

DRAINAGE STRATEGY REPORT

Todmorden Road, Littleborough
For CRP Limited

Date 14/02/2025
Ref **22090/DSR001**

Report Details

Client	CRP Limited
Report Title	DRAINAGE STRATEGY REPORT
Project	Todmorden Road, Littleborough
Ref.	22090/DSR001
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Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
1	Approval	14/02/2025	-			
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INTRODUCTION

Project Understanding

CRP Limited intend to develop land at their existing commercial premises at Todmorden Road, Littleborough, OL15 9EG, in accordance with design proposals developed by Hulme Upright Architects to provide a partial re-development of the commercial site.

Bright Young Consulting Ltd have been engaged to prepare a Drainage Strategy Report in support of a detailed planning application for the development.

Scope of Works

- Review existing conditions including drainage plans, information on ground conditions and topographical information.
- Review LLFA drainage policies.
- Estimate existing and proposed impermeable areas.
- Estimate existing surface water runoff rates and outfall locations.
- Review appropriate methods of surface water runoff disposal.
- Evaluate site suitability for infiltration solutions.
- Estimate attenuation storage volumes using Microdrainage software.
- Advise on suitable storage options.
- Advise on suitable range of drainage system maintenance measures.
- Advise on likely constraints for foul water drainage.
- Prepare outline drainage strategy proposals.

Sources of Information

The following sources of information have been reviewed and assessed for the purpose of this Drainage Strategy Report:

- Topographical survey information.
- Drainage survey information.

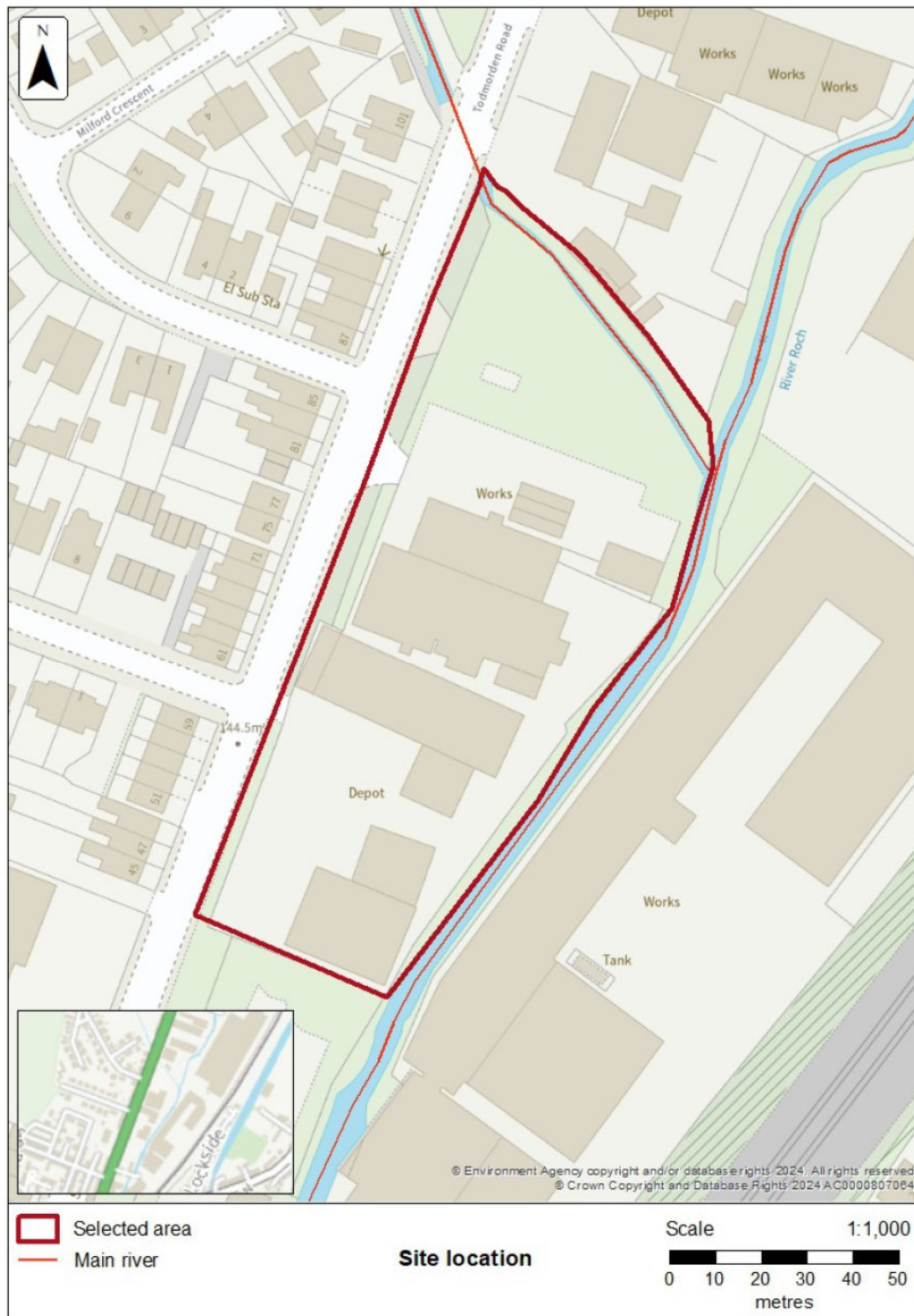
SITE DESCRIPTION

The site is adjacent to Todmorden Road, Littleborough to the west and is also adjacent to Town House Brook to the north and the River Roch to the east, both main rivers. The site centre is approximately at Grid reference SD 94061 16684 (394061E, 416684N).

The pre-development site is a brownfield site being buildings and hard-standing areas already used by CRP Limited. For this this drainage strategy, the development site should be considered brownfield.

A topographical survey has been undertaken of the site and the gross area of the whole site is approximately 9600 sq m (0.96 Hectares). The site slopes from north to south with levels around 145.5m to the north and around 144.4m in the south.

A site location plan and an aerial location plan of the site is shown below. The whole site outlined red.



Site Location Plan.



Site Location Plan – Aerial Location Plan.

RELEVANT POLICY AND GUIDANCE

Introduction

The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the site and relevant guidance and legislation.

Local Policy

The Lead Local Flood Authority (LLFA) is Rochdale Council who will be responsible for approving the surface water system on the development to ensure that it complies with current standards and will remain satisfactory for the lifetime of the development.

Consultations

No consultation has taken place at this point with the approving local authorities in respect of surface water and foul drainage. It is expected that detailed consultation will take place as the scheme develops through the planning process with the LLFA with respect to surface water management.

DRAINAGE STRATEGY

Predevelopment Site

The pre-development site is brownfield. There is pre-development drainage on the development site some of which outfalls to and connects with the public sewers and some surface water drainage that discharges to the River Roch.

