



Land at Pilsworth Road, Heywood, OL10 3ET

Surface Water Drainage Strategy 23-511

Revision	Description	Issued by	Checked	Date
P01	First issue	AW	MN	13/12/2023

Prepared by:	Signed:	Date
AW		13/12/2023

Approved by:	Signed:	Date
MN		13/12/2023

Table of Contents

1	Introduction	4
2	Policy Compliance	5
3	Site Location and Proposed Development	5
4	Geology and Infiltration Potential.....	6
5	Existing Drainage	6
6	Climate Change Allowances	7
7	Sustainable Urban Drainage (SuDS) Assessment	7
8	Surface Water Drainage Strategy	8
9	Water Quality	8
10	Schedule of Maintenance	9
11	CONCLUSION	10

Appendices

Appendix A – Architect Plans and topographical survey

Appendix B – Drainage strategy

Appendix C – Calculations

Appendix D – Sewer Records

Appendix E - Site Investigation

1 Introduction

QED Structures has prepared this Surface Water Drainage Strategy (SWDS) for the land at Pilsworth Road, Heywood, OL10 3ET.

It is understood the proposed development is comprised of a residential development for a specialist supported living complex (Use Class C3(b)) comprising 8no. flats with ancillary worker facilities, refuse store and landscaping.

The site is currently a greenfield site, consisting of a grassed field with trees and is on a platform raised relative to existing ground levels.

Reference to the British Geological Survey (BGS) map shows that the underlying solid geology in the location of the subject site is Pennine Lower Coal Measures Formation consisting of mudstone, siltstone and sandstone. Overlying this are superficial deposits of Till, Devensian – Diamicton.

Site investigation (Appendix E), carried out by Soiltechnics, found infiltration rates at the site to be 'effectively impermeable for the purposes of drainage design'. Based on this, infiltration is not considered to be feasible for managing surface water runoff at the site.

Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere.

Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances. The data published on the DEFRA database shows the site located within the Irwell Management Catchment and for this residential development (lifespan 100yrs) an upper end allowance of 45% should be applied to rainfall events as the climate change allowance within this region.

Calculations have been undertaken using the Causeway Flow+ software, using the FEH22 rainfall data. The preliminary calculations consider a hardstanding area of 560m² with an additional allowance of 430m² in case of future development.

Current local Sustainable drainage guidance is to achieve as close as feasible to greenfield runoff rates for storm runoff from new developments. A Hydrobrake is proposed to control runoff to below greenfield rates. This will reduce runoff rates to a maximum of 1.4l/s for all events up to and including the 1 in 100 year + 45%CC event.

Attenuation storage is proposed to be provided by a geocellular tank which will be 4x20m in plan area of 0.8m in depth with a storage volume of 60.8m³. Surface Water is to be discharged into a United Utilities surface water sewer to the north of the site. Any new offsite connection made will be subject to approval by United Utilities.

This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF) and the CIRIA SuDS Manual.

2 Policy Compliance

The purpose of this assessment is to demonstrate that the proposals outlined above can be satisfactorily accommodated without increasing the risk of flooding for the area or without placing the development itself at risk of flooding, as per the:

- National Planning Policy Framework
- CIRIA SuDS Manual

3 Site Location and Proposed Development

The site location is land at Pilsworth Road, Heywood, OL10 3ET.

It is understood the proposed development is comprised of a residential development for a specialist supported living complex (Use Class C3(b)) comprising 8no. flats with ancillary worker facilities, refuse store and landscaping.

The site is currently a greenfield site, consisting of a grassed field with trees and is on a platform raised relative to existing ground levels.

Architectural plans are included in Appendix A as well as a site-specific topographic survey.

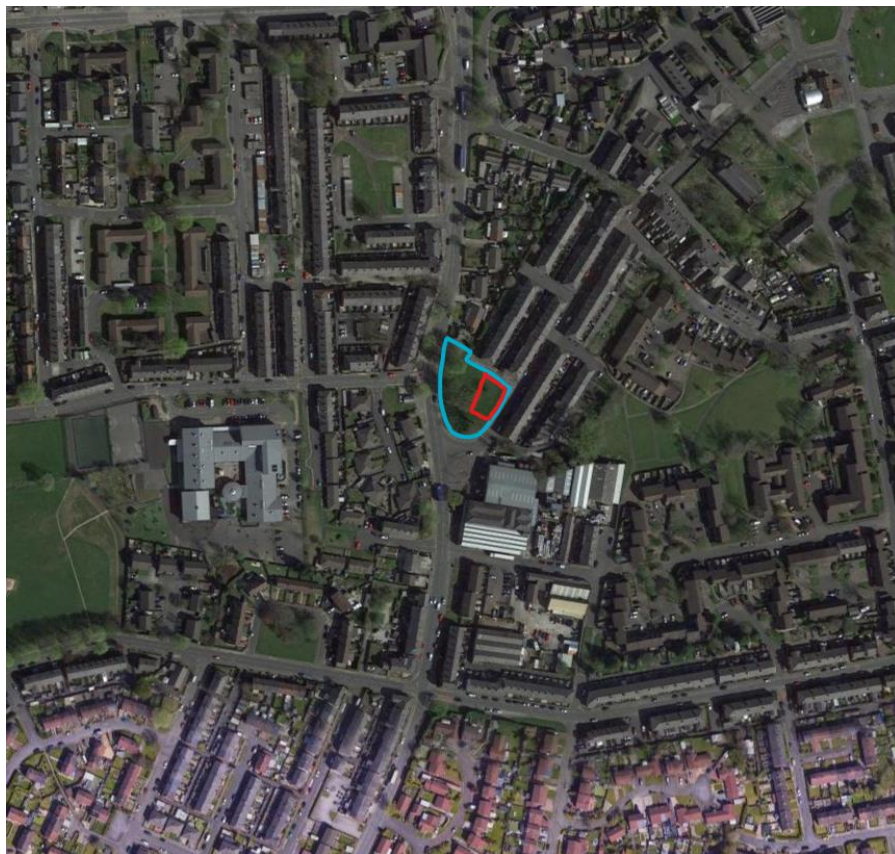
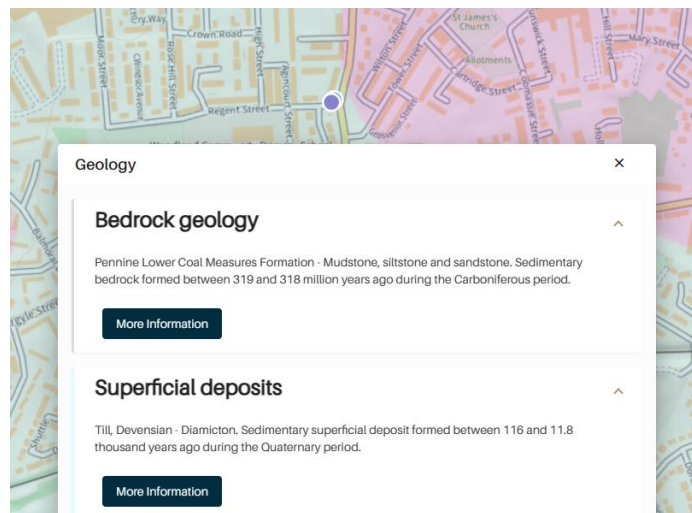


