

Shredded Wheat Factory

Drainage Strategy

Curtins Ref: 061731-CUR-00-XX-RP-S-001

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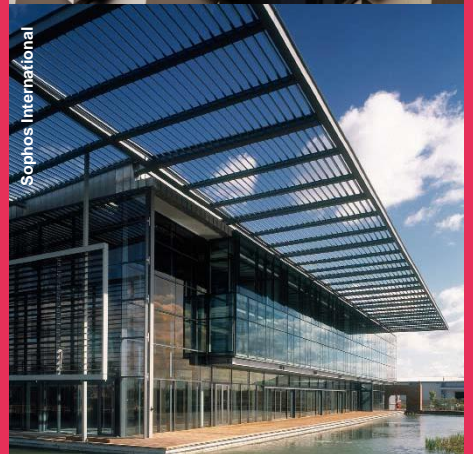
Client Name: Plutus Estates (WGC) and Metropolitan Housing Trust

Client Address:

One York Road
Uxbridge
UB8 1RN

Site Address:

Bridge Road End
Welwyn Garden City
AL7 3UQ



Rev	Description	Issued by	Checked	Date
V01	First issue	AS	RU	28/02/2018

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1.0 Introduction

1.1 Project Background

Curtins Consulting Limited has been appointed by Metropolitan Housing Trust to prepare a Drainage Strategy report for the proposed residential development at the old Shredded Wheat Factory near Bridge Road End, Welwyn Garden City AL7 3UQ.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design, and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

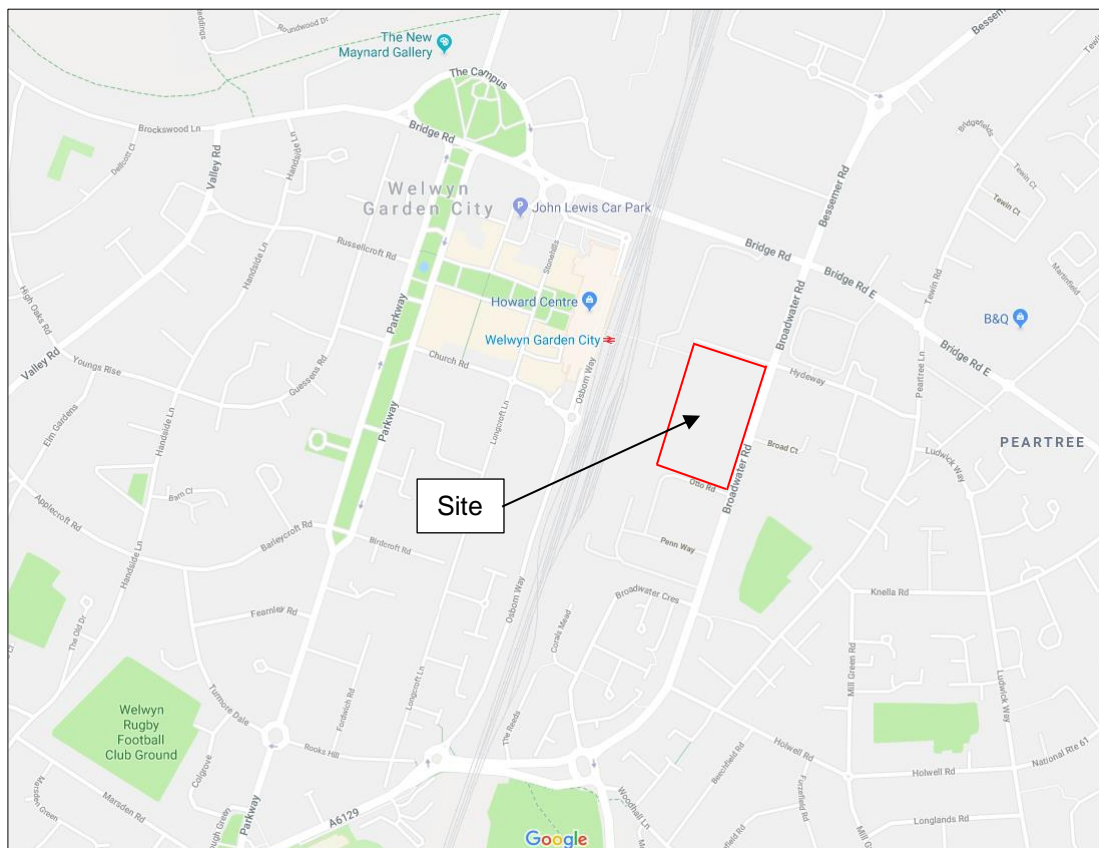


Figure 1 – Site location Plan

2.0 Flood Risk Assessment

A Flood Risk Assessment was previously carried out in February 2015 by ICIS Limited (report reference: 100007) to obtain outline planning permission, which demonstrated the site is located within Flood Zone 1 (low risk).

