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History.

Revision	Date	Reason
0	Sept 2022	Original to support planning application.

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Introduction.

Reference:

Reference document & policy requiring a drainage strategy report.

A planning application for development is to be submitted for the erection of a building to be used for 10No. residential flats. The Site is currently fenced off from Manchester Road, and comprises a rubble surface in a position of terraced dwellings.

As part of the planning application, a Drainage Strategy Report is required to address issues regarding sustainable drainage principles for the proposed 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.

Refer to the appended Location Plan.

The Site is within a mixed residential/commercial area on Manchester Road, the main thoroughfare to the village of Castleton.

The immediate area is urban, with Manchester Road to the northwest fronting the Site, and an unmade access road to the rear.

The Rochdale Canal is the closest known surface water feature, nominally 150m southeast.

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Site Plan.

The pre-development Site was formerly a commercial terraced building that was demolished c2010. The Site is now the space between the remaining terraces, and is boarded off from Manchester Road but open to the rear.

The Site surface comprises a made ground primarily consisting of demolition rubble & brick fill.

The predevelopment areas are:

- *Total area* 280 *sqm*
- *Hardstanding area (impermeable)* 0 *sqm*
- *Soft landscaped area (permeable)* 280 *sqm*.

Desk Surveys & Investigations.

Existing and proposed topography.

A topographic survey of the Site has previously been undertaken, pertinent levels are noted below:

Manchester Road back of path level	139.00m aOD
Access road area along back of Site (north to south)	137.75-137.40m aOD
Neighbouring rear yard to the south	137.20m aOD

Geology & Site Investigations.

Geological maps of the local area indicate the Site is underlain by Devensian glaciofluvial sand & gravel.

Borehole Records.

There were no relevant boreholes within close proximity to the Site.

United Utilities Records.

There is a United Utilities combined sewer flowing northwest in the access road to the rear of the Site.

There is a surface water culvert locally, but is through land to the southeast of the Site to which the developer would have no reasonable right of access.

Assessments.

Flood zone category.

Refer to the .gov flood maps appended. The Site is within Flood Zone 1, ie a LOW probability of flooding.

Watercourses – No risk from watercourses in the local area.

Surface water – No risk of surface water flooding to the Site.

Canals/Artificial Water Bodies – No risk.

Reservoirs – Not known to be a risk.

Climate change impacts.

Climate change allowances allow for uncertainty in the climate model, and the resultant change assumed through time. Allowances are thus related to the type of development and the potential lifetime expected of such development as per the Environment Agency table below:

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Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%

Residential developments are classified within the '2080s' timeframe resulting in a 40% climate change allowance to be included on the predicted extreme rainfall models.

Existing surface water system.

The Site comprises approximately 280sqm total area, all of which is considered permeable, and for the purposes of this assessment shall be classified as greenfield.

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

SAAR (mm) 	1098
M5-60 rainfall depth (mm) 	20 ▾
'r' ratio M5-60 / M5-2day 	0.3 ▾
FEH/FSR conversion factor 	1.11
Hydrological region 	10

EXISTING GREENFIELD FLOW ESTIMATE

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

Tedds calculation version 1.0.04

Pre post runoff method

Site characteristics

Location	Other
Hydrological region	10
Soil type (Wallingford Procedure W.R.A.P map)	1
Standard percentage runoff	SPR = 0.10
Average annual rainfall	SAAR = 1098 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} = 40%
Routing coefficient	C _r = 1.30
Volumetric runoff coefficient	C _v = 0.75

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable area (ha)
1	806-810 Manchester Rd, Castleton	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)	$Q_{\text{rural}} = 0.00108 \text{ m}^3/\text{s} * (\text{AREA}/1\text{km}^2)^{0.89} * (\text{SAAR}/1\text{mm})^{1.17} * \text{SPR}^{2.17} = \mathbf{14.2} \text{ l/s}$

