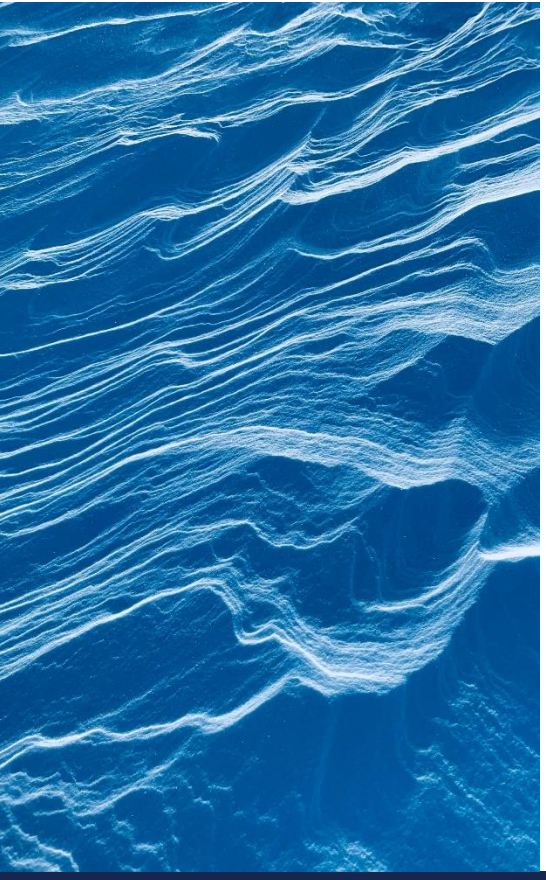
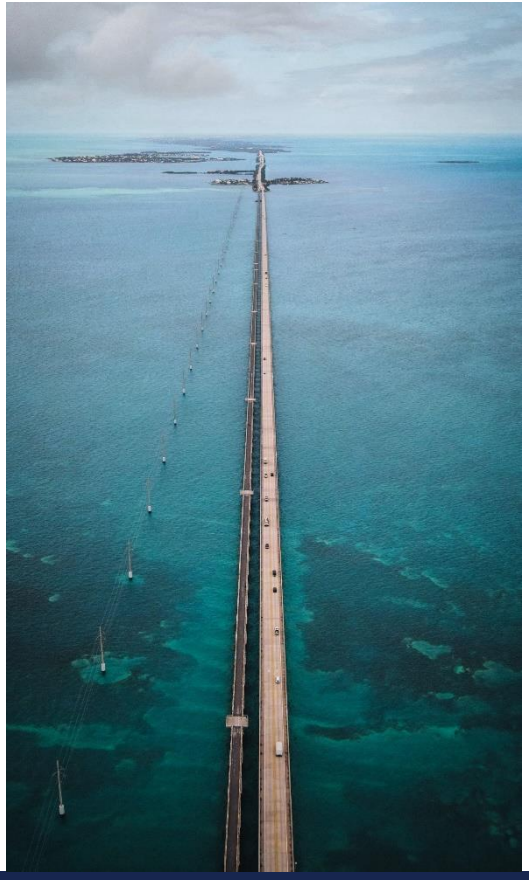


Surface Water Drainage Strategy
AEG0680_B70_West Brom_05

PUUC Architectural Design Studios

Site Address: 396 High Street,
West Brom,
B70 9LB

aegaea
Flood risk, water and environment

UK Experts in Flood Modelling, Flood Risk Assessments, and Surface Water Drainage Strategies

aegaea
Flood risk, water and environment

Document Issue Record

Project: Surface Water Drainage Strategy

Prepared for: PUUC Architectural Design Studios

Reference: AEG0680_B70_West Brom_05

Site Location: 396 High Street, West Brom, B70 9LB

Consultant		Date	Signature
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Please Note:

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Flood risk, water and environment

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Flood risk, water and environment

1. Introduction

1.1. Aegaea were commissioned by PUUC Architectural Design Studios to undertake a Surface Water Drainage Strategy to accompany a planning application for the proposed development.

1.2. This report has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

1.3. This report is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

1.4. Revision B of this report (05/02/2023) has been created to address comments raised by Staffordshire County Council Flood Risk Management Team in response to the previously submitted planning application. Due to the limited nature of the comments and for ease of use, any new or updated paragraphs are presented in red text throughout this report. The LLFA comments are replicated in Section 2 of this report.

Site Overview

1.5. The site of the proposed development is 396 High Street, West Brom, B70 9LB (Figure 1).

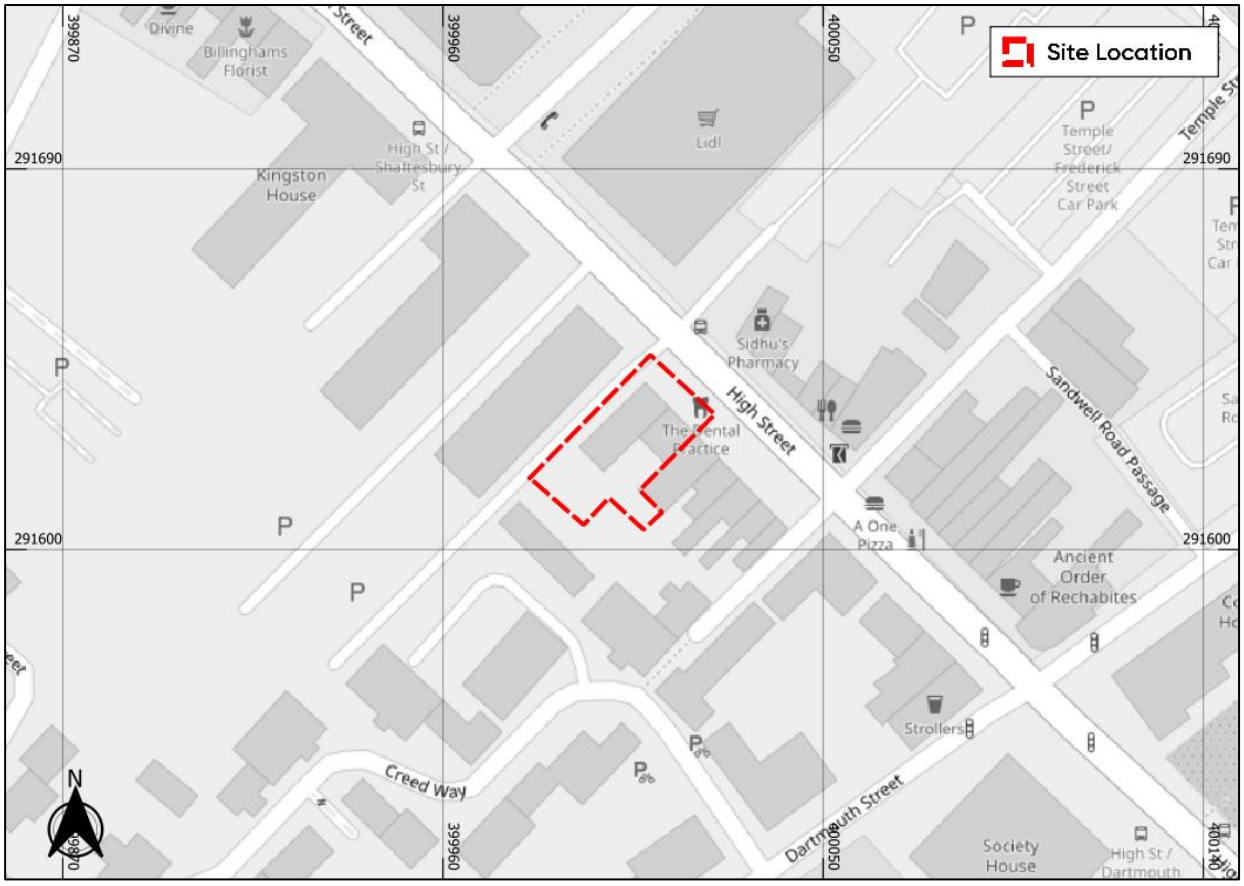


Figure 1: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors)

1.6. The existing site is comprised of a health centre building with associated parking, and is currently comprised entirely of hardstanding area. The proposed development includes the construction of a rear extension and change of use to residential (Appendix A).

1.7. In the absence of a topographic survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model (1m resolution) has been utilised to review the topography in the vicinity of the site. Ground levels generally slope to the east. The LiDAR shows ground levels in the redline parcel to the west vary between approximately 161.25m Above Ordnance Datum (AOD) to 159.50m AOD.

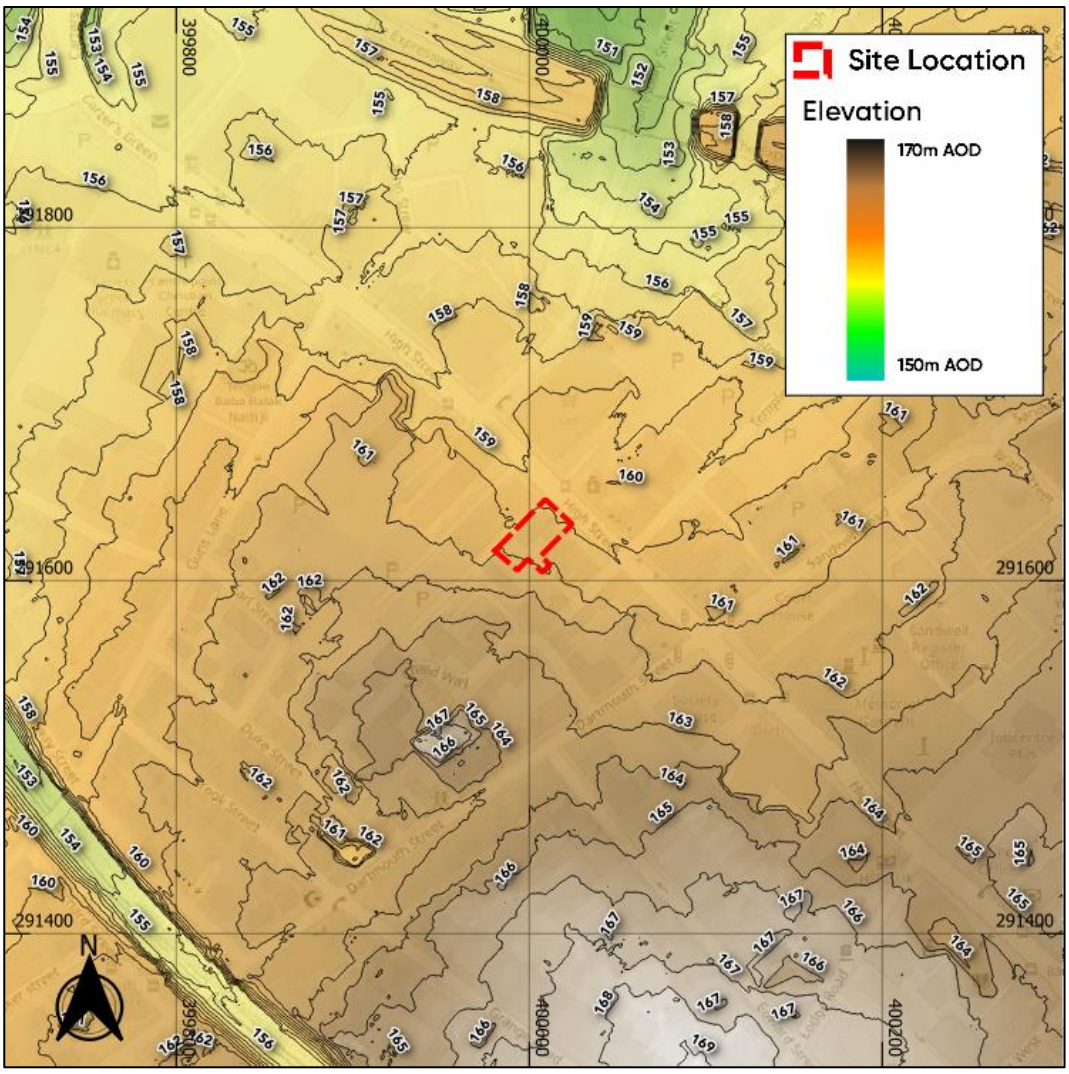


Figure 2: Site Topography (Sources: EA 1m LiDAR, Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors)

1.8. Sandwell Metropolitan Borough Council is the Local Planning Authority (LPA) for the site, and the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's West Midlands region.

2. Policy Compliance

National Planning Policy

2.1. The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional and local planning policy and associated guidance. The following section summarises the key policies and guidance relevant to the proposed development.

2.2. The National Planning Policy Framework[1] (NPPF) (DCLG, 2021) includes Government policy on development and flood risk stating that:

> *"169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*
>
> *a) take account of advice from the lead local flood authority;*
>
> *b) have appropriate proposed minimum operational standards;*
>
> *c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
>
> *d) where possible, provide multifunctional benefits.*

2.3. Sustainable drainage systems should be considered and included where practicable, in line with Defra Technical Standards[2].

[1] https://www.gov.uk/guidance/national-planning-policy-framework, **last updated July 2021**

2 Technical Standards Accessed Online
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

Local Planning Policy

2.4. The Black Country Core Strategy was jointly prepared by Sandwell Borough Council. The core strategy sets out the policies for development in the local area. The Black Country Core Strategy[3] (Adopted in 2011) includes policies related to surface water drainage. Relevant extracts from the Local Plan policies are presented below:

> *Policy ENV5 Flood Risk, Sustainable Drainage Systems and Urban Heat Island*
>
> *The Black Country Authorities will seek to minimize the probability and consequences of flood risk by adopting a strong risk-based approach in line with PPS25. Development will be steered to areas with a low probability of flooding first through the application of the sequential test. The Exception test will then be required for certain vulnerable uses in medium and high probability flood areas.*
>
> *Proposals for development must demonstrate that the level of flood risk associated with the site is acceptable in terms of the Black Country Strategic Flood Risk Assessment and its planning and development management recommendations as well as PPS25 depending on which flood zone the site falls into and the type of development that is proposed (see PPS25, table D1: Flood Zones to explain appropriate uses in flood zones).*
>
> *To assist in both reducing the extent and impact of flooding and also reducing potential urban heat island effects, all developments should:*
>
> *a) Incorporate Sustainable Drainage Systems (SUDs), unless it would be impractical to do so, in order to significantly reduce surface water run-off and improve water quality. The type of SUDs used will be dependent on ground conditions;*

3 Black Country Core Strategy - https://blackcountryplan.dudley.gov.uk/t1/p2/

b) Open up culverted watercourses where feasible and ensure development does not occur over existing culverts where there are deliverable strategies in place to implement this;

c) Take every opportunity, where appropriate development lies adjacent to the river corridors, or their tributaries or the functional floodplain, to benefit the river by reinstating a natural, sinuous river channel and restoring the functional floodplain within the valley where it has been lost previously;

d) On sites requiring a Flood Risk Assessment, reduce surface water flows back to equivalent greenfield rates;

e) Create new green space, increase tree cover and/or provide green roofs;

No development will be permitted within a groundwater Source Protection Zone 1 which would physically disturb an aquifer, and no permission will be granted without a risk assessment demonstrating there would be no adverse effect on water resources.

LLFA Comments

2.5. The Staffordshire Country Council Flood Risk Management Team provided the below comments in response to previous revisions of this report (comments received 29/11/2022). Revision B of the SWDS has been created to address the LLFA comments, which are replicated below:

We have reviewed the submitted evidence, including the Surface Water Drainage Strategy (AEG0680_B70_West Brom_05 – 08/11/22). The proposed development may present risks of flooding on-site and/or off-site if surface water runoff is not effectively managed. We would recommend that planning permission is not granted until the following issues have been addressed:

Water quality

Please provide supporting information to demonstrate that sufficient water quality measures have been incorporated into the design for all sources of runoff. This should be in accordance with the CIRIA SuDS Manual Simple Index Approach and

SuDS treatment design criteria. To achieve this, we would strongly encourage the use of SUDS such as permeable paving and rainwater harvesting systems. In addition, we would encourage any strategy that delivered wider benefits such as amenity and biodiversity.

Maintenance

Please provide a maintenance plan for the proposed surface water system, to include a schedule of planned activities with the frequencies of required maintenance. Provide name and contact details of the maintenance provider.

Exceedance

Plans illustrating flooded areas and flow paths in the event of exceedance of the drainage system. To include building FFLs and drainage levels.

