

Seven Sisters/ Eade Road: Planning Application for new warehouse living buildings

1547-LSL-XX-XX-RP-C-SWS

Surface Water Drainage Strategy

January 2023



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1.0 Introduction

1.1 Scope

London Structures Lab was commissioned by Provewell Limited (the Applicant) to provide structural and civil engineering services for the proposed development located at the junction of Seven Sisters and Eade Roads, Haringey, London N15 6RD.

This report has been produced in support of a planning application and should be read in conjunction with the other planning documents.

1.2 Sources of Information

This report has been prepared based on the following set of information:

- Topographical Survey by Point 2 Surveyors Limited, drawing reference LS2583/T 2 dated October 2022
- Building Layout proposed by Morris and Company, drawing numbers 05001 dated September 2022
- Landscape proposal by Campbell Cadey Architects, drawing numbers 2205_PL_001 to 006 dated January 2023
- Utilities records – Thames Water record reference ALS/ALS Standard/2022_4631067, dated April 2022
- Haringey Warehouse District Stage 1 report by Morris and Company, reference A343-10.01-018, dated May 2022
- Utilities Report by Landmark Information Group, report reference LM / 107336 dated May 2022
- Haringey Warehouse District Sustainable Drainage Strategy report by Expedition, dated August 2021
- Environment Agency (EA) online flood maps at <https://flood-map-for-planning.service.gov.uk/>
- British Geological Survey online mapping available at https://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.111570884.1580712057.1616278391-1852494143.1597654958



- Magic website mapping available at <https://magic.defra.gov.uk/magicmap.aspx>
- Guidance on Flood risk and coastal change – UK Government, available from <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability>
- Lead Local Flood Authority (LLFA) information – Strategic Flood Risk Assessment (c) dated March 2015 available at https://www.haringey.gov.uk/sites/haringeygovuk/files/2014s1700_haringeycouncil_sfra_v4_0_issue.pdf
- Lead Local Flood Authority (LLFA) information – London Borough of Haringey SuDS Design requirements for LLFA Technical Assessment version 1.0 dated 2016 available at https://www.haringey.gov.uk/sites/haringeygovuk/files/haringey_suds_guide_-_requirements_for_llfa_ta_issued_living_draft_final.pdf
- Lead Local Flood Authority (LLFA) information – London Borough of Haringey SuDS Design & Evaluation Guide, 2018, McCloy Consulting & Robert Bray Associates, https://www.haringey.gov.uk/sites/haringeygovuk/files/haringey_suds_design_evaluation.pdf

1.3 Limitations

This report has been prepared in accordance with the NPPF and Local Planning Policy. The proposed flood management (including ground floor level recommendations) and surface water management strategies are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice. The findings of this report are based on the information available at the time of the production.

The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves “construction” work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.



2.0 Site Setting

2.1 Site Description

The site covers approximately 0.24 ha in area and located within the London Borough of Haringey (the Council). The site is partially developed, occupied by a car park, a mechanics workshop and a Victorian end-terrace. The site is bounded by Seven Sister's Road and Eade Road to the south, existing development to the north and west and Tewkesbury Road and access stairs to the east. The approximate grid reference for the site is 532710E, 187980N.



Figure 2.1 – Site location plan

2.2 Proposed Development

The proposed development comprises two buildings – Block A to the east and Block B to the west. The buildings will be occupied by commercial and back-of-house areas at the ground and lower ground levels, with warehouse living accommodation at upper levels. Blue roofs are proposed for both blocks. 10 shipping containers stacked to two storeys will provide workspace/artist studios, toilet facilities and associated waste collection and cycle parking.



Across the site, hard and soft landscaping improvements are proposed. An improved connection between Seven Sister's Road and Tewkesbury Road is central to the scheme, with the existing Breaker's Yard developed to provide small commercial units and public amenity space.

2.3 Topography

The site has complex topography with levels generally dropping from south to north-east. The levels along the southern boundary adjacent to Eade Road and Seven Sisters Road 26.49 to 26.80 m AOD from west to east. The access from Tewkesbury Road is around 19.30 m AOD near the site boundary to the east. Currently there is a set of stairs connecting Seven Sisters Road with Tewkesbury Road with the levels drop of 3.77 m.

2.4 Hydrology

Ordnance Survey (OS) mapping and the EA's web-based mapping indicate that the River Lea (assume culverted) is located approximately 850 m to the northeast of the site. New River water transfer structure is located approximately 80 m south-southwest of the site, which feeds into East Reservoir approximately 265 m south of the site. West Warwick Reservoir is a water-body located approximately 1.6 km to the east of the site.

2.5 Geology

Based on the information available from BGS online mapping:

- Bedrock geology description - London Clay Formation - Clay, silt and sand. Sedimentary bedrock formed between 56 and 47.8 million years ago during the Palaeogene period.
- Superficial deposits – none recorded.

The nearest borehole records with similar geological profiles to the site available from this website are summarised below.

- TQ38NW468, approximately 130 m west of the site, dated 1992 - indicated uppermost 12 m made ground, with London clay between 12 to 42.5 m, with Reading Beds between 42.5 to 50.75 m, and Thanet Sands from 50.75 m to a drilled depth of 66 m. The cover level of the borehole was at 26.25 m AOD, with water rest level recorded at a depth of 47.74 m below cover level i.e. -21.49 m AOD.
- TQ38NW280, approximately 120 m south of the site, dated 1972 – indicated uppermost 2 m made ground, with stiff brown fissured clay with sulphate crystals and occasional pockets of orange silt between 2 to 10.10 m, and stiff blue fissured clay from



10.10 m to a drilled depth of 11.70 m. The cover level of the borehole was at 10.06 m AOD. Groundwater was not encountered at this borehole.

- TQ38NW95, approximately 125 m northeast of the site, undated – indicated uppermost 1.6 m made ground, with firm to stiff fissured brown silty clay with occasional gypsum crystals between 0.6 to 6.7 m, and stiff to very stiff fissured grey silty clay (London clay) from 6.7 m to a drilled depth of 26.5 m. The cover level of the borehole was at 18.7 m AOD. Groundwater was not encountered at this borehole.

Soilscape information available from Magic Maps service indicate this area as:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

At the time of the report production, no detailed site investigation works has taken place.

2.6 Hydrogeology

The following hydrogeological information was obtained from the online Magic Maps service.

- Aquifer destination (Bedrock) – Unproductive
- Aquifer Designation Map (Superficial Drift) – no features found
- Groundwater Vulnerability – Unproductive

BGS boreholes TQ38NW468 recorded rest water level at 47.74 m below a cover level of 26.25 m AOD. Groundwater was not encountered at BGS boreholes TQ38NW280 and TQ38NW95. The borehole depths were 11.70 m and 26.5 m respectively.

2.7 Existing Drainage

A schematic excerpt from Thames Water record reference ALS/ALS Standard/2022_4668973 is shown in Figure 2.2.

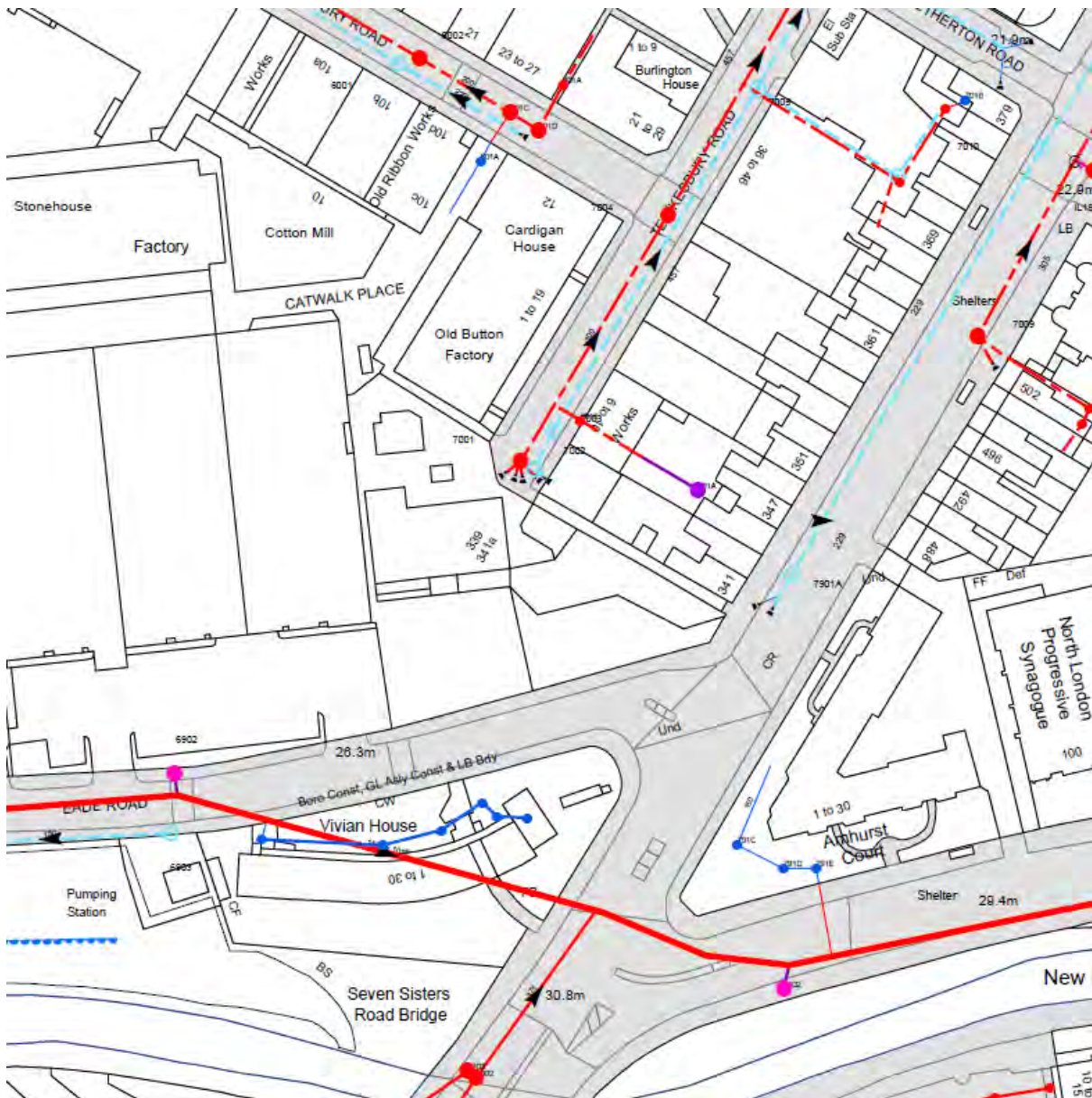


Figure 2.2 – Thames Water asset record reference ALS/ALS Standard/2022_4631067, dated April 2022

The Thames Water asset record shows that there is a combined sewer and surface water sewer located on Eade Road approximately 50 m southwest of the site, with a surface water sewer located on Seven Sister's Road approximately 15 m east of the site. Separate foul and surface water sewers run parallel along Tewkesbury to the north of the site.

Table 2.1 – Existing Thames Water manholes

Thames Water MH Ref	Location	Cover Level	Invert Level
6902 Combined Trunk Main	Eade Road	25.3	N/A
6903 SW	Eade Road	25.62	24.27



Thames Water MH Ref	Location	Cover Level	Invert Level
7901A SW	Seven Sister's Road	26.2	25.23
7001 FW	Tewkesbury Road	19.46	16.9
7002 SW	Tewkesbury Road	19.47	16.42

2.8 Summary of Flood Risk

The following table provides a summary of flood risk for the site. Please refer to the Flood Risk Assessment report (Ref: 1547-LSL-XX-XX-RP-C-FRA) for further details on sources of flooding.

Table 2.2 – Summary of sources of flood risk

Source of Flooding	Risk Level	Source of Data	Comments, Mitigation Requirements
Fluvial	Low	EA mapping	Flood zone 1
Tidal	Low	EA mapping	Inland location
Groundwater	Low	BGS mapping	Appraisal of BGS borehole logs from the closest available records to the site informed that water was struck at -21.49 m AOD at TQ38NW468, approximately 130 m west of the site. Groundwater was not encountered at BGS boreholes TQ38NW280 and TQ38NW95. The borehole depths were 11.70 m and 26.5 m respectively. Hence, the risk of ground water flooding to the site is considered to be low at this stage.
Surface water (Pluvial)	Low	EA mapping	EA surface water flood mapping indicates some limited localised surface water flooding along Eade Road and Seven Sister's Road adjacent to the southern site boundary. However, surface water flooding is not indicated within the development area, therefore the risk from surface water flooding is considered low.
Reservoirs, Canals	Low	EA mapping	Site not affected
Sewers	Low	LLFA information	At the time of report production, no records within any local flooding and drainage documents of sewer flooding in the area localised to the site were



Source of Flooding	Risk Level	Source of Data	Comments, Mitigation Requirements
			identified. Therefore, the risk of sewer flooding to the site is considered to be low.

Key	Description
	Low/Negligible Risk – No noticeable impact to site and not considered to be a constraint to development.
	Medium Risk – Issue requires consideration but not a significant constraint to development
	High Risk – Major constraint to development requiring active consideration in mitigation proposals



3.0 Surface Water Drainage Strategy

3.1 Policy Requirements

The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

London Plan 2021 Policy SI13 states the drainage hierarchy to be followed when developed the SuDS elements of the scheme.

Policy SI 13 Sustainable Drainage:

- A. *Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.*
- B. *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
 - 1) *rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*
 - 2) *rainwater infiltration to ground at or close to source*
 - 3) *rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
 - 4) *rainwater discharge direct to a watercourse (unless not appropriate)*
 - 5) *controlled rainwater discharge to a surface water sewer or drain*
 - 6) *controlled rainwater discharge to a combined sewer.*
- C. *Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.*



- D. Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

LBH's SuDS Design Requirements for LLFA Technical Assessment states the following regarding the SuDS flow control.

Approach 1 – Variable control: Non Statutory Technical Standard S2 allows for varying the outflow rate for the 1 in 1 year and 1 in 100 year greenfield runoff rates for the respective rainfall events.

Approach 2 – Qbar method: Where the design requirements for volume control (S3) cannot be achieved then all runoff from the site for the 1 in 100 year event including CCA should be discharged at a maximum Qbar rate (or equivalent) for the development. A lower flow control threshold of 2 l/sec/ha is acceptable to enable reasonable drain down times.

3.2 Contributing Areas

This assessment includes an overview and comparison of the existing brownfield scenario and proposed development scenario.

Table 3.1 – Contributing areas

Parameter	Existing (m ²)	Existing (%)	Proposed (m ²)	Proposed (%)
Impermeable area	1895	80%	2123	90%
Permeable area	471	20%	243	10%
Total area	2366	100%	2366	100%

3.3 Pre-development Situation

3.3.1 Greenfield Rates

The Greenfield runoff tool available from www.uksuds.com has been used to estimate the greenfield rates. Calculations are contained in Appendix C and the results are summarised in Table 3.2.

Table 3.2 – Greenfield runoff rates

Rainfall event	Greenfield rate (l/s)
QBar	1.01
1 in 1 year	0.86
1 in 30 year	2.31



Rainfall event	Greenfield rate (l/s)
1 in 100 year	3.21

3.3.2 Brownfield Rates

As this is a brownfield site, the existing run-off rates for a variety of return periods have been calculated using the Wallingford Method (also referred to as Modified Rational Method).

