

 T J Booth Associates. Consulting Engineers 20A Eastgate St, Rochdale OL16 1DH	Project Sigma - tweedale st (53-61), rochdale, OL11 1AH				Job Ref. rep-tjba-sigma-tweedale st-DSR-270220	
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History.

Revision	Date	Reason
0	March 2020	Original.
1	November 2023	Updated to support a new application for residential development.

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Introduction.

Reference:

Proposal for the construction of 4No infill residential terraced dwellings.

This report will support and validate a planning application for development.

Purpose of Report:

The primary purpose of this report is to identify specific drainage proposals for parts of the proposed site in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding site assessment, this report will appraise the existing site and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

General principles:

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- *infiltration*
- *watercourse*
- *public sewer*

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- *Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.*
- *Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.*
- *Development should be designed so that there is no flooding to the development in a 30yr event and so that there is no property flooding in a 100yr event considering climate change.*

Plans.

Location Plan.

The Site is a vacant plot of land, formerly terraced dwellings on Tweedale Street, Rochdale.

The local area predominantly made up of residential terraces with some local shops and amenities.

There are no watercourses in the local area – closest is the River Roch approximately 650m north or the Rochdale Canal 750m south.

Land elevation is relatively level in the local area.

Site Plan.

The existing Site simply comprises a vacant plot, covered with soft landscaping surface & minor vegetation. It lies between Nos. 51 & 63 Tweedale Street, with the main road to the front north side, and a smaller access road and parking to the rear.

The existing Site areas are as follows:

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- *Permeable lawn/soft landscaping* 345 sqm
- *Total Site area* 345 sqm

The proposed development is for the construction of 4No. residential terraced dwellings, nominally following the building lines of the existing dwellings.

The proposed Site areas are as follows:

- *Impermeable roof area* 215 sqm
- *Permeable lawn/yard* 130 sqm
- *Total Site area* 345 sqm

Desk Study, Surveys & Investigations.

Existing and proposed topography.

A topographic survey of the site has yet to be undertaken.

However, ground level is relatively level locally.

Geology & site investigations.

BGS Maps indicate the Site to be underlain by glaciofluvial SAND & GRAVEL.

HR Wallingford Maps suggest heavy clay subsoil over the area (class 4 soil).

Assessments.

Existing surface water system.

The Site is a brownfield plot due to the past development and infill characteristics. However, the Site is an infill plot which has returned to a permeable vegetated surface, and will be considered as a greenfield plot of land for the purposes of surface water runoff assessment.

Hydrological characteristics for the site were obtained from the HR Wallingford mapping database:

SAAR (mm) ⓘ	1129
M5-60 rainfall depth (mm) ⓘ	20
'r' ratio M5-60 / M5-2day ⓘ	0.3
FEH/FSR conversion factor ⓘ	1.14
Hydrological region ⓘ	10
Specify SOIL type ⓘ	4
SPR ⓘ	0.47

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EXISTING GREENFIELD RUNOFF

Attenuation design in accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 1.0.04

EA_Defra method

Site characteristics

Location	Other
Hydrological region	10
Soil type (Wallingford Procedure W.R.A.P map)	4
Standard percentage runoff	SPR = 0.47
Average annual rainfall	SAAR = 1129 mm
5 year return period rainfall of 60 minute duration	M5_60min = 20.0 mm
Ratio 60-minute to 2 day rainfalls of 5 year return	r = 0.30
Rainfall intensity increase due to global warming	p _{climate} = 0%
Impervious area req. attenuation storage	a = 0.0 %

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable area (ha)
1	tweeddale st (53-61)	0.03	0.0	0.00
Total		0.03	0.0	0.00

Greenfield runoff rates

Catchment area	AREA = 50.00 hectare
Greenfield runoff rate (50 hectare site)	$\dot{Q}_{\text{rural}} = 0.00108 \text{ m}^3/\text{s} * (\text{AREA}/1\text{km}^2)^{0.89} * (\text{SAAR}/1\text{mm})^{1.17} * \text{SPR}^{2.17} =$ 422.3 l / s
Greenfield runoff rate	$\dot{Q} = \dot{Q}_{\text{rural}} / \text{AREA} * A =$ 0.3 l / s
Greenfield runoff rate per unit area	$\dot{Q}_A = \dot{Q} / A =$ 8.4 l / s / hectare

