

DRAINAGE & SuDS STRATEGY REPORT

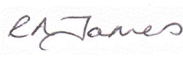
for a

**PROPOSED COMMERCIAL DEVELOPMENT AT
GREENBROW ROAD, NEWALL GREEN**

for

DPPS Trading Ltd

Quality Management

Job No	12860		
Project	Proposed Commercial Development at Greenbrow Road		
Location	Greenbrow Road, Newall Green, Wythenshawe, Manchester, M23 2XQ		
Title	Drainage & SuDS Strategy Report		
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1. Executive Summary

Figure 1 Flood Risk and Drainage Strategy Summary

Item	Brief Description
Development Proposed	Commercial redevelopment of an existing nursery building into a single storey convenience store with storage, 2 further retail units and 33 car parking spaces.
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	According to British Geological Survey (BGS) the superficial ground is classed as Till, which generally encompasses clays and silts. The local borehole record has also identified clays to depth.
Infiltration Rate	No infiltration tests have been completed at this time. However, based on the anticipated cohesive ground conditions, infiltration is not deemed to be suitable.
Nearest Watercourses	The Millbrook watercourse is located approximately 150m to the west of the site.
Nearest Adopted Sewers & Private drainage	A 600mm dia combined water sewer passes just within the western boundary, flowing north towards Simonsway. A smaller 225mm diameter combined sewer flows west along the southern boundary and outfalls to this larger sewer. There are no surface water sewers in close proximity. The existing car park and nursery building are served by a combined drainage network that outfalls to the 600mm combined sewer.
Surface Water Drainage Outfall and SuDS Hierarchal Approach	Based on the unsuitable ground conditions and no watercourse or surface water sewer in close proximity, the proposal is to outfall to the combined sewer via the existing connection at restricted rates.
Existing Discharge Rate	Brownfield discharge rates defined below based on a site area of 0.155ha: 1yr – 12.9 l/s (30mm/hr) 30yr – 28.0 l/s (65mm/hr) 100yr – 40.9 l/s (95mm/hr)
Proposed Discharge Rate	5l/s for the car parking area. Existing roof area to remain unchanged. Overall reduction for all events.
Allowance for Climate Change	20% - based on a commercial > 25-year design life to 'the 2050's'.
Proposed Attenuation Method	Permeable surfacing
SuDS features	Permeable surfacing
Maintenance Responsibility	Owners
Foul Drainage Outfall	Free discharge to foul drain / sewer passing through the site via the existing connection.

2. Introduction

- 2.1 Marston and Grundy LLP (M&G) has been appointed by DPPS Trading Ltd to prepare this Drainage & SuDS (Sustainable Drainage Systems) Strategy Report to support a full planning submission for a proposed commercial redevelopment of a single storey property, consisting of one convenience store with storage and two further units with cycle storage and 33 car parking spaces situated at Greenbrow Road, Newall Green, Wythenshawe, Manchester, M23 2XQ. The assessment has been undertaken in line with Section 10 of the 2021 'National Planning Policy Framework', plus the accompanying Technical Guidance on Flood Risk and any local policies.
- 2.2 This report has been commissioned by DPPS Trading Ltd and is specific to their interest in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 2.3 The report has been commissioned to identify any drainage related issues associated with the proposed development and any likely constraints that could be imposed. The following issues have been addressed within this report;
- Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Discuss Sustainable Drainage Systems (SUDS) as an option for reducing surface water flood risk and devise an outline Drainage layout.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
 - Devise an appropriate outline foul water drainage strategy.

3. Development Description and Location

3.1 Site Location

3.1.1 The site is referenced in Figure 2, and a site location map is provided in Appendix A.

Item	Brief Description
Project name	Greenbrow Road, Wythenshawe.
Site address and location	Greenbrow Road, Newall Green, Wythenshawe, M23 2XQ
Council Area	Manchester City Council
Approximate Grid Reference	OS: 381395, 387170
General Locality	The site is located some 2km north of Manchester Airport in the suburb of Newall Green.

Figure 2 Site Referencing Information

3.2 Existing Site Description

3.2.1 The development site (Red Line Boundary) is predominantly rectangular in plan shape and is situated within a residential led area. The site currently encompasses a children's amusement centre (Anchors Away Play) with a concrete flag pedestrian access off Greenbrow Road. There is a small grassed area to the front and a tarmac car park to the rear. The site can be classed for drainage purposes as 'Brownfield'. Access to the site will continue to be from Greenbrow Road.

3.2.2 Figure 3 overleaf identifies the overall site location. Further details of the existing layout can be seen on the Red Line Plans in Appendix A and the Topographical survey in Appendix B.

