Vent Chamber
  - Paradeock Chamber
  - Network Storage Tank
  - Sewer Overflow
  - WW Treatment Works
  - Septic Tank
  - Control Kiosk

MANHOLE FUNCTION

- FO Foul
- SW Surface Water
- CO Combined
- OY Overflow

SEWER SHAPE

- CI Circular
- TR Triangular
- E8 Egg
- AE Arch
- OY Oval
- BA Barrel
- FT Flat Top
- HO Horseshoe
- RE Rectangular
- UN Unspecified
- SO Square

SEWER MATERIAL

- AC Asbestos Cement
- BR Brick
- PE Polyethylene
- RP Reinforced Plastic Matrix
- CO Concrete
- CSB Concrete Segment Balled
- CSU Concrete Segment Unballed
- CC Concrete Box Culverted
- PSC Plastic Steel Composite
- GRC Glass Reinforced Plastic
- DI Ductile Iron
- PVC Polyvinyl Chloride
- CI Cast Iron
- SI Sawn Iron
- ST Steel
- VC Vitrified Clay
- PP Polypropylene
- PF Pitch Fibre
- MAC Masonry Coursed
- MAR Masonry Random
- U Unspecified

Address or Site Reference:

4 HEADLANE,  
LITTLEBOROUGH,  
OL15 0DW

OS sheet SD9315NE

Number:

Scale: 1:1250

Nodes: 45

Date: 04/09/2018

Sheet: 7 of 7

Printed by: Property Searches

SEWER  
RECORDS



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LEGEND



All point assets follow the standard colour convention:

- red - combined
  - blue - surface water
  - brown - foul
  - purple - overflow
- Manhole  
Head of System  
Extent of Survey  
Rising Eye  
Inlet  
Discharge Point  
Vent  
Prestock  
Wastout Chamber  
Valve  
Air Valve  
Non Return Valve  
Gully  
Cascade  
Flow Meter  
Hatch Box  
Oil Interceptor  
Summit  
Drop Shaft  
Office Plate
- Side Entry Manhole  
Outfall  
Screen Chamber  
Inspection Chamber  
Bifurcation Chamber  
Lamp Hole  
T Junction / Saddle  
Catchpit  
Valve Chamber  
Vent Chamber  
Prestock Chamber  
Network Storage Tank  
Sewer Overflow  
WW Treatment Works  
Septic Tank  
Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

- FO Foul
- SW Surface Water
- CO Combined
- OV Overflow

SEWER SHAPE

- CI Circular
- EA Elliptical
- OV Oval
- FT Flat Top
- RE Rectangular
- UN Unspecified
- SQ Square

SEWER MATERIAL

- AC Asbestos Cement
- BR Brick
- PE Polyethylene
- RP Reinforced Plastic Matrix
- CO Concrete
- CSB Concrete Segment Bolted
- CSU Concrete Segment Unbolted
- CC Concrete Box Culverted
- PSC Plastic Steel Composite
- GRC Glass Reinforced Plastic
- DI Ductile Iron
- PVC Polyvinyl Chloride
- CI Cast Iron
- SI Spun Iron
- ST Steel
- VC Vitreous Clay
- PP Polypropylene
- PF Pitch Fibre
- MAC Masonry, Curved
- MAR Masonry, Random
- U Unspecified

Address or Site Reference:

4 HEAD LANE,  
LITTLEBOROUGH,  
OL15 0DW

OS sheet SD9315SE  
Number:  
Scale: 1:1250  
Nodes: 20  
Sheet: 3 of 7  
Date: 04/09/2018

Printed by: Property Searches

SEWER  
RECORDS



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Hollingworth Lake Country Park

## APPENDIX F – SURFACE WATER RUN-OFF CALCULATIONS

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[14]

Old Marsh Farm Barns  
Welsh Road, Sealand  
Flintshire CH5 2LY  
Telephone: 01244 289 041

Calculated by: Megan Berry

Site name: HOLLINGWORTH ROAD

Site location: LITTLEBOROUGH

## Site coordinates

Latitude: 53.63614° N

Longitude: 2.10171° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 6512492

Date: 2019-01-04T13:54:01

## Methodology

FEH Statistical

## Site characteristics

|                      |        |
|----------------------|--------|
| Total site area (ha) | 17.336 |
|----------------------|--------|

## Methodology

|                               |                             |
|-------------------------------|-----------------------------|
| Qmed estimation method        | Calculate from BFI and SAAR |
| BFI and SPR estimation method | Specify BFI manually        |
| HOST class                    | 21                          |
| BFI / BFIHOST                 | 0.36                        |
| Qmed (l/s)                    | 248.68                      |
| Qbar / Qmed Conversion Factor | 1.08                        |

## Hydrological characteristics

|                               | Default | Edited |
|-------------------------------|---------|--------|
| SAAR (mm)                     | 1246    | 1246   |
| Hydrological region           | 10      | 10     |
| Growth curve factor: 1 year   | 0.87    | 0.87   |
| Growth curve factor: 30 year  | 1.7     | 1.7    |
| Growth curve factor: 100 year | 2.08    | 2.08   |

