



Virgil Street, Trafford

Outline Drainage Strategy

Project No: 2202-01
February 2023
VST-REN-00-ZZ-RP-C-00002
Rev: 00

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1.0 INTRODUCTION

1.1 Purpose of this report

This Outline Surface Water Drainage Strategy has been prepared to support the planning application for the proposed Virgil Street development.

The assessment includes: a summary of the site, an estimate of the existing and proposed surface water discharge rates, infiltration assessment, SUDs assessment, and outline drainage proposals and performance criteria.

This report should be read in conjunctions with the Flood Risk Assessment, renaissance, February 2023 and the completed North-West SuDS Pro-Forma.

The proposals within this report are intended to demonstrate the feasibility of the overarching drainage strategy to support the planning proposal.

2.0 THE SITE

2.1 Site Location

The proposed development site is located on Virgil Street, Old Trafford, Stretford.

When considered cumulatively, the site is bound to the west by Oldfield Road; the east by Islington Way; north partially by James Street; and south partially by a railway line.

The site location is described below:

- Post Code M15 4ED
- OS X (Easting) 382544
- OS Y (Northing) 396815
- Nat. Grid SJ 825968
- What3Words upper.traps.gloves

The site location is illustrated in Figure 2.1 below.



Figure 2.1: Site Location

2.2 Site Description

The development site is circa 0.166 hectares and comprises several areas of land as indicated in the site location plan above. The site comprises parking to the northern end, a warehouse towards the southern end with vegetation to the most southerly tip. The site can only be accessed off Virgil Street. Refer to topographical survey contained within Appendix A for details.

The structure of the two storey warehouse building appears to be masonry clad with the brick bond suggesting a cavity wall construction and accented piers suggesting a framed structure

A culverted watercourse, (the river Cornbrook), is known to pass along the northern side of the site and passes under the existing warehouse on site. The culvert has been surveyed and a summary of the survey information is contained in Appendix B.

Car parking areas are largely formed of asphalt/tarmacadam/ concrete hard standing. The access road is formed of asphalt/tarmacadam.

2.3 Existing Site Drainage

The majority of the existing site areas are impermeable with associated existing drainage. The adjacent culverted watercourse has been surveyed to establish its line and levels and inform the proposals for the site. A summary of the survey is enclosed in Appendix B. Based on United Utilities' sewer records drawing (Appendix C) and Topographical, survey (Appendix A) the existing on site foul and surface water drainage from the site is thought to discharge to the United Utilities (UU) sewers within Virgil Street. The location, condition and connectivity of the existing site drainage is to be confirmed with a CCTV survey.

2.4 Geology

BGS mapping does not display any made ground deposits on site, however given the presence of made ground in the surrounding area and the site's historical mapping and development that has taken place, made ground deposits are likely to be present.

The site is indicated to be underlain by Glaciofluvial Sheet Deposits. This stratum typically comprises sand and gravel.

The deeper solid geology is indicated to be part of the Chester Formation which typically comprises sandstone.

One normal fault is shown to lie 188m to the south-west of the site. However, any movement anticipated from this fault will now have ceased. No risk to the site has been identified from Non-Coal Mining activities.

2.5 Hydrology

A summary of the pertinent hydrological aspects within the Geo-Environmental Data Report are provided below:

- Nearest Watercourse: Onsite - Cornbrook, underground inland river flowing south-east to north-west.
- Nearest Surface Water Abstraction: No active surface water abstractions within 1500m.
- Closest Active Licenced Discharge Consent: None within 500m.

Information obtained from the Environment Agency (EA) Risk of Flooding from Rivers and the Sea (RoFRaS) database indicates that a very low risk of flooding exists at the site from Rivers and the Sea.

The same source indicates there is a potential for surface water flooding at the subject site, with a low risk rating, (greater than 1 in 1000 but less than 1 in 100 chance of flooding in any given year).

The site is also indicated by the same source to be a risk of flooding from reservoirs.

The site is not indicated to lie within an EA designated Zone 2 or 3 flood plain.

Refer to renaissance flood risk assessment (ref VST-REN-00-ZZ-RP-C-00001) date February 2023 for details.

2.6 Proposed Development

The proposed new build aspect of the development is for 4No residential townhouses with associated private gardens to the rear and a sperate parking area to service the retained building. A turning head is being provided on site adjacent to the new townhouses. The detail and extent of the wider site can be seen within the Nick Moss Architects Feasibility Report, provided to renaissance by the architect. Refer to Appendix D for further details.

3.0 EXISTING & PROPOSED SURFACE WATER DISCHARGE RATES

3.1 Pre-Development Surface Water Run-Off Rates

The total site area, including the existing building is considered 61% impermeable consisting of the existing building and concrete hardstanding. The remaining 39% is considered permeable.

The existing building and associated drainage network within the site are being maintained and as a result, the area of the building footprint has not been included in the discharge calculations. This results in two separate zones of land with a total impermeable area of 0.058 Ha.

Refer to topographical survey in Appendix A and Existing Impermeable Areas drawing VST-REN-XX-XX-DR-C-00050 in Appendix E.

3.2 Existing Brownfield Run-Off Rates

To estimate the pre-development surface water discharge into the public sewer a two-pipe model has been modelled in industry approved Micro Drainage Software (Appendix F). The model uses a variable rainfall intensity for the different storm events and is based on a 60-minute storm duration. A summary of the results are presented in the Tables 3.1.1:

Return Period	Q _{GREENFIELD} (l/s)		
	Zone A	Zone B	Total
1 in 1 year	1.0	0.1	1.1
1 in 2 year	1.3	0.2	1.5
1 in 30 year	2.3	0.3	2.6
1 in 100 year	3.0	0.4	3.4

Table 3.1 –Brownfield Run-off Rates

3.3 Existing Greenfield Run-Off Rates

The greenfield run-off for the total site area has been considered, this has been calculated using Microdrainage ICP SUDS method (Appendix G). The rates presented below are what would be typical of a site with an equivalent surface area which remains undeveloped / covered in grass or vegetation. A partly urbanised catchment ratio of 0.75, Q_{BAR} has a return period of 2.3 years.

The equivalent greenfield run-off rate is tabled below: -

Return Period	Q _{BROWNFIELD} (l/s)		
	Zone A	Zone B	Total
1 in 1 year	0.6	0.1	0.7
1 in 2 year	0.7	0.1	0.8
1 in 30 year	1.0	0.1	1.1
1 in 100 year	1.1	0.2	1.3
Q _{BAR}	0.7	0.1	0.8

Table 3.2 – Greenfield Run-off Rates

3.4 Proposed Surface Water Discharge Rates

As set out within the Strategic Flood Risk Assessment (SFRA) developments which have been previously developed (brownfield) should aim for a minimum reduction in surface water runoff rates of 50%, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, considering climate change.

The North West SuDS Pro-Forma requires that discharge from the development is to be restricted to Q_{BAR} to control the flow and volume of runoff from the site.

Based on the small site area and existing building on the site, it is not practical to discharge via one outfall. Instead it is proposed to s to drain each of the zones mentioned above separately

Considering the above, the discharge rate for the development will be restricted to as close to Q_{BAR} as reasonably possible. It is therefore proposed that the maximum discharge will be limited to **2 l/s** for each of the outfalls (4 l/s total) to prevent the risk of blockage.

3.5 Attenuation Requirements

The proposed development results in circa 884.4m² of building footprint, external hard landscaping and car parking. Refer to Appendix H for the proposed impermeable areas.

Due to the nature of the development urban creep has not been considered as it is unlikely that the percentage of impermeable area will increase during the lifetime of the development.

The post development discharge rates will include for an increase in the rainfall intensity of 45% for the 1% annual exceedance probability (AEP), to allow for climate change as is consistence with a design life of the development of 100 years, as outlined by the National Planning Practice Framework (NPPF).

Quick storage estimates for the above return periods, using Micro Drainage, indicate that the approximate attenuation volumes shown in table 3.4 are required to limit the peak surface water discharge for each of the zones of land to 2 l/s. The micro drainage calculations can be seen in Appendix I.

Return Period	Storage Volume (m ³)		
	Zone A	Zone B	Total
1 in 100 year + 45% Climate Change	20	8	28

Table 3.4 – Surface Water Attenuation Estimates

4.0 SURFACE WATER DISCHARGE & SUDS ASSESSMENT

4.1 Surface Water Discharge Assessment

In accordance with NPPF, the following hierarchy of surface water drainage options has been considered:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;

BGS mapping indicates there to be a high chance of made ground deposits on site which could potentially pose risks to the mobilisation of contaminants should infiltration be utilised. Based on this, large scale infiltration is unlikely to be feasible, however, the possibility and extent of small scale infiltration will be reviewed upon receipt of the phase 2 site investigation report.

Opportunities for discharge to watercourse have been considered. The closest watercourse is the Cornbrook culverted watercourse which flows beneath the site from south-east to north-west.

It is therefore proposed that surface water will be collected by a dedicated gravity system designed in accordance with BS EN 752 before discharging to the Cornbrook Culvert.

4.2 Sustainable Urban Drainage

Table 4.1 below provides a summary of typical SUDs techniques outlined within CIRIA guide 753 SUDs manual. Based on a review of the suitability of the SUDs techniques it is proposed that the Virgil Street development may incorporate the following:

SUDS TECHNIQUE	DESCRIPTION	SUITABILITY FOR DEVELOPMENT SITE
Rainwater Harvesting	Collection of rainwater run-off for use	Large impermeable area and limited usage deems this unsuitable ✕
Soft Landscaping	Grassed areas that allow direct infiltration of rainwater	Soft landscaping will be utilised to limit the impermeable area ✓
Filter Drains	Granular filled Linear drains / soakaway with either granular fill and perforated pipe, or dense vegetation that treat runoff from adjacent impermeable areas	Not suitable due to known ground conditions ✕
Swales	Shallow landscape channel that can infiltrate or convey runoff.	Existing trees and limited soft landscaping deem this unsuitable ✕
Infiltration Basins	Depressions in the ground designed to store and infiltration runoff to the ground. Can be landscaped to provide amenity value.	Not suitable due to known ground conditions and limited space ✕
Wet Ponds	Basins with permanent pool of water providing water quality treatment, wildlife, and amenity benefit. Designed to provide temporary storage for additional runoff.	Not suitable due to limited space and poses a health and safety risk to the end users. ✕
Extended Detention Basins	Dry basins that are designed to temporarily store runoff providing water quality treatment.	Not suitable due to limited space and poses a health and safety risk to the end users. ✕
Constructed Wetland	Ponds and shallow wetland areas with vegetation to improve pollution removal and enhance wildlife habitat.	Not suitable due to limited space and poses a health and safety risk to the end users. ✕
Porous Paving	Granular build-up beneath permeable paving systems that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	Not suitable due to limited space on site ✕
Trees Pits	Managed permeable paving systems around tree pits that can be used to either store runoff (lined system) and	Not suitable due to limited space on site ✕

		increase time of concentration or allow percolation into the ground.		
Soakaways		Infiltration device to temporarily store runoff and allow it to percolate into the ground.	Not suitable due to proximity to existing buildings	✗
Green Roof		Vegetated roof area that reduces runoff and increases time of concentration.	Not suitable due to sloped roofs	✗
Blue Roof		Roof area designed to store and reduce peak runoff rates during intense storms.	Not suitable due to limited feasible roof area	✗
Underground Storage		Attenuation structures installed below ground to provide runoff storage.	Suitable beneath the outdoor all-weather sports pitches and beneath external areas.	✓

✗ Not suitable

? Potentially suitable subject to further investigation

✓ Suitable

Table 4.1 – SUDs Techniques & Suitability for Development Site

4.3 Water Quality Assessment

The drainage from the site is from the roof to the main youth zone building and sports hall, external all-weather sports pitches, car park, access road and external hard landscaping. Water quality is generally affected by frequent rainfall events, 1 in 1 year events or less, which is circa 5mm/hr for the proposed development site. To assess the water quality consideration will be given to the guidance with the National Standard for Sustainable Urban Drainage (NSSUD) and CIRIA Guide C753. The pollution hazard levels for difference land uses are presented in table 4.2 and are based on the definitions in the NSSUD and C753.

POLLUTION HAZARD LEVEL	LAND USE
Very Low	Residential roofs
Low	Individual property driveways, non-residential roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (e.g. Schools, offices)
Medium	Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospital, retail), minor roads
High	Site with heavy pollution (e.g. Haulage yards, lorry parks, waste sites, sites with chemical and fuels are delivered, handled, stored etc.)

