



**SHELDON BAKERY,
OPENSHAW,
MANCHESTER,
M11 2FB**

DRAINAGE STRATEGY

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CONTENTS

1.	INTRODUCTION.....	4
2.	SITE LOCATION AND TOPOGRAPHY	5
	Site Topography	6
	Geology Hydrogeology	7
	Groundwater	7
	Soil infiltration rates.....	7
	Hydrogeology/Hydrology	7
3.	EXISTING DRAINAGE CHARACTERISTICS	8
	Public sewers	8
	Site Drainage	9
	Foul Drainage	10
4.	PROPOSED DEVELOPMENT DETAILS.....	10
5.	CONSULTATION AND DATA REVIEW.....	12
	Water Authority	12
	Lead Local Flood Authority	12
	Internal Drainage Board District	12
6.	EXISTING RUNOFF RATE.....	13
	Existing Greenfield Runoff Rate	13
	Existing Greenfield Runoff Volume	13
	Existing Brownfield Runoff Rate.....	13
7.	PROPOSED DRAINAGE RUN-OFF.....	14
	Proposed Runoff Rate	14
	Proposed Runoff Volume	14
8.	PROPOSED SURFACE WATER RUNOFF DESTINATION	16
	Discharge into the ground - infiltration expectations	16
	Discharge to surface water body.	17
	Discharge to Surface Water Sewer	17
9.	SuDS COMPONENTS.....	17
10.	CLIMATE CHANGE ALLOWANCE	20
11.	SURFACE WATER DRAINAGE STRATEGY	21
	Surface Water Network	22
12.	FOUL WATER DRAINAGE STRATEGY	22
	Foul Water Network.....	22

13.	DESIGN FOR EXCEEDANCE	23
14.	WATER QUALITY	23
	The Proposed SuDS Components -	24
15.	EXECUTIVE SUMMARY	25
	APPENDIX 1 – TOPOGRAPHICAL SURVEY	26
	APPENDIX 2 – PROPOSED SITE PLAN	27
	APPENDIX 3 – PROPOSED IMPERMEABLE AREAS PLAN	28
	APPENDIX 4 – UNITED UTILITIES PRE-DEVELOPMENT RESPONSE	29
	APPENDIX 5 – GREENFIELD RUN-OFF RATES	30
	APPENDIX 6 – PROPOSED DRAINAGE LAYOUT	31
	APPENDIX 7 – HYDRAULIC CALCULATIONS.....	32

1. INTRODUCTION

- 1.1 HBL Associates Ltd have been instructed to prepare a Drainage Strategy in support of a full planning application for a development proposed at land off Parkhouse Street in Openshaw, Manchester.
- 1.2 Table 1.1 below shows details of the proposed development.

Project Name	Sheldon Bakery, Openshaw
Project Description	The project includes commercial buildings, car parking with associated landscaping and infrastructure works
Location	land off Parkhouse Street, Openshaw, Manchester, Greater Manchester, England, M11 2FB.
NGR (Approximate)	387678E 397725N
Application Site Area (HA) – Red Boundary Line	21,666m ² = 2.17ha (Approximate area)
Development Type	“Greenfield” – the site is currently vacant and vegetated, with well-established dense vegetation present across part of the site. Historically the site was developed, including a dyeworks and terraced housing.
Local Planning Authority	Manchester City Council
Lead Local Flood Authority	Manchester City Council
Sewerage Undertaker	United Utilities

Table 1.1 Existing Site Details.

- 1.3 Sources of flooding will be assessed as part of the Drainage Strategy for the proposed development in its current context.
- 1.4 This document is to be read in conjunction with all associated drawings, supported reports and documentation.
- 1.5 The report follows advice contained in the Department for Communities and Local Government’s National Planning Policy Framework (NPPF) and Planning Practice Guidance, which provides advice to planning authorities, developers, the public and Environment Agency (EA) on development and flood risk.

2. SITE LOCATION AND TOPOGRAPHY

2.1 The application site is an area of land in the east of Manchester, as indicated in Figure 2.1 below.



Figure 2.1 Site Location Plan – (Source: Google maps)

2.2 Figure 2.2 shows the aerial image of the site and the immediate surrounding area.



Figure 2.2 Satellite imagery – (Source: Google maps)

- 2.3 The site is greenfield undeveloped land, with vegetation present.
- 2.4 The eastern site boundary is Kelbrook Road, the southern boundary is Parkhouse Street, and the southern part of the western boundary is Clayton Lane. The remainder of the western boundary and the northern boundary is formed by commercial developments.
- 2.5 The site is within the Manchester District of the Greater Manchester Combined Authority area.
- 2.6 The proposed development is a large commercial bakery and includes HGV loading docks, service yard, vehicle parking with associated landscaping and infrastructure works.

Site Topography

- 2.7 The site can be identified by approximate National Grid Reference 387688 , 397722.
- 2.8 A topographical survey has been undertaken by The CAD Room in March 2021, reference 01-S-1038 (**Appendix 1**).
- 2.9 The topographical survey shows that there is a general trend of levels falling down to the west across the site. however, large parts of the site were unable to be surveyed due to the dense vegetation, so existing levels are unconfirmed across much of the site.
- 2.10 Levels around 60.30m AOD are present in the southeast corner, falling to around 58m AOD in the southwest corner. The northwest corner is around 60.70m AOD, and the northwestern point is approximately 61m AOD.

- 2.11 Levels are in the region of 60 – 61m AOD in the centre of the site.

Geology Hydrogeology

- 2.12 LK Consult undertook a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy report, dated September 2021.
- 2.13 This report should be referred to for information relating to the existing ground conditions of the site.
- 2.14 The report advises that made ground is present across parts of the development site and a mixture of other strata was also recorded. Made Ground to 1.2mbgl to greater than 3mbgl and comprised gravelly sand or clay with ash, clinker, brick and other anthropogenic inclusions (slightly silty gravelly sand with ash, clinker, brick, occasional metal, cloth, ceramics).

Groundwater

- 2.15 The Phase 2 Ground Investigation Interpretative Report states groundwater and groundwater seepages were encountered within several of the exploratory holes at a number of locations across the site, at depths of between 1.8m and 9.0mbgl.
- 2.16 Excavation/drilling and the Made Ground and natural deposits included granular strata containing perched groundwater.
- 2.17 The report notes shallow groundwater identified on the site may present a constraint to the development and that suitable drainage should be considered in the proposed development layout. It is assumed that “shallow groundwater” is referring to the groundwater noted at a minimum of 1.8m depths at certain locations within the site.

Soil infiltration rates

- 2.18 The Phase 2 Geo-Environmental Investigation indicates that soil infiltration rates have not been determined by on site investigation. The report advises that it may be possible to implement soakaway drainage for disposing of surface water runoff in the north and south of the site and that soakaway tests, in accordance with BRE 365 should be undertaken to establish the viability of Sustainable Urban Drainage (SUDs).

Hydrogeology/Hydrology

- 2.19 The nearest watercourse is Clayton Brook, which is culverted through the site.
- 2.20 The culvert is recorded on the United Utilities sewer records as being 1200mm in diameter and shown to cross the site from the northeast to southwest. It is thought to run broadly east – west across the site, with a gentle curvature shown on the records.
- 2.21 The maintenance of ordinary watercourses is the responsibility of the landowner. This culverted watercourse is expected to be a Lead Local Flood Authority asset, who has a power to regulate i.e., powers associated with the prevention, mitigation and remedying of flood damage associated with ordinary watercourses.
- 2.22 The culvert is not shown on the online Flood Map for Planning, however, shows the Ashton Canal as the nearest canal to the site, as below within Figure 2.3.
- 2.23 There are no other known watercourses within the immediate vicinity of the Site.

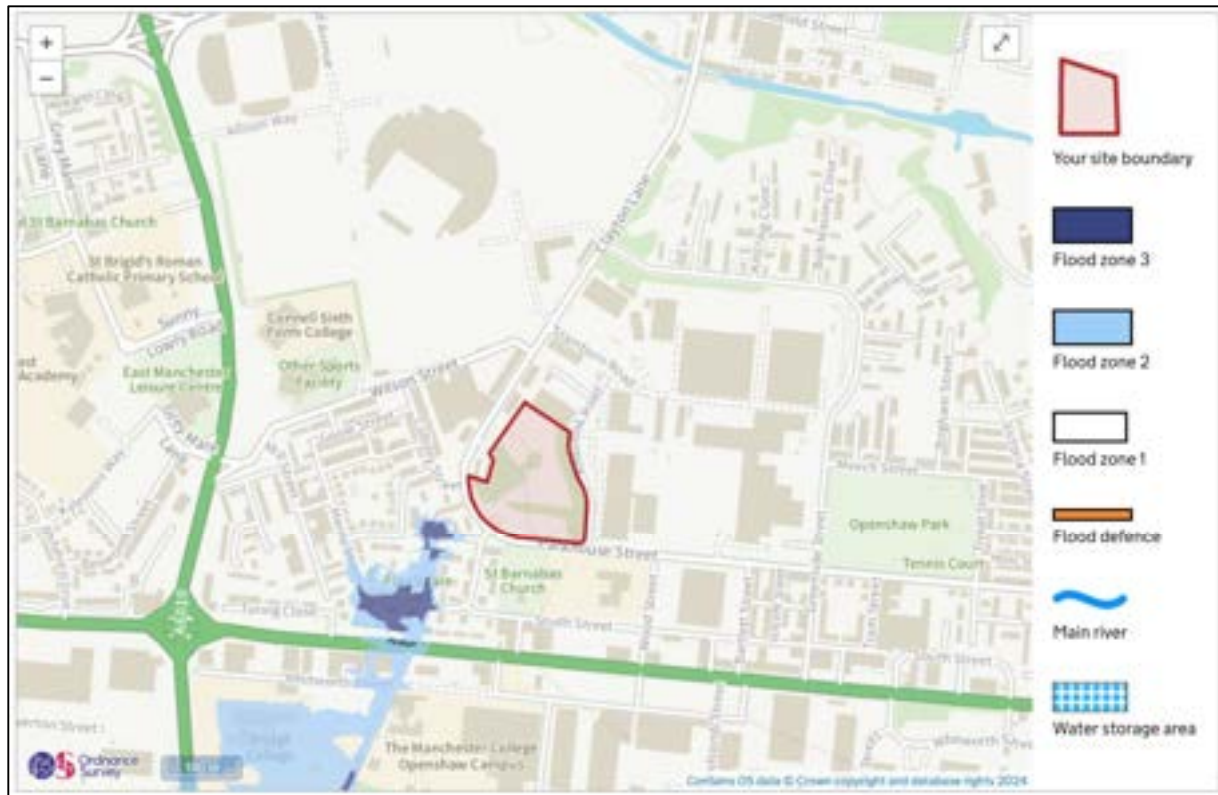


Figure 2.3 Extract from Flood Map for Planning. Source Environment Agency online mapping.

3. EXISTING DRAINAGE CHARACTERISTICS

Public sewers

3.1 Public sewer records have been obtained from United Utilities, who is the Water Authority for the area. A summary of the drainage is provided below and indicated in **Appendix 4** and Figure 3.1.

- The buildings close to the northwest corner of the site have a network of combined public sewers present, which include a 150mm sewer at the rear of the properties which runs close to the site boundary at this location.
- There are combined public sewers within the highways to the west and south of the site.
- A 750mm public surface water sewer is within Clayton Lane to the west of the site.
- A 300mm public surface water sewer is within Parkhouse Street to the southwest of the site.
- As noted above, a 1200mm diameter culvert is shown to cross the site from the northeast to southwest. It is expected this is a LLFA asset.

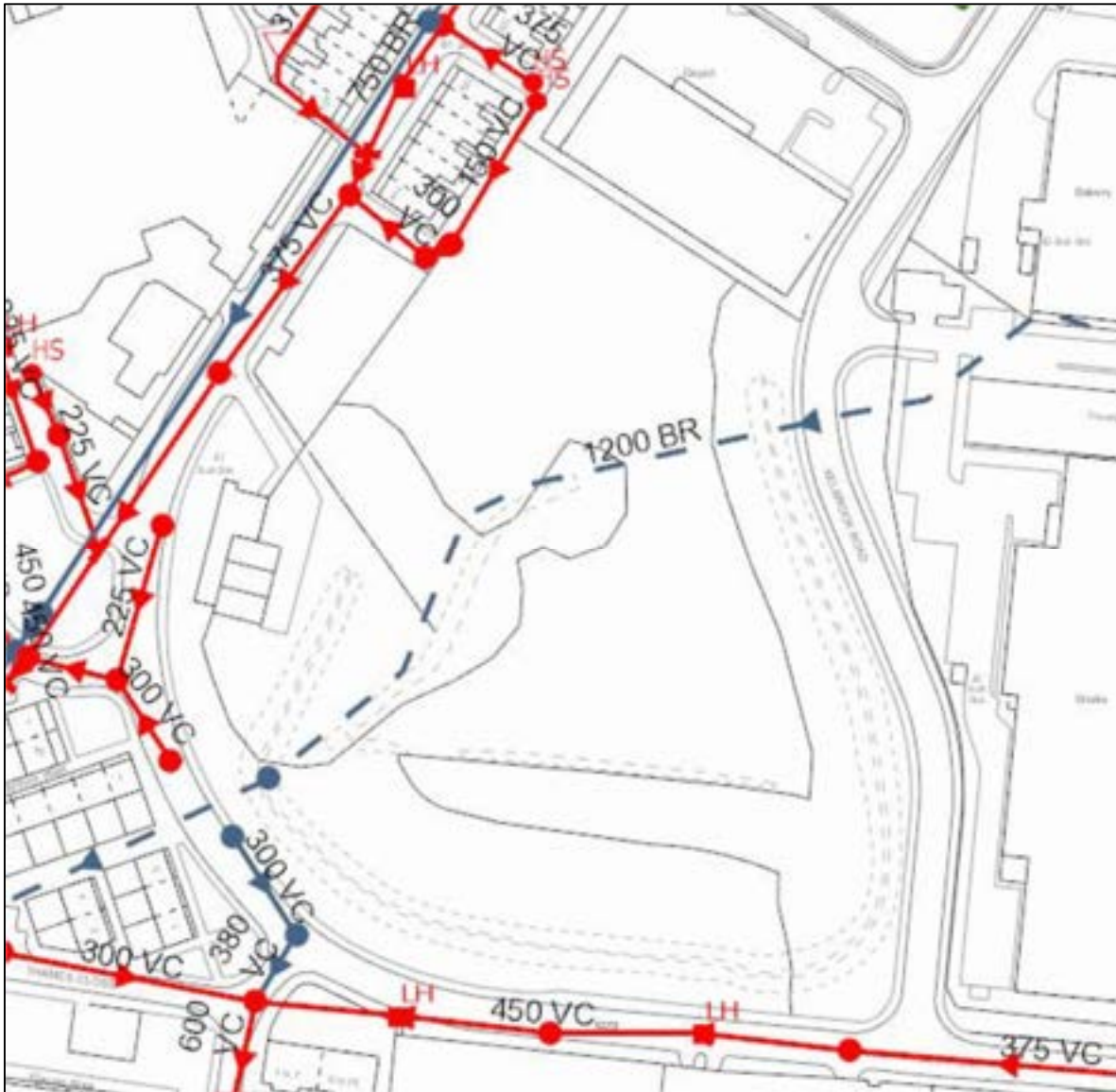


Figure 3.1 Extract from United Utilities sewer records. (Source: United Utilities).

Site Drainage

- 3.2 The site was historically developed and dye works and terraced housing were present. There would have been drainage systems present to accommodate the historic developments. However, the former developments have been demolished and removed, and the site is presently vacant and densely vegetated. The previous drainage systems would be expected to have been removed as part of the demolition, and any remnants would be unexpected to be functional. Therefore, the site is expected to be undrained in the present scenario.
- 3.3 The presence of existing field drains or other drainage infrastructure cannot be ruled out.
- 3.4 Highway drainage is present within the highway network adjacent to the site.
- 3.5 Further investigation would be required to determine the extent of any existing drainage within the site. However, the Phase 2 Geo-Environmental Investigation included intrusive investigation and does not suggest finding any functioning drainage system.

Foul Drainage

- 3.6 No existing foul drainage is expected on site, as previous drainage systems would be expected to have been removed as part of the demolition of the former developments.

4. PROPOSED DEVELOPMENT DETAILS

- 4.1 The proposed development is a large commercial bakery and includes HGV loading docks, service yard, vehicle parking with associated landscaping and infrastructure works.
- 4.2 A copy of the latest proposed site plan has been included within **Appendix 2** and an excerpt is below in Figure 4.1.

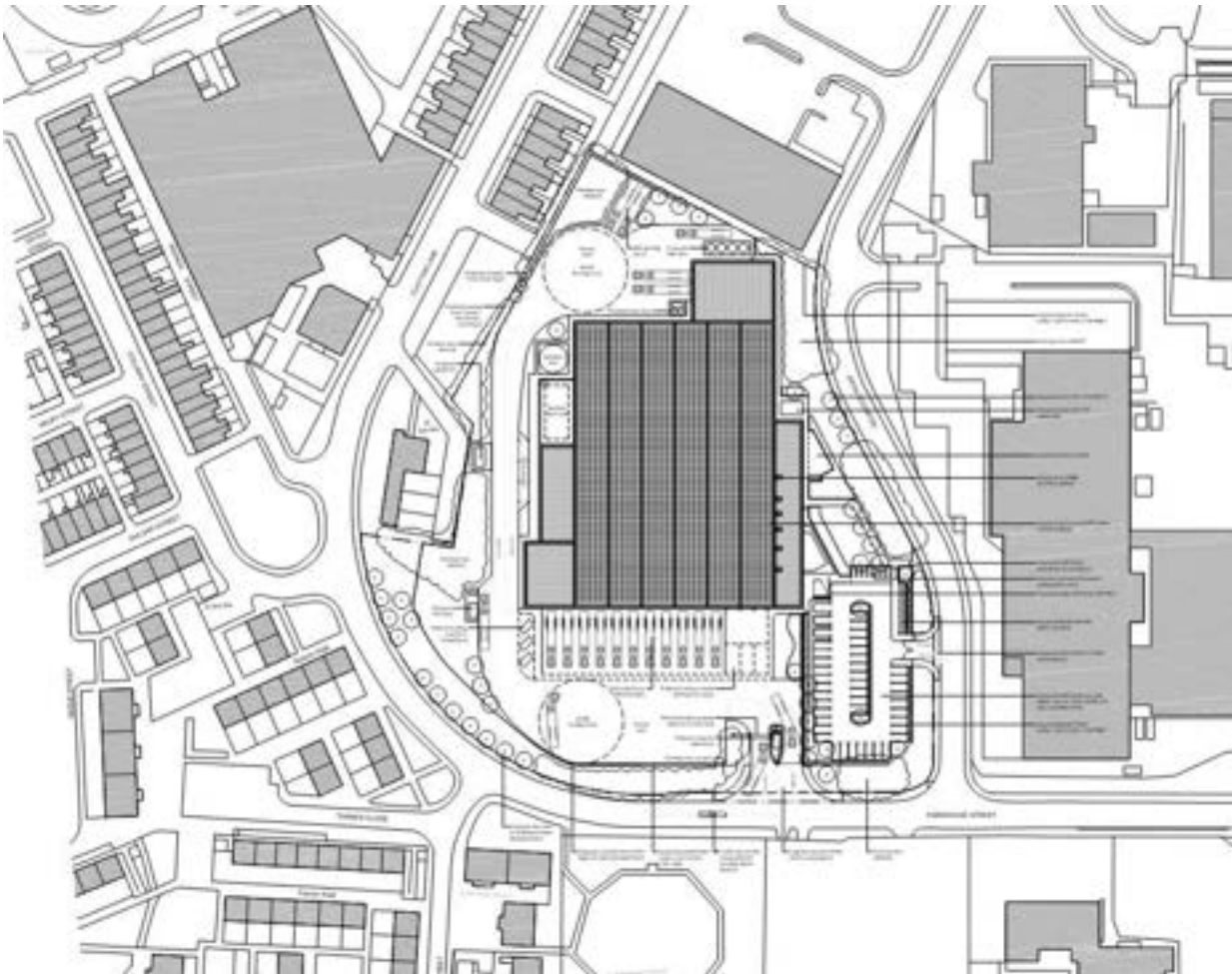


Figure 4.1 Proposed Preliminary Site Layout

- 4.3 An assessment of existing permeable/ impermeable areas is included in Figures 4.2 below and shown in **Appendix 3**. Existing/proposed site areas are summarised in Table 4.1 below.