The Modified Rational method uses the following equation to calculate peak runoff rate from an area:

$$Q = 2.78 C_v C_r i A$$

Where:

2.78 = Coefficient which accounts for the differences in units used for the inputs and the outputs of the equation.

C_v = Volumetric Runoff Coefficient - a co-efficient that describes the proportion of rainfall appearing in the surface water drainage system, assumed to be 0.95 for impermeable areas

C_r = Routing Coefficient - a routing co-efficient added to the Rational Method to represent runoff characteristics of a particular site or area in a more accurate manner, assumed to be 1.3 for urban areas

i = Rainfall Intensity (mm/hr)

A = Area (ha)

Taking conservative peak 1 year, 30 year and 100-year rainfall rates of 50 mm/hr, 125 mm/hr and 185 mm/hr respectively, the maximum existing peak discharge rates have been calculated as follows. The existing impermeable area is 100 % of the development area.

Table 3.3 – Modified Rational Method pre-development surface water runoff

Return period	Rainfall Intensity (mm)	Peak flow (l/s)
1 in 1 year	50	32.5
1 in 30 year	125	81.3
1 in 100 year	185	120.4



3.4 Offsite Discharge Options

3.4.1 Discharge to Ground

The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

As the area is underlain by London Clay, infiltration is not considered as a suitable option.

3.4.2 Discharge to Surface Water Body

There are no suitable surface water bodies near to the site that can be used for surface water discharge.

3.4.3 Discharge to Surface Water Sewer/Combined Sewer

Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

It is proposed that the surface water is discharged via the existing Thames Water surface water sewers located in Tewkesbury Road.

3.5 Post-development Situation

3.5.1 Discharge Rate

It is proposed that the surface water discharge is restricted to 1.0 l/s for all rainfall events up to 1 in 100-year storm plus an allowance for climate change. This is equivalent to QBAR greenfield rate for the site area hence in line with the local policy requirements.

3.5.2 Climate change allowance

Based on the latest guidance from Environment Agency, the climate change factor to apply has been taken as 40 % for this development.

3.5.3 Urban Creep

A 10 % allowance has been applied to account for urban creep.

3.6 Sustainable Drainage Systems (SuDS)

To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 3.4 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.



Table 3.4 - SuDS selection based on the SuDS Hierarchy

Component	Recommendation
Rainwater reuse	Rainwater harvesting can offer opportunities to reuse rainwater. Rainwater harvesting opportunities are to be explored at the next design stage.
Green/Blue roofs	Whilst the use of green and blue roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority. If feasible, depending on the roof design, a green/blue roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green/blue roofs can offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1 in 2-year storms). Blue roofs are proposed for Block A and B roofs. Please see architectural layouts and landscape proposals for further details of the extent of the terrace areas (Appendix B). The total available area of the blue roof is 445 m² which can provide approximately 42 m³ of storage with a 100 mm depth of storage.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. Open storage features are not considered suitable for the development due to the urban setting restricting the availability of space.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within runoff. They also create biodiverse areas for planting and habitat. Swales are not considered suitable for this site due to the urban setting restricting the availability of space. However, rain gardens are proposed for some parts of the site. Please refer to the landscape architect's drawings for further details on the rain garden locations.
Infiltration Devices	Infiltration is not considered a suitable option due to the underlying geology of London Clay.



Component	Recommendation
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. Permeable paving is incorporated to the landscape proposals for the scheme. For a conservative design, the drainage strategy currently does not take into account the storage available in the subbase of the permeable paving as the volume available will be impacted by belowground constraints including service routes and foundation. This is to be reviewed at the detailed design stage when these constraints are better understood; storage available will be incorporated to the drainage modelling.
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. Attenuation tanks are located within the hard standing areas to provide the majority of the attenuation storage. Please refer to the surface water drainage strategy drawing provided in Appendix C for further details.

3.7 Attenuation Requirements

The attenuation estimation presented below are based on the proposed discharge rates as listed below. Please refer to the calculation included in Appendix C for further details.

Table 3.5 – Attenuation requirements

Rainfall event	Discharge rate
1 in 1-yr	1.0 l/s
1 in 30-yr	1.0 l/s
1 in 100-yr	1.0 l/s
Attenuation for 1 in 100-yr + 40% climate change allowance	227 m ³



3.8 Flood Risk Reduction

It is proposed to discharge the surface water from the development via the existing Thames Water sewer. Compared to the existing situation this will reduce the runoff from the site.

The calculations include an assessment of proposed drainage system for all storm events up to the 100-year storm + 40 % climate change.

3.9 Exceedance Flooding and Overland Flow

The area is not subject to overland flow routes and surface water flooding as summarised in Section 2.8 of this report. The drainage system for the proposed development has been designed to cater for the 1 in 100 year + 40 % climate change storm. i.e. in such a storm event, all surface water would be collected on site and slowly released. Thus, the overland flow route would only be required in the event of a drainage network failure, or if a storm in excess of the 1 in 100 year + 40 % climate change storm caused flows from offsite to flow through the site. Surface water from rainfall event in excess of the design-rainfall, would follow the existing topography.

3.10 Consents, Offsite Works and Diversions

The proposed surface water drainage strategy is accommodated entirely on site. A pre-development enquiry has been submitted to Thames Water regarding the connection from the development.

3.11 Adoption and Maintenance

The long-term maintenance of the SuDS features within the site boundary will most likely be undertaken by a management company.

Maintenance of SuDS features should be undertaken in line with maintenance schedules outlined in the SuDS Manual. Full maintenance schedules should be confirmed at the detailed design stage in consultation with appropriate product suppliers. An example maintenance schedule is provided in Appendix D.

3.12 Drainage During Construction

Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site. A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known.



Run-off control measures will need to be implemented in order not to overwhelm the temporary system and cause flooding issues. Runoff rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading. All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.



4.0 Water Quality

In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of runoff to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water runoff close to source
- Treat surface water runoff on the surface
- Treat surface water runoff to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

SuDS Manual Table 26.2 provides the details for assessing the pollution levels associated with the developments. This table is reproduced below in Table 4.1 with the applicable land use highlighted.

Table 4.1 – Extract of SuDS Manual Table 26.2: Pollution hazard indices for different land use classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg	Low	0.5	0.4	0.4



Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
schools, offices) ie <300 traffic movements/day				
Commercial yard and delivery areas, non-residential car parking with frequent change (eg. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

The proposed drainage strategy utilises the following SuDS features:

- Blue/green roofs
- Rain gardens
- Attenuation tank with a catchpit manhole or other proprietary product to provide pollution mitigation for the discharge

The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed in relation to the proposed measures. This table is reproduced in Table 4.2.

Table 4.2 – Extract of Table 26.3: Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydro-carbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8



Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydro-carbons
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

The SuDS Manual States:

Total SuDS mitigation index (for each contaminant type) $\geq$ pollution hazard index (for each contaminant type)

Residential and commercial roofs and low traffic hardstanding areas have very low to low levels of pollution hazard indexes. Green roofs and rain gardens can provide the level of treatment required to mitigate against the contamination levels. Hence the design is considered to deliver the water quality mitigation measures required.



5.0 Foul Water Drainage Design

5.1 Existing Arrangements

It is assumed that there is an existing connection from the site to the Thames Water foul sewer located in Tewkesbury Road. This is to be established with further surveys.

5.2 Proposed Arrangement

It is proposed that any new SVPs are connected to the Thames Water sewer via the foul water sewer in Tewkesbury Road.



6.0 Conclusion

London Structures Lab was commissioned by the Applicant to develop a surface water drainage strategy to support the planning application for the proposed development at the site located on the junction of Seven Sisters and Eade Roads, Haringey, London N15 6RD.

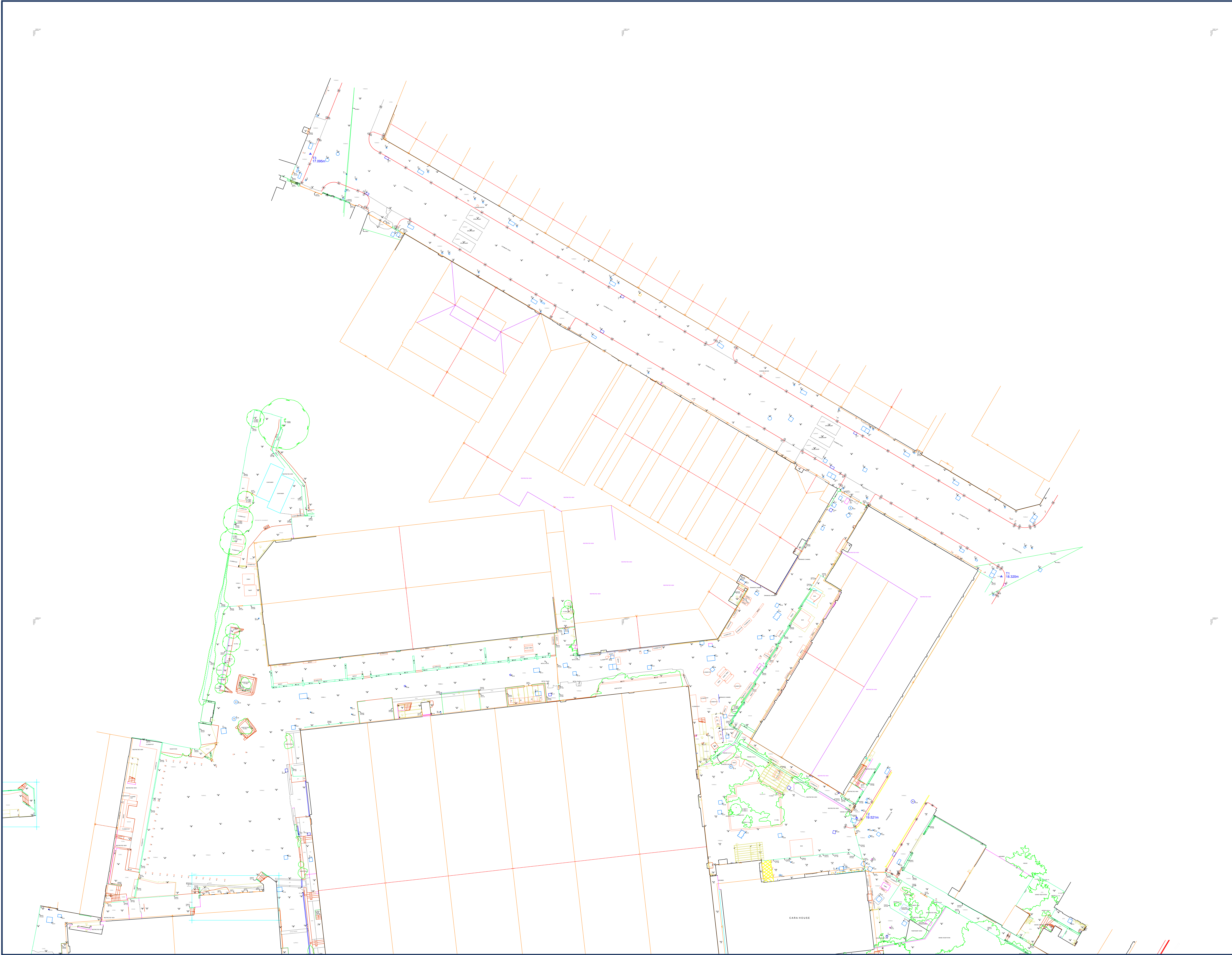
The existing site is 0.24 ha in area and 80 % impermeable. The proposed development comprises two buildings; Block A to east the and Block B to the west. The buildings will be occupied by commercial and back-of-house areas at its lower levels, with warehouse living accommodation at upper levels. It will also contain workspaces/studies constructed from shipping containers. The proposals will result in an increase to the impermeable area.

The site has been identified as at a low risk of flooding from all sources, with no mitigation required from a flood risk perspective. In accordance with local and national policy, a range of SuDS techniques have been considered for inclusion within the scheme with the aim of providing a reduction in runoff rates from the site.

It is proposed that, in line with the local policy requirements, the discharge from the development is restricted to 1.0 l/s which is a significant reduction from the existing discharge rates for the associated area. Attenuation storage is provided to accommodate all rainfall event up to and including 1 in 100-year event plus 40 % climate change allowance. Proposed SuDS measures include green/blue roofs, permeable paving and rain gardens. These also offer the required levels of mitigation required for the water quality mitigation. Hence, this report demonstrates that the site can be developed in a sustainable manner to manage the surface water discharge from the development.



Appendix A – Surveys & Asset Records



A/C Air Conditioning Unit
B Bollard
BP Brick paving
BT BT Inspection Cover
CATV Cable Television Inspection Cover
CH Coal Hole
CPS Concrete Paving Slab
DK Drugged Kerb
DP Down Pipe
EL Eaves Level
FH Fire Hydrant
G Gully
GP Gate Post
H Illuminated Bollard
RS Illuminated Road Sign

IC Inspection Cover
JB Junction Box
LP Lamp Post
MH Man Hole Cover
PB Post Box
PL Pavement Light
PO Post
RL Ridge Level
S/D Silted Outlet
SL Slope Level
SV Stop Valve
SFC Surface Change
SV Stop Valve
TCB Telephone Call Box
TV Tactile Paving
W Water Inspection Cover
WM Water Meter

↑
N

Control Stations

Stn-001, 532738.001, 187966.427, 27.193
Stn-002, 532746.901, 187981.043, 26.464
Stn-003, 532755.136, 187994.758, 25.777

Notes:

Levels are related to Ordnance Survey
Datum via GPS Observations
Survey location is related to Ordnance
Survey Grid via GPS Observations
All information contained in this drawing
(including digital data) should be checked and
verified prior to any fabrication or construction.