Pre-Development Drainage

A pre-development utilities survey has been undertaken and this includes information on the surface water and drainage systems for the pre-development site. A drainage record drawing is also available and also the topographical survey. Using these 3 pieces of information, the pre-development drainage system has been assessed.

The pre-development drainage has foul drainage connected to the public sewer in Todmorden Road, through two separate connections.

The surface water has 4 separate catchments. One catchment (catchment A) is connected via one of the foul drainage systems on site to the public sewer in Todmorden Road. The other 3 catchments (catchment B, C and D) have separate surface water outfalls to the River Roch to the east of the site.

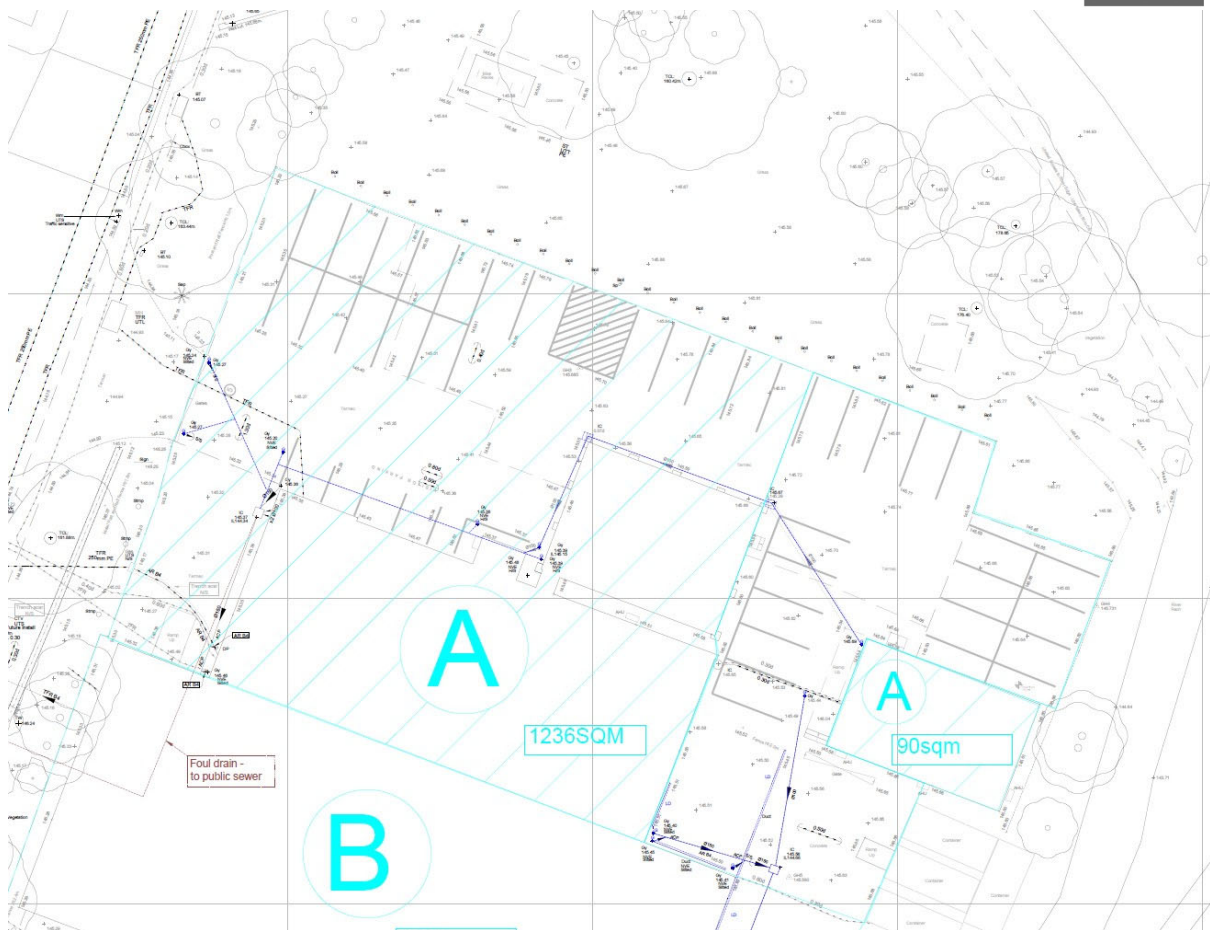
Catchment A.

Catchment A has a surface water drainage system that runs along the north of the most northern building and joins a foul drain to the west which outfalls to the public sewer in Todmorden Road.

Catchment A has contributing areas of part of the northern most building, the smaller building to the east and part of the car park area. This amounts to a contributing area to the drainage of approximately 1326 sq m.

This contributing area would produce, in the 1 in 1 year storm event, a flow of about 19l/s to the public sewer.

A plan of the drainage and catchment A is shown below.



Surface Water Catchment A.

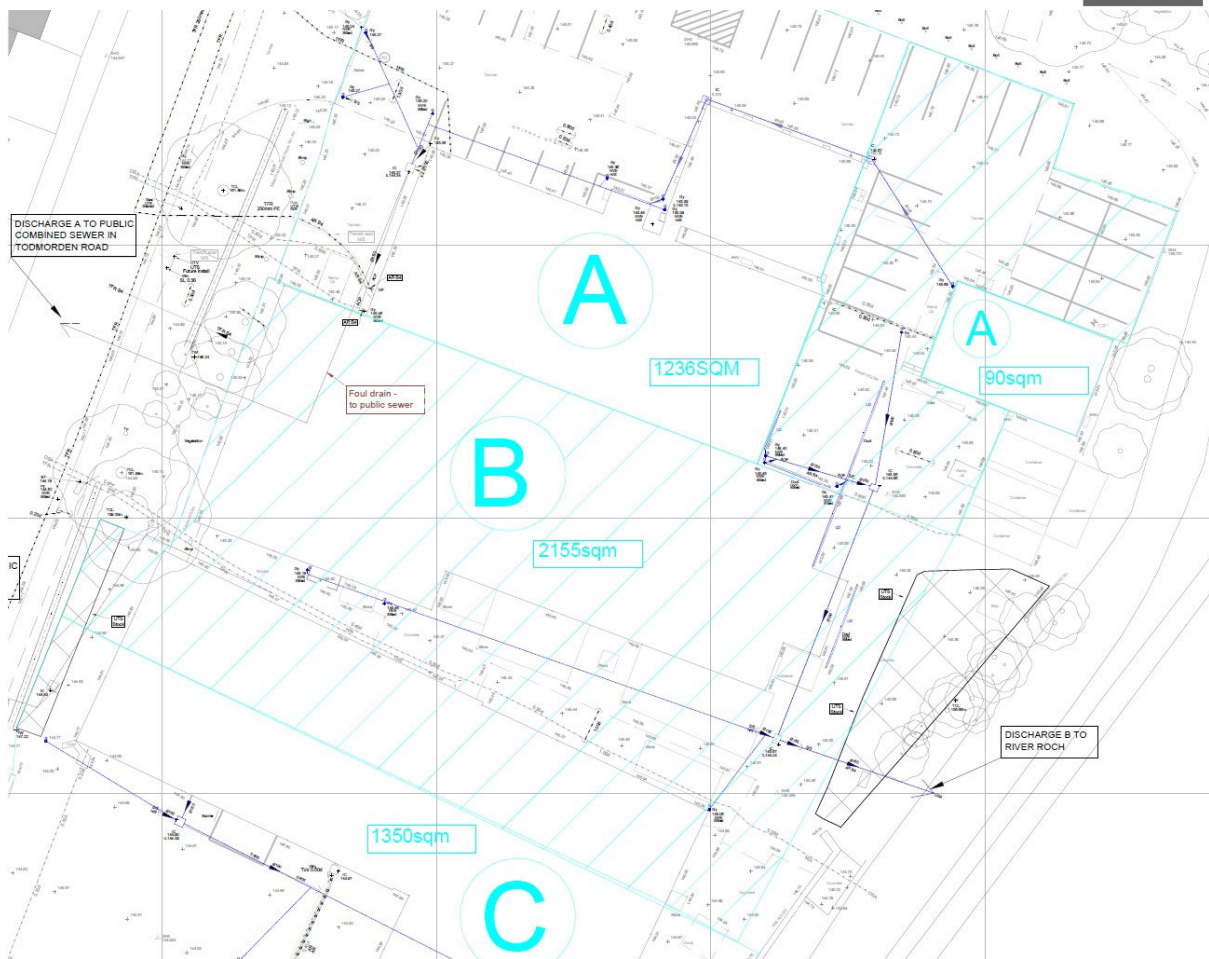
Catchment B.