Area	m ²	ha
Application Site Area Total	21,666	2.17
Existing Drained Impermeable areas	0	0.0
Proposed Impermeable Areas.	15,821	1.58
Percentage of (additional) Proposed Impermeable (PIMP) within application site	100%	

Table 4.1 Existing / proposed site areas.

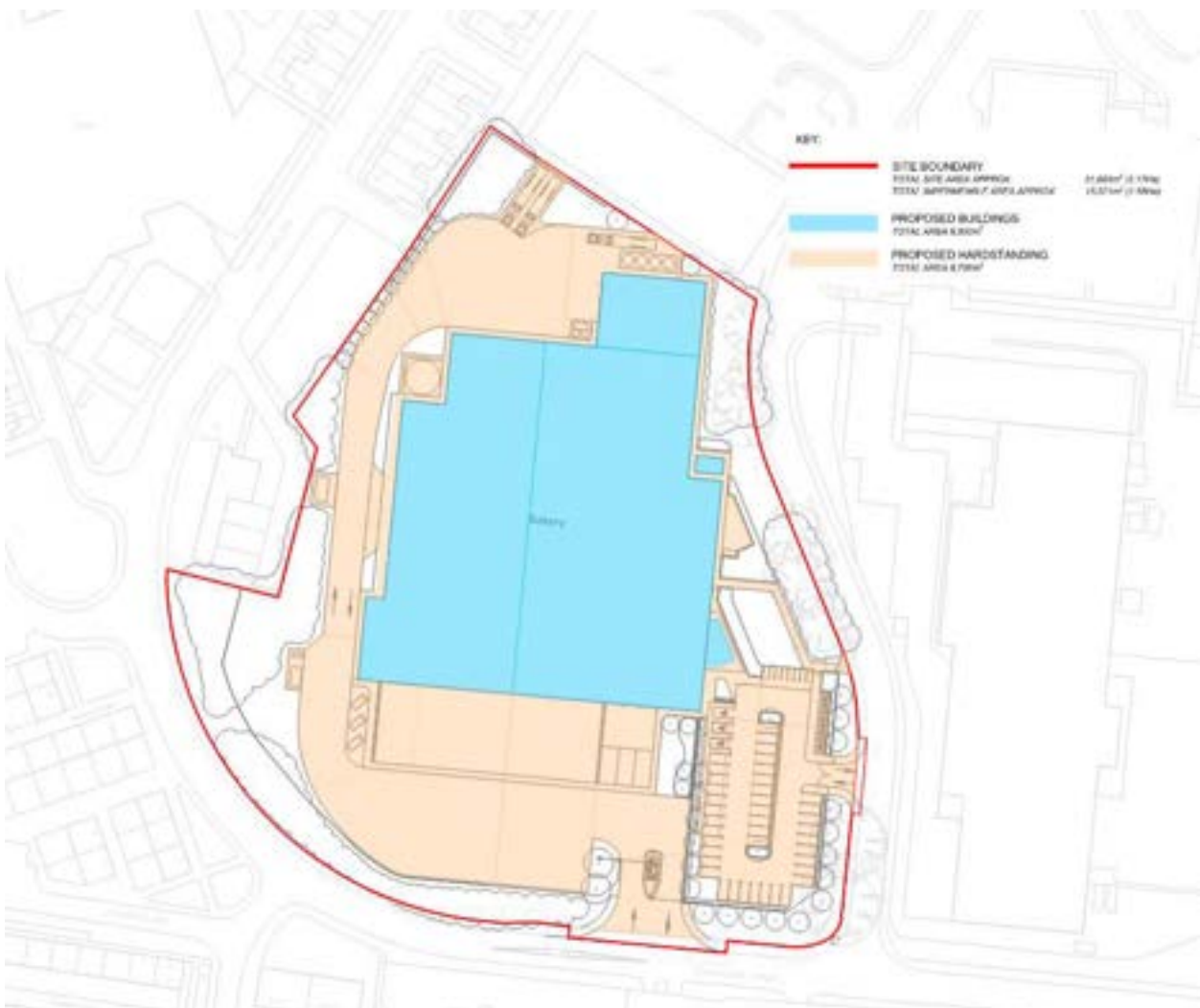


Figure 4.2 Proposed Impermeable Areas (to be drained).

- 4.4 Comparison of existing and proposed site areas presented in Table 4.2 and Figure 4.2 indicates an increase in impermeable areas post development.

Area	m ²	ha
Application Site Area Total	21,666	2.17
Existing Drained Impermeable areas	0	0.0
Percentage of Impermeable (PIMP) within application site	0%	
Total proposed impermeable areas.	15,821	1.58
Percentage of Impermeable (PIMP) within application site post-development	100%	
Increase in impermeable areas post development	15,821	1.58

Table 4.2 Proposed site areas.

5. CONSULTATION AND DATA REVIEW

Water Authority

- 5.1 A pre-planning consultation has been undertaken with the Water Authority, United Utilities. A response was received by email on 29/10/2024, reference **UU REF 06538060**, and is included in **Appendix 4** for reference.
- 5.2 The Water Authority advised foul flow from this site will be allowed to drain into the public 375dia or 450dia combined sewers running adjacent to the site.
- 5.3 They advised all surface water flow from the proposed development should drain in-line with the drainage hierarchy. They noted they would support the proposed surface water drainage strategy to drain to the culvert, and confirmed the requirement to discuss the diversion, connection points and flow rates with the riparian owner and local authority.
- 5.4 Further consultation will be acquired at planning, and the general principles will be followed from their standard guidance and consultation responses in due course.

Lead Local Flood Authority

- 5.5 A formal consultation has not been formally undertaken with the Lead Local Flood Authority for the area, Manchester City Council, at the time of writing this report.
- 5.6 Further consultation will be acquired at planning, and the general principles will be followed from their standard guidance and consultation responses in due course.
- 5.7 It is expected that a sustainable drainage system will need to be undertaken as part of a detailed drainage strategy.

Internal Drainage Board District

- 5.8 The Site is not located within an Internal Drainage Board (IDB) District.

6. EXISTING RUNOFF RATE

Existing Greenfield Runoff Rate

- 6.1 The existing site is considered fully developable, with an existing greenfield area assessed as 2.17ha, as shown in Table 5.2 above.
- 6.2 An assessment of the existing greenfield runoff rates has been undertaken using online HR Wallingford IH124 Methodology and the results are summarised in Table 7.1 below and the calculations are included within **Appendix 5**.
- 6.3 The assessment below includes rates for the full area of the existing site.

Return Period	Run-off Rates		
	Greenfield per 50 hectare (l/s/ha)	Greenfield per hectare (l/s/ha)	For total Developable area of Site (2.17ha)
1 in 1	281.80	5.64	12.2
Qbar	323.91	6.48	14.0
1 in 30	550.65	11.01	23.9
1 in 100	673.73	13.47	29.2

Table 6.1. Greenfield run off rate for a range of areas and return periods

Existing Greenfield Runoff Volume

- 6.4 An assessment of the existing greenfield runoff volume has been undertaken using Causeway Flow, and the results are summarised below in Figure 6.1.

Pre-development discharge

Site Makeup: Greenfield

Greenfield Method: FSR/FEH

Positively Drained Area (ha): 2.160

Soil Index: 4

SPR: 0.47

Catchment Wetness Index: 105.037

Return Period (years): 100

Climate Change (%): 0

Storm Duration (mins): 360

Betterment (%): 0

PR: 0.449

Runoff Volume (m³): 528

Calc

OK

Cancel

Note: FEH point descriptors can be downloaded from fehweb.cmh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor

ReFH2 – Contains the new BFIHOST19 descriptor

Figure 6.1 Pre-Development "Greenfield" run-off volume

Existing Brownfield Runoff Rate

- 6.5 The site is considered to be greenfield in terms of existing drainage systems and land use, therefore, no Pre-development (Brownfield) Runoff Volume has been calculated.

7. PROPOSED DRAINAGE RUN-OFF

Proposed Runoff Rate

- 7.1 As the site is considered to be fully greenfield and permeable, the proposed development will introduce additional impermeable/contributing areas.
- 7.2 It may therefore be necessary for surface water discharge from the site to be limited to the equivalent greenfield runoff rate.
- 7.3 The Regulatory Authorities will need to confirm the allowable discharge rates.
- 7.4 The National Standards for Sustainable Drainage systems (NSSDS 2011) and Non-Statutory Technical Standards for Sustainable Drainage (NSTSSD 2015) require that:
 - *For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield runoff rate for the same event. (S2 NSTSSD 2015).*
 - *‘For developments which were previously developed, the peak runoff rate from the development to any drain, sewer, or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event’. (S3 NSTSSD 2015).*
- 7.5 For this development, therefore, it is proposed that the drainage system should be designed with a proposed discharge rate as close as reasonably practicable to the existing Qbar greenfield runoff rate.
- 7.6 The existing greenfield rates are shown above within Table 6.1. On the assumption that the entire development is to be considered greenfield, this range of rates can be set as proposed discharge rates for the same rainfall events and are summarised below in Table 8.1.

Return Period	Run-off Rates
	For total Developable area of Site (2.16ha)
1 in 1	12.2
Qbar	14.0
1 in 30	23.9
1 in 100	29.2

Table 8.1. Greenfield run off rate for range of return periods

- 7.7 On the above basis, it is proposed that the proposed maximum discharge rate for the development be set at the existing QBar greenfield rate of **14l/s**.
- 7.8 The proposed development will introduce an additional 15,821m² of impermeable/contributing areas positively drained. This is based on Table 4.2 above, which, as stated, assumes all proposed buildings and all surfacing are impermeable. This is to ensure a robust analysis is undertaken, and is considered “worst case scenario”.

Proposed Runoff Volume

- 7.9 ‘Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same

event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.' (**S5 NSTSSD 2015**)

- 7.10 An assessment of the proposed storage volume required has been undertaken using Causeway Flow as a surface water storage estimate, both with and without an allowance for climate change, and the results are summarised below in Figure 7.1 and 7.2.

Storage Estimate	
Return Period (years)	100
Climate Change (%)	0
Impermeable Area (ha)	1.600
Peak Discharge (l/s)	14.000
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m ³)	Calc
from	475
to	669

Figure 7.1. Surface Water Storage Volume Estimate (no climate change)

Storage Estimate	
Return Period (years)	100
Climate Change (%)	45
Impermeable Area (ha)	1.600
Peak Discharge (l/s)	14.000
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m ³)	Calc
from	771
to	1064

Figure 7.2. Surface Water Storage Volume Estimate (including 45% climate change)

- 7.11 The assessment above suggests the proposed storage volume without an allowance for climate change would be between 475 m³ and 669 m³, giving an average value of 572m³.
- 7.12 The assessment above suggests the proposed storage volume would be between 771 m³ and 1064 m³, including an allowance of 45% for climate change, giving an average value of 918m³.
- 7.13 The comparison of greenfield, brownfield and proposed runoff volumes has been included within the table below.

	Application Site 21,589m ²
Proposed impermeable/contributing areas (m ²)	15,821
Existing Greenfield Runoff Volume (m ³)	528
Existing Brownfield Runoff Volume (m ³)	0
Total Existing Runoff Volume (m ³)	528
Proposed Runoff Volume from proposed impermeable areas (m ³) – not including Climate Change factor	572
Difference in Runoff volume post development (m ³)	Increase by 44
Proposed Runoff Volume including 45% Climate Change factor	918
Difference in Runoff Volume post development (m ³) including 45% Climate Change Factor	Increase by 390

TABLE 8.2. Greenfield, Brownfield and Proposed run-off volume - YR 100 (1% AEP) 6-hour rainfall event.

- 7.14 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body to brownfield runoff volume, S6 NSTSSD 2015 states that the runoff volume must be discharged at a rate that does not adversely affect flood risk.
- 7.15 The proposed discharge rate 14.0l/s. is considered meeting the above standard.

8. PROPOSED SURFACE WATER RUNOFF DESTINATION

- 8.1 According to National Standards for sustainable drainage systems Part II Section A – the following order of preference must be considered in respect of the Surface Water Runoff destination:

- Discharge into the ground,
- Discharge to surface water body,
- Discharge to a surface water sewer, drain,
- Discharge to a combined sewer,

- 8.2 Subject to complying with these National standards, different destinations may apply for different parts of the site.

Discharge into the ground - infiltration expectations

- 8.3 The proposed means of managing surface water runoff from the proposed development has been considered with respect to the hierarchy set out in Building Regulations Part H (2010) as follows.
- 8.4 Consideration of the proposed means of surface water drainage should firstly be given to infiltration techniques (to ground).
- 8.5 Infiltration rates are unconfirmed therefore the viability of proposing surface water disposal via infiltration is not known at this time. This will be investigated further to determine the suitability of infiltration systems.
- 8.6 On this basis, discharge into the ground is not yet confirmed as viable for the development, and alternative methods are considered below.

Discharge to surface water body.

- 8.7 The nearest watercourse is Clayton Brook, which is culverted through the site.
- 8.8 The culvert is recorded on the United Utilities sewer records as being 1200mm in diameter and shown to cross the site from the northeast to southwest. It is thought to run east – west across the site.
- 8.9 There are no other watercourses within the immediate vicinity of the Site.
- 8.10 On the above basis, discharge to the culverted surface water body crossing the site is recommended for the proposed development.
- 8.11 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out.

Discharge to Surface Water Sewer

- 8.12 As above, a proposed connection to the existing surface water culvert within the site is considered feasible, therefore, at this stage, a proposed connection to public sewer is not considered further at this time.

9. SuDS COMPONENTS

- 9.1 It is policy for all surface water systems for development sites to be designed using SuDS wherever possible.
- 9.2 Initial assessment of the SuDS techniques is summarised in Table 10.1 below.

TABLE: 10.1. Types of SuDS Components – Ciria SuDS Manual 2015.

Component Type	Description and Proposed Development Suitability	
Rainwater harvesting systems	Description	Rainwater is collected from the roof of a building or from other paved surfaces in an over ground or underground tank for use on site. Depending on its intended use, the system may include treatment elements. The system should include specific storage provision if it is to be used to manage runoff to a design standard.
	Suitability	Rainwater butts should be considered.
Green Roofs/ Blue Roofs	Description	A planted soil layer constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by the vegetation. Blue roofs store water at roof level, without the use of vegetation.
	Suitability	Not suitable due to the development layout.
Infiltration systems	Description	These systems collect and store runoff allowing it to infiltrate into the ground. Overlaying vegetation and underlaying unsaturated solid can offer protection to ground water from pollution risks.
	Suitability	Infiltration rates are unconfirmed therefore the viability of proposing surface water disposal via infiltration is not known at this time. This will be investigated further to determine the suitability of infiltration systems.

Filter Strips	Description	Runoff from impermeable area is allowed to flow across a grassed or otherwise planted area to promote sedimentation and filtration.
	Suitability	Shedding water to landscaped areas will be encouraged where site layout and external levels permit.
Filter drains	Description	Runoff is temporarily stored below the surface in a shallow trench filled with stone/gravel, providing attenuation, conveyance and treatment (via filtration).
	Suitability	Not suitable due to the development layout and soil infiltration properties.
Swales	Description	A vegetation channel is used to convey and treat runoff via shallow naturally landscaped channels that convey and/or infiltrate the runoff (via infiltration). These can be 'wet', where water is designed to remain permanently at the base of the swale, or 'dry' where water is only present in the channel after rainfall events. It can be lines, or unlined to allow infiltration.
	Suitability	Not suitable due to the development layout.
Bioretention systems	Description	A shallow landscaped depression allows runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils prior to collection or infiltration. In its simplest form it is often referred to as a rain garden. Engineered soils (gravel and sand layers) and enhanced vegetation can be used to improve treatment performance.
	Suitability	Small rain gardens could be incorporated within landscaping. Proprietary systems suggested below.
Trees	Description	Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone features within soil-filled tree pits, tree planters or structural soils, collection and storing runoff and providing treatment (via infiltration and phytoremediation).
	Suitability	Existing trees will be retained where possible. See ecologist report for details.
Pervious Pavements	Description	Runoff is allowed to soak through structural paving. This can be paving blocks with gaps between solid blocks, or porous paving where water filters through the block itself. Water can be stored in the sub-base and potentially allowed to infiltrate into the ground.
	Suitability	The vehicle parking areas have potential for pervious/porous pavement systems, as shown on the attached Proposed Drainage Plan.
Attenuation storage tanks	Description	Below ground voided spaces can be used to temporarily store runoff before infiltration, controlled release or use. The storage structure is often constructed using geocellular or other modular storage systems, concrete tanks or oversized pipes.
	Suitability	Attenuation storage tanks could be utilised as part of the drainage proposal via Proprietary systems suggested below. See attached Proposed Drainage Plan.
Detention Basin	Description	During a rainfall event, runoff drains to a landscaped depression with an outlet that restricts flows, so that the basin fills and provides attenuation. Generally, basins are dry, except during and immediately following the rainfall events. If vegetated, runoff will be treated as it is conveyed and filtered across the base of the basin. Naturally, vegetated depressions designed to store runoff temporarily.
	Suitability	Not suitable for the Proposed Development Layout.

Ponds and wetlands	Description	Features with a permanent pool of water can be used to provide attenuation and treatment of runoff, where outflows are controlled, and water levels are allowed to increase following rainfall. They can support emergent and submerged vegetation along their shoreline and in shallow. Marshy zones, which enhance treatment processes and biodiversity.
	Suitability	Small ponds are not proposed on this development.