Project:

341-343 Seven Sisters Road
Haringey Warehouse District
London
N15 6RD

Title:

Topographic Survey
Sheet 1 of 2

Drawn by:

HH

Scale:

1:200

Date:

October 2022

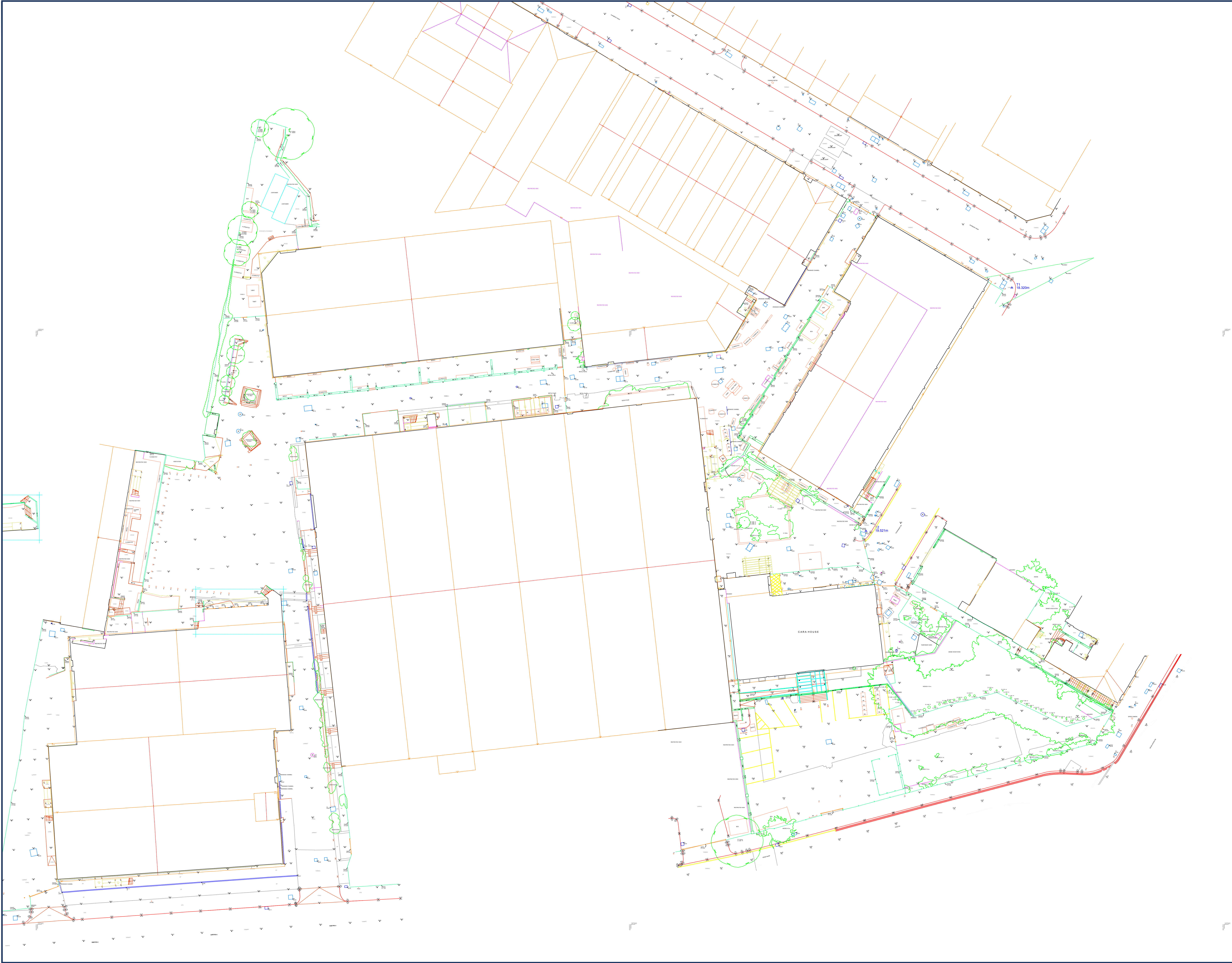
Dwg No:

LS2583/T 2

A0

Point 2 Surveyors Limited
17 Singaby Place
London
WC2E 9AB
0207 836 5828
point2.co.uk

POINT



Key:

A/C	Air Conditioning Unit	IC	Inspection Cover
B	Bollard	JB	Junction Box
BP	Brick paving	LP	Lamp Post
BT	BT Inspection Cover	MH	Man Hole Cover
CAV	Cable Television Inspection Cover	PH	Post Box
CH	Coat Hole	PL	Pavement Light
CPS	Concrete Paving Slab	PO	Post
DK	Dropped Kerb	RL	Ridge Level
DP	Down Pipe	S/O	Smoke Outlet
EL	Eaves Level	SV	Stop Valve
FM	Fire Hydrant	SWC	Surface Change
G	Gully	TCB	Telephone Call Box
GP	Gate Post	TF	Traffic Fencing
ILS	Illuminated Bollard	W	Water Inspection Cover
IRS	Illuminated Road Sign	WM	Water Meter

Control Stations

Stn-001, 532738.001, 187966.427, 27.193
Stn-002, 532746.901, 187961.043, 26.464
Stn-003, 532755.136, 187994.758, 25.777

Notes:

Levels are related to Ordnance Survey
Datum via GPS Observations
Survey location is related to Ordnance
Survey Grid via GPS Observations
All information contained in this drawing
(including digital data) should be checked and
verified prior to any fabrication or construction.

Project: 341-343 Seven Sisters Road
Haringey Warehouse District
London
N15 6RD

Title: Topographic Survey
Sheet 2 of 2

Drawn by: HH	Scale: 1:200	Date: October 2022
--------------	--------------	--------------------

Dwg No: **LS2583/T 2**

Point 2 Surveyors Limited
17 Singaby Place
London
WC2E 9AB
0207 836 5828
point12.co.uk

Atkins Ltd
Stats Enquiries Team The Hub
500 Park Avenue
BRISTOL
BS32 4RZ

Search address supplied Site off Seven Sisters Road, Tottenham, London
N16 5AX

CHECKED

Your reference 107336

Our reference ALS/ALS Standard/2022_4631067

Search date 25 April 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Search address supplied: Site off Seven Sisters Road, Tottenham, London, N16 5AX

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.



For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

The map displays a section of the Seven Sisters area in London, featuring a network of streets and buildings. A prominent red line with arrows indicates a proposed route or boundary, starting from the bottom left and extending towards the top right. Key locations and features include:

- Streets:** Seven Sisters Road, Catwalk Place, Old Ribbon Works, Burlington House, Cardigan House, Old Button Factory, Amhurst Court, and North London Progressive Synagogue.
- Buildings and Landmarks:** Stonehouse, Factory, Cotton Mill, Old Button Factory, Cardigan House, Burlington House, Amhurst Court, and North London Progressive Synagogue.
- Infrastructure:** Seven Sisters Road Bridge, Pumping Station, and various utility lines (e.g., CR, FF, Def, Und).
- Proposed Route:** A red line with arrows, marked with red, blue, and purple dots, indicating a path through the area. The route starts near the Pumping Station, passes through the Seven Sisters Road Bridge, and continues towards the top right.
- Other Features:** Various numbered plots (e.g., 10a, 10b, 10c, 10d, 10e, 10f, 10g, 10h, 10i, 10j, 10k, 10l, 10m, 10n, 10o, 10p, 10q, 10r, 10s, 10t, 10u, 10v, 10w, 10x, 10y, 10z), a 'Shelters' area, and a 'Shelter' near Amhurst Court.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6001	17.91	16.54
6002	17.95	16.02
701C	n/a	n/a
701D	n/a	n/a
701A	n/a	n/a
7005	17.74	14.1
70WW	n/a	n/a
701B	n/a	n/a
791A	n/a	n/a
7002	19.47	16.42
7001	19.46	16.9
7003	19.2	16.23
8034	n/a	n/a
701E	n/a	n/a
7033	n/a	n/a
7009	24.03	19.47
7004	18.27	15.01
70WV	n/a	n/a
70WS	n/a	n/a
8001	22.72	n/a
601A	n/a	n/a
7010	22.71	21.53
791D	n/a	n/a
7902	29.82	n/a
7901A	26.2	25.23
791E	n/a	n/a
78YX	n/a	n/a
78YY	n/a	n/a
6802	31.1	26.88
6803	31.08	n/a
69ZS	n/a	n/a
791C	n/a	n/a
69ZR	n/a	n/a
6903	25.62	24.27
69ZT	n/a	n/a
79ZS	n/a	n/a
69ZV	n/a	n/a
69ZU	n/a	n/a
6902	25.3	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve		Meter
	Dam Chase		Vent
	Fitting		

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary		Drop Pipe
	Control Valve		Well

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet		Outfall
	Undefined End		

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator		Public / Private Pumping Station
	Invert Level		Summit

Areas

Lines denoting areas of underground surveys, etc.

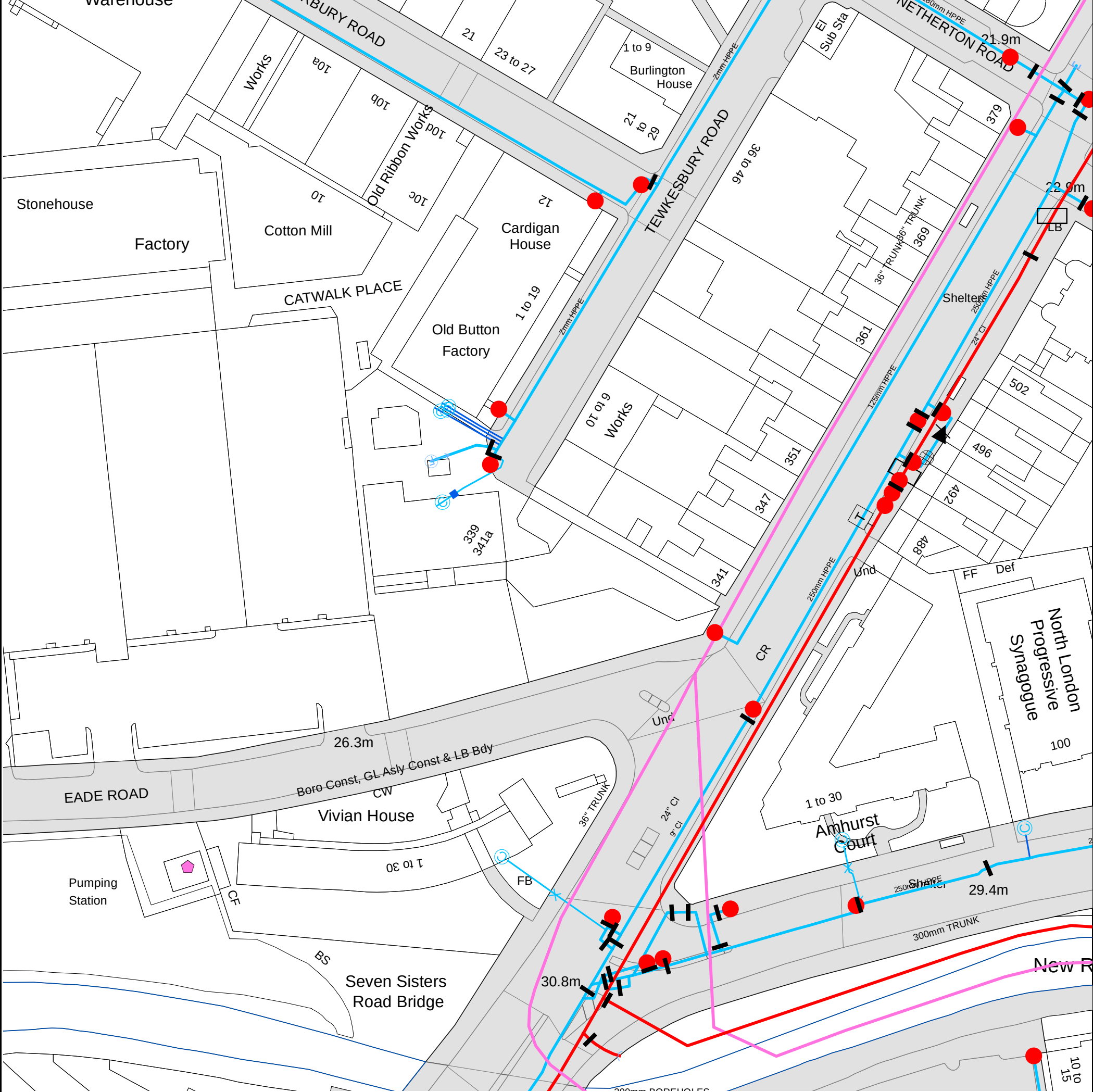
	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 532710, 187987.
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.



Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

-  **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
-  **Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
-  **Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
-  **Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
-  **Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
-  **Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
-  **Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	300mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 6")
600mm and bigger (24" and over)	1000mm (8')

Valves

-  General Purpose Valve
-  Air Valve
-  Pressure Control Valve
-  Customer Valve

Hydrants

-  Single Hydrant

Meters

-  Meter

End Items

Symbol indicating what happens at the end of a water main.

-  Blank Flange
-  Capped End
-  Emptying Pit
-  Undefined End
-  Manifold
-  Customer Supply
-  Fire Supply

Operational Sites

-  Booster Station
-  Other
-  Other (Proposed)
-  Pumping Station
-  Service Reservoir
-  Shaft Inspection
-  Treatment Works
-  Unknown
-  Water Tower

Other Symbols

-  Data Logger
-  **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

-  **Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
-  **Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

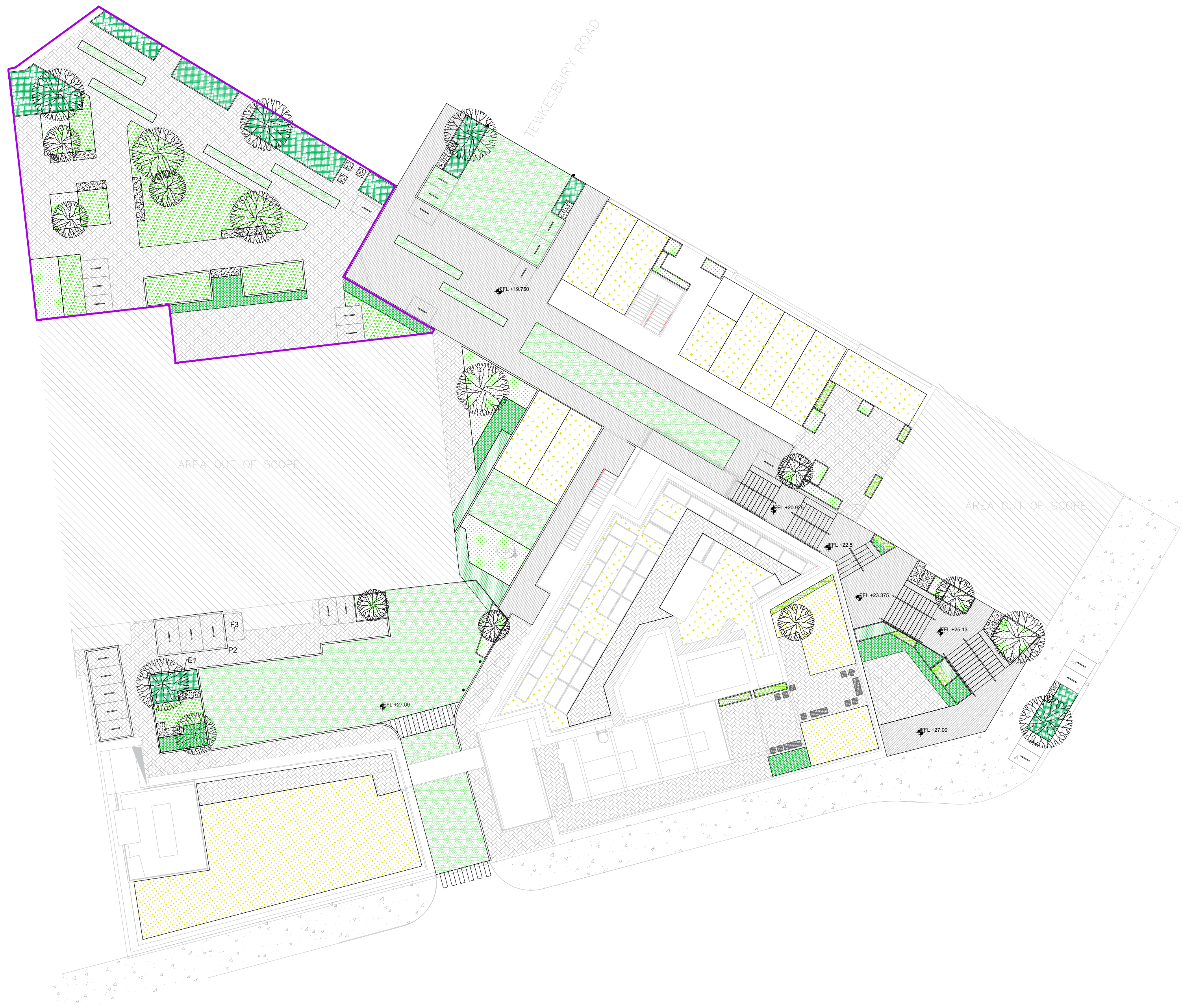
Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0800 009 4540 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.