Catchment B has a surface water drainage system that runs from west to east and discharges to the River Roch.

Catchment B has contributing areas of part buildings, hard-standing areas and some of the car park area. This amounts to a contributing area to the drainage of approximately 2155 sq m.

This contributing area would produce, in the 1 in 1 year storm event, a flow of about 30l/s to the River Roch.

A plan of the drainage and catchment B is shown below.



Surface Water Catchment B.

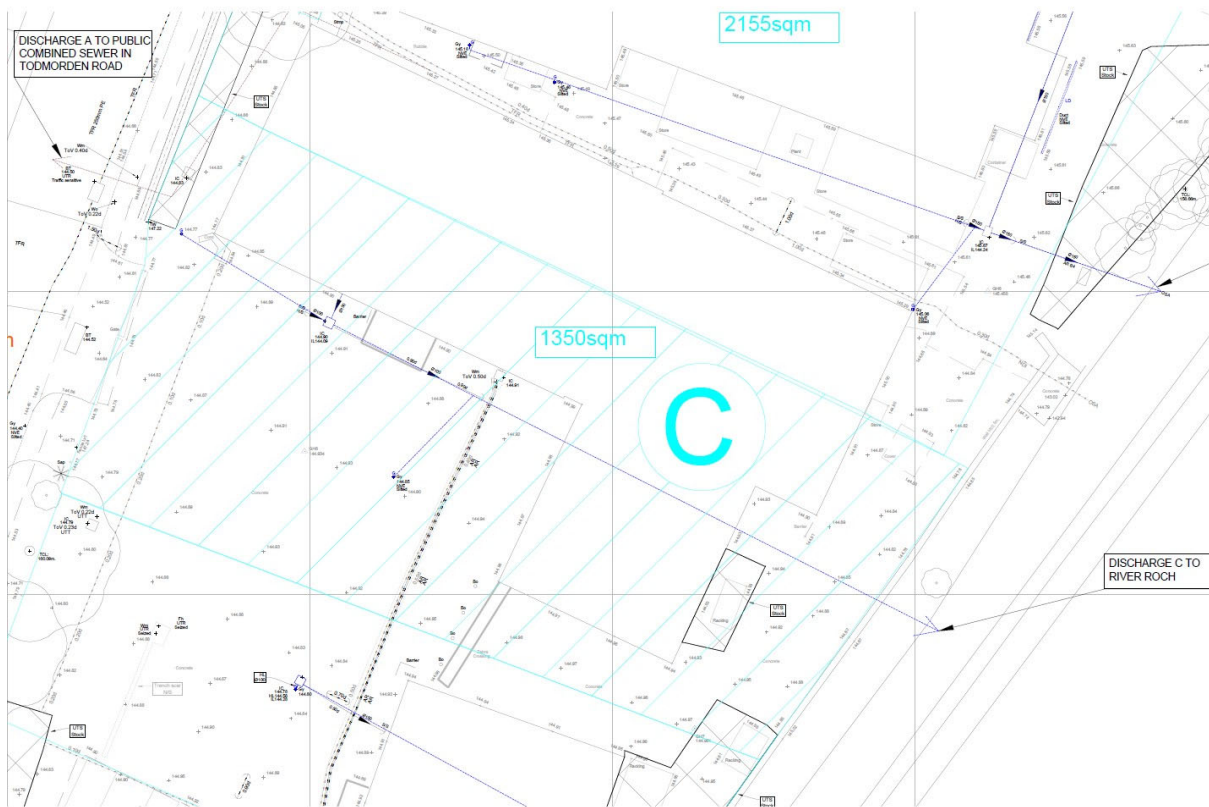
Catchment C.

Catchment C has a surface water drainage system that runs from west to east and discharges to the River Roch.

Catchment C has contributing areas of part buildings and hard-standing areas. This amounts to a contributing area to the drainage of approximately 1350 sq m.

This contributing area would produce, in the 1 in 1 year storm event, a flow of about 19l/s to the River Roch.

A plan of the drainage and catchment C is shown below.



Surface Water Catchment C.