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Greenfield runoff rate

$$Q = Q_{\text{rural}} / \text{AREA} * A = 0.0 \text{ l/s}$$

Greenfield runoff rate per unit area

$$Q_A = Q / A = 0.3 \text{ l/s / hectare}$$

Estimated site discharges

FSR growth rate (1 year)

$$\text{FSR}_{1\text{yr}} = 0.87$$

Discharge (1 year)

$$Q_{1\text{yr}} = Q * \text{FSR}_{1\text{yr}} = 0.0 \text{ l/s}$$

FSR growth rate (30 year)

$$\text{FSR}_{30\text{yr}} = 1.70$$

Discharge (30 year)

$$Q_{30\text{yr}} = Q * \text{FSR}_{30\text{yr}} = 0.0 \text{ l/s}$$

FSR growth rate (100 year)

$$\text{FSR}_{100\text{yr}} = 2.08$$

Discharge (100 year)

$$Q_{100\text{yr}} = Q * \text{FSR}_{100\text{yr}} = 0.0 \text{ l/s}$$

Pass Forward Flow Rates:

The existing greenfield flow rate is negligible owing to the presumed soil type and permeable geology. It is normal practice to limit proposed flows to a minimum of 5l/s due to the potential for blockages and so should surface water need to be discharged to the proposed sewer, it should be at a pass forward flow rate of max 5l/s.

Proposed Surface Water System.

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

- **INFILTRATION:** BGS maps suggest the subsoils comprise Devensian glaciofluvial sand & gravel, which is permeable often with high infiltration rates suitable of sustaining infiltration techniques such as soakaways & permeable paving etc. HR Wallingford data also suggest highly permeable class1 subsoil.
- However, there is only approximately 3m max width of rear yard from the building foundations at any point, and infiltration by mass storage methods such as soakaways would be in violation of building regulations and put foundations at risk of subsidence, and is therefore not a suitable discharge method.
- Direct surface infiltration such as permeable paving for the rear yards would offer some sustainable infiltration however, and can be achieved by using a permeable paving, macadam or other surface material with a minimum 150 type 3 subbase to act as a reservoir.
- **WATERCOURSE:** No watercourses noted in the immediate local area.
- **SEWER:** Suitable for the discharge of roof areas only.
- The front roof of the terraces will not have a pathway to the rear as the proposed building is to be built up to the existing terrace gables. However, it should be connected into any existing drain at the front of the Site. Where this is not available, the rainwater should drain to the highway gullies, as is normal for the terraces locally.
- Drainage from the rear roof area should drain to the rear combined sewer.
- Surface water from the development (roof areas) to the sewer will not exceed 5l/s as calculated below:

PROPOSED DEVELOPMENT SW FLOW ESTIMATE

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area

Other

Storm duration

D = 1 hr

Return period

Period = 100 yr

Ratio 60 min to 2 day rainfall of 5 yr return period

r = 0.300

5-year return period rainfall of 60 minutes duration

M5_60min = 20.0 mm

Increase of rainfall intensity due to global warming

p_{climate} = 40 %

Factor Z1 (Wallingford procedure)

Z1 = 1.00

Rainfall for 1hr storm with 5 year return period

M5_1hr_r = Z1 * M5_60min * (1 + p_{climate}) = 28.0 mm

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Factor Z2 (Wallingford procedure)

$$Z2 = \mathbf{1.99}$$

Rainfall for 1hr storm with 100 year return period

$$M100_1hr = Z2 * M5_1hr_i = \mathbf{55.6 \text{ mm}}$$

Design rainfall intensity

$$I_{max} = M100_1hr / D = \mathbf{55.6 \text{ mm/hr}}$$

Maximum surface water runoff

Catchment area

$$A_{catch} = \mathbf{280 \text{ m}^2}$$

Percentage of area that is impermeable

$$p = \mathbf{100 \%}$$

Maximum surface water runoff

$$Q_{max} = A_{catch} * p * I_{max} = \mathbf{4.3 \text{ l/s}}$$

Proposed Foul Water System.

Foul water flows from the proposed development will need to be kept separate from surface water flows and combined in the last manhole on Site if surface water is to be discharged to sewer.

Additional Recommendations.

At the groundworks stage of development, any existing connections to the sewer must be identified, recorded, and surveyed prior to construction and for reuse where required.