Appendix B – Development Proposals



- LEGEND
HARD LANDSCAPING
- P1: Concrete Block Paving, 600x800x50mm; Charcon Moordale or equal approved
- P2: Permeable paving
- P3: Turfstone, 600x400x100mm, or equal approved
- P4: Corduroy warning paving, 400x400x50mm, in Buff. Charcon or equal approved
- P5: Existing footpath paving to be made good
- E1: Flush steel edging; Kinley AluExcel or equal approved
- E2: Pre-cast concrete edging to planters;
- E3: Steel tree planters, 800mm high, RAAFT Plantline or equal approved
- E4: Painted strip to delimitate areas, colour TBC
- Pre-cast concrete seating steps;
- F1: Pre-cast concrete bench; Broxap Lithos Standard bench or equal approved; 400mm x 450mm x various
- F2: Urban furniture
- F3: Sheffield cycle stand
- Bollards
- SOFT LANDSCAPING
- Native Hedges Mix
- Wildflower Enriched turfs
- Rain Gardens Mix
- Herbaceous Perennial Mix
- Climbers
- Species Rich Lawn Turf
- Green Roofs
- Trees
- Illustrative design - final proposal subject to further consultation with residents.

221207	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

Campbell Cadey Architects
Illustrative design - final proposal subject to further consultation with residents.
Bussey Building, Unit BGK, 133, Copeland Rd, London SE15 3SN
www.campbellcadey.com/

DRAWING STATUS :

PLANNING

CLIENT :

PROVEWELL

PROJECT TITLE :

**HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS**

DRAWING TITLE :

**Landscape General Arrangement
Seven Sisters Site Plan**

DRAWING SCALE : 1:100	DRAWN BY : FC	DRAWN DATE : DEC 2022
PAPER SIZE : A1	APPROVED BY : RC	APPROVED DATE : DEC 2022

DRAWING NUMBER :
2205_PL_001

REVISION :

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GENERAL NOTES:

- Do not scale drawing.
- All setting out, levels and dimensions are to be agreed on site.
- The dimensions of all materials must be checked on site before any fabrication or installation can commence.
- This drawing must be read in conjunction with all other Works Information.
- Order of construction and setting out to be agreed on site.

NOTE:

Please refer to architect's plans for architectural arrangement and information

Please refer to structural and M&E engineers' plans and drawings for information.



LEGEND	
HARD LANDSCAPING	
	P1: Concrete Block Paving, 600x800x50mm; Charcon Moordale or equal approved
	P2: Permeable paving
	P3: Turfstone, 600x400x100mm, or equal approved
	P4: Corduroy warning paving, 400x400x50mm, in Buff. Charcon or equal approved
	P5: Existing footpath paving to be made good
	E1: Flush steel edging; Kinley AluExcel or equal approved
	E2: Pre-cast concrete edging to planters;
	E3: Steel tree planters, 800mm high, RAAFT Plantline or equal approved
	E4: Painted strip to delimitate areas, colour TBC
	Pre-cast concrete seating steps;
	F1: Pre-cast concrete bench; Broxap Litros Standard bench or equal approved; 400mm x 450mm x various
	F2: Urban furniture
	F3: Sheffield cycle stand
	Bollards
SOFT LANDSCAPING	
	Native Hedges Mix
	Wildflower Enriched turfs
	Rain Gardens Mix
	Herbaceous Perennial Mix
	Climbers
	Species Rich Lawn Turf
	Green Roofs
	Trees

221208	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

Campbell Cadey Architects

Bussey Building, Unit BGK, 133, Copeland Rd, London SE15 3SN
www.campbellcadey.com/

DRAWING STATUS :

PLANNING

CLIENT :

PROVEWELL

PROJECT TITLE :

**HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS**

DRAWING TITLE :

**Landscape General Arrangement
Seven Sisters Road Plan**

DRAWING SCALE :	DRAWN BY :	DRAWN DATE :
1:100	FC	DEC 2022
PAPER SIZE :	APPROVED BY :	APPROVED DATE :
A1	RC	DEC 2022

DRAWING NUMBER :	REVISION :
2205_PL_002	

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GENERAL NOTES:

1. Do not scale drawing.
2. All setting out, levels and dimensions are to be agreed on site.
3. The dimensions of all materials must be checked on site before any fabrication or installation can commence.
4. This drawing must be read in conjunction with all other Works Information.
5. Order of construction and setting out to be agreed on site.

NOTE:

Please refer to architect's plans for architectural arrangement and information

Please refer to structural and M&E engineers' plans and drawings for information.



LEGEND	
HARD LANDSCAPING	
	P1: Concrete Block Paving, 600x600x50mm; Charcon Moorstone or equal approved
	P2: Permeable paving
	P3: Turfstone, 600x400x100mm, or equal approved
	P4: Corduroy warning paving, 400x400x50mm, in Bluff; Charcon or equal approved
	P5: Existing footpath paving to be made good
	E1: Flush steel edging; Kinley AluExcel or equal approved
	E2: Pre-cast concrete edging to planters;
	E3: Steel tree planters, 900mm high, RAAFT Planterline or equal approved
	E4: Painted strip to delineate areas, colour TBC
	Pre-cast concrete seating steps;
	F1: Pre-cast concrete bench; Broxap Lithos Standard bench or equal approved, 400mm x 450mm x various
	F2: Urban furniture
	F3: Sheffield cycle stand
	Bollards
SOFT LANDSCAPING	
	Native Hedges Mix
	Wildflower Enriched turfs
	Rain Gardens Mix
	Herbaceous Perennial Mix
	Climbers
	Species Rich Lawn Turf
	Green Roofs
	Trees

221208	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

Campbell Cadey Architects

Bussey Building, Unit BGK, 133, Copeland Rd, London SE15 3SN
www.campbellcadey.com/

DRAWING STATUS : PLANNING

CLIENT :
PROVEWELL

PROJECT TITLE :
HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS

DRAWING TITLE :
Landscape General Arrangement
Tewkesbury Road Mezzanine Plan

DRAWING SCALE : 1:100	DRAWN BY : FC	DRAWN DATE : DEC 2022
PAPER SIZE : A1	APPROVED BY : RC	APPROVED DATE : DEC 2022

DRAWING NUMBER :
2205_PL_003

REVISION :
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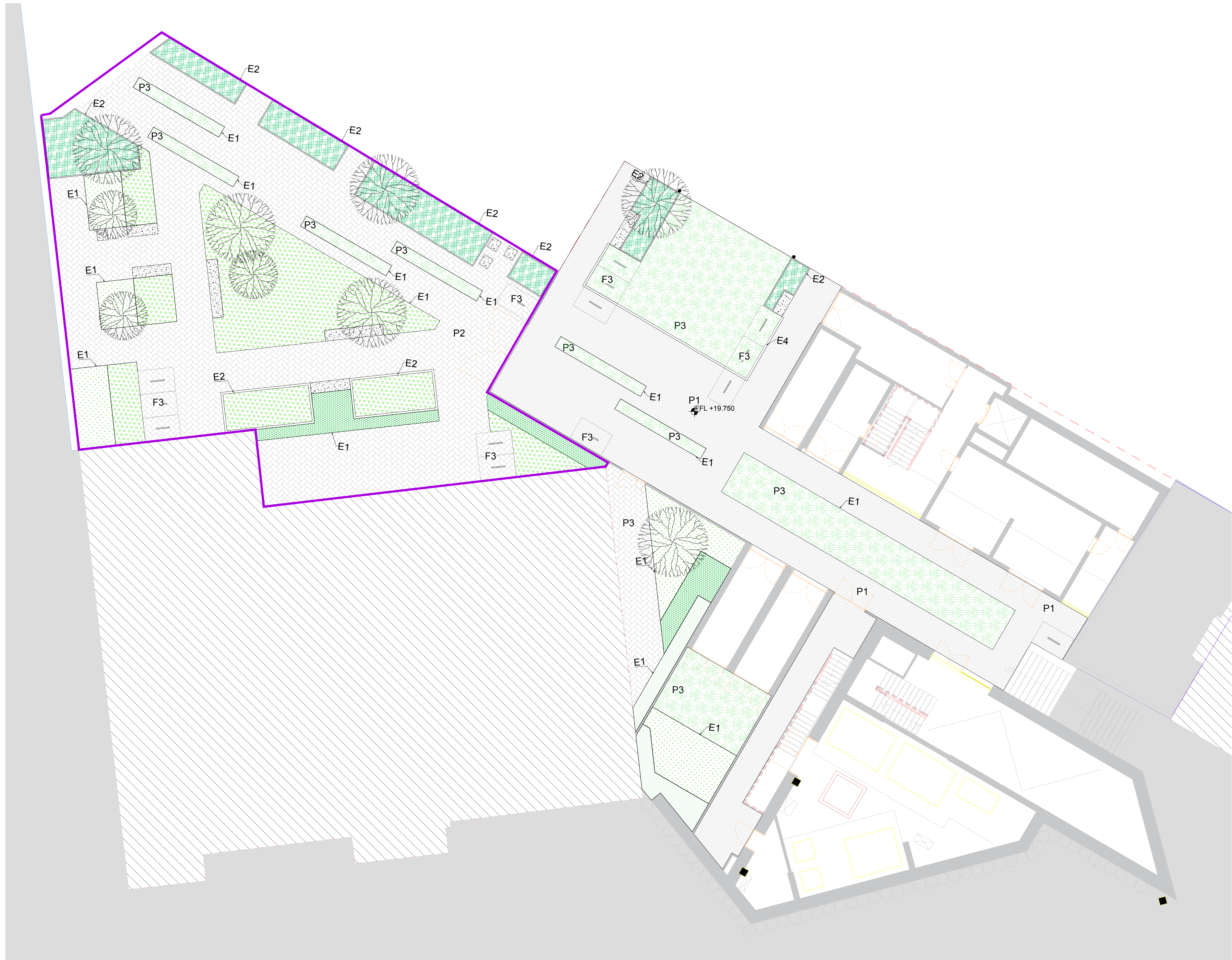
GENERAL NOTES:

- Do not scale drawing.
- All setting out, levels and dimensions are to be agreed on site.
- The dimensions of all materials must be checked on site before any fabrication or installation can commence.
- This drawing must be read in conjunction with all other Works Information.
- Order of construction and setting out to be agreed on site.

NOTE:

Please refer to architect's plans for architectural arrangement and information

Please refer to structural and M&E engineers' plans and drawings for information.



LEGEND	
HARD LANDSCAPING	
	P1: Concrete Block Paving, 600x600x50mm; Charcon Mordale or equal approved
	P2: Permeable paving
	P3: Turfstone, 600x400x100mm, or equal approved
	P4: Corduroy warning paving, 400x400x50mm, in Buff; Charcon or equal approved
	P5: Existing footpath paving to be made good
	E1: Flush steel edging; Kinley AuExcel or equal approved
	E2: Pre-cast concrete edging to planters;
	E3: Steel tree planters, 900mm high, RAAFT Planterline or equal approved
	E4: Painted strip to delimitate areas, colour TBC
	Pre-cast concrete seating steps;
	F1: Pre-cast concrete bench; Broxap Lithos Standard bench or equal approved; 400mm x 450mm x various
	F2: Urban furniture
	F3: Sheffield cycle stand
	Bollards
SOFT LANDSCAPING	
	Native Hedges Mix
	Wildflower Enriched turfs
	Rain Gardens Mix
	Herbaceous Perennial Mix
	Climbers
	Species Rich Lawn Turf
	Green Roofs
	Trees
Illustrative design - final proposal subject to further consultation with residents.	

221207	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

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DRAWING STATUS :
PLANNING

CLIENT :
PROVEWELL

PROJECT TITLE :
**HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS**

DRAWING TITLE :
**Landscape General Arrangement
Tewkesbury Road Ground Plan**

DRAWING SCALE : 1:100	DRAWN BY : FC	DRAWN DATE : DEC 2022
PAPER SIZE : A1	APPROVED BY : RC	APPROVED DATE : DEC 2022

DRAWING NUMBER :
2205_PL_004

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LEGEND	
HARD LANDSCAPING	
	P1: Concrete Block Paving, 600x600x50mm; Charcon Moorstone or equal approved
	P2: Permeable paving
	P3: Turfstone, 600x400x100mm, or equal approved
	P4: Corduroy warning paving, 400x400x50mm, in Buff; Charcon or equal approved
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	E1: Flush steel edging; Kinley AluExcel or equal approved
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	E4: Painted strip to delimitate areas, colour TBC
	Pre-cast concrete seating steps;
	F1: Pre-cast concrete bench; Broxap Lithos Standard bench or equal approved; 400mm x 450mm x various
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	F3: Sheffield cycle stand
	Bollards
SOFT LANDSCAPING	
	Native Hedges Mix
	Wildflower Enriched turfs
	Rain Gardens Mix
	Herbaceous Perennial Mix
	Climbers
	Species Rich Lawn Turf
	Green Roofs
	Trees

221208	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

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DRAWING STATUS :

PLANNING

CLIENT :

PROVEWELL

PROJECT TITLE :

**HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS**

DRAWING TITLE :

**Landscape General Arrangement
Roof Terrace Plan**

DRAWING SCALE : 1:100	DRAWN BY : FC	DRAWN DATE : DEC 2022
PAPER SIZE : A1	APPROVED BY : RC	APPROVED DATE : DEC 2022

DRAWING NUMBER : 2205_PL_005	REVISION :
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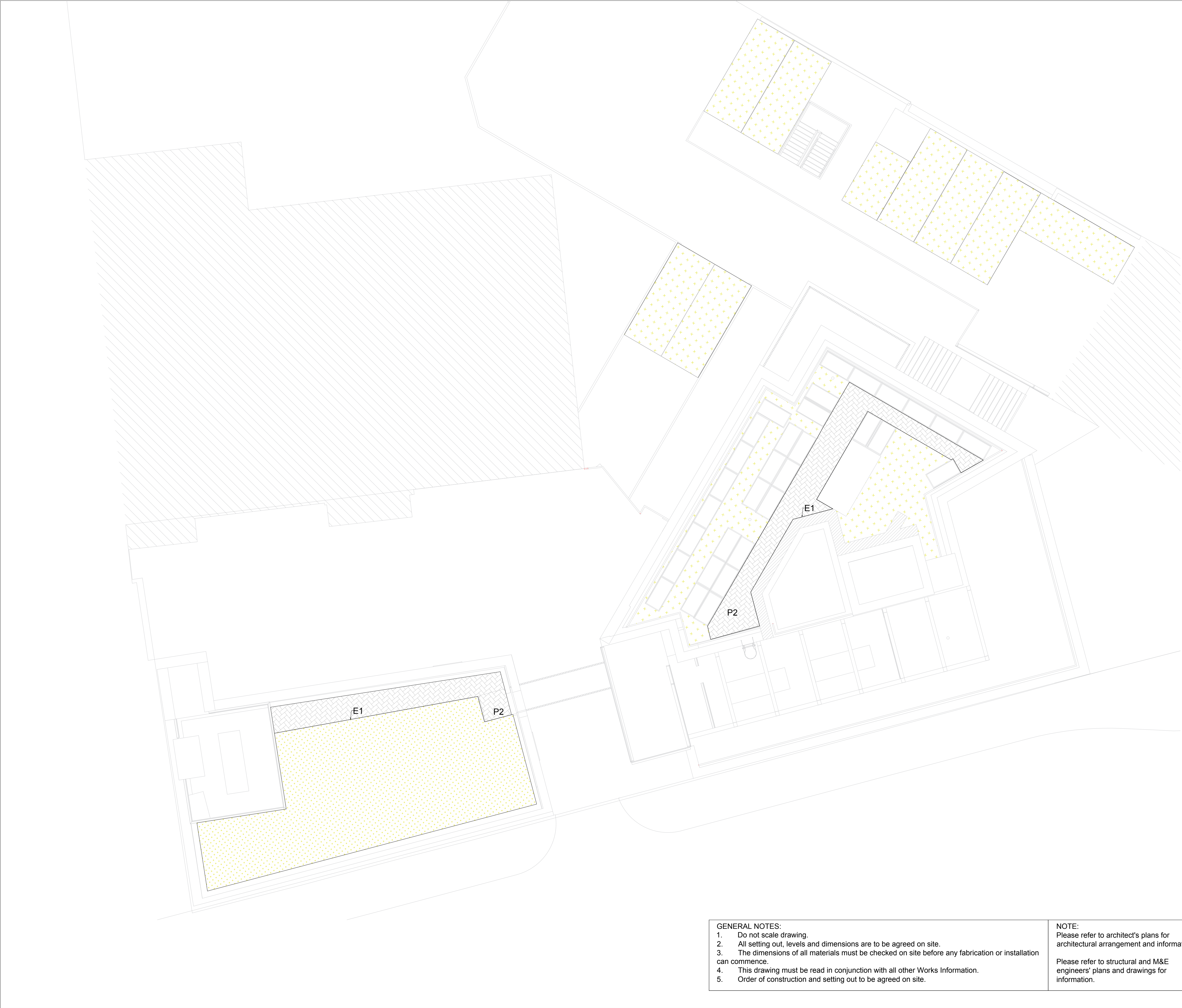
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3. The dimensions of all materials must be checked on site before any fabrication or installation can commence.
4. This drawing must be read in conjunction with all other Works Information.
5. Order of construction and setting out to be agreed on site.