3. Surface Water Drainage Strategy

Surrounding Water Environment & Existing Drainage

3.1. The nearest watercourse is the Wednesbury Old Canal, located approximately 1,300m west of the site location.

3.2. A CCTV drainage survey has been undertaken by BogStandard Drainage in October 2022. The CCTV survey identifies a combined sewer network on site, which outfall to an existing combined public sewer to the rear of the site. The CCTV survey identifies the existing combined sewer drainage network as being 1.96m deep (MH1).

3.3. The British Geological Survey's (BGS) mapping shows superficial deposits at the site location comprised of Till - diamicton. The bedrock underlying the site is indicated to be Alveley Member, comprised of sandstone. A review of BGS onshore borehole records in the vicinity of the site generally shows the presence of "Sandy Clay", "Clay", and "sandstone" (borehole references: SP09SW467, SP09SW945, SP09SW260).

3.4. As such, based on this online mapping infiltration of surface water runoff is not expected to be a viable method of discharge for the proposed development. Infiltration tests in accordance with BRE 365 should be carried out at the detailed design stage, and this SWDS should be refined in light of these tests.

3.5. It is expected that surface water currently generated on site discharges to the existing combined sewer.

Pre-Development / Greenfield Runoff Rates

3.6. The total area of the site is approximately 847m^2 (0.085 hectares).

3.7. The entire site area will be positively drained. Therefore, for the purpose of this report and calculations, the proposed impermeable area being managed is approximately 847m^2 (0.085hectares).

3.8. The greenfield runoff rate for the site's proposed hardstanding area draining to the sewer has been calculated using the IH124 method (via the ICP SuDS variation) within InfoDrainage Software v2023.0.

3.9. The IH124 method was developed as part of the original Flood Studies Report (FSR) in 1975 and was devised to calculate runoff from small catchments by estimating the mean annual flood flow (Qbar) using the following equation:

$$Qbar_{rural} = 0.00108(0.1 \times AREA)0.89 \times SAAR1.17 \times SPR2.17\ m^3/s$$

Where:

$Qbar_{rural}$ is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the hardstanding surfaces in ha.

SAAR is the Standard Average Annual Rainfall for the period 1941 to 1970 in mm

SPR is Standard Percentage Runoff coefficient for the SOIL category. The SOIL category is extracted from UK Winter Rainfall Acceptance Potential (WRAP) map.

3.10. The ICP SuDS variation is a scaled-down version of the IH124 runoff method for estimating peak flow rates from both undeveloped and partly urbanised catchments that are smaller than 50 ha in size, which is appropriate in this instance.

3.11. The parameters used for estimating the greenfield runoff rates for the site are presented in Table 1.

Table 1 IH-124 Input Parameters

Greenfield runoff rates from the site – simulation criteria	
Rainfall Data	FSR
Area	0.085ha
SAAR	730
SOIL	0.470
Region	Region 4
Urban %	0

3.12. Table 2 displays the estimated greenfield runoff rates for the proposed impermeable area that will be discharged to the sewer 0.085 Ha.

Table 2 Greenfield Runoff Rates

Return Period	Greenfield Runoff Rate (l/s)
1 in 1 Year	0.4
1 in 2 Year (Q_{BAR})	0.4
1 in 30 Year	0.8
1 in 100 Year	1.1

3.13. In line with the Black Country Core Strategy, runoff rates from the proposed development should be restricted to as close to greenfield rates as possible. The calculated greenfield runoff rates are very low. It is considered that a 1.0l/s discharge rate is the lowest acceptable discharge rate that can be incorporated into the proposed drainage strategy without unnecessarily increasing the risk of blockage and sedimentation. Therefore, a peak discharge rate of 1.0l/s is proposed.

Surface Water Drainage Strategy

3.14. In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.

3.15. The management of surface water has been considered in respect to the SuDS hierarchy below, as detailed in the CIRIA 753 "The SuDS Manual" (section 3.2.3).

Table 3 SuDS Drainage Hierarchy

SUDS DRAINAGE HIERARCHY				
			Suitability	**Comment**
↓	**1.**	**Store rainwater for later use**	✓	Rainwater harvesting for the proposed development should be considered by a specialist at the detailed design stage. There are plot scale opportunities for rainwater harvesting measures such as water butts and these should be implemented where practical. The captured rainwater could be re-used throughout the landscaping on site.
	2.	**Use infiltration techniques, such as porous surfaces in non-clay areas**	x	The British Geological Survey's (BGS) mapping shows superficial deposits at the site location comprised of Till - diamicton. The bedrock underlying the site is indicated to be Alveley Member, comprised of sandstone. A review of BGS onshore borehole records in the vicinity of the site generally shows the presence of "Sandy Clay", "Clay", and "sandstone" (borehole references: SP09SW467, SP09SW945, SP09SW260). Furthermore, space on site is very limited for infiltration SuDS features due to the need to allow for a minimum of 5m buffer distance to any structures. As such, based on this online mapping infiltration of surface water runoff is not expected to be a viable method of discharge for the proposed development. It is recommended that infiltration tests in accordance with BRE 365 are carried out at the detailed design stage, and this SWDS should be refined in light of these tests.
	3.	**Attenuate rainwater in ponds or open water features for gradual release**	x/✓	Space on site is limited for above ground SuDS. It is not expected that features such as basins, swales, or ponds would be practical given the slope and arrangement of the site.

				Smaller scale features such as bioretention areas could be incorporated as a source control measures prior to a entering the subsurface piped network.
	4.	**Attenuate rainwater by storing in tanks or sealed water features for gradual release**	✓	Attenuation can be provided in the form of a below ground geocellular crate system, Type C Permeable Paving, or in the subsurface piped network itself through manholes and oversized pipes.
	5.	**Discharge rainwater direct to a watercourse**	x	The nearest watercourse is the Wednesbury Old Canal, located approximately 1,300m west of the site location.
	6.	**Discharge rainwater to a surface water sewer/drain**	x	A CCTV drainage survey has been undertaken by BogStandard Drainage in October 2022. The CCTV survey does not identify any surface water infrastructure within the site boundary.
	7.	**Discharge rainwater to Combined Sewer**	✓	A CCTV drainage survey has been undertaken by BogStandard Drainage in October 2022. The CCTV survey identifies a combined sewer network on site, which outfall to an existing Sever Trent combined public sewer to the rear of the site

3.16. Within the site boundary, it is proposed to discharge all surface water runoff generated by the proposed development to the existing combined sewer. Surface water flows will be restricted to a peak rate of 1.0l/s by a Hydrobrake flow control device. Excess flows will back up into a geocellular attenuation tank.

3.17. Permeable paving – Type C, raised planter bioretention systems, and petrol interceptor manholes will provide water quality benefits.

3.18. Infiltration tests in accordance with BRE 365 are recommended to be carried out at the detailed design stage, and this SWDS should be refined in light of these tests.

3.19. Rainwater harvesting for the proposed development, and plot scale SuDS features such as tree pits should be considered by a specialist at the detailed design stage.

3.20. Any existing outfalls from the site should be reused where possible.

3.21. In line with best practice, the proposed surface water drainage network will remain separate from the foul network until the final downstream manhole on site. This ensures that the proposed surface water network could instead discharge to a surface water sewer if new surface water infrastructure is built by Severn Trent Water in the future.

InfoDrainage Modelling

3.22. A simplified model has been produced in InfoDrainage software (v 2023.0) whereby hardstanding area is applied as inflow throughout the network, with surface water from the proposed development being restricted to 1.0l/s. The model comprises;

- 2no. contributing catchment area across the proposed development area representing hardstanding surfaces for a total area of 0.085ha.
- 3no. surface water manholes.
- 1no. geocellular attenuation tank unit with 95% porosity. The tank has a storage depth of 1.0m, a width of 10.0m and a length of 5.0m.
- 1no. Hydro-Brake flow control unit, limited to a total peak flow rate of 1.0l/s.

3.23. The Environment Agency Peak Rainfall Climate Change Allowance guidance was reviewed and subsequently the Defra Peak Rainfall Allowances Map was assessed to determine appropriate climate change allowances to inform the surface water drainage strategy. The upper end allowances for the Tame Anker and Mease Management Catchment have been used for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (35% and 40% respectively for the 1% and 3.3% events).

Table 4 Simulation Criteria

Catchment Area Simulation Parameters	
Rainfall Data	FSR
Total Area	0.085 Ha
M5-60	19.6mm
Ratio R	0.400
Return Periods	1, 30, 30+35% for climate change, 100, 100 +40% for Climate Change. Summer and Winter
Storm Durations	15, 30, 60, 120, 240, 360, 480, 960, 1440 minute
Volumetric Runoff Coefficient	0.9 (summer and winter storms)
Percentage Impervious	100%
Time of Concentration	5 minutes

InfoDrainage Modelling Results

3.24. The full calculation outputs can be found in Appendix B of this report although the 1 in 100 year +40% climate change results have been summarised below:

- The maximum predicted depth within the 1.0m deep geocellular attenuation tank unit is expected to reach 0.962m during the critical event period (360 minute - winter). Flow rates through the Hydrobrake Manhole would be 1.0l/s in this event. No flooding is observed in this event based on the InfoDrainage model.

3.25. As such, these results indicate that the runoff from the proposed development could be accommodated within a drainage system of the approximate size modelled, with surface water runoff discharging to the sewer restricted to rate of 1.0/s. Full InfoDrainage results for all return periods and durations can be found in Appendix B.

Maintenance

3.26. The LLFA has requested a maintenance plan for the proposed surface water system, to include a schedule of planned activities with the frequencies of required maintenance. Contact details and name of the maintenance provider should be provided by the developer to accompany this SWDS report.

3.27. Table 5, 6 and 7 present details regarding the maintenance requirements for the proposed SuDS included as part of the development, taken from the CIRIA C753 'The SuDS Manual'. Each manufacturer will have bespoke requirements however the below should be used as a guide.

3.28. It is expected that the SuDS features on site will remain in private ownership, a management team should be appointed by the developer to ensure the agreed maintenance tasks are undertaken.

Table 5 Maintenance Requirements for Geocellular Systems

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

Table 6 Maintenance Requirements for Permeable Paving – Type C

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Annually, or as required
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	Annually, or as required
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
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

Table 7 Maintenance Requirements for Proprietary Treatment Systems

Maintenance Schedule	Required Action	Typical Frequency
Regular 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 required
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 for six months, then every six months

3.29. The proposed flow control is self-cleaning and requires no routine maintenance. Action is only required in the event of a blockage or suspected blockage. However, the chamber containing the flow control unit and disc valve should be inspected in line with normal practice. Any debris or silt should be removed. Any visible fixing bolts should be checked. If an internal blockage is suspected the vortex unit can be inspected internally and cleaned out by opening the inspection/access cover on the upstream end. The cover must be replaced and secured before the unit becomes operational.

3.30. Hydro-International offer maintenance and support services for their water management products including:

- Scheduled cleaning
- Emergency breakdown assistance
- On-site repairs
- Equipment strip-down
- Planned maintenance
- Planned spares replacements

Surface Water Drainage Arrangement

3.31. The proposed outline surface water drainage layout can be found in Appendix C of this report.

Designing for Exceedance

3.32. Periods of exceedance occur when the rate of surface water runoff exceeds the drainage system capacity. Conveyance beneath ground cannot, generally, be economically or sustainably constructed to the scale required for the most extreme rainfall events. This may result, on occasion, in the surface water runoff exceeding the capacity of the drainage network, with excess water (exceedance flow) being conveyed above ground.

3.33. The LLFA has requested plans illustrating flooded areas and flow paths in the event of exceedance of the drainage system. To include building FFLs and drainage levels. Exceedance flow paths are shown in Appendix C. FFLs are not specified in m AOD but are proposed to be a minimum of 150mm above existing ground levels.

3.34. For situations where extreme rainfall intensity exceeds inlet capacities, or for extreme storm events exceeding the design flood event considered for drainage design, surface water would flow overland towards the east of the site, flowing towards High Street where it is expected to be contained within the highway boundary until flood waters recede.

3.35. It is recommended to lay hardstanding areas surrounding the proposed dwelling such that the ground levels fall away from entry thresholds/external entry points, to minimise the chance of internal flooding. Additionally, entry thresholds are proposed to be raised 150mm above external levels to further mitigate against exceedance flows.

3.36. Furthermore, it could be considered that the proposed development will provide betterment over the existing situation during an exceedance event given that attenuation storage is proposed which will accommodate flows for up to and including the 1 in 100 year +40% climate change event, reducing the volume of water leaving the site for an exceedance event above the design event.

Water Quality

3.37. In order to protect the downstream receiving water body, a key element of SuDS is that they have the potential to improve the quality of surface water discharged from a site. In order to assess this, the "Pollution hazard indices for different land use classifications", provided in the CIRIA SuDS Manual (C753) as table 26.2, has been reviewed. The indices use four different methods of assessing pollution potential based on the hazard level, total suspended solids (TSS), Metals, and Hydrocarbons.

3.38. The Pollution Hazard Indices are summarised in Table 8 below (with reference to table 26.3 in the CIRIA SuDS manual). The pollution hazard indices for "residential roofs" and "low traffic roads" have been used.

Table 8 Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

3.39. Runoff from residential roofs is generally considered very low contamination risk and does not usually warrant any significant treatment. All downpipes should be fitted with silt traps to reduce the amount of sediment entering the subsurface piped network.

3.40. Additionally, two petrol interceptor manholes are proposed on site, upstream of the geocellular attenuation tank. This will remove oil and pollution from the surface water prior to discharge.

3.41. In addition to the silt traps and petrol interceptor manholes, raised planter bioretention systems and permeable paving – type C, are proposed on site. Raised planter bioretention systems and permeable paving offer pollution mitigation indices well in excess of the residential roofs and low traffic roads/residential parking.

Table 9 Pollutant Mitigation Indices

	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Bioretention System	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7

3.42. It is therefore considered that the proposed SuDS features are appropriate and acceptable in terms of water quality and the comment raised by the LLFA has been fully addressed.

4. Conclusions

4.1. This Surface Water Drainage Strategy has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 396 High Street, West Brom, B70 9LB. It has been written to support a full planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.

4.2. Within the site boundary, it is proposed to discharge all surface water runoff generated by the proposed development to the existing combined sewer. Surface water flows will be restricted to a peak rate of 1.0l/s by a Hydrobrake flow control device. Excess flows will back up into a geocellular attenuation tank.

4.3. Infiltration tests in accordance with BRE 365 are recommended to be carried out at the detailed design stage, and this SWDS should be refined in light of these tests.

4.4. Rainwater harvesting for the proposed development, and plot scale SuDS features such as tree pits should be considered by a specialist at the detailed design stage.

4.5. The Infodrainage model results indicate that the runoff from the proposed development could be accommodated within a drainage system of the approximate size modelled for all events up to the 1 in 100 year + 40% climate change event.

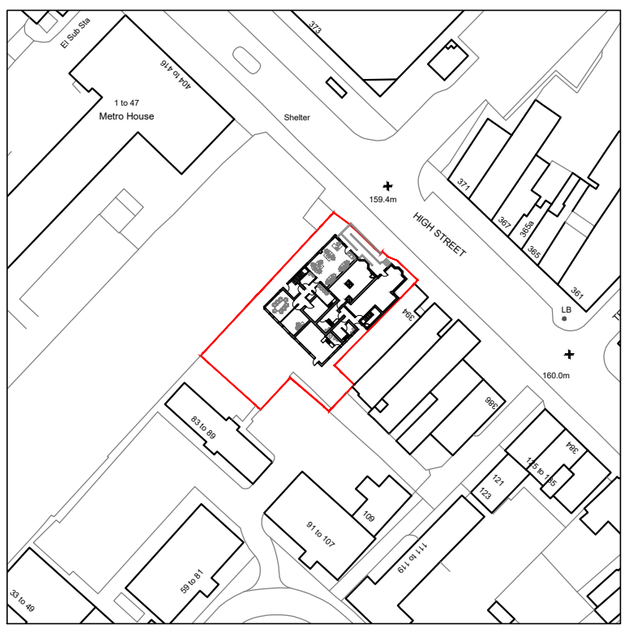
4.6. This Drainage Strategy should be submitted as part of the planning application to satisfy the requirements under NPPF and Sandwell Metropolitan Borough Council's requirements.

4.7. It is considered that the comments raised by the Staffordshire Country Council Flood Risk Management Team have been addressed by this Revision of the SWDS (comments received 29/11/2022). Contact details for the maintenance provider should be provided by the developer and should be submitted alongside this SWDS.