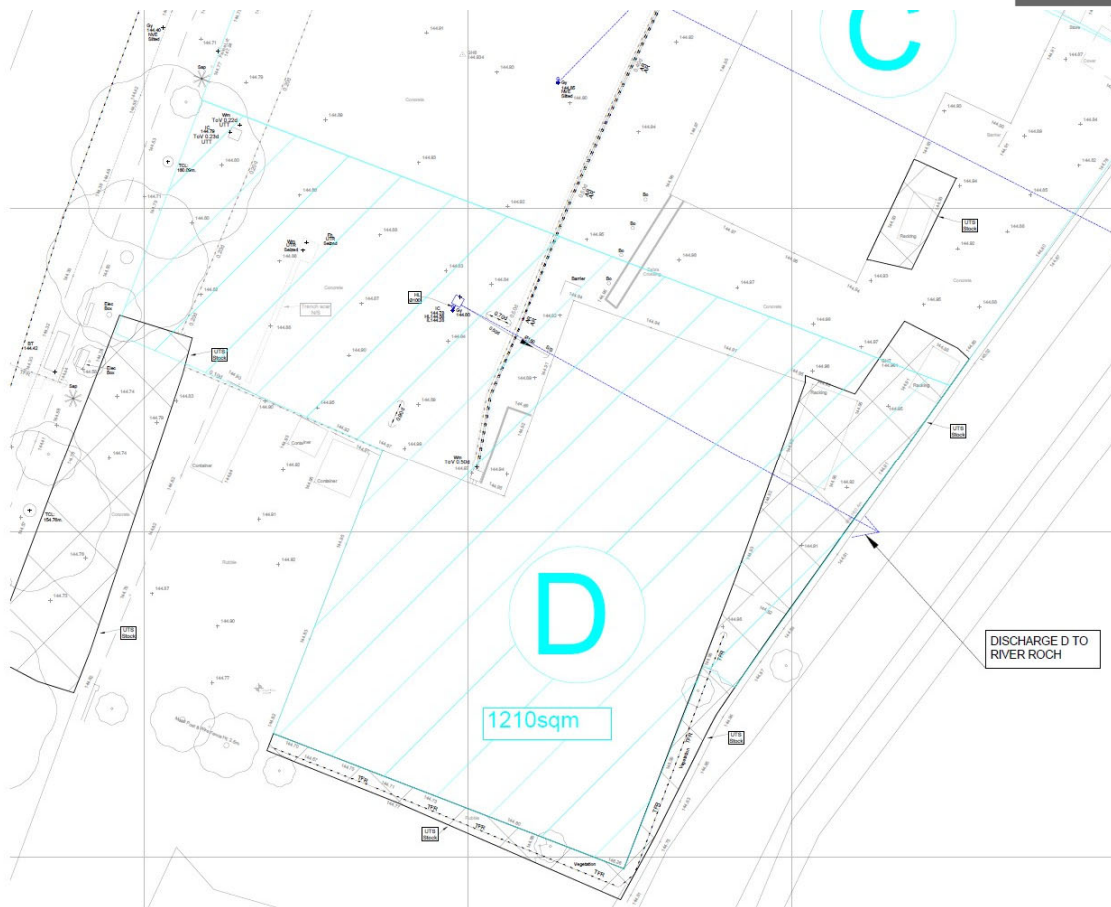
Catchment D.

Catchment D has a surface water drainage system that runs from west to east and discharges to the River Roch.

Catchment D has contributing areas of part buildings and hard-standing areas. This amounts to a contributing area to the drainage of approximately 1290 sq m.

This contributing area would produce, in the 1 in 1 year storm event, a flow of about 17l/s to the River Roch.

A plan of the drainage and catchment D is shown below.



Surface Water Catchment D.

Overall for the site, surface water discharges in the 1 in 1 year storm would be about 19l/s to the public sewer in Todmorden Road and 66l/s to the River Roch.

Post Development Site

The site is to be partially re-developed to provide a new building (manufacturing building) to the north of the site and a new access road and parking areas also to the north. And a new building (storage building) to the south of the site.

The post-development site will partially affect the pre-development drainage.

- Catchment system A surface water drainage will be removed from post-development and so provide betterment to the discharge to the public sewer, removing surface water contributing areas and a minimum of 19l/s of flow.
- Catchment system B will have a reduction in contributing impermeable area of about 520 sq m and so reduce contributing areas in this drainage system to about 1625 sq m. Therefore, catchment system B will have reduced discharge to the River Roch in the 1 in 1 year event of 23l/s.
- Catchment system C will remain as existing as it is unaffected by the proposals.
- Catchment system D will have a reduction in contributing impermeable area of about 370 sq m and so reduce contributing areas in this drainage system to about 920 sq m. Therefore,

catchment system D will have a reduced discharge to the River Roch in the 1 in 1 year event of 13l/s.

Post-development, the discharge from existing drainage systems to the River Roch, in the 1 in 1 year storm would be reduced to 55l/s, approximately 11l/s less than pre-development flows. 19l/s of discharge will be removed from the public sewer.

Surface Water Drainage Hierarchy

The recommended surface water drainage hierarchy (Paragraph 080 of the NPPG: Flood Risk and Coastal Change) is to utilise soakaway systems or infiltration as the preferred option, followed by discharging to an appropriate watercourse. If this is not feasible, the final option is to discharge to an existing public sewer.

Consideration should therefore be given to one or more of the following, in this order of priority.

- **Discharge to the ground (infiltration).**
- **Discharge to a surface water body.**
- **Discharge to a surface water sewer, highway drain or other drain.**
- **Discharge to a combined sewer.**

Surface Water Discharge to Ground (Infiltration)

Initial consideration of ground conditions on this development site indicates that infiltration will not be possible.

Further ground investigation will be carried out and include suitable infiltration to confirm this initial assumption. If infiltration is possible, the drainage strategy will be amended to suit. However, this drainage strategy assumes that infiltration will not be possible and another form of surface water disposal will be required.

Surface Water Discharge to Watercourse

Where soakaways are not suitable a connection to watercourse is the next consideration. The adjacent rivers would be suitable discharge points and so these will be used.

Surface Water Discharge to Sewer

Where disposal of surface water to watercourse is not possible, a connection to the public sewer system is the final consideration. There is a combined sewer in Todmorden Road. However, it is expected that surface water flows from the site will be removed from this system and so provide betterment to the public sewer system.

Post Development Surface Water Strategy

The proposed development will be served by two separate surface water systems, one each for the new buildings. Two systems are required due to levels constraints on site. Both systems will discharge to the adjacent watercourses. Flow rates will be set at the smallest practical rate and this is recommended as 3l/s for each discharge point. The LLFA will need to approve the discharge rate and work within the watercourse for the proposed headwalls.

System 1. Serving the northern manufacturing building, access road and car parking areas will discharge to Town House Brook. The proposed drainage system is a SuDS system where external areas will be permeable paving with a permeable subbase providing some attenuation storage. The permeable paving subbase will be drained via filter drains. Additional storage will be provided by cellular storage. The flow rate to the watercourse will be limited to 3l/s by a hydrobrake.

System 2. Serving the southern storage building. This system is taking roof water only from the proposed building and is a storage system with restricted flow to the watercourse (River Roch). The storage is to be provided by a cellular storage system and with a restricted flow of 3l/s.

Some saving on pre-development discharge rate will be made post-development. As such, it is expected that the new drainage systems will not increase post-development flow rates to the watercourse for the overall site.

Post Development Foul Drainage Strategy

The foul and surface water systems will be separate systems on site.

Foul drainage from the development will connect to the public combined sewer within Todmorden Road, Littleborough. This will use existing connections where possible providing these are at adequate depth and in adequate condition.

Consent to connect to the public combined sewer may require the consent of United Utilities.

The proposed foul sewers on site are expect to remain private.

The drainage strategy proposals are shown on Bright Young Consulting drawing 'Drainage Strategy' numbered 22090/100.