NOTE:

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LEGEND	
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	Pre-cast concrete seating steps;
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	Bollards
SOFT LANDSCAPING	
	Native Hedges Mix
	Wildflower Enriched turfs
	Rain Gardens Mix
	Herbaceous Perennial Mix
	Climbers
	Species Rich Lawn Turf
	Green Roofs
	Trees

221208	Planning App	-	FC	RC
DATE	DESCRIPTION OF REVISION	REV	DR	CH

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DRAWING STATUS :

PLANNING

CLIENT :

PROVEWELL

PROJECT TITLE :

HARRINGAY WAREHOUSE DISTRICT
SEVEN SISTERS

DRAWING TITLE :

Landscape General Arrangement
ROOF PLAN

DRAWING SCALE : 1:100	DRAWN BY : FC	DRAWN DATE : DEC 2022
PAPER SIZE : A1	APPROVED BY : RC	APPROVED DATE : DEC 2022

DRAWING NUMBER : 2205_PL_006	REVISION :
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3. The dimensions of all materials must be checked on site before any fabrication or installation can commence.
4. This drawing must be read in conjunction with all other Works Information.
5. Order of construction and setting out to be agreed on site.

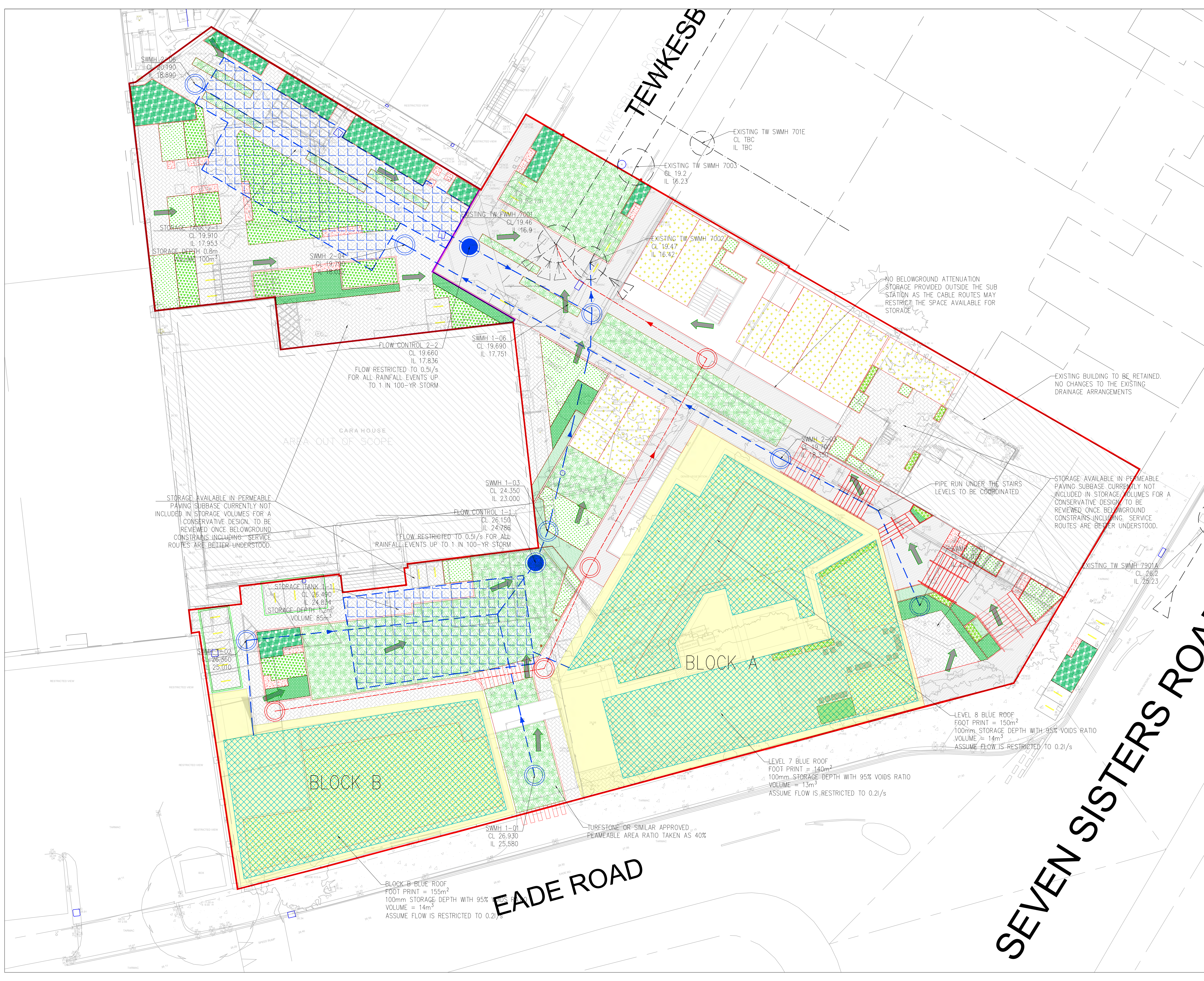
NOTE:

Please refer to architect's plans for architectural arrangement and information

Please refer to structural and M&E engineers' plans and drawings for information.



Appendix C – Drainage Design and Calculations



NOTES

- THIS DRAWING IS NOT TO BE SCALED.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS ARE SPECIFICATION.
- ALL LEVELS ARE IN METRES (m) AND ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.

DRAINAGE DESIGN NOTES

- TOPOGRAPHICAL INFORMATION TAKEN FROM THE POINT2 SURVEYORS DRAWING LS2583/T2 DATED OCTOBER 2022.
- THAMES WATER SEWER RECORDS REFERENCE ALS/ALS Standard/2022_4631067 DATED 25 APRIL 2022.
- LANDSCAPE PROPOSALS TAKEN FROM CAMPBELL CADEY ARCHITECTS' DRAWINGS 2205_PL_001 - 006 DATED JANUARY 2023.
- PROPOSED SVP AND RWP TO BE CONFIRMED.
- PLEASE NOTE THAT THE DRAINAGE DESIGN HAS NOT BEEN COORDINATED WITH OTHER SERVICES AT THIS STAGE.
- SURFACE WATER ATTENUATION TO BE PROVIDED IN A TANK LOCATED WITHIN THE SITE BOUNDARY AND BLUE ROOFS
- REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR EXTERNAL FINISHES. IT IS ASSUMED THAT EXISTING EXTERNAL LEVELS WILL BE MAINTAINED AS FAR AS PRACTICABLE FOR ALL EXTERNAL AREAS.
- BELOWGROUND TANKS ARE PROPOSED FOR THE MAJORITY OF THE ATTENUATION STORAGE.
- BLUE ROOFS ARE TO BE DESIGNED BY A SPECIALIST. CURRENT LAYOUTS ARE BASED ON ASSUMED DISCHARGE RESTRICTIONS FOR ALL BLUE ROOFS. THE BELOWGROUND STORAGE VOLUMES ARE TO BE REVIEWED WHEN THE BLUE ROOFS AREA FULLY DESIGNED.
- CURRENTLY THE SURFACE WATER DRAINAGE IS BASED ON TWO SEPARATE NETWORKS WITH A COMBINED DISCHARGE RATE OF 1 1/3 FOR ALL RAINFALL EVENTS UP TO 1 IN 100 YEAR STORM FOR THE SITE.
- DRAINAGE NETWORK INCLUDING ATTENUATION STORAGE TANK LOCATIONS ARE INDICATIVE ONLY. TO BE REVIEWED AT THE NEXT DESIGN STAGE WHEN FURTHER INFORMATION BECOME AVAILABLE ABOUT SITE CONSTRAINTS, PROPOSED SERVICES AND FOUNDATIONS.

KEY

- SITE REDLINE BOUNDARY
- EXISTING SW SEWER
- EXISTING FW SEWER
- EXISTING COMBINED SEWER
- PROPOSED SW DRAIN
- PROPOSED FW DRAIN
- PROPOSED SWC/MH
- PROPOSED FWC/MH
- PROPOSED ROOF AREA
- PROPOSED ATTENUATION STORAGE
- PROPOSED PERMEABLE PAVING
- PROPOSED SOFT LANDSCAPING/RAIN GARDENS
- PROPOSED TURFSTONE (40% PERMEABLE SURFACE)
- OVERLAND FLOW DIRECTION

P04	31/01/23	Drawing notes updated	CA	AB
P03	31/01/23	Text added about permeable paving	CA	AB
P02	23/01/23	Landscape finishes updated	CA	AB
P01	02/12/22	First issue	CA	AB

No.	Date	Description	Issued by	Issued to

LONDON STRUCTURES LAB

CLIENT

PROVEWELL

PROJECT

WAREHOUSE LIVING

TITLE

SURFACE WATER DRAINAGE STRATEGY

DRN.	DRN. DATE	CHK.	CHK. DATE	SCALE	SATISFACTORY CODE
CA	31/01/22	AB	31/01/22	1:125@A1	S2

STAGE

PRELIMINARY

1547-LSL-ZZ-ZZ-DR-C-1100 P04

PROJECT No.	ORIGINATOR	ZONE	LEVEL	TYPE	DISCIPLIN	DRAWING No.	REV

Calculated by:	Cham Ariyaratne
Site name:	Warehouse Living
Site location:	N15 6RD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details	
Latitude:	51.57502° N
Longitude:	0.08625° W
Reference:	2239394439
Date:	Nov 21 2022 16:14

Runoff estimation approach **IH124**

Site characteristics

Total site area (ha): 0.2366

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics Default Edited

SOIL type: 4 4

HOST class: N/A N/A

SPR/SPRHOST: 0.47 0.47

Hydrological characteristics Default Edited

SAAR (mm): 628 628

Hydrological region: 6 6

Growth curve factor 1 year: 0.85 0.85

Growth curve factor 30 years: 2.3 2.3

Growth curve factor 100 years: 3.19 3.19

Growth curve factor 200 years: 3.74 3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates Default Edited

Q _{BAR} (l/s):	1.01	1.01
1 in 1 year (l/s):	0.86	0.86
1 in 30 years (l/s):	2.31	2.31
1 in 100 year (l/s):	3.21	3.21
1 in 200 years (l/s):	3.76	3.76

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Blue Roof 1-1(Block B)	0.023	5.00	30.000		532683.392	187965.027	1.350
SWMH 1-02			26.360	1200	532682.118	187974.094	1.350
Attenuation Tank 1-1	0.026	5.00	26.490		532699.768	187975.640	1.656
Flow Control 1-1			26.150	1200	532702.614	187979.448	1.364
SWMH 1-03			24.350	1200	532703.518	187981.783	1.350
SWMH 1-06			19.690	1200	532705.032	187998.607	1.350
Outfall TWMH			19.690	1200	532706.637	188001.685	3.270
SWMH 1-01			26.930	1200	532702.533	187963.667	1.350
Blue Roof 1-2 (Block A)	0.021	5.00	35.000		532718.784	187968.572	1.350
Blue Roof 1-3(Block A)	0.025	5.00	35.000	1200	532704.986	187971.469	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	Blue Roof 1-1(Block B)	SWMH 1-02	9.156	0.600	28.650	25.010	3.640	2.5	150	5.02	50.0
2.001	SWMH 1-02	Attenuation Tank 1-1	17.718	0.600	25.010	24.834	0.176	100.7	150	5.32	50.0
1.002	Attenuation Tank 1-1	Flow Control 1-1	4.754	0.600	24.834	24.786	0.048	99.0	150	5.40	50.0
1.003	Flow Control 1-1	SWMH 1-03	2.504	0.600	24.786	23.000	1.786	1.4	150	5.40	50.0
1.004	SWMH 1-03	SWMH 1-06	16.892	0.600	23.000	18.340	4.660	3.6	150	5.45	50.0
1.005	SWMH 1-06	Outfall TWMH	3.471	0.600	18.340	16.420	1.920	1.8	150	5.46	50.0
1.001	SWMH 1-01	Attenuation Tank 1-1	12.288	0.600	25.580	25.140	0.440	27.9	150	5.15	50.0
1.000	Blue Roof 1-2 (Block A)	SWMH 1-01	16.975	0.600	33.650	25.580	8.070	2.1	150	5.04	50.0
3.000	Blue Roof 1-3(Block A)	Attenuation Tank 1-1	6.680	0.600	33.650	25.140	8.510	0.8	150	5.01	50.0

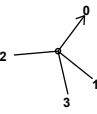
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	6.402	113.1	3.1	1.200	1.200	0.023	0.0	17	2.819
2.001	1.001	17.7	3.1	1.200	1.506	0.023	0.0	42	0.755
1.002	1.010	17.8	12.9	1.506	1.214	0.095	0.0	95	1.098
1.003	8.580	151.6	12.9	1.214	1.200	0.095	0.0	30	5.275
1.004	5.331	94.2	12.9	1.200	1.200	0.095	0.0	37	3.743
1.005	7.554	133.5	12.9	1.200	3.120	0.095	0.0	31	4.805
1.001	1.912	33.8	2.8	1.200	1.200	0.021	0.0	30	1.172
1.000	7.002	123.7	2.8	1.200	1.200	0.021	0.0	16	2.878
3.000	11.471	202.7	3.4	1.200	1.200	0.025	0.0	14	4.363