## Notes:

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

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

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

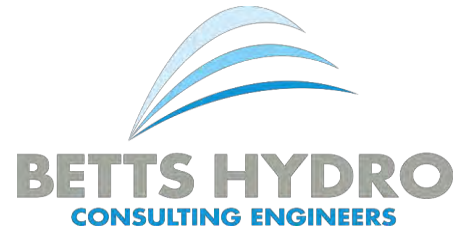
## Greenfield runoff rates

|                      | Default | Edited |
|----------------------|---------|--------|
| Qbar (l/s)           | 267.33  | 256.05 |
| 1 in 1 year (l/s)    | 232.58  | 222.77 |
| 1 in 30 years (l/s)  | 454.46  | 435.29 |
| 1 in 100 years (l/s) | 556.05  | 532.59 |

## SURFACE WATER RUN-OFF CALCULATION SHEET

|             |                                  |
|-------------|----------------------------------|
| Development | HOLLINGWORTH ROAD, LITTLEBOROUGH |
| Project No. | HYD383                           |

|          |          |              |    |
|----------|----------|--------------|----|
| Revision | 0.0      | Completed by | MB |
| Date     | 04.01.19 | Checked by   | KW |



| Areas                                  |           | Catchment Characteristics |            |
|----------------------------------------|-----------|---------------------------|------------|
| Total Site                             | 17.336 ha | SAAR                      | 1209 mm    |
| Development Area (for SW Strategy)     | 17.336 ha | BFI                       | 0.36       |
| Existing Impermeable                   | 0.867 ha  | $i_1$                     | 18.4 mm/hr |
| Existing Impermeable (for SW Strategy) | 0.867 ha  | $i_{30}$                  | 34.5 mm/hr |
| Existing Pervious                      | 16.469 ha | $i_{100}$                 | 44.5 mm/hr |
| Existing Pervious (for SW Strategy)    | 16.469 ha | $d_1$                     | 22.81 mm   |
| Proposed Impermeable (total)           | 7.800 ha  | $d_{100}$                 | 68.16 mm   |
| Proposed Impermeable (domestic only)   | 7.800 ha  |                           |            |

| Run-off Rates           |          |            |  | Volumes                 |          |             |  |
|-------------------------|----------|------------|--|-------------------------|----------|-------------|--|
| <i>Pre-development</i>  |          |            |  | <i>Pre-development</i>  |          |             |  |
| Impermeable             | 1yr      | 44.3 l/s   |  | Impermeable             | 1yr      | 197.8 cu.m  |  |
|                         | 30yr     | 83.1 l/s   |  |                         | 100yr    | 590.9 cu.m  |  |
| Pervious                | 100yr    | 107.3 l/s  |  | Pervious                | 1yr      | 2107.4 cu.m |  |
|                         | 50mm/hr  | 120.4 l/s  |  |                         | 100yr    | 6410.6 cu.m |  |
| Total                   | 1yr      | 222.8 l/s  |  | Total                   | 1yr      | 2305.1 cu.m |  |
|                         | 30yr     | 435.3 l/s  |  |                         | 100yr    | 7001.5 cu.m |  |
|                         | 100yr    | 532.6 l/s  |  | <i>Post-development</i> |          |             |  |
|                         | QBar     | 256.1 l/s  |  | Impermeable (total)     | 1yr      | 1779.2 cu.m |  |
| Total                   | 1yr      | 267.0 l/s  |  |                         | 100yr+CC | 6911.4 cu.m |  |
|                         | 30yr     | 518.4 l/s  |  |                         |          |             |  |
|                         | 100yr    | 639.8 l/s  |  |                         |          |             |  |
| <i>Post-development</i> |          |            |  |                         |          |             |  |
| Impermeable (total)     | 1yr      | 398.2 l/s  |  |                         |          |             |  |
|                         | 30yr     | 747.8 l/s  |  |                         |          |             |  |
|                         | 100yr+CC | 1254.4 l/s |  |                         |          |             |  |