Post Development Surface Water Design

The post-development surface water systems will be as follows:-

- System 1. Permeable paving with storage in permeable subbase with additional storage provided as cellular storage. Restricted flow to watercourse @3l/s. Restricted flow controlled by a Hydrobrake.
- System 2. A storage system for the roof of the proposed storage building with restricted discharge of 3l/s to the watercourse. The attenuation storage would be provided by cellular storage crates.

The surface water systems will be designed to adequately deal with rainfall events, as follows;-

- 1 in 100 year plus 40% climate change.

The systems have been modelled in Microdrainage to ensure that the systems work satisfactorily within the design event. System 1 has a critical duration of 480 minutes, where storage volumes are at a maximum. System 2 has a critical duration of 120 minutes, where storage volumes are at a maximum. The design is based on no flooding in the 1 in 100 year plus climate change storm condition. The modelled results for both systems are included in the appendix to this report.

Climate change

The design of the surface water system includes an allowance for climate change where 40% has been added to rainfall events.

Urban Creep

No urban creep allowance is required for this development site.

Pollution Control

The proposed access road and car parking areas will be constructed using permeable paving and so provide a treatment stage prior to water entering the watercourse.

Flood Route

The development site is elevated above Todmorden Road and flood routes will be to Todmorden Road. Some areas will likely fall to the watercourses.

Surface Water Maintenance

The post-development surface water system will be maintained for the lifetime of the development. This will be carried out by the owner/operator of the site following a satisfactory maintenance regime.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- A foul and surface water drainage system to satisfactorily drain this proposed development site can be provided.
- Separate systems of foul water and surface water will be provided on and off site.
- Foul drainage will connect to the public combined sewer in Todmorden Road.
- Surface water discharge to the public sewer will be removed, providing betterment.

- Surface water systems drainage serving unaffected areas will remain, with outfalls to the River Roch. Some reduction in contributing areas post-development will be made, thus reducing overall discharge rates to the watercourse.
- Surface water will discharge will be to the watercourses @ 3l/s for each of the two discharge points.
- Permeable paving and attenuation storage will be provided on the development for the new access road and parking areas.
- The surface water system will be designed for the 1 in 100 year storm plus 40% climate change condition.
- All the drainage on site will remain private and maintained for the lifetime of the development.
- Details of the maintenance for the lifetime of the development will be provided as part of the detailed design.

Recommendations

- Include infiltration testing within the geotechnical reporting to determine if infiltration is possible on site.
- Complete consultations with regulators through the planning process, including agreement of the surface water design and discharges to the watercourses.
- Carry out a detailed surface water design, based on this strategy.
- Determine a maintenance regime for the surface water systems for the lifetime of the development.

APPENDICES

Appendix A – Microdrainage Calculations.

System A – Simulation Results.

System B – Storage Estimate.

Appendix B - Limitations

		TODMORDEN ROAD LITTLEBOROUGH								Page 1	
Date 14/02/2025 File LITTLEBOROUGH 1.SW.MDX		Designed by HM Checked by									
Micro Drainage		Network 2020.1									
<u>STORM SEWER DESIGN by the Modified Rational Method</u>											
<u>Network Design Table for LITTLEBOROUGH 1.SW.SWS</u>											
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	
1.000	17.255	0.100	172.6	0.098	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	12.522	0.050	250.4	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	33.512	0.100	335.1	0.055	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	36.909	0.200	184.5	0.108	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	25.947	0.100	259.5	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	13.500	0.100	135.0	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	5.482	0.050	109.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
<u>Network Results Table</u>											
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
1.000	5.00	5.38	144.850	0.098	0.0	0.0	0.0	0.76	13.5	1.3	
1.001	5.00	5.71	144.750	0.112	0.0	0.0	0.0	0.63	11.1	1.5	
1.002	5.00	6.74	144.700	0.167	0.0	0.0	0.0	0.54	9.6	2.3	
2.000	5.00	5.84	144.800	0.108	0.0	0.0	0.0	0.74	13.0	1.5	
1.003	5.00	7.43	144.600	0.300	0.0	0.0	0.0	0.62	10.9	4.1	
1.004	5.00	7.70	144.500	0.308	0.0	0.0	0.0	0.86	15.3	4.2	
1.005	5.00	7.79	144.400	0.308	0.0	0.0	0.0	0.96	16.9	4.2	
<u>Simulation Criteria for LITTLEBOROUGH 1.SW.SWS</u>											
Volumetric Runoff Coeff 0.840 Foul Sewage per hectare (l/s) 0.000											
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 40.000											
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000											
Hot Start Level (mm) 0 Run Time (mins) 2000											
Manhole Headloss Coeff (Global) 0.500 Output Interval (mins) 1											
Number of Input Hydrographs 0 Number of Storage Structures 6											
Number of Online Controls 1 Number of Time/Area Diagrams 0											
Number of Offline Controls 0											
<u>Synthetic Rainfall Details</u>											
Rainfall Model FSR Profile Type Winter											
Return Period (years) 100 Cv (Summer) 0.750											
Region England and Wales Cv (Winter) 0.840											
M5-60 (mm) 19.600 Storm Duration (mins) 15											
Ratio R 0.270											
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Micro Drainage	Network 2020.1	

Online Controls for LITTLEBOROUGH 1.SW.SWS

Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.005, Volume (m³): 2.0

Unit Reference	MD-SHE-0084-3000-0900-3000
Design Head (m)	0.900
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	144.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	3.0
Flush-Flo™	0.267	3.0
Kick-Flo®	0.570	2.4
Mean Flow over Head Range	-	2.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.4	3.000	5.2	7.000	7.8
0.200	3.0	1.400	3.7	3.500	5.6	7.500	8.1
0.300	3.0	1.600	3.9	4.000	6.0	8.000	8.3
0.400	2.9	1.800	4.1	4.500	6.3	8.500	8.6
0.500	2.7	2.000	4.3	5.000	6.7	9.000	8.8
0.600	2.5	2.200	4.5	5.500	7.0	9.500	9.0
0.800	2.8	2.400	4.7	6.000	7.3		
1.000	3.1	2.600	4.9	6.500	7.5		