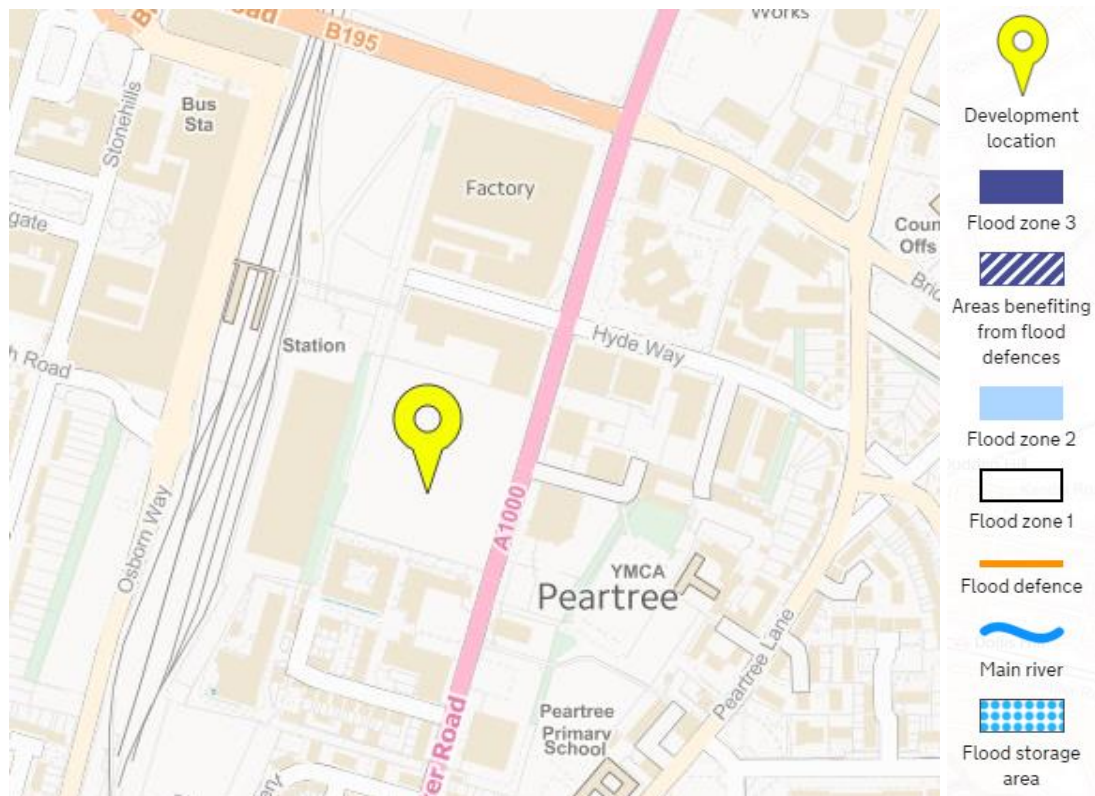


Figure 2 – Environment Agency Flood Map

Other sources of flooding including pluvial (surface water), sewer, reservoirs and groundwater were assessed and considered to be low.

3.0 Drainage Strategy

3.1 Existing Drainage

The topographical survey carried out by Laser Surveys in October 2014 (drawing reference: L 6080 Rev 1) demonstrates the slope across the site is generally flat, with levels ranging from 84.17 – 85.60 AOD, sloping from north-west to south-east.

The topographical survey is contained within Appendix A.

Thames Water (TW) sewer records indicate two parallel surface water sewers are located within Broadwater Road to the east of the site, and discharge to the north. The first surface water sewer upsizes from 825 to 900mm diameter and is approximately five metres deep. The second surface water sewer upsizes from 225 to 300mm diameter and is approximately four metres deep.

A 225mm foul sewer is also located within Broadwater Road and discharges to the north, and is approximately four metres deep.

TW sewer records are contained within Appendix B.

A ground-penetrating radar (GPR) survey was also carried out by MK Surveys in January 2014 (project number ref: 19040) and demonstrates the site was previously served by a separate foul and surface water network, which has largely been abandoned.

It is noted however, several foul and surface water manholes immediately adjacent to Broadwater Road, along with their downstream connections to the public sewer, are still present. It is therefore proposed to carry out a CCTV survey of these drain runs, and re-use them for the proposed drainage network, if shown to be feasible.

The GPR survey is contained with Appendix C.

3.2 Proposed Drainage Design

A new drainage system has been designed for the proposed development, with separate surface and foul water networks, which both connect into the public sewer to the east in Broadwater Road (refer to Appendix D for the Proposed Drainage Layout).

A Pre- Development enquiry has been submitted to Thames Water to determine the capacity, condition, etc. of the public sewer and allowable discharge rate. At the time of writing this report, Curtins are awaiting a response from TW.