| Quick storage Estimates |          | low  | high | mean  | Imp. Area (ha) | Max. Discharge (l/s) | Rainfall | CC  |
|-------------------------|----------|------|------|-------|----------------|----------------------|----------|-----|
| Return Period           | 1yr      | 248  | 687  | 467.5 | 7.800          | 256.1                | FEH      | 0   |
| Return Period           | 30yr     | 1203 | 2002 | 1603  | 7.800          | 256.1                | FEH      | 0   |
| Return Period           | 100yr+CC | 2374 | 3756 | 3065  | 7.800          | 256.1                | FEH      | 20% |
| Return Period           | 100yr+CC | 2909 | 4691 | 3800  | 7.800          | 256.1                | FEH      | 40% |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|-----------------------|---|-----------------------|-----|--------|-------------------|------------|--------|---------|-------|------------------------|------|-----------|--------|-----------|------|-----|---------|-------|-------|-----|--------|-----------------------|-------|-------------------------------|----------|
| Betts Associates Ltd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    | Page 1                                                                              |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Old Marsh Farm Barns<br>Welsh Road<br>Sealand Flintshire CH5 2LY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | HOLLINGWORTH ROAD<br>LITTLEBOROUGH |  |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Date 04/01/2019<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Designed by MB<br>Checked by DK    |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Micro Drainage Source Control 2018.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| <p style="text-align: center;"><u>Greenfield Runoff Volume</u></p> <p style="text-align: center;">FSR Data</p> <table> <tr> <td>Return Period (years)</td> <td>1</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> </tr> <tr> <td>Ratio R</td> <td>0.253</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>17.336</td> </tr> <tr> <td>SAAR (mm)</td> <td>1206</td> </tr> <tr> <td>CWI</td> <td>123.833</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>47.000</td> </tr> </table> <p style="text-align: center;">Results</p> <table> <tr> <td>Percentage Runoff (%)</td> <td>46.71</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>2107.376</td> </tr> </table> |                                    |                                                                                     | Return Period (years) | 1 | Storm Duration (mins) | 360 | Region | England and Wales | M5-60 (mm) | 19.000 | Ratio R | 0.253 | Areal Reduction Factor | 1.00 | Area (ha) | 17.336 | SAAR (mm) | 1206 | CWI | 123.833 | Urban | 0.000 | SPR | 47.000 | Percentage Runoff (%) | 46.71 | Greenfield Runoff Volume (m³) | 2107.376 |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1                                  |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Storm Duration (mins)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 360                                |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | England and Wales                  |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| M5-60 (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 19.000                             |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Ratio R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.253                              |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Areal Reduction Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1.00                               |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 17.336                             |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1206                               |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| CWI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 123.833                            |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Urban                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.000                              |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| SPR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 47.000                             |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Percentage Runoff (%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 46.71                              |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Greenfield Runoff Volume (m³)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2107.376                           |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| ©1982-2018 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |                                                                                     |                       |   |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|-----------------------|-----|-----------------------|-----|--------|-------------------|------------|--------|---------|-------|------------------------|------|-----------|--------|-----------|------|-----|---------|-------|-------|-----|--------|-----------------------|-------|-------------------------------|----------|