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	9.156	2.5	150	Circular	30.000	28.650	1.200	26.360	25.010	1.200
2.001	17.718	100.7	150	Circular	26.360	25.010	1.200	26.490	24.834	1.506
1.002	4.754	99.0	150	Circular	26.490	24.834	1.506	26.150	24.786	1.214
1.003	2.504	1.4	150	Circular	26.150	24.786	1.214	24.350	23.000	1.200
1.004	16.892	3.6	150	Circular	24.350	23.000	1.200	19.690	18.340	1.200
1.005	3.471	1.8	150	Circular	19.690	18.340	1.200	19.690	16.420	3.120
1.001	12.288	27.9	150	Circular	26.930	25.580	1.200	26.490	25.140	1.200
1.000	16.975	2.1	150	Circular	35.000	33.650	1.200	26.930	25.580	1.200
3.000	6.680	0.8	150	Circular	35.000	33.650	1.200	26.490	25.140	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	Blue Roof 1-1(Block B)		Junction		SWMH 1-02	1200	Manhole	Adoptable
2.001	SWMH 1-02	1200	Manhole	Adoptable	Attenuation Tank 1-1		Junction	
1.002	Attenuation Tank 1-1		Junction		Flow Control 1-1	1200	Manhole	Adoptable
1.003	Flow Control 1-1	1200	Manhole	Adoptable	SWMH 1-03	1200	Manhole	Adoptable
1.004	SWMH 1-03	1200	Manhole	Adoptable	SWMH 1-06	1200	Manhole	Adoptable
1.005	SWMH 1-06	1200	Manhole	Adoptable	Outfall TWMH	1200	Manhole	Adoptable
1.001	SWMH 1-01	1200	Manhole	Adoptable	Attenuation Tank 1-1		Junction	
1.000	Blue Roof 1-2 (Block A)		Junction		SWMH 1-01	1200	Manhole	Adoptable
3.000	Blue Roof 1-3(Block A)	1200	Manhole	Adoptable	Attenuation Tank 1-1		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Blue Roof 1-1(Block B)	532683.392	187965.027	30.000	1.350					
SWMH 1-02	532682.118	187974.094	26.360	1.350	1200		0	2.000	28.650
Attenuation Tank 1-1	532699.768	187975.640	26.490	1.656			0	2.001	25.010
Flow Control 1-1	532702.614	187979.448	26.150	1.364	1200		1	3.000	25.140
SWMH 1-03	532703.518	187981.783	24.350	1.350	1200		2	2.001	24.834
SWMH 1-06	532705.032	187998.607	19.690	1.350	1200		3	1.001	25.140
							0	1.002	24.834
							1	1.002	24.786
							0	1.003	24.786
							1	1.003	23.000
							0	1.004	23.000
							1	1.004	18.340
							0	1.005	18.340

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Outfall TWMH	532706.637	188001.685	19.690	3.270	1200		1.005	16.420	150
SWMH 1-01	532702.533	187963.667	26.930	1.350	1200		1.000	25.580	150
Blue Roof 1-2 (Block A)	532718.784	187968.572	35.000	1.350			1.001	25.580	150
Blue Roof 1-3(Block A)	532704.986	187971.469	35.000	1.350	1200		1.000	33.650	150
							3.000	33.650	150

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

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	20	0	0
100	40	0	0

Node Flow Control 1-1 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.200	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	0.5		
Invert Level (m)	24.786	Diameter (m)	0.014		

Node Blue Roof 1-2 (Block A) Online Orifice Control

Flap Valve	✓	Design Depth (m)	0.100	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	0.2		
Invert Level (m)	33.650	Diameter (m)	0.017		

Node Blue Roof 1-3(Block A) Online Orifice Control

Flap Valve	x	Design Depth (m)	0.100	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	0.2		
Invert Level (m)	33.650	Diameter (m)	0.017		

Node Blue Roof 1-1(Block B) Online Orifice Control

Flap Valve	x	Design Depth (m)	0.100	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	0.2		
Invert Level (m)	28.650	Diameter (m)	0.017		

Node Blue Roof 1-2 (Block A) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	34.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	140.0	0.0	0.100	140.0	0.0	0.101	0.0	0.0

Node Blue Roof 1-3(Block A) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	34.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	150.0	0.0	0.100	150.0	0.0	0.101	0.0	0.0

Node Blue Roof 1-1(Block B) Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	155.0	0.0	0.100	155.0	0.0	0.101	0.0	0.0

Node Attenuation Tank 1-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.834
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	80.0	0.0	1.200	80.0	0.0	1.201	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Blue Roof 1-1(Block B)	76	29.778	1.128	1.5	0.3845	0.0000	FLOOD RISK
600 minute summer	SWMH 1-02	600	25.049	0.039	0.4	0.0437	0.0000	OK
600 minute summer	Attenuation Tank 1-1	600	25.049	0.215	1.9	17.2382	0.0000	SURCHARGED
600 minute summer	Flow Control 1-1	600	25.049	0.263	0.6	0.2970	0.0000	SURCHARGED
600 minute summer	SWMH 1-03	600	23.006	0.006	0.2	0.0062	0.0000	OK
600 minute summer	SWMH 1-06	600	18.345	0.005	0.2	0.0053	0.0000	OK
600 minute summer	Outfall TWMH	600	16.424	0.004	0.2	0.0000	0.0000	OK
120 minute summer	SWMH 1-01	76	25.594	0.014	0.6	0.0159	0.0000	OK
120 minute summer	Blue Roof 1-2 (Block A)	76	34.677	1.027	1.4	0.3195	0.0000	SURCHARGED
120 minute summer	Blue Roof 1-3(Block A)	78	34.601	0.951	1.6	1.4278	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	Blue Roof 1-1(Block B)	Orifice	SWMH 1-02	0.6				
600 minute summer	SWMH 1-02	2.001	Attenuation Tank 1-1	0.4	0.298	0.024	0.1877	
600 minute summer	Attenuation Tank 1-1	1.002	Flow Control 1-1	0.6	0.130	0.031	0.0837	
600 minute summer	Flow Control 1-1	1.003	SWMH 1-03	0.2	1.268	0.001	0.0004	
600 minute summer	SWMH 1-03	1.004	SWMH 1-06	0.2	1.167	0.002	0.0030	
600 minute summer	SWMH 1-06	1.005	Outfall TWMH	0.2	1.415	0.002	0.0005	7.9
120 minute summer	SWMH 1-01	1.001	Attenuation Tank 1-1	0.6	0.731	0.018	0.0102	
120 minute summer	Blue Roof 1-2 (Block A)	Orifice	SWMH 1-01	0.6				
120 minute summer	Blue Roof 1-3(Block A)	Orifice	Attenuation Tank 1-1	0.6				

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Blue Roof 1-1(Block B)	88	29.822	1.172	4.0	3.8894	0.0000	FLOOD RISK
1440 minute summer	SWMH 1-02	1410	25.318	0.308	0.5	0.3482	0.0000	SURCHARGED
1440 minute summer	Attenuation Tank 1-1	1410	25.318	0.484	2.1	38.8615	0.0000	SURCHARGED
1440 minute summer	Flow Control 1-1	1410	25.318	0.532	0.3	0.6015	0.0000	SURCHARGED
1440 minute summer	SWMH 1-03	1410	23.007	0.007	0.3	0.0074	0.0000	OK
1440 minute summer	SWMH 1-06	1410	18.346	0.006	0.3	0.0062	0.0000	OK
1440 minute summer	Outfall TWMH	1410	16.425	0.005	0.3	0.0000	0.0000	OK
120 minute summer	SWMH 1-01	88	25.595	0.015	0.6	0.0165	0.0000	OK
120 minute summer	Blue Roof 1-2 (Block A)	88	34.822	1.172	3.7	3.3394	0.0000	FLOOD RISK
180 minute summer	Blue Roof 1-3(Block A)	128	34.823	1.173	3.3	5.3191	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	Blue Roof 1-1(Block B)	Orifice	SWMH 1-02	0.7				
1440 minute summer	SWMH 1-02	2.001	Attenuation Tank 1-1	0.5	0.328	0.029	0.3119	
1440 minute summer	Attenuation Tank 1-1	1.002	Flow Control 1-1	-0.3	0.131	-0.017	0.0837	
1440 minute summer	Flow Control 1-1	1.003	SWMH 1-03	0.3	1.414	0.002	0.0005	
1440 minute summer	SWMH 1-03	1.004	SWMH 1-06	0.3	1.302	0.003	0.0039	
1440 minute summer	SWMH 1-06	1.005	Outfall TWMH	0.3	1.576	0.002	0.0007	21.7
120 minute summer	SWMH 1-01	1.001	Attenuation Tank 1-1	0.6	0.746	0.019	0.0305	
120 minute summer	Blue Roof 1-2 (Block A)	Orifice	SWMH 1-01	0.6				
180 minute summer	Blue Roof 1-3(Block A)	Orifice	Attenuation Tank 1-1	0.7				

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Blue Roof 1-1(Block B)	132	29.836	1.186	4.1	6.1214	0.0000	FLOOD RISK
720 minute summer	SWMH 1-02	720	25.531	0.521	0.6	0.5890	0.0000	SURCHARGED
720 minute summer	Attenuation Tank 1-1	720	25.531	0.697	3.5	55.9577	0.0000	SURCHARGED
720 minute summer	Flow Control 1-1	720	25.531	0.745	0.6	0.8423	0.0000	SURCHARGED
720 minute summer	SWMH 1-03	735	23.007	0.007	0.4	0.0079	0.0000	OK
720 minute summer	SWMH 1-06	735	18.346	0.006	0.4	0.0067	0.0000	OK
720 minute summer	Outfall TWMH	735	16.426	0.006	0.4	0.0000	0.0000	OK
120 minute summer	SWMH 1-01	98	25.595	0.015	0.7	0.0165	0.0000	OK
120 minute summer	Blue Roof 1-2 (Block A)	96	34.837	1.187	4.9	5.3375	0.0000	FLOOD RISK
180 minute summer	Blue Roof 1-3(Block A)	136	34.841	1.191	4.4	8.0109	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Blue Roof 1-1(Block B)	Orifice	SWMH 1-02	0.7				
720 minute summer	SWMH 1-02	2.001	Attenuation Tank 1-1	0.6	0.403	0.035	0.3119	
720 minute summer	Attenuation Tank 1-1	1.002	Flow Control 1-1	0.6	0.120	0.032	0.0837	
720 minute summer	Flow Control 1-1	1.003	SWMH 1-03	0.4	1.490	0.002	0.0006	
720 minute summer	SWMH 1-03	1.004	SWMH 1-06	0.4	1.373	0.004	0.0044	
720 minute summer	SWMH 1-06	1.005	Outfall TWMH	0.4	1.656	0.003	0.0007	14.3
120 minute summer	SWMH 1-01	1.001	Attenuation Tank 1-1	0.7	0.747	0.019	0.1111	
120 minute summer	Blue Roof 1-2 (Block A)	Orifice	SWMH 1-01	0.7				
180 minute summer	Blue Roof 1-3(Block A)	Orifice	Attenuation Tank 1-1	0.7				

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 98.01%

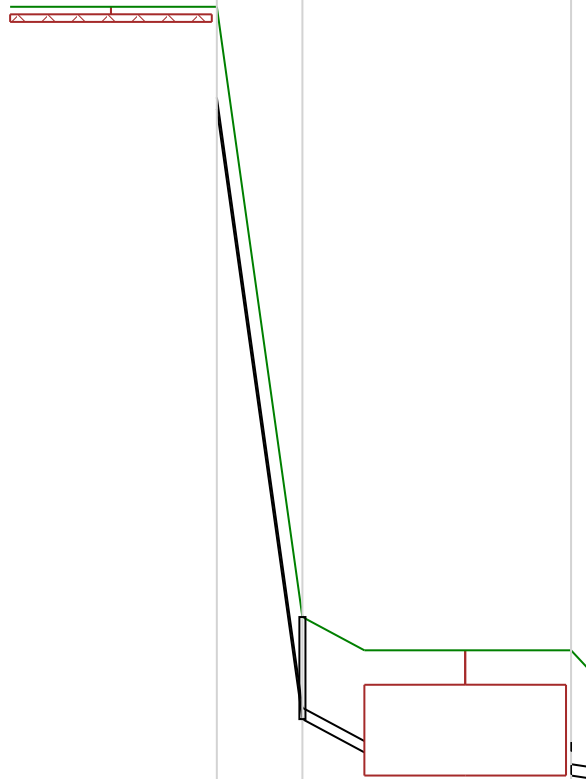
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	Blue Roof 1-1(Block B)	144	29.850	1.200	4.9	8.1674	0.0000	FLOOD RISK
720 minute summer	SWMH 1-02	750	25.690	0.680	0.7	0.7691	0.0000	SURCHARGED
720 minute summer	Attenuation Tank 1-1	750	25.690	0.856	3.8	68.7481	0.0000	SURCHARGED
720 minute summer	Flow Control 1-1	750	25.690	0.904	0.6	1.0224	0.0000	SURCHARGED
720 minute summer	SWMH 1-03	750	23.007	0.007	0.4	0.0083	0.0000	OK
720 minute summer	SWMH 1-06	750	18.346	0.006	0.4	0.0070	0.0000	OK
720 minute summer	Outfall TWMH	750	16.426	0.006	0.4	0.0000	0.0000	OK
720 minute summer	SWMH 1-01	750	25.690	0.110	0.6	0.1244	0.0000	OK
180 minute summer	Blue Roof 1-2 (Block A)	136	34.850	1.200	4.5	7.1320	0.0000	FLOOD RISK
180 minute summer	Blue Roof 1-3(Block A)	148	34.856	1.206	5.3	10.2179	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	Blue Roof 1-1(Block B)	Orifice	SWMH 1-02	0.7				
720 minute summer	SWMH 1-02	2.001	Attenuation Tank 1-1	0.6	0.409	0.035	0.3119	
720 minute summer	Attenuation Tank 1-1	1.002	Flow Control 1-1	0.6	0.202	0.033	0.0837	
720 minute summer	Flow Control 1-1	1.003	SWMH 1-03	0.4	1.537	0.003	0.0006	
720 minute summer	SWMH 1-03	1.004	SWMH 1-06	0.4	1.410	0.004	0.0047	
720 minute summer	SWMH 1-06	1.005	Outfall TWMH	0.4	1.703	0.003	0.0008	15.6
720 minute summer	SWMH 1-01	1.001	Attenuation Tank 1-1	0.6	0.745	0.019	0.1932	
180 minute summer	Blue Roof 1-2 (Block A)	Orifice	SWMH 1-01	0.7				
180 minute summer	Blue Roof 1-3(Block A)	Orifice	Attenuation Tank 1-1	0.7				

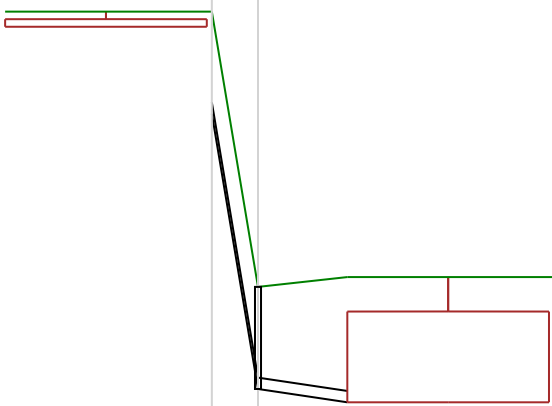
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.01%