3.3 Proposed Surface Water Network

Surface water from building roofs will be conveyed to ground floor level through a series of rainwater pipes, and connect to the below ground network. Runoff in hardstanding external areas (outside the proposed building footprint) will collect to gullies, channels and permeable paving which will be located in accordance with proposed levels. Exact locations will be coordinated with the landscape architect.

It is proposed to provide three separate surface water networks across the site, which will all discharge separately into the public sewer within Broadwater Road. Existing connections have been identified on site and it is proposed to re-use them, subject to the findings of the CCTV drainage survey.

Proposed surface water runoff from site will be restricted to Greenfield rates (5 l/s/Ha) which equates to 19.85 l/s for the whole site, in line with the Strategic Flood Risk Assessment (SFRA) for Welwyn Hatfield Borough Council produced by Scott Wilson (May 2009). This is a significant reduction in the surface water regime, as the existing surface water runoff rate from site to the public sewer has been calculated to be 143 l/s (refer to Appendix E).

The required surface water attenuation storage volume has been sized preliminarily using Micro Drainage Source Control (Appendix E), to attenuate up to the 1 in 100 year rainfall event, with an allowance for climate change (40%). The Micro Drainage preliminary estimates indicate approximately 2674m³ of attenuation is required. It is noted this attenuation volume will be reduced in due course, subject to a more detailed model using Micro Drainage Network, which will account for grassed landscaping areas, green roofs, and sustainable urban drainage systems (SuDS) proposed across site.

It is proposed that surface water storage will be distributed within ponds, permeable paving course graded aggregate build-ups and geocellular storage tanks (subject to detailed design).

Green roofs are currently proposed for all six residential blocks across site, however will be confirmed with the architect at the detailed design stage.

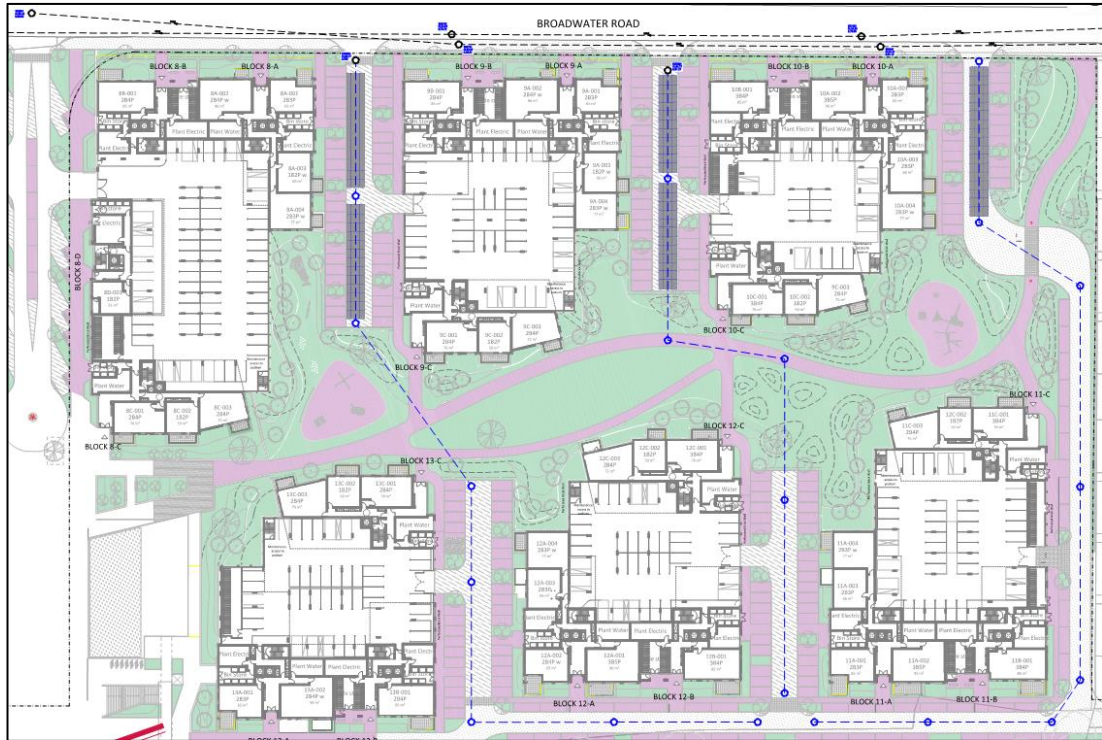


Figure 3 – Proposed Drainage Layout

3.4 Proposed Foul Water Network

A foul water network will be provided in areas adjacent to the building, which will collect flows from soil vent pipes, stub stacks, foul gullies, etc. Foul manholes and drains have been located where these vertical drain points are likely to be, subject to the design of the M&E engineer.

The foul network will discharge to the public foul sewer within Broadwater Road to the east of the site, and the proposed network will be provided at a later detailed design stage.

4.0 Sustainable Drainage Strategy (SuDS)

4.1 SuDS Hierarchy

Developments should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. The design should aim to reduce run-off rates and ensure that run-off is managed as close to its source as possible.