Estimated site discharges

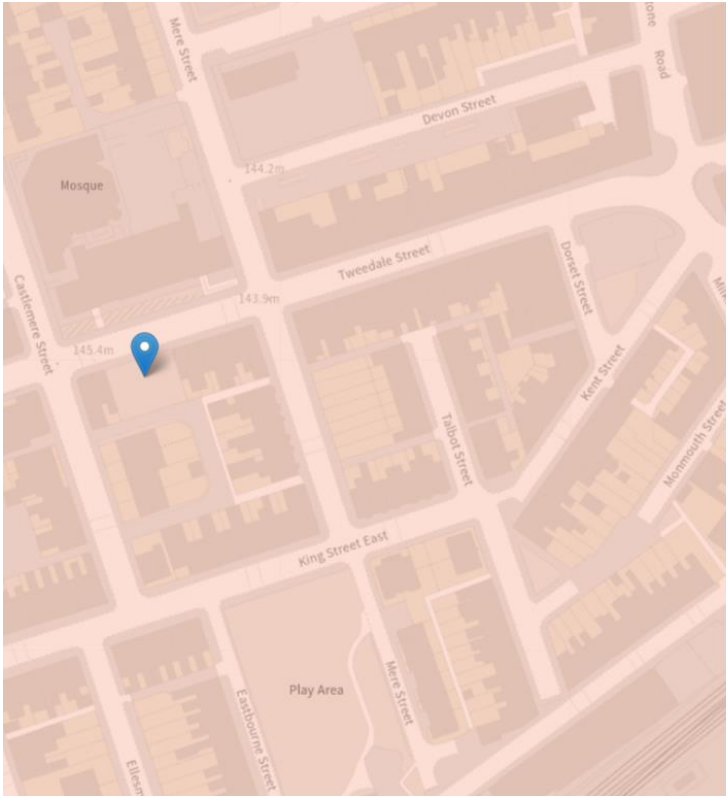
FSR growth rate (1 year)	FSR _{1yr} = 0.87
Discharge (1 year)	Q _{1yr} = $\dot{Q} * \text{FSR}_{1\text{yr}} =$ 0.3 l/s
FSR growth rate (30 year)	FSR _{30yr} = 1.70
Discharge (30 year)	Q _{30yr} = $\dot{Q} * \text{FSR}_{30\text{yr}} =$ 0.5 l/s
FSR growth rate (100 year)	FSR _{100yr} = 2.08
Discharge (100 year)	Q _{100yr} = $\dot{Q} * \text{FSR}_{100\text{yr}} =$ 0.6 l/s

Given the low discharge rate associated with the greenfield flow (QBAR 0.3l/s), and the impracticality of limiting proposed flows to such low discharges, any proposed pass forward flow rate from the Site should be set to 5.0 l/s max for all rainfall events up to and including the 100yr+CC rainfall scenario.

Climate change impacts (rainfall).

Climate change allowances to peak rainfall intensity are given nationally for each catchment area across the whole of England. Refer to the DEFRA table below for the Irwell Management Catchment area:

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Irwell Management Catchment

peak rainfall allowances

✕

3.3% annual exceedance rainfall event

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

1% annual exceedance rainfall event

Epoch		
	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

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

Given the residential Site end use, the 2070s epoch is considered suitable for climate change allowance estimation, indicating the following allowances to be used:

- 30yr rainfalls +40% climate change allowance
- 100yr rainfalls +45% climate change allowance

Proposed Surface Water System.

Following the guidance of hierarchy for disposal of surface water (SUDS):

- INFILTRATION:**

BGS maps suggest the subsoils comprise glaciofluvial sand & gravel deposits over the local area. However, all external yards/gardens are within 5m of the rear foundation line and the use of soakaways would be in contravention of current building regulation guidance.

Although soakaways aren't feasible for areas of the Site not in direct contact with the ground (roofs), the external yard areas can be made from permeable paving which includes shallow open graded subbase to manage rainwater sustainably, and protect against exceedance rainfall events.

Surface water from roof areas will have to discharge via another method.
- WATERCOURSE:**

There are no watercourses locally & surface water from roof areas will have to discharge via another method.
- SEWER:**

There are only combined sewers in the local area, and surface water discharge from proposed roof areas will have to discharge via this method.

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All terraces in the local area fronting onto Tweedale Street comprise rain water pipes connecting into the ground, which suggests there is either a local SW connection main running in the back of pavement, OR, individual properties have direct connection to the sewer main.

The Site is a mid-terrace infill block, and combining flows from the front and rear roof areas will be difficult. However, it is likely that upon construction, existing former surface water connections will be identified to the building front which can be reused.

It is proposed to reuse these connections from the front, and new rear connections can be formed as required into the existing combined sewer.