Appendix A – Development Proposals

LOCATION PLAN

1:1250



PROPOSED SITE PLAN

1:1250

PROPOSED BLOCK PLAN

1:500

0 10 20 30 40 50 60m

Scale 1:500

0 25 50 75 100 125 150m

Scale 1:1250

PLANNING

Rev	Description	Date	Drwn	Chkd

PUUC Architectural Design Solutions

SUITE 212 - SECOND FLOOR - CITIBASE LOCAL HALESOWEN - NEW ROAD
HALESOWEN - WEST MIDLANDS - B63 3HY - TEL: 0121 630 2263

Client

-

Project

396 High Street

Title

LOCATION SITE & BLOCK PLAN

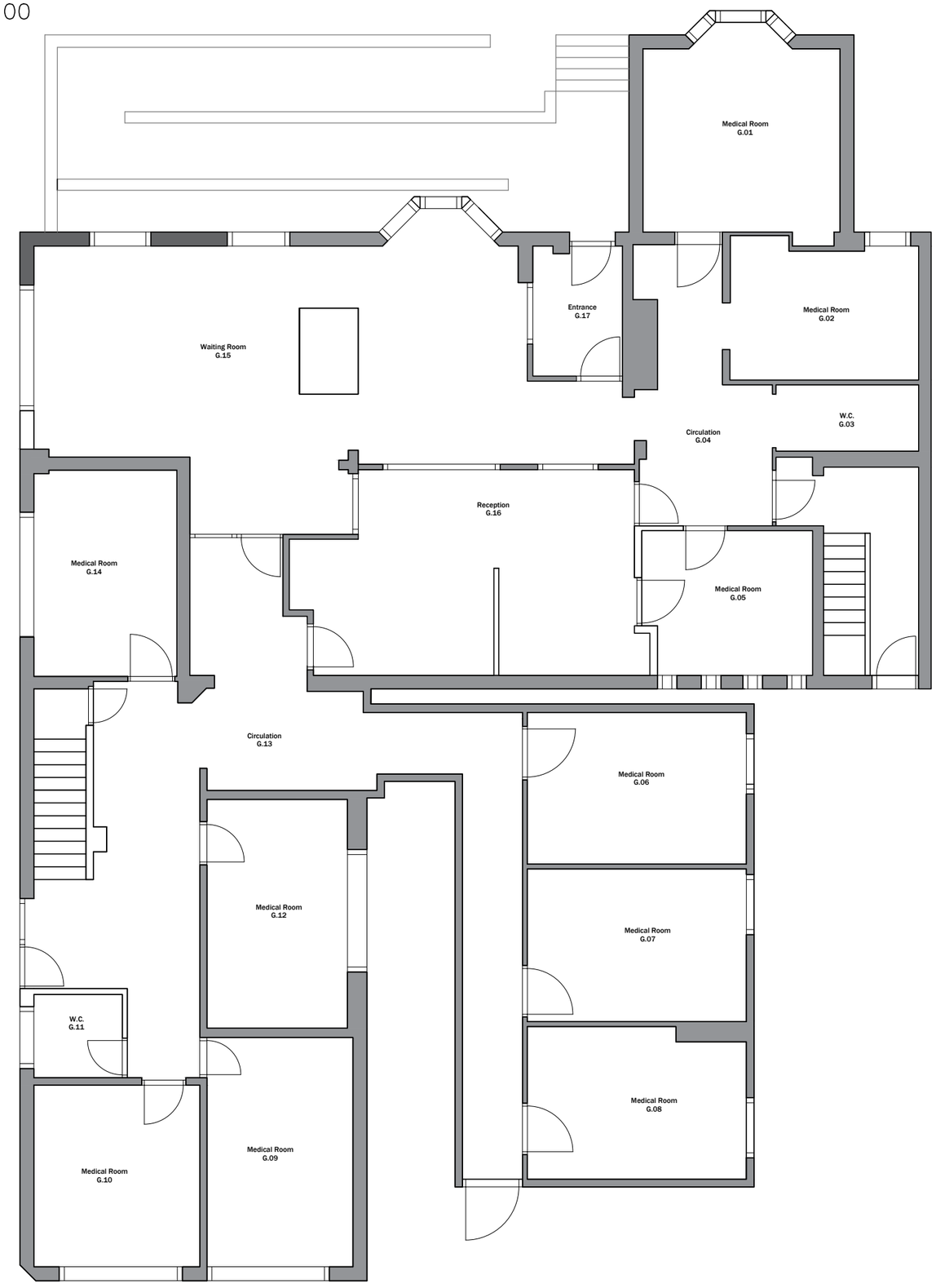
Scale	Date
AS @ A3	08.10.21

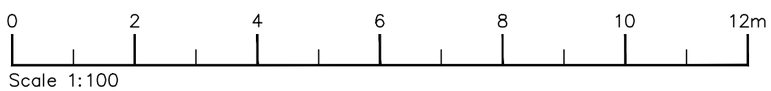
Drawing Number	Revision
50051 - 01 - 01	-

Drawn	Checked
RC	JG

EXISTING GROUND FLOOR PLAN

1:100





Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

PUUC
Architectural Design Solutions

SUITE 212 - SECOND FLOOR - CITIBASE LOCAL HALESOWEN - NEW ROAD
HALESOWEN - WEST MIDLANDS - B63 3HY - TEL: 0121 630 2263

Client

-

Project

396 High Street

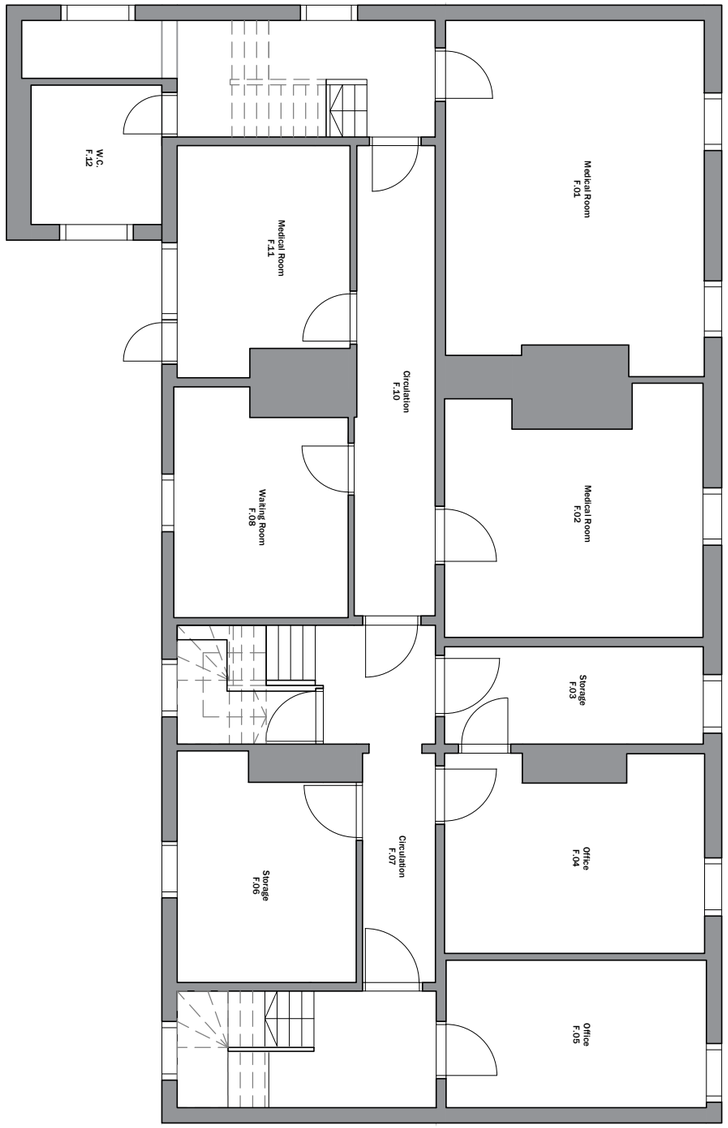
Title

EXISTING GROUND FLOOR PLAN

Scale	Date
1:100 @ A3	08.04.21

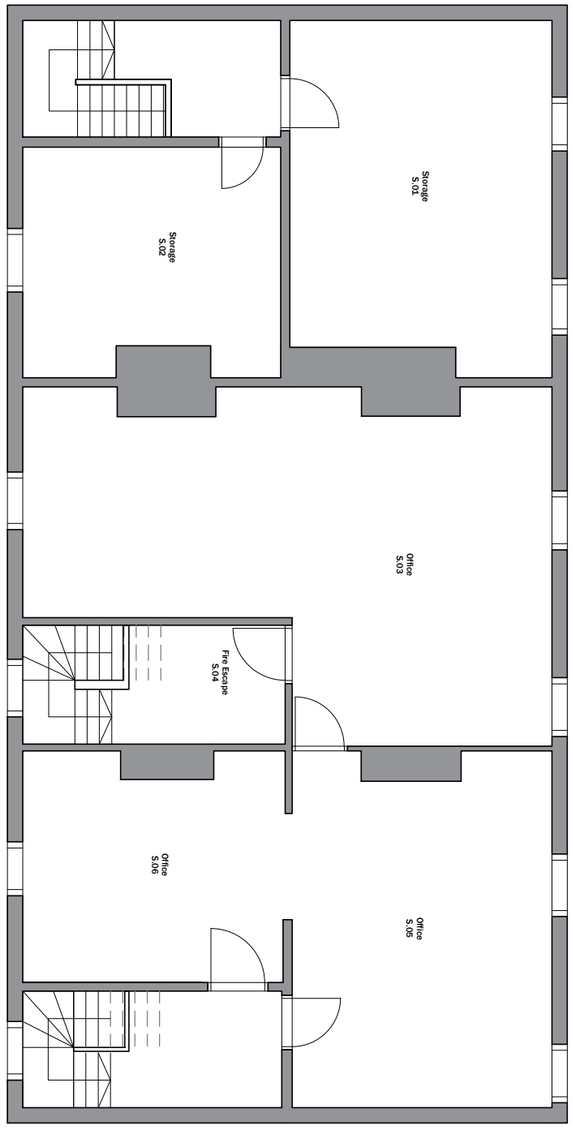
Drawing Number 50051 - 01 - 02 **Revision** A

Drawn	Checked
RC	JG



EXISTING FIRST FLOOR PLAN

1:100



EXISTING SECOND FLOOR PLAN

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Client

-

Project

396 High Street

Title

EXISTING GROUND FLOOR PLAN

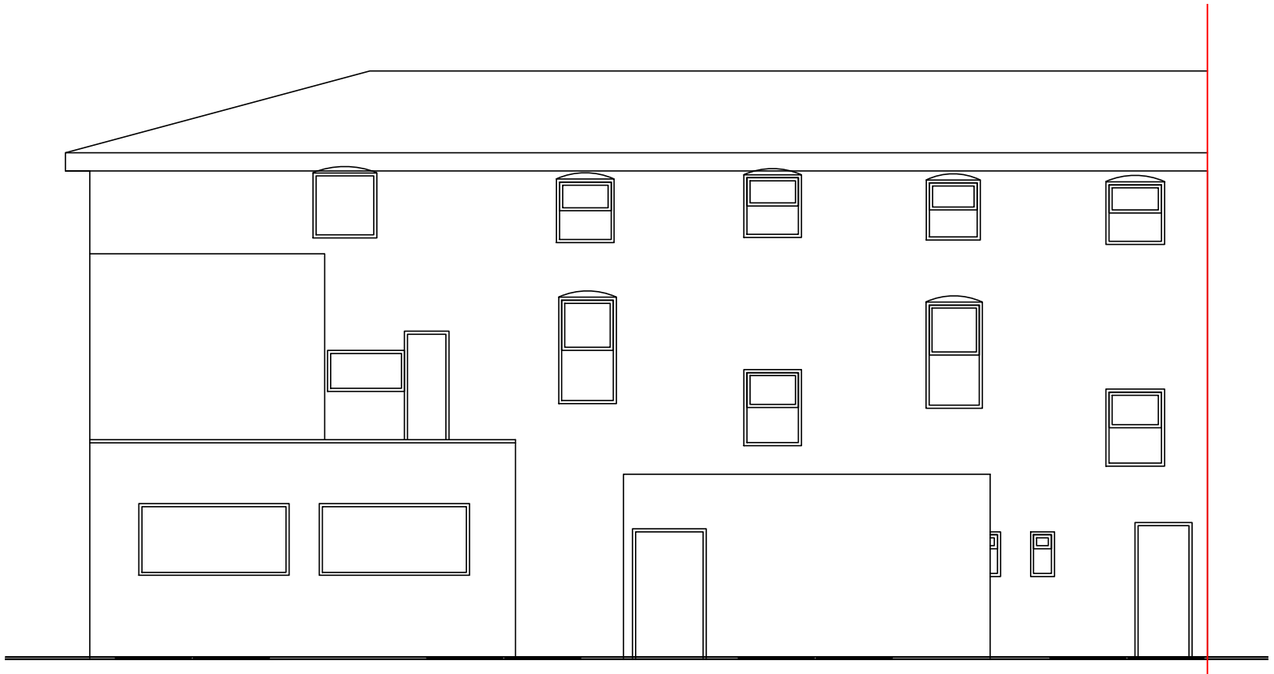
Scale	Date
1:100 @ A3	08.04.21

Drawing Number	Revision
50051 - 01 - 03	B

Drawn	Checked
RC	JG

EXISTING FRONT ELEVATION

1:100



EXISTING REAR ELEVATION

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

PUUC

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SUITE 212 - SECOND FLOOR - CITIBASE LOCAL HALESOWEN - NEW ROAD
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Client

-

Project

396 High Street

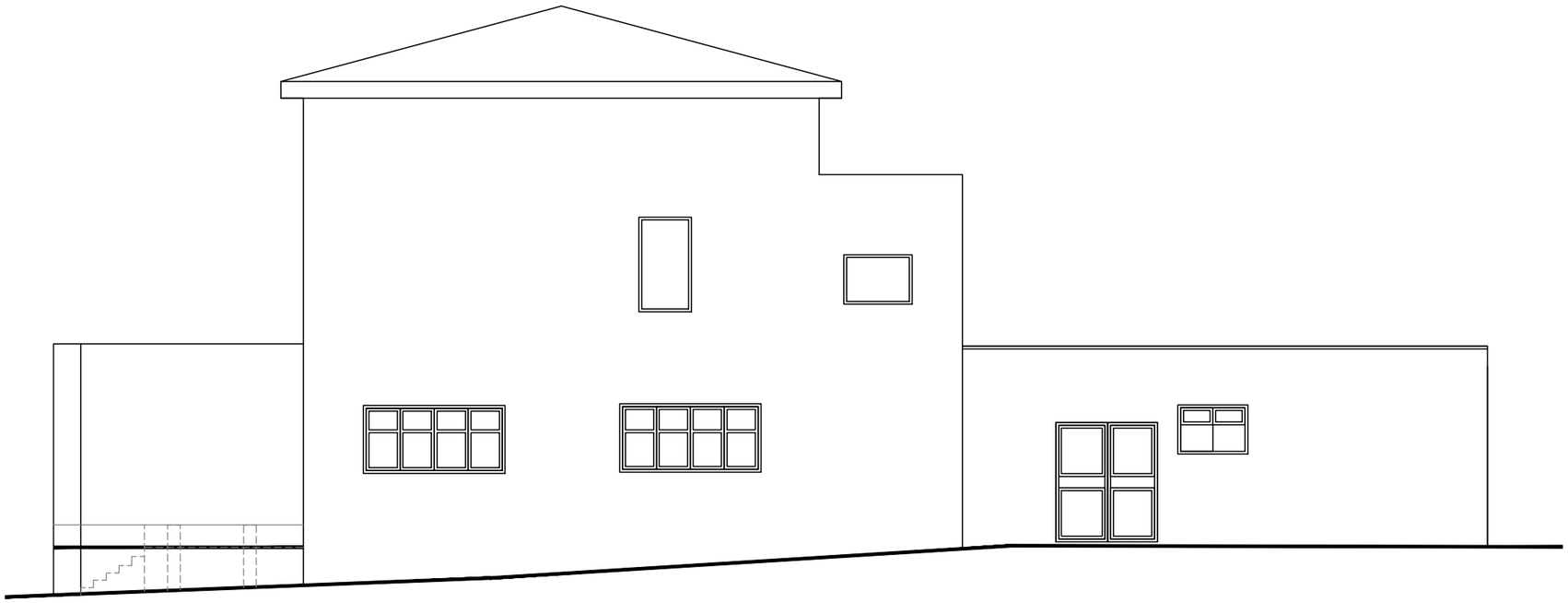
Title

EXISTING FRONT AND REAR ELEVATIONS

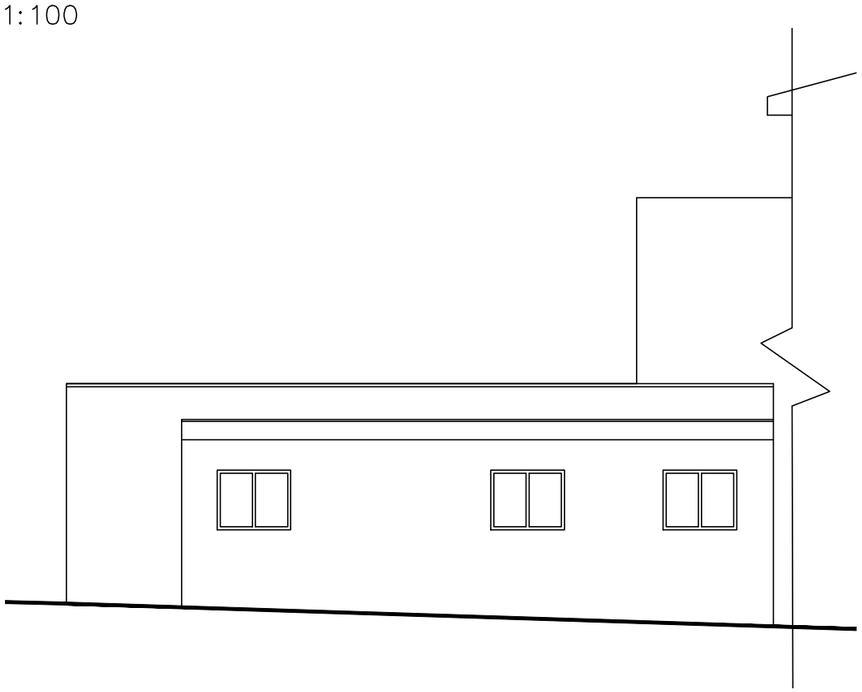
Scale	Date
1:100 @ A3	19.08.21

Drawing Number	Revision
50051 - 01 - 04	-

Drawn	Checked	
RC	JG	.