| Betts Associates Ltd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    | Page 1                                                                              |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Old Marsh Farm Barns<br>Welsh Road<br>Sealand Flintshire CH5 2LY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | HOLLINGWORTH ROAD<br>LITTLEBOROUGH |  |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Date 04/01/2019<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Designed by MB<br>Checked by DK    |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Micro Drainage Source Control 2018.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| <p style="text-align: center;"><u>Greenfield Runoff Volume</u></p> <p style="text-align: center;">FSR Data</p> <table> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> </tr> <tr> <td>Ratio R</td> <td>0.253</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>17.336</td> </tr> <tr> <td>SAAR (mm)</td> <td>1206</td> </tr> <tr> <td>CWI</td> <td>123.833</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>47.000</td> </tr> </table> <p style="text-align: center;">Results</p> <table> <tr> <td>Percentage Runoff (%)</td> <td>51.74</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>6410.598</td> </tr> </table> |                                    |                                                                                     | Return Period (years) | 100 | Storm Duration (mins) | 360 | Region | England and Wales | M5-60 (mm) | 19.000 | Ratio R | 0.253 | Areal Reduction Factor | 1.00 | Area (ha) | 17.336 | SAAR (mm) | 1206 | CWI | 123.833 | Urban | 0.000 | SPR | 47.000 | Percentage Runoff (%) | 51.74 | Greenfield Runoff Volume (m³) | 6410.598 |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 100                                |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Storm Duration (mins)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 360                                |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | England and Wales                  |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| M5-60 (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 19.000                             |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Ratio R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.253                              |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Areal Reduction Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.00                               |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 17.336                             |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1206                               |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| CWI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 123.833                            |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Urban                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.000                              |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| SPR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 47.000                             |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Percentage Runoff (%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 51.74                              |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| Greenfield Runoff Volume (m³)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6410.598                           |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |
| ©1982-2018 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |                                                                                     |                       |     |                       |     |        |                   |            |        |         |       |                        |      |           |        |           |      |     |         |       |       |     |        |                       |       |                               |          |

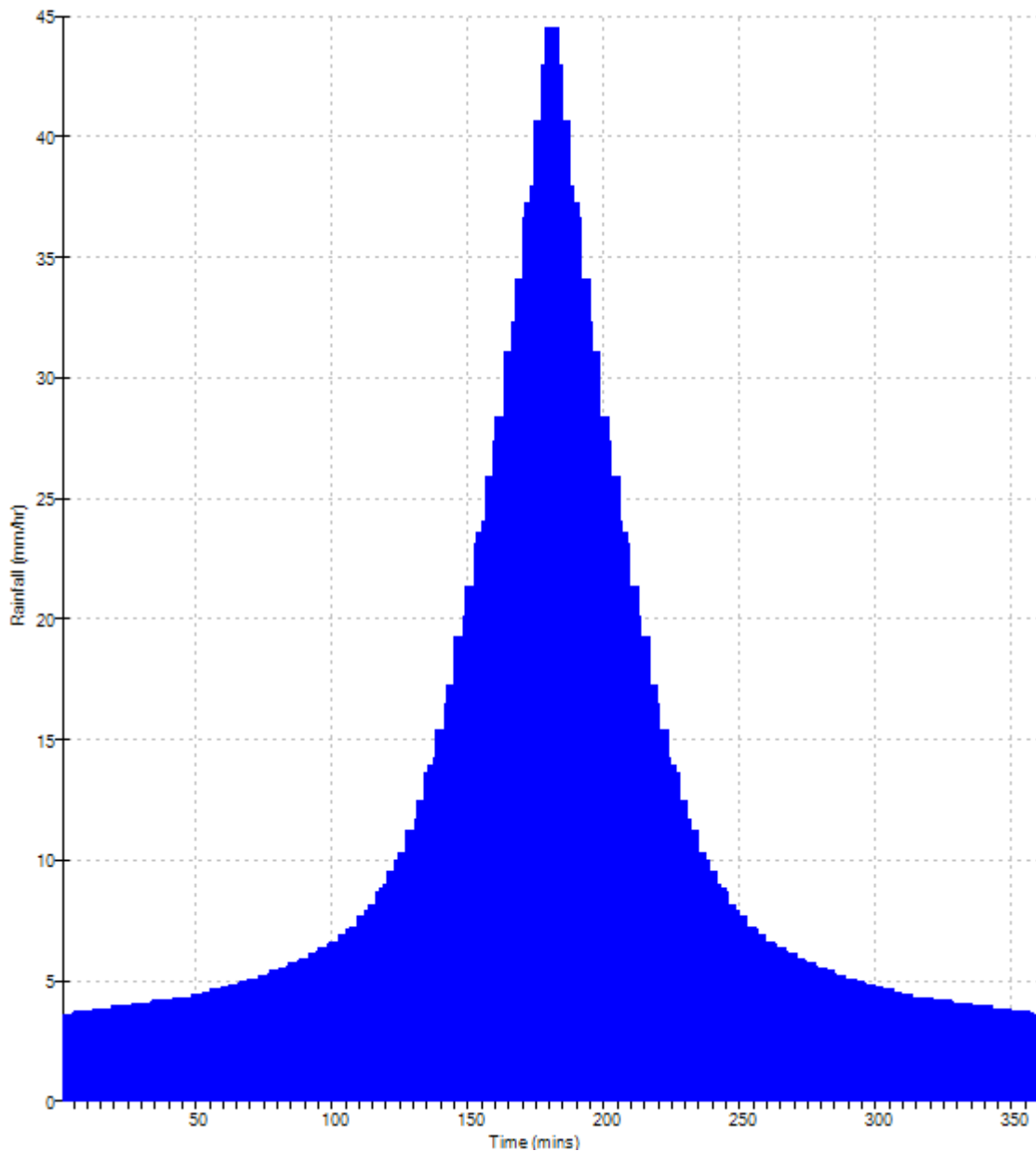
|                                                                  |                                    |                                                                                     |
|------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|
| Betts Associates Ltd                                             |                                    | Page 1                                                                              |
| Old Marsh Farm Barns<br>Welsh Road<br>Sealand Flintshire CH5 2LY | HOLLINGWORTH ROAD<br>LITTLEBOROUGH |  |
| Date 04/01/2019<br>File                                          | Designed by MB<br>Checked by DK    |                                                                                     |
| Micro Drainage                                                   | Network 2018.1                     |                                                                                     |