As the Site and associated roof area is small, the peak runoff rates were estimated using the Modified Rational Method in accordance with CIRIA SUDS Manual C753:

MODIFIED RATIONAL METHOD					
Client:	sigma				
Site:	tweedale st (53-61), rochdale, OL11 1AH				
PEAK RUNOFF RATE ESTIMATION ON PROPOSED DEVELOPMENTS					
in accordance with CIRIA C753, pgs 519-520, EQ. 24.5					
modified rational method		$Q = 2.78 C i A$	return period (Tr)	rainfall mintensity (mm/hr)	runoff rate (l/s)
site area:	215	sqm	2yr	24.70	1.48
	0.022	Ha	30yr	35.00	2.09
volumetric runoff coefficient Cv:	1		100yr	50.00	2.99
dimensionless routing coefficient Cr:	1		30yr+40%	49.00	2.93
runoff coefficient C (Cv x Cr):	1		100yr+45%	72.50	4.33
rainfall intensity assumptions:					
1yr rainfall	24.7	mm/hr	synthetic 2yr TEDDS calculation		
30yr rainfall	35	mm/hr	constant lower intensity estimation, CIRIA C758		
100yr rainfall	50	mm/hr	constant upper intensity estimation, CIRIA C758		

Due to the small areas involved, the peak flow estimation indicates that even at the extreme 100yr+45%CC rainfall event, flows will be below the generally accepted 5l/s min flow rate, and therefore it is proposed that the roof areas are simply connected to the combined drainage with no flow restriction.

Proposed Foul Water System.

Foul water flows from the proposed development buildings will be connected into the existing combined system that discharges into to the rear of the buildings.

Additional Recommendations.

This report should be issued to the LPA to approve and/or comment on the proposed drainage strategy.

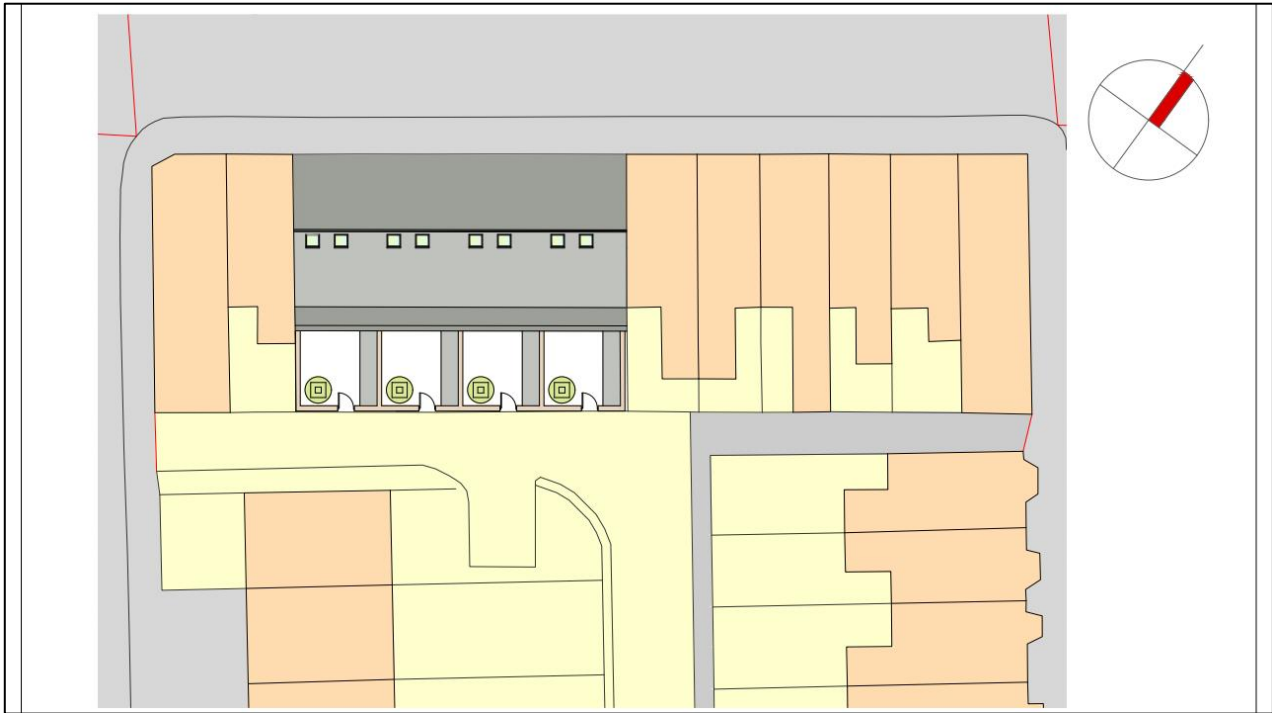
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Appendix.