EXISTING SIDE ELEVATION
1:100



EXISTING SIDE ELEVATION
1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Project
396 High Street

Title
EXISTING SIDE ELEVATION

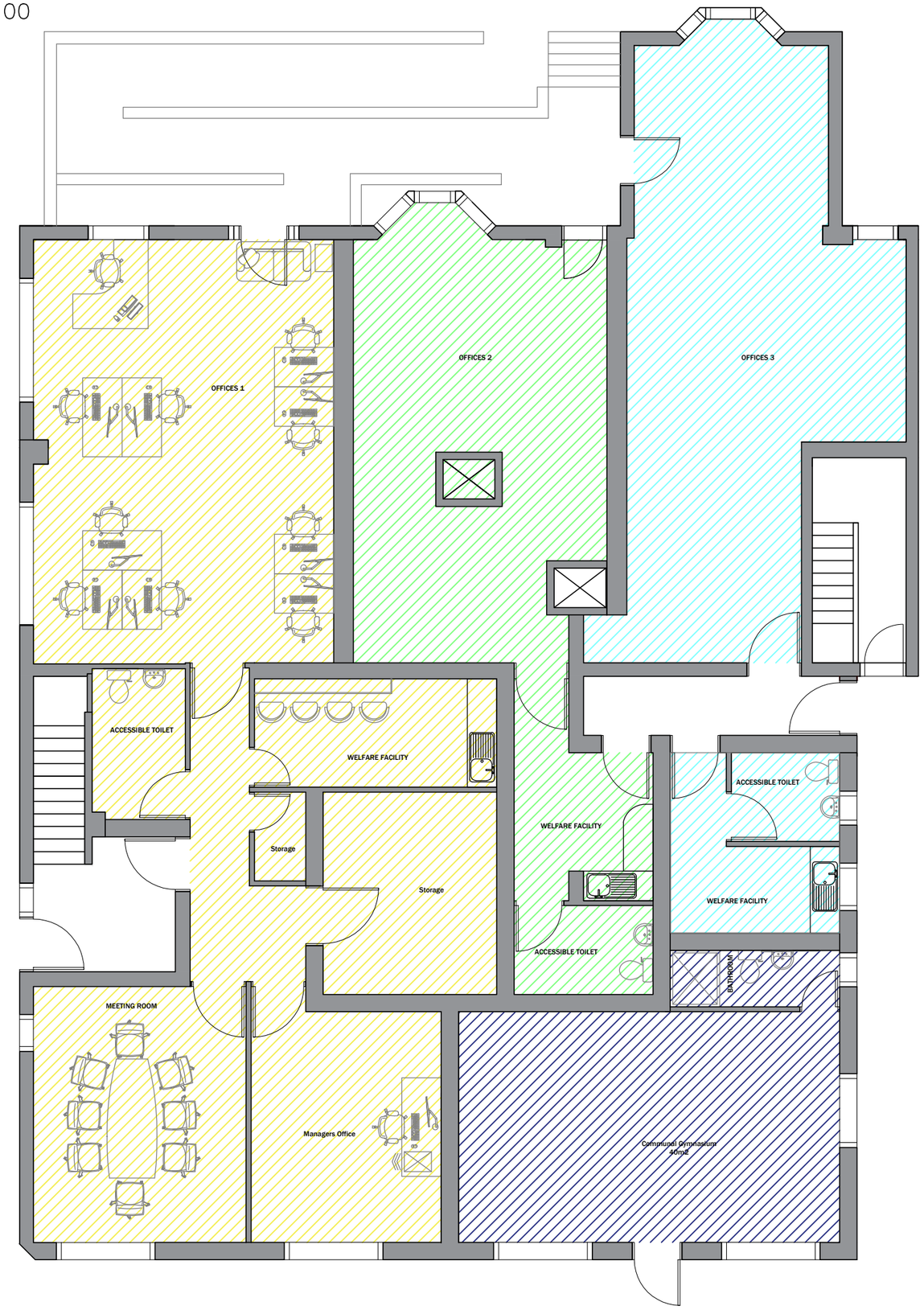
Scale	Date
1:100 @ A3	29.03.22

Drawing Number	Revision
50051 - 01 - 05	-

Drawn	Checked	
AJ	JG	.

PROPOSED GROUND FLOOR PLAN

1:100



Proposed Room Schedule :			
Colour	Name	Area (m^2)	Area (sq ft)
	Office 1	132.9	1430.5
	Office 2	58.8	632.9
	Office 3	70	753.4
	Gymnasium	40	430.5

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Project

396 High Street

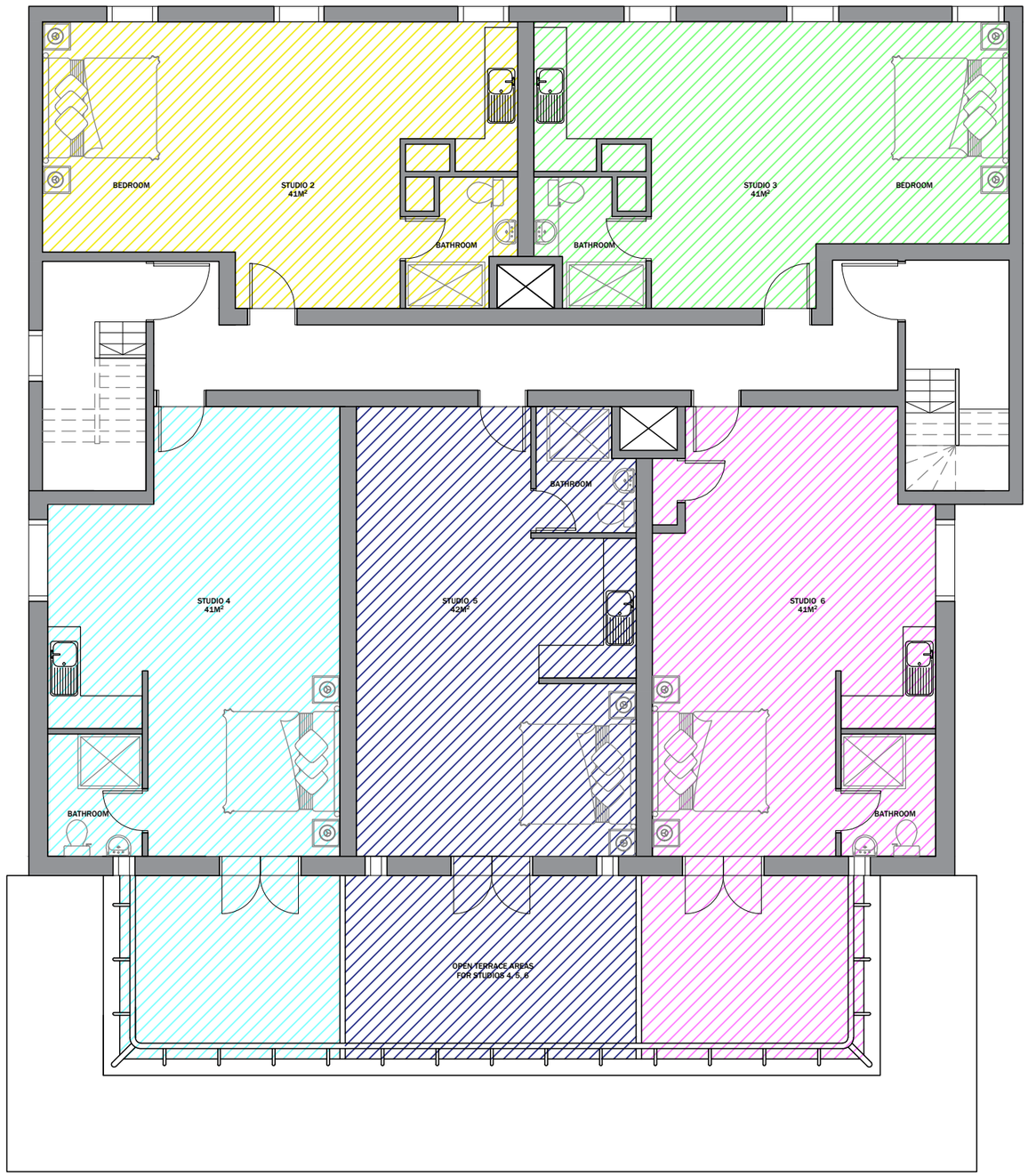
Title

PROPOSED GROUND FLOOR PLAN

Scale	Date
1:100 @ A3	14.06.22

Drawing Number	Revision
50051 - 01 - 06	B

Drawn	Checked
OM	JG



Proposed Room Schedule :			
Colour	Name	Area (m^2)	Area (sq ft)
	Studio 2	41	441.3
	Studio 3	41	441.3
	Studio 4	41	441.3
	Studio 5	42	452.1
	Studio 6	41	441.3

PROPOSED FIRST FLOOR PLAN

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Client
-

Project
396 High Street

Title
PROPOSED FIRST FLOOR PLAN

Scale	Date
1:100 @ A3	14.06.22

Drawing Number	Revision
50051 - 01 - 07	B

Drawn	Checked
OM	JG

Proposed Room Schedule :			
Colour	Name	Area (m^2)	Area (sq ft)
	Studio 7	41	441.3
	Studio 8	41	441.3
	Studio 9	41	441.3
	Studio 10	42	452.1
	Studio 11	41	441.3

PROPOSED SECOND FLOOR PLAN

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Client
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Project
396 High Street

Title
PROPOSED SECOND FLOOR PLAN

Scale	Date
1:100 @ A3	14.06.22

Drawing Number	Revision
50051 - 01 - 08	B

Drawn	Checked
RC	JG

PROPOSED FRONT ELEVATION

1:100

PROPOSED REAR ELEVATION

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Project

396 High Street

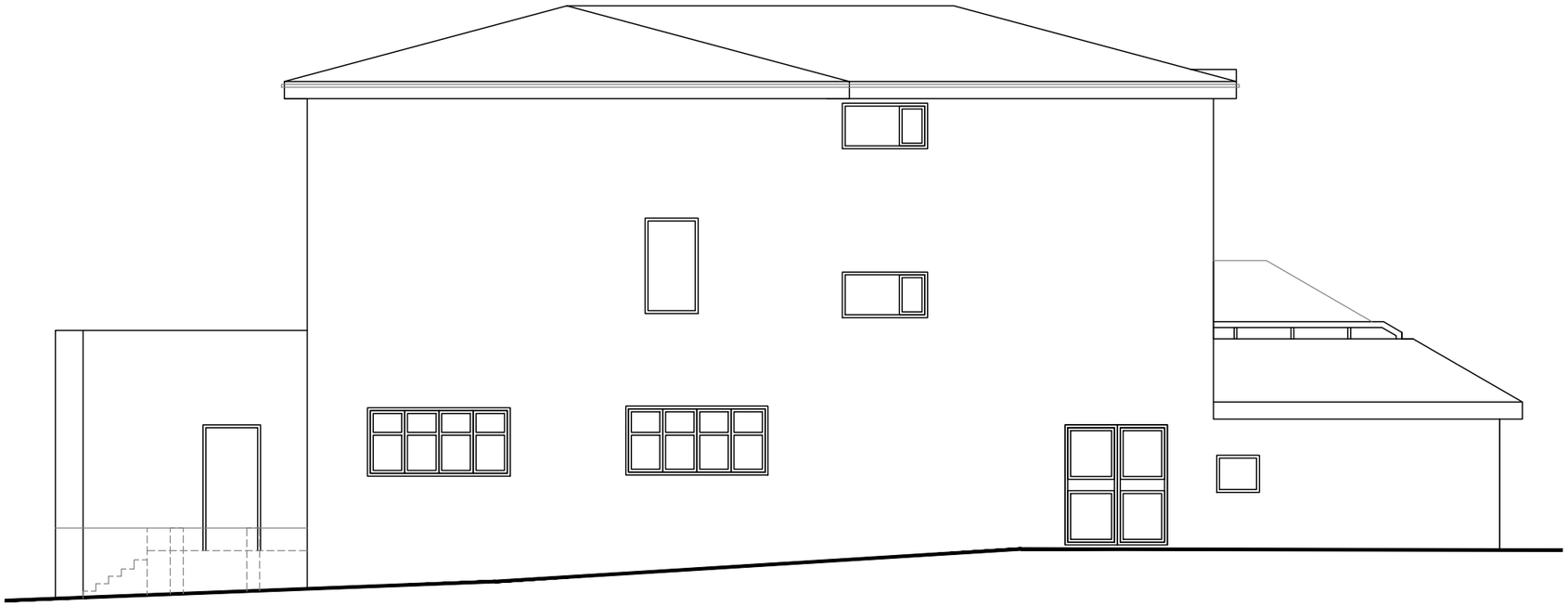
Title

PROPOSED FRONT AND REAR ELEVATIONS

Scale	Date
1:100 @ A3	14.06.22

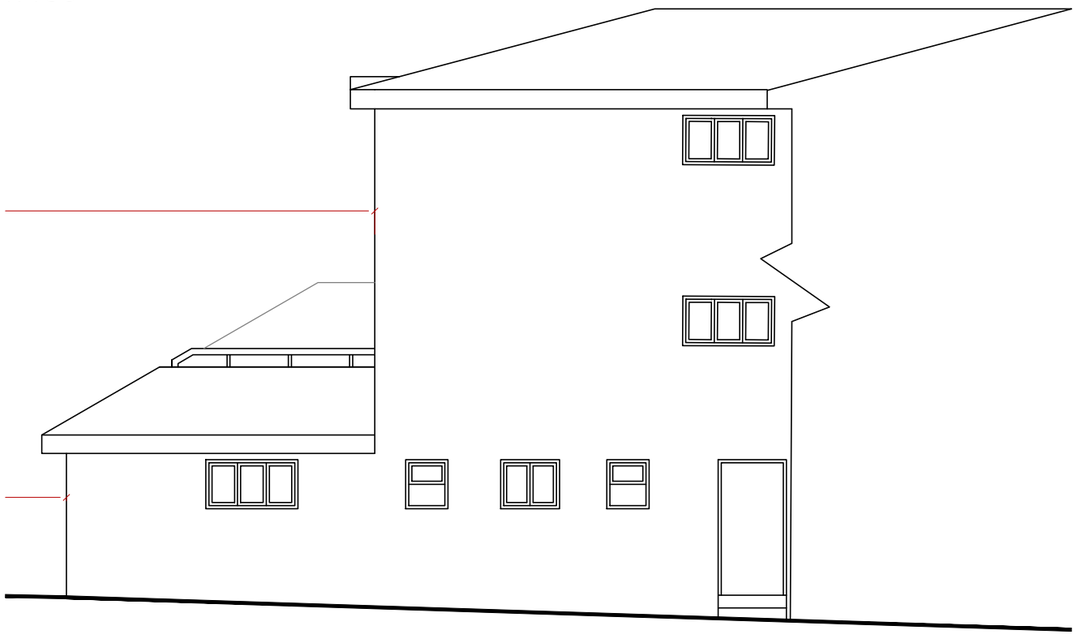
Drawing Number	Revision
50051 - 01 - 09	A

Drawn	Checked	
OM	JG	.