9.3 It is proposed to adopt appropriate SuDS throughout the new development wherever possible, with specific target areas being:

- Source Control SuDS techniques, such as rain gardens with broad leaves high water interception species. Permeable surfaces with overflow to next stage of drainage system will be encouraged where possible.
- Site - control - reduction in peak flows to outfall, thereby not increasing flood risk downstream of connection.
- Improvement of water quality arriving at outfall (passive removal of pollutants), thereby reducing potential for pollution downstream of the connection point.

9.4 Based on the assessment of the hierarchy of discharge, the proposed site layout and topography, the following SuDS elements have been included within the proposed surface water management on site:

- **Surface Water Storage and Attenuation: Geocellular Attenuation System**
- **Proprietary Treatment System: GreenBlue HydroPlanter System**

9.5 Indicative information of the HydroPlanter system is shown below:



Figure 10.1 Proposed GreenBlue HydroPlanter System (Source: GreenBlue)



Figure 10.2 Proposed GreenBlue HydroPlanter System (Source: GreenBlue)

10. CLIMATE CHANGE ALLOWANCE

- 10.1 It is anticipated that climate change will bring an increase in rainfall intensity in the future and therefore an allowance for climate change should be included to help minimise vulnerability and provide resilience to flooding and coastal change in the future. Both the 'central' and 'upper end' allowance should be assessed to understand the range of impact.
- 10.2 The 'Central' allowance should be applied to the surface water drainage network/design to assess its performance and ability to contain critical events. The 'Upper End' allowance should be applied to assess the potential flood risk implications to the site and to ensure that flooding is wholly contained onsite.
- 10.3 New Environment Agency guidance "Flood risk assessments: climate change allowances" issued in August 2022 provides up to date information on expected changes in rainfall, river flows and sea level rise as a consequence of climate change based on a 1981-2000 baseline.
- 10.4 The Environment Agency Guidance in Figure 11.1 and Table 11.1 show a summary of the anticipated changes in extreme rainfall intensity within in the Irwell Management Catchment.

Table 11.1 Peak rainfall intensity allowance in small and urban catchments.

Applies across all of England	Total potential change anticipated for the 2050s (2040-2069)	Potential Change anticipated for the 2080s (2070 – 2115)
Upper End	+40%	+45%
Central	+25%	+30%

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

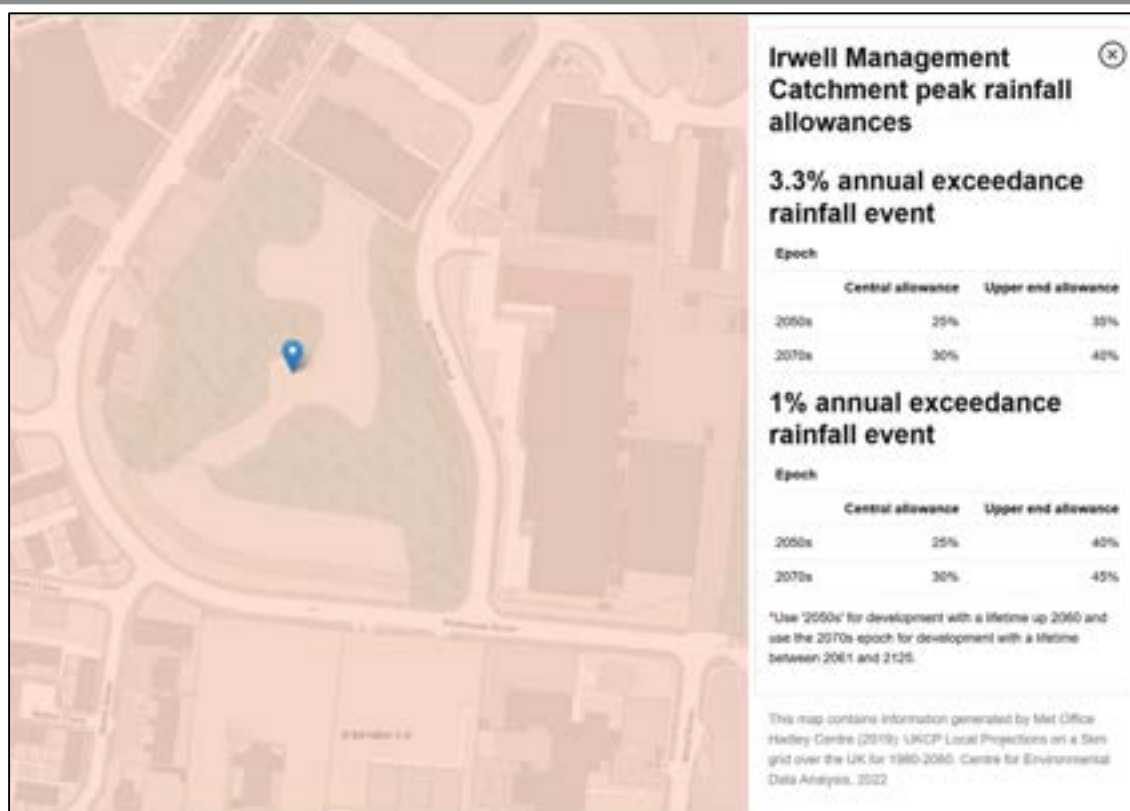


Figure 11.1 Peak rainfall intensity allowance in small and urban catchments

- 10.5 The National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (NPPG) states that the residential development should be considered for a minimum of 100 years, but that the lifetime for a nonresidential development depends on the characteristics of the development.
- 10.6 Drainage design methods limiting surface water disposal flows should incorporate rainfall intensities that have been increased by 45% to take account of the effects of climate change until the year 2115.
- 10.7 It is recommended that for the proposed development the drainage is designed to make sure there is no increase in the rate of runoff discharge from the site for the upper end allowance of 45% CC (Climate Change).

11. SURFACE WATER DRAINAGE STRATEGY

- 11.1 A preliminary drainage strategy has been undertaken to establish principles of the design for foul and surface water drainage for the proposed development.
- 11.2 All drained areas will be designed to meet the Statutory Requirements as follows:
 - Source Control SuDS techniques such as rain gardens planted with broad-leaved shrubs/plants with high rainfall interception and water demand allowing interception of surface water runoff from adjoining surfaces.
 - Site control - All SuDS features will be designed for the critical 100-year (1%) rainfall event with an allowance for climate change and therefore there will be no risk of uncontrolled flooding on site for all rainfall events up to 100-year return with 45% climate change.

- All exceedance flows beyond those for which the drainage system is designed will be directed thought the site, as such that there will be no risk of flooding of vulnerable or critical areas.
- 11.3 Via proprietary systems, permeable surfaced SuDS features will be encouraged throughout the development to provide interception and pollution removal, storage and disposal via partial infiltration at source with overflow from the sub-base storage layer to next element of drainage system i.e. attenuation structures.
- 11.4 All recommendations will be investigated/developed further during the detailed design stage.
- 11.5 The Phase 2 Geo-Environmental Investigation advises that the presence of substantial depths of Made Ground across the site may result in settlement and recommends that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement. This will need to be considered further at detailed design stage.
- 11.6 Current drainage strategy includes:
 - GreenBlue HydroPlanter system, a modular bioretential rain garden system.
 - Geocellular Attenuation Tank
- 11.7 All recommendations will be investigated/developed further during the detailed design stage and are subject to amendment.

Surface Water Network

- 11.8 All surface water runoff arising from the proposed building, parking, service yard, access road, ponds and any other impermeable areas (approximate contributing area of 15,821sqm) will be directed by underground gravity pipes to attenuation storage structures. Proprietary treatment systems are proposed to satisfy the SuDS requirements of the system.
- 11.9 Discharge from attenuation structures will be via flow control devices set to the agreed discharge rate to the proposed discharge location.
- 11.10 See attached Outline Drainage Strategy plan in **Appendix 6**.
- 11.11 See attached hydraulic surface water calculations in **Appendix 7**.
- 11.12 Proposed systems to be installed in strict accordance with manufacturers' design and instructions. Systems to include maintenance access features / ventilation pipes as required.
- 11.13 In order to accommodate the 1 in 100 year plus 45% climate change event, based on the proposed discharge rate, approximately 918m³ of storage would be required.
- 11.14 It is proposed that the majority of the attenuation will be provided within a geocellular attenuation tank system with isolator row.
- 11.15 The configuration, depths and layout of the attenuation features will need to be calculated in more detail when the existing and proposed details are clarified further.

12. FOUL WATER DRAINAGE STRATEGY

Foul Water Network

- 12.1 The foul water records noted above indicate that there are combined public sewers within the highways to the west and south of the site. United Utilities has advised that foul flow from this site will be allowed to drain into the public 375dia or 450dia combined sewers running adjacent to the site.

- 12.2 Foul Water flows associated with the proposed development will therefore be directed into the existing public combined drainage network. See attached Outline Drainage Strategy plan in **Appendix 6**.
- 12.3 Therefore, a connection into the existing public drainage system is recommended as the point of discharge for Foul Water from the site.
- 12.4 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out.
- 12.5 Any proposed private foul drainage will be designed in accordance with Building Regulations Document H1.
- 12.6 Any connections are to be approved by United Utilities prior to any works being undertaken on the existing network.

13. DESIGN FOR EXCEEDANCE

- 13.1 The drainage system will be designed so that, unless an area is designed to hold/or convey water as part of the design, flooding does not occur on any part of the site for 1 in 100-year rainfall event plus 45% climate change.
- 13.2 The design has considered flows resulting from rainfall in excess of the 1 in 100-year rainfall event plus 45% climate change and site surfaces will be modelled so that flood flows generated on site from events beyond the stipulated drainage design criteria will be directed away from vulnerable areas and contained on site where possible.
- 13.3 Following measures have been considered:
- Slope of footpaths/driveways to direct surface water away from buildings where possible,
 - Raised and dropped kerb details to direct flow,
 - Raised door threshold, dpc height 150mm around the proposed buildings

14. WATER QUALITY

- 14.1 Runoff quality from various land use is classed as Very Low, Low, Medium, and High Hazard depending on its source.
- 14.2 Pollution hazard from non-residential car parking is classed as **low**. Removal of gross solids and sediments is required. Silt chambers to be installed upstream of attenuation tanks.
- 14.3 Pollution hazard from commercial yard and delivery yards, low traffic roads, (e.g. general access road) is classed as **medium** and simple index approach will be used to deliver adequate treatment.

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
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, roofs (excluding residential) , residential car parks, low traffic roads, (e.g. cul de sacs, home zones, general access road), non-residential	Low	0.5	0.4	0.4

Commercial yard and delivery yard, 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
--	--------	-----	-----	-----

Table 15.1. Minimum water quality management requirements for discharge to receiving surface waters and groundwater – Extract from Ciria SuDS Manual 2015 Table 26.2

- 14.4 Bespoke products are proposed to be incorporated as part of the drainage network, to provide a suitable system configuration to accommodate the required on-site storage to attenuate the calculated runoff and manage the treatment train to provide appropriate pollution mitigation.
- 14.5 Where run off cannot be intercepted by treatment SuDS, other forms of treatment such as petrol interceptors will be used to ensure water quality is managed appropriately.

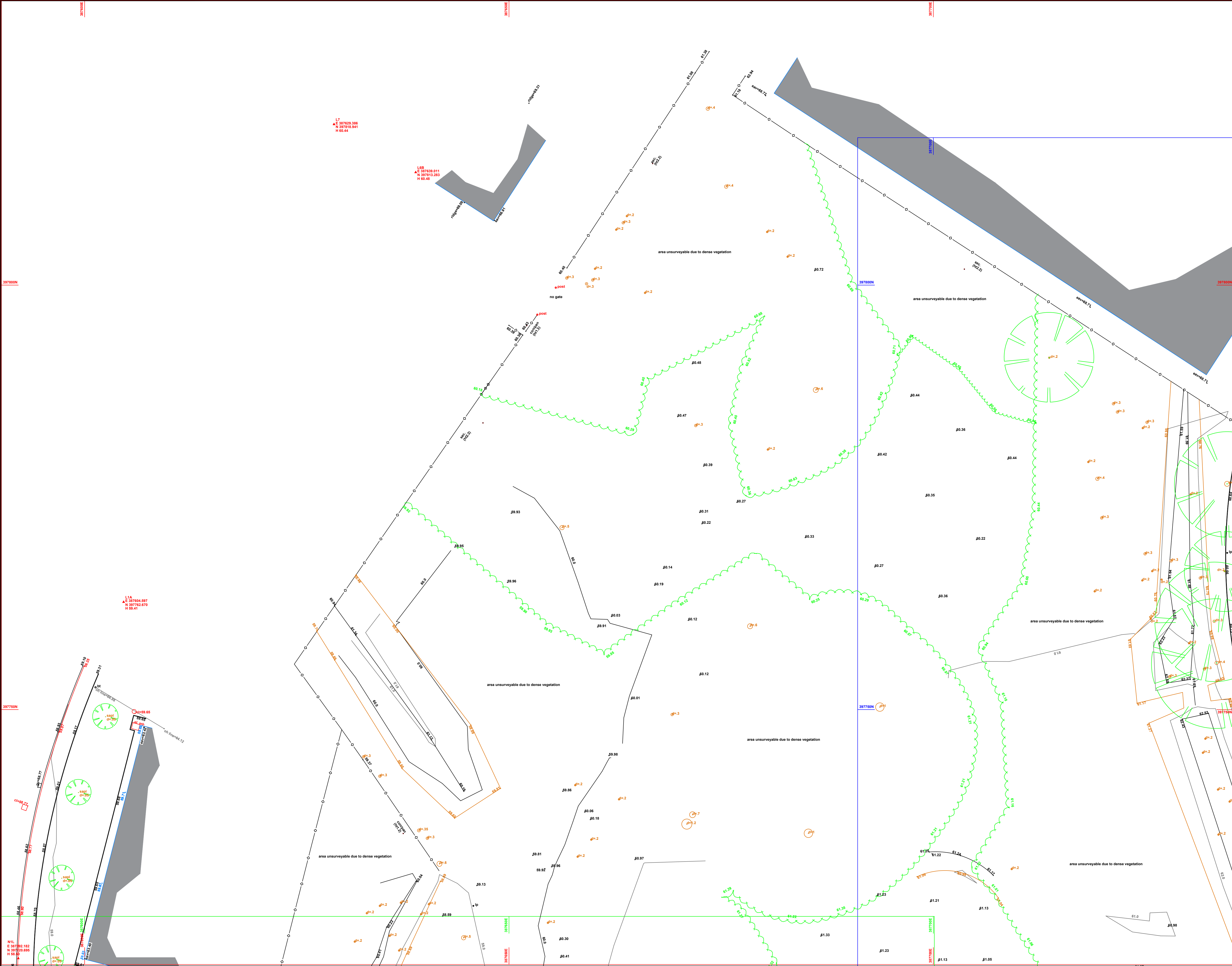
The Proposed SuDS Components -

- 14.6 Pollution Mitigation Indices for Proprietary Treatment System: GreenBlue HydroPlanter System / TreePits
- Pollution Mitigation Index - Suspended Solids TSS = 0.8
 - Pollution Mitigation Index - Metals = 0.8
 - Pollution Mitigation Index - Hydrocarbons = 0.8
- 14.7 Following assessment of the pollution indices for the development (**Low** and **Medium**) Hazard and the pollution mitigation indices for the proposed SuDS Components, it is considered that the total mitigation level of proposed SuDS components exceeds the development pollution risk and therefore comply with the Water Framework Directives.
- 14.8 Additional Silt trap units or silt filters can be specified for surface water inspection chambers throughout the system to minimize silt accumulation in the proposed drainage network.
- 14.9 Manufacturer of Proprietary Treatment Systems noted above to confirm whether additional oil interceptors need to be incorporated into the proposed system to assist intercepting suspended solids, metals and hydrocarbons.
- 14.10 Channel drains and road gullies can also be specified with silt sump units.

15. EXECUTIVE SUMMARY

- 15.1 The site development lies within Flood Zone 1, there is no requirement to satisfy either the Sequential Test or the Exception Test.
- 15.2 A surface water drainage strategy has been prepared for the site providing interception, attenuation, and controlled disposal for all rainfall events up to and including the 100-year critical rainfall event with an increase of 45% to allow for increases in rainfall intensities due to climate change.
- 15.3 Infiltration testing needs to be carried out to confirm the viability of discharging to the ground via soakaways.
- 15.4 It is proposed in accordance with the drainage hierarchy that surface water runoff will be directed into the existing culverted watercourse that passes through the site as the point of discharge for Surface Water from the site.
- 15.5 The existing culverted watercourse currently sits within the proposed building footprint. Therefore the watercourse will need to be diverted to mitigate the potential for it to be damaged during construction works and to allow for easier maintenance access.
- 15.6 All surface water runoff arising from the existing building extension, parking, service yard and access road (approximate contributing area of 15,821 m sq.) will be directed by underground gravity pipes to attenuation storage structures.
- 15.7 Discharge from attenuation structures will be via flow control devices set to the agreed discharge rate to the proposed discharge location.
- 15.8 Drainage design considers flows resulting from rainfall in excess of the 1 in 100-year rainfall event plus 45% climate change. Site surfaces should be modelled so that flood flows generated on site from events beyond the stipulated drainage design criteria will flow away from buildings and other sensitive areas and will be contained on site as reasonably practicable.
- 15.9 Connection into the existing combined sewers neighboring the site is recommended as the point of discharge for Foul Water from the site.
- 15.10 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out for both foul and surface water.
- 15.11 All SuDS on site will be installed with full consideration for long term maintenance.
- 15.12 Any proposed on-site drainage will be designed and constructed in accordance with current best practice, Lead Local Flood Authority and Regulatory Authority requirements and Building Regulations as appropriate.