### Rainfall profile

Storm duration (mins) 360

#### FEH Data

|                        |               |
|------------------------|---------------|
| FEH Rainfall Version   | 2013          |
| Site Location GB       | 392867 415636 |
| Data Type              | Point         |
| Peak Intensity (mm/hr) | 44.534        |
| Ave. Intensity (mm/hr) | 11.361        |
| Return Period (years)  | 100.0         |

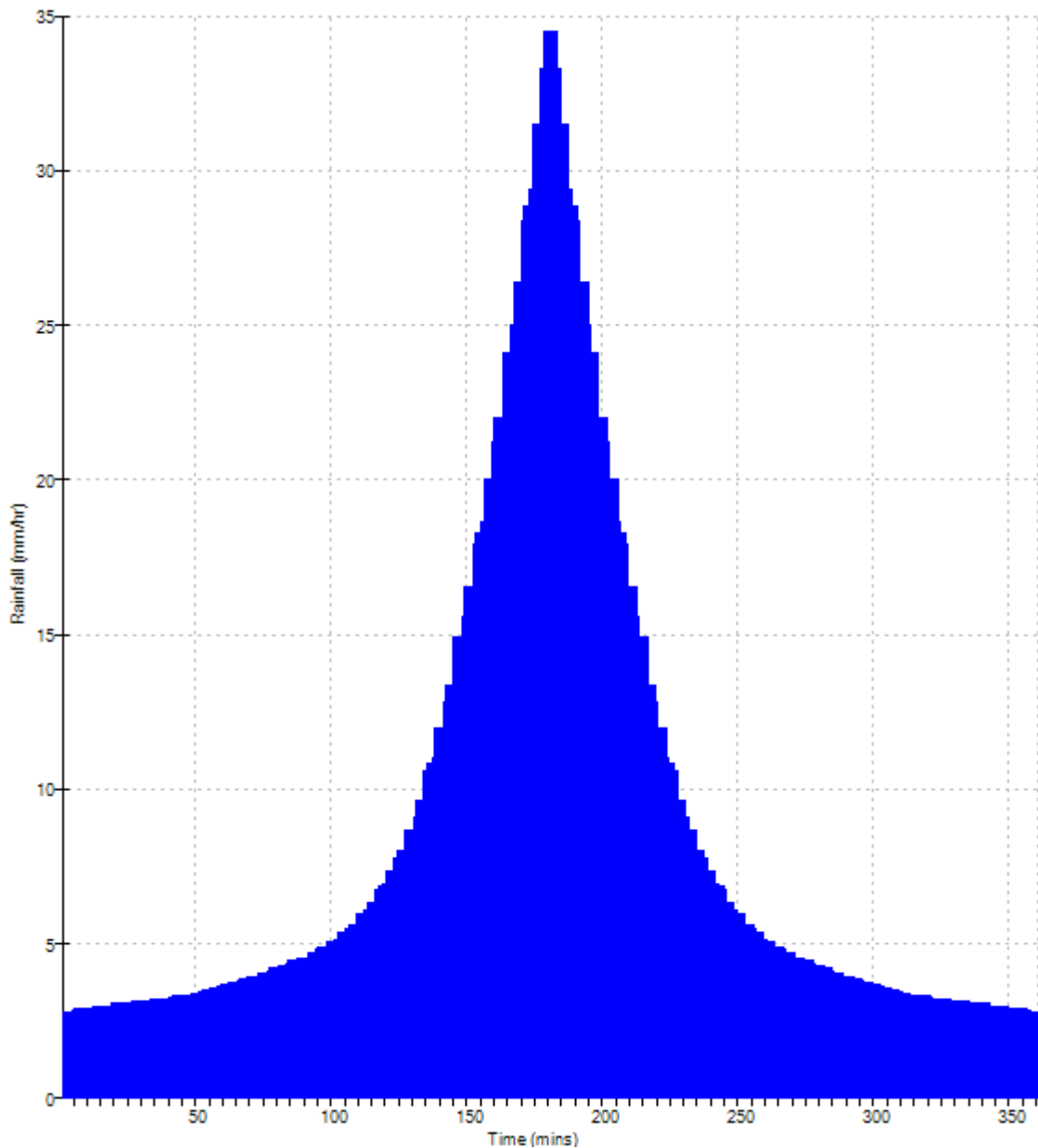


|                                                                  |                                    |                                                                                     |
|------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|
| Betts Associates Ltd                                             |                                    | Page 1                                                                              |
| Old Marsh Farm Barns<br>Welsh Road<br>Sealand Flintshire CH5 2LY | HOLLINGWORTH ROAD<br>LITTLEBOROUGH |  |
| Date 04/01/2019<br>File                                          | Designed by MB<br>Checked by DK    |                                                                                     |
| Micro Drainage                                                   | Network 2018.1                     |                                                                                     |

### Rainfall profile

Storm duration (mins) 360

FEH Data  
 FEH Rainfall Version 2013  
 Site Location GB 392867 415636  
 Data Type Point  
 Peak Intensity (mm/hr) 34.515  
 Ave. Intensity (mm/hr) 8.805  
 Return Period (years) 30.0

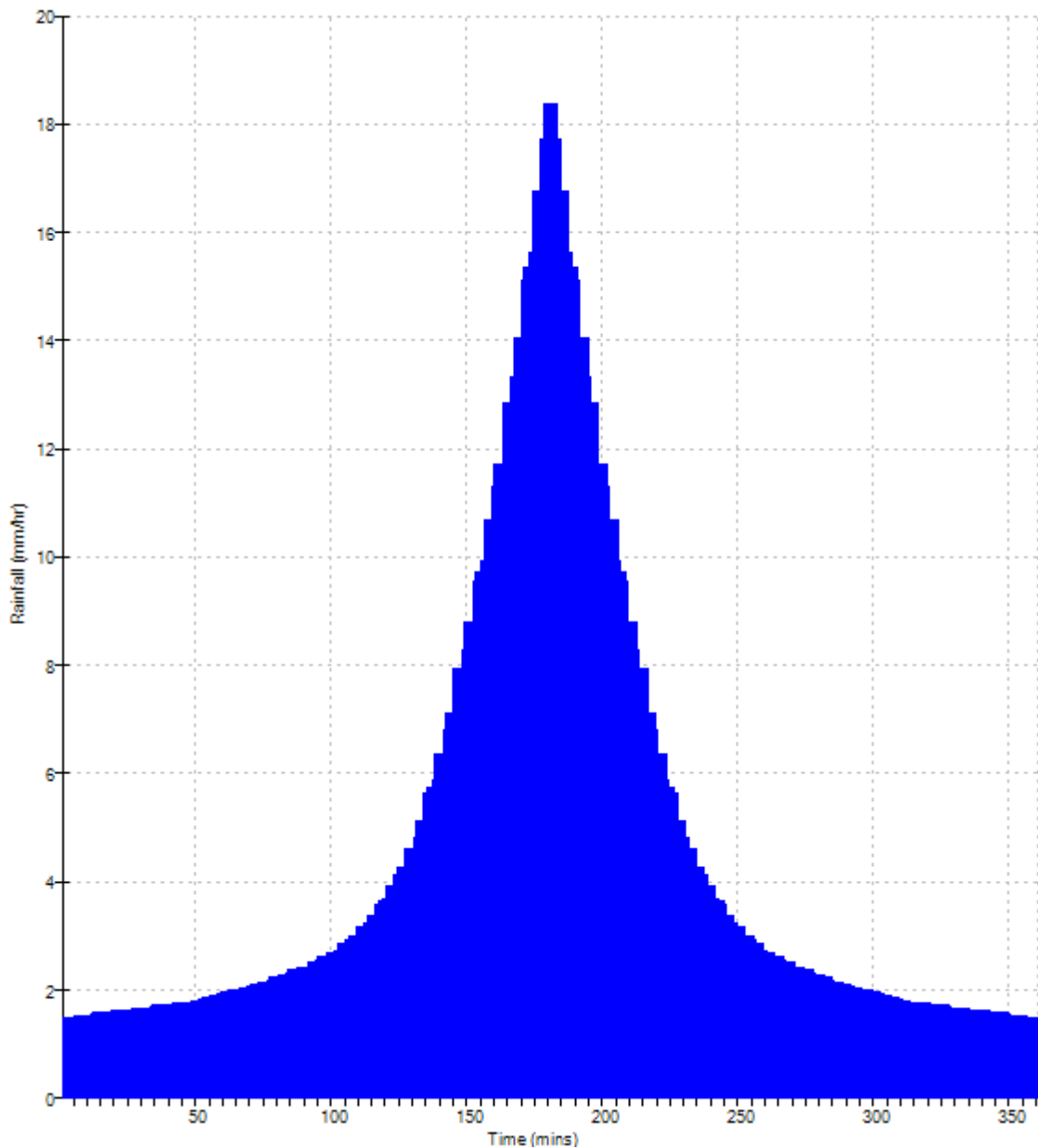


|                                                                  |                                    |                                                                                     |
|------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------|
| Betts Associates Ltd                                             |                                    | Page 1                                                                              |
| Old Marsh Farm Barns<br>Welsh Road<br>Sealand Flintshire CH5 2LY | HOLLINGWORTH ROAD<br>LITTLEBOROUGH |  |
| Date 04/01/2019<br>File                                          | Designed by MB<br>Checked by DK    |                                                                                     |
| Micro Drainage                                                   | Network 2018.1                     |                                                                                     |