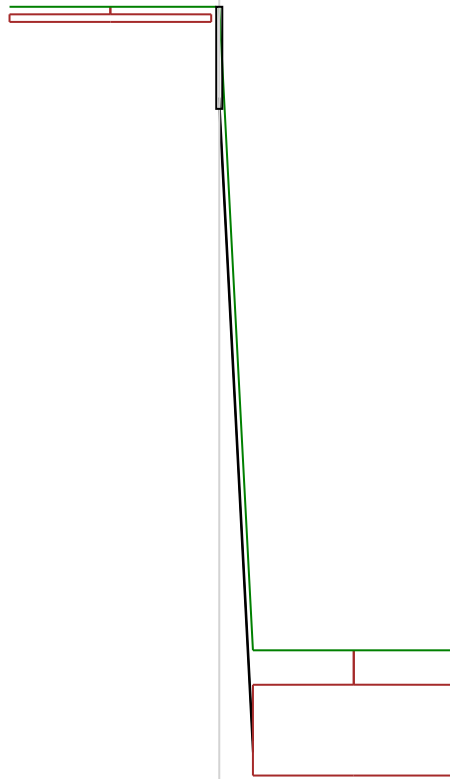
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	Blue Roof 1-1(Block B)	184	29.863	1.213	4.9	10.2879	0.0000	FLOOD RISK
960 minute summer	SWMH 1-02	975	25.844	0.834	0.7	0.9434	0.0000	SURCHARGED
960 minute summer	Attenuation Tank 1-1	975	25.844	1.010	3.7	81.1286	0.0000	SURCHARGED
960 minute summer	Flow Control 1-1	975	25.844	1.058	0.6	1.1967	0.0000	SURCHARGED
960 minute summer	SWMH 1-03	975	23.008	0.008	0.4	0.0086	0.0000	OK
960 minute summer	SWMH 1-06	975	18.346	0.006	0.4	0.0073	0.0000	OK
960 minute summer	Outfall TWMH	975	16.426	0.006	0.4	0.0000	0.0000	OK
960 minute summer	SWMH 1-01	975	25.844	0.264	0.6	0.2988	0.0000	SURCHARGED
240 minute summer	Blue Roof 1-2 (Block A)	180	34.864	1.214	4.5	8.8935	0.0000	FLOOD RISK
180 minute summer	Blue Roof 1-3(Block A)	160	34.871	1.221	6.2	12.5080	0.0000	FLOOD RISK

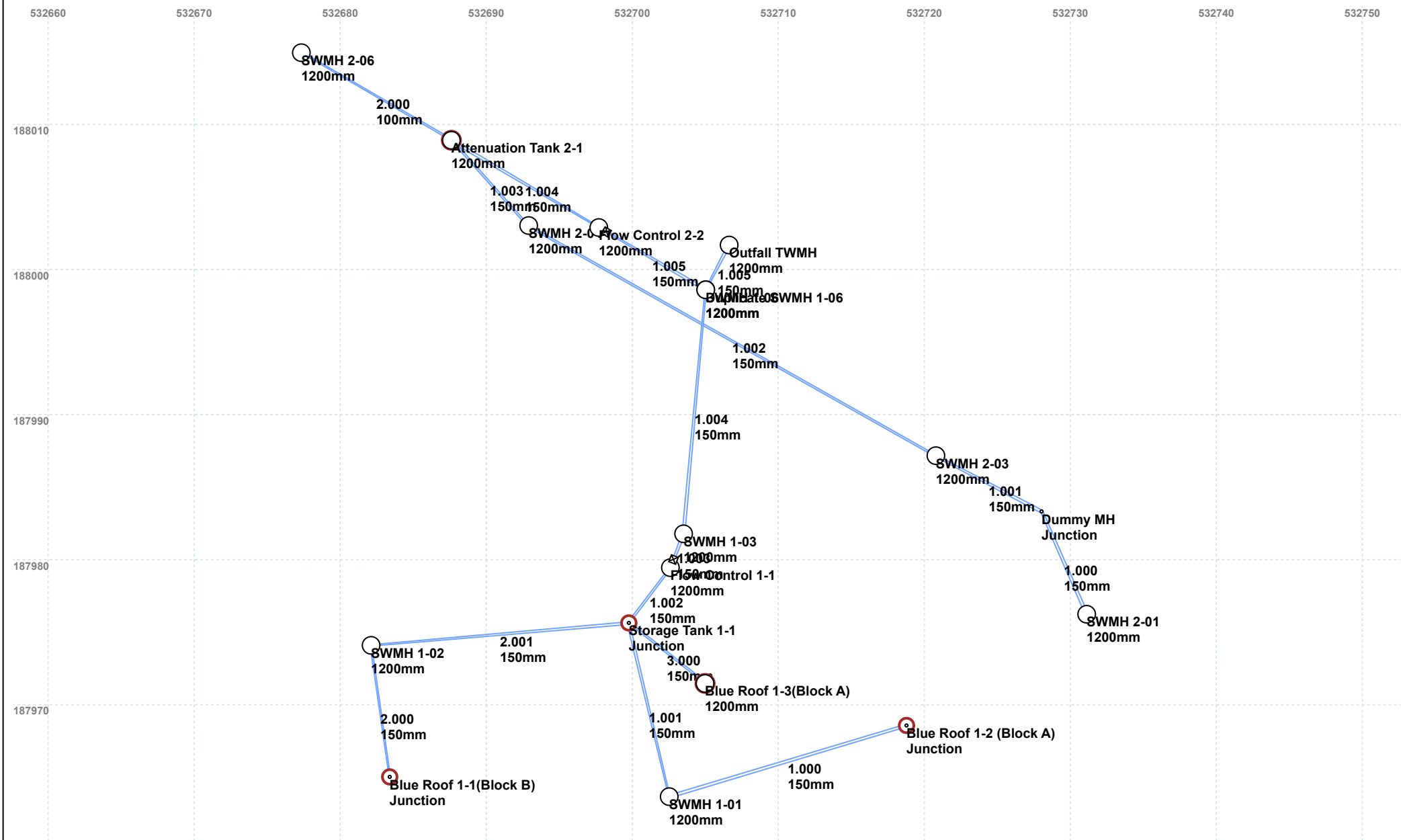
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute summer	Blue Roof 1-1(Block B)	Orifice	SWMH 1-02	0.7				
960 minute summer	SWMH 1-02	2.001	Attenuation Tank 1-1	0.6	0.361	0.035	0.3119	
960 minute summer	Attenuation Tank 1-1	1.002	Flow Control 1-1	0.6	0.198	0.033	0.0837	
960 minute summer	Flow Control 1-1	1.003	SWMH 1-03	0.4	1.573	0.003	0.0007	
960 minute summer	SWMH 1-03	1.004	SWMH 1-06	0.4	1.438	0.004	0.0049	
960 minute summer	SWMH 1-06	1.005	Outfall TWMH	0.4	1.742	0.003	0.0008	20.8
960 minute summer	SWMH 1-01	1.001	Attenuation Tank 1-1	0.6	0.744	0.019	0.2163	
240 minute summer	Blue Roof 1-2 (Block A)	Orifice	SWMH 1-01	0.7				
180 minute summer	Blue Roof 1-3(Block A)	Orifice	Attenuation Tank 1-1	0.7				

Node Name	Blue Road (Block A)	Stage Control 1-1
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 24.000		
Link Name	1.000	1.001
Section Type	150mm	150m
Slope (1:X)	2.1	27.9
Cover Level (m)	35.000	26.930
Invert Level (m)	33.650	25.580
Length (m)	16.975	12.28

Node Name	Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd		
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 16.000			
	Link Name	1	1.004 1
	Section Type	1150mm1	
	Slope (1:X)	1	3.6 1
	Cover Level (m)	23.000	19.690
Invert Level (m)	23.000	18.340	18.340
Length (m)	2	16.892 3.	

Node Name	Blue SWM 1-1 (Slope Bank 1-1)		
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 22.000			
	Link Name	2.00	2.001
	Section Type	150	150mm
	Slope (1:X)	2.5	100.7
	Cover Level (m)	30.000	26.360
Invert Level (m)		28.650	24.834
Length (m)		9.15	17.718

Node Name	Structure Details	Structure Details	Structure Details
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 24.000			
Link Name	3.0		
Section Type	150		
Slope (1:X)	0.8		
Cover Level (m)	35.000 26.490		
Invert Level (m)	25.640 25.640		
Length (m)	6.6		



Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH 2-01	0.005	5.00	27.020	1200	532731.122	187976.239	1.350
Dummy MH			23.330		532728.030	187983.321	1.350
SWMH 2-03	0.031	5.00	19.700	1200	532720.796	187987.167	1.350
SWMH 2-04	0.053	5.00	19.790	1200	532692.908	188003.030	1.758
Attenuation Tank 2-1	0.028	5.00	19.910	1200	532687.614	188008.907	1.957
SWMH 2-06		5.00	20.190	1200	532677.341	188014.943	1.300
Flow Control 2-2			19.660	1200	532697.711	188002.892	1.824
Duplicate SWMH 1-06			19.690	1200	532705.033	187998.601	1.939

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SWMH 2-01	Dummy MH	7.728	0.600	25.670	21.980	3.690	2.1	150	5.02	50.0
1.001	Dummy MH	SWMH 2-03	8.193	0.600	21.980	18.350	3.630	2.3	150	5.04	50.0
1.002	SWMH 2-03	SWMH 2-04	32.084	0.600	18.350	18.032	0.318	100.9	150	5.57	50.0
1.003	SWMH 2-04	Attenuation Tank 2-1	7.910	0.600	18.032	17.953	0.079	100.1	150	5.70	50.0
2.000	SWMH 2-06	Attenuation Tank 2-1	11.915	0.600	18.890	18.610	0.280	42.6	100	5.17	50.0
1.004	Attenuation Tank 2-1	Flow Control 2-2	11.753	0.600	17.953	17.836	0.117	100.5	150	5.90	50.0
1.005	Flow Control 2-2	Duplicate SWMH 1-06	8.487	0.600	17.836	17.751	0.085	99.8	150	6.04	50.0

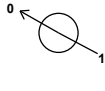
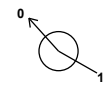
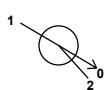
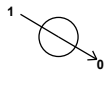
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	7.018	124.0	0.7	1.200	1.200	0.005	0.0	8	1.833
1.001	6.760	119.5	0.7	1.200	1.200	0.005	0.0	8	1.765
1.002	1.000	17.7	4.9	1.200	1.608	0.036	0.0	54	0.854
1.003	1.004	17.7	12.1	1.608	1.807	0.089	0.0	91	1.077
2.000	1.185	9.3	0.0	1.200	1.200	0.000	0.0	0	0.000
1.004	1.002	17.7	15.9	1.807	1.674	0.117	0.0	111	1.131
1.005	1.005	17.8	15.9	1.674	1.789	0.117	0.0	110	1.133

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	7.728	2.1	150	Circular	27.020	25.670	1.200	23.330	21.980	1.200
1.001	8.193	2.3	150	Circular	23.330	21.980	1.200	19.700	18.350	1.200
1.002	32.084	100.9	150	Circular	19.700	18.350	1.200	19.790	18.032	1.608
1.003	7.910	100.1	150	Circular	19.790	18.032	1.608	19.910	17.953	1.807
2.000	11.915	42.6	100	Circular	20.190	18.890	1.200	19.910	18.610	1.200
1.004	11.753	100.5	150	Circular	19.910	17.953	1.807	19.660	17.836	1.674
1.005	8.487	99.8	150	Circular	19.660	17.836	1.674	19.690	17.751	1.789

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SWMH 2-01	1200	Manhole	Adoptable	Dummy MH		Junction	
1.001	Dummy MH		Junction		SWMH 2-03	1200	Manhole	Adoptable
1.002	SWMH 2-03	1200	Manhole	Adoptable	SWMH 2-04	1200	Manhole	Adoptable
1.003	SWMH 2-04	1200	Manhole	Adoptable	Attenuation Tank 2-1	1200	Manhole	Adoptable
2.000	SWMH 2-06	1200	Manhole	Adoptable	Attenuation Tank 2-1	1200	Manhole	Adoptable
1.004	Attenuation Tank 2-1	1200	Manhole	Adoptable	Flow Control 2-2	1200	Manhole	Adoptable
1.005	Flow Control 2-2	1200	Manhole	Adoptable	Duplicate SWMH 1-06	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWMH 2-01	532731.122	187976.239	27.020	1.350	1200				
						0	1.000	25.670	150
Dummy MH	532728.030	187983.321	23.330	1.350			1	1.000	21.980
						0	1.001	21.980	150
SWMH 2-03	532720.796	187987.167	19.700	1.350	1200		1	1.001	18.350
						0	1.002	18.350	150
SWMH 2-04	532692.908	188003.030	19.790	1.758	1200		1	1.002	18.032
						0	1.003	18.032	150
Attenuation Tank 2-1	532687.614	188008.907	19.910	1.957	1200		1	2.000	18.610
						2	1.003	17.953	150
						0	1.004	17.953	150
SWMH 2-06	532677.341	188014.943	20.190	1.300	1200		0	2.000	18.890
						0	2.000	18.890	100
Flow Control 2-2	532697.711	188002.892	19.660	1.824	1200		1	1.004	17.836
						0	1.005	17.836	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Duplicate SWMH 1-06	532705.033	187998.601	19.690	1.939	1200	1 	1.005	17.751	150

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Analysis Speed	Normal	Additional Storage (m³/ha)	20.0		

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	20	0	0
100	40	0	0

Node Flow Control 2-2 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	0.5		
Invert Level (m)	17.836	Diameter (m)	0.016		

Node Attenuation Tank 2-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	17.953
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	137.4	0.0	0.800	137.4	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2-01	10	25.678	0.008	0.7	0.0099	0.0000	OK
15 minute summer	Dummy MH	10	21.988	0.008	0.7	0.0000	0.0000	OK
15 minute summer	SWMH 2-03	10	18.402	0.052	4.8	0.0830	0.0000	OK
15 minute summer	SWMH 2-04	9	18.154	0.122	11.6	0.2108	0.0000	OK
600 minute summer	Attenuation Tank 2-1	600	18.089	0.136	2.6	18.8412	0.0000	OK
15 minute summer	SWMH 2-06	1	18.890	0.000	0.0	0.0000	0.0000	OK
600 minute summer	Flow Control 2-2	600	18.089	0.253	0.3	0.2858	0.0000	SURCHARGED
600 minute summer	Duplicate SWMH 1-06	600	17.764	0.013	0.3	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	SWMH 2-01	1.000	Dummy MH	0.7	1.881	0.006	0.0028	
15 minute summer	Dummy MH	1.001	SWMH 2-03	0.7	0.267	0.006	0.0238	
15 minute summer	SWMH 2-03	1.002	SWMH 2-04	4.6	0.486	0.262	0.3310	
15 minute summer	SWMH 2-04	1.003	Attenuation Tank 2-1	12.1	1.584	0.684	0.0649	
600 minute summer	Attenuation Tank 2-1	1.004	Flow Control 2-2	0.3	0.142	0.015	0.2020	
15 minute summer	SWMH 2-06	2.000	Attenuation Tank 2-1	0.0	0.000	0.000	0.0000	
600 minute summer	Flow Control 2-2	1.005	Duplicate SWMH 1-06	0.3	0.362	0.015	0.0061	10.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2-01	10	25.684	0.013	2.0	0.0163	0.0000	OK
15 minute summer	Dummy MH	10	21.993	0.013	2.0	0.0000	0.0000	OK
15 minute summer	SWMH 2-03	11	18.685	0.335	14.4	0.5331	0.0000	SURCHARGED
15 minute summer	SWMH 2-04	11	18.498	0.466	32.8	0.8081	0.0000	SURCHARGED
600 minute summer	Attenuation Tank 2-1	600	18.294	0.341	5.8	47.2869	0.0000	SURCHARGED
15 minute summer	SWMH 2-06	1	18.890	0.000	0.0	0.0000	0.0000	OK
600 minute summer	Flow Control 2-2	600	18.294	0.458	0.4	0.5175	0.0000	SURCHARGED
600 minute summer	Duplicate SWMH 1-06	600	17.766	0.015	0.4	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	SWMH 2-01	1.000	Dummy MH	2.0	2.602	0.016	0.0059	
15 minute summer	Dummy MH	1.001	SWMH 2-03	2.0	0.329	0.017	0.0752	
15 minute summer	SWMH 2-03	1.002	SWMH 2-04	13.4	0.761	0.757	0.5648	
15 minute summer	SWMH 2-04	1.003	Attenuation Tank 2-1	32.5	2.180	1.834	0.1285	
600 minute summer	Attenuation Tank 2-1	1.004	Flow Control 2-2	0.4	0.133	0.020	0.2069	
15 minute summer	SWMH 2-06	2.000	Attenuation Tank 2-1	0.0	0.000	0.000	0.0000	
600 minute summer	Flow Control 2-2	1.005	Duplicate SWMH 1-06	0.4	0.396	0.020	0.0076	14.1