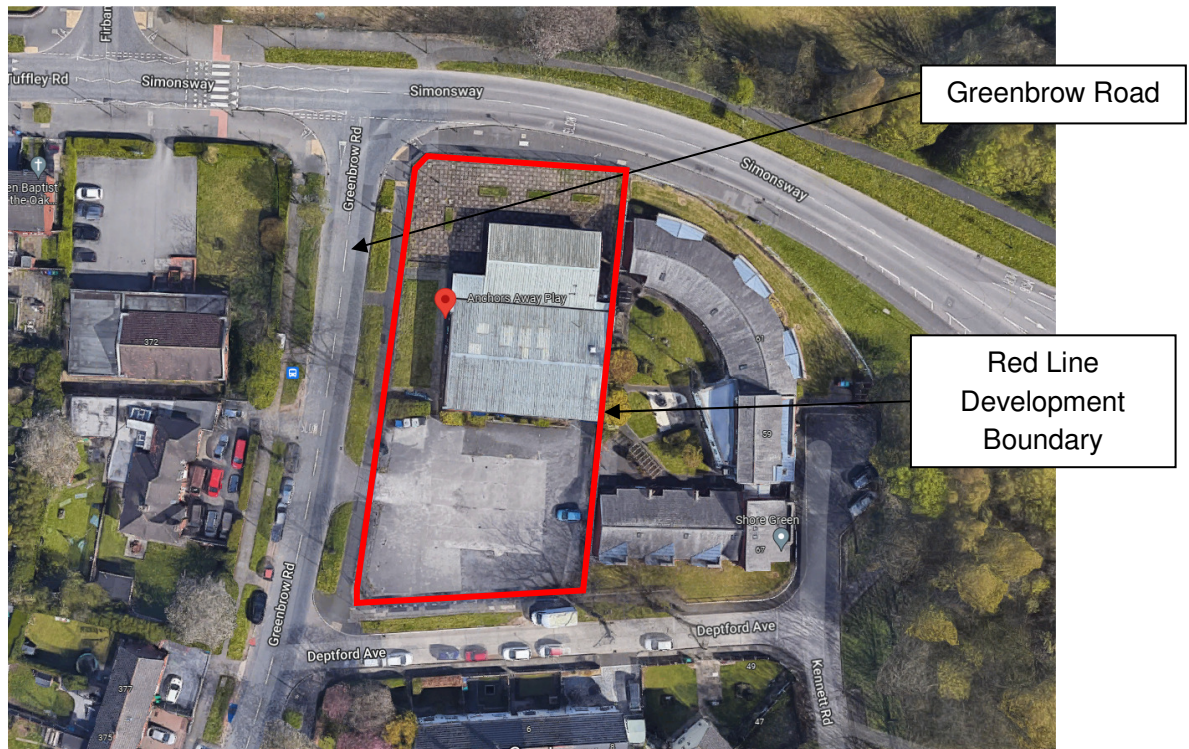


Figure 3 Site Location

3.3 Topography

- 3.3.1 A formal topographical survey has been completed. This has identified the current building to hold a level of 56.15m AOD. The rear car park is slightly elevated and falls to the centre at 56.36m AOD. The northern landscaped area falls away from the building.

3.4 Hydrology

- 3.4.1 A review of local maps has identified the closest watercourse to be the Millbrook, located some 150m to the west.

3.5 Development Proposals

- 3.5.1 As discussed in the earlier sections, the report is prepared to support a planning application for the redevelopment of the existing nursery building into a single storey property consisting of 1 convenience store & storage, and 2 further retail units with 33 car parking spaces and cycle storage.
- 3.5.2 The outline Site Master Plan as indicated in Appendix A provides details of the proposed development intent. Access into the site would continue to be off Greenbrow Road.

4. Fluvial Flood Risk Review

- 4.1 Figure 4 below locates the site on the Environment Agency's indicative flood plain map. It is clear from this that the red line boundary sits outside of a fluvial generator of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with the 2019 National Planning Policy Framework (NPPF) Flood Risk Guidance Notes, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels, removing the requirement for further investigation and assessment of the fluvial flood regime.

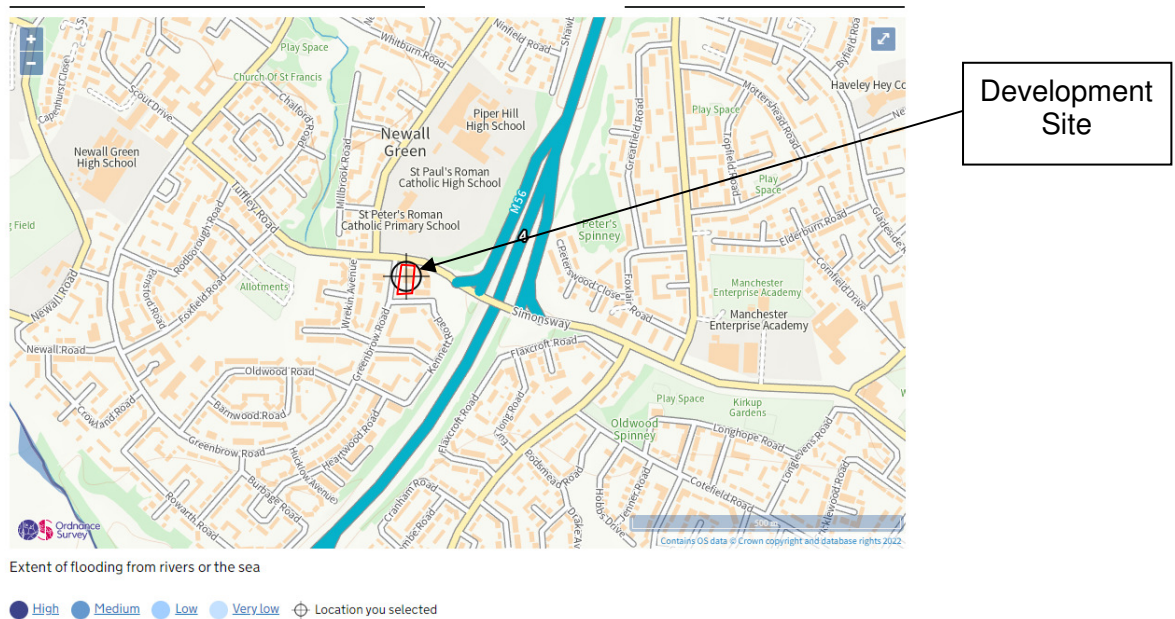


Figure 4 EA Indicative Flood Maps

- 4.2 In addition, the development application boundary is less than 1ha in plan area. In line with criteria set within the NPPF a Flood Risk Assessment is not required to support a planning application if the development is less than 1ha and in Flood Zone 1.