Figure 1 Site Location. Blueline shows the site. Redline shows the extent of the development

4 Geology and Infiltration Potential

Reference to the British Geological Survey (BGS) map shows that the underlying solid geology in the location of the subject site is Pennine Lower Coal Measures Formation consisting of mudstone, siltstone and sandstone. Overlying this are superficial deposits of Till, Devensian – Diamicton.

Site investigation (Appendix E), carried out by Soiltechnics, found infiltration rates at the site to be ‘effectively impermeable for the purposes of drainage design’. Based on this, infiltration is not considered to be feasible for managing surface water runoff at the site.



5 Existing Drainage

Given the site is currently open green space it is considered unlikely there are existing drainage connections from the site.

United Utilities have provided local sewer records and these show a 375mm combined drain running southwards on Tower Street to the east of the development. Additionally shown is a 150mm surface water drain at the north corner of the site running north along Pilsworth Road. Sewer record plans are included in Appendix D. Proposals are to connect to the storm sewer in line with the SuDS hierarchy.



Figure 3: UU Sewer record extract

6 Climate Change Allowances

Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere.

Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances. The data published on the DEFRA database shows the site located within the Irwell Management Catchment and for this residential development (lifespan 100yrs) an upper end allowance of 45% should be applied to rainfall events as the climate change allowance within this region.

7 Sustainable Urban Drainage (SuDS) Assessment

In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development. An initial drainage strategy plan is provided in Appendix B.

The management of surface water has been considered in respect to the SuDS hierarchy below as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3:

SUDS DRAINAGE HIERARCHY				
			Suitability	Comment
	1.	Store rainwater for later use	✓	Rainwater harvesting is being considered by the developer and could be used around the wider site where feasible
	2.	Use infiltration techniques, such as porous surfaces in non-clay areas	x	Site investigation found soil to be 'effectively impermeable for the purposes of drainage design'. As a result infiltration is not considered viable for managing surface water runoff
	3.	Attenuate rainwater in ponds or open water features for gradual release	x	The area within the redline boundary of the site does not provide sufficient space for open SuDS features
	4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	A geocellular tank is proposed to provide necessary attenuation storage
	5.	Discharge rainwater direct to a watercourse	x	No watercourse near the site
	6.	Discharge rainwater to a surface water sewer/drain	✓	It is proposed that surface water is discharged to a surface water sewer to the north of the site
	7.	Discharge rainwater to Combined Sewer	-	Unnecessary due to management further up hierarchy

Table 3 SuDS Drainage Hierarchy

The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as follows in the below table.

SUITABILITY OF SUDS COMPONENTS		
SuDS Component	Comment	Suitability
Soakaways	Site investigation shows infiltration to be nonviable for managing surface water runoff	x
Permeable Pavement	Not considered suitable due to poor infiltration	x
Green / Blue Roofs	Green/Blue Roofs are being considered by the developer	✓
Rainwater Harvesting	It is recommended that a rainwater harvesting tanks are considered for the block of flats in order to reduce the clean water usage of the site by providing water for toilet flushes and washing machines, while simpler devices like water butts are considered for the proposed houses to provide water for watering of private garden spaces.	✓
Swales	Swales are deemed unnecessary for the site	x
Rills and Channels	These could be incorporated in to the proposed landscaping plan but overall provide only small additional storage capacity compared to the required site runoff to be managed.	✓
Bioretention Systems	These could be incorporated in to the proposed landscaping plan but overall provide only small additional storage capacity compared to the required site runoff to be managed.	✓
Retention Ponds and Wetlands	The area withing the redline boundary of the site does not provide sufficient space for open SuDS features	x
Detention Basins	The area withing the redline boundary of the site does not provide sufficient space for open SuDS features	x
Proprietary Treatment Systems	Sediment traps and catchpit chambers should be implemented to reduce the potential of silting up and leaves entering the soakaway	✓
Filter Drains and Filter Strips	The site is not deemed suitable for filter drains.	x
Geocellular tank	Geocellular systems can be configured to suit almost every site/development. They can be used in this development to provide necessary attenuation storage.	✓

Table 4: Suitability of SuDS Components

8 Surface Water Drainage Strategy

Calculations have been undertaken using the Causeway Flow+ software, using the FEH22 rainfall data.