APPENDIX 1 – TOPOGRAPHICAL SURVEY



GRID
To local grid based on oad15/04gn15

control point
spot level
#0.11

All linework described by layering system or nearby text

wall (see text for height / width / type)

fence (see text nearby for height / type)

gate

hedge scaled to width

Canopy/Vegetation line

deciduous tree
defined by trunk & one point on canopy
(girth size and position +/- 50mm)

conifer tree
defined by trunk & one point on canopy
(girth size and position +/- 50mm)

GENERAL ABBREVIATIONS
ac box - air conditioning box
av - air valve
bp - bath/sha beacon
bt - British Telecom
conc - concrete
conc. boll - concrete bollard
conc. wall - concrete wall
cvt - cable TV
dk - drop kerb
ds - down spout
dsg - down spout with gully
earth - earth point
edg cut grass - edge cut grass
el - electric
el sub st - elec. substation
face conc - face of concrete
face clad - face of cladding
face tim - face of timber
Fingr - fire hydrant
guy - guy ropelift
lp - lamp post
rod. eye - rodding eye
ret. wall - retaining wall
rg - steel rg
salf - salt box
sl - sign - with indicative text
sur. drain - surface drain
sl tap - stop tap
sv - sluice valve
tel - tele
ts - traffic signal
utility - utility (unknown)

LEVEL ABBREVIATIONS
ch#0.11 - cover level
dpo#0.11 - dip level
eav#0.11 eaves level
ff#0.11 finished floor level
gun#0.11 - gully top level
gu#0.11 - gutter level
hip#0.11 - hip level
inv#0.11 - invert level
ch#0.11 - overhead level
ramp#0.11 - ramp level
rhd#0.11 - ridge level
silt #0.11 - silt level
sll#0.11 - all level
top conc#0.11 - top of concrete
tp#0.11 dia 10 - top of pipe
Lsl#0.11 - top of sleep
tw#0.11 - top of wall
w#0.11 - water level

FENCE ABBREVIATIONS
b/w - barbed wire
c/l - chain link
c/b - close boarded
c/r - corrugated iron
conban - concrete panel
cra - crash barrier
h/r - hand rail
ip - iron rail
pal - palisade
panel - panel
p/b - public barrier
pick - picket
p/r - post & rail
p/w - post & wire
sec - security fence
wood - wooden fence

FLOOR PLAN ABBREVIATIONS
ff - finished floor level
FD - floor to cill
CH - cill to head
CH - ceiling height
LP - low point
HP - high point
BH - Beam height
DH - Door height
SKY - skylight
A/H - access hatch

Disclaimer
Only manholes that were accessible on site during survey other manholes may be present but covered
all level levels taken where possible at main channel
Man Entry to sewers has not been undertaken. Depths, Pipesizes etc are measured from the ground. All sewers and inverts to be checked prior to any works commencing on site. The CAD Room Ltd are not responsible for manholes, services, information not surveyed which may have an impact on site development.
Boundaries shown are physical and may not represent legally conveyed

Location Plan
Sheet 1 of 4

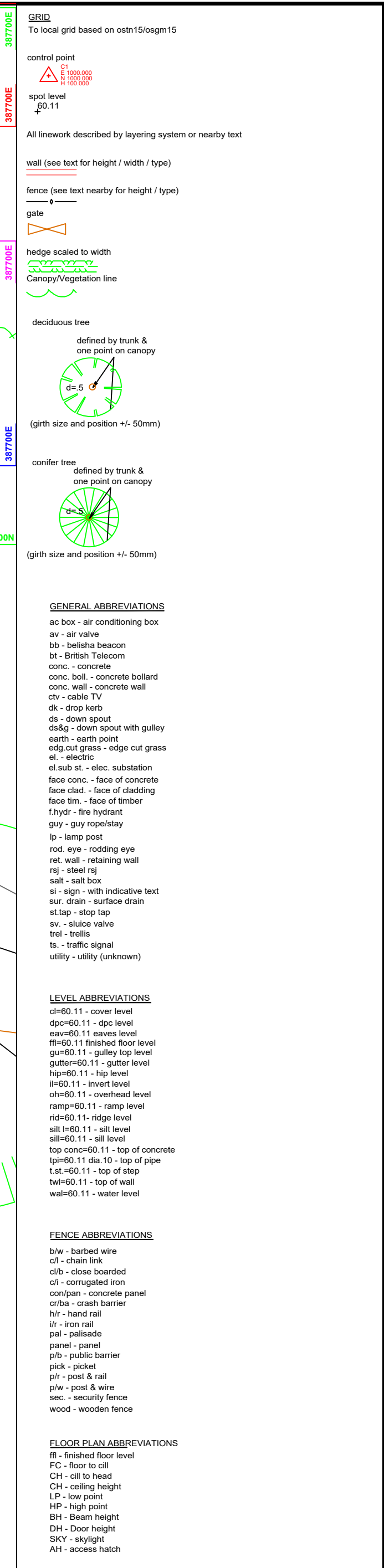
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Bredbury
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E: www.thecadroom.com

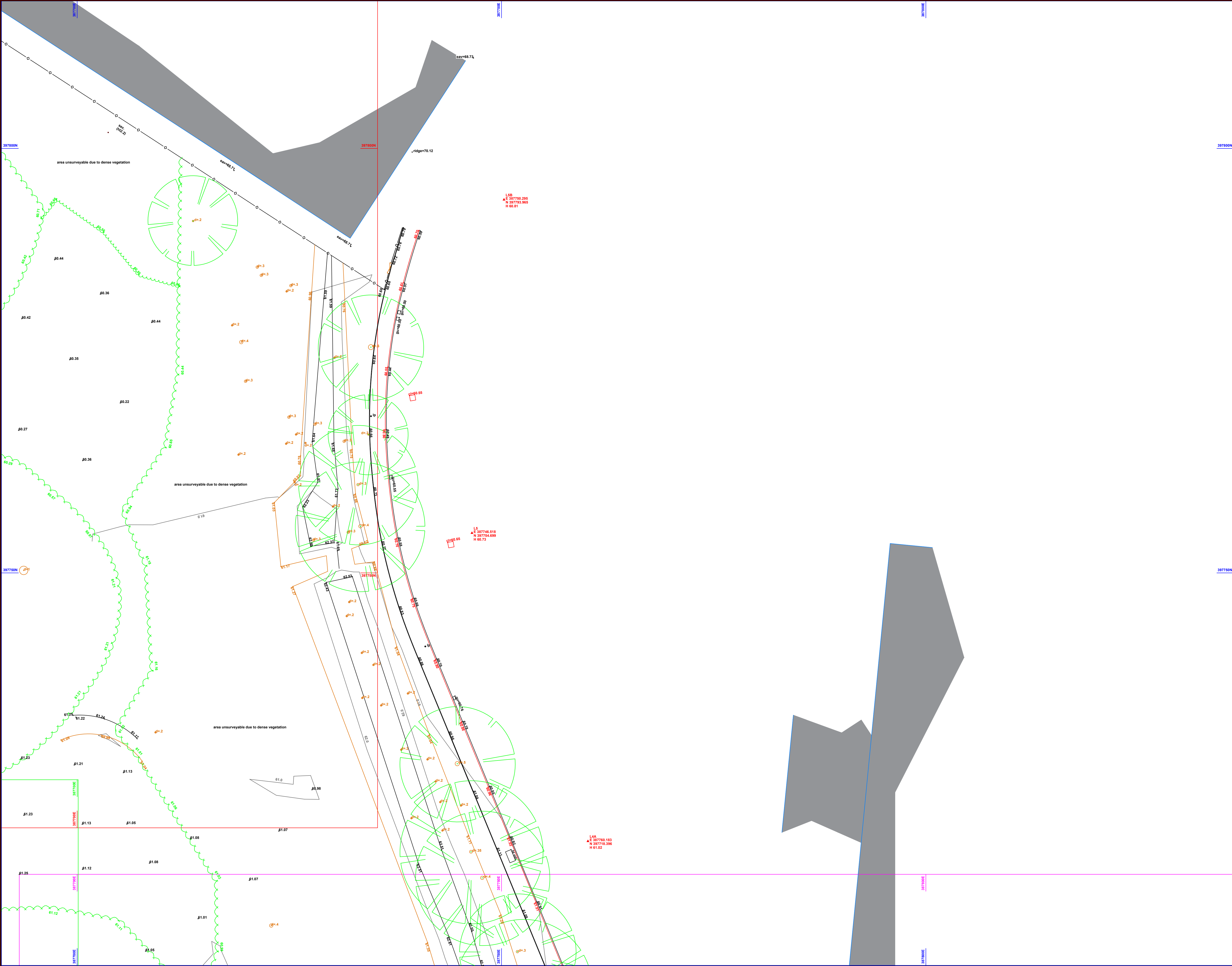
Client:
Sheldons Bakery

Location:
Kilbrook Road Openshaw

Comments:
Detail and levels surveyed where possible in dense vegetation some may be missing

Drawing Number: 01-S-1038-Kilbrook Road Openshaw
Date: 10.03.2021
Scale: 1:250 @ A1
Drawn By: LK
Checked By: CG





GRID
To local grid based on osn150sgrn15

control point

60.11

spot level
60.11

All linework described by layering system or nearby text

wall (see text for height / width / type)

fence (see text nearby for height / type)

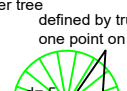
gate


hedge scaled to width

Canopy/Vegetation line


deciduous tree
defined by trunk & one point on canopy

(girth size and position +/- 50mm)

conifer tree
defined by trunk & one point on canopy

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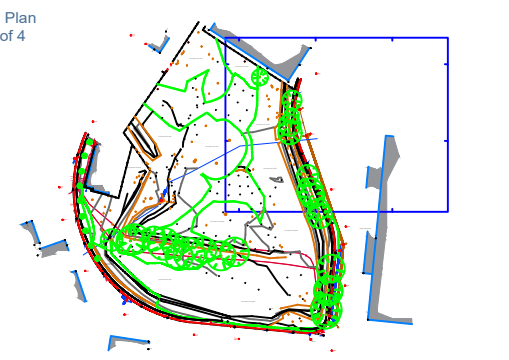
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el sub st. - elec. substation
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guy - guy ropelink
lp - lamp post
rod. eye - rodding eye
ret. wall - retaining wall
ret. steel ret.
saft - saft box
si - sign - with indicative text
sur. drain - surface drain
sl lap - slip lap
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trai - trails
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utility - utility (unknown)

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bw - barbed wire
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cub - close boarded
cl - corrugated iron
conpan - concrete panel
crba - crash barrier
hr - hand rail
ir - iron rail
pal - palisade
panel - panel
pb - public barrier
pick - picket
pi - post & rail
pwr - post & wire
sec - security fence
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Location Plan
Sheet 3 of 4


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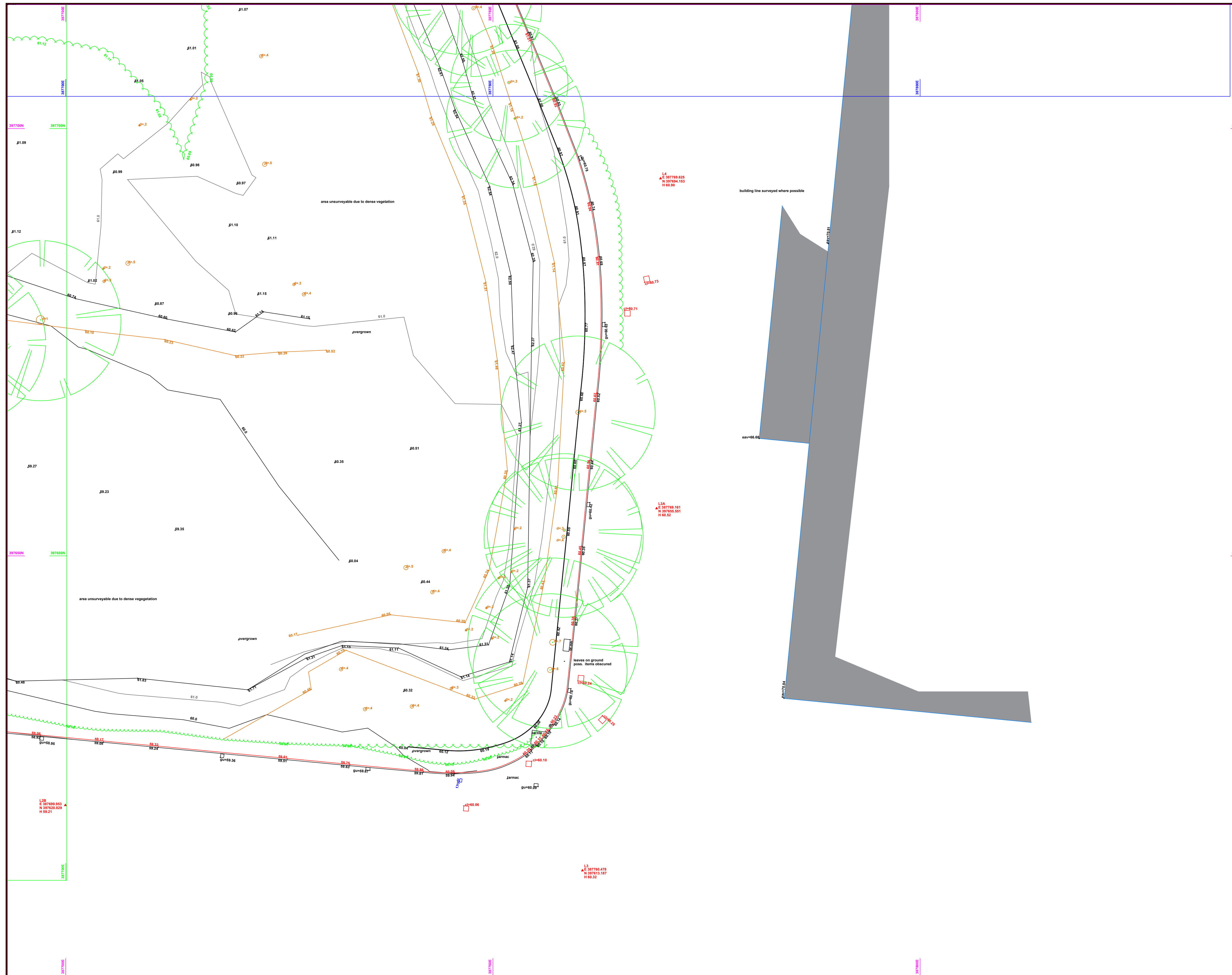
Client:
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Location:
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Comments:
Detail and levels surveyed where possible in dense vegetation some may be missing

Drawing Number: 01-S-1038-Kilbrook Road Openshaw
Date: 10.03.2021
Drawn By: UK

Revision: A
Scale: 1:250 @ A1
Checked By: CG



GRID
To local grid based on ostm15/osgm15

control point

spot level
60,11

all linework described by layering system or nearby text

ball (see text for height / width / type)

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tr - traffic signal
util - utility (unknown)