PROPOSED SIDE ELEVATION

1:100



PROPOSED SIDE ELEVATION

1:100

0 2 4 6 8 10 12m

Scale 1:100

PLANNING

Rev	Description	Date	Drwn	Chkd

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Project
396 High Street

Title
PROPOSED SIDE ELEVATIONS

Scale	Date
1:100 @ A3	14.06.22

Drawing Number	Revision
50051 - 01 - 10	A

Drawn	Checked	
OM	JG	.

PROPOSED SITE PLAN

1:200

0 5 10 15 20 25m

Scale 1:200

PLANNING

Rev	Description	Date	Drwn	Chkd

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Client
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Project
396 High Street

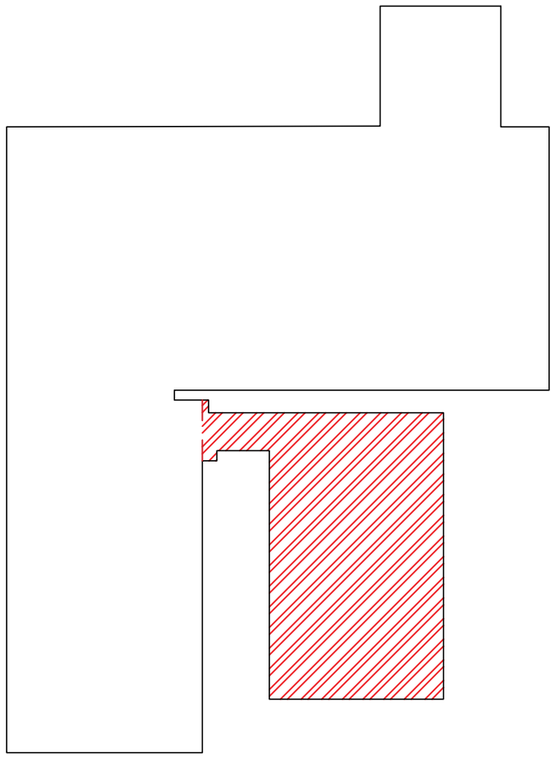
Title
PROPOSED SITE PLAN

Scale	Date
1:200 @ A3	17.06.22

Drawing Number	Revision
50051 - 01 - 11	B

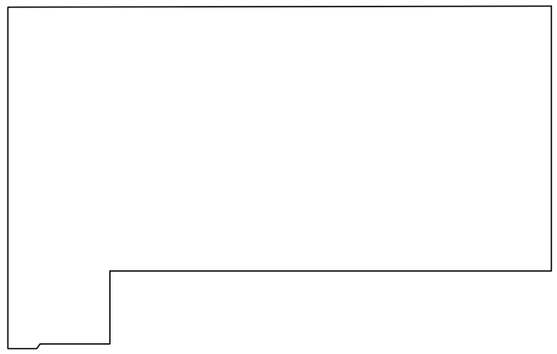
Drawn	Checked
OM	JG

PLANNING

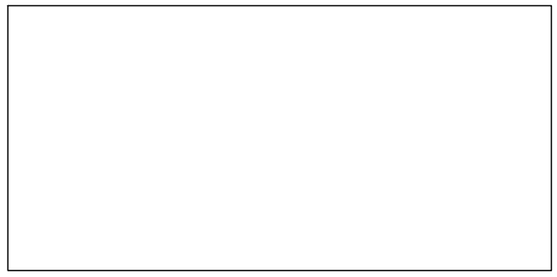


EXISTING GROUND FLOOR PLAN
1: 200

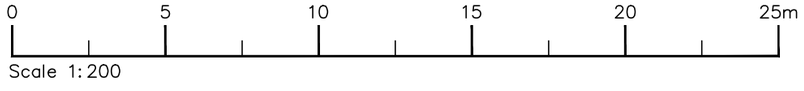
Proposed Room Schedule :			
Colour	Name	Area (m^2)	Area (sq ft)
	Proposed demolition	55.9	601.7



EXISTING FIRST FLOOR PLAN
1: 200



EXISTING SECOND FLOOR PLAN
1: 200



Scale 1: 200

Rev	Description	Date	Drwn	Chkd

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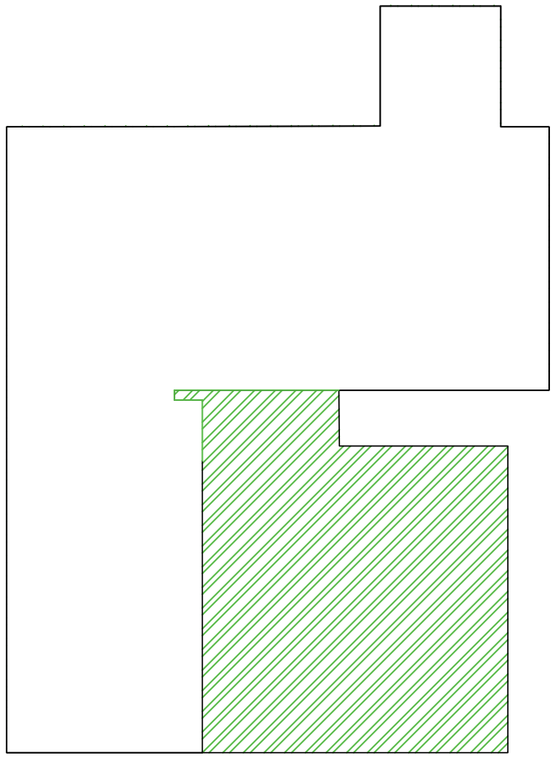
Project
396 High Street

Title
PROPOSED DEMOLITION WORKS

Scale	Date
1:200 @ A3	29.03.22

Drawing Number	Revision
50051 - 01 - 12	-

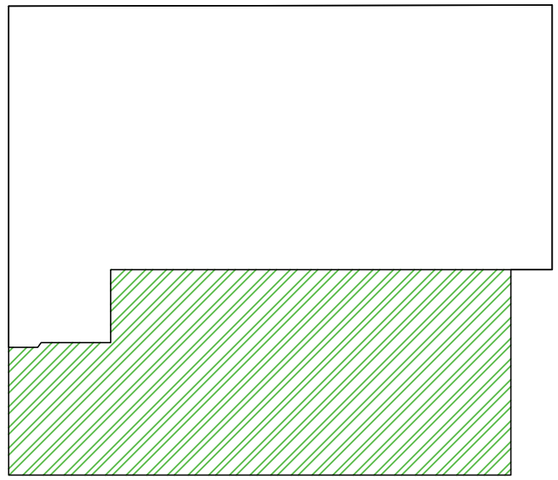
Drawn	Checked
AJ	JG



PROPOSED GROUND FLOOR PLAN

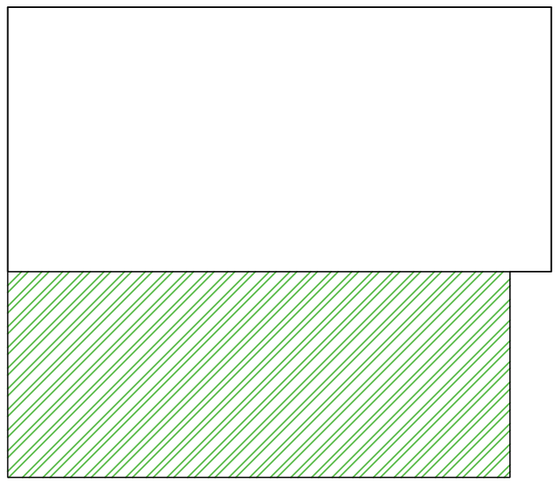
1: 200

Proposed Room Schedule :			
Colour	Name	Area (m^2)	Area (sq ft)
	Proposed New Build	319.5	3439.1



PROPOSED FIRST FLOOR PLAN

1: 200



PROPOSED SECOND FLOOR PLAN

1: 200

0 5 10 15 20 25m

Scale 1: 200

PLANNING

Rev	Description	Date	Drwn	Chkd

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-

Project
396 High Street

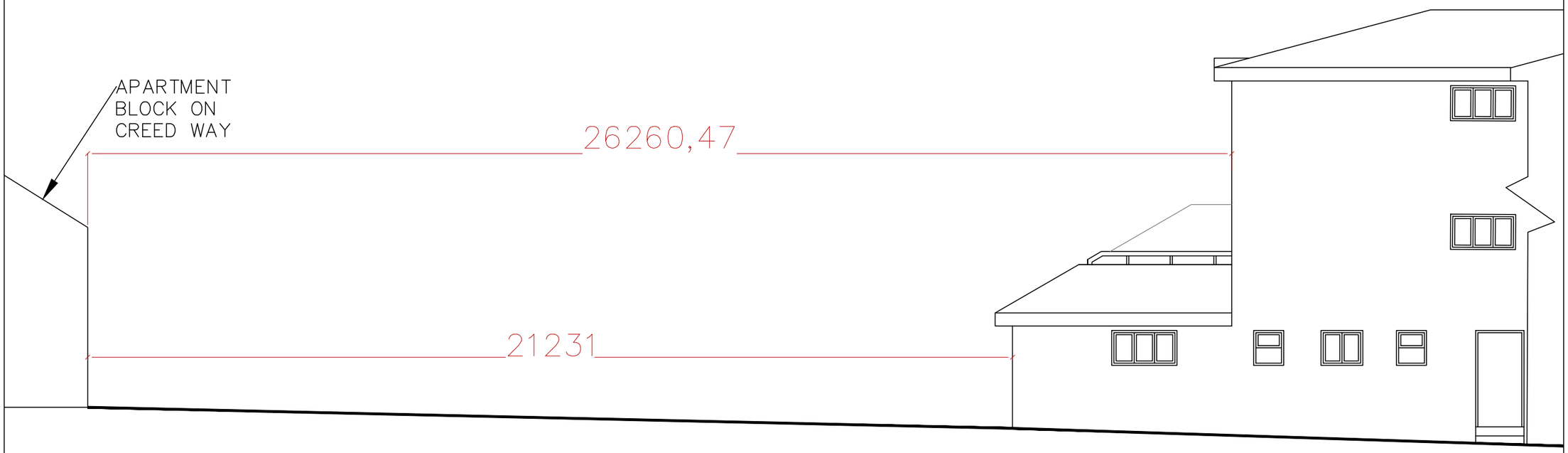
Title
PROPOSED NEW BUILD

Scale	Date
1:200 @ A3	29.03.22

Drawing Number	Revision
50051 - 01 - 13	-

Drawn	Checked
AJ	JG

PLANNING



SEPARATION DISTANCE

1:500

0 2 4 6 8 10 12m

Scale 1:100

0 10 20 30 40 50 60m

Scale 1:500

Rev	Description	Date	Drwn	Chkd

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Project
396 High Street

Title
SEPARATION DISTANCES

Scale	Date
AS @ A3	15.06.22

Drawing Number	Revision
50051 - 01 - 14	-

Drawn	Checked
OM	JG

Appendix B – Infodrainage Calculations

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Cellular Storage

Type : Cellular Storage

Dimensions

Exceedence Level (m)	161.000
Depth (m)	1.000
Base Level (m)	158.950
Number of Crates Long	5
Number of Crates Wide	10
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	1
Crate Height (m)	1
Total Volume (m^3)	48.550

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (3)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Free Discharge

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Title: UK and Ireland Rural Runoff Calculator	Company Address:		

ICP SUDS / IH 124

Details

Method	ICP SUDS
Area (ha)	0.085
SAAR (mm)	730.0
Soil	0.47
Region	Region 4
Urban	0
Return Period (years)	0

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 4	0.4	0.4	0.4	0.8	1.1

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m^3)
Catchment Area	FSR: 1 years: +0 %: 15 mins: Summer	0.04	6.3	2.735
Catchment Area (1)	FSR: 1 years: +0 %: 15 mins: Summer	0.05	7.1	3.071

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m^3)
Catchment Area	FSR: 30 years: +0 %: 15 mins: Summer	0.04	15.2	6.731
Catchment Area (1)	FSR: 30 years: +0 %: 15 mins: Summer	0.05	17.1	7.576

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m^3)
Catchment Area	FSR: 30 years: +35 %: 15 mins: Summer	0.04	20.6	9.076
Catchment Area (1)	FSR: 30 years: +35 %: 15 mins: Summer	0.05	23.1	10.212

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m^3)
Catchment Area	FSR: 100 years: +0 %: 15 mins: Summer	0.04	19.7	8.720
Catchment Area (1)	FSR: 100 years: +0 %: 15 mins: Summer	0.05	22.2	9.813

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m^3)
Catchment Area	FSR: 100 years: +40 %: 15 mins: Summer	0.04	27.7	12.194
Catchment Area (1)	FSR: 100 years: +40 %: 15 mins: Summer	0.05	31.1	13.719

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FSR: 1 years: +0 %: 120 mins: Winter	160.000	159.000	159.105	0.105	1.9	0.119	0.000	1.9	5.445	OK
Manhole (1)	FSR: 1 years: +0 %: 120 mins: Winter	161.000	158.850	159.105	0.255	1.9	0.288	0.000	0.7	8.120	Surcharged
Manhole (2)	FSR: 1 years: +0 %: 1440 mins: Summer	161.000	158.750	158.771	0.021	0.7	0.000	0.000	0.7	23.759	OK
Manhole (3)	FSR: 1 years: +0 %: 15 mins: Summer	161.000	159.200	159.252	0.052	7.1	0.058	0.000	7.0	3.069	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FSR: 30 years: +0 %: 240 mins: Winter	160.000	159.000	159.413	0.413	2.7	0.467	0.000	2.5	14.794	Surcharged
Manhole (1)	FSR: 30 years: +0 %: 240 mins: Winter	161.000	158.850	159.413	0.563	2.5	0.636	0.000	0.7	24.384	Surcharged
Manhole (2)	FSR: 30 years: +0 %: 240 mins: Winter	161.000	158.750	158.772	0.022	0.7	0.000	0.000	0.7	18.149	OK
Manhole (3)	FSR: 30 years: +0 %: 240 mins: Winter	161.000	159.200	159.413	0.213	3.0	0.241	0.000	3.1	17.474	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FSR: 30 years: +35 %: 240 mins: Winter	160.000	159.000	159.620	0.620	3.7	0.701	0.000	3.5	20.025	Surcharged
Manhole (1)	FSR: 30 years: +35 %: 240 mins: Winter	161.000	158.850	159.620	0.770	3.5	0.871	0.000	0.9	30.826	Surcharged
Manhole (2)	FSR: 30 years: +35 %: 240 mins: Winter	161.000	158.750	158.773	0.023	0.9	0.000	0.000	0.9	20.946	OK
Manhole (3)	FSR: 30 years: +35 %: 240 mins: Winter	161.000	159.200	159.620	0.420	4.1	0.475	0.000	3.9	23.380	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FSR: 100 years: +0 %: 240 mins: Winter	160.000	159.000	159.594	0.594	3.5	0.671	0.000	3.4	19.360	Surcharged
Manhole (1)	FSR: 100 years: +0 %: 240 mins: Winter	161.000	158.850	159.594	0.744	3.4	0.841	0.000	0.9	30.028	Surcharged
Manhole (2)	FSR: 100 years: +0 %: 240 mins: Winter	161.000	158.750	158.773	0.023	0.9	0.000	0.000	0.9	20.619	OK
Manhole (3)	FSR: 100 years: +0 %: 240 mins: Winter	161.000	159.200	159.594	0.394	4.0	0.446	0.000	3.8	22.655	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Status
Manhole	FSR: 100 years: +40 %: 360 mins: Winter	160.000	159.000	159.911	0.911	3.6	1.030	0.000	3.5	29.835	Flood Risk
Manhole (1)	FSR: 100 years: +40 %: 360 mins: Winter	161.000	158.850	159.911	1.061	3.5	1.200	0.000	1.0	49.803	Surcharged
Manhole (2)	FSR: 100 years: +40 %: 360 mins: Winter	161.000	158.750	158.775	0.025	1.0	0.000	0.000	1.0	35.724	OK
Manhole (3)	FSR: 100 years: +40 %: 15 mins: Summer	161.000	159.200	159.913	0.713	31.1	0.807	0.000	25.9	13.465	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FSR: 1 years: +0 %: 120 mins: Winter	159.105	159.105	0.155	0.155	3.3	7.361	0.000	0.000	0.4	3.462	85	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FSR: 30 years: +0 %: 240 mins: Winter	159.413	159.413	0.463	0.463	4.8	21.982	0.000	0.000	0.7	10.775	55	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FSR: 30 years: +35 %: 240 mins: Winter	159.620	159.620	0.670	0.670	6.6	31.833	0.000	0.000	0.8	12.191	34	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FSR: 100 years: +0 %: 240 mins: Winter	159.594	159.594	0.644	0.644	6.4	30.598	0.000	0.000	0.8	12.032	37	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FSR: 100 years: +40 %: 360 mins: Winter	159.912	159.912	0.962	0.962	6.4	45.675	0.000	0.000	1.0	21.503	6	OK