The SFRA for Welwyn Hatfield Borough Council in May 2009, which outlines a sustainable drainage hierarchy, has been considered in the design of the site's surface water system.

Figure 4 provides rationale for selecting/neglecting certain techniques for this development.

Figure 4: SuDS Hierarchy

SUDS Technique		Site Specific Analysis
Most Sustainable → Least Sustainable	Living Roofs/Areas	Green roofs are currently proposed for the residential blocks, and the exact areas will be determined at the detailed design phase.
	Basins and Ponds	There may be an opportunity to incorporate a large dry (detention) pond within the central area of the site, along with a wet (retention) pond at the north-east corner of the site. This will be subject to coordination with the landscape architect.
	Filter Strips and Swales	Due to a large area being required for public and play areas for children, open flow channels are not considered to be feasible for this site.
	Infiltration Devices	<p>Although the site is underlain by chalk, Curtins geo-environmental team has advised discharging to the ground would undermine the foundations for the high rise residential blocks, and doing so would be high risk for this site.</p> <p>There may be some opportunities to discharge runoff from footpaths via permeable paving into the ground, and will be reviewed at the detailed design stage.</p>
	Permeable Surfaces	It is proposed to include permeable surfaces within the parking bays, footpaths and play areas across the site. The exact areas will be subject to coordination with Curtins geo-environmental team as the design progresses.
	Tanked Systems	<p>The remainder of surface water from the site will be attenuated in cellular storage tanks, whilst being slowly discharged into the public sewer. Whilst discharge into a sewer is the least favourable option in the sustainable drainage hierarchy, the lack of an alternative public surface water system or nearby watercourse means there is no other option.</p> <p>This attenuation volume has been based on proposed discharge rates being restricted to Greenfield rates of 5 l/s/Ha.</p>

5.0 Summary

Three separate surface water networks are proposed across the site, which will discharge separately into the public sewer within Broadwater Road.

A GPR survey identified several existing foul and surface water manholes immediately adjacent to Broadwater Road, along with their downstream connections to the public sewer. It is therefore proposed to carry out a CCTV survey of these drain runs, and re-use them for the proposed drainage network, if shown to be feasible.

Surface water runoff from site will be restricted to Greenfield rates (5 l/s/Ha) which equates to 19.85 l/s for the whole site, in line with the SFRA for Welwyn Hatfield Borough Council. This is a significant reduction in the surface water regime, as the existing surface water runoff rate from site to the public sewer has been calculated to be 143 l/s.

The required surface water attenuation storage volume for the whole site has been sized using Micro Drainage Source Control to attenuate up to the 1 in 100 year rainfall event, with an allowance for climate change (40%).

The Micro Drainage preliminary estimates indicate approximately 2674m³ of attenuation is required. It is noted this attenuation volume will be reduced in due course, subject to a more detailed model using Micro Drainage Network, which will account for grassed landscaping areas, green roofs, and SuDS proposed across site.

It is proposed that surface water storage will be distributed within ponds, permeable paving course graded aggregate build-ups and geocellular storage tanks (subject to detailed design).