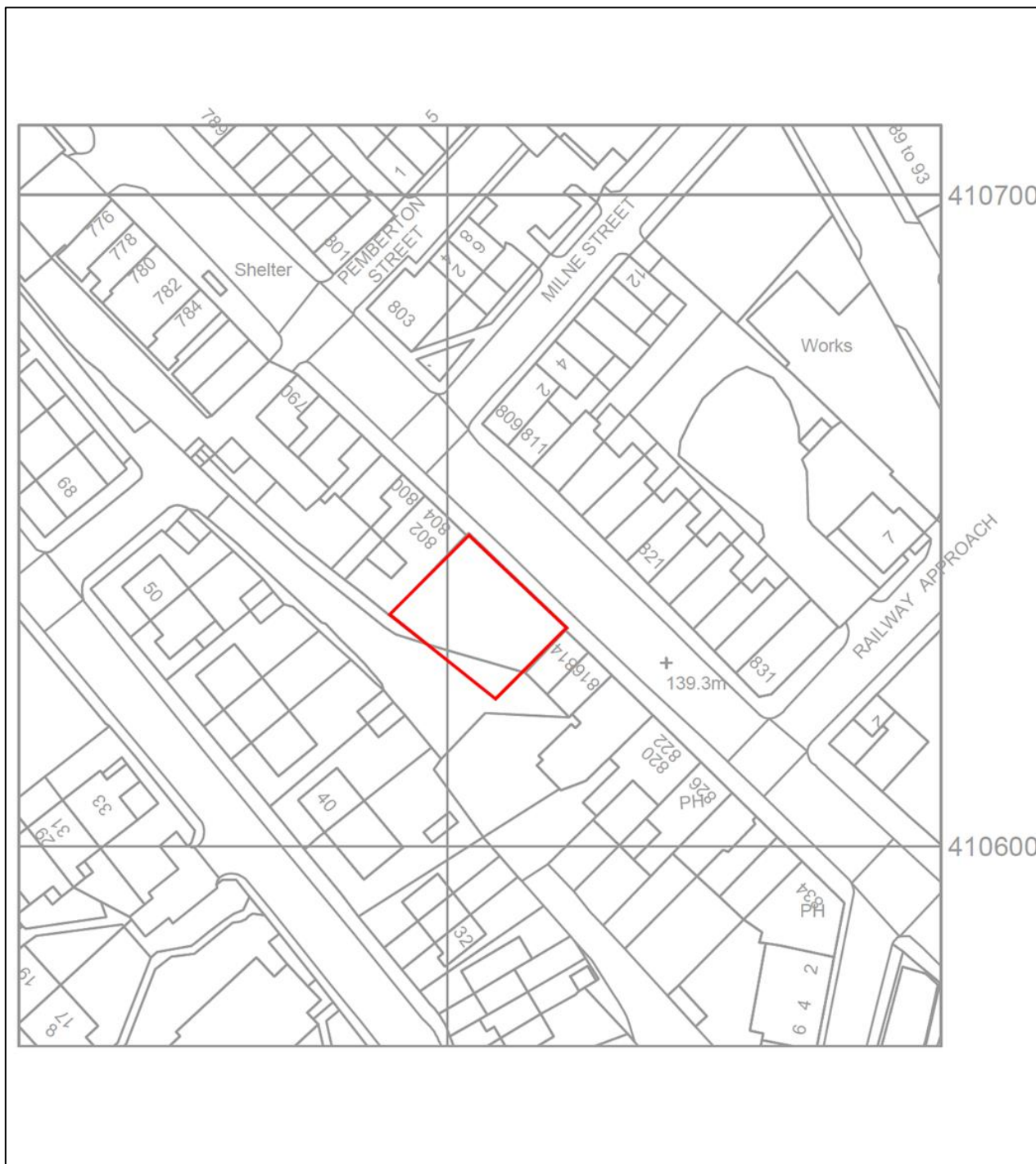
An S106 connection application to United Utilities will need to be submitted & approved.

This report should be submitted as part of a planning application to RMBC, and approved in writing by the RMBC Drainage Officer. Once the proposal and flow rates have been agreed, detailed design can be undertaken to address any relevant planning conditions.

