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Surface Water Drainage Strategy

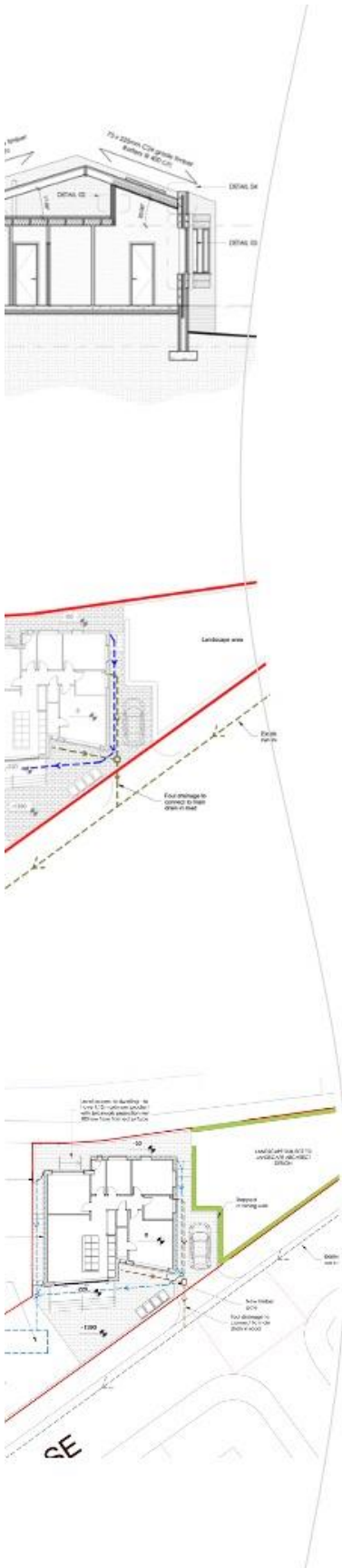
Old Market Street

Manchester

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On behalf of

Zahid Khalid



Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

Tel : 0161 975 6088

Email info@earthenvironmental.co.uk
www.earthenvironmental.co.uk

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Drafted By:	Nicola Sugg
Reviewed By:	Adam Czarnecki
Authorised By:	Adam Czarnecki

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1. Introduction

Earth Environmental and Geotechnical Ltd has prepared a Surface Water Drainage Strategy to support the proposed residential development off Old Market Street, Manchester, M9 8DX.

This drainage strategy has been prepared in accordance with the following national and local guidance on flood risk and sustainable drainage systems (SuDS):

- The National Planning Policy Guidance (NPPG) on Flood Risk and Coastal Change and DEFRA's 2015 Non-statutory technical standards for sustainable drainage systems.
- The SuDS Manual (CIRIA, 2015)
- Policy EN14 – Flood Risk, of Manchester City Council's Core Strategy 2012-2027, which states:

All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In Critical Drainage Areas, evidence to justify the surface water run-off approach / rates will be required.

- Manchester City, Salford City and Trafford Councils Level 2 SFRA (March 2011) and Hybrid SFRA User Guide (May 2010).

2. Site Setting and Description

2.1. Site Location

The address of the development site is Old Market Street, Manchester, M9 8DX, and the co-ordinates of the site are: Easting: 385634, Northing: 402926.

The development site is within the suburban area of Blackley, in north Manchester and is surrounded to the west and south by existing residential development off Old Market Street and Grant Close. The site is bound to the north by Old Market Street, with a churchyard and commercial/retail units beyond. A site location plan is included below as Figure 1.

The total area of the development site is 0.051ha.



Figure 1 – Site Location Plan

2.2. Existing Site

As detailed on the site layout plan in Appendix A and Figure 2 below, the existing site consists of rough vegetation with parking bays in the south, off Grant Close.



Figure 2 – Existing Site Layout, view north from Grant Close (Google Streetview Image)

2.3. Proposed Development

The proposed development is shown on the site plans in Appendix B.

In brief, and in relation to this Drainage Strategy, the proposed development comprises the erection of a single residential property, with associated landscaping and parking.

2.4. Topography

Ordnance Survey mapping indicates that the local topography falls gently to the south, towards Boggart Hole Brook, which passes approximately 50m south of the application site. Ground levels at the site are shown to be in the region of 55mAOD to 60mAOD. Figure 3 presents an extract of the Environment Agency's 2020 1m resolution LIDAR dataset. This confirms an average ground level of approximately 57mAOD within the development site, falling from approximately 58mAOD in the north, adjacent to Old Market Street, to approximately 56.5mAOD in the south, adjacent to Grant Close.