The preliminary calculations consider a hardstanding area of 560m² with an additional allowance of 430m² in case of future development.

Current local Sustainable drainage guidance is to achieve as close as feasible to greenfield runoff rates for storm runoff from new developments. A Hydrobrake is proposed to control runoff to below greenfield rates. This will reduce runoff rates to a maximum of 1.4l/s for all events up to and including the 1 in 100 year + 45%CC event.

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9 Water Quality

The primary risk to water quality is from the roof areas. As they can be considered residential roofs, and residential roof are largely considered to be uncontaminated specific pollution mitigation measures are not considered to be necessary, in line with the treatment index methodology outlined in the Ciria SuDS Manual C753.

Runoff from the roofs entering the geocellular tank is to be treated via sediment traps and catchpit chambers.

■ Hove ■ London ■ Manchester ■ Leeds ■ Barcelona

10 Schedule of Maintenance

All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be agreed with the site owners before adoption.

In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

The property owner will be responsible for the management and maintenance of SuDS devices. Therefore, the proposed SuDS features will not be adoptable. Typical key suds components operation and maintenance activities are provided below.

Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Attenuation crates	See Comments	See Comments	See Comments	Maintained in accordance with manufacturer's recommendation
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Hydrobrake	6 monthly	As required	N/A	Cleansing to be carried as necessary. Inspect after heavy rainfall event
Catchpits	1 year	1 year	N/A	Cleansing to be carried as necessary

Table 8: Schedule of maintenance for below ground drainage

The maintenance of the geocellular system should be in accordance with the manufacturer's recommendations

11 CONCLUSION

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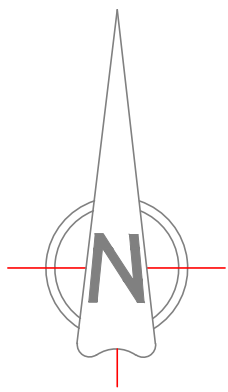
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APPENDIX A – ARCHITECT PLANS AND TOPOGRAPHICAL SURVEY



Abbreviations/Symbols (Measured Building Surveys):

- C: Window Cill Height
H: Window Head Height
BH: Beam Height
DH: Door Height
COL: Column
SVP: Soil Vent Pipe
FL: Floor Level
TH: Threshold Level
Floor to Ceiling Height
Vaulted Ceiling

Line types

- Hedge Lines
Drainage Runs
Overhead Electricity Cables
Overhead Telephone Cables

Symbols

- Tree/Bush
Control Station
Borehole
Trial Hole
Glass House
Ostom

Abbreviations (Topographic Survey):

- AH: Arch Height
AV: Air Valve
BB: Belta Beacon
BOB: Electricity Box, Cables Box, Etc.
BOL: Bollard
BS: British Telecom Inspection Chamber
BS: Bus Stop
BS/LP: Bus Stop / Lamp Post
CAIV: CAIV Inspection Chamber
CCIV: Closed Circuit Television
CL: Cellar Light
CLP: Catch Pit
ER: Earth Road
EC: Electricity Inspection Chamber
EP: Electricity Pole
FH: Fire Hydrant
FP: Flag Pole
GV: Gas Valve
G: Gully
IC: Inspection Chamber
KO: Kerb Outlet
LP: Lamp Post
LB: Letter Box
LC: Lighting Column
M: Marker
MH: Manhole
MP: Mooring Point
MS: Mile Stone
NYNEX: Nynex Inspection Chamber
O/H: Over Hang
P: Post
PO/IC: Post Office Inspection Chamber
R/S: Road Sign
RE: Roadside Eye
RTW: Retaining Wall
S/P: Sign Post
SNP: Street Name Plate
ST: Stop Tap
SV: Stop Valve
T: Telecom Inspection Chamber
TCB: Telephone Call Box
TH: Threshold Level
TL: Traffic Light
TP: Telegraph Pole
TROUGH: Trough
WO: Water Outlet
WM: Water Meter

Fence Descriptions:

- B/W: Barbed Wire
C/B: Close Boarded
C/BARRIER: Crash Barrier
C/L: Chain Link
C/P: Chestnut Paving
C/I: Corrugated Iron
I/R: Iron Rolling
MIS: Miscellaneous
P/R: Post & Rail
P/W: Post & Wire
P/C: Post & Chain
S/PAL: Steel Palisade
W/M: Wire Mesh

Survey Notes:

Coordinates and Levels related to Ordnance Survey Datum - GPS OSGB36

Revision	Date	Description



Chris Parlington Land Surveyors

56a Carrington Lane

Sale

Cheshire

M33 5NR

T: 0161 976 1194

www.cpls.co.uk esurvey@cpls.co.uk



Client
Triangle Architects

Project
Pilsworth Road, Heywood
Site Survey

Scale	Surveyed By	Date
1:200	J C	09.10.23
Drawing No.	Checked By	Date
091023JC-01	CPLS	10.10.23
	Drawn By	Date
	J C	10.10.23

Station	Easting	Northing	Level
1	384967.777	410472.403	112.461
2	384941.437	410463.764	110.161