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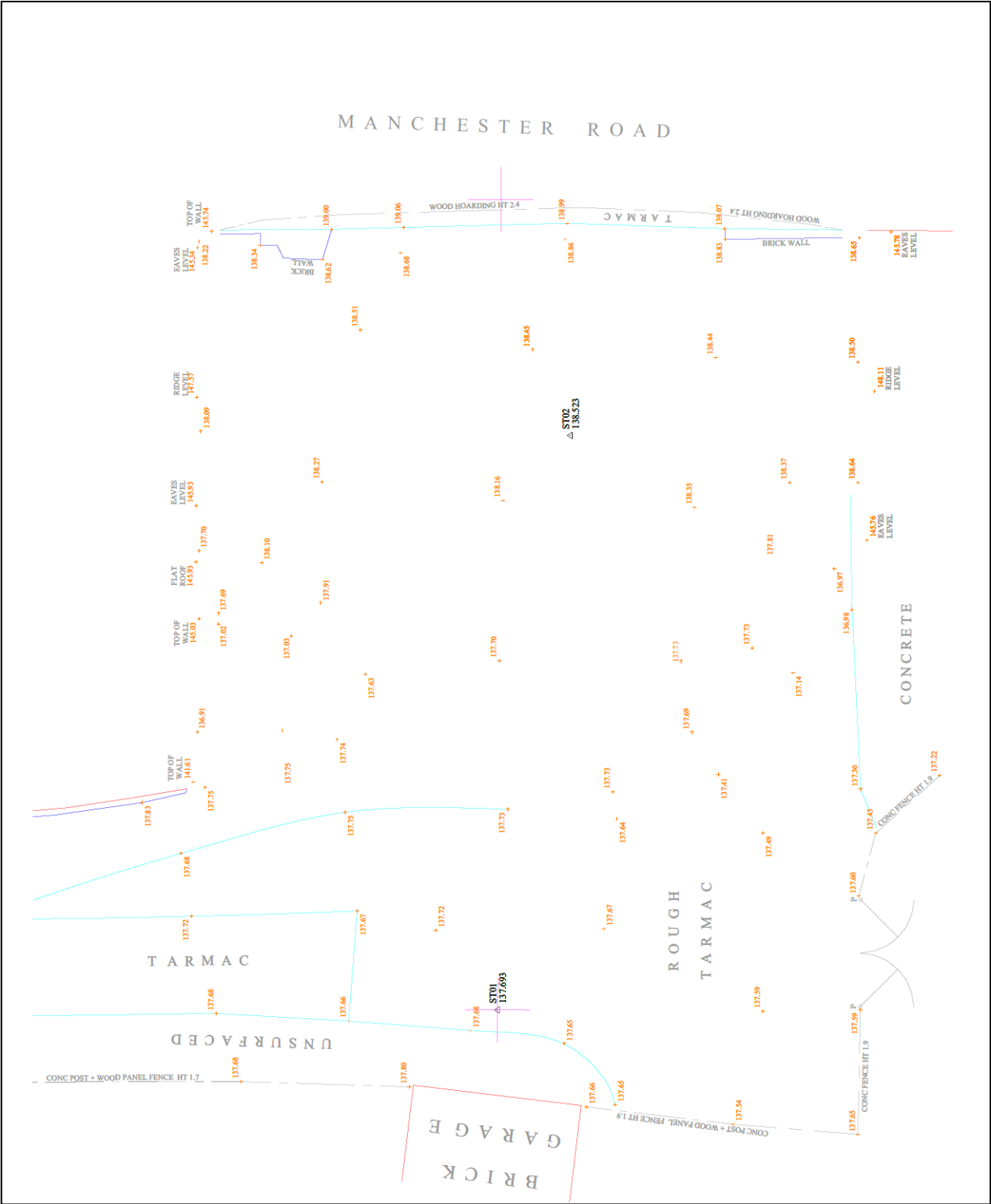
Appendix.

Location Plan.