Appendix A – Topographical Survey

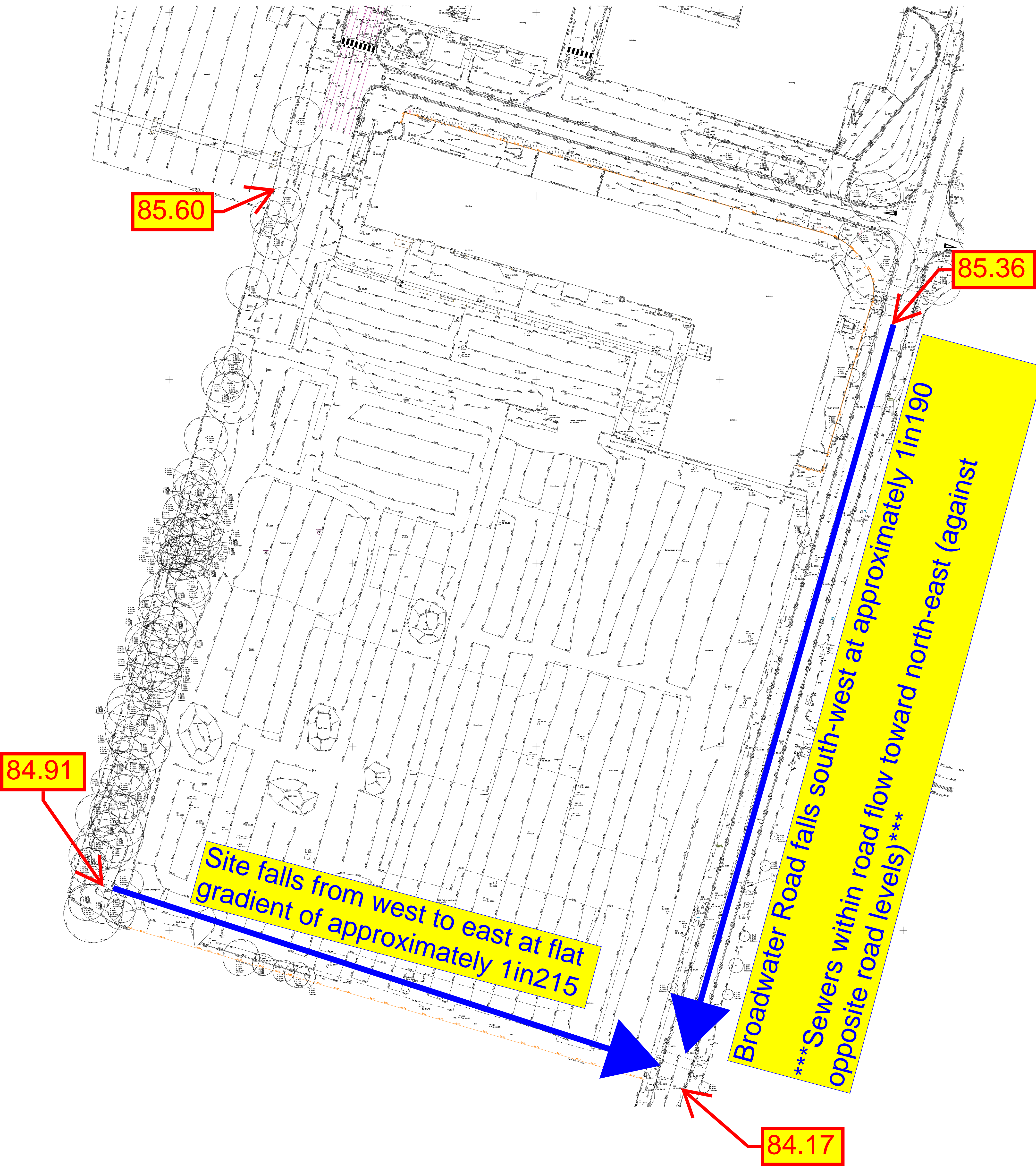
Appendix B – Thames Water Sewer Records

Appendix C – GPR Survey by MK Surveys

Appendix D – Proposed Drainage Layout

Appendix E – Existing Surface Water Rates and Micro Drainage Calculations

Appendix A – Topographical Survey



Appendix B – Thames Water Sewer Records



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

Scale: 1:1790
Width: 500m
Printed By: Vkumar1
Print Date: 10/11/2016
Map Centre: 524250,212750
Grid Reference: TL2412NW

Comments:

CDWS/CDWS Standard/2016_3443187

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
0903		
0902	85.57	81.33
2805	85.42	82.29
2804	85.52	78.36
2801	85.45	80.05
2903	85.77	79.65
2904	85.61	78.12
391A		
3802	84.9	79.57
3901	85.54	83
4801	84.52	79.15
4901	84.73	81.77
1504	84.59	80.58
1503	84.48	80.16
1604	84.2	83.27
1602	84.57	80.43
1603	84.5	79.65
2701	84.97	80.61
2501	83.71	80.25
4502	84.7	81.11
4504	84.51	81.02
4505	84.09	81.46
4602	83.12	79.88
4603	82.74	79.61
451A		
4503	85	81.29

REFERENCE	COVER LEVEL	INVERT LEVEL
0901	85.82	81.02
1801	85.58	83.67
2802	85.45	82.28
2803	85.47	79.98
2902	85.79	81.73
2901	85.76	81.72
391B		
3801	84.94	79.57
371A		
4702	84.04	78.76
4802	84.47	79.16
4902	85.22	83.35
1501	84.44	81.67
1502	84.29	79.96
1505	84.48	79.99
1601	84.47	81.13
2702	85.08	80.6
2703	84.97	78.92
2502	84.14	80.35
4506	84.67	81.09
4501	84.13	80.75
4701	84.06	78.69
4604	83.08	79.86
4601	82.66	79.53
3501	83.56	80.63
4507	84.97	81.3



Sewer Key - Commercial Drainage and Water Enquiry

Public Sewer Types (Operated & Maintained by Thames Water)

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

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

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

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

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

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

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

	Outfall
	Undefined End
	Inlet

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0118 925 1504.