5. Outline Drainage Strategy

5.1 Existing Drainage

- 5.1.1 The United Utilities sewer records have been reviewed and confirms a 600mm diameter combined water sewer passes just within the western boundary, flowing north towards Simonsway. A smaller 225mm diameter combined sewer flows west along the southern boundary and outfalls to this larger sewer. There are no surface water sewers in close proximity. Refer to Figure 5 below for further details.
- 5.1.2 CCTV survey has been undertaken and has informed that the existing car park and nursery building are served by a combined drainage network that outfalls to the 600mm combined sewer via a 150mm diameter connection.

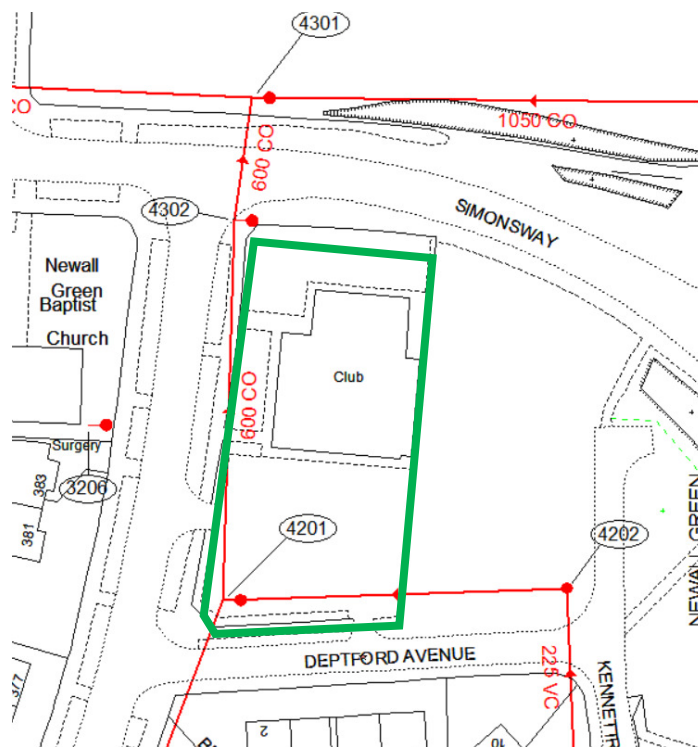


Figure 5 United Utilities Sewer Records

5.2 Existing Runoff

- 5.2.1 The existing site currently comprises the nursery building and tarmac carpark, and can therefore be classed for drainage purposes as Brownfield. Figure 6 below defines the existing brownfield runoff rates.

Existing Impermeable Area (ha)	Brownfield Rates		
	1 yr (30mm/hr)	30yr (65mm/hr)	100yr (95mm/hr)
0.155	12.9 l/s	28.0 l/s	40.9 l/s

Figure 6 Brownfield Runoff Rates

5.3 Geology & Infiltration

- 5.3.1 According to British Geological Survey (BGS) the superficial ground is classed as Till, which generally encompasses clays and silts. This is supported by a review of the local borehole records on the BGS website that also indicate the underlying ground to encompass clays. The cohesive nature of the underlying geology therefore precludes the use of soakaways on the site.

5.4 Hydrological Assessment

- 5.4.1 As discussed in previous sections, a review of the topographical survey, OS Maps and Environment Agency maps would indicate the closest surface water feature to be Millbrook, located some 150m to the west of the site.

5.5 Sustainable Drainage Systems (SuDS) Assessment

5.5.1 *SuDS Objectives*

- 5.5.1.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

5.5.2 *SuDS Design Themes*

- 5.5.2.1 The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

5.5.3 *SuDS Site Constraints*

5.5.3.1 SuDS techniques are suitable for all sites; therefore an assessment of the existing site is required so that SuDS limitations can be determined.

- *Land Use Characteristics:* The size and type of development enables the potential range of site control SuDS devices to be considered below ground only.
- *Site Characteristics:* A site specific Phase 2 intrusive investigation has not been carried out to date at the site. However, findings from a review of the BGS website has determined that infiltration techniques would not be suitable.
- *Catchment Characteristics:* The site is currently classed for drainage purposes as 'Brownfield' and the discharge rate from the site will need to reduce from the existing brownfield runoff rates.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. All types of SuDS will be considered and blended into the landscaping zone, if possible. Safety to all future users is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

5.5.4 *SuDS Methods*

5.5.4.1 Figure 7 and 8 on the following pages provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the commercial development.

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> Not suitable due to the existing pitch roof being retained.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Not suitable:</u> No end use for a commercial development such as this.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of the development. - Running and maintenance costs would not be acceptable to our client and future occupiers. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Ground conditions anticipated to be cohesive and thus unsuitable for infiltration-based options.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Ground conditions anticipated to be cohesive and thus unsuitable for infiltration-based options.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> To be placed in the central low lying car parking area to provide treatment and attenuation measures.