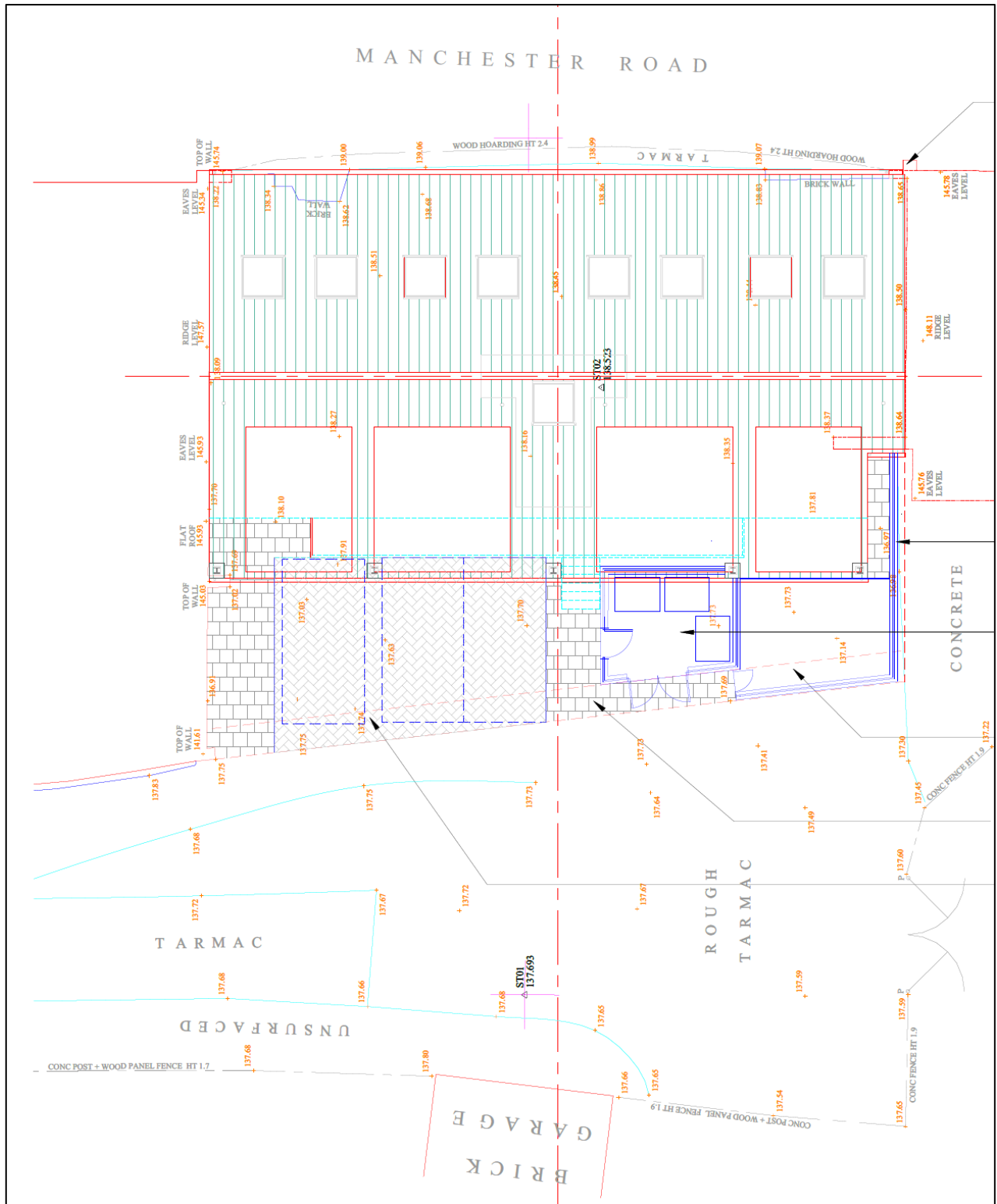
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Existing Site/Topographic Plans.



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Proposed Site Plans.