Other Symbols

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

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

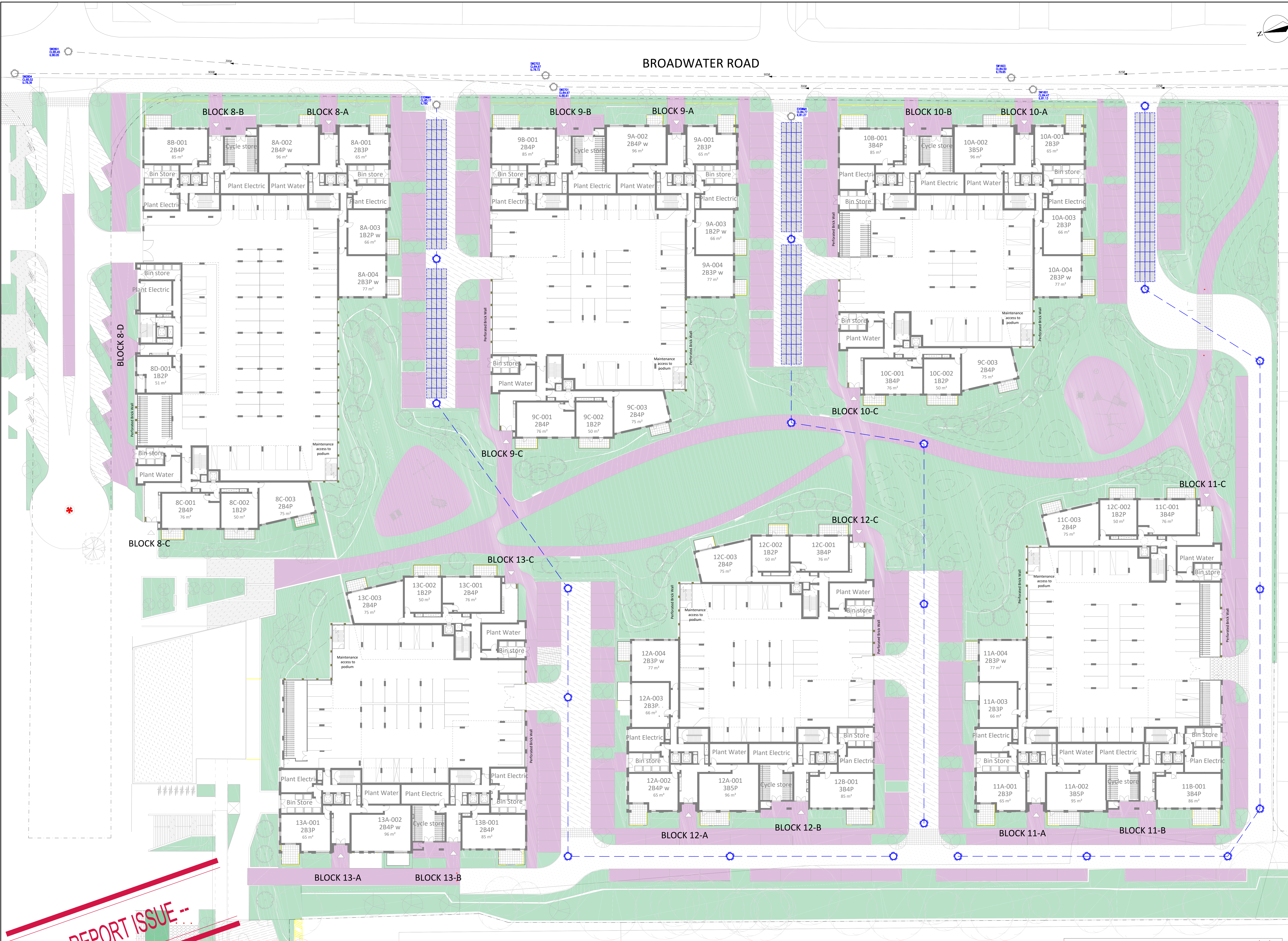
	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

	Foul Sewer		Surface Water Sewer
	Combined Sewer		Gully
	Culverted Watercourse		Proposed
			Abandoned Sewer

Appendix C – GPR Survey by MK Surveys

Appendix D – Proposed Drainage Layout



BROADWATER ROAD

OTTO ROAD

GENERAL NOTES:

- This drawing is to be read in conjunction with all relevant Architects and Engineers drawings and specifications.
- Do not scale from this drawing. All details and dimensions and levels are to be checked by the contractor prior to commencement of construction. Any discrepancies are to be reported to the Engineer.
- All levels are in meters & dimensions in millimeters unless noted otherwise.
- Design based on topographical survey and CCTV survey information available at the time of design. All existing sewers, connections, pipe sizes and invert levels to be confirmed by contractor prior to commencement of works to ensure connectivity. Any variance from the information shown should be reported to the engineer for review.
- Where existing drainage is being used, allowances should be made to remediate this drainage in line with available CCTV survey information.
- Where there is no requirement to keep existing drainage, allowances should be made to abandon this in line with Curtins drainage specification.
- Any new gully and external surface water inlet positions and associated falls to them are shown indicatively and to be designed set out by the Landscape Architect.
- Cover levels should be confirmed against Landscape Architects site design. Any discrepancy should be raised and coordinated to the engineer ASAP.
- All internal drainage points are shown indicatively and are to be designed and set out by the M&E engineer.
- Any drainage runs and their connections damaged through construction works should be replaced to sufficient standard.
- Division and abandonment of services associated with these designs by others.
- Soakage devices not considered suitable for this design.
- Lateral connections from internal drain points should be sized to match above ground designs, with minimum size of 1000.
- Perforated pipes to be concrete where specified.