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ramp=60.11 - ramp level
rid=60.11 - ridge level
silt l=60.11 - silt level
sill=60.11 - sill level
top conc=60.11 - top of concrete
tpi=60.11 dia.10 - top of pipe
t.st.=60.11 - top of step
tw=60.11 - top of wall
wal=60.11 - water level
```

FENCE ABBREVIATIONS

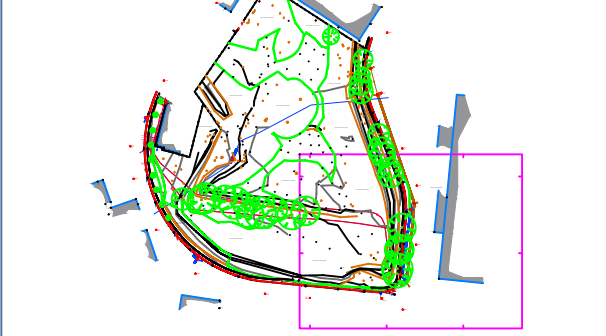
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Location Plan
Sheet 4 of 4

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Seldons Bakery

ation:
Weekly Read C

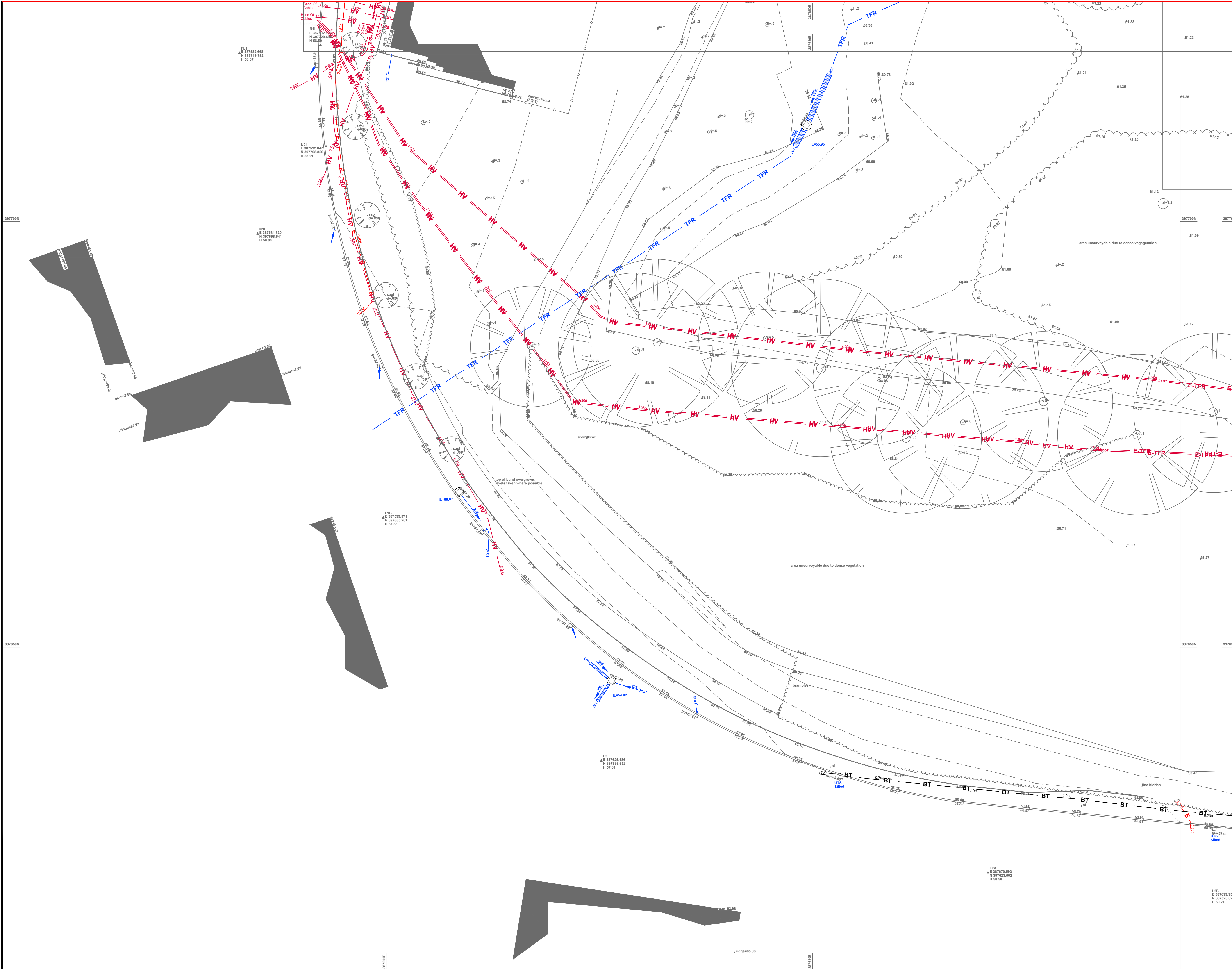
Comments:

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Drawing Number: 01-S-1038-Kellbrook Road Openshaw Revision: A

Date:	09.03.2021	Scale:	1:200 @ A
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Drawn By:	LK	Checked By:	CC
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General Notes

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ABBREVIATIONS

AR	assumed route	MH	manhole
BD	base bend	PR	pipe riser
BD	backdrop	RE	rodding eye
CP	cable pit	RVP	rainwater pipe
CL	cover level	SV	stop valve
CR	cable riser	SVP	soil vent pipe
DP	down pipe	TE	trapped exit
EOT	end of trace	TFR	telegraph pole
EP	electricity pole	UTL	unable to find
FH	fire hydrant	UTS	unable to survey
G	gully	UTL	unable to lift
GV	gas valve	UTS	unable to survey
HOR	head of run	UTL	unable to trace
HL	high level	VP	vent pipe
IC	inspection chamber	WL	water level
IL	invert level	WM	water meter
		WO	wash out valve

LEGEND

Four/Combined water drain	→
Four/Combined drain 3000 and above	→
Surface water drain	→
Surface water drain 3000 and above	→
End of trace	EOT
Electric cables	E
HV cables	HV
Gas	GAS
Water	W
Telephone	BT
Catv	CATV
CCTV	CCTV
Comms	COM
Fibre Optics	FO
Pipe	PIPE
Vents	V
Frail	F
Offsets	O
Vapour Recovery	VR
Gauge Lines	G
Unidentified GPR	U-GPR
Unidentified EML	U-EML
Taken From Records	E-TFR
Assumed Routes	GAS-AR
Empty Ducts	ED
Earth Rod	ER
Rising Main	RM
Overhead	OH
Heating Pipes	HP
Traffic Signals	TS

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus:

Location Plan Sheet 2 of 4

Unit 1 Arden Business Centre
Horsfield Way
Bredbury Ind. Estate
Bredbury
S16 2SU
T: 0161 427 0348
E: www.thecadroom.com

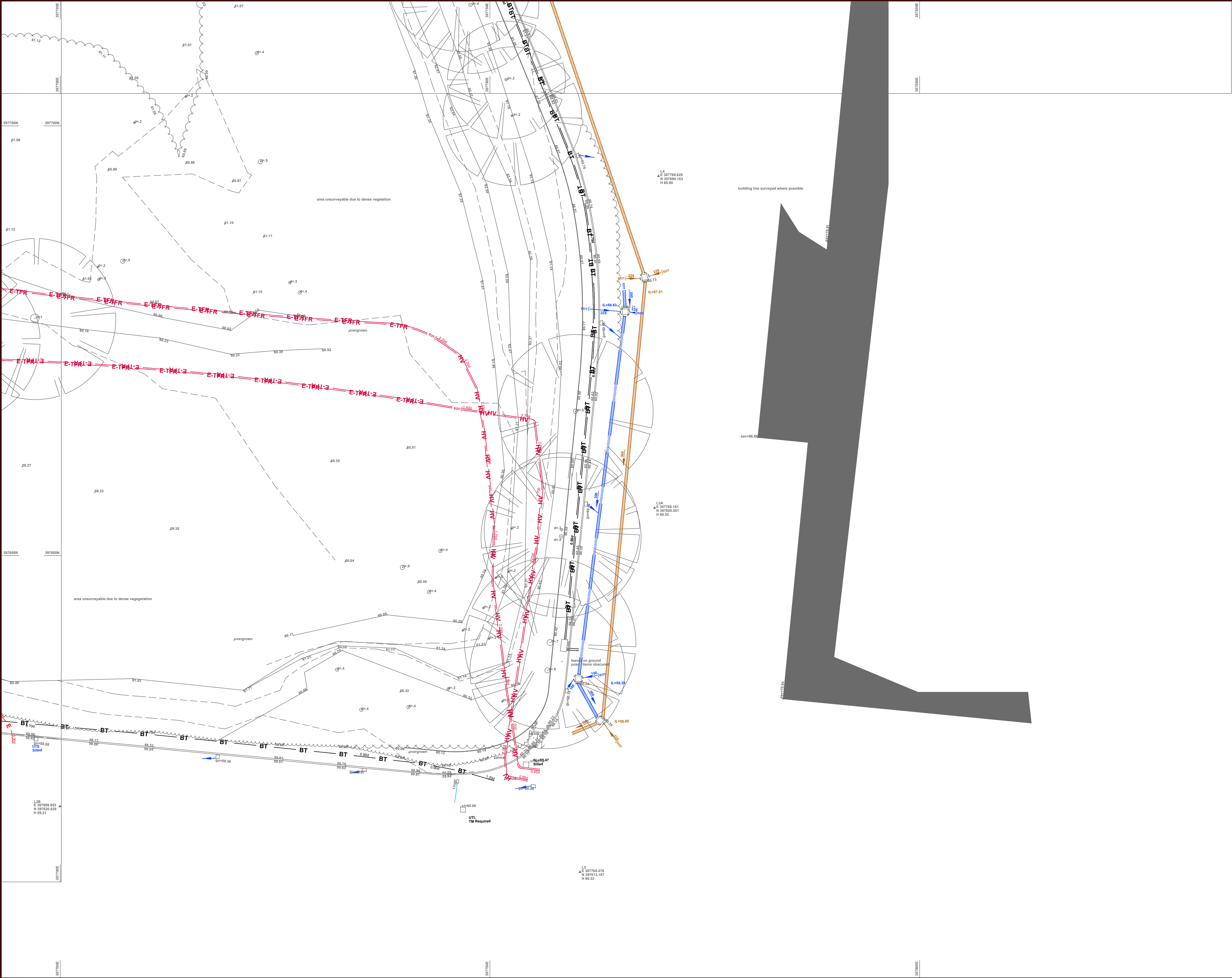
Client:
Sheldons Bakery

Location:
Kilbrook Road Openhaw

Comments:
Detail and levels surveyed where possible in dense vegetation some may be missing

Drawing Number: 01-S-1038-Kilbrook Road Openhaw
Date: 19.03.2021
Scale: 1:200 @ A1
Drawn By: LK
Checked By: CG

Revision: A



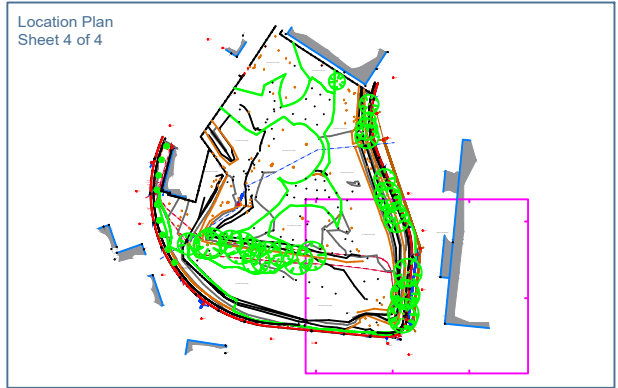
General Notes

Disclaimer

ABBREVIATIONS

LEGEND

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus:

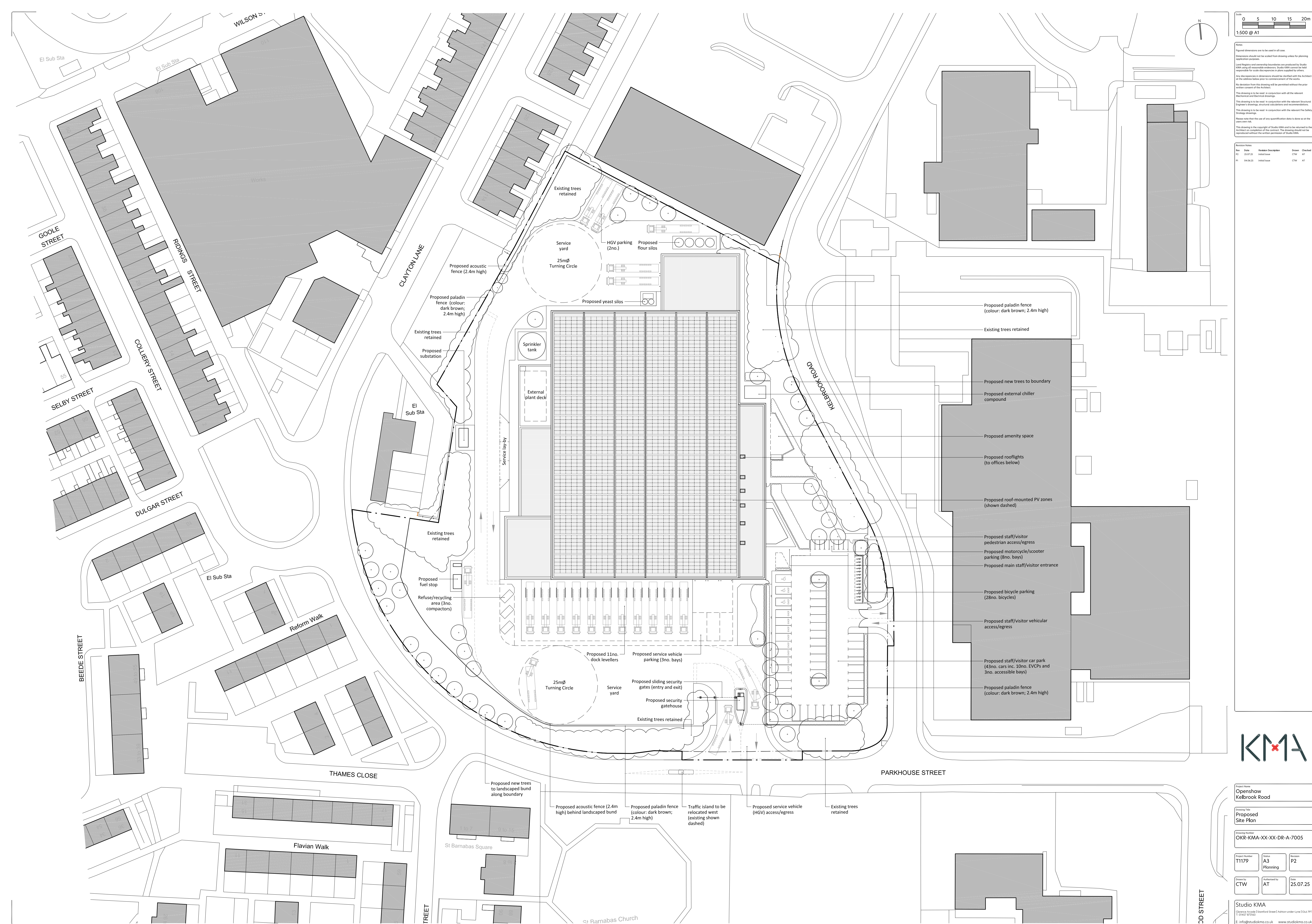


THE CAD ROOM

Unit 1 Arden Business Centre
Horsfield Way
Bredbury Ind. Estate
Bredbury
S16 2SU
T: 0161 427 0348
E: www.thecadroom.com

Client: Sheldons Bakery	
Location: Kilbrook Road Openshaw	
Comments: Detail and levels surveyed where possible in dense vegetation some may be missing	
Drawing Number: 01-S-1038-Kilbrook Road Openshaw	
Date: 19.03.2021	Scale: 1:200 @ A1
Drawn By: LK	Checked By: CG

APPENDIX 2 – PROPOSED SITE PLAN



Scale

0 5 10 15 20m

1:500 @ A1

Notes

Figured dimensions are to be used in all cases.

Dimensions should not be used from drawing unless for planning application purposes.

Land Register and ownership boundaries are provided by Studio KMA using all reasonable endeavours. Studio KMA cannot be held responsible for title discrepancies in plans supplied by others.

Any discrepancies in dimensions should be clarified with the Architect at the address below prior to commencement of the works.

No deviation from this drawing will be permitted without the prior written consent of the Architect.

This drawing is to be used in conjunction with all the relevant Mechanical and Electrical drawings.

This drawing is to be used in conjunction with the relevant Structural Engineer's drawings, structural calculations and recommendations.

This drawing is to be used in conjunction with the relevant Fire Safety Strategy drawings.

Please note that the use of any quantification data is done so at the client's own risk.

This drawing is the copyright of Studio KMA and is to be returned to the Architect on completion of the contract. The drawing should not be reproduced without the written permission of Studio KMA.

Revision Notes

Rev	Date	Revision Description	Drawn	Checked
P2	25.07.25	Initial issue	CTW	AT
P1	04.06.25	Initial issue	CTW	AT

Project Name

Openshaw
Kelbrook Road

Drawing Title

Proposed
Site Plan

Drawing Number

OKR-KMA-XX-XX-DR-A-7005

Project Number	Status	Revision
T1179	A3 Planning	P2

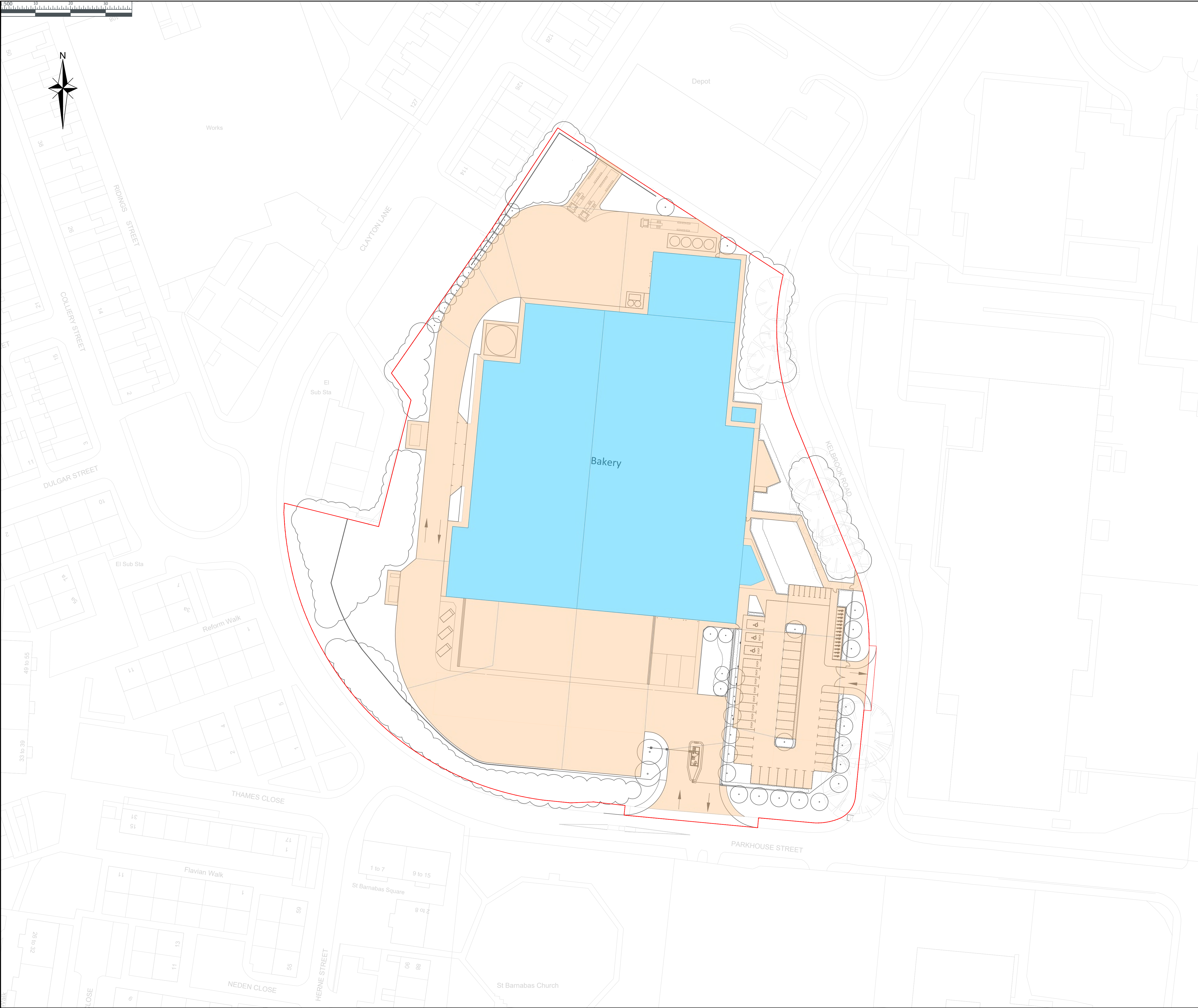
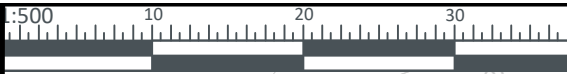
Drawn by	Authorised by	Date
CTW	AT	25.07.25

Studio KMA

Cheshire Academy | Stamford Street | Ashton-under-Lyne | OL6 9PT
T: 01607 873126 E: info@studiokma.co.uk www.studiokma.co.uk

3D STREET

APPENDIX 3 – PROPOSED IMPERMEABLE AREAS PLAN



DO NOT SCALE FROM THIS DRAWING

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

- NOTES
- ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS IN METERS UNLESS OTHERWISE SPECIFIED.
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KEY:

	SITE BOUNDARY	
	PROPOSED BUILDINGS	
	PROPOSED HARDSTANDING	

TOTAL SITE AREA APPROX. 21,666m² (2.17ha)
TOTAL IMPERMEABLE AREA APPROX. 15,821m² (1.58ha)
TOTAL AREA 6,890m²
TOTAL AREA 8,796m²

P02	31.07.25	RJ	REVISED TO REMOVE PONDS	RJ	RJ
P01	06.06.25	AC	ISSUED FOR INFORMATION	AC	AC
REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
STATUS DESCRIPTION				STATUS	
FOR INFORMATION				S2	

HBL

Brook House

Weybrook Road,

Manchester M19 2QD

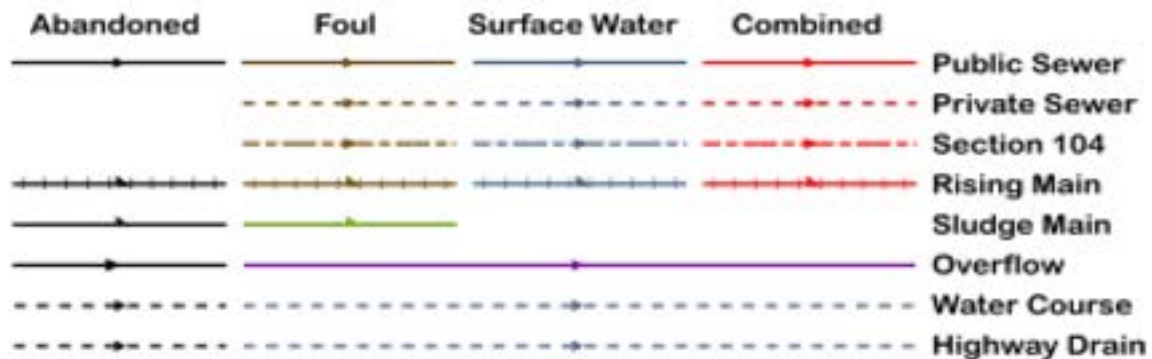
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Consulting Civil & Structural Engineers

PROJECT			
SHELDON BAKERY OPENSRAW, MANCHESTER			
DRAWING TITLE			
PROPOSED CONTRIBUTING AREAS			
CLIENT			
S.H. SHELDON WHOLESALE BAKERY			
HBL REF.	DATE	SCALE(S)	A1
8885	13.05.25	1:500	
DRAWN	CHECKED	APPROVED	
AC	AC	AC	
DRAWING No.			REV.
8885-HBL-XX-XX-DR-C-5105			P02

APPENDIX 4 – UNITED UTILITIES PRE-DEVELOPMENT RESPONSE

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

- | | |
|------------------|--------------------------|
| Manhole | Side Entry Manhole |
| Head of System | Outfall |
| Extent of Survey | Screen Chamber |
| Rodding Eye | Inspection Chamber |
| Inlet | Bifurcation Chamber |
| Discharge Point | Lamp Hole |
| Vortex | T Junction / Saddle |
| Penstock | Catchpit |
| Washout Chamber | Valve Chamber |
| Valve | Vent Column |
| Air Valve | Vortex Chamber |
| Non Return Valve | Penstock Chamber |
| Soakaway | Network Storage Tank |
| Gully | Sewer Overflow |
| Cascade | Ww Treatment Works |
| Flow Meter | Ww Pumping Station |
| Hatch Box | Septic Tank |
| Oil Interceptor | Control Kiosk |
| Summit | |
| Drop Shaft | Change of Characteristic |
| Orifice Plate | |



SEWER RECORDS

Address or Site Reference

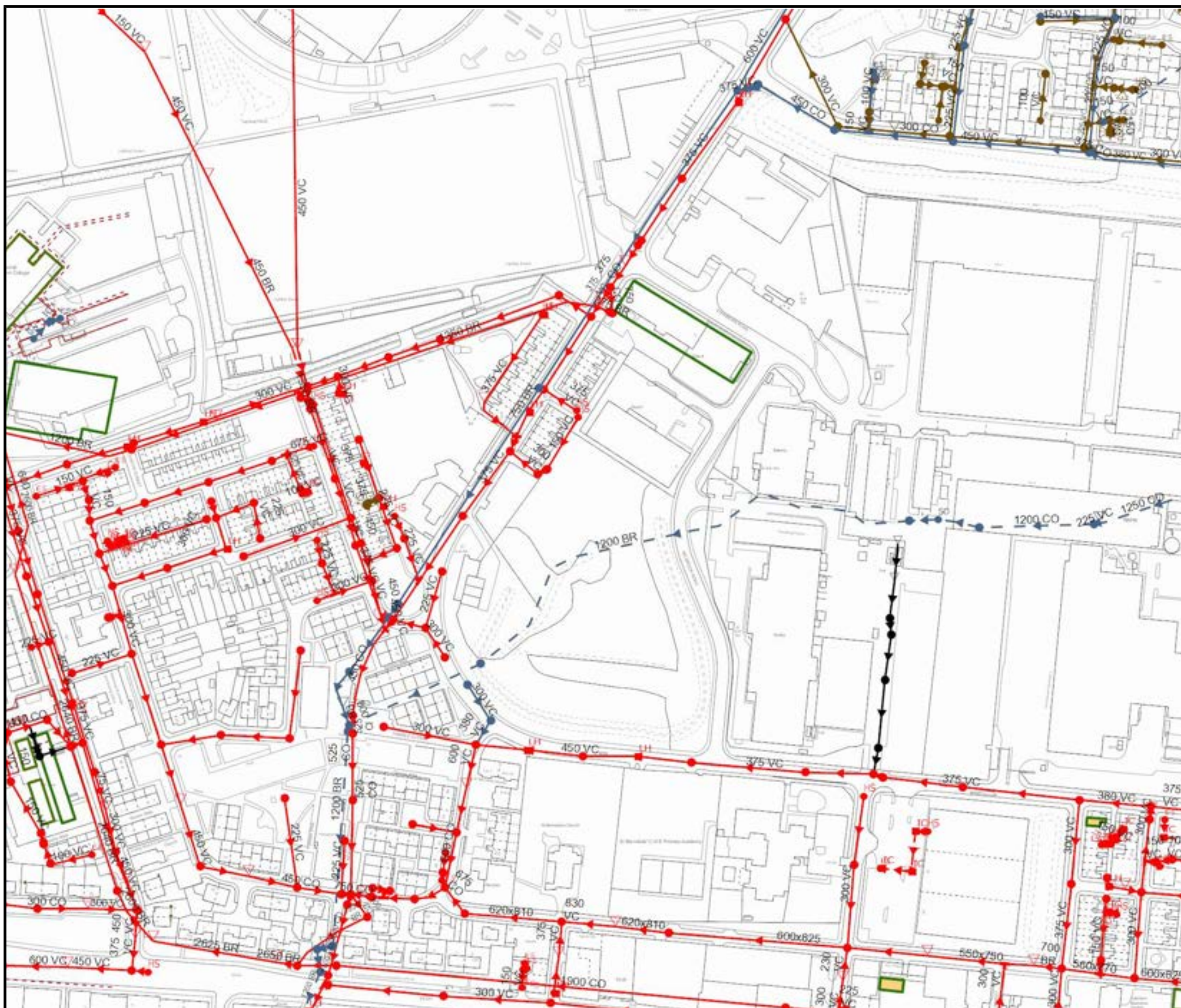
115 PARKHOUSE STREET,
MANCHESTER,
M11 2JX

Scale: 1:2500
Date: 15/03/2021

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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reproduction will infringe these copyrights.



From: seweradoptions@uuplc.co.uk
Sent: 29 October 2024 00:49
To: paul@psc-civil-engineering.co.uk
Cc: ryan.jones@hbl.ltd
Subject: UU REF 06538060 - WW PDE – Land off Parkhouse Street, Manchester

Good Morning,

Thank you for your WW PDE application, please see our reply below:

UU REF 06538060 - WW PDE – Land off Parkhouse Street, Manchester

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

Foul flow from this site will be allowed to drain into the public 375dia or 450dia combined sewers running adjacent to the site.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**
- 2. to a surface waterbody;**
- 3. to a surface water sewer or highway drain;**
- 4. to a combined sewer.**

For guidance, The [North West SuDS Pro-Forma](#) provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

I note your proposal is to drain to the watercourse which would support, however you would need to discuss the diversion, connection points and flow rates with the riparian owner and local authority.

Regards

Anthony



Anthony Laithwaite
Ww Engineer
Developer Services & Metering
Customer Services

T: 01925 429090
unitedutilities.com

----- Original Message -----

From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]

Sent: 28/10/2024 11:09

To: paul@psc-civil-engineering.co.uk

Cc: ryan.jones@hbl.ltd

Subject: Land off Parkhouse Street, M11 2FB - 06538060 - Pre Development Enquiry

Good Morning,

Thank you for your email,

Please be advised this has now been logged to Anthony who will respond or before 07/11/2024.

Please quote ref **06538060** for any further correspondence

Kind Regards



Lewis Barr
D-MeX Lead
Developer Services & Metering
Customer Services
07827286541
unitedutilities.com

If you have received a great service today why not tell us?

Visit: <http://unitedutilities.thewowawards.co.uk/nominate>

APPENDIX 5 – GREENFIELD RUN-OFF RATES

Calculated by:	Paul Carter
Site name:	Sheldon Bakery
Site location:	Parkhouse Street, Openshaw, Manchester

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:	53.47600° N
Longitude:	2.18704° W
Reference:	1924162580
Date:	Oct 24 2024 20:52

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	50
-----------------------	----

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

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.

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

(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.

Hydrological characteristics

	Default	Edited
SAAR (mm):	900	900
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is SPR/SPRHOST ≤ 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

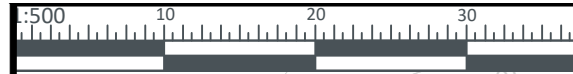
Default

Edited

Q ₅₀ (l/s):	323.91	323.91
1 in 1 year (l/s):	281.8	281.8