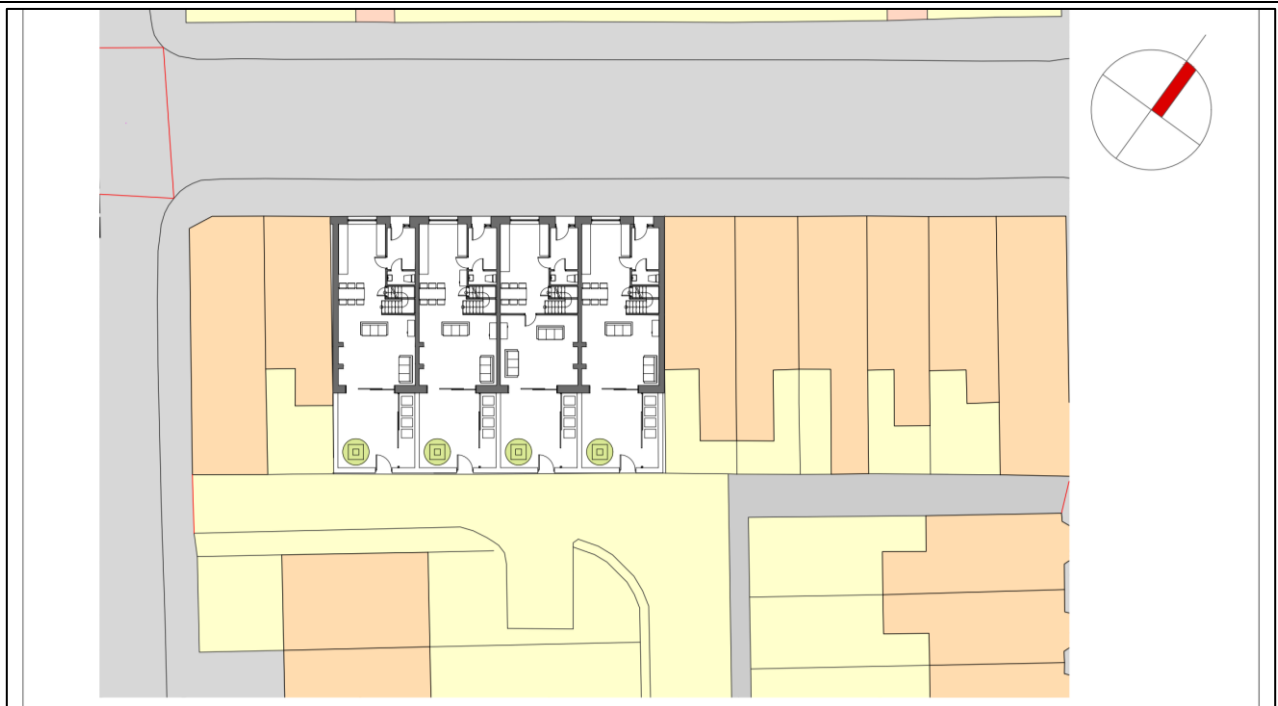
Location Plan.



Proposed Site Plans.