Swales, basins and ponds	• Provide areas for above ground surface runoff storage. • Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> • No space available in the site for any of these features to be incorporated.
Bio-Retention	• Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> • Space constraints on site do not permit large above ground areas for flood storage. • No scope to reduce development area due to site viability. • Infiltration options viable.

Figure 7 Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	• Suitable for sites with insufficient space for basins etc. • Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> • Subject to detailed design and drainage layout.
Large Diameter Pipes, Culverts or Tanks	• Suitable for sites with insufficient space for basins etc. • Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. • Generally be suitable for adoption by the statutory water company (e.g. Severn Trent Water).	<u>Not Suitable:</u> • More suited for larger developments where the drainage is to be adopted by United Utilities.

Figure 8 Sub-Surface SuDS Methods

5.5.5 SuDS Hierarchal Approach

5.5.5.1 Based on the SuDS assessment in Figure 7 and 8, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Cohesive ground conditions would preclude the use of infiltration-based options.
Connection to Watercourse	No	No watercourse in close proximity.
Connection to Surface Water Sewer	No	No surface water sewer in close proximity.
Connection to a Combined Sewer	Yes	Reuse existing connection to combined sewer at restricted rates.

Figure 9 SuDS Hierarchal Approach

5.5.6 SuDS Design Philosophy

5.5.6.1 SuDS assessment and hierarchal approach discussed in Figure 7, 8 and 9 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Source Control and Site Control techniques with discharge to the combined sewer at restricted rates.

5.5.6.2 The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the existing drainage infrastructure.
- Reduce the impermeable fraction of the post development area where possible.
- Include permeable paving to the parking areas that will also act as the attenuation measure.

5.6 Outline Surface Water Drainage Strategy

- 5.6.1 The general principal of the surface water drainage strategy is for the roof area of the retained building to be unchanged as the below ground drainage network will be altering and it combines with the foul drainage.
- 5.6.2 A new area of permeable surfacing will be incorporated into the central parking area to collect the runoff from the surfacing and direct to the underlying stone mattress that will act as treatment, flow control and attenuation. An orifice plate flow control from this area will be restricted to 5l/s to provide a significant reduction in the predevelopment peak flow rates.
- 5.6.3 The proposed private drainage layout for the new development building will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance. This is to indicate no flooding for up to the 30-year storm event.
- 5.6.4 Flooding can occur on a local scale beyond the 30yr criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. NPPF Guidance states that properties should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.
- 5.6.5 Although it is envisaged that Source Controls measures will be included in the final scheme, this strategy will assume for outline calculations purposes that only Site Control methods are incorporated. Taking into account the reduced discharge rate to the car park of 5l/s and assuming no infiltration to ground is possible then the worst-case attenuation volumes are defined in the figures below. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information is made available. Further details on the drainage strategy plan can be found in Appendix B with the calculations in Appendix C.

New Impermeable Area to Car Park	Attenuation Volume for 30-year Event	Attenuation Volume for 100 year + 20% CC Event (Extra Over 30-year event can be retained in low lying parking areas)
0.090 ha	8.8m ³	16.0m ³

Figure 10 Outline Attenuation Volumes

- 5.6.6 Any future drainage calculations carried out as part of a site wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate change allowances.

5.7 Maintenance

- 5.7.1 The long-term maintenance of the new drainage and SuDS infrastructure will be with the owner of the development in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, catchpits and permeable paving constructed.

Typically the maintenance regime will be in line with Figure 10 below.