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	TODMORDEN ROAD LITTLEBOROUGH																			
Date 14/02/2025 File LITTLEBOROUGH 1.SW.MDX	Designed by HM Checked by																			
Micro Drainage	Network 2020.1																			
Storage Structures for LITTLEBOROUGH 1.SW.SWS Complex Manhole: 1, DS/PN: 1.000 Filter Drain Infiltration Coefficient Base (m/hr) 0.00000 Pipe Diameter (m) 0.150 Infiltration Coefficient Side (m/hr) 0.00000 Pipe Depth above Invert (m) 0.000 Safety Factor 2.0 Number of Pipes 1 Porosity 0.30 Slope (1:X) 170.0 Invert Level (m) 144.850 Cap Volume Depth (m) 0.210 Trench Width (m) 0.5 Cap Infiltration Depth (m) 0.000 Trench Length (m) 17.0 Cellular Storage Invert Level (m) 144.850 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>96.0</td><td>96.0</td><td>0.211</td><td>0.0</td><td>104.2</td></tr><tr><td>0.210</td><td>96.0</td><td>104.2</td><td></td><td></td><td></td></tr></table> Porous Car Park Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 10.0 Membrane Percolation (mm/hr) 1000 Length (m) 22.0 Max Percolation (l/s) 61.1 Slope (1:X) 1000.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 145.220 Membrane Depth (mm) 85 Porous Car Park Manhole: 2, DS/PN: 1.001 Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 12.0 Membrane Percolation (mm/hr) 1000 Length (m) 12.0 Max Percolation (l/s) 40.0 Slope (1:X) 1000.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 145.085 Membrane Depth (mm) 80 Complex Manhole: 3, DS/PN: 1.002 Filter Drain Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.30			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	96.0	96.0	0.211	0.0	104.2	0.210	96.0	104.2			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	96.0	96.0	0.211	0.0	104.2															
0.210	96.0	104.2																		
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	TODMORDEN ROAD LITTLEBOROUGH																			
Date 14/02/2025 File LITTLEBOROUGH 1.SW.MDX	Designed by HM Checked by																			
Micro Drainage	Network 2020.1																			
Filter Drain Invert Level (m) 144.700 Number of Pipes 1 Trench Width (m) 0.5 Slope (1:X) 335.0 Trench Length (m) 17.0 Cap Volume Depth (m) 0.200 Pipe Diameter (m) 0.150 Cap Infiltration Depth (m) 0.000 Pipe Depth above Invert (m) 0.000 Porous Car Park Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 20.0 Membrane Percolation (mm/hr) 1000 Length (m) 24.0 Max Percolation (l/s) 133.3 Slope (1:X) 1000.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 145.380 Membrane Depth (mm) 80 Complex Manhole: 8, DS/PN: 2.000 Filter Drain Infiltration Coefficient Base (m/hr) 0.00000 Pipe Diameter (m) 0.150 Infiltration Coefficient Side (m/hr) 0.00000 Pipe Depth above Invert (m) 0.000 Safety Factor 2.0 Number of Pipes 1 Porosity 0.30 Slope (1:X) 36.0 Invert Level (m) 144.800 Cap Volume Depth (m) 0.150 Trench Width (m) 0.5 Cap Infiltration Depth (m) 0.000 Trench Length (m) 36.0 Porous Car Park Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 38.0 Membrane Percolation (mm/hr) 1000 Length (m) 13.0 Max Percolation (l/s) 137.2 Slope (1:X) 1000.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 144.940 Membrane Depth (mm) 80 Cellular Storage Invert Level (m) 144.800 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>50.0</td><td>50.0</td><td>0.211</td><td>0.0</td><td>56.0</td></tr><tr><td>0.210</td><td>50.0</td><td>55.9</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	50.0	50.0	0.211	0.0	56.0	0.210	50.0	55.9			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	50.0	50.0	0.211	0.0	56.0															
0.210	50.0	55.9																		
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	TODMORDEN ROAD LITTLEBOROUGH				
Date 14/02/2025 File LITTLEBOROUGH 1.SW.MDX	Designed by HM Checked by				
Micro Drainage	Network 2020.1				
<u>Complex Manhole: 4, DS/PN: 1.003</u>					
<u>Filter Drain</u>					
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150		
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000		
Safety Factor	2.0	Number of Pipes	1		
Porosity	0.30	Slope (1:X)	260.0		
Invert Level (m)	144.600	Cap Volume Depth (m)	0.390		
Trench Width (m)	0.5	Cap Infiltration Depth (m)	0.000		
Trench Length (m)	25.9				
<u>Porous Car Park</u>					
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.0		
Membrane Percolation (mm/hr)	1000	Length (m)	12.0		
Max Percolation (l/s)	66.7	Slope (1:X)	1000.0		
Safety Factor	2.0	Depression Storage (mm)	5		
Porosity	0.30	Evaporation (mm/day)	3		
Invert Level (m)	144.990	Membrane Depth (mm)	80		
<u>Complex Manhole: 5, DS/PN: 1.004</u>					
<u>Filter Drain</u>					
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150		
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000		
Safety Factor	2.0	Number of Pipes	1		
Porosity	0.30	Slope (1:X)	135.0		
Invert Level (m)	144.500	Cap Volume Depth (m)	0.190		
Trench Width (m)	0.5	Cap Infiltration Depth (m)	0.000		
Trench Length (m)	13.5				
<u>Cellular Storage</u>					
Invert Level (m)	144.500	Safety Factor	2.0		
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95		
Infiltration Coefficient Side (m/hr)	0.00000				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	216.0	216.0	0.421	0.0	240.7
0.420	216.0	240.7			
<u>Porous Car Park</u>					
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30		
Membrane Percolation (mm/hr)	1000	Invert Level (m)	144.690		
Max Percolation (l/s)	20.8	Width (m)	15.0		
Safety Factor	2.0	Length (m)	5.0		
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	TODMORDEN ROAD LITTLEBOROUGH	
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Micro Drainage	Network 2020.1	
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Micro Drainage						Network 2020.1			
Summary of Results for 15 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)									
Margin for Flood Risk Warning (mm)						80.0			
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status						OFF			
DVD Status						OFF			
Inertia Status						OFF			

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Micro Drainage		Network 2020.1							
<u>Summary of Results for 30 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)</u>									
Margin for Flood Risk Warning (mm)				80.0					
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status				OFF					
DVD Status				OFF					
Inertia Status				OFF					
	US/MH	Water	Surcharged	Flooded	Half Drain	Pipe			
	Name	Level	Depth	Volume	Flow /	Time	Flow		
PN		(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
1.000	1	145.329	0.329	0.000	0.98		46	12.4	SURCHARGED
1.001	2	145.274	0.374	0.000	1.19		18	12.0	SURCHARGED
1.002	3	145.234	0.384	0.000	1.65		123	15.3	SURCHARGED
2.000	8	145.070	0.120	0.000	0.67		39	8.4	SURCHARGED
1.003	4	145.023	0.273	0.000	1.95		53	20.4	SURCHARGED
1.004	5	144.817	0.167	0.000	0.28		241	3.9	SURCHARGED
1.005	6	144.806	0.256	0.000	0.21			3.0	SURCHARGED