0 2 4 6 8 10 20m

SCALE 1:200

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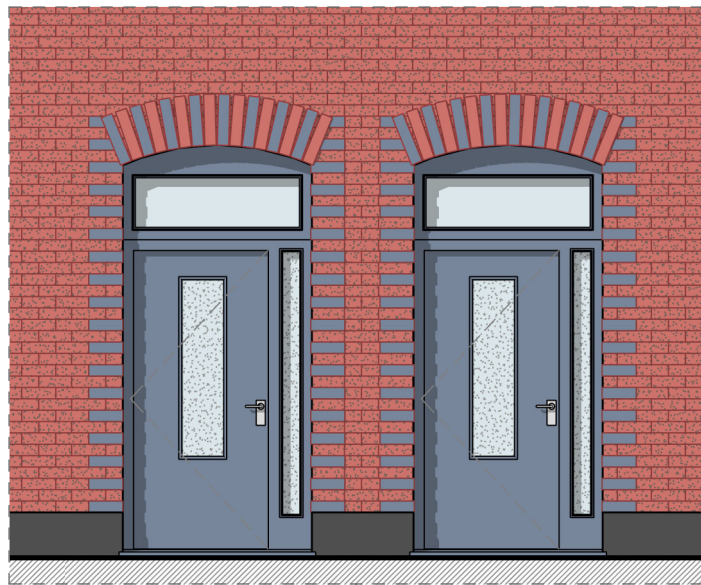
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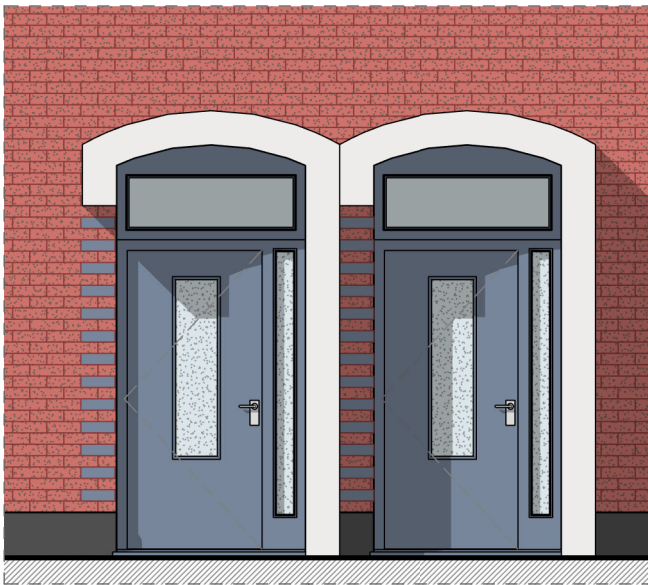
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■ CHECK ALL DIMENSIONS ON SITE.

■ DRAWING TO BE READ IN CONJUNCTION WITH THE HEALTH & SAFETY PLAN AND ALL RELEVANT RISK ASSESSMENTS AND THE FOLLOWING DRAWINGS:



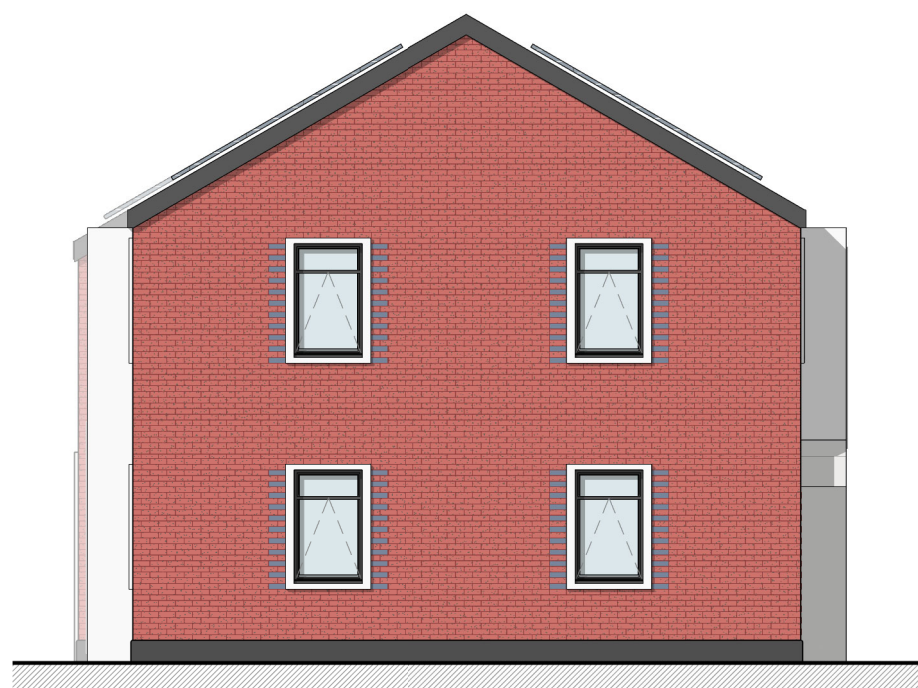
Entrance Door Detailing
Option 1



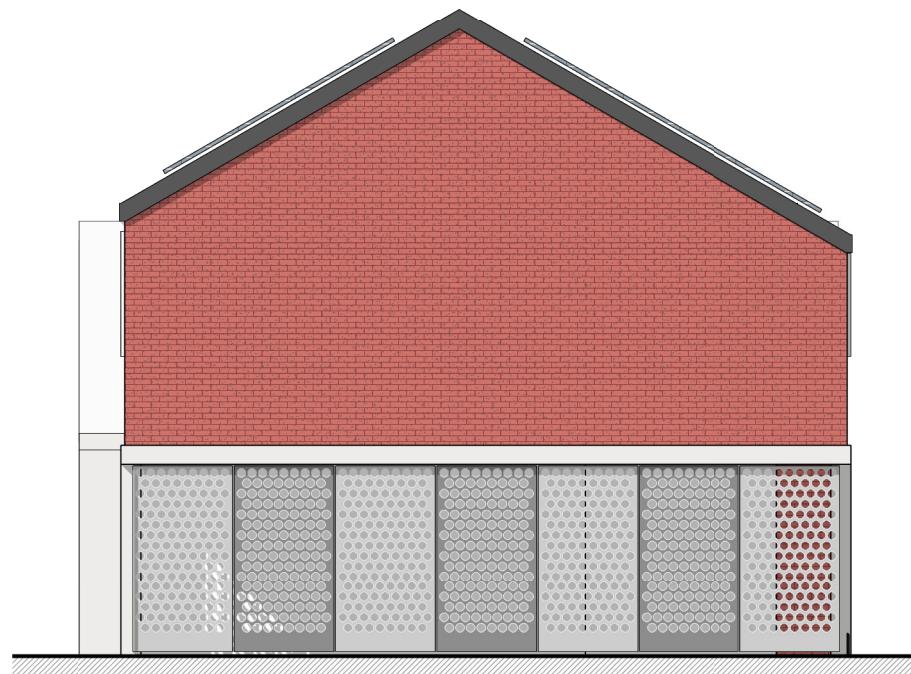
Entrance Door Detailing
Option 2



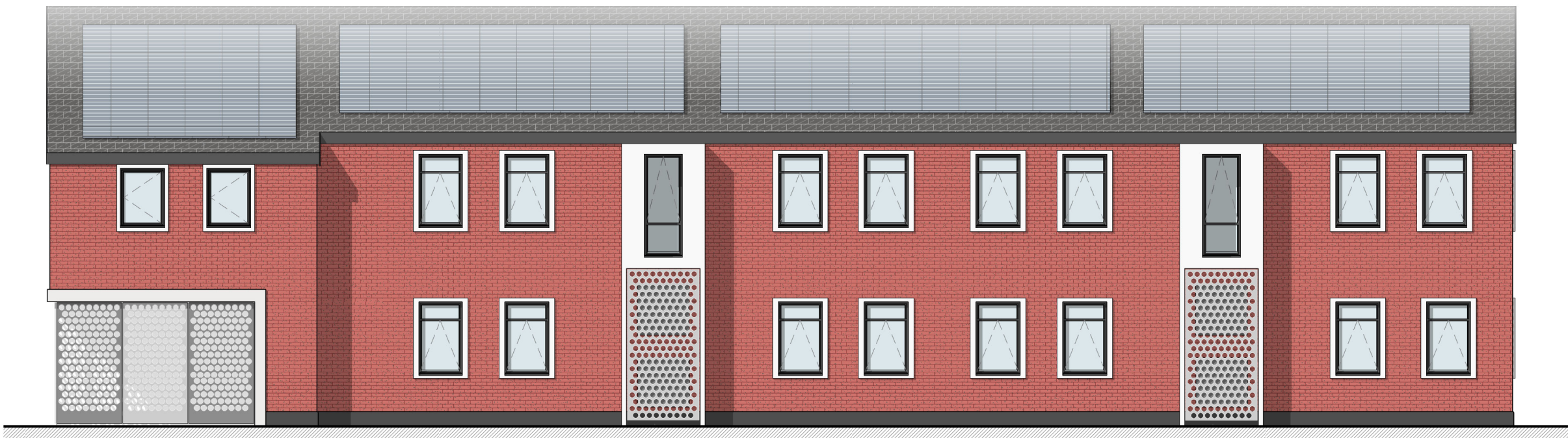
FRONT ELEVATION



SIDE ELEVATION 1



SIDE ELEVATION 2



REAR ELEVATION

Scale 1:100

0m 1m 2m 5m



Precedent 1 - Existing Context

The Victorian terraces along Tower Street demonstrate the attention to detail and craftsmanship of the bricklayers of the time, with decorative arch features accentuating the doors and windows. The tall, narrow proportions of the properties create a dense rhythm of fenestration. These features, along with the deep red Victorian brick, inspire the design, which re-interprets these features in a contemporary manner.



Precedent 2 - Port Loop, Birmingham

This precedent recreates similar tall, narrow proportions to the Victorian terraces, and accentuates the portrait windows with surround features. A similar feature is incorporated in the design to accentuate the fenestration and provide depth to the facade.



Precedent 3 - Seven Acres, Cambridge

The monolithic brick forms cantilever over the timber clad undercrofts, concealing the service spaces below the main building. A similar principle is adopted for the cycle and bin stores, with the brick mass extending over the cycle and bin stores, which are enclosed with perforated metal panels.

P02	07.12.23	JS	Drawings amended with two emergency accommodation, extended undercroft space, and developed elevational detailing.
P01	24.11.23	JS	Draft floor plans & elevations issued for comment.
Rev	Date	By	Remarks

Client:	Cornerstone Place				
Project Name:	Pilsworth Road				
Drawing Name:	Proposed Elevations				
Drawing Purpose:	INFORMATION				
Project Number:	Drawing Number:			Revision:	
23-030	SK16			P02	
Scale @ A1	Drawn:	Checked:	Date:		
As indicated	JS	AJD	November 2023		

TRIANGLE
ARCHITECTS

Tel: 0161 272 3500
E-mail: studio@trianglearchitects.co.uk
Web: www.trianglearchitects.co.uk
Twitter: @TriangleArch