### Rainfall profile

Storm duration (mins) 360

FEH Data  
 FEH Rainfall Version 2013  
 Site Location GB 392867 415636  
 Data Type Point  
 Peak Intensity (mm/hr) 18.377  
 Ave. Intensity (mm/hr) 4.688  
 Return Period (years) 2.0



## APPENDIX G – EXISTING AND PROPOSED DRAINAGE PLANS

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[15]

Old Marsh Farm Barns  
Welsh Road, Sealand  
Flintshire CH5 2LY  
Telephone: 01244 289 041

LITTLEBORO

EXISTING DRAINAGE SITUATION

**LEGEND**

Masterplan Boundary

Site Extents

AKZO Nobel Site

Rochdale Council Carpark

Railway Line

Gas Main and Easement

Existing Drainage Features

Topography

Man River

Canal

Reservoir

Pond

Existing Sewer Networks

Public Combined Sewer

Public Foul Water Sewer

Lake to Canal Pipeline and Easement

**FURTHER NOTES:**  
This drawing is not a drainage 'design' it is a preliminary drainage strategy showing key existing sewer locations (see sewer records for full details).

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.



PRELIMINARY DRAINAGE

STRATEGY PLAN

LEGEND

Masterplan Boundary

Site Extents

AKZO Nobel Site

Rochdale Council Carpark

Railway Line

Gas Main and Easement

Existing Drainage Features

Main River

Canal

Reservoir

(P)

Pond

Existing Sewer Networks

Public Combined Sewer

Public Foul Water Sewer

Lake to Canal Pipeline and Easement

Proposed Drainage Connections

Surface Water Drainage Connection(s)

Foul Water Drainage Connection(s)

\*

Proposed Point of Connection

**FURTHER NOTES:**

This drawing is not a drainage 'design' it is a preliminary drainage strategy showing key existing sewer locations (see sewer records for full details).

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.



**\* 1 SURFACE WATER CONNECTION INTO A WATERCOURSE:**

Assuming infiltration will not be feasible based on the information reviewed, then in accordance with the drainage hierarchy the next method to be explored is to discharge surface water run-off to a watercourse. The nearest watercourse to site is the River Roch (Main River) located approximately 450m to the north of site beyond the canal and railway. Given the engineering constraints associated with routing to the Main River it is unlikely that a direct discharge from site to the River Roch will be achievable as routing would need to span across 450m beneath a canal structure and railway line.

**\* 2 SURFACE WATER CONNECTION INTO A CANAL:**

Given that infiltration and a connection into the River Roch is unlikely to offer a surface water management solution for the site, it is therefore proposed the development site mimics the existing situation and discharges at the restricted pre-development greenfield rate of 256.1l/s (QBar) to the canal. The canal is a private asset as such consent for works to this asset will be required from the CRT. An enquiry has been sent to the CRT however a response is at this time outstanding. It is understood that the CRT can accept formal surface water discharges on competitive commercial terms and they will charge accordingly for the benefits provided. It should also be noted as the CRT are not a statutory drainage authority, they are not obliged to accept discharges into their network, therefore it is important at this early stage to evidence all other methods of handling surface water are not feasible we have therefore reviewed other options available.

**\* 3 SURFACE WATER CONNECTION INTO A SURFACE WATER PIPE:**

If a new formal outfall into the Rochdale Canal cannot be agreed, then the alternative would be to consider discharging into the public sewer network. UU have identified a surface water piped network crossing the development site which feeds the canal with water from Hollingworth Lake. This piped network could provide an alternative method for discharging surface water from the development site. Early pre-development discussion should be undertaken with UU to determine whether this UU asset crossing site would be suitable to cater for the site.

## APPENDIX H – CANAL & RIVERS TRUST

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[16]

Old Marsh Farm Barns  
Welsh Road, Sealand  
Flintshire CH5 2LY  
Telephone: 01244 289 041

## Megan Berry

---

**From:** Mark Heath <Mark.Heath@canalrivertrust.org.uk>  
**Sent:** 19 December 2018 10:58  
**To:** Megan Berry  
**Cc:** Ken Fowler; Customer Services  
**Subject:** RE: Historical Canal Flooding  
**Attachments:** Appendix A.PDF

Dear Megan,

### **RE:- Historical Canal Flooding: Hollingworth Road, Littleborough, Rochdale Canal**

Further to your enquiry received 17 December 2018, Canal & River Trust can confirm the following:-

The Trust are not aware of any breach or overtopping events in the vicinity.

The Trust also add that whilst Hollingworth Reservoir provides a feed to the Rochdale Canal, this is not under the jurisdiction of the Trust, as is owned and maintained by United Utilities.

Further, please note that the canal pound (lock to lock) adjacent to the site identified is approximately 5.75km in length, with an average width of 14m.