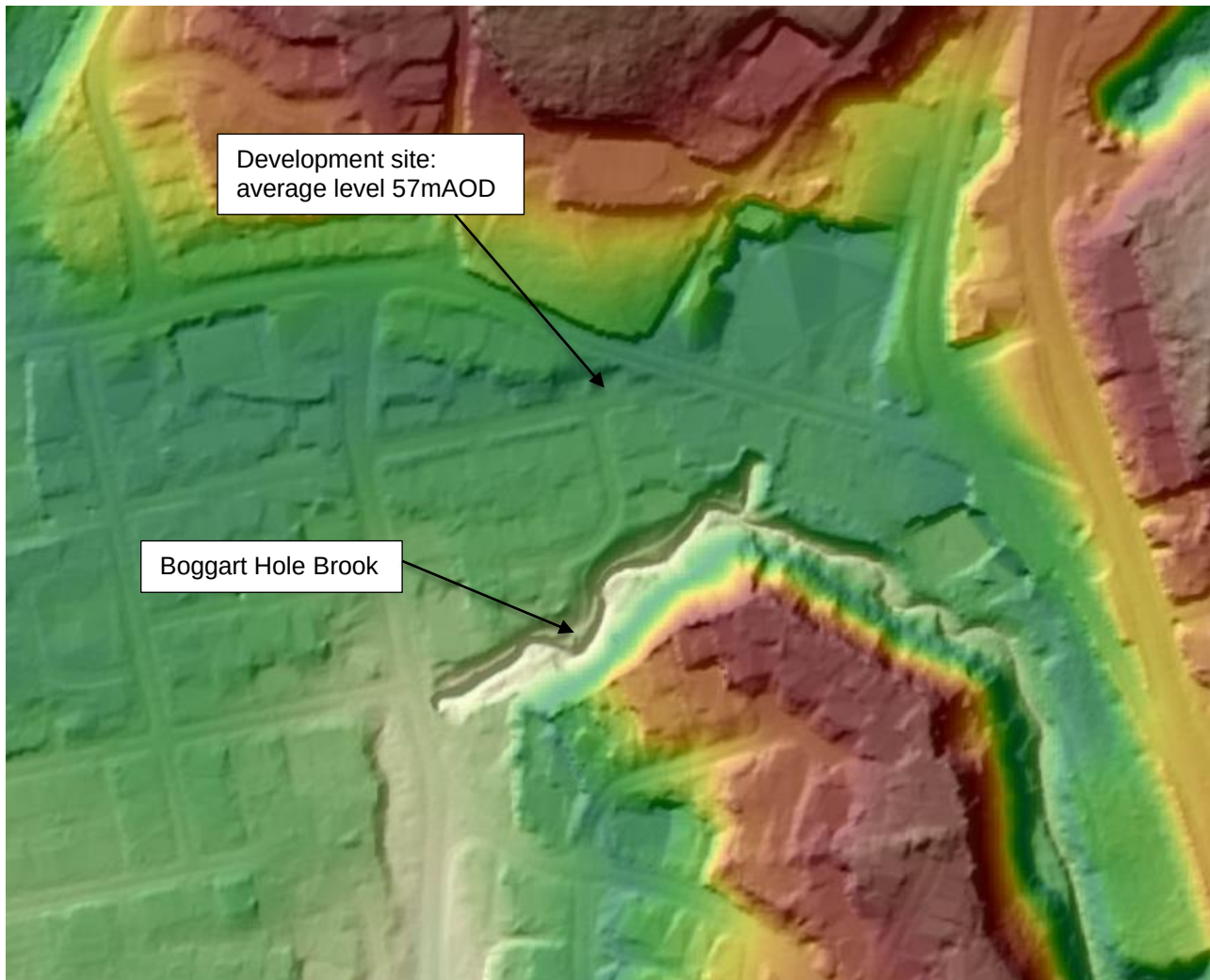


Figure 3 - LIDAR Topographic Data (Environment Agency)

2.5. Local Hydrology

The nearest waterbody to the development site is Boggart Hole Brook (classified as a main river), which flows in a westerly direction approximately 50m south of the site, as indicated on Figure 3. Boggart Hole Brook flows in a westerly, then southerly direction, often culverted, to its confluence with the River Irk, approximately 0.5km downstream of the site. There are no other known watercourses or canals in the vicinity of the development site.