Table 4.2 – Pollution Hazard Levels

The pollution hazard level is considered to be very low based on Table 4.2 with the primary consideration given to removal of gross solids and sediment.

The following tables indicate the minimum number of treatment stages required before surface runoff should reach the infiltration or receiving water body and are extracted from the NSSUD.

POLLUTION HAZARD LEVEL	LAND USE	LOW	MEDIUM	HIGH
G1	Source Protection Zone 1, within 50m of a well, spring or borehole that supplies potable water.	1	3	Consult the EA
G2	Into or immediately adjacent to a sensitive receptor that could be influenced by infiltrated water. Includes designated nature conservation, heritage, and landscape sites – including Biodiversity Action Plan (BAP) habitats and Protected Species.	1	3	
G3	Source Protection Zone II and III or Principal Aquifer	1	3	
G4	Secondary Aquifer	1	2	
G5	Unproductive strata	1	2	

Table 4.3 – Groundwater Minimum Treatment Stages

POLLUTION HAZARD LEVEL	NORMAL SURFACE WATER	SENSITIVE SURFACE WATER
Low	0	1
Medium	2	3
High	Consult the EA	

Table 4.4 – Surface Water Body Minimum Treatment Stages

Infiltration is not viable due to the ground conditions however discharge into the principal and secondary aquifers would require 1 level of treatment for a low pollution level.

Discharge of surface water to the receiving public surface water sewer requires no treatment stages due to the low pollution hazard level. However, the adoption of SuDS, sumps and good practice will provide inherent treatment.

External areas will pass through silt traps/sumps prior to entering the attenuation tank and flow control device. The silt traps and sumps will allow most of the sediment and solids to settle out under low flows, prior to discharging to the public sewer. The run off from the car park will drain through a permeable paving system which will provide treatment at source by trapping pollutants within the sub-base allowing them to biodegrade over time.

4.4 SuDS Management Plan

The Sustainable Urban Drainage systems are to be maintained by the property owner and/or a maintenance company on their behalf. They will be required to maintain the SuDS features in line with the following recommendations and suppliers' requirements of the various features.

The following operation and maintenance requirements for the SUDs features incorporated into the development are to be adopted by the Building Management Company. These requirements are general and have been extracted from the CIRA Guide C753.

Table 21.3 - Operation and maintenance requirement for Attenuation storage tanks

The Contractor delivering the development is to update the general requirements to reflect the product specific requirements of the as installed proprietary SuDS and incorporate these into the Operation & Maintenance manual for the development.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually	
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly	
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually	
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required	
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required	
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually	
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required	

5.0 OUTLINE DRAINAGE STRATEGY

Refer to Appendix J for the Below Ground Drainage General Arrangement drawing.

5.1 Surface Water System

The development will have two dedicated surface water networks that will collect the rainwater from the proposed building roofs, and impermeable external areas on the site. The systems will then discharge under gravity to the Cornbrook Culvert located beneath the site, subject to approval by the Lead Local Flood Authority.

The surface water discharge from the site is to be limited to the rate detailed within Section 3.3 of this report using a flow control device within the final manholes on site prior to discharge at each of the proposed discharge points. Proposed discharge rates are to be confirmed with the Lead Local Flood Authority.

Attenuation will be provided by geocellular storage tanks in each of the networks.

The surface water discharging from the site will be from the proposed buildings and external hard landscaping and no water treatment is required to ensure water quality to the public sewer however the adoption of sumps within channels and catchpit manholes will provide inherent treatment.

The surface water drainage network is to be designed in accordance with Building Regulation Part H, BS EN 752 and Code for Adoption. In addition, the following requirements will also be adopted in accordance with the Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance and Salford City Council SuDS requirements for new developments:

- The below ground drainage system will be designed to ensure flooding does not occur on site for the 1 in 30 year and no internal flooding for the 1 in 100-year rainfall events
- The surface water system is to be designed to accommodate the 1, 2, 30 and 100 year return events and a 45% climate change allowances for the 100 year event. The system will be designed for a maximum storm duration of 6 hours.

Micro Drainage calculations for the proposed surface water system are available in Appendix J.

5.2 Foul Water System

The site will have a dedicated foul water network that will collect the foul water associated with the development that will discharge to the United Utilities 375-diameter combined sewer within Virgil Street. A drainage survey will be required to confirm whether any of the existing connections on the site can be reused.

A pre-development enquiry has been submitted to United Utilities to gain initial feedback.

The connection will be subject to a section 106 application with United Utilities.

The drainage system is to be designed in accordance with Building Regulations Part H, BS EN 752 and Codes for Adoption.

5.3 Phasing & Surface Water Management During Construction

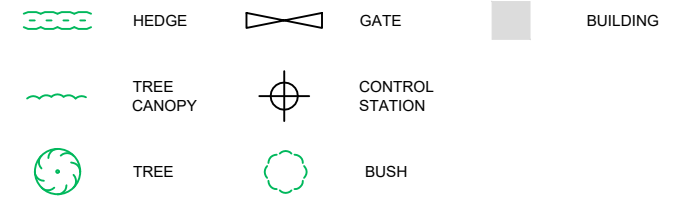
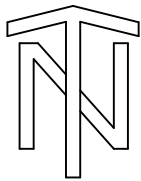
It is assumed that, given the scale of the development, it will be delivered in a single phase.

The management of surface water management during construction will be addressed by the Main Contractor as part of their 'Construction Management Plan'.

A brief overview of the key consideration relating to surface water management and flood risk that will need to be incorporated into the Main Contractors construction methodology include:

- Subject to the level of contamination beneath the site, level of site remediation, and quality of working platform compaction to reduce infiltration, consideration should be given to the risk of residual contamination on site affecting groundwaters and the adjacent watercourse.
- The risk of spillage of diesel and other contamination risk during construction activities are to be assessed and measures implemented to ensure they do not cause a risk to groundwaters and the adjacent watercourse

APPENDIX A
Existing Topographical Survey



Heights Obscured Due To Trees

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APPENDIX B
Culvert Survey Summary