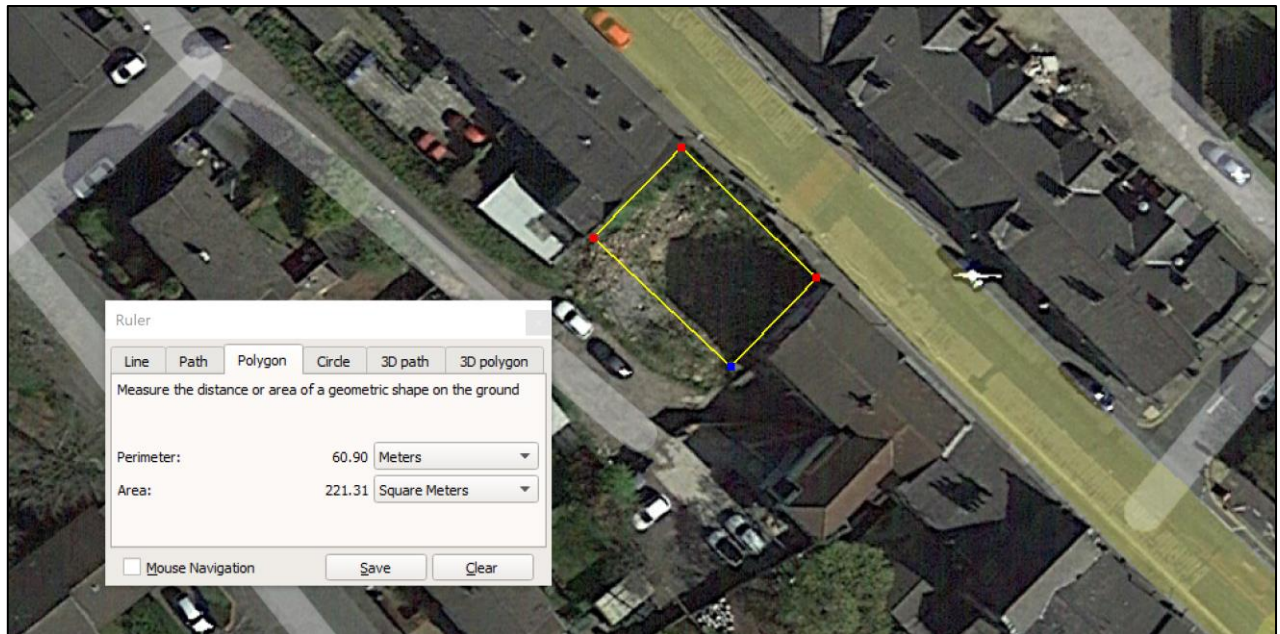


Existing Impermeable Area Plan.

N/A.

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Proposed Impermeable Area Plan.



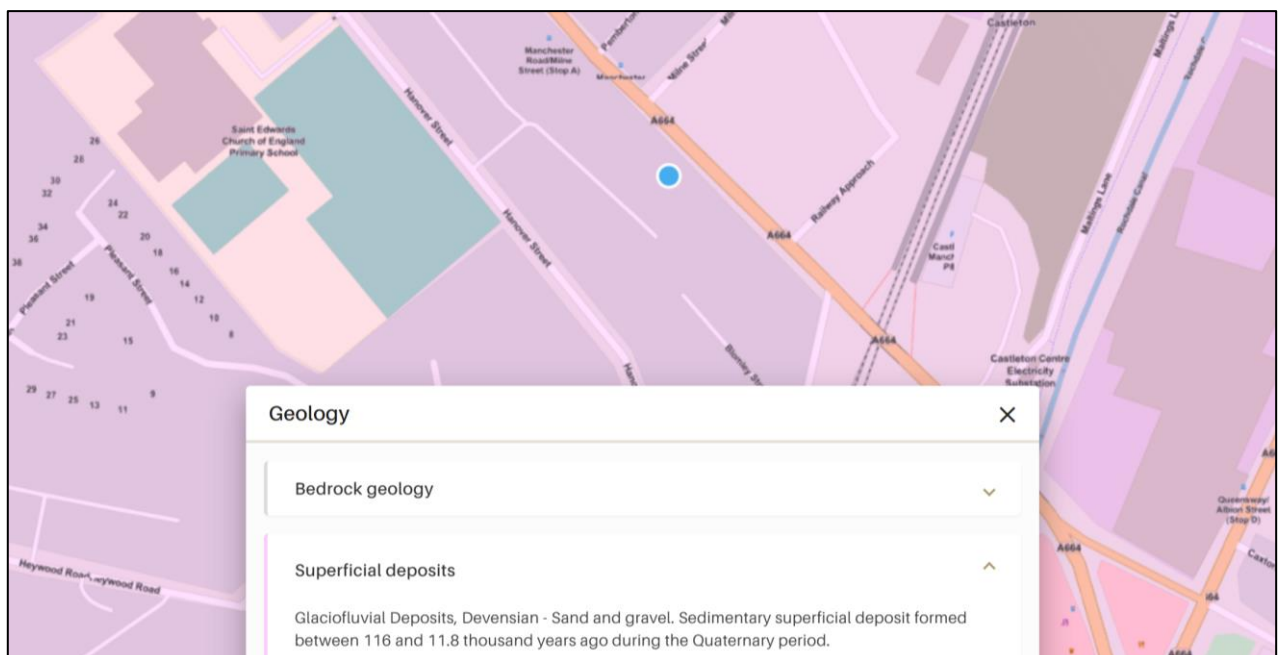
Local BGS Borehole Records.