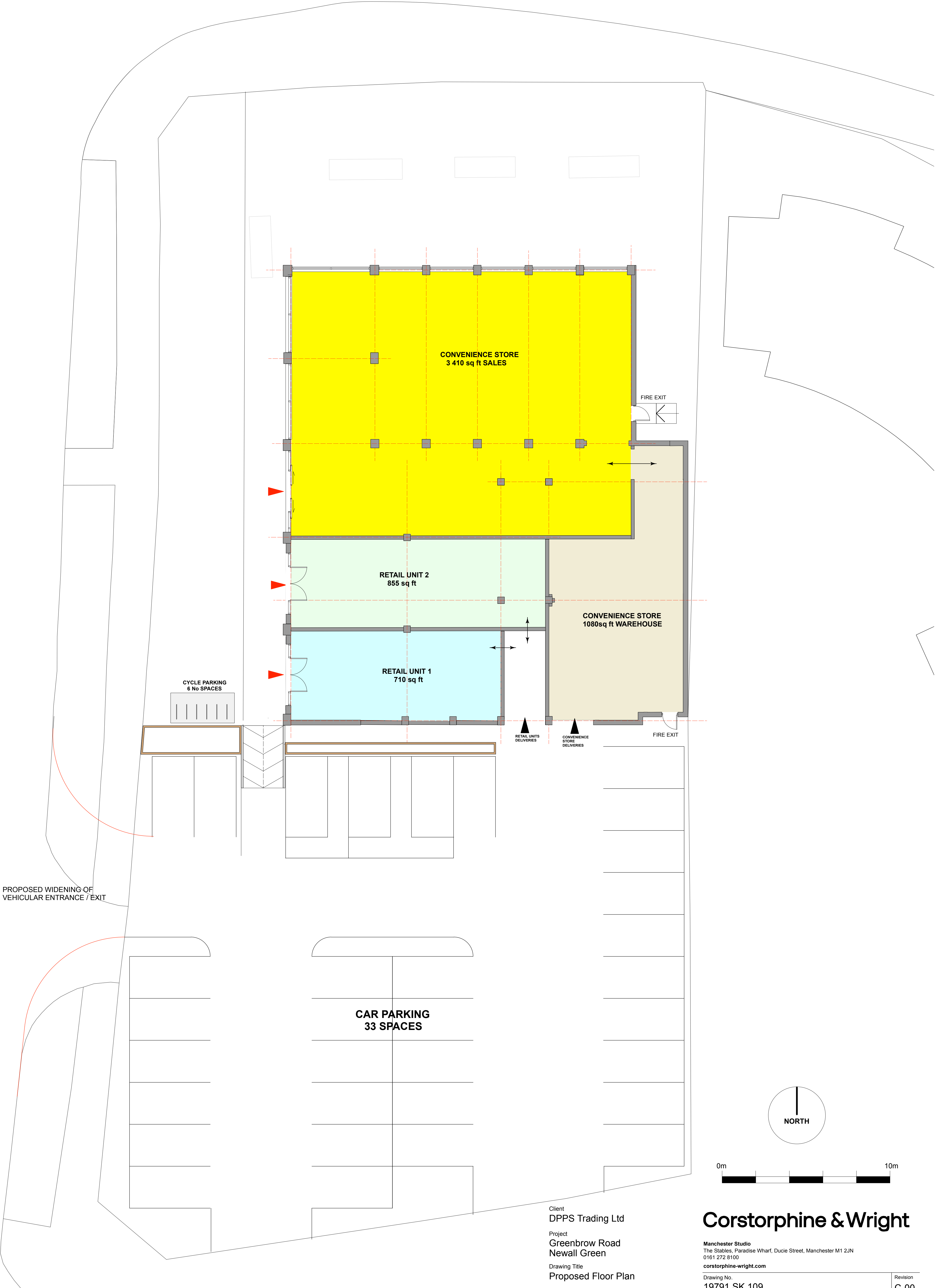
<u>Future Maintenance of the Drainage System</u>			
Responsibility	Feature	Maintenance	Frequency
Owner / Management Company	Rainwater gutters, downpipes and above ground drainage.	Regular maintenance and inspections.	Ad-hoc sweeping and emptying of silt and debris required. Annual visual inspections to check for damage/leaks.
	Permeable Paving	Brushing and Vacuuming, removal of weeds	Annual inspection and following significant rainfall events.
	Pipes, sewers, manholes	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.

Figure 11 Outline Management and Maintenance Strategy

5.8 Foul Water Drainage

- 5.8.1 Foul drainage generated from the redevelopment will discharge to the existing foul water drainage serving the current building and altered accordingly to suit the new drop locations.
- 5.8.2 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance.

Appendix A – Architects Drawings



PROPOSED WIDENING OF
VEHICULAR ENTRANCE / EXIT

CYCLE PARKING
6 No SPACES

RETAIL UNIT 2
855 sq ft

RETAIL UNIT 1
710 sq ft

CONVENIENCE STORE
3 410 sq ft SALES

CONVENIENCE STORE
1080sq ft WAREHOUSE

CAR PARKING
33 SPACES

FIRE EXIT

FIRE EXIT

RETAIL UNITS
DELIVERIES

CONVENIENCE
STORE
DELIVERIES

NORTH

0m

10m

Client
DPPS Trading Ltd
Project
Greenbrow Road
Newall Green
Drawing Title
Proposed Floor Plan