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		TODMORDEN ROAD LITTLEBOROUGH						
Date 14/02/2025		Designed by HM						
File LITTLEBOROUGH 1.SW.MDX		Checked by						
Micro Drainage		Network 2020.1						
<u>Summary of Results for 60 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)</u>								
Margin for Flood Risk Warning (mm)		80.0						
Analysis Timestep		2.5 Second Increment (Extended)						
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow	Half Drain	Pipe	
PN	Name	(m)	(m)	(m³)	Cap. (l/s)	Time (mins)	Flow (l/s)	Status
1.000	1	145.438	0.438	0.000	0.99	68	12.5	FLOOD RISK
1.001	2	145.343	0.443	0.000	1.17	34	11.9	SURCHARGED
1.002	3	145.302	0.452	0.000	1.59	328	14.7	SURCHARGED
2.000	8	145.104	0.154	0.000	0.62	60	7.7	SURCHARGED
1.003	4	145.058	0.308	0.000	2.01	36	21.0	SURCHARGED
1.004	5	144.907	0.257	0.000	0.27	370	3.7	SURCHARGED
1.005	6	144.896	0.346	0.000	0.21		3.0	SURCHARGED

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Micro Drainage		Network 2020.1						
Summary of Results for 120 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)								
Margin for Flood Risk Warning (mm)				80.0				
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status				OFF				
DVD Status				OFF				
Inertia Status				OFF				
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	145.450	0.450	0.000	1.01	224	12.7	FLOOD RISK
1.001	2	145.362	0.462	0.000	1.03	48	10.4	SURCHARGED
1.002	3	145.319	0.469	0.000	1.59	584	14.7	SURCHARGED
2.000	8	145.117	0.167	0.000	0.50	216	6.2	SURCHARGED
1.003	4	145.087	0.337	0.000	1.89	132	19.8	SURCHARGED
1.004	5	145.046	0.396	0.000	0.24	652	3.3	SURCHARGED
1.005	6	145.036	0.486	0.000	0.21		3.0	SURCHARGED

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Micro Drainage		Network 2020.1						
Summary of Results for 180 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)								
Margin for Flood Risk Warning (mm)		80.0						
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
	Water	Surcharged	Flooded			Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow / Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)	Status
1.000	1	145.355	0.355	0.000	0.93	366	11.6	SURCHARGED
1.001	2	145.315	0.415	0.000	0.94	60	9.5	SURCHARGED
1.002	3	145.279	0.429	0.000	1.51	717	14.0	SURCHARGED
2.000	8	145.138	0.188	0.000	0.50	267	6.2	SURCHARGED
1.003	4	145.147	0.397	0.000	1.77	165	18.5	SURCHARGED
1.004	5	145.132	0.482	0.000	0.24	780	3.3	SURCHARGED
1.005	6	145.121	0.571	0.000	0.21		3.0	SURCHARGED

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Micro Drainage		Network 2020.1						
Summary of Results for 240 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)								
Margin for Flood Risk Warning (mm)		80.0						
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow	Half Drain Time	Pipe Flow	
PN	Name	(m)	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)	Status
1.000	1	145.318	0.318	0.000	0.91	488	11.4	SURCHARGED
1.001	2	145.283	0.383	0.000	0.85	100	8.6	SURCHARGED
1.002	3	145.250	0.400	0.000	1.42	812	13.2	SURCHARGED
2.000	8	145.183	0.233	0.000	0.49	296	6.2	SURCHARGED
1.003	4	145.182	0.432	0.000	1.63	208	17.1	SURCHARGED
1.004	5	145.167	0.517	0.000	0.22	856	3.1	SURCHARGED
1.005	6	145.156	0.606	0.000	0.21		3.0	SURCHARGED

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Micro Drainage		Network 2020.1						
Summary of Results for 360 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)								
Margin for Flood Risk Warning (mm)				80.0				
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status				OFF				
DVD Status				OFF				
Inertia Status				OFF				
	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow	Half Drain Time	Pipe Flow	Status
PN	Name	(m)	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)	
1.000	1	145.260	0.260	0.000	0.76	660	9.5	SURCHARGED
1.001	2	145.240	0.340	0.000	0.72	138	7.3	SURCHARGED
1.002	3	145.235	0.385	0.000	1.30	816	12.0	SURCHARGED
2.000	8	145.228	0.278	0.000	0.46	330	5.8	SURCHARGED
1.003	4	145.222	0.472	0.000	1.42	258	14.8	SURCHARGED
1.004	5	145.207	0.557	0.000	0.23	930	3.1	SURCHARGED
1.005	6	145.196	0.646	0.000	0.21		3.0	SURCHARGED

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		TODMORDEN ROAD LITTLEBOROUGH							
Date 14/02/2025	Designed by HM								
File LITTLEBOROUGH 1.SW.MDX	Checked by								
Micro Drainage		Network 2020.1							
Summary of Results for 480 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)									
Margin for Flood Risk Warning (mm)		80.0							
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status		OFF							
DVD Status		OFF							
Inertia Status		OFF							
	Water	Surcharged	Flooded			Half Drain	Pipe		
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
1.000	1	145.260	0.260	0.000	0.60		584	7.6	SURCHARGED
1.001	2	145.256	0.356	0.000	0.66		168	6.7	SURCHARGED
1.002	3	145.251	0.401	0.000	1.14		864	10.6	SURCHARGED
2.000	8	145.246	0.296	0.000	0.43		360	5.4	SURCHARGED
1.003	4	145.240	0.490	0.000	1.27		288	13.3	SURCHARGED
1.004	5	145.224	0.574	0.000	0.22		976	3.1	FLOOD RISK
1.005	6	145.213	0.663	0.000	0.21			3.0	SURCHARGED

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Date 14/02/2025		Designed by HM						
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Micro Drainage		Network 2020.1						
<u>Summary of Results for 600 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)</u>								
Margin for Flood Risk Warning (mm)		80.0						
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow	Half Drain Time	Pipe Flow	
PN	Name	(m)	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)	Status
1.000	1	145.266	0.266	0.000	0.51	590	6.4	SURCHARGED
1.001	2	145.261	0.361	0.000	0.58	180	5.9	SURCHARGED
1.002	3	145.257	0.407	0.000	1.01	880	9.3	SURCHARGED
2.000	8	145.253	0.303	0.000	0.38	380	4.8	SURCHARGED
1.003	4	145.247	0.497	0.000	1.19	300	12.4	SURCHARGED
1.004	5	145.231	0.581	0.000	0.22	1000	3.1	FLOOD RISK
1.005	6	145.220	0.670	0.000	0.21		3.0	SURCHARGED

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Micro Drainage		Network 2020.1						
Summary of Results for 720 minute 100 year Winter (LITTLEBOROUGH 1.SW.SWS)								
Margin for Flood Risk Warning (mm)		80.0						
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	145.264	0.264	0.000	0.43	612	5.4	SURCHARGED
1.001	2	145.260	0.360	0.000	0.53	192	5.4	SURCHARGED
1.002	3	145.256	0.406	0.000	0.91	888	8.4	SURCHARGED
2.000	8	145.252	0.302	0.000	0.36	396	4.6	SURCHARGED
1.003	4	145.246	0.496	0.000	1.10	324	11.5	SURCHARGED
1.004	5	145.230	0.580	0.000	0.22	1020	3.1	FLOOD RISK
1.005	6	145.219	0.669	0.000	0.21		3.0	SURCHARGED