APPENDIX C
United Utilities Sewer Records

APPENDIX D Proposed Development Layouts



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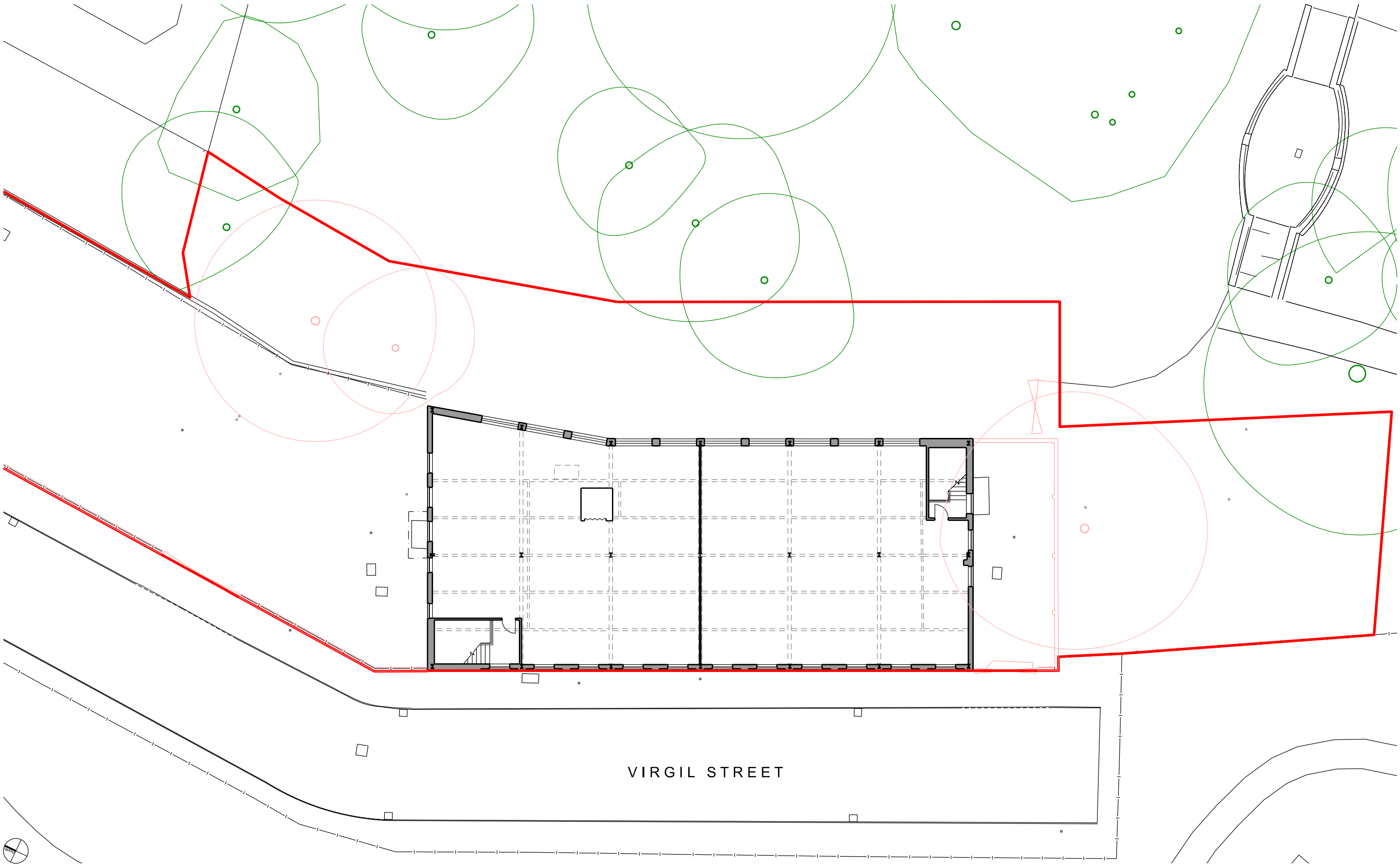
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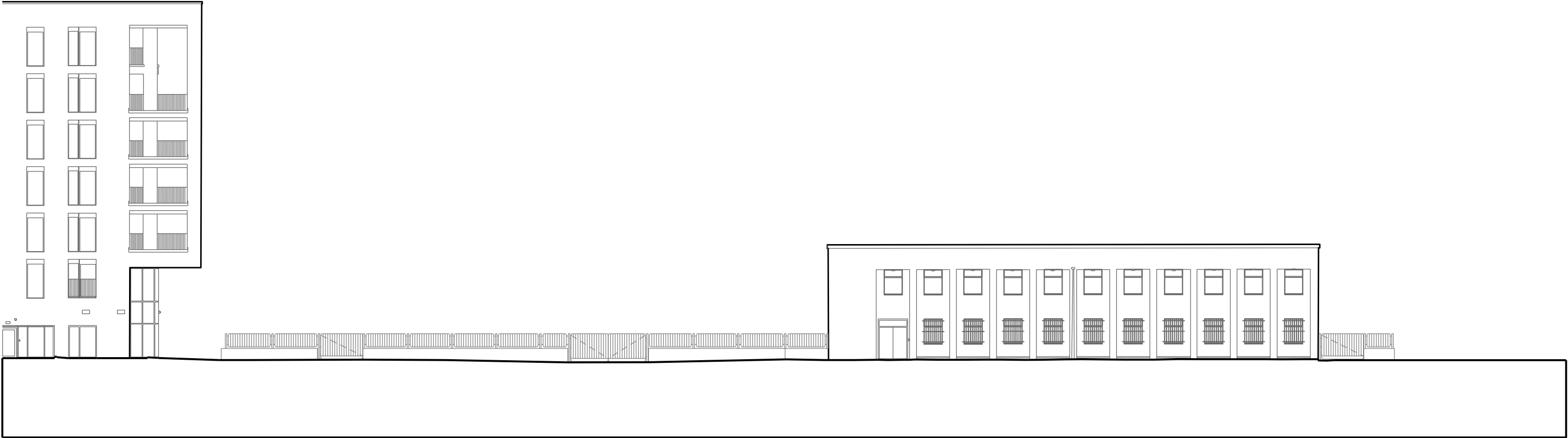
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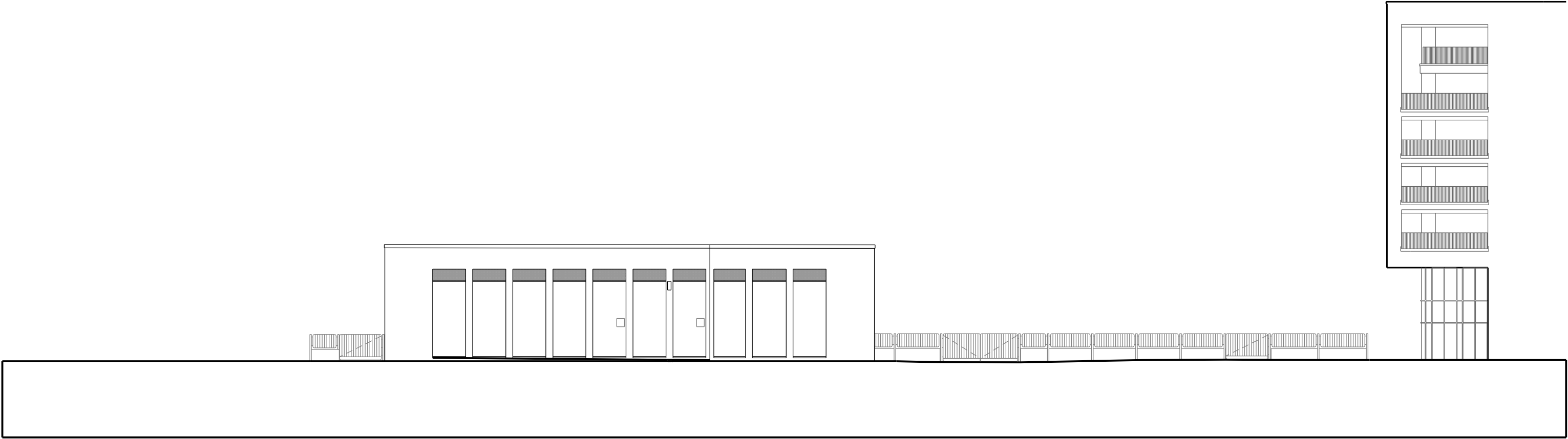
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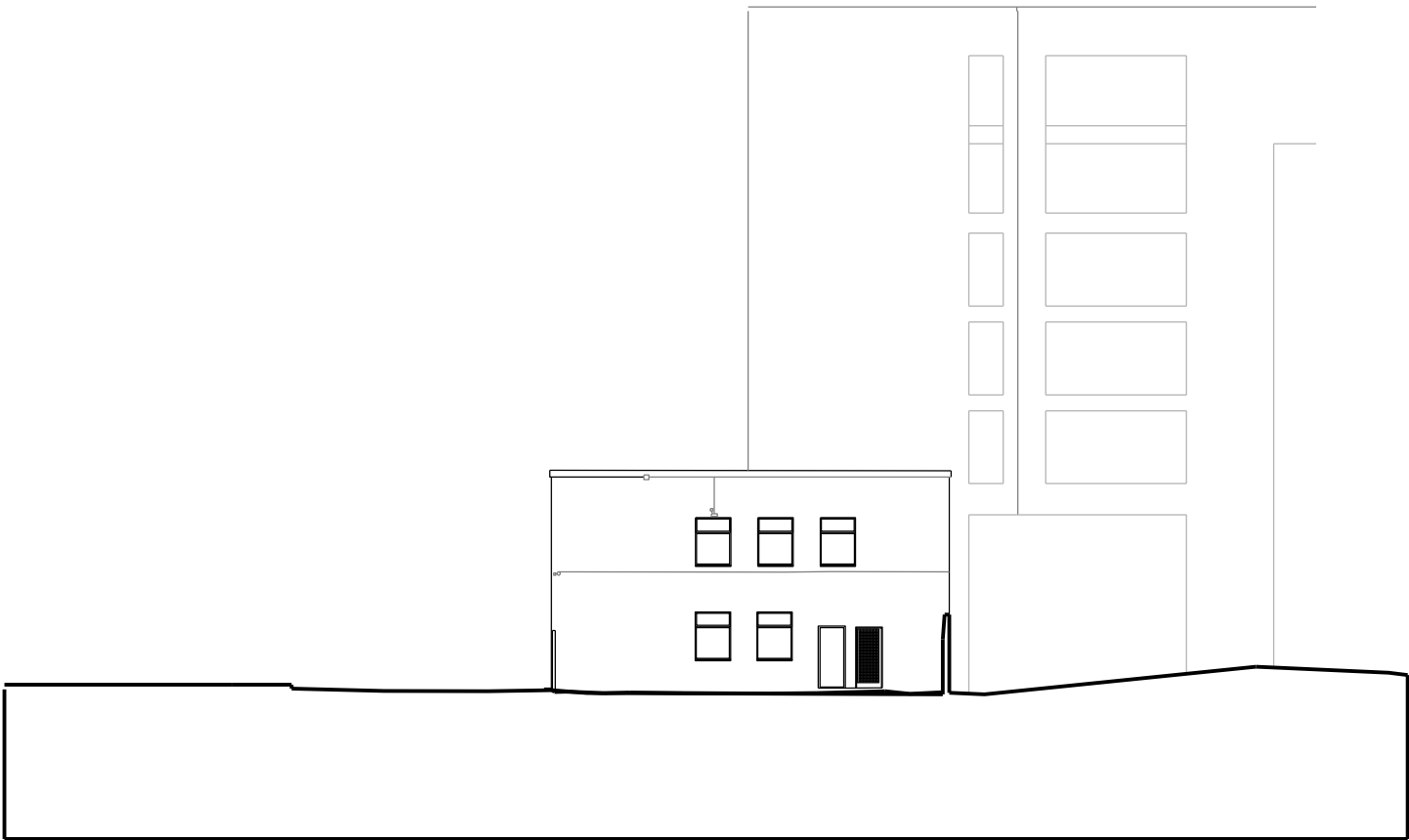
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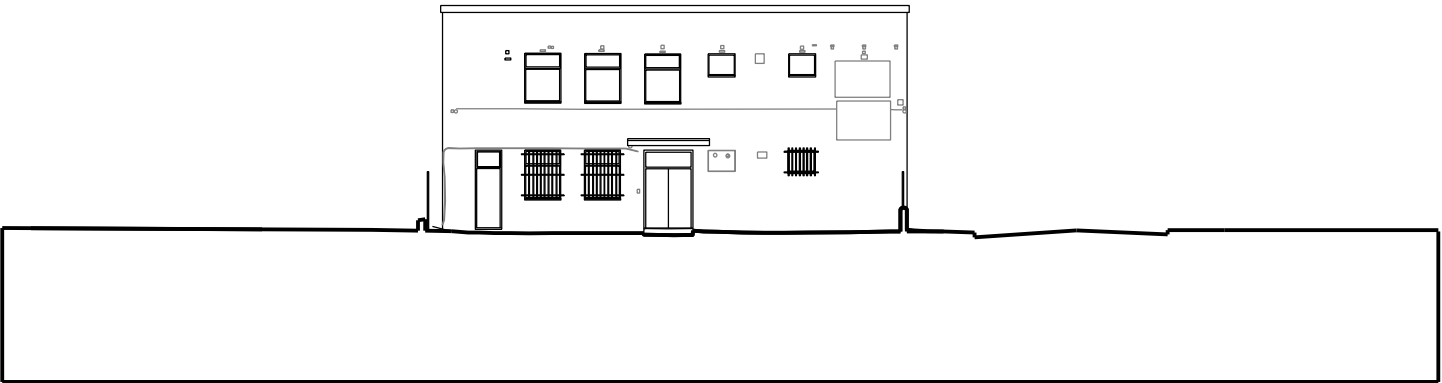
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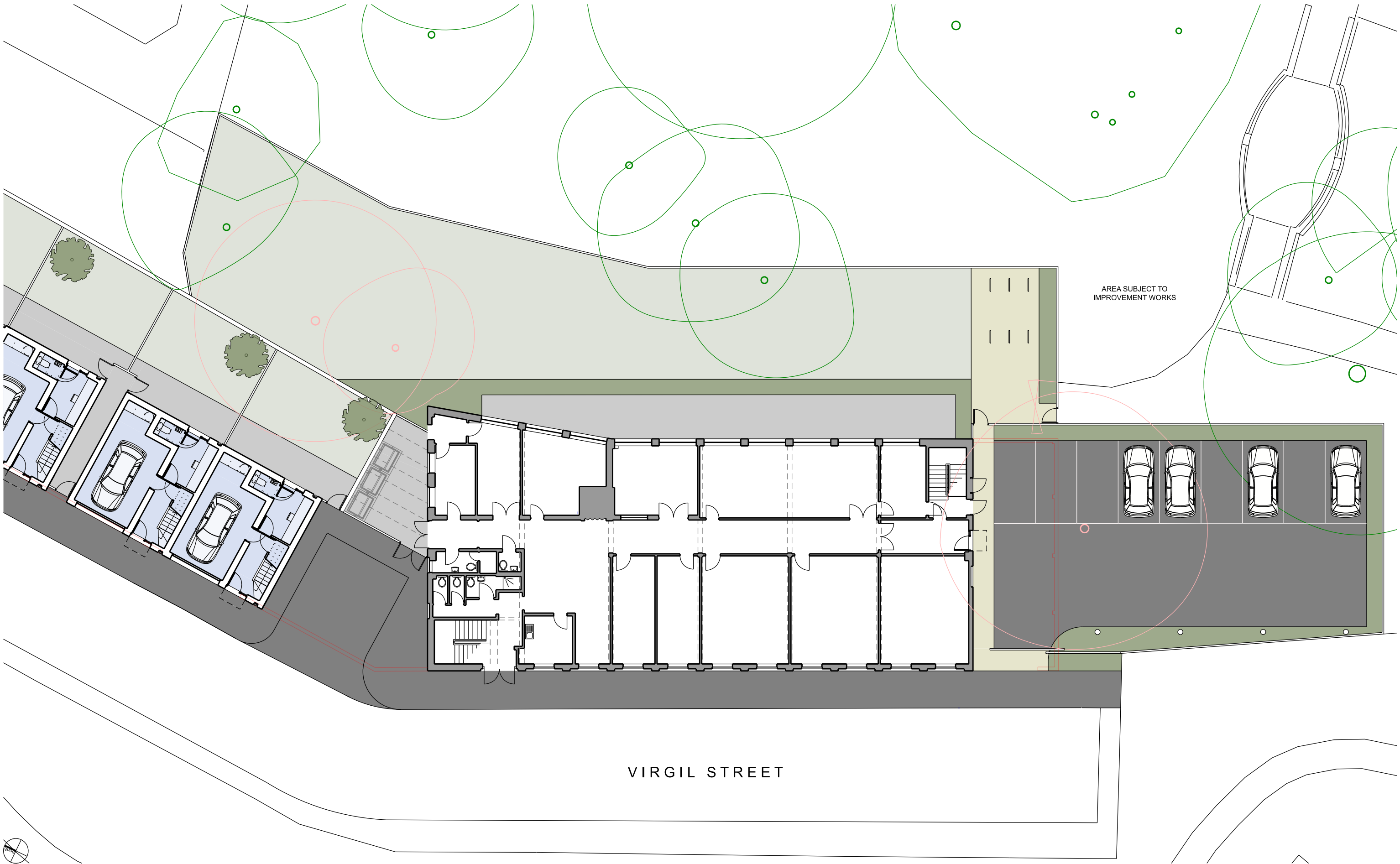
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INFORMATION
drawing number:
AL(05)105 D5
issue:



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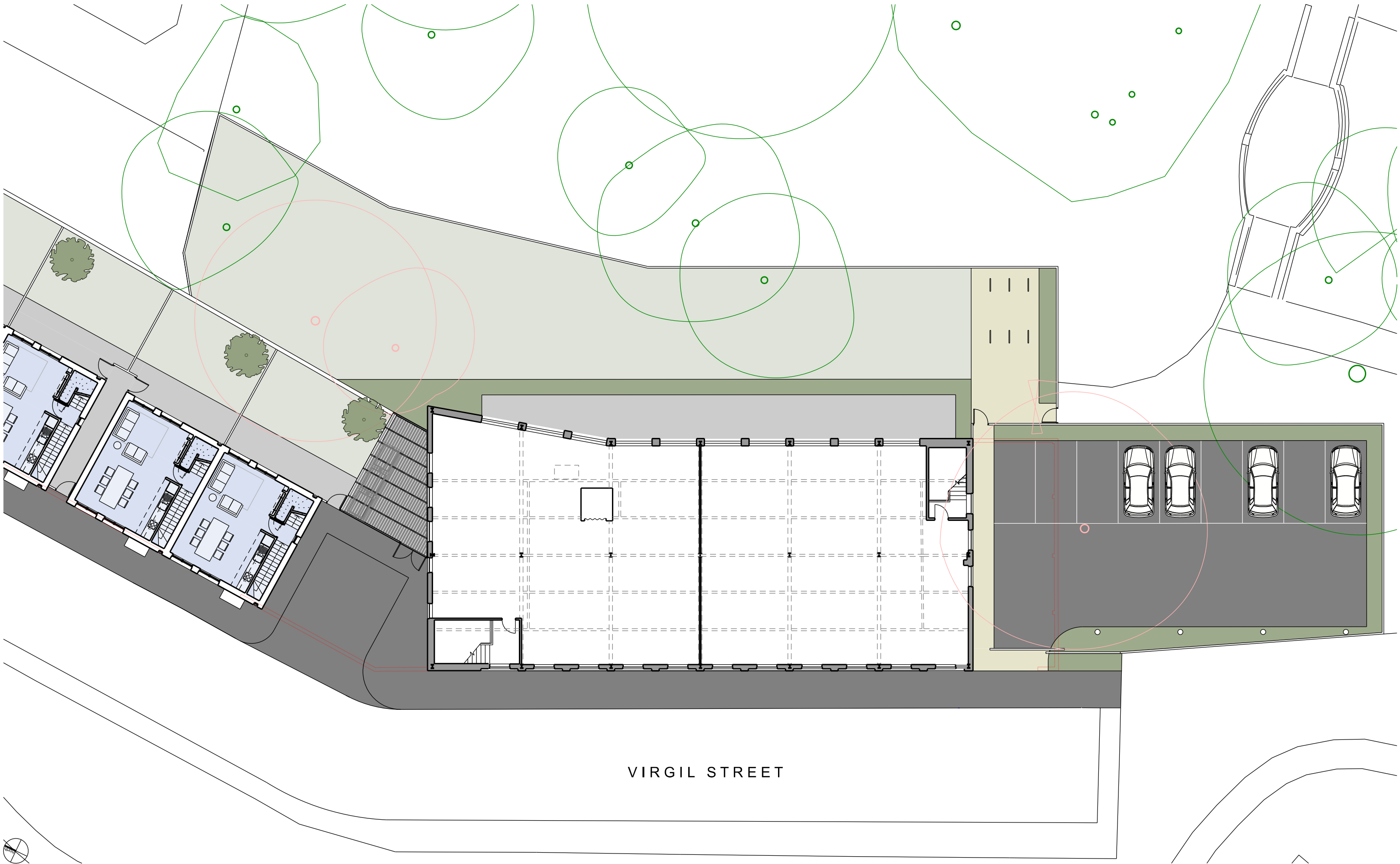
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revisions + notes:

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED REFURBISHMENT PLAN: GROUND FLOOR
scale:
1:200 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)110 D5
issue:



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job number:
0213
title:
PROPOSED REFURBISHMENT PLAN: LEVEL 01
scale:
1:200 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)111 D1
issue:



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job number:
0213
title:
PROPOSED GROUND FLOOR PLAN
scale:
1:100 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)120 D4
issue:



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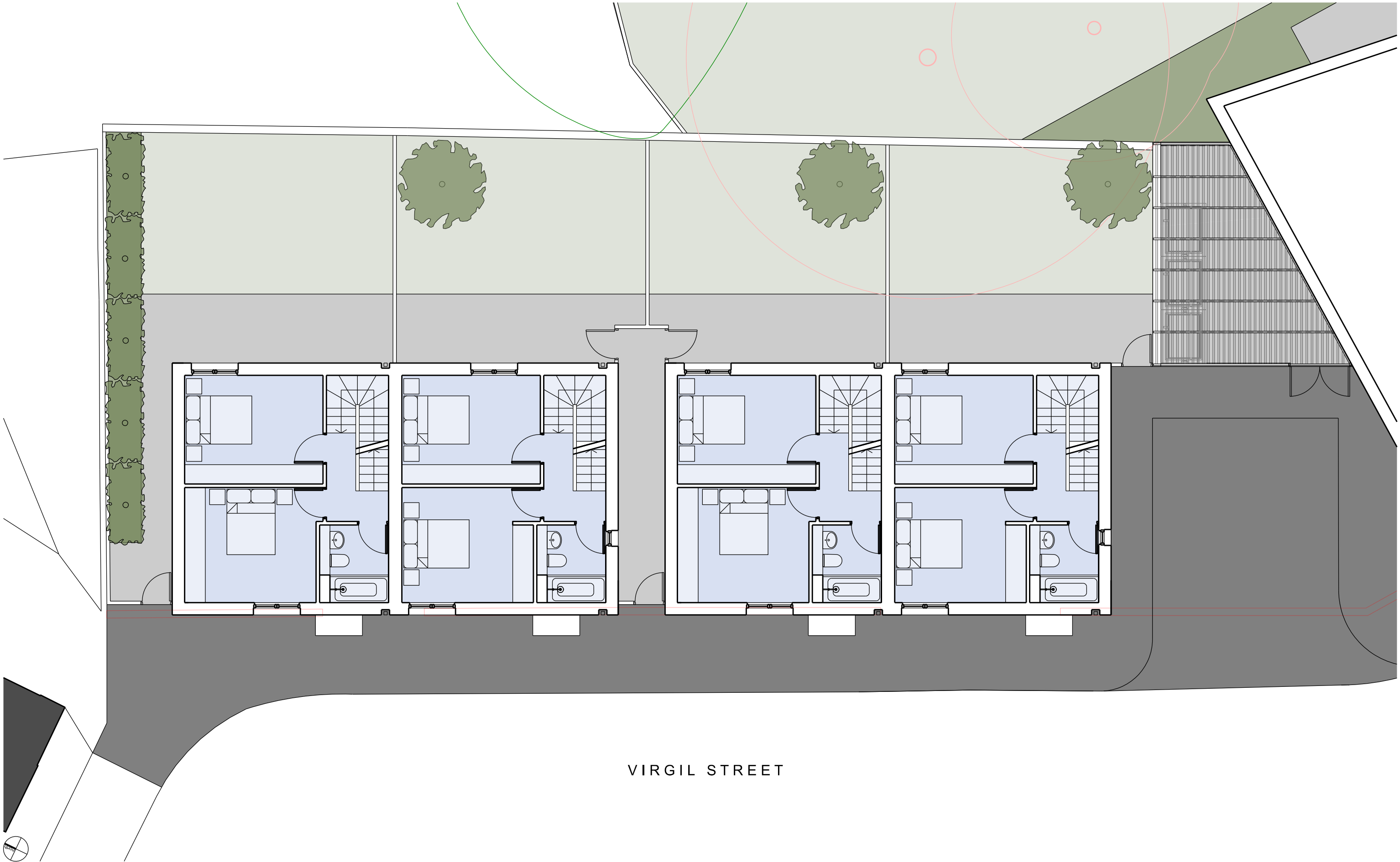
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revisions + notes:

VIRGIL STREET

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED FIRST FLOOR PLAN
scale:
1:100 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)121 D4
issue:



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project:
VIRGIL STREET
job number:
0213
title:
PROPOSED SECOND FLOOR PLAN
scale:
1:100 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)122 D4
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VIRGIL STREET

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED THIRD FLOOR PLAN
scale:
1:100 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)123 D5
issue:



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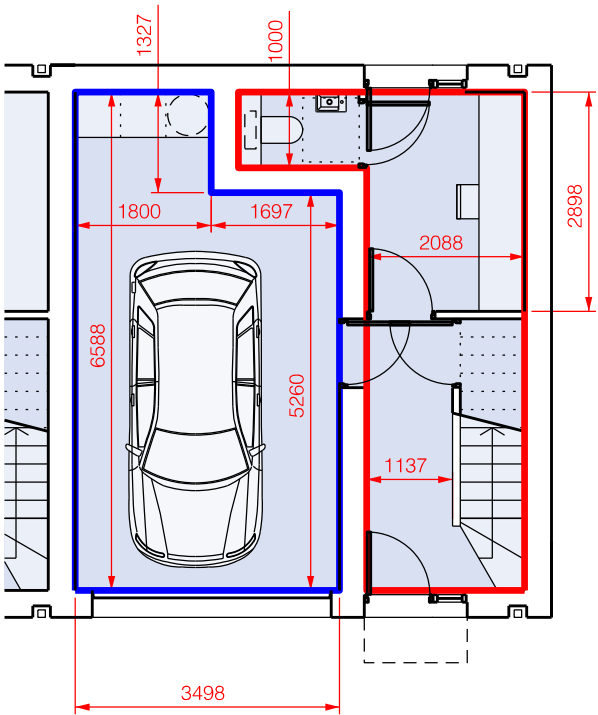
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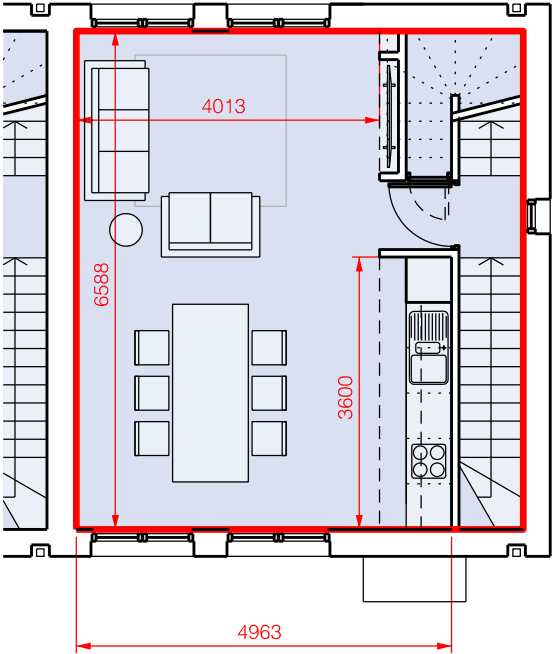
revisions + notes:

VIRGIL STREET

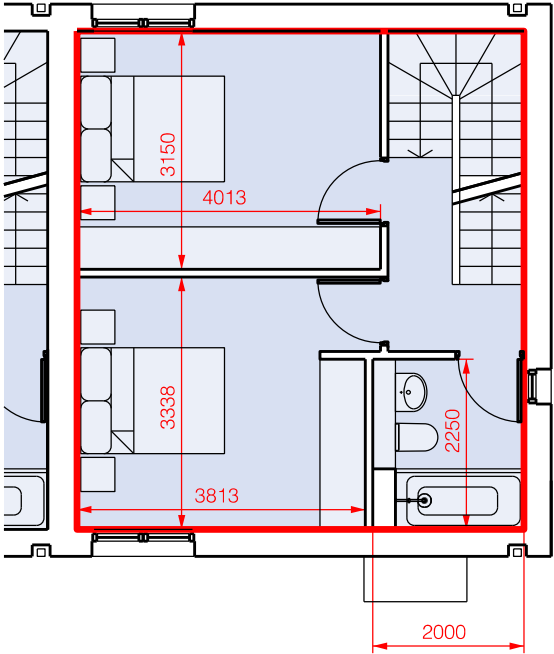
project:
VIRGIL STREET
job number:
0213
title:
PROPOSED FOURTH FLOOR PLAN
scale:
1:100 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)124 D4
issue:



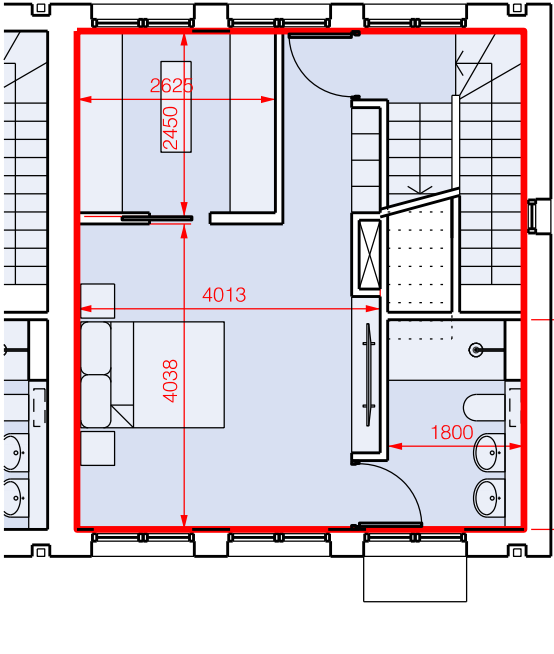
GROUND FLOOR PLAN



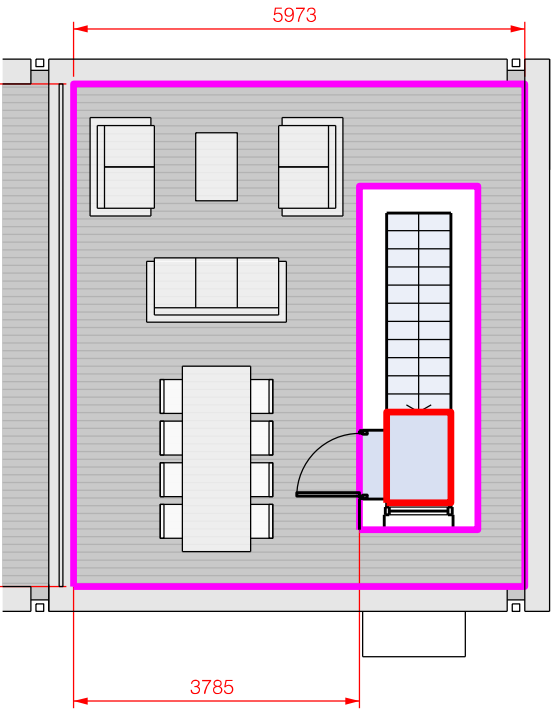
FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



FOURTH FLOOR PLAN

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revisions + notes:

FLOOR	AREA	
GROUND	15.45	20.79 (Garage + Utility)
FIRST	38.95	
SECOND	38.95	
THIRD	38.95	
FOURTH	1.02	32.59 (Terrace)
TOTAL	133.31 m ²	(NOT INCL GARAGE or TERRACE)

project:
VIRGIL STREET
job number:
0213
title:
PLAN SUMMARY
scale:
1:100 @ A3
issued by:
INFORMATION
drawing number:
issue:

AL(05)126 D4



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revisions + notes:

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED VIRGIL STREET CONTEXT ELEVATION
scale:
1:250 @ A3
drawing type:
INFORMATION
drawing number:
AL(05)130 D3
issue:



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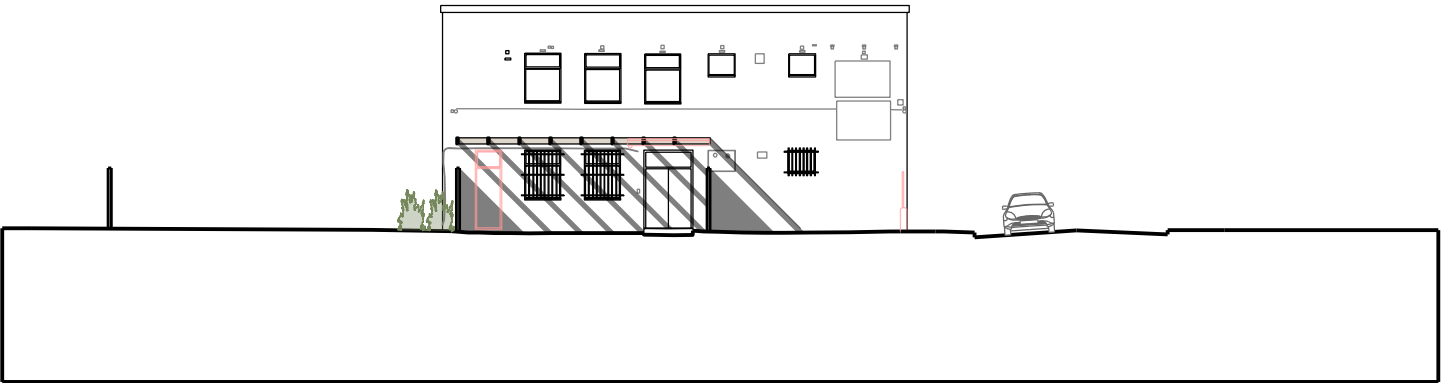
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revisions + notes:

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED REAR ELEVATION
scale:
1:250 @ A3
board type:
INFORMATION
drawing number:
AL(05)131 D4
issue:



PROPOSED SOUTH ELEVATION



PROPOSED NORTH ELEVATION

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project:
VIRGIL STREET
job number:
0213
title:
EXISTING BUILDING: PROPOSED SIDE ELEVATIONS
scale:
1:250 @ A3
board type:
INFORMATION
drawing number:
AL(05)132 D1
issue:



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revisions + notes:

- | | | | |
|---|-------------------------------------|---|------------------------------------|
| ① | Red brick | ⑥ | Powder coated aluminium capping |
| ② | Powder coated aluminium window | ⑦ | Timber lattice b/n store roof |
| ③ | Powder coated aluminium door | ⑧ | Timber fencing |
| ④ | Powder coated aluminium garage door | ⑨ | Powder coated aluminium planter |
| ⑤ | Powder coated aluminium cladding | ⑩ | Hit and miss brickwork over window |

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED ELEVATIONS
scale:
1:100 @ A3
board top:
INFORMATION
drawing number:
Issue:

AL(05)140 D4



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revisions + notes:

- | | | | |
|---|-------------------------------------|---|------------------------------------|
| ① | Red brick | ⑥ | Powder coated aluminium capping |
| ② | Powder coated aluminium window | ⑦ | Timber lattice b/n store roof |
| ③ | Powder coated aluminium door | ⑧ | Timber fencing |
| ④ | Powder coated aluminium garage door | ⑨ | Powder coated aluminium planter |
| ⑤ | Powder coated aluminium cladding | ⑩ | Hit and miss brickwork over window |

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED ELEVATIONS
scale:
1:100 @ A3
issued by:
INFORMATION
drawing number:
issue:

AL(05)141 D5



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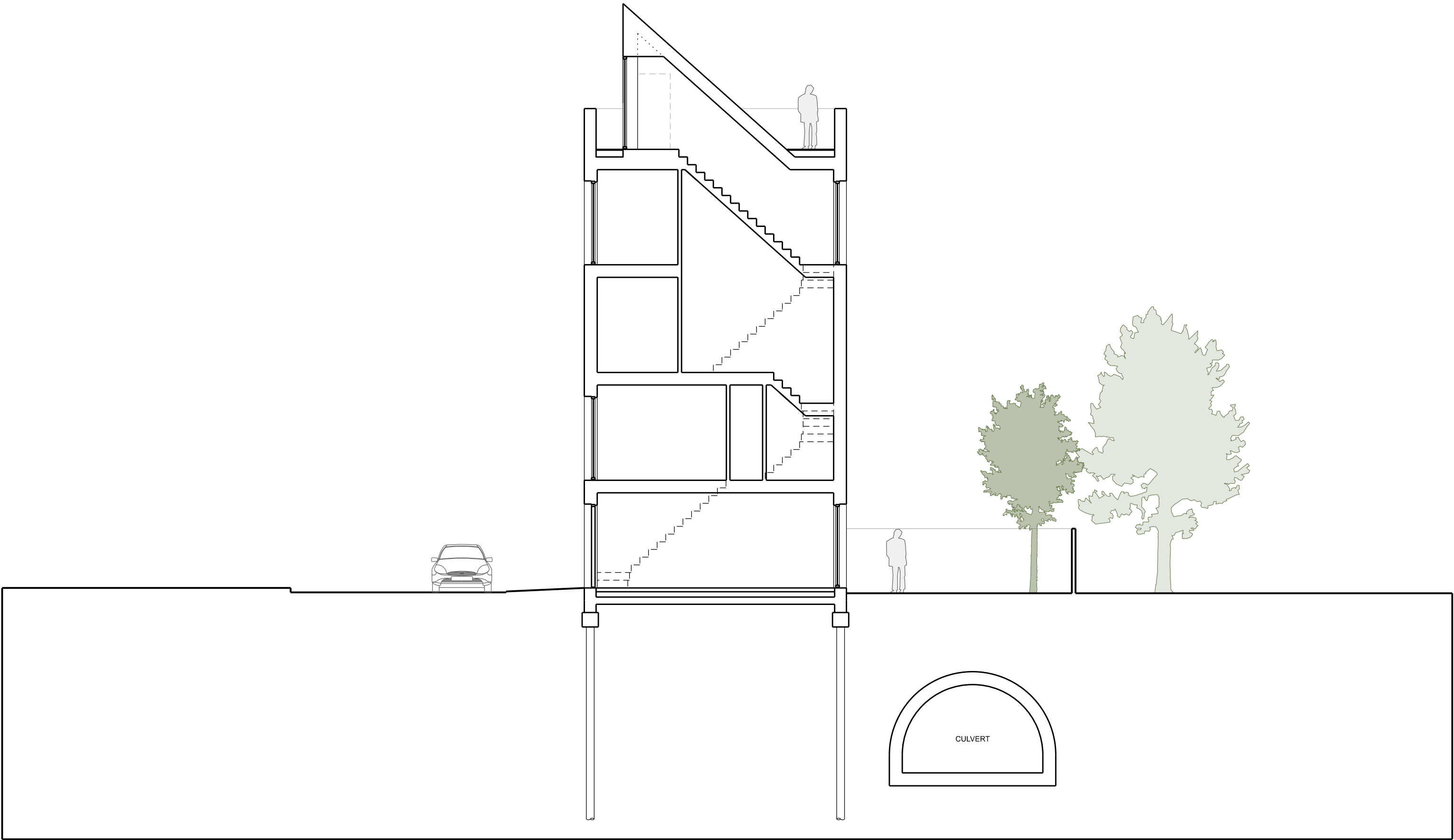
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revisions + notes:

- | | | | |
|---|-------------------------------------|---|------------------------------------|
| ① | Red brick | ⑥ | Powder coated aluminium capping |
| ② | Powder coated aluminium window | ⑦ | Timber lattice bin store roof |
| ③ | Powder coated aluminium door | ⑧ | Timber fencing |
| ④ | Powder coated aluminium garage door | ⑨ | Powder coated aluminium planter |
| ⑤ | Powder coated aluminium cladding | ⑩ | Hit and miss brickwork over window |

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED SIDE ELEVATIONS
scale:
1:100 @ A3
issued by:
INFORMATION
drawing number:
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revisions + notes:

project:
VIRGIL STREET
job number:
0213
title:
PROPOSED SECTION A-A
scale:
1:100 @ A3
issued for:
INFORMATION
drawing number:
AL(05)150 D1
issue:

APPENDIX E
Existing Impermeable Areas Plan

1. THIS DRAWING IS INTENDED TO INDICATE THE EXISTING DRAINED AREAS FROM THE VIRGIL STREET SITE. IT IS BASED UPON A REVIEW OF THE TOPOGRAPHICAL SURVEY AND AERIAL IMAGES OF THE SITE.

EXISTING DISCHARGE RATES GIVEN HAVE BEEN CALCULATED USING MICRODRAINAGE. BROWNFIELD RUN-OFF RATES ARE BASED ON THE HARD PAVED AREAS.