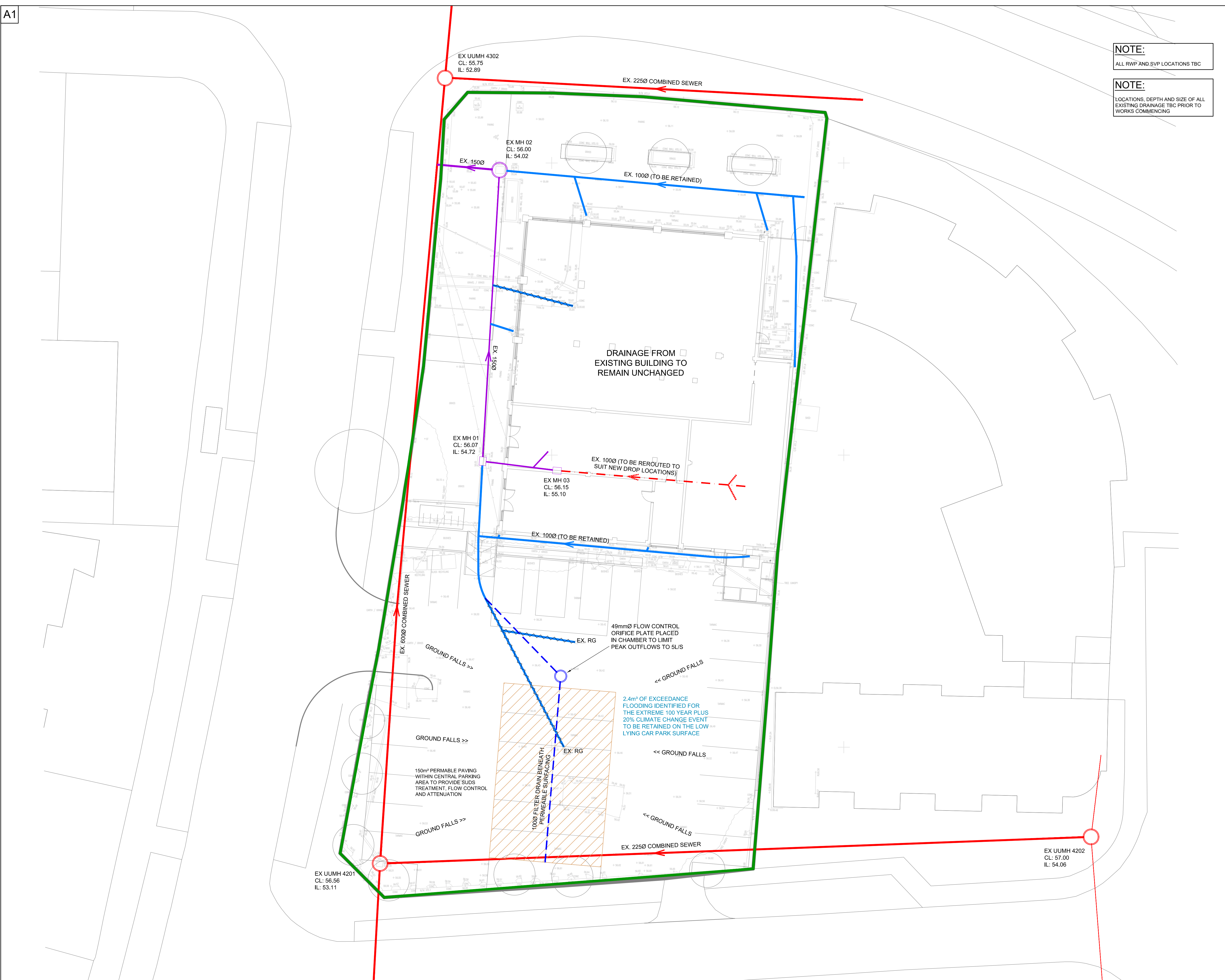
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Appendix B – Marston & Grundy Drawings



NOTE:

ALL RWP AND SVP LOCATIONS TBC

NOTE:

LOCATIONS, DEPTH AND SIZE OF ALL EXISTING DRAINAGE TBC PRIOR TO WORKS COMMENCING

NOTES

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KEY

- EXISTING COMBINED WATER PUBLIC SEWER
- EXISTING COMBINED WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE
- EXISTING SURFACE WATER DRAINAGE
- EXISTING DRAINAGE TO BE ABANDONED
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERMEABLE SURFACING
- SITE BOUNDARY

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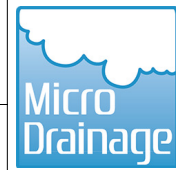
Project
**PROPOSED CONVEINIENCE STORE
GREENBROW ROAD, NEWALL GREEN**

Drawing
DRAINAGE STRATEGY PLAN

Purpose of Issue FOR INFORMATION				Status
Scale @ A1 1:150	Date 16.06.22	Drawn PG	Checked DG	Revision
Project No. 12860	Drawing No. 100	Revision P1		

Appendix C – Hydraulic Calculations

Greenbrow Road
30yr Attenuation
Within Permeable Surfacing



Date 16/06/2022
File Greenbrow Car Park 30yr...

Designed by paulg
Checked by

Innovyze

Source Control 2017.1.2

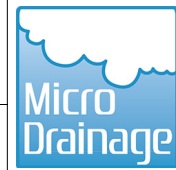
Summary of Results for 30 year Return Period

Half Drain Time : 20 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
	15 min Summer	55.675	0.125	0.0	4.0	4.0	5.3	O K
	30 min Summer	55.718	0.168	0.0	4.2	4.2	7.2	Flood Risk
	60 min Summer	55.722	0.172	0.0	4.2	4.2	7.4	Flood Risk
	120 min Summer	55.696	0.146	0.0	4.1	4.1	6.2	O K
	180 min Summer	55.666	0.116	0.0	4.0	4.0	4.9	O K
	240 min Summer	55.638	0.088	0.0	3.9	3.9	3.6	O K
	360 min Summer	55.593	0.043	0.0	3.8	3.8	1.6	O K
	480 min Summer	55.566	0.016	0.0	3.7	3.7	0.4	O K
	600 min Summer	55.550	0.000	0.0	3.6	3.6	0.0	O K
	720 min Summer	55.550	0.000	0.0	3.1	3.1	0.0	O K
	960 min Summer	55.550	0.000	0.0	2.5	2.5	0.0	O K
	1440 min Summer	55.550	0.000	0.0	1.9	1.9	0.0	O K
	2160 min Summer	55.550	0.000	0.0	1.4	1.4	0.0	O K
	2880 min Summer	55.550	0.000	0.0	1.1	1.1	0.0	O K
	4320 min Summer	55.550	0.000	0.0	0.8	0.8	0.0	O K
	5760 min Summer	55.550	0.000	0.0	0.6	0.6	0.0	O K
	7200 min Summer	55.550	0.000	0.0	0.5	0.5	0.0	O K
	8640 min Summer	55.550	0.000	0.0	0.5	0.5	0.0	O K
10080	min Summer	55.550	0.000	0.0	0.4	0.4	0.0	O K
	15 min Winter	55.700	0.150	0.0	4.1	4.1	6.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	67.599	0.0	10.7	28
30 min Summer	44.180	0.0	14.1	37
60 min Summer	27.653	0.0	17.7	54
120 min Summer	16.831	0.0	21.8	86
180 min Summer	12.468	0.0	24.6	118
240 min Summer	10.038	0.0	26.2	148
360 min Summer	7.355	0.0	28.9	206
480 min Summer	5.889	0.0	30.9	262
600 min Summer	4.957	0.0	32.5	0
720 min Summer	4.305	0.0	33.9	0
960 min Summer	3.444	0.0	36.1	0
1440 min Summer	2.512	0.0	39.5	0
2160 min Summer	1.829	0.0	43.0	0
2880 min Summer	1.460	0.0	45.7	0
4320 min Summer	1.062	0.0	49.5	0
5760 min Summer	0.846	0.0	52.3	0
7200 min Summer	0.710	0.0	54.5	0
8640 min Summer	0.614	0.0	56.2	0
10080 min Summer	0.544	0.0	57.7	0
15 min Winter	67.599	0.0	12.1	28