Raven House,
113 Farfield Street,
Manchester,
M12 6EL



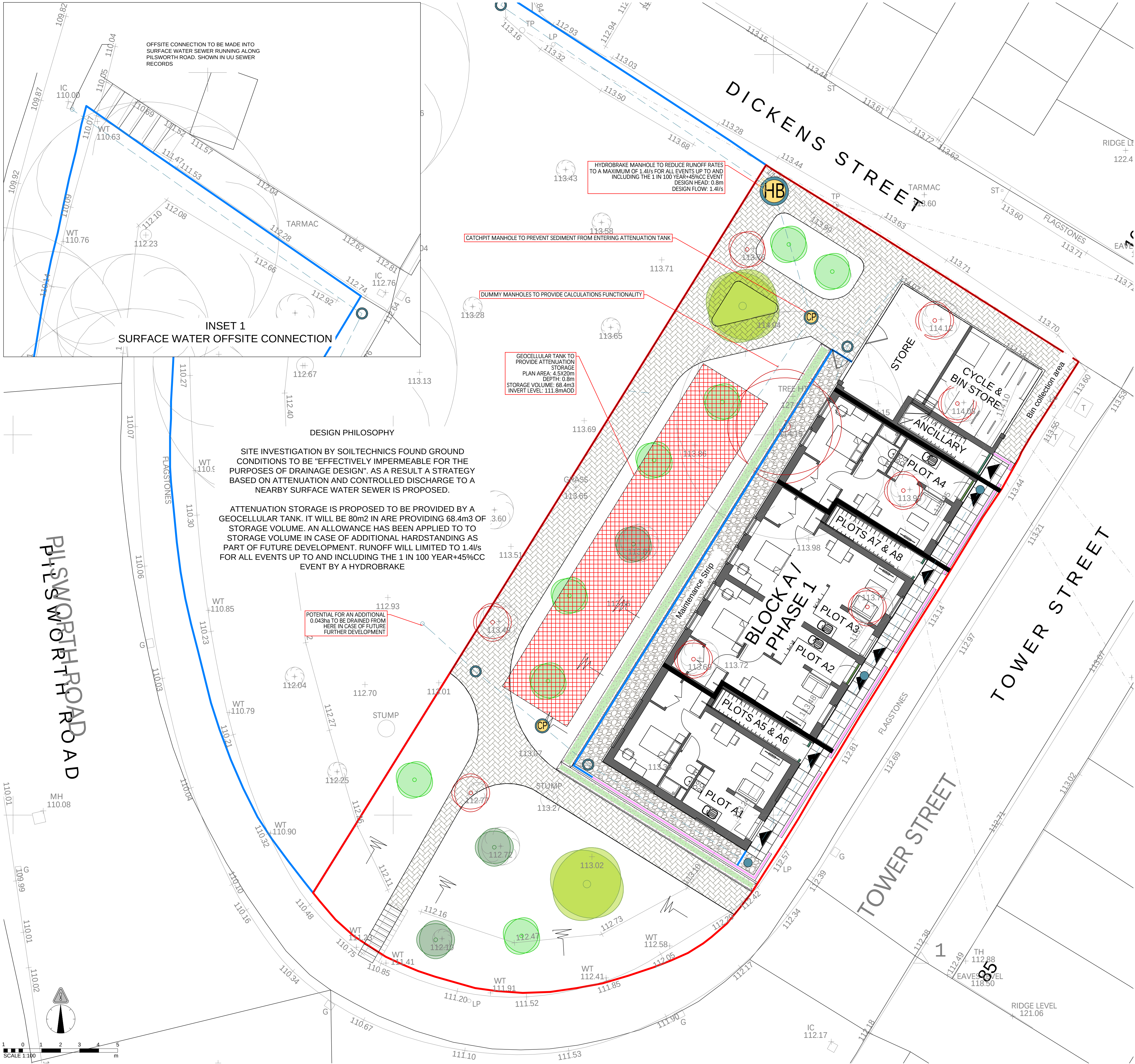
APPENDIX B – DRAINAGE STRATEGY

NOTES

- This drawing shall be read in conjunction with the civil engineering specification, and all relevant Architect's and Engineer's drawings.
- This document must not be altered, reproduced or distributed without prior written consent of the originator.
- Do not scale from this document – use figured dimensions only. All dimensions must be checked on site prior to commencement of any related works.
- Contractor to provide and have an approved method statement prior to works.
- All setting out to be in accordance with the Architects drawings. Any discrepancies between QED Structures and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
- All levels are in metres above ordance datum.
- The Contractor is to comply full with CDM regulations in the course of constructing the works.
- At the commencement of the works, the Contractor is to carry out trial pits and liaise with utility companies in order to establish the exact position of all existing utility plant in the vicinity of the works and take adequate precautions for their protection.
- The Contractor is to refer to Health and Safety Executive 'Note 47 – Avoiding Danger from Underground Services' and 'Document C56 – Avoiding Danger from Overhead Electric Lines'.
- Works on or adjacent to existing public highway will be executed in accordance with the Traffic Safety Code for Road Works and Traffic Signs Manual; Chapter 8.
- The Contractor will ascertain the CBR value of the subgrade in order to determine the required sub-base / capping thickness. Prior to laying any material, the subgrade must be inspected and any soft spots removed and filled with 6F2 capping material.
- Prior to the construction of any drainage works, the Contractor is to confirm the invert levels of existing manholes, drains and sewers. Any variations from the designed levels shown on the drawings must be reported to the Drainage Engineer in advance of construction works commencing. All new sewers and drains are to be laid in sequence starting from the outfall location.
- All drainage to be installed in accordance with relevant Building Regulation documents and current Sewers for Adoption. Connections to public sewers are to be agreed and inspection by the Water Authority.
- All drain and sewer pipes are Ø100mm and laid soffit to soffit, unless shown otherwise.
- Invert to base of soil stack bends to be 450mm below lowest branch connection for up to three storey buildings; for buildings up to five storeys, the invert to the base of soil stack bends should not be less than 750mm. All foul and surface water drainage stacks are to have above ground ridding access. Refer to above ground drainage layout(s) by others.
- All below ground connections are to match above ground outlet size, minimum Ø100mm. SVPs are to project 100mm above finished floor level.
- All internal manholes and inspection chambers to have double sealed recessed covers to suit floor finishes as defined by the Architect.
- All external covers in non-asphalt areas are to have recessed covers to suit the paving material.
- A CCTV survey and report in WINCAN format for all new drainage will be required prior to 'as built' drawing being issued.
- The Contractor is responsible for the traffic safety and management associated with the construction of the works. Works will not commence on the existing highway until their traffic management proposals have been agreed with Highway Authority.
- Where the works involve the obstruction of a footway, the Contractor will provide an alternative safe footway properly signed, guarded and lit.