	SITE BOUNDARY
	TOTAL AREA: 1660m ² (0.166 ha)
	ZONE A BOUNDARY
	ZONE B BOUNDARY
	SOFT LANDSCAPING AREA = 650 m ² (0.065 Ha)
	ZONE A POSITIVELY DRAINED HAP AREA = 510 m ² (0.051 Ha)
	ZONE B POSITIVELY DRAINED HAP AREA = 65 m ² (0.007 Ha)
	EXISTING BUILDING - DRAINAGE TO MAINTAINED AREA NOT CONSIDERED IN CALCULATIONS

BROWNFIELD RUN-OFF RATES			
BROWNFIELD RUN-OFF			
EVENT	AREA A	AREA B	TOTAL
1.1	1.01/s	0.13/s	1.11/s
1.2	1.31/s	0.21/s	1.51/s
1.30	2.31/s	0.31/s	2.61/s
1.100	3.01/s	0.41/s	3.41/s

- BROWNFIELD RUN-OFF CALCULATED IN MICRODRAINAGE USING 2-PIPE MODEL

- POSITIVELY DRAINED AREA POST-DEMODR

GREENFIELD RUN-OFF RATES			
GREENFIELD RUN-OFF			
EVENT	AREA A	AREA B	TOTAL
1:1	0.6 U/s	0.1 U/s	0.7 U/s
1:2	0.7 U/s	0.1 U/s	0.8 U/s
1:30	1.0 U/s	0.1 U/s	1.1 U/s
1:100	1.1 U/s	0.2 U/s	1.3 U/s
Q _{max}	0.7 U/s	0.1 U/s	0.8 U/s

- GREENFIELD RUN-OFF CALCULATED IN MICRODRAINAGE USING SOURCE CONTROL



P01	DRAFT FOR COMMENT	01.02.23	HW	HG
Rev:	Description:	Date:	By:	Chkd:
		Renaissance Associates Ltd Carvers Warehouse 77 Dale Street Manchester M1 2HG		
Project:				
VIRGIL STREET, TRAFFORD				
Drawing Title:				
<i>EXISTING DRAINED AREAS</i>				
Status:				
STAGE 2				
Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	FEB'23	HW	HW	HW
Scale:	1: 200		Project No:	2202-01
Project:	Originator:	Volume:	Level:	Type:
				Category/Number:
				Rev:

VST-REN-XX-XX-DR-C-00050-P01

APPENDIX F
Microdrainage Existing Runoff Calculations

Renaissance Assoc.		Page 1
Carvers Warehouse 77 Dale Street Manchester M1 2HG	Virgil Street Zone A	
Date 01/02/2023 13:14 File 2 Pipe Model Browndfiel...	Designed by HenryWilkinson Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.361	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.036	4-8	0.015

Total Area Contributing (ha) = 0.051

Total Pipe Volume (m³) = 1.590

Network Design Table for Storm

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	Auto Design
1.000	20.000	0.200	100.0	0.051	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	20.000	0.200	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

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	50.00	5.25	18.800	0.051	0.0	0.0	0.0	1.31	52.0	6.9
1.001	50.00	5.51	18.600	0.051	0.0	0.0	0.0	1.31	52.0	6.9

Renaissance Assoc.		Page 2
Carvers Warehouse 77 Dale Street Manchester M1 2HG	Virgil Street Zone A	
Date 01/02/2023 13:14 File 2 Pipe Model Browndfiel...	Designed by HenryWilkinson Checked by	
Innovyze	Network 2020.1.3	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.051	0.051	0.051
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.051	0.051	0.051

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.001		20.000	18.400	0.000	0	0
-------	--	--------	--------	-------	---	---

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.361		

Renaissance Assoc.		Page 1
Carvers Warehouse 77 Dale Street Manchester M1 2HG	Virgil Street Zone B	
Date 01/02/2023 13:13 File 2 Pipe Model Browndfiel...	Designed by HenryWilkinson Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.361	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.026	4-8	0.011

Total Area Contributing (ha) = 0.037

Total Pipe Volume (m³) = 1.590

Network Design Table for Storm

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	Auto Design
1.000	20.000	0.200	100.0	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	20.000	0.200	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

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	50.00	5.25	18.800	0.037	0.0	0.0	0.0	1.31	52.0	5.0
1.001	50.00	5.51	18.600	0.037	0.0	0.0	0.0	1.31	52.0	5.0

Renaissance Assoc.		Page 2
Carvers Warehouse 77 Dale Street Manchester M1 2HG	Virgil Street Zone B	
Date 01/02/2023 13:13 File 2 Pipe Model Browndfiel...	Designed by HenryWilkinson Checked by	
Innovyze	Network 2020.1.3	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.037	0.037	0.037
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.037	0.037	0.037

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.001		20.000	18.400	0.000	0	0
-------	--	--------	--------	-------	---	---

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.361		

Renaissance Assoc.		Page 4
Carvers Warehouse 77 Dale Street Manchester M1 2HG	Virgil Street Zone B	
Date 01/02/2023 13:13 File 2 Pipe Model Browndfiel...	Designed by HenryWilkinson Checked by	
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2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.359
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 0

					Water				
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
1.000	1	360 Summer	2	+0%					18.824
1.001	2	360 Summer	2	+0%					18.624

Surcharged Flooded					Half Drain Pipe		
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Pipe Flow (l/s)	Level Exceeded
1.000	1	-0.201	0.000	0.03		1.3	OK
1.001	2	-0.201	0.000	0.03		1.3	OK

Renaissance Assoc.				Page 6															
Carvers Warehouse 77 Dale Street Manchester M1 2HG				Virgil Street Zone B															
Date 01/02/2023 13:13 File 2 Pipe Model Browndfiel...				Designed by HenryWilkinson Checked by															
Innovyze				Network 2020.1.3															
100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm																			
Simulation Criteria																			
Areal Reduction Factor		1.000		Additional Flow - % of Total Flow		0.000													
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage		2.000													
Hot Start Level (mm)		0		Inlet Coefficient		0.800													
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day)		0.000													
Foul Sewage per hectare (l/s)		0.000																	
Number of Input Hydrographs				0		Number of Storage Structures		0											
Number of Online Controls				0		Number of Time/Area Diagrams		0											
Number of Offline Controls				0		Number of Real Time Controls		0											
Synthetic Rainfall Details																			
Rainfall Model		FSR		Ratio R		0.359													
Region		England and Wales		Cv (Summer)		0.750													
M5-60 (mm)		18.000		Cv (Winter)		0.840													
Margin for Flood Risk Warning (mm)				400.0															
Analysis Timestep				2.5 Second Increment (Extended)															
DTS Status				OFF															
DVD Status				ON															
Inertia Status				ON															
Profile(s) Summer and Winter																			
Duration(s) (mins)		360																	
Return Period(s) (years)		1, 2, 30, 100																	
Climate Change (%)		0, 0, 0, 0																	
Water																			
US/MH		Return Climate		First (X)		First (Y)		First (Z)		Overflow		Level							
PN		Name		Storm		Period		Change		Surcharge		Flood		Overflow		Act.		(m)	
1.000		1		360 Summer		100		+0%										18.837	
1.001		2		360 Summer		100		+0%										18.637	
Surcharged Flooded								Half Drain Pipe											
US/MH		Depth		Volume		Flow / Overflow		Time		Pipe		Level							
PN		Name		(m)		(m³)		Cap.		(l/s)		(mins)		Flow		Status		Exceeded	
1.000		1		-0.188		0.000		0.06						3.0		OK			
1.001		2		-0.188		0.000		0.06						3.0		OK			
©1982-2020								Innovyze											

APPENDIX G

Microdrainage Greenfield Runoff Calculations

Zone A

Rural Runoff Calculator

Micro Drainage

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years)

Area (ha)

SAAR (mm)

Soil

Growth Curve

Partly Urbanised Catchment (QBAR)

Urban

Region

Results

QBAR rural (l/s)

QBAR urban (l/s)

Return Period Flood

	Region	QBAR (l/s)	Q (2yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
IH 124	Region 1	0.7	0.7	0.6	1.1	1.2
ICP SUDS	Region 2	0.7	0.7	0.6	1.1	1.2
ADAS 345	Region 3	0.7	0.7	0.6	1.1	1.2
FEH	Region 4	0.7	0.7	0.6	1.1	1.3
ReFH2	Region 5	0.7	0.7	0.6	1.3	1.5
	Region 6/Region 7	0.7	0.7	0.6	1.2	1.4
Greenfield Volume	Region 8	0.7	0.7	0.6	1.1	1.2
Greenfield Volume (ReFH2)	Region 9	0.7	0.7	0.6	1.1	1.2
	Region 10	0.7	0.7	0.6	1.0	1.1

OK Cancel Help

Enter Return Period between 1 and 1000

Zone B

Rural Runoff Calculator

Micro Drainage

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years)

Area (ha)

SAAR (mm)

Soil

Growth Curve

Partly Urbanised Catchment (QBAR)

Urban

Region

Results

QBAR rural (l/s)

QBAR urban (l/s)

Return Period Flood

	Region	QBAR (l/s)	Q (2yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
IH 124	Region 1	0.1	0.1	0.1	0.1	0.2
ICP SUDS	Region 2	0.1	0.1	0.1	0.1	0.2
ADAS 345	Region 3	0.1	0.1	0.1	0.1	0.2
FEH	Region 4	0.1	0.1	0.1	0.2	0.2
ReFH2	Region 5	0.1	0.1	0.1	0.2	0.2
	Region 6/Region 7	0.1	0.1	0.1	0.2	0.2
Greenfield Volume	Region 8	0.1	0.1	0.1	0.2	0.2
Greenfield Volume (ReFH2)	Region 9	0.1	0.1	0.1	0.1	0.2
	Region 10	0.1	0.1	0.1	0.1	0.2

OK Cancel Help

Enter Return Period between 1 and 1000

APPENDIX H
Proposed Drained Areas Plan

- NOTES:
1. THIS DRAWING IS INTENDED TO INDICATE THE EXISTING DRAINED AREAS FROM THE VIRGIL STREET SITE AND BELOW GROUND DRAINAGE DRAWING. IT IS BASED UPON A REVIEW OF THE PROPOSED LANDSCAPING PLAN
 2. FOR TOPOGRAPHICAL SURVEY REFER TO13643-100_2DT
 3. EXISTING DISCHARGE RATES GIVEN HAVE BEEN CALCULATED USING MICRODRAINAGE. BROWNFIELD RUN-OFF RATES ARE BASED ON THE HARD PAVED AREAS.

- KEY
- SITE BOUNDARY
TOTAL AREA: 1660m² (0.166 ha)
 - ZONE A PROPOSED IMPERMEABLE AREA
AREA = 510 m² (0.051 Ha)
 - ZONE B PROPOSED IMPERMEABLE AREA
AREA = 290 m² (0.029 Ha)
 - IMPERMEABLE AREA DRAINING TO SOFT LANDSCAPING
AREA = 70 m² (0.007 Ha)
 - SOFT LANDSCAPING
AREA = 370 m² (0.037 Ha)
 - EXISTING BUILDING - DRAINAGE TO BE MAINTAINED. AREA NOT CONSIDERED IN CALCULATIONS

P01	DRAFT FOR COMMENT			HW	
Rev.	Description:			Date:	By: Chkd:
				Renaissance Associates Ltd Carvers Warehouse 77 Dale Street Manchester M1 2HG	
Project:					
VIRGIL STREET, TRAFFORD					
Drawing Title:					
PROPOSED DRAINED AREAS					
Status:					
STAGE 2					
Size:	Date:	Drawn by:	Designed by:	Checked by:	
A1	FEB'23	HW	HW	HG	
Scale:	1: 200		Project No: 2202-01		
Project:	Originator:	Volume:	Level:	Type:	Role: Category/Number: Rev:

VST-REN-XX-XX-DR-C-00060-P01

APPENDIX I
Microdrainage Quick Storage Estimates

Renaissance Assoc.		Page 1																																																																																																																																																																																																																																																																																		
Carvers Warehouse 77 Dale Street Manchester M1 2HG		Zone A Attenuation Tank																																																																																																																																																																																																																																																																																		
Date 31/01/2023 18:41 File		Designed by HenryWilkinson Checked by																																																																																																																																																																																																																																																																																		
Innovyze		Source Control 2020.1.3																																																																																																																																																																																																																																																																																		
Summary of Results for 100 year Return Period (+45%) Half Drain Time : 76 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (1/s)</th><th>Max Control (1/s)</th><th>Max Σ Outflow (1/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>28.743</td><td>0.543</td><td>0.0</td><td>2.0</td><td>2.0</td><td>10.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>28.888</td><td>0.688</td><td>0.0</td><td>2.0</td><td>2.0</td><td>13.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>28.977</td><td>0.777</td><td>0.0</td><td>2.0</td><td>2.0</td><td>14.8</td><td>O K</td></tr><tr><td>120 min Summer</td><td>28.988</td><td>0.788</td><td>0.0</td><td>2.0</td><td>2.0</td><td>15.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>28.961</td><td>0.761</td><td>0.0</td><td>2.0</td><td>2.0</td><td>14.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>28.923</td><td>0.723</td><td>0.0</td><td>2.0</td><td>2.0</td><td>13.7</td><td>O K</td></tr><tr><td>360 min Summer</td><td>28.832</td><td>0.632</td><td>0.0</td><td>2.0</td><td>2.0</td><td>12.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>28.724</td><td>0.524</td><td>0.0</td><td>2.0</td><td>2.0</td><td>10.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>28.627</td><td>0.427</td><td>0.0</td><td>2.0</td><td>2.0</td><td>8.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>28.548</td><td>0.348</td><td>0.0</td><td>2.0</td><td>2.0</td><td>6.6</td><td>O K</td></tr><tr><td>960 min Summer</td><td>28.435</td><td>0.235</td><td>0.0</td><td>2.0</td><td>2.0</td><td>4.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>28.326</td><td>0.126</td><td>0.0</td><td>1.8</td><td>1.8</td><td>2.4</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>28.281</td><td>0.081</td><td>0.0</td><td>1.5</td><td>1.5</td><td>1.5</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>28.264</td><td>0.064</td><td>0.0</td><td>1.2</td><td>1.2</td><td>1.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>28.249</td><td>0.049</td><td>0.0</td><td>0.9</td><td>0.9</td><td>0.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>28.242</td><td>0.042</td><td>0.0</td><td>0.7</td><td>0.7</td><td>0.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>28.238</td><td>0.038</td><td>0.0</td><td>0.6</td><td>0.6</td><td>0.7</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>28.235</td><td>0.035</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.7</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>28.233</td><td>0.033</td><td>0.0</td><td>0.5</td><td>0.5</td><td>0.6</td><td>O K</td></tr><tr><td>15 min Winter</td><td>28.818</td><td>0.618</td><td>0.0</td><td>2.0</td><td>2.0</td><td>11.7</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>122.849</td><td>0.0</td><td>11.7</td><td>18</td></tr><tr><td>30 min Summer</td><td>82.249</td><td>0.0</td><td>15.7</td><td>32</td></tr><tr><td>60 min Summer</td><td>52.627</td><td>0.0</td><td>20.1</td><td>60</td></tr><tr><td>120 min Summer</td><td>32.592</td><td>0.0</td><td>24.9</td><td>92</td></tr><tr><td>180 min Summer</td><td>24.304</td><td>0.0</td><td>27.9</td><td>126</td></tr><tr><td>240 min Summer</td><td>19.616</td><td>0.0</td><td>30.0</td><td>162</td></tr><tr><td>360 min Summer</td><td>14.378</td><td>0.0</td><td>33.0</td><td>232</td></tr><tr><td>480 min Summer</td><td>11.541</td><td>0.0</td><td>35.3</td><td>296</td></tr><tr><td>600 min Summer</td><td>9.724</td><td>0.0</td><td>37.2</td><td>354</td></tr><tr><td>720 min Summer</td><td>8.449</td><td>0.0</td><td>38.8</td><td>412</td></tr><tr><td>960 min Summer</td><td>6.764</td><td>0.0</td><td>41.4</td><td>522</td></tr><tr><td>1440 min Summer</td><td>4.934</td><td>0.0</td><td>45.3</td><td>750</td></tr><tr><td>2160 min Summer</td><td>3.592</td><td>0.0</td><td>49.5</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.864</td><td>0.0</td><td>52.6</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>2.078</td><td>0.0</td><td>57.2</td><td>2180</td></tr><tr><td>5760 min Summer</td><td>1.653</td><td>0.0</td><td>60.7</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.383</td><td>0.0</td><td>63.5</td><td>3592</td></tr><tr><td>8640 min Summer</td><td>1.196</td><td>0.0</td><td>65.8</td><td>4272</td></tr><tr><td>10080 min Summer</td><td>1.056</td><td>0.0</td><td>67.9</td><td>5096</td></tr><tr><td>15 min Winter</td><td>122.849</td><td>0.0</td><td>13.1</td><td>18</td></tr></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status	15 min Summer	28.743	0.543	0.0	2.0	2.0	10.3	O K	30 min Summer	28.888	0.688	0.0	2.0	2.0	13.1	O K	60 min Summer	28.977	0.777	0.0	2.0	2.0	14.8	O K	120 min Summer	28.988	0.788	0.0	2.0	2.0	15.0	O K	180 min Summer	28.961	0.761	0.0	2.0	2.0	14.5	O K	240 min Summer	28.923	0.723	0.0	2.0	2.0	13.7	O K	360 min Summer	28.832	0.632	0.0	2.0	2.0	12.0	O K	480 min Summer	28.724	0.524	0.0	2.0	2.0	10.0	O K	600 min Summer	28.627	0.427	0.0	2.0	2.0	8.1	O K	720 min Summer	28.548	0.348	0.0	2.0	2.0	6.6	O K	960 min Summer	28.435	0.235	0.0	2.0	2.0	4.5	O K	1440 min Summer	28.326	0.126	0.0	1.8	1.8	2.4	O K	2160 min Summer	28.281	0.081	0.0	1.5	1.5	1.5	O K	2880 min Summer	28.264	0.064	0.0	1.2	1.2	1.2	O K	4320 min Summer	28.249	0.049	0.0	0.9	0.9	0.9	O K	5760 min Summer	28.242	0.042	0.0	0.7	0.7	0.8	O K	7200 min Summer	28.238	0.038	0.0	0.6	0.6	0.7	O K	8640 min Summer	28.235	0.035	0.0	0.5	0.5	0.7	O K	10080 min Summer	28.233	0.033	0.0	0.5	0.5	0.6	O K	15 min Winter	28.818	0.618	0.0	2.0	2.0	11.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	122.849	0.0	11.7	18	30 min Summer	82.249	0.0	15.7	32	60 min Summer	52.627	0.0	20.1	60	120 min Summer	32.592	0.0	24.9	92	180 min Summer	24.304	0.0	27.9	126	240 min Summer	19.616	0.0	30.0	162	360 min Summer	14.378	0.0	33.0	232	480 min Summer	11.541	0.0	35.3	296	600 min Summer	9.724	0.0	37.2	354	720 min Summer	8.449	0.0	38.8	412	960 min Summer	6.764	0.0	41.4	522	1440 min Summer	4.934	0.0	45.3	750	2160 min Summer	3.592	0.0	49.5	1100	2880 min Summer	2.864	0.0	52.6	1468	4320 min Summer	2.078	0.0	57.2	2180	5760 min Summer	1.653	0.0	60.7	2936	7200 min Summer	1.383	0.0	63.5	3592	8640 min Summer	1.196	0.0	65.8	4272	10080 min Summer	1.056	0.0	67.9	5096	15 min Winter	122.849	0.0	13.1	18
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960 min Summer	6.764	0.0	41.4	522																																																																																																																																																																																																																																																																																
1440 min Summer	4.934	0.0	45.3	750																																																																																																																																																																																																																																																																																
2160 min Summer	3.592	0.0	49.5	1100																																																																																																																																																																																																																																																																																
2880 min Summer	2.864	0.0	52.6	1468																																																																																																																																																																																																																																																																																
4320 min Summer	2.078	0.0	57.2	2180																																																																																																																																																																																																																																																																																
5760 min Summer	1.653	0.0	60.7	2936																																																																																																																																																																																																																																																																																
7200 min Summer	1.383	0.0	63.5	3592																																																																																																																																																																																																																																																																																
8640 min Summer	1.196	0.0	65.8	4272																																																																																																																																																																																																																																																																																
10080 min Summer	1.056	0.0	67.9	5096																																																																																																																																																																																																																																																																																
15 min Winter	122.849	0.0	13.1	18																																																																																																																																																																																																																																																																																
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Renaissance Assoc.								Page 2
Carvers Warehouse 77 Dale Street Manchester M1 2HG						Zone A Attenuation Tank		
Date 31/01/2023 18:41 File						Designed by HenryWilkinson Checked by		
Innovyze						Source Control 2020.1.3		
<u>Summary of Results for 100 year Return Period (+45%)</u>								
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	28.983	0.783	0.0	2.0	2.0	14.9	O	K
60 min Winter	29.095	0.895	0.0	2.0	2.0	17.0	O	K
120 min Winter	29.108	0.908	0.0	2.0	2.0	17.3	O	K
180 min Winter	29.069	0.869	0.0	2.0	2.0	16.5	O	K
240 min Winter	29.009	0.809	0.0	2.0	2.0	15.4	O	K
360 min Winter	28.870	0.670	0.0	2.0	2.0	12.7	O	K
480 min Winter	28.697	0.497	0.0	2.0	2.0	9.4	O	K
600 min Winter	28.554	0.354	0.0	2.0	2.0	6.7	O	K
720 min Winter	28.453	0.253	0.0	2.0	2.0	4.8	O	K
960 min Winter	28.341	0.141	0.0	1.9	1.9	2.7	O	K
1440 min Winter	28.281	0.081	0.0	1.5	1.5	1.5	O	K
2160 min Winter	28.259	0.059	0.0	1.1	1.1	1.1	O	K
2880 min Winter	28.249	0.049	0.0	0.9	0.9	0.9	O	K
4320 min Winter	28.240	0.040	0.0	0.6	0.6	0.8	O	K
5760 min Winter	28.235	0.035	0.0	0.5	0.5	0.7	O	K
7200 min Winter	28.232	0.032	0.0	0.4	0.4	0.6	O	K
8640 min Winter	28.229	0.029	0.0	0.4	0.4	0.6	O	K
10080 min Winter	28.227	0.027	0.0	0.3	0.3	0.5	O	K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)				
30 min Winter	82.249	0.0	17.6	31				
60 min Winter	52.627	0.0	22.5	60				
120 min Winter	32.592	0.0	27.9	98				
180 min Winter	24.304	0.0	31.2	136				
240 min Winter	19.616	0.0	33.6	174				
360 min Winter	14.378	0.0	36.9	252				
480 min Winter	11.541	0.0	39.5	316				
600 min Winter	9.724	0.0	41.7	370				
720 min Winter	8.449	0.0	43.4	422				
960 min Winter	6.764	0.0	46.4	522				
1440 min Winter	4.934	0.0	50.7	738				
2160 min Winter	3.592	0.0	55.4	1092				
2880 min Winter	2.864	0.0	58.9	1460				
4320 min Winter	2.078	0.0	64.1	2204				
5760 min Winter	1.653	0.0	68.0	2856				
7200 min Winter	1.383	0.0	71.1	3600				
8640 min Winter	1.196	0.0	73.7	4320				
10080 min Winter	1.056	0.0	76.0	4984				
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Carvers Warehouse 77 Dale Street Manchester M1 2HG	Zone A Attenuation Tank	
Date 31/01/2023 18:41 File	Designed by HenryWilkinson Checked by	
Innovyze		Source Control 2020.1.3

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.360	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.051

Time (mins)	Area
From:	To: (ha)
0	4 0.051

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Carvers Warehouse 77 Dale Street Manchester M1 2HG	Zone A Attenuation Tank	
Date 31/01/2023 18:41 File	Designed by HenryWilkinson Checked by	
Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 29.800

Cellular Storage Structure

Invert Level (m) 28.200 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	20.0	0.0	1.001	0.0	0.0
1.000	20.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCL-0064-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	28.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.259	2.0
Kick-Flo®	0.569	1.6
Mean Flow over Head Range	-	1.7

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	1.7	1.200	2.2	3.000	3.3	7.000	4.9
0.200	2.0	1.400	2.3	3.500	3.5	7.500	5.0
0.300	2.0	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.6
0.800	1.8	2.400	3.0	6.000	4.5		
1.000	2.0	2.600	3.1	6.500	4.7		

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Carvers Warehouse

77 Dale Street

Manchester M1 2HG

Date 31/01/2023 18:48

File

Zone B

Attenuation Tank

Designed by HenryWilkinson

Checked by

Innovyze

Source Control 2020.1.3

Page 1



Summary of Results for 100 year Return Period (+45%)