KEY:

- PRIVATE DRAINAGE**
- 1500 — SURFACE WATER DRAIN
 - SWC 0.25.29 1.27.88 — SURFACE WATER CHAMBER
 - BELOW GROUND SURFACE WATER ATTENUATION STORAGE SYSTEM
 - PROPOSED GREEN AREA
 - PROPOSED PERMEABLE PAVING
- EXISTING DRAINAGE**
- SWC 0.25.29 1.27.88 — EXISTING SURFACE WATER MANHOLE TO REMAIN
 - 1500 — SURFACE WATER DRAIN TO REMAIN

P01	PRELIMINARY ISSUE	77.77.77	DSR	AS
Rev.	Description	Date	By	Chk.



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Status: PRELIMINARY

Project: SHREDDED WHEAT, METROPOLITAN

Dwg Title: PROPOSED DRAINAGE LAYOUT

Size:	A0	Date:	??	Drawn By:	D.ROLFE	Designed By:	A.SMITH	Checked By:	??
Scale:	1:250	Project No:	066571	Originator:	CUR	Zone:	00	Level:	00
		Type:	DR	Discipline:	C	Category:	90001	Rev:	P01

SURFACE WATER TO BE RESTRICTED TO 5 l/s/Ha

CCTV SURVEY TO CONFIRM LOCATION AND CONDITION OF EXISTING DRAINAGE.

REPORT ISSUE

Appendix E – Existing Surface Water Rates and Micro Drainage Calculations

Existing Surface Water Runoff Estimation

- * GPR Survey identified existing derelict building currently discharges surface water runoff to public sewer in Broadwater Road.