Greenbrow Road
30yr Attenuation
Within Permeable Surfacing



Date 16/06/2022
File Greenbrow Car Park 30yr...

Designed by paulg
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Source Control 2017.1.2

Summary of Results for 30 year Return Period

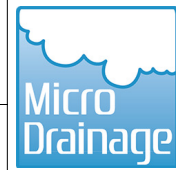
Storm Event			Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	
30 min	Winter		55.749	0.199	0.0	4.3	4.3	8.6	Flood	Risk
60 min	Winter		55.752	0.202	0.0	4.3	4.3	8.8	Flood	Risk
120 min	Winter		55.707	0.157	0.0	4.1	4.1	6.7	Flood	Risk
180 min	Winter		55.659	0.109	0.0	4.0	4.0	4.6		O K
240 min	Winter		55.617	0.067	0.0	3.9	3.9	2.7		O K
360 min	Winter		55.561	0.011	0.0	3.7	3.7	0.2		O K
480 min	Winter		55.550	0.000	0.0	3.1	3.1	0.0		O K
600 min	Winter		55.550	0.000	0.0	2.6	2.6	0.0		O K
720 min	Winter		55.550	0.000	0.0	2.3	2.3	0.0		O K
960 min	Winter		55.550	0.000	0.0	1.8	1.8	0.0		O K
1440 min	Winter		55.550	0.000	0.0	1.3	1.3	0.0		O K
2160 min	Winter		55.550	0.000	0.0	1.0	1.0	0.0		O K
2880 min	Winter		55.550	0.000	0.0	0.8	0.8	0.0		O K
4320 min	Winter		55.550	0.000	0.0	0.6	0.6	0.0		O K
5760 min	Winter		55.550	0.000	0.0	0.5	0.5	0.0		O K
7200 min	Winter		55.550	0.000	0.0	0.4	0.4	0.0		O K
8640 min	Winter		55.550	0.000	0.0	0.3	0.3	0.0		O K
10080 min	Winter		55.550	0.000	0.0	0.3	0.3	0.0		O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	44.180	0.0	15.9	37
60 min Winter	27.653	0.0	20.2	56
120 min Winter	16.831	0.0	24.7	90
180 min Winter	12.468	0.0	27.4	124
240 min Winter	10.038	0.0	29.6	154
360 min Winter	7.355	0.0	32.5	202
480 min Winter	5.889	0.0	34.7	0
600 min Winter	4.957	0.0	36.5	0
720 min Winter	4.305	0.0	38.1	0
960 min Winter	3.444	0.0	40.6	0
1440 min Winter	2.512	0.0	44.4	0
2160 min Winter	1.829	0.0	48.4	0
2880 min Winter	1.460	0.0	51.3	0
4320 min Winter	1.062	0.0	55.7	0
5760 min Winter	0.846	0.0	58.9	0
7200 min Winter	0.710	0.0	61.4	0
8640 min Winter	0.614	0.0	63.4	0
10080 min Winter	0.544	0.0	65.2	0

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Greenbrow Road
100yr + 20% Attenuation
Within Permeable Surfacing