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	28.895	0.695	0.0	2.0	2.0	5.3	O K
30 min Summer	29.018	0.818	0.0	2.0	2.0	6.2	O K
60 min Summer	29.055	0.855	0.0	2.0	2.0	6.5	O K
120 min Summer	29.003	0.803	0.0	2.0	2.0	6.1	O K
180 min Summer	28.916	0.716	0.0	2.0	2.0	5.4	O K
240 min Summer	28.815	0.615	0.0	2.0	2.0	4.7	O K
360 min Summer	28.580	0.380	0.0	2.0	2.0	2.9	O K
480 min Summer	28.445	0.245	0.0	2.0	2.0	1.9	O K
600 min Summer	28.368	0.168	0.0	1.9	1.9	1.3	O K
720 min Summer	28.324	0.124	0.0	1.8	1.8	0.9	O K
960 min Summer	28.288	0.088	0.0	1.6	1.6	0.7	O K
1440 min Summer	28.263	0.063	0.0	1.2	1.2	0.5	O K
2160 min Summer	28.249	0.049	0.0	0.9	0.9	0.4	O K
2880 min Summer	28.242	0.042	0.0	0.7	0.7	0.3	O K
4320 min Summer	28.235	0.035	0.0	0.5	0.5	0.3	O K
5760 min Summer	28.230	0.030	0.0	0.4	0.4	0.2	O K
7200 min Summer	28.228	0.028	0.0	0.3	0.3	0.2	O K
8640 min Summer	28.225	0.025	0.0	0.3	0.3	0.2	O K
10080 min Summer	28.224	0.024	0.0	0.3	0.3	0.2	O K
15 min Winter	28.994	0.794	0.0	2.0	2.0	6.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	122.849	0.0	6.7	17
30 min Summer	82.249	0.0	8.9	29
60 min Summer	52.627	0.0	11.4	46
120 min Summer	32.592	0.0	14.2	80
180 min Summer	24.304	0.0	15.9	116
240 min Summer	19.616	0.0	17.1	150
360 min Summer	14.378	0.0	18.8	206
480 min Summer	11.541	0.0	20.1	262
600 min Summer	9.724	0.0	21.1	316
720 min Summer	8.449	0.0	22.0	374
960 min Summer	6.764	0.0	23.5	490
1440 min Summer	4.934	0.0	25.8	734
2160 min Summer	3.592	0.0	28.1	1076
2880 min Summer	2.864	0.0	29.9	1436
4320 min Summer	2.078	0.0	32.5	2172
5760 min Summer	1.653	0.0	34.5	2840
7200 min Summer	1.383	0.0	36.1	3672
8640 min Summer	1.196	0.0	37.4	4400
10080 min Summer	1.056	0.0	38.6	5120
15 min Winter	122.849	0.0	7.5	17

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77 Dale Street
Manchester M1 2HG

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Zone B
Attenuation Tank

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Source Control 2020.1.3

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Summary of Results for 100 year Return Period (+45%)

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	29.147	0.947	0.0	2.0	2.0	7.2	O K
60 min Winter	29.185	0.985	0.0	2.0	2.0	7.5	O K
120 min Winter	29.091	0.891	0.0	2.0	2.0	6.8	O K
180 min Winter	28.950	0.750	0.0	2.0	2.0	5.7	O K
240 min Winter	28.778	0.578	0.0	2.0	2.0	4.4	O K
360 min Winter	28.455	0.255	0.0	2.0	2.0	1.9	O K
480 min Winter	28.334	0.134	0.0	1.9	1.9	1.0	O K
600 min Winter	28.293	0.093	0.0	1.6	1.6	0.7	O K
720 min Winter	28.279	0.079	0.0	1.4	1.4	0.6	O K
960 min Winter	28.262	0.062	0.0	1.2	1.2	0.5	O K
1440 min Winter	28.249	0.049	0.0	0.9	0.9	0.4	O K
2160 min Winter	28.240	0.040	0.0	0.6	0.6	0.3	O K
2880 min Winter	28.235	0.035	0.0	0.5	0.5	0.3	O K
4320 min Winter	28.229	0.029	0.0	0.4	0.4	0.2	O K
5760 min Winter	28.225	0.025	0.0	0.3	0.3	0.2	O K
7200 min Winter	28.223	0.023	0.0	0.2	0.2	0.2	O K
8640 min Winter	28.221	0.021	0.0	0.2	0.2	0.2	O K
10080 min Winter	28.220	0.020	0.0	0.2	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.249	0.0	10.0	30
60 min Winter	52.627	0.0	12.8	48
120 min Winter	32.592	0.0	15.9	88
180 min Winter	24.304	0.0	17.8	124
240 min Winter	19.616	0.0	19.1	162
360 min Winter	14.378	0.0	21.0	210
480 min Winter	11.541	0.0	22.5	260
600 min Winter	9.724	0.0	23.7	308
720 min Winter	8.449	0.0	24.7	368
960 min Winter	6.764	0.0	26.4	490
1440 min Winter	4.934	0.0	28.8	728
2160 min Winter	3.592	0.0	31.5	1084
2880 min Winter	2.864	0.0	33.5	1432
4320 min Winter	2.078	0.0	36.4	2144
5760 min Winter	1.653	0.0	38.7	2832
7200 min Winter	1.383	0.0	40.4	3648
8640 min Winter	1.196	0.0	41.9	4376
10080 min Winter	1.056	0.0	43.2	5032

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Carvers Warehouse 77 Dale Street Manchester M1 2HG	Zone B Attenuation Tank	
Date 31/01/2023 18:48 File	Designed by HenryWilkinson Checked by	
Innovyze		Source Control 2020.1.3

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.360	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.029

Time (mins)	Area
From:	To: (ha)
0	4 0.029

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Carvers Warehouse 77 Dale Street Manchester M1 2HG	Zone B Attenuation Tank	
Date 31/01/2023 18:48 File	Designed by HenryWilkinson Checked by	
Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 29.800

Cellular Storage Structure

Invert Level (m) 28.200 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	8.0	0.0	1.001	0.0	0.0
1.000	8.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SCL-0064-2000-1000-2000
Design Head (m) 1.000
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise blockage risk
Application Surface
Sump Available Yes
Diameter (mm) 64
Invert Level (m) 28.200
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

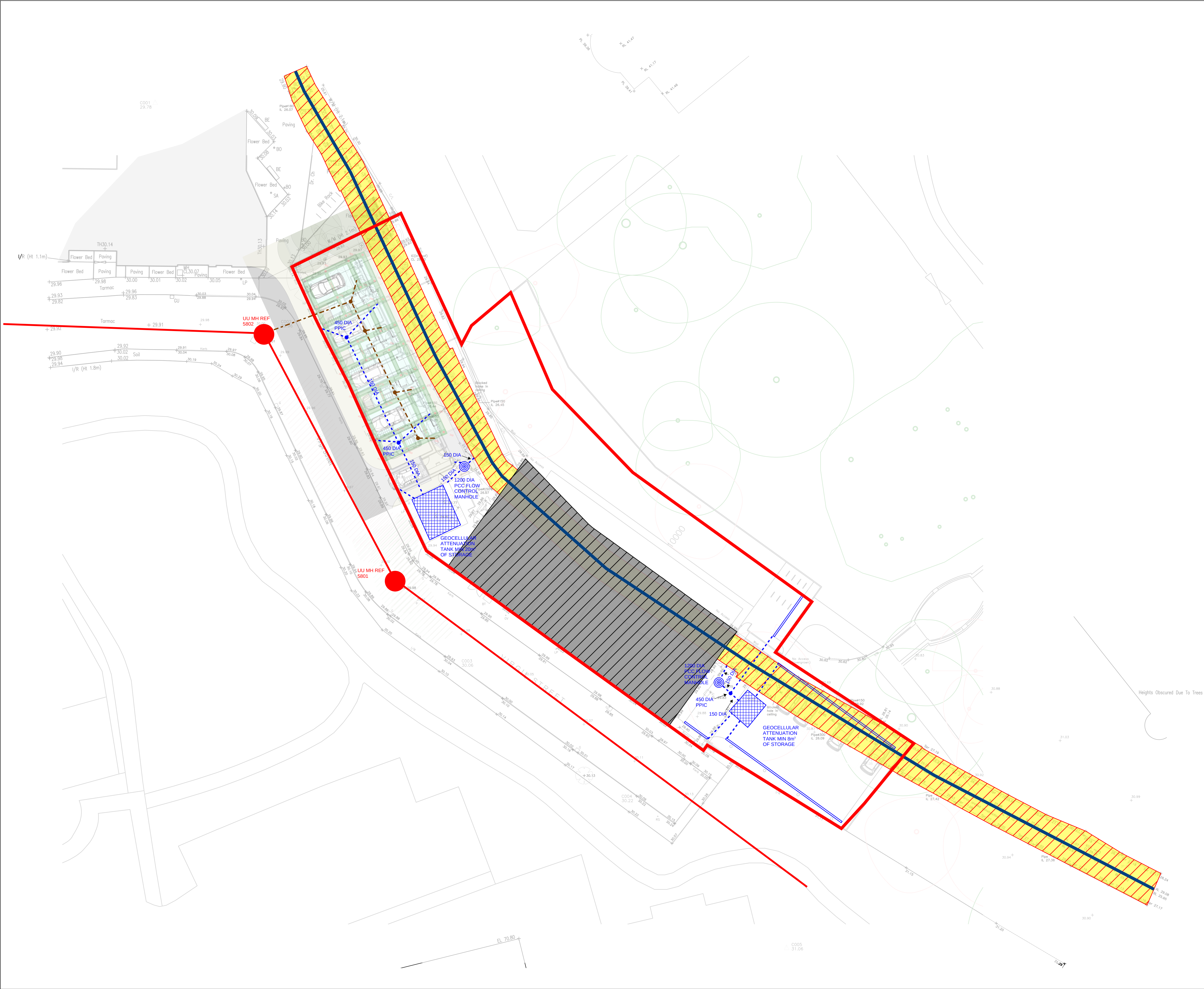
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.259	2.0
Kick-Flo®	0.569	1.6
Mean Flow over Head Range	-	1.7

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	1.7	1.200	2.2	3.000	3.3	7.000	4.9
0.200	2.0	1.400	2.3	3.500	3.5	7.500	5.0
0.300	2.0	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.6
0.800	1.8	2.400	3.0	6.000	4.5		
1.000	2.0	2.600	3.1	6.500	4.7		

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APPENDIX J
Proposed Below Ground Drainage Layout



- NOTES:**
- THIS DRAWING INDICATES THE PROPOSED DESIGN APPROPRIATE FOR RIBA STAGE 2 AND IS SUBJECT TO DESIGN DEVELOPMENT AS THE SCHEME PROGRESSES AND FURTHER ANALYSIS IS UNDERTAKEN.
 - ALL BELOW GROUND DRAINAGE WORKS TO BE IN ACCORDANCE WITH RELEVANT BUILDING REGULATIONS AND SEWER SECTOR GUIDANCE APPENDIX C- DESIGN AND CONSTRUCTION GUIDANCE. IF DISCREPANCIES ARE NOTED BETWEEN SSG AND DRAWINGS THESE SHOULD BE BROUGHT TO THE ATTENTION OF RENAISSANCE FOR REVIEW.
 - RWPs, SVPS, SSS AND FLOOR GULLEYS TO BE TRAPPED AND HAVE RODDABLE ACCESS
 - THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
 - MINIMUM COVER TO DRAINAGE CROWN LEVEL:
LANDSCAPED AREAS- 0.35m
TRAFFICKED AREAS- 0.90m
ADOPTED HIGHWAYS- 1.20m
 - ALLOW FOR HIGHWAYS GULLIES, CHANNEL DRAINS AND BRANCH DRAINS [OMITTED FOR CLARITY]
 - OUTLINE DRAINAGE STRATEGY AND PROPOSED DISCHARGE RATE IS TO BE DISCUSSED AND AGREED WITH THE LEAD LOCAL FLOOD AUTHORITY AND UNITED UTILITIES AS PART OF A PLANNING PRE-APPLICATION AND PRE-DEVELOPMENT ENQUIRY RESPECTIVELY.

- DRAWING LEGEND**
- SITE BOUNDARY
 - PROPOSED SURFACE WATER DRAINAGE (150 DIA PIPES AND 450 DIA PPIC UNO)
 - PROPOSED FOUL WATER DRAINAGE (150 DIA PIPES AND 450 DIA PPIC UNO)
 - UNITED UTILITIES COMBINED SEWER
 - 1200 DIA PCC MANHOLE W/ HYDROBRAKE FLOW CONTROL DEVICE
 - CHANNEL DRAIN
 - GEO-CELLULAR ATTENUATION TANK
 - APPROXIMATE EXTENT OF CORNBROOK CULVERT BELOW. REFER TO CULVERT SURVEY SUMMARY (REF: VST-REN-ZZ-XX-SK-S-01100)

P01	FOR INFORMATION	01.02.23	HW	HG
Rev.	Description:	Date:	By:	Chkd:



Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

**VIRGIL STREET,
TRAFFORD**

Drawing Title:

DRAINAGE STRATEGY

Status:

STAGE 2

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	FEB'23	HW	--	HG

Scale:	1: 200	Project No:	2202-01
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Project:	Originator:	Volume:	Level:	Type:	Role:	Category/Number:	Rev:
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VST-REN-XX-00-DR-C-01100-P01