1 in 30 years (l/s):	550.65	550.65
1 in 100 year (l/s):	673.73	673.73
1 in 200 years (l/s):	767.66	767.66

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.

APPENDIX 6 – PROPOSED DRAINAGE LAYOUT



SHEET 1

8885-HBL-XX-XX-DR-C-5101

LINE, LOCATION AND DEPTH OF EXISTING SEWERS TO BE VERIFIED. LOCATION AND LEVEL OF OUTFALL CURRENTLY ASSUMED.

THE LINE OF EXISTING CULVERT IS APPROXIMATE, AND IS BASED ON 3RD PARTY ANALYSIS AND UNITED UTILITIES RECORDS

INDICATIVE LINE OF 1200mm CULVERT, BASED ON WATER AUTHORITY RECORDS
ABANDONED CULVERT TO BE GROUTED UP OR REMOVED

INDICATIVE LINE OF CULVERT, BASED ON ASSUMED DATA

SIPHONIC DRAINAGE SYSTEM TO BE DESIGNED BY OTHERS. HBL TO DESIGN POINT OF CONNECTION AT OUTFALL

THE OUTFALL ARRANGEMENTS AND DETAILS OF THE PROPOSED DRAINAGE TO BE CONSIDERED FURTHER FOLLOWING CONFIRMATION OF EXISTING DRAINAGE AND WATERCOURSE DETAILS. THE PROPOSED DRAINAGE WILL NEED TO BE UPDATED.

LINE, LOCATION AND DEPTH OF EXISTING CULVERT TO BE VERIFIED. LOCATION AND LEVEL OF OUTFALL CURRENTLY ASSUMED.

SHEET 2

8885-HBL-XX-XX-DR-C-5102

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- THE ENGINEER IS TO BE NOTIFIED OF ANY DISCREPANCIES TO THE DETAILS SHOWN ON THE DRAINAGE AND ANY UNRECORDED CONNECTIONS NOT SHOWN ON THE DRAWINGS.
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FOUL AND STORM DRAINAGE DESIGN SUBJECT TO CONFIRMATION OF DISCHARGE ALLOWANCE. IF STORM DISCHARGE IS RESTRICTED, FURTHER ON SITE ATTENUATION WILL BE REQUIRED. INFORMATION TO BE CONFIRMED WITHIN DEVELOPERS ENQUIRY

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- DEVELOPMENT CONTROL
- LA PLANNING AUTHORITY
- SEWERAGE UNDERTAKER

KEY:

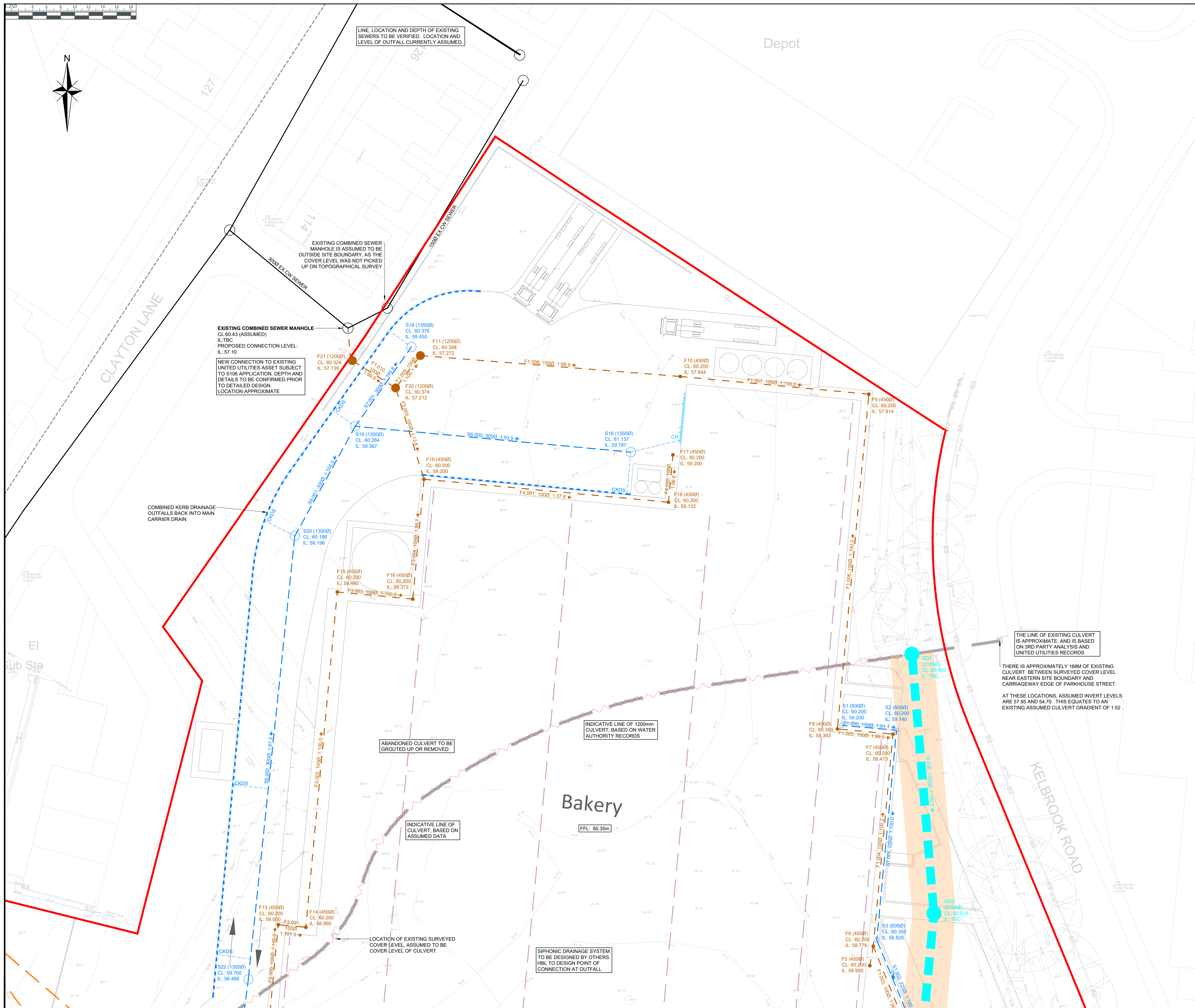
- SITE BOUNDARY**
TOTAL SITE AREA APPROX. 21.66ha (2.17ha)
TOTAL IMPERMEABLE AREA APPROX. 15.82ha (1.58ha)
- PROPOSED GEO CELLULAR ATTENUATION SYSTEM**
LEVELS AND DIMENSIONS NOTED ON PLAN
- PROPOSED GREENBLUE HYDRO PLANTER STANDARD**
REFER TO MANUFACTURER DRAWINGS FOR INSTALLATION GUIDANCE AND FINAL SIZES
- PROPOSED PERMEABLE PAVING**
LINED AND DRAINED
- EXISTING COMBINED WATER SEWER**
- EXISTING CULVERT**
- EXISTING CULVERT TO BE ABANDONED**
- PROPOSED CULVERT DIVERSION**
- PROPOSED CULVERT EASEMENT**
- PROPOSED SURFACE WATER DRAIN**
- PROPOSED SURFACE WATER PERFORATED PIPE**
- PROPOSED FOUL WATER DRAIN**
- PROPOSED HYDROBRAKE FLOW CONTROL CHAMBER**
- PROPOSED SIPHONIC DRAINAGE**
TO BE DESIGNED BY OTHERS
- PROPOSED SLOT / CHANNEL DRAIN**
- PROPOSED KERB DRAIN**
- PROPOSED GULLY**
- PROPOSED BACKDROP**
- PROPOSED HEADWALL**
- PROPOSED PETROL INTERCEPTOR**

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
P02	31.07.25	RJ	REVISED TO NEW LAYOUT	RJ	RJ
P01	06.06.25	AC	ISSUED FOR INFORMATION	AC	AC
STATUS DESCRIPTION					STATUS
FOR INFORMATION					P01



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Weybrook Road,
Manchester M19 2QD
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Consulting Civil & Structural Engineers

PROJECT				SHELDON BAKERY OPENSHAW, MANCHESTER	
DRAWING TITLE				PROPOSED DRAINAGE STRATEGY OVERVIEW	
CLIENT				S. H. SHELDON WHOLESALE BAKERY	
HBL REF.	8885	DATE	13.05.25	SCALE(S)	1:500
DRAWN	AC	CHECKED	AC	APPROVED	AC
DRAWING No.				8885-HBL-XX-XX-DR-C-5100	REV. P02



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SUBJECT TO CONFIRMATION OF
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DEVELOPERS ENQUIRY

PRELIMINARY SCHEME
FOR COMMENT AND REVIEW ONLY.
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- SEWERAGE UNDERTAKER

KEY:

- | | | |
|---|--|-------------------------------|
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P02	31.07.25	RJ	REVISED TO NEW LAYOUT		
P01	06.06.25	AC	ISSUED FOR INFORMATION		RJ RJ AC AC
REV.	DATE	DRAWN	DESCRIPTION		CHKD APPR
STATUS			DESCRIPTION		STATUS
FOR INFORMATION					P01

FOR INFORMATION

P01



PROJECT

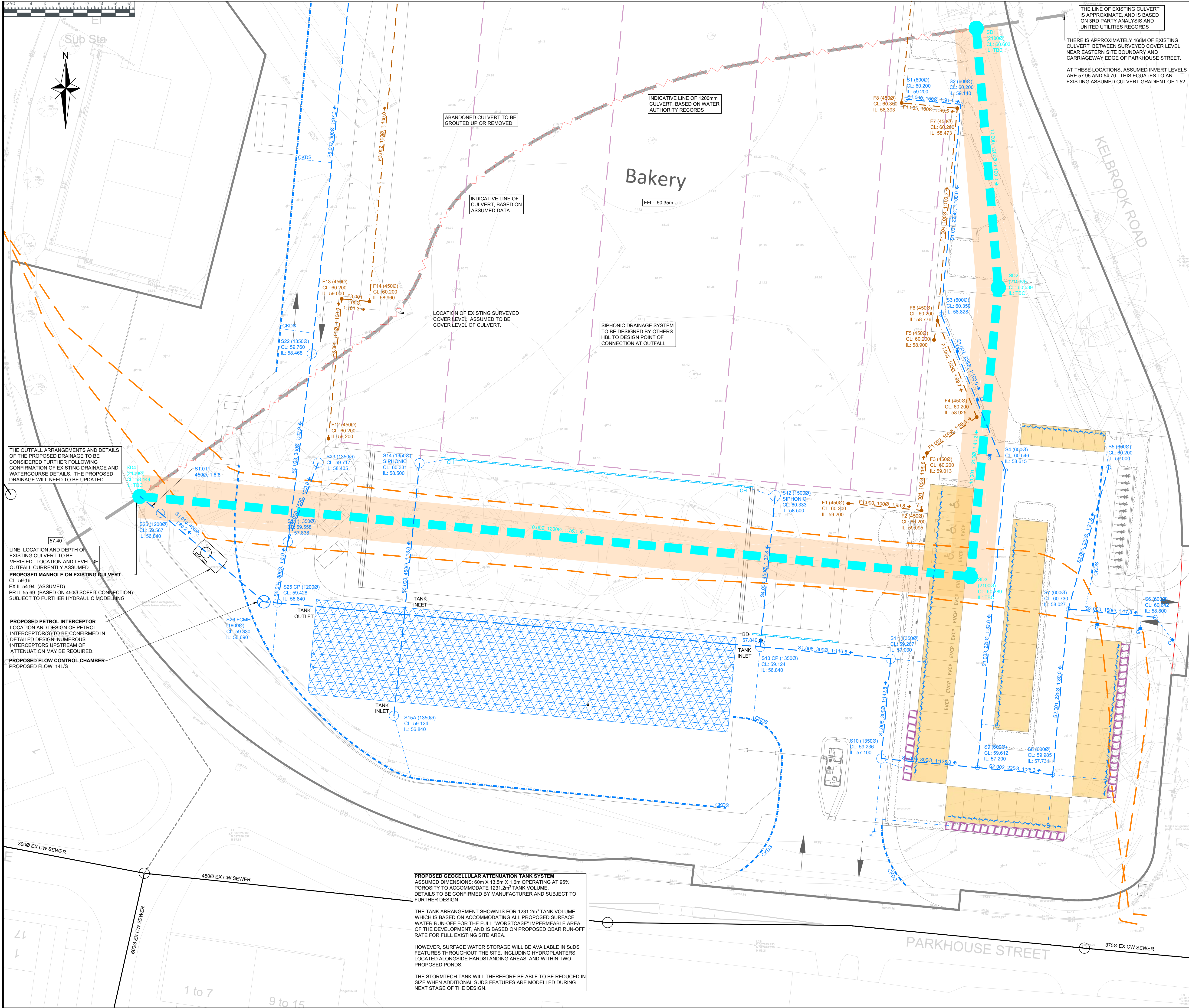
SHELDON BAKERY
OPENSHAW, MANCHESTER

DRAWING TITLE

PROPOSED DRAINAGE STRATEGY
SHEET 1

CLIENT S.H. SHELDON WHOLESALE BAKERY

HBL REF. 8885	DATE 06.06.25	SCALE(S) 1.250	A1
DRAWN AC	CHECKED AC	APPROVED AC	
DRAWING No. 8885-HBL-XX-XX-DR-C-5101			REV. P02



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REV.	DATE	DRAWN	DESCRIPTION	STATUS
P02	31.07.25	RJ	REVISED TO NEW LAYOUT	RJ
P01	06.06.25	AC	ISSUED FOR INFORMATION	AC

FOR INFORMATION

PROJECT

DRAWING TITLE

CLIENT

STATUS

8885

06.06.25

1:250

A1

8885-HBL-XX-XX-DR-C-5102

P02

SHeldon Bakery

OPenshaw, Manchester

S.H. Sheldon Wholesale Bakery

Brook House
Weybrook Road,
Manchester M19 2QD
+44 (0)161 432 9977 | www.hbl.td
Consulting Civil & Structural Engineers

APPENDIX 7 – HYDRAULIC CALCULATIONS

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.003	5.00		60.200	600	387721.460	397741.301	1.000
S2	0.013	5.00		60.200	600	387729.266	397740.605	1.060
S3	0.032	5.00		60.350	600	387726.457	397710.690	1.522
S4	0.035	5.00		60.546	600	387735.620	397688.506	1.931
S5	0.026	5.00		60.200	600	387750.330	397688.907	1.200
S6	0.008	5.00		60.642	600	387756.950	397667.538	1.842
S7	0.051	5.00		60.730	600	387744.560	397668.701	2.703
S8	0.019	5.00		59.985	600	387742.346	397645.129	2.254
S9	0.014	5.00		59.612	600	387731.641	397646.134	2.412
S10	0.033	5.00		59.236	1350	387717.952	397647.420	2.136
S11	0.032	5.00		59.207	1350	387719.283	397661.638	2.207
S12	0.369	5.00		60.333	1500	387702.838	397684.840	1.833
S13	0.032	5.00		59.124	1350	387700.708	397663.325	2.284
S14	0.273	5.00		60.331	1350	387652.212	397689.483	1.831
S15 TANK	0.244	5.00		59.452	1200	387650.083	397667.924	2.612
S16	0.087	5.00		61.137	1350	387691.391	397780.234	1.350
S18	0.090	5.00		60.376	1350	387660.121	397795.223	0.926
S19	0.000	5.00		60.284	1350	387652.119	397783.922	0.917
S20	0.047	5.00		60.186	1350	387643.495	397768.276	0.990
S22	0.073	5.00		59.760	1350	387636.870	397705.098	1.217
S23	0.040	5.00		59.717	1350	387637.804	397689.557	1.312
S24	0.040	5.00	0.0	59.558	1350	387633.470	397678.299	1.645
S25				59.428	1200	387631.987	397669.568	2.588
S26 FCMH				59.330	1800	387628.150	397669.917	2.640
S27				58.567	1200	387615.347	397682.361	2.122
SD4				58.444	2100	387612.419	397684.758	3.504
SD1		5.00		60.603	2100	387731.466	397751.432	2.703
SD2				60.539	2100	387734.607	397714.504	3.010
SD3				60.289	2100	387730.631	397673.331	3.789

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
OUTFALL				58.444	2100	387609.877	397684.901	3.523

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	S1	S2	5.465	0.600	59.200	59.140	0.060	91.1	150	5.09	33.6
1.001	S2	S3	31.195	0.600	59.140	58.828	0.312	100.0	225	5.48	32.5
1.002	S3	S4	21.259	0.600	58.828	58.615	0.213	100.0	225	5.76	31.8
1.003	S4	S9	43.651	0.600	58.615	57.275	1.340	32.6	225	6.07	31.0
2.000	S5	S7	21.014	0.600	59.000	58.027	0.973	21.6	225	5.12	33.5
3.000	S6	S7	12.445	0.600	58.800	58.102	0.698	17.8	150	5.09	33.6
2.001	S7	S8	23.676	0.600	58.027	57.731	0.296	80.0	225	5.39	32.7
2.002	S8	S9	12.000	0.600	57.731	57.275	0.456	26.3	225	5.47	32.5
1.004	S9	S10	12.502	0.600	57.200	57.100	0.100	125.0	300	6.22	30.6
1.005	S10	S11	14.281	0.600	57.100	57.000	0.100	142.8	300	6.40	30.2
1.006	S11	S13	18.651	0.600	57.000	56.840	0.160	116.6	300	6.61	29.8
4.000	S12	S13	21.620	0.600	58.500	57.840	0.660	32.8	450	5.10	33.5
1.007	S13	S15 TANK	50.834	0.600	56.840	56.840	0.000	0.0	450	7.46	27.6

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	1.053	18.6	0.4	0.850	0.910	0.003	0.0	14	0.405
1.001	1.307	52.0	1.9	0.835	1.297	0.016	0.0	29	0.626
1.002	1.307	52.0	5.5	1.297	1.706	0.048	0.0	50	0.860
1.003	2.300	91.4	9.3	1.706	2.112	0.083	0.0	48	1.485
2.000	2.827	112.4	3.1	0.975	2.478	0.026	0.0	26	1.257
3.000	2.397	42.3	1.0	1.692	2.478	0.008	0.0	16	0.980
2.001	1.463	58.2	10.1	2.478	2.029	0.085	0.0	63	1.100
2.002	2.560	101.8	12.2	2.029	2.112	0.104	0.0	52	1.739
1.004	1.405	99.3	22.2	2.112	1.836	0.201	0.0	96	1.140
1.005	1.313	92.8	25.6	1.836	1.907	0.234	0.0	108	1.128
1.006	1.455	102.8	28.6	1.907	1.984	0.266	0.0	108	1.253
4.000	3.561	566.4	44.7	1.383	0.834	0.369	0.0	85	2.166
1.007	1.000	159.0	66.5	1.834	2.162	0.667	0.0	0	∞

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)
5.000	S14	S15 TANK	21.620	0.600	58.500	56.840	1.660	13.0	450	5.06	33.6
1.008	S15 TANK	S25	18.170	0.600	56.840	56.840	0.000	0.0	450	7.76	27.1
6.000	S16	S19	39.444	0.600	59.787	59.367	0.420	93.9	300	5.41	32.7
7.001	S18	S19	13.847	0.600	59.450	59.367	0.083	166.8	300	5.19	33.3
6.001	S19	S20	17.865	0.600	59.367	59.196	0.171	104.5	300	5.60	32.2
6.002	S20	S22	63.525	0.600	59.196	58.543	0.653	97.3	300	6.26	30.5
6.003	S22	S24	27.014	0.600	58.543	57.913	0.630	42.9	300	6.45	30.1
9.000	S23	S24	12.064	0.600	58.405	57.989	0.416	29.0	150	5.11	33.5
6.004	S24	S25	8.856	0.600	57.913	56.915	0.998	8.9	300	6.48	30.1
1.009	S25	S26 FCMH	3.795	0.600	56.840	56.690	0.150	25.3	450	7.78	27.3
1.010	S26 FCMH	S27	19.642	0.600	56.690	56.445	0.245	80.2	450	7.92	27.2
1.011	S27	SD4	3.783	0.600	56.445	55.889	0.556	6.8	450	7.93	27.2
10.000	SD1	SD2	37.099	0.600	57.900	57.529	0.371	100.0	1200	5.17	33.3
10.001	SD2	SD3	41.328	0.600	57.529	56.500	1.029	40.2	1200	5.28	32.9
10.002	SD3	SD4	118.763	0.600	56.500	54.940	1.560	76.1	1200	5.74	31.8
1.012	SD4	OUTFALL	2.546	0.600	54.940	54.921	0.019	134.0	1200	7.95	27.2

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)
5.000	5.656	899.5	33.2	1.381	2.162	0.273	0.0	58	2.761
1.008	1.000	159.0	116.0	2.162	2.138	1.184	0.0	0	∞
6.000	1.622	114.7	10.3	1.050	0.617	0.087	0.0	60	1.014
7.001	1.214	85.8	10.8	0.626	0.617	0.090	0.0	72	0.839
6.001	1.537	108.7	20.6	0.617	0.690	0.177	0.0	88	1.191
6.002	1.594	112.7	24.7	0.690	0.917	0.224	0.0	95	1.286
6.003	2.407	170.1	32.3	0.917	1.345	0.297	0.0	88	1.866
9.000	1.876	33.2	4.8	1.162	1.419	0.040	0.0	38	1.338
6.004	5.308	375.2	41.0	1.345	2.213	0.377	0.0	67	3.526
1.009	4.054	644.8	154.0	2.138	2.190	1.561	0.0	149	3.355
1.010	2.271	361.2	153.5	2.190	1.672	1.561	0.0	204	2.182
1.011	7.832	1245.7	153.4	1.672	2.105	1.561	0.0	106	5.408
10.000	3.741	4231.0	0.0	1.503	1.810	0.000	0.0	0	0.000
10.001	5.911	6684.6	0.0	1.810	2.589	0.000	0.0	0	0.000