Please be aware that we are unable to comment on the flood risk to individual properties or developments and interpretation of the information provided in this e-mail is your responsibility.

For further advice on flood risk from canals we have included some generic guidance, please refer to Appendix A attached.

We trust this is satisfactory, however if you do require any further information please do not hesitate to contact the undersigned.

Kind regards

Mark

**Mark Heath**

*Water Engineer, Water Management Team*

**(North West, Yorkshire & the North East, East Midlands Regions)**

Canal & River Trust | **Red Bull Yard** | Congleton Road South | **Church Lawton** | Stoke-on-Trent | **ST7 3AP**

We have published our 2017 Annual Lockage Report - [take a look at this year's figures here!](#)

---

**From:** Ken Fowler  
**Sent:** 18 December 2018 14:08  
**To:** Mark Heath <Mark.Heath@canalrivertrust.org.uk>  
**Cc:** Customer Services <Customer.Services@canalrivertrust.org.uk>; Megan Berry <meganberry@betts-associates.co.uk>  
**Subject:** RE: Historical Canal Flooding

Mark, you know this area a lot better than I do; please can you research and reply.

Thanks

Ken Fowler MICE, CEng  
Principal Water Engineer

*Water Management Team  
Yorkshire & North East, East Midlands and North West Regions*

T 0113 2816875

M 07710 175461

E [Ken.Fowler@canalrivertrust.org.uk](mailto:Ken.Fowler@canalrivertrust.org.uk)

W canalrivertrust.org.uk

Canal & River Trust, Fearn's Wharf, Neptune Street, Leeds, LS9 8PB

---

**From:** Megan Berry <[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)>

**Sent:** 17 December 2018 17:38

**To:** Ken Fowler <[Ken.Fowler@canalrivertrust.org.uk](mailto:Ken.Fowler@canalrivertrust.org.uk)>

**Cc:** Customer Services <[Customer.Services@canalrivertrust.org.uk](mailto:Customer.Services@canalrivertrust.org.uk)>

**Subject:** Historical Canal Flooding

***F.A.O Flood Risk, Drainage and/or Planning department***

***Please forward to the correct department/ office***

Good Afternoon Ken,

***Hollingworth Road, Littleborough.***

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

**Megan Berry** BSc(Hons) GradCIWEM  
Graduate Flood Risk Analyst

**BETTS HYDRO**

*Engineering Consultants*

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER - 01244 289041

[meganberry@betts-associates.co.uk](mailto:meganberry@betts-associates.co.uk)

[www.betts-associates.co.uk](http://www.betts-associates.co.uk)

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT  
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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## APPENDIX H – STORMWATER STORAGE ESTIMATES

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## 1 YEAR RETURN PERIOD STORM EVENT

|                                                                                                                                                                |                                   |                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <br><b>Variables</b><br>Results<br>Design<br>Overview 2D<br>Overview 3D<br>Vt | <b>Variables</b>                  |                  |
|                                                                                                                                                                | FEH Rainfall                      |                  |
|                                                                                                                                                                | Return Period (years)             | 2                |
|                                                                                                                                                                | Version                           | 2013             |
|                                                                                                                                                                | Point                             |                  |
|                                                                                                                                                                | Site                              | GB 392867 415636 |
|                                                                                                                                                                |                                   |                  |
|                                                                                                                                                                | Cv (Summer)                       | 0.750            |
|                                                                                                                                                                | Cv (Winter)                       | 0.840            |
|                                                                                                                                                                | Impervious Area (ha)              | 7.800            |
|                                                                                                                                                                | Maximum Allowable Discharge (l/s) | 5.0              |
|                                                                                                                                                                | Infiltration Coefficient (m/hr)   | 0.00000          |
|                                                                                                                                                                | Safety Factor                     | 2.0              |
|                                                                                                                                                                | Climate Change (%)                | 0                |

|                                                                                   |                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Results</b>                                                                                                                                                                                             |
|                                                                                   | <p><b>Global Variables require approximate storage of between 4132 m<sup>3</sup> and 6063 m<sup>3</sup>.</b></p> <p><b>These values are estimates only and should not be used for design purposes.</b></p> |

## 30 YEAR RETURN PERIOD STORM EVENT

|                                                                                                                                                                  |                                   |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <br><b>Variables</b><br>Results<br>Design<br>Overview 2D<br>Overview 3D<br>Vt | <b>Variables</b>                  |                  |
|                                                                                                                                                                  | FEH Rainfall                      |                  |
|                                                                                                                                                                  | Return Period (years)             | 30               |
|                                                                                                                                                                  | Version                           | 2013             |
|                                                                                                                                                                  | Point                             |                  |
|                                                                                                                                                                  | Site                              | GB 392867 415636 |
|                                                                                                                                                                  |                                   |                  |
|                                                                                                                                                                  | Cv (Summer)                       | 0.750            |
|                                                                                                                                                                  | Cv (Winter)                       | 0.840            |
|                                                                                                                                                                  | Impervious Area (ha)              | 7.800            |
|                                                                                                                                                                  | Maximum Allowable Discharge (l/s) | 5.0              |
|                                                                                                                                                                  | Infiltration Coefficient (m/hr)   | 0.00000          |
|                                                                                                                                                                  | Safety Factor                     | 2.0              |
|                                                                                                                                                                  | Climate Change (%)                | 0                |

|                                                                                     |                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Results</b>                                                                                                                                                                                             |
|                                                                                     | <p><b>Global Variables require approximate storage of between 7741 m<sup>3</sup> and 9755 m<sup>3</sup>.</b></p> <p><b>These values are estimates only and should not be used for design purposes.</b></p> |