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 1 years: +0 %: 15 mins: Summer	Pipe	Manhole	Manhole (1)	160.0	159.060	0.121	2.624	0.3	0.16	5.9	OK
Pipe (2)	FSR: 1 years: +0 %: 1440 mins: Summer	Pipe	Manhole (1)	Manhole (2)	161.0	159.022	0.021	23.759	0.6	0.1	0.7	Surcharged
Pipe (3)	FSR: 1 years: +0 %: 15 mins: Summer	Pipe	Manhole (3)	Cellular Storage	161.0	159.252	0.054	3.069	2.2	0.41	7.0	OK
Pipe (1)	FSR: 1 years: +0 %: 240 mins: Winter	Pipe	Cellular Storage	Manhole (1)	161.0	159.103	0.100	6.690	0.1	0.07	0.6	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	Manhole	Manhole (1)	160.0	159.218	0.225	6.054	0.3	0.33	11.9	OK
Pipe (2)	FSR: 30 years: +0 %: 240 mins: Winter	Pipe	Manhole (1)	Manhole (2)	161.0	159.413	0.022	18.149	0.6	0.1	0.7	Surcharged
Pipe (3)	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	Manhole (3)	Cellular Storage	161.0	159.353	0.100	7.563	2.5	0.92	15.7	Surcharged
Pipe (1)	FSR: 30 years: +0 %: 240 mins: Winter	Pipe	Cellular Storage	Manhole (1)	161.0	159.413	0.100	4.563	0.1	0.08	0.7	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 30 years: +35 %: 15 mins: Summer	Pipe	Manhole	Manhole (1)	160.0	159.415	0.225	8.245	0.4	0.47	17.3	Surcharged
Pipe (2)	FSR: 30 years: +35 %: 240 mins: Winter	Pipe	Manhole (1)	Manhole (2)	161.0	159.620	0.024	20.946	0.6	0.12	0.9	Surcharged
Pipe (3)	FSR: 30 years: +35 %: 15 mins: Summer	Pipe	Manhole (3)	Cellular Storage	161.0	159.570	0.100	10.102	2.6	1.17	19.8	Surcharged
Pipe (1)	FSR: 30 years: +35 %: 240 mins: Winter	Pipe	Cellular Storage	Manhole (1)	161.0	159.620	0.100	2.337	0.1	0.09	0.8	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +0 %: 15 mins: Summer	Pipe	Manhole	Manhole (1)	160.0	159.384	0.225	7.908	0.4	0.45	16.6	Surcharged
Pipe (2)	FSR: 100 years: +0 %: 240 mins: Winter	Pipe	Manhole (1)	Manhole (2)	161.0	159.594	0.024	20.619	0.6	0.12	0.9	Surcharged
Pipe (3)	FSR: 100 years: +0 %: 15 mins: Summer	Pipe	Manhole (3)	Cellular Storage	161.0	159.533	0.100	9.720	2.6	1.12	19.1	Surcharged
Pipe (1)	FSR: 100 years: +0 %: 240 mins: Winter	Pipe	Cellular Storage	Manhole (1)	161.0	159.594	0.100	2.648	0.1	0.09	0.8	Surcharged

Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	Manhole	Manhole (1)	160.0	159.690	0.225	11.212	0.6	0.63	23.1	Surcharged
Pipe (2)	FSR: 100 years: +40 %: 360 mins: Winter	Pipe	Manhole (1)	Manhole (2)	161.0	159.911	0.026	35.724	0.6	0.14	1.0	Surcharged
Pipe (3)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	Manhole (3)	Cellular Storage	161.0	159.913	0.100	13.463	3.3	1.52	25.9	Surcharged
Pipe (1)	FSR: 100 years: +40 %: 240 mins: Winter	Pipe	Cellular Storage	Manhole (1)	161.0	159.909	0.100	0.122	0.1	0.11	1.0	Surcharged

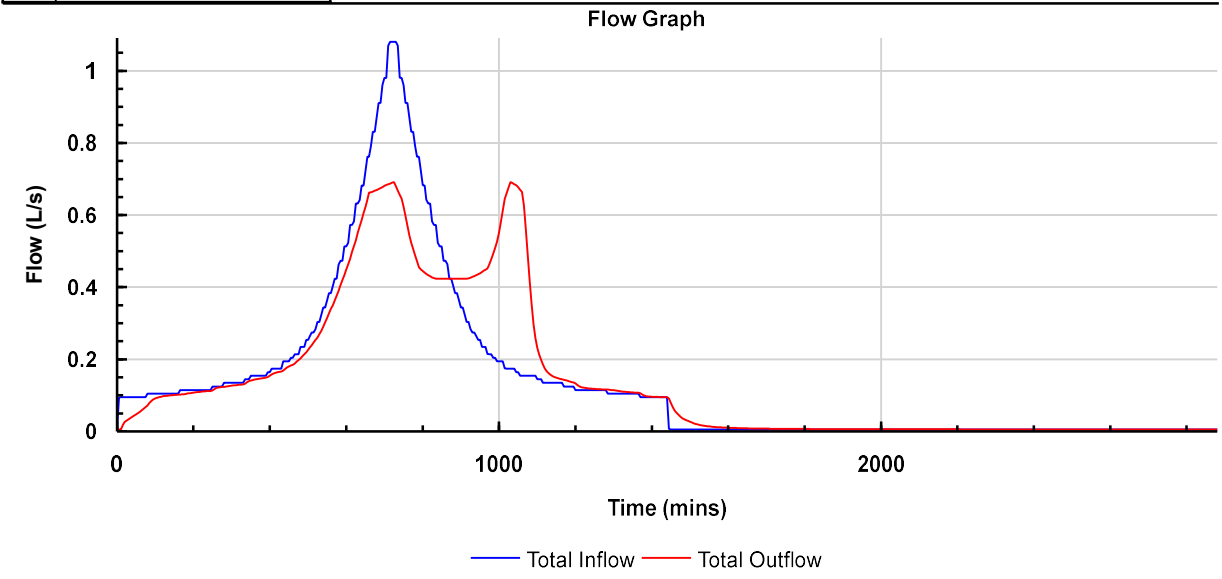
Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

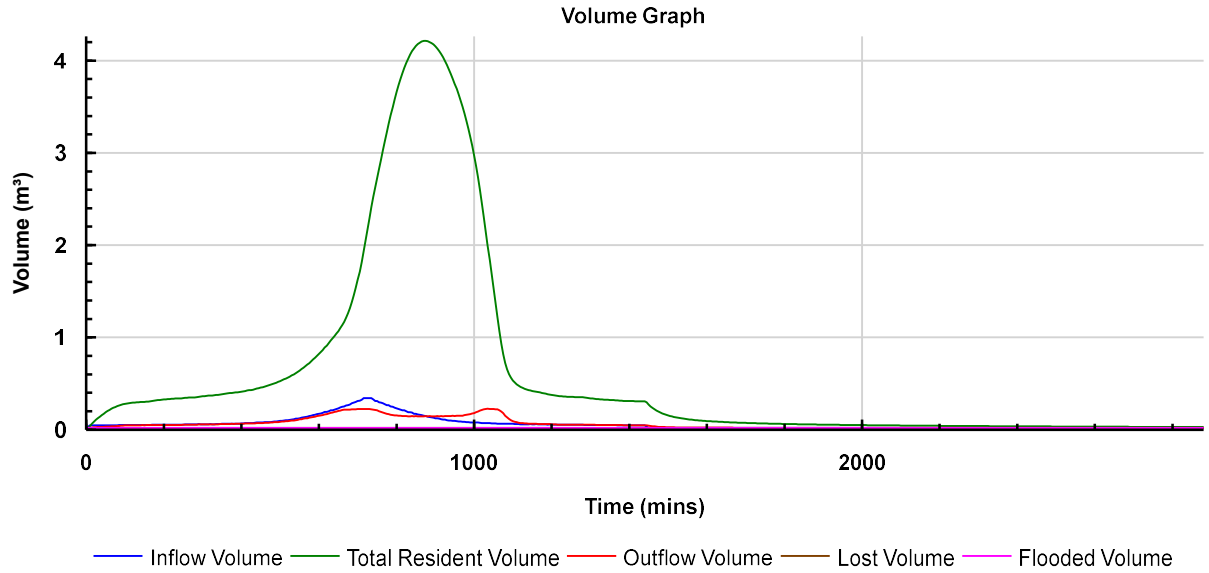
Phase
FSR: 1 years: Increase Rainfall (%): +0: 1440 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Manhole (2)			0.7	23.759
TOTAL	1.1	23.790	0.7	23.759

Graphs





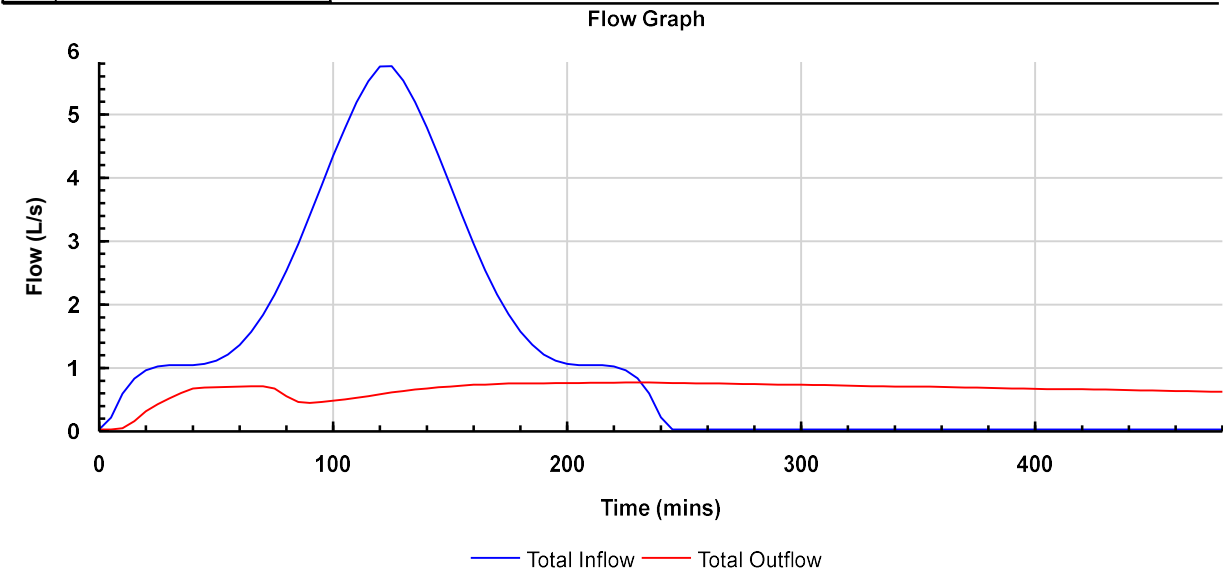
Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

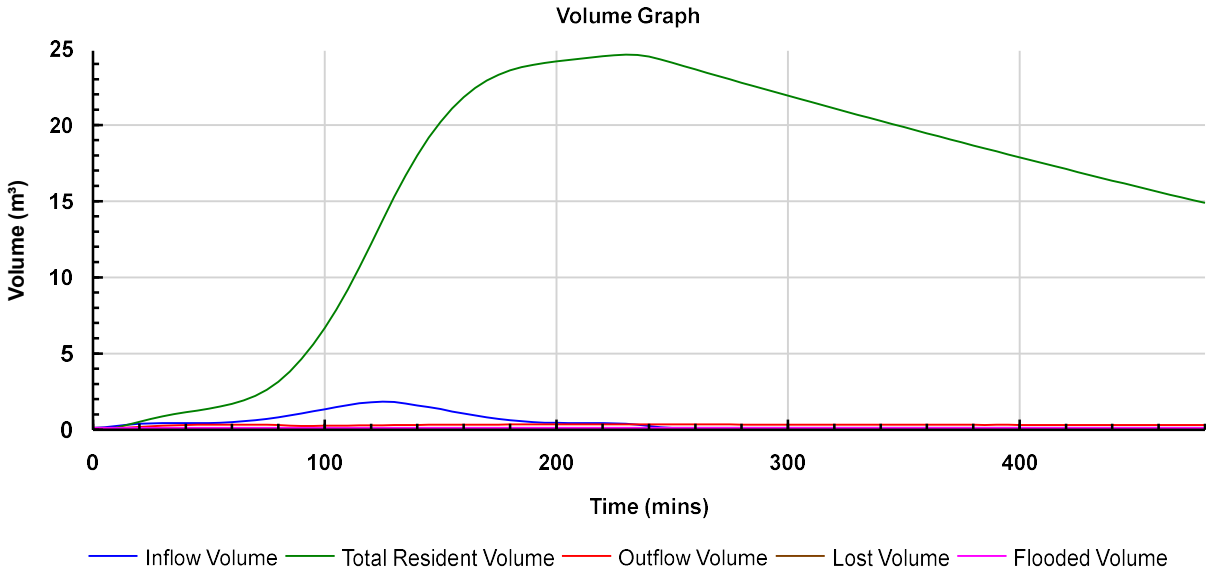
Phase
FSR: 30 years: Increase Rainfall (%): +0: 240 mins: Winter

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Manhole (2)			0.7	18.149
TOTAL	5.8	33.051	0.7	18.149

Graphs





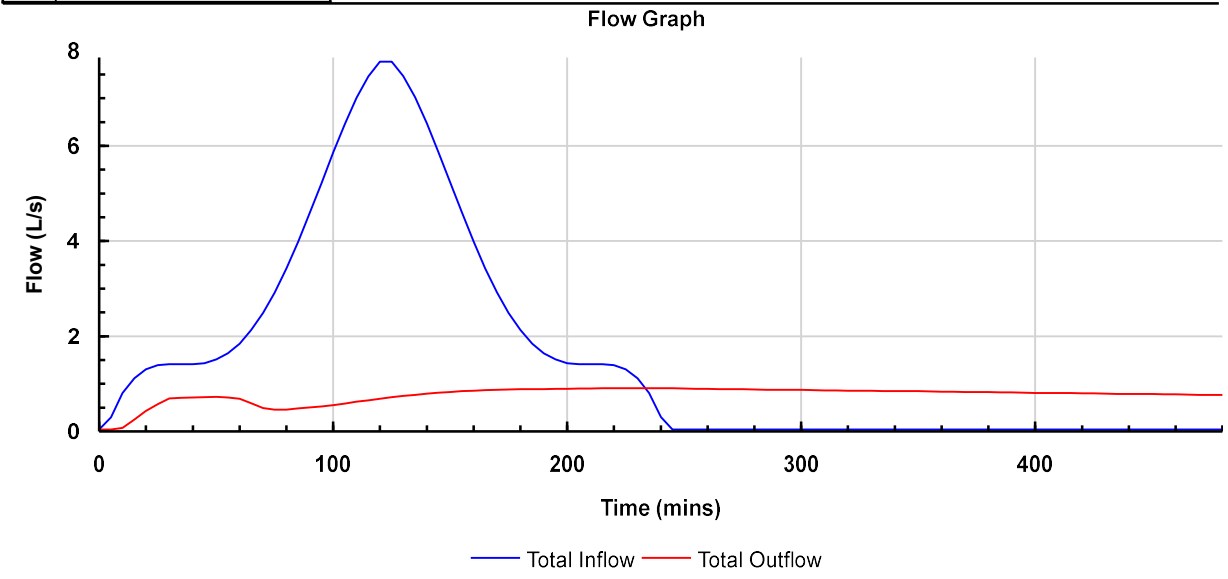
Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