10.002	4.289	4851.2	0.0	2.589	2.304	0.000	0.0	0	0.000
1.012	3.230	3652.9	153.3	2.304	2.323	1.561	0.0	164	1.650

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	5.465	91.1	150	Circular	60.200	59.200	0.850	60.200	59.140	0.910
1.001	31.195	100.0	225	Circular	60.200	59.140	0.835	60.350	58.828	1.297
1.002	21.259	100.0	225	Circular	60.350	58.828	1.297	60.546	58.615	1.706
1.003	43.651	32.6	225	Circular	60.546	58.615	1.706	59.612	57.275	2.112
2.000	21.014	21.6	225	Circular	60.200	59.000	0.975	60.730	58.027	2.478
3.000	12.445	17.8	150	Circular	60.642	58.800	1.692	60.730	58.102	2.478
2.001	23.676	80.0	225	Circular	60.730	58.027	2.478	59.985	57.731	2.029
2.002	12.000	26.3	225	Circular	59.985	57.731	2.029	59.612	57.275	2.112
1.004	12.502	125.0	300	Circular	59.612	57.200	2.112	59.236	57.100	1.836
1.005	14.281	142.8	300	Circular	59.236	57.100	1.836	59.207	57.000	1.907
1.006	18.651	116.6	300	Circular	59.207	57.000	1.907	59.124	56.840	1.984
4.000	21.620	32.8	450	Circular	60.333	58.500	1.383	59.124	57.840	0.834
1.007	50.834	0.0	450	Circular	59.124	56.840	1.834	59.452	56.840	2.162
5.000	21.620	13.0	450	Circular	60.331	58.500	1.381	59.452	56.840	2.162
1.008	18.170	0.0	450	Circular	59.452	56.840	2.162	59.428	56.840	2.138
6.000	39.444	93.9	300	Circular	61.137	59.787	1.050	60.284	59.367	0.617
7.001	13.847	166.8	300	Circular	60.376	59.450	0.626	60.284	59.367	0.617

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.001	S2	600	Manhole	Adoptable	S3	600	Manhole	Adoptable
1.002	S3	600	Manhole	Adoptable	S4	600	Manhole	Adoptable
1.003	S4	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
2.000	S5	600	Manhole	Adoptable	S7	600	Manhole	Adoptable
3.000	S6	600	Manhole	Adoptable	S7	600	Manhole	Adoptable
2.001	S7	600	Manhole	Adoptable	S8	600	Manhole	Adoptable
2.002	S8	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
1.004	S9	600	Manhole	Adoptable	S10	1350	Manhole	Adoptable
1.005	S10	1350	Manhole	Adoptable	S11	1350	Manhole	Adoptable
1.006	S11	1350	Manhole	Adoptable	S13	1350	Manhole	Adoptable
4.000	S12	1500	Manhole	Adoptable	S13	1350	Manhole	Adoptable
1.007	S13	1350	Manhole	Adoptable	S15 TANK	1200	Manhole	Adoptable
5.000	S14	1350	Manhole	Adoptable	S15 TANK	1200	Manhole	Adoptable
1.008	S15 TANK	1200	Manhole	Adoptable	S25	1200	Manhole	Adoptable
6.000	S16	1350	Manhole	Adoptable	S19	1350	Manhole	Adoptable
7.001	S18	1350	Manhole	Adoptable	S19	1350	Manhole	Adoptable

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)
6.001	17.865	104.5	300	Circular	60.284	59.367	0.617	60.186	59.196	0.690
6.002	63.525	97.3	300	Circular	60.186	59.196	0.690	59.760	58.543	0.917
6.003	27.014	42.9	300	Circular	59.760	58.543	0.917	59.558	57.913	1.345
9.000	12.064	29.0	150	Circular	59.717	58.405	1.162	59.558	57.989	1.419
6.004	8.856	8.9	300	Circular	59.558	57.913	1.345	59.428	56.915	2.213
1.009	3.795	25.3	450	Circular	59.428	56.840	2.138	59.330	56.690	2.190
1.010	19.642	80.2	450	Circular	59.330	56.690	2.190	58.567	56.445	1.672
1.011	3.783	6.8	450	Circular	58.567	56.445	1.672	58.444	55.889	2.105
10.000	37.099	100.0	1200	Circular	60.603	57.900	1.503	60.539	57.529	1.810
10.001	41.328	40.2	1200	Circular	60.539	57.529	1.810	60.289	56.500	2.589
10.002	118.763	76.1	1200	Circular	60.289	56.500	2.589	58.444	54.940	2.304
1.012	2.546	134.0	1200	Circular	58.444	54.940	2.304	58.444	54.921	2.323

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6.001	S19	1350	Manhole	Adoptable	S20	1350	Manhole	Adoptable
6.002	S20	1350	Manhole	Adoptable	S22	1350	Manhole	Adoptable
6.003	S22	1350	Manhole	Adoptable	S24	1350	Manhole	Adoptable
9.000	S23	1350	Manhole	Adoptable	S24	1350	Manhole	Adoptable
6.004	S24	1350	Manhole	Adoptable	S25	1200	Manhole	Adoptable
1.009	S25	1200	Manhole	Adoptable	S26 FCMH	1800	Manhole	Adoptable
1.010	S26 FCMH	1800	Manhole	Adoptable	S27	1200	Manhole	Adoptable
1.011	S27	1200	Manhole	Adoptable	SD4	2100	Manhole	Adoptable
10.000	SD1	2100	Manhole	Adoptable	SD2	2100	Manhole	Adoptable
10.001	SD2	2100	Manhole	Adoptable	SD3	2100	Manhole	Adoptable
10.002	SD3	2100	Manhole	Adoptable	SD4	2100	Manhole	Adoptable
1.012	SD4	2100	Manhole	Adoptable	OUTFALL	2100	Manhole	Adoptable

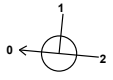
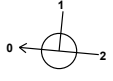
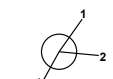
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	387721.460	397741.301	60.200	1.000	600				
						0	1.000	59.200	150

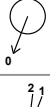
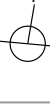
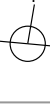
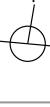
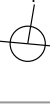
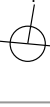
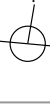
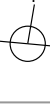
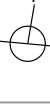
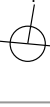
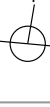
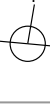
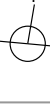
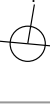
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S2	387729.266	397740.605	60.200	1.060	600		1	1.000	59.140	150
							0	1.001	59.140	225
S3	387726.457	397710.690	60.350	1.522	600		1	1.001	58.828	225
							0	1.002	58.828	225
S4	387735.620	397688.506	60.546	1.931	600		1	1.002	58.615	225
							0	1.003	58.615	225
S5	387750.330	397688.907	60.200	1.200	600		0	2.000	59.000	225
S6	387756.950	397667.538	60.642	1.842	600		0	3.000	58.800	150
S7	387744.560	397668.701	60.730	2.703	600		1	3.000	58.102	150
							2	2.000	58.027	225
							0	2.001	58.027	225
S8	387742.346	397645.129	59.985	2.254	600		1	2.001	57.731	225
							0	2.002	57.731	225
S9	387731.641	397646.134	59.612	2.412	600		1	2.002	57.275	225
							2	1.003	57.275	225
							0	1.004	57.200	300
S10	387717.952	397647.420	59.236	2.136	1350		1	1.004	57.100	300
							0	1.005	57.100	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S11	387719.283	397661.638	59.207	2.207	1350	 1	1.005	57.000	300
S12	387702.838	397684.840	60.333	1.833	1500	 0	1.006	57.000	300
S13	387700.708	397663.325	59.124	2.284	1350	 1 2 0	4.000 1.006	57.840 56.840	450 300
S14	387652.212	397689.483	60.331	1.831	1350	 0	1.007	56.840	450
S15 TANK	387650.083	397667.924	59.452	2.612	1200	 1 2 0	5.000 1.007	58.500 56.840	450 450
S16	387691.391	397780.234	61.137	1.350	1350	 0	6.000	59.787	300
S18	387660.121	397795.223	60.376	0.926	1350	 0	7.001	59.450	300
S19	387652.119	397783.922	60.284	0.917	1350	 1 2 0	7.001 6.000	59.367 59.367	300 300
S20	387643.495	397768.276	60.186	0.990	1350	 1 0	6.001 6.002	59.367 59.196	300 300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S22	387636.870	397705.098	59.760	1.217	1350	 1 0	6.002	58.543	300
S23	387637.804	397689.557	59.717	1.312	1350	 1 0	6.003	58.543	300
S24	387633.470	397678.299	59.558	1.645	1350	 2 0	9.000	57.989	150
S25	387631.987	397669.568	59.428	2.588	1200	 1 0	6.004	57.913	300
S26 FCMH	387628.150	397669.917	59.330	2.640	1800	 1 0	6.004	56.915	300
S27	387615.347	397682.361	58.567	2.122	1200	 1 0	1.008	56.840	450
SD4	387612.419	397684.758	58.444	3.504	2100	 1 0	1.009	56.840	450
SD1	387731.466	397751.432	60.603	2.703	2100	 1 0	1.009	56.690	450
SD2	387734.607	397714.504	60.539	3.010	2100	 1 0	1.010	56.445	450
						 1 0	1.011	56.445	450
						 1 0	10.002	54.940	1200
						 1 0	1.011	55.889	450
						 1 0	1.012	54.940	1200
						 1 0	10.000	57.900	1200
						 1 0	10.000	57.529	1200
						 1 0	10.001	57.529	1200

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SD3	387730.631	397673.331	60.289	3.789	2100		1	10.001	56.500	1200
							0	10.002	56.500	1200
OUTFALL	387609.877	397684.901	58.444	3.523	2100		1	1.012	54.921	1200

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Rate(s)	✓	100 year (l/s)	50.3
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	2 year (l/s)	18.3	Check Discharge Volume	✓
Summer CV	1.000	Skip Steady State	x	Starting Level (m)		30 year (l/s)	39.6	100 year 360 minute (m³)	

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	0	0	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.312	Growth Factor 100 year	2.48	Q 30 year (l/s)	39.6
Greenfield Method	FEH	Region	1	Betterment (%)	0	Q 100 year (l/s)	50.3
Positively Drained Area (ha)	2.166	QBar/QMed conversion factor	1.111	QMed	18.3		
SAAR (mm)	896	Growth Factor 2 year	0.90	QBar	20.3		
Host	1	Growth Factor 30 year	1.95	Q 2 year (l/s)	18.3		

Pre-development Discharge Volume

Site Makeup	Greenfield	Soil Index	4	Return Period (years)	100	Betterment (%)	0
Greenfield Method	FSR/FEH	SPR	0.47	Climate Change (%)	0	PR	
Positively Drained Area (ha)	2.166	CWI		Storm Duration (mins)	360	Runoff Volume (m³)	

Node S26 FCMH Online Hydro-Brake® Control

Flap Valve	x	Design Flow (l/s)	14.0	Min Outlet Diameter (m)	0.225
Replaces Downstream Link	x	Objective	(HE) Minimise upstream storage	Min Node Diameter (mm)	1800
Invert Level (m)	56.690	Sump Available	✓		
Design Depth (m)	2.000	Product Number	CTL-SHE-0155-1400-2000-1400		

Node S15 TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	56.840
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	800.0	800.0	1.600	800.0	960.4	1.601	0.0	960.4

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.217	0.017	0.5	0.0058	0.0000	OK
15 minute summer	S2	11	59.174	0.034	2.7	0.0181	0.0000	OK
15 minute summer	S3	11	58.888	0.060	7.9	0.0424	0.0000	OK
15 minute summer	S4	11	58.674	0.059	13.5	0.0380	0.0000	OK
15 minute summer	S5	10	59.030	0.030	4.3	0.0214	0.0000	OK
15 minute summer	S6	11	58.818	0.018	1.3	0.0068	0.0000	OK
15 minute summer	S7	10	58.106	0.079	14.1	0.0519	0.0000	OK
15 minute summer	S8	10	57.797	0.066	17.1	0.0296	0.0000	OK
15 minute summer	S9	11	57.334	0.134	32.6	0.0534	0.0000	OK
15 minute summer	S10	9	57.290	0.190	38.1	0.3304	0.0000	OK
15 minute summer	S11	9	57.278	0.278	43.9	0.4782	0.0000	OK
15 minute summer	S12	10	58.605	0.105	61.5	0.6065	0.0000	OK
15 minute summer	S13	9	57.222	0.382	115.1	0.6537	0.0000	OK
15 minute summer	S14	9	58.581	0.081	45.5	0.3571	0.0000	OK
480 minute summer	S15 TANK	320	57.112	0.272	40.7	207.7838	0.0000	OK
15 minute summer	S16	10	59.858	0.071	14.5	0.1926	0.0000	OK