## QUICK STORAGE ESTIMATES

HOLLINGWORTH ROAD, LITTLEBOROUGH

### 100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE

| Variables                 |                                         |
|---------------------------|-----------------------------------------|
| FEH Rainfall              | Cv (Summer) 0.750                       |
| Return Period (years) 100 | Cv (Winter) 0.840                       |
| Version 2013 Point        | Impervious Area (ha) 7.800              |
| Site GB 392867 415636     | Maximum Allowable Discharge (l/s) 5.0   |
|                           | Infiltration Coefficient (m/hr) 0.00000 |
|                           | Safety Factor 2.0                       |
|                           | Climate Change (%) 20                   |

| Results                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------|--|
| Global Variables require approximate storage of between 12299 m <sup>3</sup> and 14355 m <sup>3</sup> . |  |
| These values are estimates only and should not be used for design purposes.                             |  |

### 100 YEAR RETURN PERIOD STORM EVENT + 40% CLIMATE CHANGE

| Variables                 |                                         |
|---------------------------|-----------------------------------------|
| FEH Rainfall              | Cv (Summer) 0.750                       |
| Return Period (years) 100 | Cv (Winter) 0.840                       |
| Version 2013 Point        | Impervious Area (ha) 7.800              |
| Site GB 392867 415636     | Maximum Allowable Discharge (l/s) 5.0   |
|                           | Infiltration Coefficient (m/hr) 0.00000 |
|                           | Safety Factor 2.0                       |
|                           | Climate Change (%) 40                   |

| Results                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------|--|
| Global Variables require approximate storage of between 14836 m <sup>3</sup> and 16903 m <sup>3</sup> . |  |
| These values are estimates only and should not be used for design purposes.                             |  |

## 1 YEAR RETURN PERIOD STORM EVENT

| Variables                                                                         |                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------|
|  |                                         |
| FEH Rainfall                                                                      | Cv (Summer) 0.750                       |
| Return Period (years) 2                                                           | Cv (Winter) 0.840                       |
| Version 2013 Point                                                                | Impermeable Area (ha) 7.800             |
| Site GB 392867 415636                                                             | Maximum Allowable Discharge (l/s) 256.1 |
|                                                                                   | Infiltration Coefficient (m/hr) 0.00000 |
|                                                                                   | Safety Factor 2.0                       |
|                                                                                   | Climate Change (%) 0                    |

| Results                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------|--|
|                        |  |
| <b>Global Variables require approximate storage of between 248 m<sup>3</sup> and 687 m<sup>3</sup>.</b> |  |
| <b>These values are estimates only and should not be used for design purposes.</b>                      |  |

## 30 YEAR RETURN PERIOD STORM EVENT

| Variables                                                                           |                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------|
|  |                                         |
| FEH Rainfall                                                                        | Cv (Summer) 0.750                       |
| Return Period (years) 30                                                            | Cv (Winter) 0.840                       |
| Version 2013 Point                                                                  | Impermeable Area (ha) 7.800             |
| Site GB 392867 415636                                                               | Maximum Allowable Discharge (l/s) 256.1 |
|                                                                                     | Infiltration Coefficient (m/hr) 0.00000 |
|                                                                                     | Safety Factor 2.0                       |
|                                                                                     | Climate Change (%) 0                    |

| Results                                                                                                   |  |
|-----------------------------------------------------------------------------------------------------------|--|
|                        |  |
| <b>Global Variables require approximate storage of between 1203 m<sup>3</sup> and 2002 m<sup>3</sup>.</b> |  |
| <b>These values are estimates only and should not be used for design purposes.</b>                        |  |

## QUICK STORAGE ESTIMATES

## HOLLINGWORTH ROAD, LITTLEBOROUGH

### 100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE

| Variables                 |                                         |
|---------------------------|-----------------------------------------|
| FEH Rainfall              | Cv (Summer) 0.750                       |
| Return Period (years) 100 | Cv (Winter) 0.840                       |
| Version 2013              | Impervious Area (ha) 7.800              |
| Point                     | Maximum Allowable Discharge (l/s) 256.1 |
| Site GB 392867 415636     | Infiltration Coefficient (m/hr) 0.00000 |
|                           | Safety Factor 2.0                       |
|                           | Climate Change (%) 20                   |

| Results                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Global Variables require approximate storage of between 2374 m<sup>3</sup> and 3756 m<sup>3</sup>.</b></p> <p><b>These values are estimates only and should not be used for design purposes.</b></p> |

### 100 YEAR RETURN PERIOD STORM EVENT + 40% CLIMATE CHANGE

| Variables                 |                                         |
|---------------------------|-----------------------------------------|
| FEH Rainfall              | Cv (Summer) 0.750                       |
| Return Period (years) 100 | Cv (Winter) 0.840                       |
| Version 2013              | Impervious Area (ha) 7.800              |
| Point                     | Maximum Allowable Discharge (l/s) 256.1 |
| Site GB 392867 415636     | Infiltration Coefficient (m/hr) 0.00000 |
|                           | Safety Factor 2.0                       |
|                           | Climate Change (%) 40                   |

| Results                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Global Variables require approximate storage of between 2909 m<sup>3</sup> and 4691 m<sup>3</sup>.</b></p> <p><b>These values are estimates only and should not be used for design purposes.</b></p> |