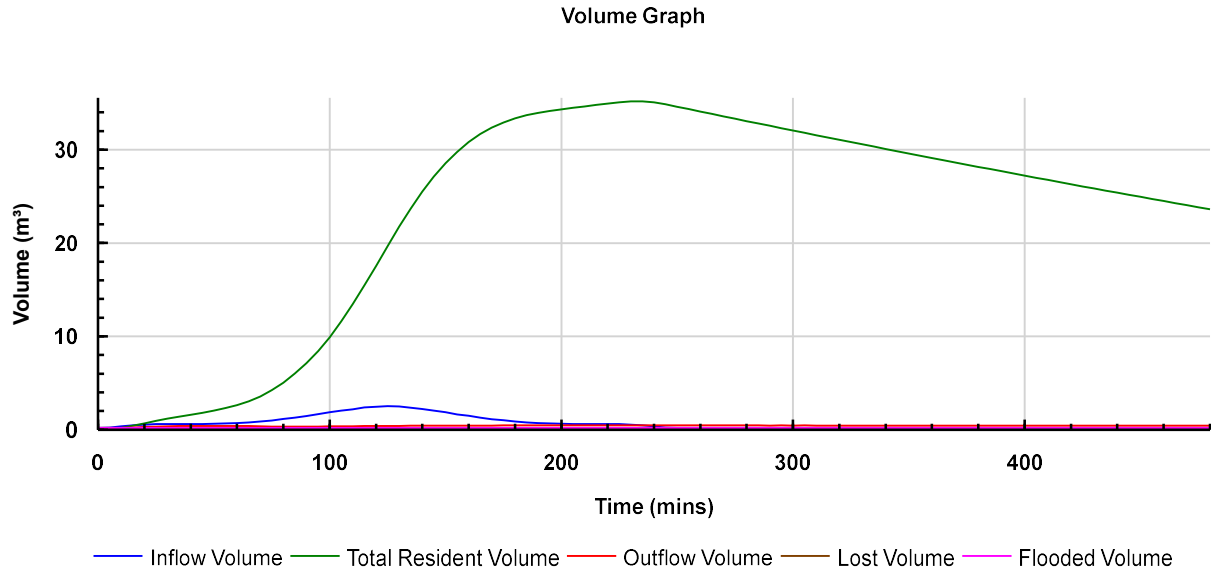
Phase
FSR: 30 years: Increase Rainfall (%): +35: 240 mins: Winter

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Manhole (2)			0.9	20.946
TOTAL	7.8	44.613	0.9	20.946

Graphs





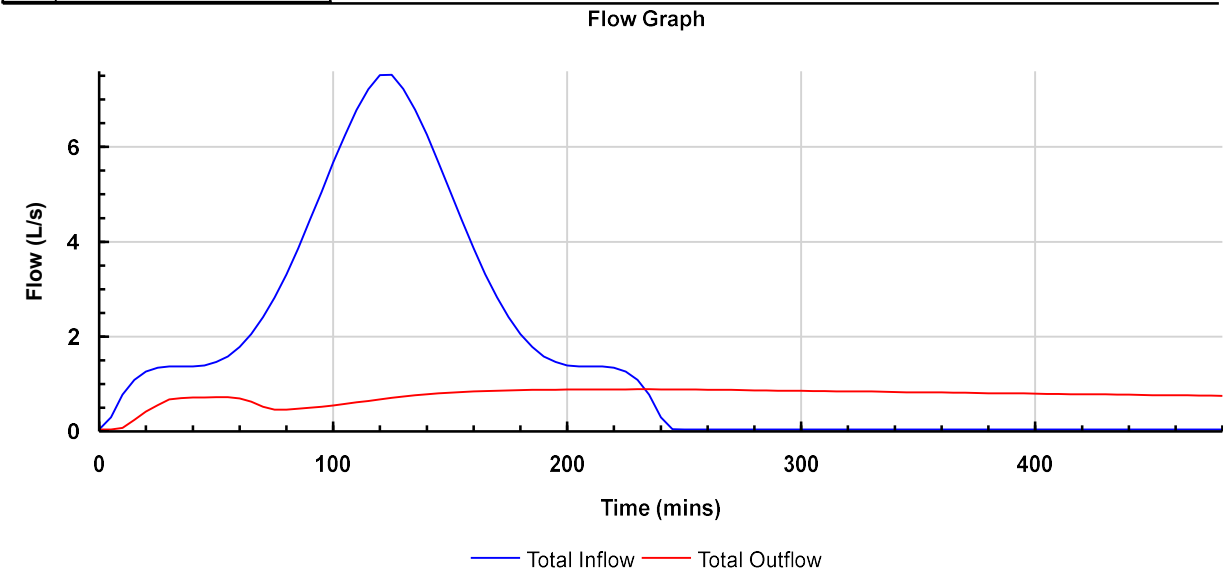
Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

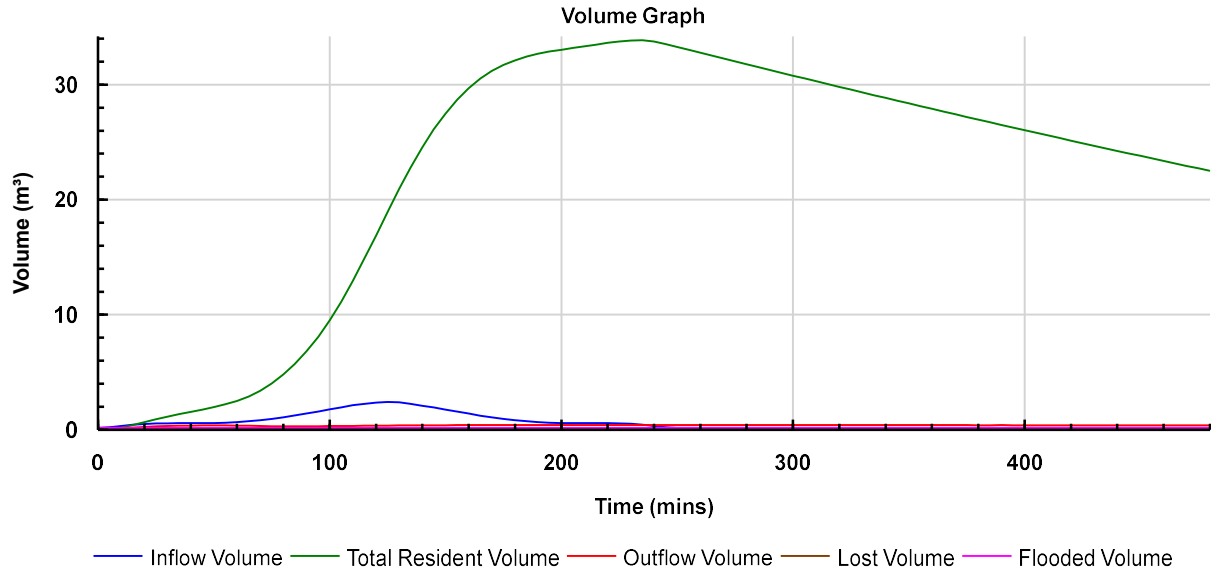
Phase
FSR: 100 years: Increase Rainfall (%): +0: 240 mins: Winter

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Manhole (2)			0.9	20.619
TOTAL	7.5	43.173	0.9	20.619

Graphs





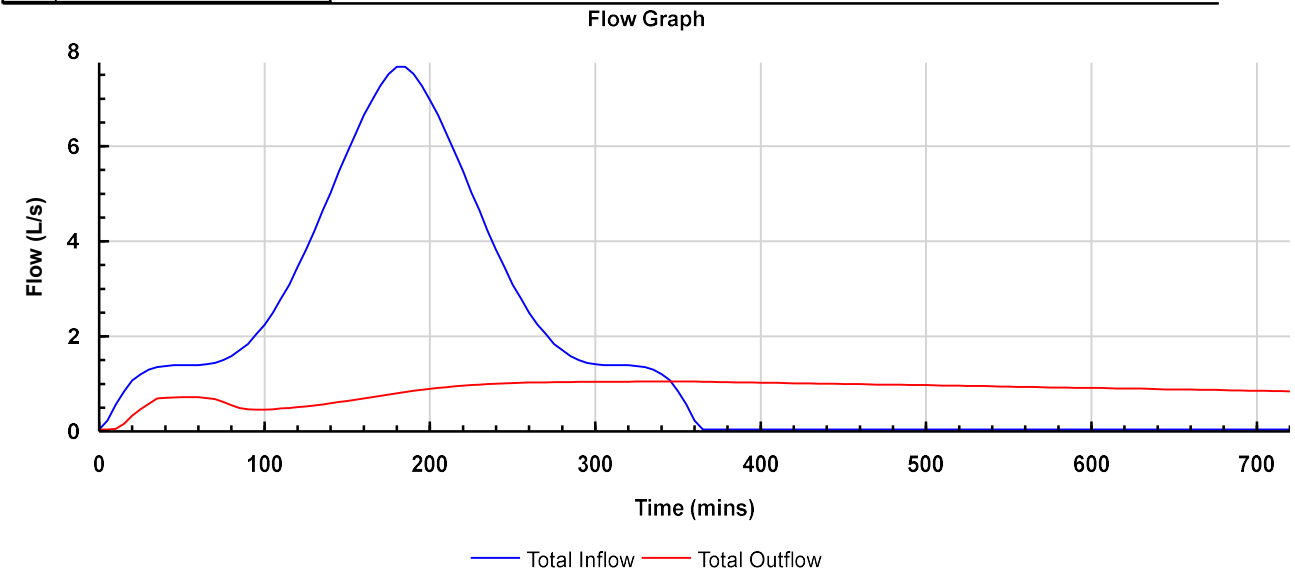
Project:	Date: 18/10/2022		
	Designed by: Chris Hann	Checked by:	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

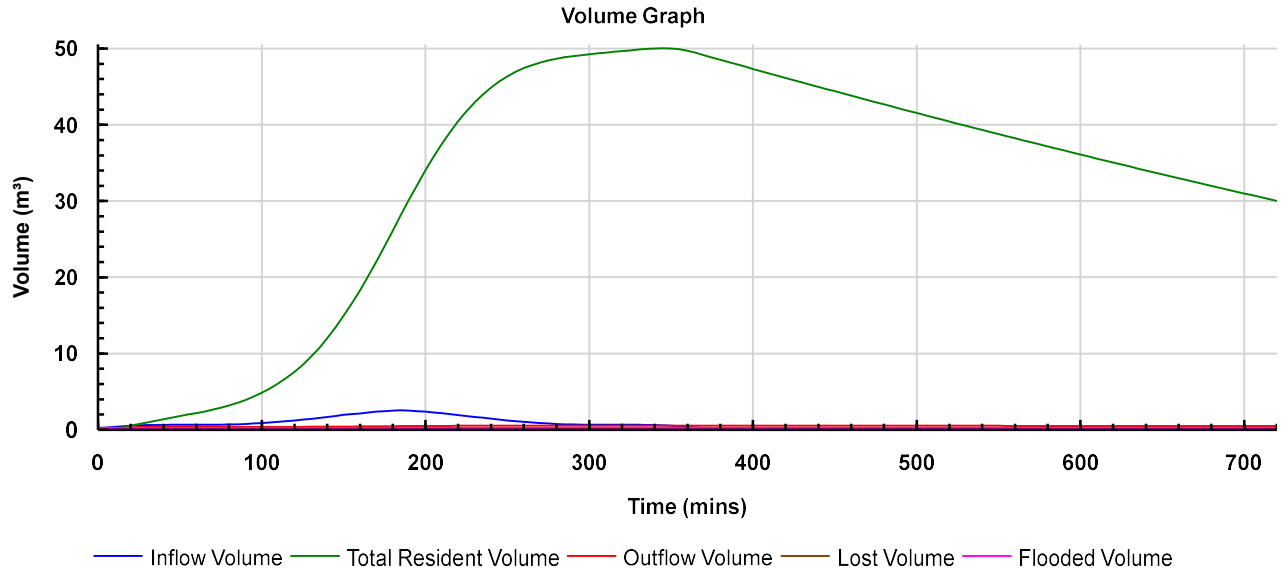
Phase
FSR: 100 years: Increase Rainfall (%): +40: 360 mins: Winter

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
Manhole (2)			1.0	35.724
TOTAL	7.7	65.807	1.0	35.724

Graphs





Appendix C – Surface Water Drainage Layout

159.4m

HIGH

394

SURFACE WATER RUNOFF FROM ROOF AREAS TO BE ROUTED TO RAINWATER DOWNPIPES AND INTO SUBSURFACE SURFACE WATER DRAINAGE NETWORK.

PROPOSED CONNECTION TO EXISTING SEVERN TRENT PUBLIC COMBINED WATER SEWER.

EXISTING OUTFALL TO BE USED WHERE PRACTICAL.

ASSUMED IL: 158.75

CL: 161.00
IL: 158.85

HYDROBRAKE MANHOLE
PEAK FLOW RATES
RESTRICTED TO 1.0 L/S

TYPE C PERMEABLE PAVING

CL: 160.00
IL: 159.00

FFL minimum 150mm above ground levels

GEOCELLULAR ATTENUATION TANK
CL: 161.00
BL: 158.90
DIMENSIONS: 5m (l) x 10m (w) x 1m (h)
POROSITY: 95%
VOLUME: 47.5m³

CL: 161.00
IL: 159.20

SURFACE WATER RUNOFF FROM ROAD/PARKING AREAS TO BE CAPTURED VIA PERMEABLE PAVING AND SLOT DRAINS AND ROUTED INTO SUBSURFACE SURFACE WATER DRAINAGE NETWORK.

83 to 89

398

ALL LEVELS ARE TO METRES ABOVE ORDNANCE DATUM (AOD) UNLESS OTHERWISE SPECIFIED

DISCHARGE FROM SITE TO BE RESTRICTED TO 1.0L/S PRIOR TO DISCHARGE TO EXISTING COMBINED SEWER.

ATTENUATION STORAGE TO BE PROVIDED IN GEOCELLULAR ATTENUATION TANK FOR UP TO AND INCLUDING THE 1 IN 100 YEAR CRITICAL STORM EVENT (PLUS 40% ALLOWANCE FOR CLIMATE CHANGE).

DETAILED TOPOGRAPHIC SURVEY / CONNECTIVITY SURVEY REQUIRED TO CONFIRM THE LOCATION, LEVEL AND CONDITION OF ANY EXISTING OUTFALLS AND THE EXISTING COMBINED SEWEEN. ANY EXISTING OUTFALLS SHOULD BE REUSED WHERE PRACTICAL.

APPROVAL AND CONSENT TO DISCHARGE FROM SEVERN TRENT WATER AND LLFA REQUIRED.

INFILTRATION TESTING IN ACCORDANCE WITH BRE 365 SHOULD BE UNDERTAKEN AND THE SURFACE WATER DRAINAGE STRATEGY SHOULD BE REFINED AT THE DETAILED DESIGN STAGE SUBJECT TO INFILTRATION TESTING RESULTS.

ROOF DRAINAGE SYSTEMS (DOWNPIPES) SHOWN INDICATIVELY.