Review of the Environment Agency's online Flood Map for Planning confirms that the application site is entirely within low probability Flood Zone 1.

2.6. Ground Conditions

The ground conditions for the site can be determined via the British Geological Survey (BGS) website, where it indicates the site is underlain by superficial Glaciofluvial deposits (sand and gravel) and Glacial Till (Boulder Clay) over mudstone of the Manchester Marls Formation. A published BGS geological log from a borehole installed to a depth of 14.5m below ground level (mbgl) on Grant Close immediately south of the application site in 1988 confirms ground conditions of Made Ground to 2.5mbgl overlying interbedded sands and gravels to 13.1mbgl overlying Boulder Clay. Groundwater (rest water level) was recorded at 5.8mbgl.

Review of Natural England's MAGIC website confirms that the application site is not located within, or in the vicinity of, a groundwater Source Protection Zone.

Due to the relatively high permeability ground conditions and predominantly undeveloped nature of the application

site, a high proportion of incident rainfall would infiltrate to ground.

2.7. Existing Drainage Infrastructure

The site is currently undeveloped with no known drainage system, and the majority of incident rainfall is likely to infiltrate to ground. Any surface water runoff during extreme rainfall events and from the impermeable parking bays would discharge, via gravity flow, towards the south, to the adjacent Grant Close and be managed via the highways drainage system.

3. Surface Water Drainage Strategy

3.1. Introduction and Design Standards

Local and national planning policy confirms that all development proposals should manage surface water runoff through the use of Sustainable Drainage Systems (SuDS), if feasible, in order to manage the risk of surface water flooding to the development and to prevent any increase in flood risk to others.

Policy EN14 – Flood Risk, of Manchester City Council's Core Strategy 2012-2027, states:

All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In Critical Drainage Areas, evidence to justify the surface water run-off approach / rates will be required.

Review of Drawing Number SS_4.5 of the Level 2 Hybrid SFRA confirms that the application site lies within the extensive Conurbation Core Critical Drainage Area due to localised flooding problems.

Discharge Rate

The SFRA User Guide provides the following guidance regarding discharge rates from new development within Critical Drainage Areas:

- Development should aim to deliver Greenfield runoff on Greenfield sites up to a 1 in 100-year storm event, considering climate change
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100-year storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100 year plus climate change event

Climate Change Allowance

It is recognised that the frequency and intensity of rainfall, and river flows are predicted to increase as a result of climate change, and this must be considered within the drainage strategy. Table 2 of the Environment Agency's guidance on climate change allowances indicates that peak rainfall intensity within small (<5km²) and urban catchments could increase by between 20% (central allowance) and 40% (upper allowance) by the 2080's (2070 to 2115), from 1961-1990 baseline data.

The guidance states that drainage systems should be designed to ensure there is no increase in runoff discharged from the site for the upper end (40%) allowance.

The following drainage strategy is based on the above planning policy and guidance.

3.2. Greenfield Rate of Runoff

The theoretical pre-development Greenfield rate of runoff from the application site area (0.051 hectares) has been calculated using Innovyze MicroDrainage software using the IOH124 method; rates are summarised below, and calculations are included within Appendix C. The runoff rate is calculated for a 50-hectare site, in accordance with the IOH124 method and the results scaled for the application site area of 0.051 ha.

Annual Probability of Rainfall Event	Greenfield Runoff Rate for 50ha Site	Greenfield Runoff Rate for 0.051ha Application Site
QBAR	322.1l/s	0.33l/s
1 Year	280.2l/s	0.29l/s
30 Year	546.1l/s	0.56l/s
100 Year	670l/s	0.68l/s

Based on the MicroDrainage calculations the pre-development Greenfield runoff rate (QBAR) is 0.33l/s.

3.3. Surface Water Discharge Options

In accordance with Paragraph 080 of the NPPG Guidance, surface water runoff from new development should discharge as high up the following hierarchy of drainage options as reasonably practicable:

- infiltration to ground
- to a surface water body
- to a surface water sewer, highway drain, or another drainage system
- to a combined sewer

Review of published geological mapping and local published borehole logs indicates that the ground conditions beneath the application site comprise superficial sand and gravel, with groundwater approximately 5mbgl and therefore are appropriate for the discharge of surface water runoff to ground.