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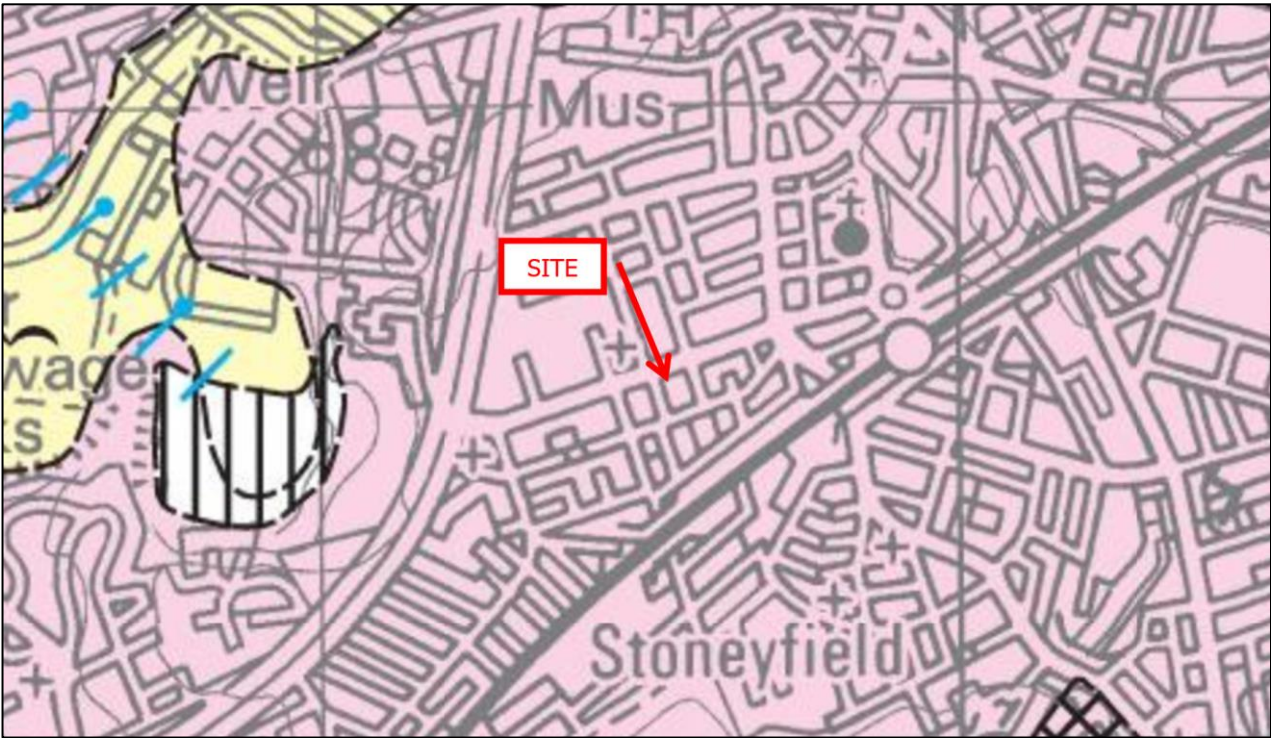


Topographic/Level Survey.

N/A – not undertaken.

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Geological Maps (Solid & Superficial).



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Drainage Calculations.

Proposed Attenuation Estimates.

N/A – not used.

Drainage Utilities Maps.

Not used.

Site Photographs.



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Soil Permeability values.

Typical values of soil permeability

Some typical values of permeability coefficient are given below for different soil types. It refers to normally consolidated condition unless otherwise mentioned. These values should be used only as guideline for geotechnical problems; however, specific condition of each engineering problem often needs to be considered for an appropriate choice of geotechnical parameters.

Description	USCS	min (m/s)	max (m/s)	Specific value (m/s)	Reference
Well graded gravel, sandy gravel, with little or no fines	GW	5.00E-04	5.00E-02		[1].
Poorly graded gravel, sandy gravel, with little or no fines	GP	5.00E-04	5.00E-02		[1].
Silty gravels, silty sandy gravels	GM	5.00E-08	5.00E-06		[1].
Alluvial sand and gravel	(GM)	4.00E-04	4.00E-03		[2&3 in 4]
Clayey gravels, clayey sandy gravels	GC	5.00E-09	5.00E-06		[1].
Well graded sands, gravelly sands, with little or no fines	SW	1.00E-08	1.00E-06		[1].
Very fine sand, very well sorted	(SW)			8.40E-05	[5].
Medium sand, very well sorted	(SW)			2.23E-03	[5].
Coarse sand, very well sorted	(SW)			3.69E-01	[5].
Poorly graded sands, gravelly sands, with little or no fines	SP	2.55E-05	5.35E-04		[1]. [2&3 in 4]
Clean sands (good aquifers)	(SP-SW)	1.00E-05	1.00E-02		[5].
Uniform sand and gravel	(SP-GP)	4.00E-03	4.00E-01		[2&3 in 4]
Well graded sand and gravel without fines	(GW-SW)	4.00E-05	4.00E-03		[2&3 in 4]
Silty sands	SM	1.00E-08	5.00E-06		[1].
Clayey sands	SC	5.50E-09	5.50E-06		[1]. [5]
Inorganic silts, silty or clayey fine sands, with slight plasticity	ML	5.00E-09	1.00E-06		[1].
Inorganic clays, silty clays, sandy clays of low plasticity	CL	5.00E-10	5.00E-08		[1].
Organic silts and organic silty clays of low plasticity	OL	5.00E-09	1.00E-07		[1].
Inorganic silts of high plasticity	MH	1.00E-10	5.00E-08		[1].
Inorganic clays of high plasticity	CH	1.00E-10	1.00E-07		[1].
Compacted silt	(ML-MH)	7.00E-10	7.00E-08		[2&3 in 4]
Compacted clay	(CL-CH)	-	1.00E-09		[2&3 in 4]
Organic clays of high plasticity	OH	5.00E-10	1.00E-07		[1].
Peat and other highly organic soils	Pt	-	-		