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File Greenbrow Car Park 100y...
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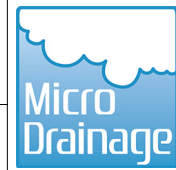
Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 36 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
	15 min Summer	55.796	0.246	0.0	4.4	4.4	10.8	Flood Risk
	30 min Summer	55.877	0.327	0.0	4.6	4.6	14.4	Flood Risk
	60 min Summer	55.902	0.352	0.0	4.7	4.7	15.5	Flood Risk
	120 min Summer	55.876	0.326	0.0	4.6	4.6	14.3	Flood Risk
	180 min Summer	55.841	0.291	0.0	4.5	4.5	12.8	Flood Risk
	240 min Summer	55.804	0.254	0.0	4.4	4.4	11.1	Flood Risk
	360 min Summer	55.734	0.184	0.0	4.2	4.2	8.0	Flood Risk
	480 min Summer	55.677	0.127	0.0	4.0	4.0	5.4	O K
	600 min Summer	55.633	0.083	0.0	3.9	3.9	3.4	O K
	720 min Summer	55.600	0.050	0.0	3.8	3.8	1.9	O K
	960 min Summer	55.561	0.011	0.0	3.7	3.7	0.2	O K
	1440 min Summer	55.550	0.000	0.0	2.8	2.8	0.0	O K
	2160 min Summer	55.550	0.000	0.0	2.0	2.0	0.0	O K
	2880 min Summer	55.550	0.000	0.0	1.6	1.6	0.0	O K
	4320 min Summer	55.550	0.000	0.0	1.2	1.2	0.0	O K
	5760 min Summer	55.550	0.000	0.0	0.9	0.9	0.0	O K
	7200 min Summer	55.550	0.000	0.0	0.8	0.8	0.0	O K
	8640 min Summer	55.550	0.000	0.0	0.7	0.7	0.0	O K
10080	min Summer	55.550	0.000	0.0	0.6	0.6	0.0	O K
	15 min Winter	55.837	0.287	0.0	4.5	4.5	12.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	104.840	0.0	16.8	29
30 min Summer	69.156	0.0	22.7	38
60 min Summer	43.553	0.0	28.6	58
120 min Summer	26.567	0.0	34.9	90
180 min Summer	19.658	0.0	38.8	124
240 min Summer	15.794	0.0	41.9	156
360 min Summer	11.510	0.0	45.8	220
480 min Summer	9.176	0.0	48.5	280
600 min Summer	7.701	0.0	51.1	338
720 min Summer	6.670	0.0	53.1	394
960 min Summer	5.313	0.0	56.3	502
1440 min Summer	3.850	0.0	61.2	0
2160 min Summer	2.785	0.0	66.2	0
2880 min Summer	2.211	0.0	70.0	0
4320 min Summer	1.595	0.0	75.4	0
5760 min Summer	1.264	0.0	79.3	0
7200 min Summer	1.054	0.0	82.4	0
8640 min Summer	0.909	0.0	84.9	0
10080 min Summer	0.802	0.0	87.0	0
15 min Winter	104.840	0.0	19.1	29

Greenbrow Road
100yr + 20% Attenuation
Within Permeable Surfacing



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Date 16/06/2022
File Greenbrow Car Park 100y...
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Summary of Results for 100 year Return Period (+20%)

	Storm Event	Max	Max	Max	Max	Max	Max	Status
		Level (m)	Depth (m)	Infiltration (l/s)	Control (l/s)	Σ Outflow (l/s)	Volume (m³)	
	30 min Winter	56.001	0.451	0.0	5.0	5.0	16.7	FLOOD
	60 min Winter	56.002	0.452	0.0	5.0	5.0	18.2	FLOOD
	120 min Winter	56.000	0.450	0.0	5.0	5.0	16.3	FLOOD
	180 min Winter	55.866	0.316	0.0	4.6	4.6	13.9	Flood Risk
	240 min Winter	55.808	0.258	0.0	4.4	4.4	11.3	Flood Risk
	360 min Winter	55.706	0.156	0.0	4.1	4.1	6.7	Flood Risk
	480 min Winter	55.628	0.078	0.0	3.9	3.9	3.2	O K
	600 min Winter	55.576	0.026	0.0	3.7	3.7	0.8	O K
	720 min Winter	55.550	0.000	0.0	3.5	3.5	0.0	O K
	960 min Winter	55.550	0.000	0.0	2.8	2.8	0.0	O K
	1440 min Winter	55.550	0.000	0.0	2.0	2.0	0.0	O K
	2160 min Winter	55.550	0.000	0.0	1.5	1.5	0.0	O K
	2880 min Winter	55.550	0.000	0.0	1.2	1.2	0.0	O K
	4320 min Winter	55.550	0.000	0.0	0.9	0.9	0.0	O K
	5760 min Winter	55.550	0.000	0.0	0.7	0.7	0.0	O K
	7200 min Winter	55.550	0.000	0.0	0.6	0.6	0.0	O K
	8640 min Winter	55.550	0.000	0.0	0.5	0.5	0.0	O K
	10080 min Winter	55.550	0.000	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	69.156	0.9	25.4	39
60 min Winter	43.553	2.4	32.2	60
120 min Winter	26.567	0.6	39.6	96
180 min Winter	19.658	0.0	43.9	132
240 min Winter	15.794	0.0	47.1	166
360 min Winter	11.510	0.0	51.5	230
480 min Winter	9.176	0.0	54.6	288
600 min Winter	7.701	0.0	57.2	338
720 min Winter	6.670	0.0	59.5	0
960 min Winter	5.313	0.0	63.2	0
1440 min Winter	3.850	0.0	68.6	0
2160 min Winter	2.785	0.0	74.4	0
2880 min Winter	2.211	0.0	78.6	0
4320 min Winter	1.595	0.0	84.7	0
5760 min Winter	1.264	0.0	89.2	0
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Appendix D – CCTV Survey





Legend/Notes:

- Combined Sewer
- Foul Sewer
- SW Sewer
- Assumed Sewer (Not Proven)
- Rising Main
- Highway Drainage
- Culvert Sewer
- Open Water Course
- Overflow Line
- Treated Line
- Rain Water Down Pipe
- Foul Down Pipe
- Combined Down Pipe
- Grey Water Down Pipe
- Highway Gully
- Septic Tanks
- Direction of overland flows
- Spot levels
- Air Valve
- Hatchbox
- Capped End
- Penstock

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Client

Marston & Grundy LLP

Drawing Title

Greenbrown Road,
Wythenshawe
Drainage Layout

Scale(s)

N.T.S

Drawn

PW

Date

09.06.22

Checked

RD

Job Number

1952

Approved

KN

Sheet Size, Drawing Number & Revision

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