Rational Method

$$Q = 2.78 \phi i A$$

$$i = 50 \text{ mm/hr}$$

$$A = 1.03 \text{ Ha (Hard standing)}$$

$$Q = (2.78)(1)(50)(1.03)$$

$$Q = 143 \text{ l/s}$$

Shredded Wheat Factory – Preliminary Attenuation Estimates

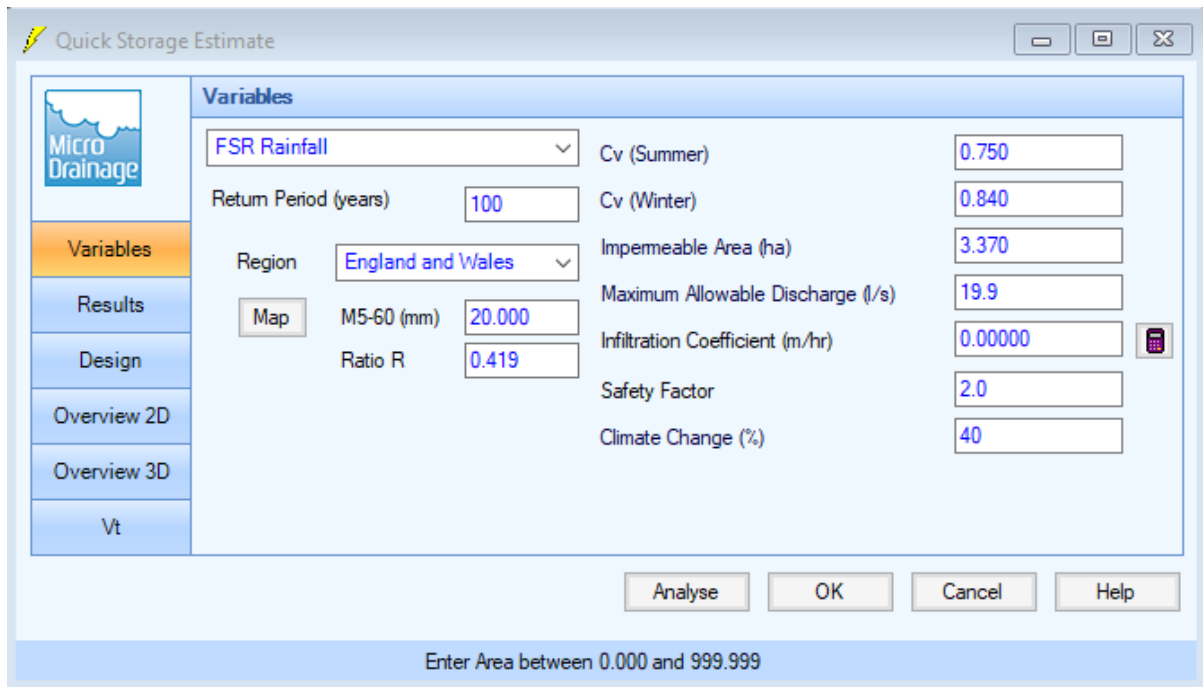
Runoff restricted to 5 l/s/Ha

Site area = 3.97 Ha

Runoff = (5 l/s/Ha) * (3.97 Ha) = **19.85 l/s**

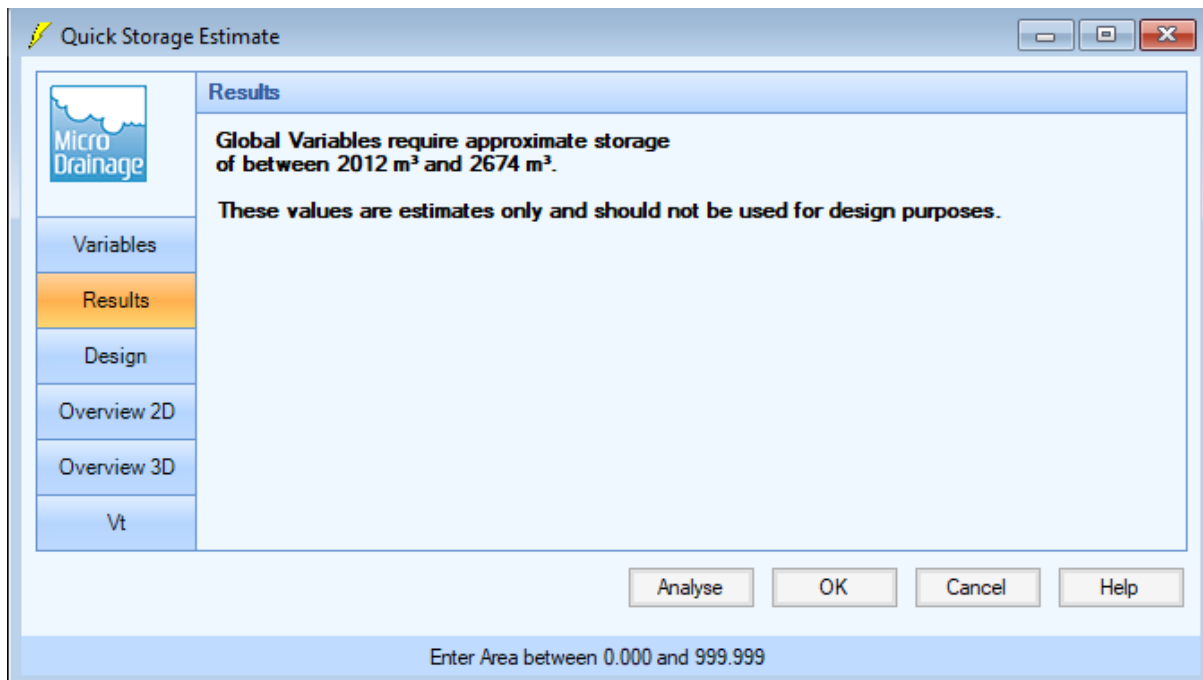
Assuming **85%** of site is impermeable:-

Impermeable area = (3.97 Ha) * (0.85) = **3.37 Ha**



The screenshot shows the 'Quick Storage Estimate' software window with the 'Variables' tab selected. The left sidebar contains a 'Micro Drainage' logo and a list of tabs: Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area displays various input fields for variables. The 'Return Period (years)' is set to 100. The 'Region' is set to 'England and Wales'. The 'Map' button is visible. The 'M5-60 (mm)' is set to 20.000, and the 'Ratio R' is set to 0.419. The 'Cv (Summer)' is 0.750, 'Cv (Winter)' is 0.840, and 'Impermeable Area (ha)' is 3.370. The 'Maximum Allowable Discharge (l/s)' is 19.9, 'Infiltration Coefficient (m/hr)' is 0.00000, 'Safety Factor' is 2.0, and 'Climate Change (%)' is 40. At the bottom, there are buttons for 'Analyse', 'OK', 'Cancel', and 'Help'. A status bar at the very bottom reads 'Enter Area between 0.000 and 999.999'.

Variable	Value
FSR Rainfall	
Return Period (years)	100
Region	England and Wales
Map	
M5-60 (mm)	20.000
Ratio R	0.419
Cv (Summer)	0.750
Cv (Winter)	0.840
Impermeable Area (ha)	3.370
Maximum Allowable Discharge (l/s)	19.9
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40



The screenshot shows the 'Quick Storage Estimate' software window with the 'Results' tab selected. The left sidebar is the same as the previous window. The main area displays the results of the calculation. It states: 'Global Variables require approximate storage of between 2012 m³ and 2674 m³. These values are estimates only and should not be used for design purposes.' At the bottom, there are buttons for 'Analyse', 'OK', 'Cancel', and 'Help'. A status bar at the very bottom reads 'Enter Area between 0.000 and 999.999'.

Global Variables require approximate storage of between 2012 m³ and 2674 m³.

These values are estimates only and should not be used for design purposes.

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