N/A, none available.

Landmark Watercourse Map.

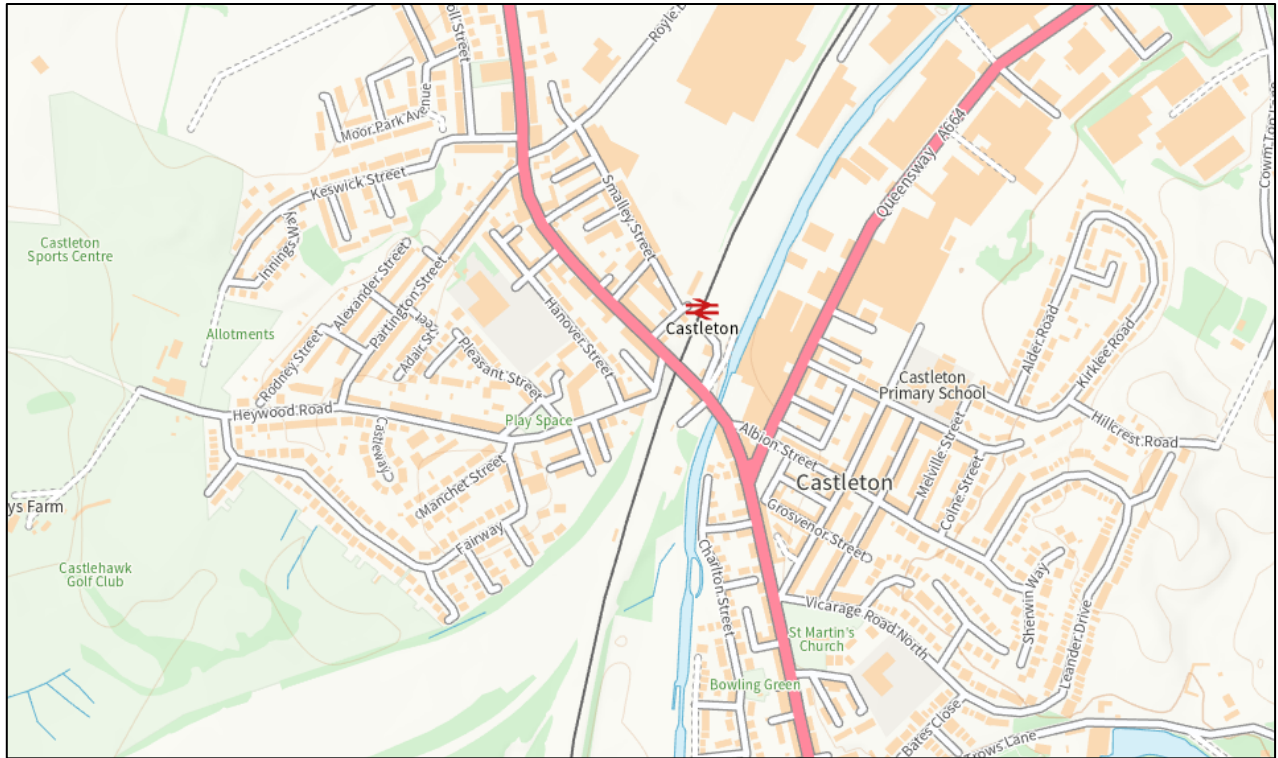
N/A, none available.

BGS Superficial Geology Maps.



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Gov River Flood Map (Flood Zones).



Gov Surface Water Flood Map



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Drainage Calculations.

N/A.

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	-	-		

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Site Photographs.



Drainage Utilities Maps.