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT REPORTS, PLANS AND ARCHITECTURAL DRAWINGS
2. THIS DRAWING SHOULD NOT BE SCALED. THERE SHOULD BE NO RELIANCE ON THIS DRAWING WITH REGARDS TO DIMENSIONS. ALL DIMENSIONS SHOULD BE CONFIRMED ON SITE.
3. ANY DISCREPANCY ON THIS DRAWING SHOULD BE REPORTED TO AEGAEA IMMEDIATELY FOR CLARIFICATION.
4. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORKS AND FOR THE STABILITY, INSTALLATION AND HEALTH AND SAFETY OF THE WORKS.
5. AEGAEA HAVE PRODUCED THIS DRAWING BASED ON THE DRAWINGS AND INFORMATION PROVIDED BY THE CLIENT AVAILABLE AT THE TIME OF PRODUCTION. WE CANNOT ACCEPT RESPONSIBILITY FOR DISCREPANCIES RESULTING FROM NEW PLANS/ INFORMATION BEING ISSUED POST-ISSUE OF THIS DRAWING. THE CONTRACTOR SHOULD REVIEW THIS DRAWING IN LIGHT OF WIDER SITE INFORMATION SUCH AS CONTAMINATION, UTILITIES SURVEYS AND SITE INVESTIGATIONS
6. IT IS THE RESPONSIBILITY OF THE PRINCIPLE CONTRACTOR TO MAKE THE DESIGNER AND CLIENT AWARE OF SITE-SPECIFIC RISKS AND HAZARDS THAT MAY AFFECT THE DRAWING AND SPECIFICATION

LEGEND

- PROPOSED SURFACE WATER DRAIN
- SURFACE WATER MANHOLE/ INSPECTION CHAMBER
- PETROL INTERCEPTOR MANHOLE
- PROPOSED HYDROBRAKE MANHOLE
- GEOCELLULAR ATTENUATION TANK
- RAISED PLANTER BIORETENTION SYSTEM
- TYPE C PERMEABLE PAVING
- EXISTING COMBINED SEWER
- PROPOSED SLOT DRAIN
- EXCEEDANCE FLOW ROUTE

CLIENT:
PUUC ARCHITECTURAL DESIGN STUDIOS

SITE:
396 HIGH STREET, WEST BROM, B70 9LB

DRAWING:
SURFACE WATER DRAINAGE STRATEGY

DRAWING NUMBER:
AEG0680_DR001

DATE:
05/01/2023

REV:
B

DRAWN BY:
AJB

DRAWING SCALE:
1:100

PRELIMINARY DRAWING FOR PLANNING ONLY - NOT FOR CONSTRUCTION

aegaea
Flood risk, water and environment

Appendix D – CCTV Survey

CCTV Inspection Report

396 HIGH STREET
CARTERS GREEN MEDICAL CENTRE
WEST BROMWICH
B70 9QL

05/10/2022

Job Number: 7676

Bog Standard Drainage

Unit 14, Vauxhall Street, Dudley, DY1 1TA
01384 939 393
info@bogstandarddrainage.co.uk

Project Information

Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Client Details:

SIMON BAGRI

Site Details:

396 HIGH STREET
CARTERS GREEN MEDICAL CENTRE
WEST BROMWICH
B70 9QL

Contractor Details:

Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Office Contact Number: 01384 939393

Purpose of Survey:

COMMERCIAL BUILD OVER SURVEY FOR NEW BUILD OF FLATS

Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Report Contents

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Page 5 Site Photos

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Page 9 Survey Run Sheet(Survey 2 - MH2 BURIED to OUTFALL)

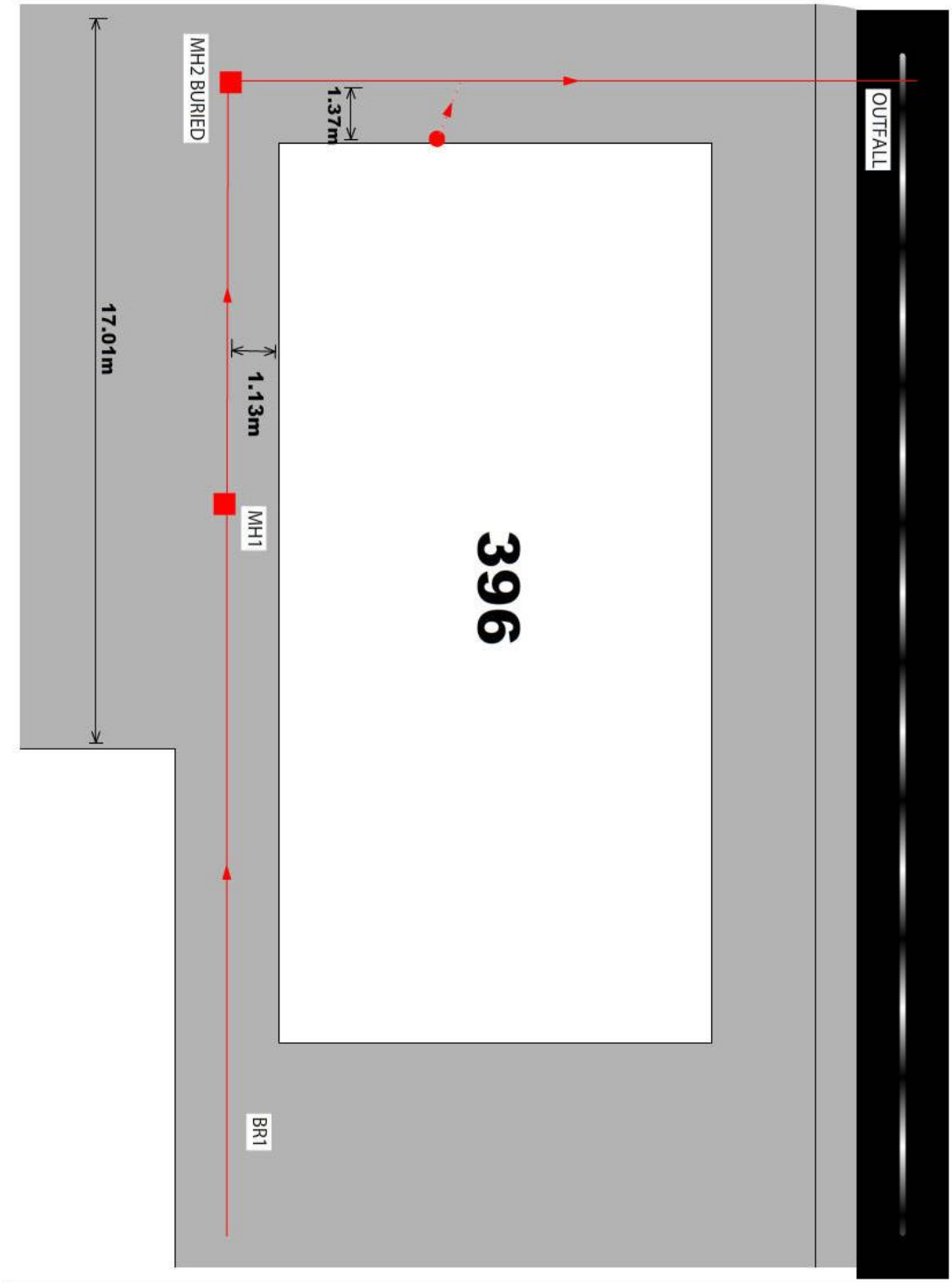
Page 11 Survey Run Sheet(Survey 3 - MH1 to BR1)

Page 13 Grade Defect Descriptions

Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

This sketch is not to scale and does not represent the exact routing of the drainage system



Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Site Photos

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Manhole / **Access Point:** MH1 Internal

Manhole / **Access Point:** MH1 Location

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Report Summary

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Job Information

Total Distance Surveyed: **59.24 metres**
Engineer: **MG**
Number of Surveys: **3**
Number of Surveys grade 4 or above: **0**

Job Comments

COMPLETED DOMESTIC CCTV SURVEY ON COMBINED PUBLIC SEWER AT REAR OF PROPERTY
NO RECCOMEMDATIONS NEEDED FOR PIPEWORK
MH2 IS BURIED MAY NEED TO BE UNCOVERED

Section 1 Overview (05/10/2022)

Manholes: **MH1 to OUTFALL**
Pipe Length: **8.31 metres**
Structural Grade: **0**
Service Grade: **0**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Combined**

Section 2 Overview (05/10/2022)

Manholes: **MH2 BURIED to OUTFALL**
Pipe Length: **34.93 metres**
Structural Grade: **0**
Service Grade: **2**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Combined**

Section 3 Overview (05/10/2022)

Manholes: **MH1 to BR1**
Pipe Length: **16 metres**
Structural Grade: **0**
Service Grade: **4**
Material: **Vitrified clay**
Pipe Size: **150mm**
Use: **Combined**

SEVERN TRENT PUBLIC SEWER

CCTV Inspection Report

Bog Standard Drainage
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Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
MG	**7676**	**MH1 X**	**05/10/2022**	**Not Cleaned**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**0/0**	**AR1L6WK64X**	**1**

Road **396 HIGH STREET**
Place **CARTERS GREEN MEDICAL CENTRE**
Location **WEST BROMWICH**

Division
District
Location Details

Purpose
Duty **Combined**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **MH1**
End Node **OUTFALL**
Total length **8.31 metres**

Scale **1:0.44**
Direction **Downstream**

Start Node Ref:MH1 | I/L : metres | Depth: 1.96 metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH1	6950073	Comment / 0
0.00	WL	Water level 15% height/diameter	6950080	Comment / 0
0.40	CN	Connection other than junction at 2 o'clock, diameter 100mm	6950082	Comment / 0
2.29	JN	Junction at 1 o'clock, diameter 100mm	6950084	Comment / 0
5.74	WL	Water level 25% height/diameter	6950086	Comment / 0
8.31	MHF	Finish node type, manhole, reference MH2	6950091	Comment / 0

End Node Ref:OUTFALL | I/L : metres

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CCTV Inspection Photos

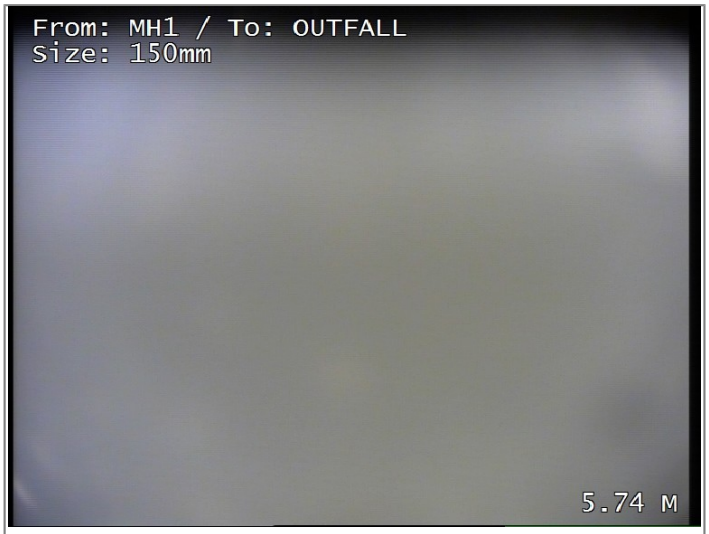
Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Start node type, manhole, reference MH1

Water level 15% height/diameter

Connection other than junction at 2 o'clock, diameter 100mm

Junction at 1 o'clock, diameter 100mm



Water level 25% height/diameter

Finish node type, manhole, reference MH2

CCTV Inspection Report

Bog Standard Drainage
Unit 14, Vauxhall Street
Dudley
West Midlands
DY1 1TA

Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
MG	**7676**	**MH2 BURIEDX**	**05/10/2022**	**Not Cleaned**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**2/0**	**AR1L6WK64X**	**2**

Road **396 HIGH STREET**
Place **CARTERS GREEN MEDICAL CENTRE**
Location **WEST BROMWICH**

Division
District
Location Details

Purpose
Duty **Combined**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **MH2 BURIED**
End Node **OUTFALL**
Total length **34.93 metres**

Scale **1:1.83**
Direction **Downstream**

Start Node Ref:MH2 BURIED | I/L : metres

Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH2 BURIED	6950094	Comment / 0
0.00	WL	Water level 5% height/diameter	6950097	Comment / 0
6.88	CN	Connection other than junction at 12 o'clock, diameter 100mm	6950100	Comment / 0
12.86	RFJ	Roots fine, at joint	6950104	Service / 2
31.38	LD	Line of drain/sewer deviates down	6950103	Comment / 0
34.93	OFF	Finish node type, outfall, reference OUTFALL	6950102	Comment / 0

End Node Ref:OUTFALL | I/L : metres

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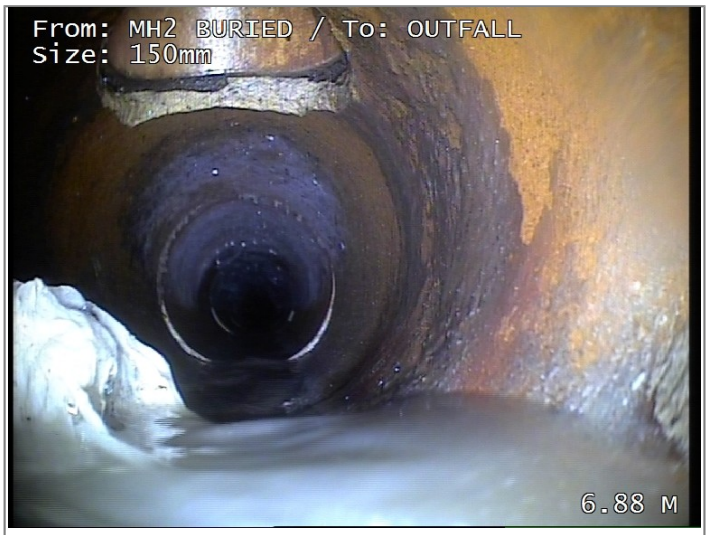
CCTV Inspection Photos

Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Start node type, manhole, reference MH2 BURIED

Water level 5% height/diameter



Connection other than junction at 12 o'clock, diameter 100mm

Roots fine, at joint

Line of drain/sewer deviates down

Finish node type, outfall, reference OUTFALL

CCTV Inspection Report

Bog Standard Drainage
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Surveyed by (Operator)	Job Number	Pipe Length Reference(PLR)	Date	Pre Cleaned
MG	**7676**	**BR1 X**	**05/10/2022**	**Not Cleaned**
Weather	Customer Present	Service Grade/Structural Grade	Base Unit	Section Number
1 - Dry		**4/0**	**AR1L6WK64X**	**3**

Road **396 HIGH STREET**
Place **CARTERS GREEN MEDICAL CENTRE**
Location **WEST BROMWICH**

Division
District
Location Details

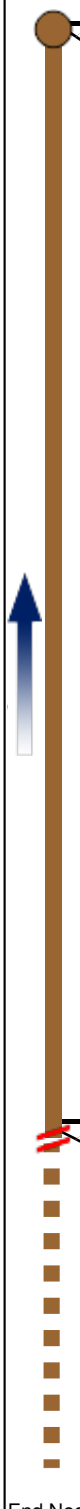
Purpose
Duty **Combined**
Catchment

Shape/Size **150mm**
Material **Vitrified clay**
Category

Start Node **MH1**
End Node **BR1**
Total length **16 metres**

Scale **1:0.84**
Direction **Upstream**

Start Node Ref:MH1 | I/L : metres | Depth: 1.96 metres



Position	Code	Description	Photo	Type/Grade
0.00	MH	Start node type, manhole, reference MH1	6950108	Comment / 0
0.00	WL	Water level 5% height/diameter	6950109	Comment / 0
12.20	DEFJ	Attached deposits, fouling from 3 to 9 o'clock 50% cross-sectional area loss, at joint	6950110	Service / 4
12.29	SA	Survey abandoned - Remark: GREASE	6950111	Comment / 0

End Node Ref:BR1 | I/L : metres

CCTV Inspection Photos

Bog Standard Drainage
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Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

Start node type, manhole, reference MH1

Water level 5% height/diameter

Attached deposits, fouling from 3 to 9 o'clock 50% cross-sectional area loss, at joint

Survey abandoned - Remark: GREASE

Defect Grade Descriptions

Bog Standard Drainage
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Job Number	Surveyed by (Operator)	Base Unit	Date
7676	**MG**	**AR1L6WK64X**	**05/10/2022**

1: Occurences without damage. For example, laterals, joints,etc.

NO DEFECTS WERE DETECTED.

2: Constructional deficiencies or occurences with insignificant influence to tightness, hydraulic or static pressure or pipe: Eg. wide joints, badly torched intakes, minor deformation of plastic pipes, minor erosions etc.

REHABILITATION CAN BE SCHEDULED LONG-TERM.

3: Constructional deficiencies diminishing static, hydraulic and tightness: Eg. untorched intakes, cracks, minor drainage obstructions such as calcite build ups, protruding laterals, minor damages to pipe wall, individual root penetrations, corroded pipe walls etc.

REHABILITATION IS NECESSARY MEDIUM-TERM WITHIN 3 TO 5 YEARS.

4: Constructional damages with insufficent static safety, hydraulic or tightness: Eg. axial/radial pipe bursts, pipe deformations, visually noticeable infiltration/exfiltration, cavities, in pipe-wall, severe protruding, laterals severe root penetrations, severe corrosion of pipe wall etc.

REHABILITATION PROCEDURE IS URGENT AND HAS TO BE COMPLETED WITHIN 1 TO 2 YEARS. NECESSITY FOR EMERGENCY OPERATIONS HAS TO BE EXAMINED.

5: Pipe is already or will shortly be impermeable: Eg. collapsed pipe, deeply rooted pipe or other drainage obstructions. Pipe loses water or danger of backwater in basements etc.

REHABILITATION IS URGENT AND SHORT-TERM. IN ORDER TO PREVENT FURTHER DAMAGE, NECESSARY TEMPORARY SPOT REPAIR HAS TO BE CONDUCTED ON EMERGENCY LEVEL.