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2-01	10	25.686	0.016	2.7	0.0187	0.0000	OK
15 minute summer	Dummy MH	10	21.995	0.015	2.7	0.0000	0.0000	OK
15 minute summer	SWMH 2-03	12	19.037	0.687	19.2	1.0916	0.0000	SURCHARGED
15 minute summer	SWMH 2-04	11	18.735	0.703	42.4	1.2197	0.0000	SURCHARGED
720 minute summer	Attenuation Tank 2-1	720	18.442	0.489	7.1	67.8580	0.0000	SURCHARGED
15 minute summer	SWMH 2-06	1	18.890	0.000	0.0	0.0000	0.0000	OK
720 minute summer	Flow Control 2-2	720	18.442	0.606	0.4	0.6851	0.0000	SURCHARGED
480 minute summer	Duplicate SWMH 1-06	488	17.767	0.016	0.4	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	SWMH 2-01	1.000	Dummy MH	2.7	2.840	0.022	0.0073	
15 minute summer	Dummy MH	1.001	SWMH 2-03	2.7	0.313	0.022	0.0759	
15 minute summer	SWMH 2-03	1.002	SWMH 2-04	17.0	0.968	0.964	0.5648	
15 minute summer	SWMH 2-04	1.003	Attenuation Tank 2-1	41.6	2.574	2.342	0.1393	
720 minute summer	Attenuation Tank 2-1	1.004	Flow Control 2-2	0.4	0.123	0.023	0.2069	
15 minute summer	SWMH 2-06	2.000	Attenuation Tank 2-1	0.0	0.000	0.000	0.0000	
720 minute summer	Flow Control 2-2	1.005	Duplicate SWMH 1-06	0.4	0.414	0.023	0.0084	18.3

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2-01	10	25.687	0.017	3.2	0.0204	0.0000	OK
15 minute summer	Dummy MH	10	21.997	0.017	3.2	0.0000	0.0000	OK
15 minute summer	SWMH 2-03	12	19.362	1.012	23.0	1.6089	0.0000	SURCHARGED
15 minute summer	SWMH 2-04	11	18.944	0.912	49.9	1.5813	0.0000	SURCHARGED
720 minute summer	Attenuation Tank 2-1	720	18.554	0.601	8.6	83.3883	0.0000	SURCHARGED
15 minute summer	SWMH 2-06	1	18.890	0.000	0.0	0.0000	0.0000	OK
720 minute summer	Flow Control 2-2	720	18.554	0.718	0.4	0.8116	0.0000	SURCHARGED
720 minute summer	Duplicate SWMH 1-06	720	17.767	0.016	0.4	0.0000	0.0000	OK

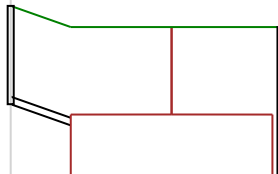
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 2-01	1.000	Dummy MH	3.2	2.989	0.026	0.0082	
15 minute summer	Dummy MH	1.001	SWMH 2-03	3.2	0.317	0.027	0.0764	
15 minute summer	SWMH 2-03	1.002	SWMH 2-04	19.9	1.130	1.125	0.5648	
15 minute summer	SWMH 2-04	1.003	Attenuation Tank 2-1	49.0	2.864	2.760	0.1393	
720 minute summer	Attenuation Tank 2-1	1.004	Flow Control 2-2	0.4	0.203	0.025	0.2069	
15 minute summer	SWMH 2-06	2.000	Attenuation Tank 2-1	0.0	0.000	0.000	0.0000	
720 minute summer	Flow Control 2-2	1.005	Duplicate SWMH 1-06	0.4	0.425	0.025	0.0089	19.8

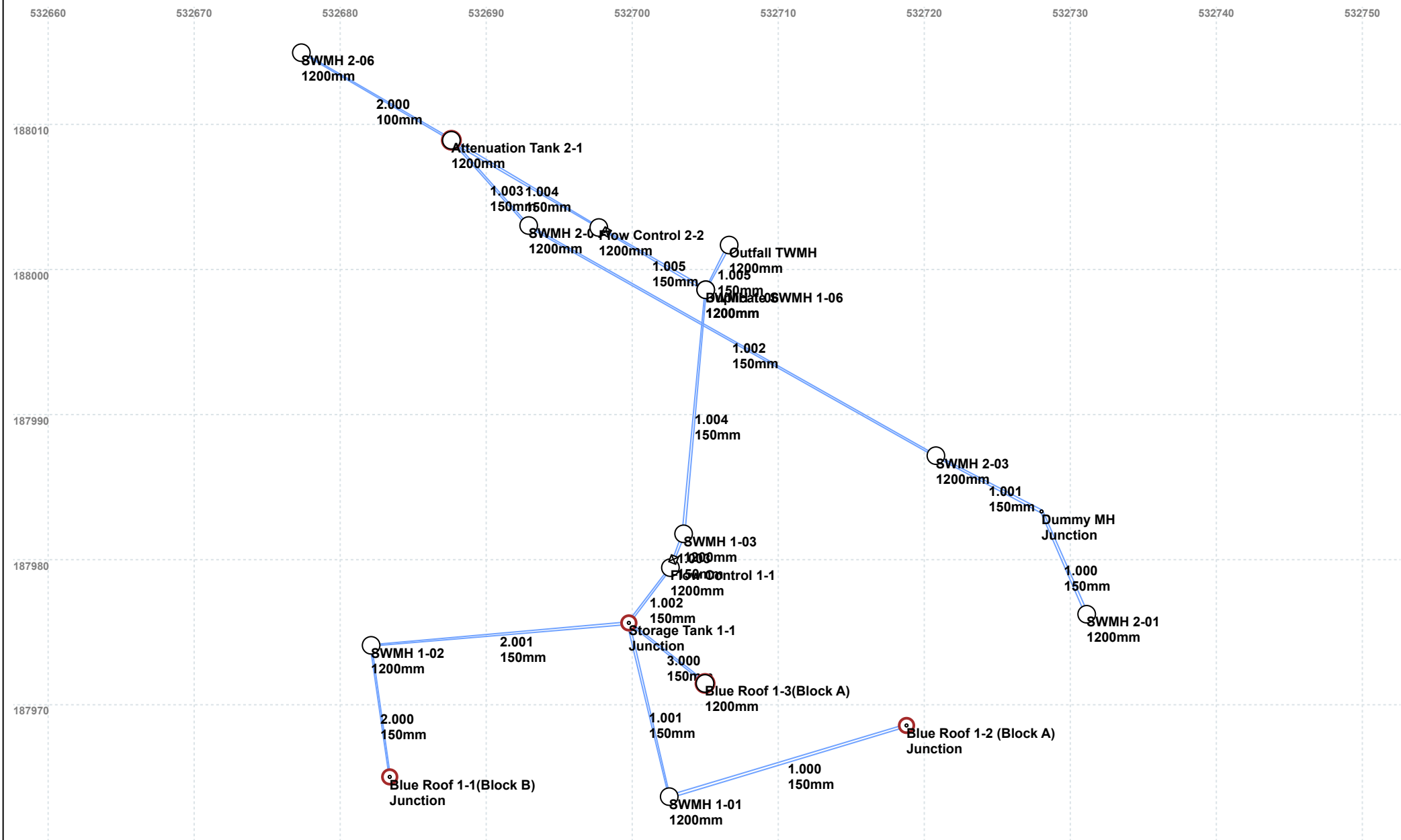
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 2-01	10	25.688	0.018	3.7	0.0218	0.0000	OK
15 minute summer	Dummy MH	10	21.998	0.018	3.7	0.0000	0.0000	OK
15 minute summer	SWMH 2-03	12	19.699	1.349	26.7	2.1452	0.0000	FLOOD RISK
15 minute summer	SWMH 2-04	11	19.170	1.138	57.4	1.9727	0.0000	SURCHARGED
600 minute summer	Attenuation Tank 2-1	615	18.664	0.711	11.4	98.7666	0.0000	SURCHARGED
15 minute summer	SWMH 2-06	1	18.890	0.000	0.0	0.0000	0.0000	OK
600 minute summer	Flow Control 2-2	615	18.664	0.828	0.5	0.9369	0.0000	SURCHARGED
600 minute summer	Duplicate SWMH 1-06	615	17.768	0.017	0.5	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	SWMH 2-01	1.000	Dummy MH	3.7	3.120	0.030	0.0091	
15 minute summer	Dummy MH	1.001	SWMH 2-03	3.7	0.327	0.031	0.0769	
15 minute summer	SWMH 2-03	1.002	SWMH 2-04	22.2	1.260	1.255	0.5648	
15 minute summer	SWMH 2-04	1.003	Attenuation Tank 2-1	55.1	3.152	3.106	0.1393	
600 minute summer	Attenuation Tank 2-1	1.004	Flow Control 2-2	0.5	0.217	0.027	0.2069	
15 minute summer	SWMH 2-06	2.000	Attenuation Tank 2-1	0.0	0.000	0.000	0.0000	
600 minute summer	Flow Control 2-2	1.005	Duplicate SWMH 1-06	0.5	0.434	0.027	0.0094	18.6

Node Name	SW 1-01	SW 1-02	SWMH 2-03	SWMH 2-04	Attenuation Pond	SWMH 1-06
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 17.000						
Link Name	1.001	1.002	1.003	1.004	1.005	1.006
Section Type	150	150	150mm	150	150m	150
Slope (1:X)	2.1	2.3	100.9	100	100.599.8	
Cover Level (m)	27.020	23.330	19.700	19.790	19.910	19.660
Invert Level (m)	25.680	23.980	18.350	18.032	17.953	17.836
Length (m)	7.78	1.15	32.084	7.91	11.758	4.8

Node Name		SWM1206 Inlet to Infiltration Tank 2-1	
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 13.000			
	Link Name	2.000	
	Section Type	100m	
	Slope (1:X)	42.6	
	Cover Level (m)	20.190 19.910	
Invert Level (m)	18.890 18.610		
Length (m)	11.91		



1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Warehouse Living
	Address & post code	Haringey, London N15 6RD
	OS Grid ref. (Easting, Northing)	E 532710 N 187980
	LPA reference (if applicable)	
	Brief description of proposed work	The proposed development comprises two live-work buildings – Block A to the east (8 storeys plus two basement levels) and Block B to the west (4 storeys, with no basement levels)
	Total site Area	2366 m ²
	Total existing impervious area	1895 m ²
	Total proposed impervious area	2123 m ²
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
	Existing drainage connection type and location	To Thames Water sewer
	Designer Name	Cham Ariyaratne
	Designer Position	Director
Designer Company	Chathom Limited	

2. Proposed Discharge Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	None recorded	
	Bedrock geology classification	London Clay	
	Site infiltration rate	m/s	
	Depth to groundwater level	m below ground level	
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		Feasible (Y/N)	Proposed (Y/N)
	1 store rainwater for later use	N	N
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	Y	Y
	7 discharge rainwater to the combined sewer.	N	N
2c. Proposed Discharge Details			
Proposed discharge location	Thames Water sewer MH ref 7002		
Has the owner/regulator of the discharge location been consulted?	Yes		

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m ³)	Proposed discharge rate (l/s)
Qbar	1.01			
1 in 1	0.86	32.5		1
1 in 30	2.31	81.3		1
1 in 100	3.21	120.4		1
1 in 100 + CC				1
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Orifice		
3c. Proposed SuDS Measures				
	Catchment area (m ²)	Plan area (m ²)	Storage vol. (m ³)	
Rainwater harvesting	0		0	
Infiltration systems	0		0	
Green roofs	0	0	0	
Blue roofs	445	0	0	
Filter strips	0	0	0	
Filter drains	0	0	0	
Bioretention / tree pits	0	0	0	
Pervious pavements	0	0	0	
Swales	0	0	0	
Basins/ponds	0	0	0	
Attenuation tanks	1921		0	
Total	2366	0	0	

4. Supporting Information	4a. Discharge & Drainage Strategy	Page/section of drainage report
	Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	2.5
	Drainage hierarchy (2b)	3.4
	Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix A
	Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	3.5, Appendix C
	Proposed SuDS measures & specifications (3b)	3.6
	4b. Other Supporting Details	Page/section of drainage report
	Detailed Development Layout	Appendix B
	Detailed drainage design drawings, including exceedance flow routes	Appendix C
	Detailed landscaping plans	Appendix B
	Maintenance strategy	Appendix D
	Demonstration of how the proposed SuDS measures improve:	
	a) water quality of the runoff?	4
	b) biodiversity?	
	c) amenity?	



Appendix D – SuDS Maintenance Schedule

Maintenance regime

As the maintenance of the communal SUDS features will be carried out via a Management Company, the form of agreement should include the required maintenance listed below. Should the maintenance be transferred at a later date to a public body, then the model agreement SUDS MA1 should be used, details of which can be found in the CIRIA guidance C625.

The following section describes the required maintenance for each feature in turn. The SUDS maintenance requirements listed below should be reviewed after the first 5 years, with a view to agreeing a new regime for the ongoing maintenance.

Notwithstanding the routine inspections and maintenance requirements, after severe storm events all features shall be inspected to clear debris and repair damaged structures or features. Records of the maintenance carried out shall be prepared by the Management Company.

Blue/Green Roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required



Maintenance schedule	Required action	Typical frequency
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting as required- clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Bioretention Systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows are rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly
	Replace any plants, to maintain planting density	As required



Maintenance schedule	Required action	Typical frequency
	Remove sediment, litter and debris build up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

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, the 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



An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Permeable Paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required



Maintenance schedule	Required action	Typical frequency
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually



Other Drainage items

Product Type	Period	Responsibility	Maintenance Methods
Silt Trap	As necessary and before wet season	Owner/ Maintenance Company	Sediment and debris that accumulated during summer needs to be removed before the wet season. Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank. Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates more often. Clean and repair as needed.
Standard Manholes/ Inspection Chambers	As necessary	Owner/ Maintenance Company	Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole. Renew/replace any damaged/missing bolts and damaged/missing manhole covers.
Drainage Pipes	Six monthly intervals	Owner/ Maintenance Company	Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.
Flow control	Annually	Maintenance Company for communal areas	Renew any missing/broken items Cleaning out Check outlet spigot