- Where one-way traffic is unavoidable, traffic will be controlled by a proper system of vehicle-actuated traffic signals or manual stop / go signs and during the hours of darkness, by a proper system of vehicle-actuated traffic signals, all to the approval of Highway Authority.
- 65mm Minimum thickness tactile paving, coloured buff will be incorporated at all pedestrian crossings in accordance with the Department for Transport and Regions document "Guidance on the Use of Tactile Paving Surfaces." (DETR No. 1998)
- All signs and road markings will be in accordance with the "Traffic Signs Regulations and General Directions 2016". (TSRGD 2016)
- All excavation and backfilling work in the existing highway to be in accordance with the provisions of the New Street Works Act 1991 or that specified on the working drawings.
- All highways works to be carried out in accordance with Highway Authority's highway standards, to the satisfaction of the Highway Authority Section 278 Inspector and in accordance with the Specification for Highway Works.
- Gullies, gully connections, drains, manholes, catch pit, soakways, headwalls and other drainage structures intended to convey only highway water are to be constructed in accordance with the specification of Highway Authority and to the satisfaction of the Highway Inspector.
- Where existing junctions and accesses are to remain in operation within the works during the construction process, the Contractor will ensure that access to these units remains available at all times.
- Highways in the vicinity of the works must be kept free from mud, debris and dust falling from vehicles or wheels of vehicles connected with the works. Where the deposits of debris and mud are unavoidable, warning signs must be displayed whilst work is in progress and affected carriageways / footways must be regularly cleaned.

Source:

- Topographical survey by ?
- Drawing No. ? dated ?
- Architect's layout by ?
- Drawing No. ? dated ?



OFFSITE CONNECTION TO BE MADE INTO SURFACE WATER SEWER RUNNING ALONG PILSWORTH ROAD. SHOWN IN UU SEWER RECORDS

INSET 1
SURFACE WATER OFFSITE CONNECTION

DESIGN PHILOSOPHY

SITE INVESTIGATION BY SOILTECHNICS FOUND GROUND CONDITIONS TO BE "EFFECTIVELY IMPERMEABLE FOR THE PURPOSES OF DRAINAGE DESIGN". AS A RESULT A STRATEGY BASED ON ATTENUATION AND CONTROLLED DISCHARGE TO A NEARBY SURFACE WATER SEWER IS PROPOSED.

ATTENUATION STORAGE IS PROPOSED TO BE PROVIDED BY A GEOCELLULAR TANK. IT WILL BE 80m2 IN ARE PROVIDING 68.4m3 OF STORAGE VOLUME. AN ALLOWANCE HAS BEEN APPLIED TO TO STORAGE VOLUME IN CASE OF ADDITIONAL HARDSTANDING AS PART OF FUTURE DEVELOPMENT. RUNOFF WILL LIMITED TO 1.4l/s FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR+45%CC EVENT BY A HYDROBRAKE

POTENTIAL FOR AN ADDITIONAL 0.043ha TO BE DRAINED FROM HERE IN CASE OF FUTURE FURTHER DEVELOPMENT

HYDROBRAKE MANHOLE TO REDUCE RUNOFF RATES TO A MAXIMUM OF 1.4l/s FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR+45%CC EVENT
DESIGN HEAD: 0.8m
DESIGN FLOW: 1.4l/s

CATCHPIT MANHOLE TO PREVENT SEDIMENT FROM ENTERING ATTENUATION TANK

DUMMY MANHOLES TO PROVIDE CALCULATIONS FUNCTIONALITY

GEOCELLULAR TANK TO PROVIDE ATTENUATION STORAGE
PLAN AREA: 4.5x20m
DEPTH: 0.8m
STORAGE VOLUME: 68.4m3
INVERT LEVEL: 111.8mAOD

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- THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS

LEGEND

- PROPOSED SW PIPE RUN
- PROPOSED TYPE 3 SW INSPECTION CHAMBER
- PROPOSED TYPE 4 SW INSPECTION CHAMBER
- PROPOSED HYDROBRAKE MANHOLE
- CATCHPIT CHAMBER/MANHOLE
- GEOCELLULAR ATTENUATION - TANKED

P01	Issued for information	N.Y.I.		
REV	DESCRIPTION	DATE	BY	APP

CONSULTING CIVIL AND
STRUCTURAL ENGINEERS
TEL +44 (0) 1273 033680

QED PROJECT No.