Approved Document H – Drainage and Waste Disposal (2015) of the Building Regulations confirms that infiltration soakaways should not be built:

- within 5m of a building or road, with 2.5m of a boundary, or in areas of unstable land;
- in ground where the water table reaches the bottom of the soakaway at any time of the year;
- near any drainage fields, drainage mounds or other soakaways where the overall soakage capacity of the ground could be exceeded, and the effectiveness of any drainage field could be impaired;
- where the presence of any contamination in the runoff could result in pollution of a groundwater source or resource.

Review of the proposed development plans (Appendix B) confirms that adequate space and offsets should be available for a soakaway beneath the area of proposed landscaping adjacent to and west of the proposed dwelling.

Therefore, in accordance with the discharge hierarchy, it is proposed that the drainage strategy should consider the discharge of surface water runoff via infiltration to ground.

3.4. Surface Water Drainage Strategy

An outline surface water drainage strategy for the proposed development is presented within Appendix D. In summary, surface water runoff from the roof area of the proposed dwelling (0.012 ha) would discharge to soakaway and the perimeter area including car parking and pedestrian access would comprise permeable paving with infiltration to ground. Foul drainage will discharge to public sewer within Grant Close.

Soakaway Design

It is proposed that runoff from the roof of the proposed dwelling would discharge to a crate soakaway located beneath the proposed landscape area, within the down-gradient, south-western part of the site, as indicated in Appendix D.

The soakaway has been sized using MicroDrainage design software to accommodate surface water runoff for all

rainfall events up to and including the 100-year (1% annual probability) rainfall event, with a 40% allowance for long term climate change. Therefore, there would be no ponding of surface water runoff on site and no off-site discharge of surface water, during rainfall events up to and including this design event.

The following assumptions have been incorporated within the soakaway design:

- Infiltration rate: 10m/hour based on local geological logs and the average recommended infiltration rate for sand within MicroDrainage. Site-specific infiltration rate to be confirmed for final design.
- Factor of Safety: 2 (default value, applied to the above infiltration rate)
- Design rainfall event: 100 year + 40% climate change, in accordance with current guidance
- Catchment area: 0.012 hectares (equivalent to the roof area of the proposed dwelling)
- Soakaway porosity: 90% (conservative value for crate soakaways)
- A minimum 5m standoff has been maintained between the soakaway and adjacent buildings/roads, in accordance with Building Regulation requirements.

The MicroDrainage calculations are included within Appendix C and confirm that a soakaway crate(s) of dimensions, width: 0.6m, length: 2.0m and height: 1.0m is appropriate to manage surface water runoff from the proposed development for all rainfall events up to and including the 100-year event, with 40% allowance for climate change. The soakaway half-drain time remains less than 24 hours, as recommended within current guidance, in readiness for subsequent rainfall events.

Permeable Paving

It is proposed that the area of car parking and pedestrian access immediately surrounding the property, indicated as blocked hatching on the Outline Surface Water Drainage Plan within Appendix D, would comprise permeable paving. It is proposed that a Type A (total infiltration) pavement system be utilised, assuming ground investigations confirm appropriate conditions, i.e., permeability $> 1.0 \times 10^{-6}$ m/s and no ground contamination.

In this type of permeable paving system, rainwater percolates through the joints between the paving blocks, then through the bedding layer and into the sub-base material. The water then slowly infiltrates into the underlying ground, with 100% of the surface water runoff managed on site, in accordance with sustainable drainage principles.

The permeable paving system would be designed, following site-specific infiltration testing, to ensure incident rainfall for all events up to and including the 100-year event + 40% climate change would be managed via infiltration to ground with no surface flooding.

The permeable paving should be constructed at the end of the development project, to minimise damage or clogging of the pavement.

3.5. SuDS Maintenance Plan

To ensure the drainage system continues to operate as designed, maintenance tasks need to be carried out at appropriate intervals.

The permeable paving and soakaway must be protected from silt/debris and the following maintenance schedules are recommended (after CIRIA, 2016, UK SuDS Manual).

Operation and maintenance requirements for soakaways

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Appendix A - Existing Site Layout Plan

Appendix B - Proposed Development Plans

Appendix C - MicroDrainage Calculations

Appendix D - Outline Surface Water Drainage Plan