15 minute summer	S18	10	59.539	0.089	15.0	0.3006	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	S1	1.000	S2	0.5	0.251	0.027	0.0112	
15 minute summer	S2	1.001	S3	2.6	0.435	0.051	0.1924	
15 minute summer	S3	1.002	S4	7.8	0.931	0.151	0.1786	
15 minute summer	S4	1.003	S9	13.5	1.634	0.148	0.3609	
15 minute summer	S5	2.000	S7	4.3	0.580	0.038	0.1625	
15 minute summer	S6	3.000	S7	1.3	1.071	0.031	0.0151	
15 minute summer	S7	2.001	S8	13.9	1.268	0.239	0.2600	
15 minute summer	S8	2.002	S9	16.9	1.836	0.166	0.1107	
15 minute summer	S9	1.004	S10	32.9	0.985	0.331	0.4506	
15 minute summer	S10	1.005	S11	38.7	1.101	0.416	0.8219	
15 minute summer	S11	1.006	S13	48.9	0.779	0.476	1.2918	
15 minute summer	S12	4.000	S13	60.9	2.280	0.107	0.5776	
15 minute summer	S13	1.007	S15 TANK	121.7	1.786	0.765	3.7442	
15 minute summer	S14	5.000	S15 TANK	46.0	4.013	0.051	0.4139	
480 minute summer	S15 TANK	1.008	S25	12.3	0.682	0.078	1.8200	
15 minute summer	S16	6.000	S19	14.2	0.795	0.124	0.7172	
15 minute summer	S18	7.001	S19	14.8	0.723	0.173	0.2844	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S19	11	59.479	0.112	29.1	0.1597	0.0000	OK
15 minute summer	S20	11	59.315	0.119	36.5	0.2833	0.0000	OK
15 minute summer	S22	11	58.662	0.119	48.2	0.3137	0.0000	OK
15 minute summer	S23	10	58.452	0.047	6.7	0.0968	0.0000	OK
15 minute summer	S24	11	57.994	0.081	60.8	0.1559	0.0000	OK
480 minute summer	S25	320	57.112	0.272	13.5	0.3073	0.0000	OK
480 minute summer	S26 FCMH	320	57.112	0.422	28.1	1.0734	0.0000	OK
480 minute summer	S27	320	56.481	0.036	13.4	0.0403	0.0000	OK
480 minute summer	SD4	320	54.998	0.058	13.4	0.2024	0.0000	OK
15 minute summer	SD1	1	57.900	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD2	1	57.529	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD3	1	56.500	0.000	0.0	0.0000	0.0000	OK
480 minute summer	OUTFALL	320	54.973	0.052	13.4	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	S19	6.001	S20	29.0	1.162	0.267	0.4454	
15 minute summer	S20	6.002	S22	36.6	1.406	0.325	1.6540	
15 minute summer	S22	6.003	S24	47.9	2.325	0.282	0.5601	
15 minute summer	S23	9.000	S24	6.6	1.429	0.200	0.0560	
15 minute summer	S24	6.004	S25	61.3	3.112	0.163	0.2274	
480 minute summer	S25	1.009	S26 FCMH	28.1	0.563	0.044	0.4827	
480 minute summer	S26 FCMH	1.010	S27	13.4	1.397	0.037	0.1943	
480 minute summer	S27	1.011	SD4	13.4	2.460	0.011	0.0206	
480 minute summer	SD4	1.012	OUTFALL	13.4	0.738	0.004	0.0464	369.7
15 minute summer	SD1	10.000	SD2	0.0	0.000	0.000	0.0001	
15 minute summer	SD2	10.001	SD3	0.0	0.000	0.000	0.0001	
15 minute summer	SD3	10.002	SD4	0.0	0.000	0.000	1.1408	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	59.227	0.027	1.3	0.0091	0.0000	OK
15 minute summer	S2	10	59.194	0.054	6.8	0.0285	0.0000	OK
15 minute summer	S3	10	58.929	0.101	20.1	0.0709	0.0000	OK
15 minute summer	S4	10	58.710	0.095	34.6	0.0611	0.0000	OK
15 minute summer	S5	10	59.047	0.047	11.0	0.0339	0.0000	OK
15 minute summer	S6	10	58.829	0.029	3.4	0.0106	0.0000	OK
15 minute summer	S7	12	58.168	0.141	35.8	0.0933	0.0000	OK
15 minute summer	S8	11	58.091	0.360	43.9	0.1622	0.0000	SURCHARGED
15 minute summer	S9	11	58.003	0.803	77.1	0.3203	0.0000	SURCHARGED
15 minute summer	S10	11	57.914	0.814	89.2	1.4160	0.0000	SURCHARGED
15 minute summer	S11	11	57.781	0.781	102.2	1.3449	0.0000	SURCHARGED
15 minute summer	S12	10	58.676	0.176	155.5	1.0193	0.0000	OK
15 minute summer	S13	11	57.573	0.733	261.8	1.2541	0.0000	SURCHARGED
15 minute summer	S14	9	58.616	0.116	115.0	0.5131	0.0000	OK
360 minute winter	S15 TANK	336	57.500	0.660	72.0	503.4823	0.0000	SURCHARGED
15 minute summer	S16	10	59.902	0.115	36.7	0.3122	0.0000	OK
15 minute summer	S18	10	59.611	0.161	38.0	0.5437	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	S1	1.000	S2	1.3	0.335	0.069	0.0214	
15 minute summer	S2	1.001	S3	6.6	0.549	0.128	0.3829	
15 minute summer	S3	1.002	S4	19.8	1.200	0.380	0.3518	
15 minute summer	S4	1.003	S9	34.2	1.558	0.373	1.2143	
15 minute summer	S5	2.000	S7	10.9	0.734	0.097	0.3303	
15 minute summer	S6	3.000	S7	3.4	1.173	0.080	0.0592	
15 minute summer	S7	2.001	S8	35.9	1.581	0.617	0.7816	
15 minute summer	S8	2.002	S9	39.5	1.826	0.388	0.4773	
15 minute summer	S9	1.004	S10	78.3	1.112	0.789	0.8804	
15 minute summer	S10	1.005	S11	91.6	1.301	0.986	1.0057	
15 minute summer	S11	1.006	S13	104.7	1.487	1.018	1.3134	
15 minute summer	S12	4.000	S13	154.4	2.887	0.273	1.1567	
15 minute summer	S13	1.007	S15 TANK	261.8	2.099	1.646	6.7245	
15 minute summer	S14	5.000	S15 TANK	115.8	4.404	0.129	1.4007	
360 minute winter	S15 TANK	1.008	S25	14.2	0.332	0.089	2.8789	
15 minute summer	S16	6.000	S19	36.3	0.975	0.316	1.4847	
15 minute summer	S18	7.001	S19	37.3	0.849	0.435	0.6163	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S19	11	59.571	0.204	73.6	0.2917	0.0000	OK
15 minute summer	S20	11	59.410	0.214	91.9	0.5091	0.0000	OK
15 minute summer	S22	11	58.755	0.212	122.0	0.5589	0.0000	OK
15 minute summer	S23	10	58.486	0.081	16.9	0.1657	0.0000	OK
15 minute summer	S24	11	58.059	0.146	154.2	0.2801	0.0000	OK
480 minute summer	S25	368	57.501	0.661	26.0	0.7472	0.0000	SURCHARGED
360 minute winter	S26 FCMH	336	57.500	0.810	21.5	2.0602	0.0000	SURCHARGED
60 minute winter	S27	105	56.481	0.036	14.0	0.0412	0.0000	OK
120 minute winter	SD4	230	55.000	0.060	14.0	0.2066	0.0000	OK
15 minute summer	SD1	1	57.900	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD2	1	57.529	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD3	1	56.500	0.000	0.0	0.0000	0.0000	OK
120 minute winter	OUTFALL	230	54.974	0.053	14.0	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	S19	6.001	S20	73.0	1.395	0.672	0.9351	
15 minute summer	S20	6.002	S22	92.6	1.730	0.822	3.4004	
15 minute summer	S22	6.003	S24	121.8	2.797	0.716	1.1801	
15 minute summer	S23	9.000	S24	16.7	1.801	0.505	0.1122	
15 minute summer	S24	6.004	S25	154.0	3.053	0.410	0.4360	
480 minute summer	S25	1.009	S26 FCMH	16.0	0.283	0.025	0.6013	
360 minute winter	S26 FCMH	1.010	S27	14.0	1.412	0.039	0.2001	
60 minute winter	S27	1.011	SD4	14.0	2.489	0.011	0.0213	
120 minute winter	SD4	1.012	OUTFALL	14.0	0.744	0.004	0.0479	279.9
15 minute summer	SD1	10.000	SD2	0.0	0.000	0.000	0.0001	
15 minute summer	SD2	10.001	SD3	0.0	0.000	0.000	0.0001	
15 minute summer	SD3	10.002	SD4	0.0	0.000	0.000	1.2017	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	12	59.666	0.466	11.5	0.1597	0.0000	SURCHARGED
15 minute summer	S2	12	59.661	0.521	20.2	0.2748	0.0000	SURCHARGED
15 minute summer	S3	12	59.642	0.814	37.0	0.5723	0.0000	SURCHARGED
15 minute summer	S4	12	59.594	0.979	58.3	0.6312	0.0000	SURCHARGED
15 minute summer	S5	12	59.768	0.768	20.1	0.5500	0.0000	SURCHARGED
15 minute summer	S6	12	59.758	0.958	6.2	0.3546	0.0000	SURCHARGED
15 minute summer	S7	12	59.746	1.719	62.4	1.1345	0.0000	SURCHARGED
15 minute summer	S8	12	59.486	1.755	60.5	0.7915	0.0000	SURCHARGED
15 minute summer	S9	12	59.258	2.058	114.4	0.8210	0.0000	SURCHARGED
15 minute summer	S10	12	59.060	1.960	132.4	3.4100	0.0000	FLOOD RISK
15 minute summer	S11	11	58.756	1.756	155.1	3.0228	0.0000	SURCHARGED
15 minute summer	S12	10	58.754	0.254	285.7	1.4734	0.0000	OK
960 minute winter	S13	900	58.403	1.563	34.3	2.6765	0.0000	SURCHARGED
15 minute summer	S14	9	58.652	0.152	211.3	0.6723	0.0000	OK
960 minute winter	S15 TANK	900	58.403	1.563	67.4	1192.4330	0.0000	SURCHARGED
15 minute summer	S16	12	60.394	0.607	67.4	1.6503	0.0000	SURCHARGED
15 minute summer	S18	12	60.330	0.880	69.7	2.9687	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)
15 minute summer	S1	1.000	S2	-9.3	-0.527	-0.498	0.0962	
15 minute summer	S2	1.001	S3	19.7	0.614	0.380	1.2407	
15 minute summer	S3	1.002	S4	36.5	1.231	0.702	0.8455	
15 minute summer	S4	1.003	S9	49.6	1.535	0.542	1.7360	
15 minute summer	S5	2.000	S7	18.9	0.786	0.168	0.8357	
15 minute summer	S6	3.000	S7	10.2	1.175	0.240	0.2191	
15 minute summer	S7	2.001	S8	49.2	1.544	0.846	0.9416	
15 minute summer	S8	2.002	S9	62.1	1.774	0.610	0.4773	
15 minute summer	S9	1.004	S10	120.0	1.705	1.209	0.8804	
15 minute summer	S10	1.005	S11	143.1	2.032	1.541	1.0057	
15 minute summer	S11	1.006	S13	168.9	2.399	1.642	1.3134	
15 minute summer	S12	4.000	S13	282.2	3.241	0.498	2.6950	
960 minute winter	S13	1.007	S15 TANK	34.2	0.631	0.215	8.0543	
15 minute summer	S14	5.000	S15 TANK	212.1	4.431	0.236	2.0219	
960 minute winter	S15 TANK	1.008	S25	46.7	0.466	0.293	2.8789	
15 minute summer	S16	6.000	S19	62.0	1.082	0.540	2.7776	
15 minute summer	S18	7.001	S19	57.4	0.911	0.668	0.9751	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S19	12	60.284	0.917	112.0	1.3122	0.6452	FLOOD
15 minute summer	S20	12	60.075	0.879	136.3	2.0921	0.0000	FLOOD RISK
15 minute summer	S22	12	59.071	0.528	181.3	1.3883	0.0000	SURCHARGED
15 minute summer	S23	10	58.536	0.131	31.0	0.2671	0.0000	OK
960 minute winter	S24	870	58.455	0.542	28.9	1.0403	0.0000	SURCHARGED
960 minute summer	S25	645	58.656	1.816	60.2	2.0544	0.0000	SURCHARGED
960 minute winter	S26 FCMH	930	58.471	1.781	136.7	4.5314	0.0000	SURCHARGED
15 minute summer	S27	143	56.481	0.036	14.0	0.0412	0.0000	OK
15 minute summer	SD4	144	55.000	0.060	14.0	0.2066	0.0000	OK
15 minute summer	SD1	1	57.900	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD2	1	57.529	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SD3	1	56.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	OUTFALL	144	54.974	0.053	14.0	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	S19	6.001	S20	102.3	1.453	0.942	1.2580	
15 minute summer	S20	6.002	S22	130.5	1.875	1.158	4.4734	
15 minute summer	S22	6.003	S24	178.2	2.810	1.048	1.6996	
15 minute summer	S23	9.000	S24	30.7	1.896	0.925	0.1992	
960 minute winter	S24	6.004	S25	-26.3	1.725	-0.070	0.6236	
960 minute summer	S25	1.009	S26 FCMH	-35.0	0.339	-0.054	0.6013	
960 minute winter	S26 FCMH	1.010	S27	14.0	1.412	0.039	0.2001	
15 minute summer	S27	1.011	SD4	14.0	2.489	0.011	0.0213	
15 minute summer	SD4	1.012	OUTFALL	14.0	0.744	0.004	0.0479	208.8
15 minute summer	SD1	10.000	SD2	0.0	0.000	0.000	0.0001	
15 minute summer	SD2	10.001	SD3	0.0	0.000	0.000	0.0001	
15 minute summer	SD3	10.002	SD4	0.0	0.000	0.000	1.2196	