23-511

CLIENT

Cornerstone Place

PROJECT

Pilsworth Road
Heywood
OL10 3BT

TITLE

Surface Water Drainage Strategy

DRAWN	ENGINEER	CHECKED BY	APPROVED BY
CL	MN	MN	MN

DATE APPROVED 07/02/2024 SCALE @ A1 1:100

STATUS

S3 - Suitable for Review and Comment

DRAWING No.	REVISION
23-511-QED-XX-XX-DR-C-02	P01



APPENDIX C – CALCULATIONS



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓ 1	0.099	4.00	110.000	Manhole	Adoptable	1200	47.299	73.051	1.425
✓ Depth/Area 1			110.000	Junction			47.807	32.034	2.080
✓ 2			110.000	Manhole	Adoptable	1200	51.706	-6.610	2.770

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node Depth/Area 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.001	Sump Available	✓
Replaces Downstream Link	x	Product Number	CTL-SHE-0059-1400-0800-1400
Invert Level (m)	107.920	Min Outlet Diameter (m)	0.075
Design Depth (m)	0.800	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.4		

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	107.920
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	416

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	80.0	0.0	0.800	80.0	0.0	0.801	0.0	0.0



Results for 2 year Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	9	108.662	0.087	16.8	0.0983	0.0000	OK
360 minute summer	Depth/Area 1	232	108.078	0.158	4.3	12.0345	0.0000	OK
360 minute summer	2	232	107.252	0.022	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	Depth/Area 1	17.1	1.987	0.259	0.3925	
360 minute summer	Depth/Area 1	1.001	2	1.3	0.686	0.019	0.0748	23.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	9	108.717	0.142	42.4	0.1602	0.0000	OK
240 minute summer	Depth/Area 1	192	108.292	0.372	11.2	28.2440	0.0000	SURCHARGED
60 minute summer	2	114	107.252	0.022	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	Depth/Area 1	43.0	2.218	0.654	0.9597	
240 minute summer	Depth/Area 1	1.001	2	1.4	0.698	0.020	0.0780	42.2



Results for 100 year Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	9	108.739	0.164	53.4	0.1857	0.0000	OK
240 minute winter	Depth/Area 1	232	108.414	0.494	9.2	37.5619	0.0000	SURCHARGED
30 minute summer	2	92	107.252	0.022	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	Depth/Area 1	54.1	2.254	0.822	1.1948	
240 minute winter	Depth/Area 1	1.001	2	1.4	0.698	0.020	0.0780	52.5



Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.25%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	109.040	0.465	77.5	0.5261	0.0000	SURCHARGED
360 minute winter	Depth/Area 1	344	108.704	0.784	9.9	59.5981	0.0000	SURCHARGED
15 minute summer	2	101	107.252	0.022	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	Depth/Area 1	76.1	2.241	1.157	1.6314	
360 minute winter	Depth/Area 1	1.001	2	1.4	0.698	0.020	0.0780	84.3



APPENDIX D – SEWER RECORDS

SEWER RECORD

Land at Pilsworth Road



The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

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APPENDIX E – SITE INVESTIGATION

Non-technical Summary

Topic	Commentary
Site description	The site comprises an area of soft landscaping with mature trees present and a footpath through the centre. The site is currently unoccupied but accessible to the general public. Adjacent land uses are occupied mostly by residential housing.
Development proposals	The scheme comprises the construction of a two-storey residential development, containing 8 No. 1-bedroom flats with a central stair core, ancillary space and soft landscaping. The development is controlled under the Rochdale Borough Council planning regime, under application reference 23/01381/FUL/2023.
Ground conditions	The site is underlain by up to 0.4m of topsoil with Made Ground only encountered within WS04 between depths of 0.25-0.55m. Devensian Till deposits were recorded underlying topsoil/Made Ground to a depth of 1.7m to 2.6m bgl. Bedrock deposits of weathered Pennine Lower Coal Measures Formation comprising clays and gravels were encountered at the base of all boreholes.
Development constraints	Several trees including a high water demand oak tree, 2 No. stumps (unknown species) and younger assumed medium water demand trees are located close to or beneath the proposed building footprint. As such all foundations will need to be deepened within influencing distance of such vegetation.
Mining Risk	The site is recorded within a coal mining reporting area, but outside of a Development High Risk Area. Based on review of mining legacy risks, the risk of instability occurring on site is considered to be very low.
Foundation and slab solution	Trench fill foundations extending onto the natural Devensian Till/weathered Pennine Lower Coal Measures can be adopted for the development. Foundations depth will be dictated by proximity of existing trees/stumps. Suspended floor slabs should be adopted. Heave protection measures will be necessary within foundation excavations. It is recommended that a concrete classification of DS-1 AC-1s is recommended for sub-surface concrete.
Drainage potential	Permeability testing was performed within the natural strata, however, very low permeability rates (9.27×10^{-7} and 1.26×10^{-6} m/s) were calculated. Given the cohesive nature of the shallow soils, it is unlikely that shallow soakaway solutions for surface water drainage will be feasible. Assessment of bedrock could be undertaken, which may exhibit permeability, but further testing would be necessary to confirm, or otherwise.
Chemical contamination and remedial requirements	Potential risks from contamination have been identified within shallow topsoil/Made Ground which would require remedial works to progress the development through planning. Given the limited thickness of topsoil/Made Ground across the site (0.3-0.55m), it is recommended that topsoil/Made Ground is removed to natural uncontaminated formation level within proposed soft landscaping areas. These soils should be replaced with a minimum 150mm depth of clean, imported topsoil.
Radon, gas risk and protection measures	The site is at a low risk from ground gas migration associated with off-site areas of infilled ground. The site is in an area where the above ground radon Affected Area status is classed as a Lower Probability Radon Area therefore no radon protection measures
Recommendation for further works	A Remediation Strategy and subsequent Verification Report.