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Micro Drainage				Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 57 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	144.030	0.230	0.0	3.0	3.0	10.9	O K
30 min Summer	144.097	0.297	0.0	3.0	3.0	14.1	O K
60 min Summer	144.146	0.346	0.0	3.0	3.0	16.4	O K
120 min Summer	144.162	0.362	0.0	3.0	3.0	17.2	O K
180 min Summer	144.150	0.350	0.0	3.0	3.0	16.6	O K
240 min Summer	144.127	0.327	0.0	3.0	3.0	15.5	O K
360 min Summer	144.076	0.276	0.0	3.0	3.0	13.1	O K
480 min Summer	144.030	0.230	0.0	3.0	3.0	10.9	O K
600 min Summer	143.991	0.191	0.0	3.0	3.0	9.1	O K
720 min Summer	143.959	0.159	0.0	3.0	3.0	7.5	O K
960 min Summer	143.917	0.117	0.0	3.0	3.0	5.5	O K
1440 min Summer	143.888	0.088	0.0	2.5	2.5	4.2	O K
2160 min Summer	143.870	0.070	0.0	1.9	1.9	3.3	O K
2880 min Summer	143.861	0.061	0.0	1.5	1.5	2.9	O K
4320 min Summer	143.851	0.051	0.0	1.1	1.1	2.4	O K
5760 min Summer	143.845	0.045	0.0	0.9	0.9	2.1	O K
7200 min Summer	143.841	0.041	0.0	0.8	0.8	1.9	O K
8640 min Summer	143.838	0.038	0.0	0.7	0.7	1.8	O K
10080 min Summer	143.835	0.035	0.0	0.6	0.6	1.7	O K
15 min Winter	144.062	0.262	0.0	3.0	3.0	12.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	117.811	0.0	12.8	17			
30 min Summer	81.173	0.0	17.6	31			
60 min Summer	53.483	0.0	23.2	52			
120 min Summer	33.975	0.0	29.5	86			
180 min Summer	25.604	0.0	33.4	122			
240 min Summer	20.771	0.0	36.1	156			
360 min Summer	15.487	0.0	40.4	220			
480 min Summer	12.551	0.0	43.6	282			
600 min Summer	10.651	0.0	46.3	340			
720 min Summer	9.308	0.0	48.6	398			
960 min Summer	7.517	0.0	52.3	508			
1440 min Summer	5.548	0.0	57.9	738			
2160 min Summer	4.083	0.0	63.9	1100			
2880 min Summer	3.279	0.0	68.5	1468			
4320 min Summer	2.403	0.0	75.2	2200			
5760 min Summer	1.930	0.0	80.6	2920			
7200 min Summer	1.629	0.0	85.0	3664			
8640 min Summer	1.418	0.0	88.8	4336			
10080 min Summer	1.261	0.0	92.1	5008			
15 min Winter	117.811	0.0	14.3	17			
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Summary of Results for 100 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	144.141	0.341	0.0	3.0	3.0	16.2	O K
60 min Winter	144.195	0.395	0.0	3.0	3.0	18.8	O K
120 min Winter	144.208	0.408	0.0	3.0	3.0	19.4	O K
180 min Winter	144.186	0.386	0.0	3.0	3.0	18.3	O K
240 min Winter	144.151	0.351	0.0	3.0	3.0	16.7	O K
360 min Winter	144.067	0.267	0.0	3.0	3.0	12.7	O K
480 min Winter	143.996	0.196	0.0	3.0	3.0	9.3	O K
600 min Winter	143.943	0.143	0.0	3.0	3.0	6.8	O K
720 min Winter	143.910	0.110	0.0	2.9	2.9	5.2	O K
960 min Winter	143.889	0.089	0.0	2.5	2.5	4.2	O K
1440 min Winter	143.870	0.070	0.0	1.9	1.9	3.3	O K
2160 min Winter	143.857	0.057	0.0	1.4	1.4	2.7	O K
2880 min Winter	143.850	0.050	0.0	1.1	1.1	2.4	O K
4320 min Winter	143.842	0.042	0.0	0.8	0.8	2.0	O K
5760 min Winter	143.837	0.037	0.0	0.7	0.7	1.8	O K
7200 min Winter	143.834	0.034	0.0	0.6	0.6	1.6	O K
8640 min Winter	143.832	0.032	0.0	0.5	0.5	1.5	O K
10080 min Winter	143.830	0.030	0.0	0.4	0.4	1.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	81.173	0.0	19.7	31			
60 min Winter	53.483	0.0	26.0	58			
120 min Winter	33.975	0.0	33.1	92			
180 min Winter	25.604	0.0	37.4	130			
240 min Winter	20.771	0.0	40.5	168			
360 min Winter	15.487	0.0	45.2	236			
480 min Winter	12.551	0.0	48.9	294			
600 min Winter	10.651	0.0	51.9	346			
720 min Winter	9.308	0.0	54.4	392			
960 min Winter	7.517	0.0	58.6	502			
1440 min Winter	5.548	0.0	64.8	738			
2160 min Winter	4.083	0.0	71.6	1104			
2880 min Winter	3.279	0.0	76.7	1468			
4320 min Winter	2.403	0.0	84.2	2156			
5760 min Winter	1.930	0.0	90.2	2832			
7200 min Winter	1.629	0.0	95.2	3624			
8640 min Winter	1.418	0.0	99.4	4376			
10080 min Winter	1.261	0.0	103.2	5088			
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.900	Shortest Storm (mins)	15
Ratio R	0.303	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.058

Time (mins)	Area
From:	To: (ha)
0	4 0.058

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Model Details

Storage is Online Cover Level (m) 144.900

Cellular Storage Structure

Invert Level (m) 143.800 Safety Factor 2.0

Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	50.0	50.0	0.421	0.0	61.9
0.420	50.0	61.9			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0090-3000-0450-3000
Design Head (m)	0.450
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	143.800
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.450	3.0
Flush-Flo™	0.148	3.0
Kick-Flo®	0.326	2.6
Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	4.7	3.000	7.2	7.000	10.9
0.200	2.9	1.400	5.1	3.500	7.8	7.500	11.3
0.300	2.7	1.600	5.4	4.000	8.3	8.000	11.7
0.400	2.8	1.800	5.7	4.500	8.8	8.500	12.0
0.500	3.1	2.000	6.0	5.000	9.2	9.000	12.4
0.600	3.4	2.200	6.3	5.500	9.7	9.500	12.7
0.800	3.9	2.400	6.5	6.000	10.1		
1.000	4.3	2.600	6.8	6.500	10.5		

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APPENDIX B – LIMITATIONS

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