LANMOR Consulting
Civil Engineers & Transport Planners

Magdalen Road

Drainage Strategy

December 2023

231760/DS/OR/RS/01

LANMOR Consulting
Civil Engineers & Transport Planners

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1 INTRODUCTION

1.1 General

1.1.1 Lanmor Consulting Ltd has been appointed to provide a Drainage Strategy report for the proposed development of 27 Magdalen Road, Oxford, OX4 1RP.

1.1.2 Figure 1.1 below shows the location of the site.

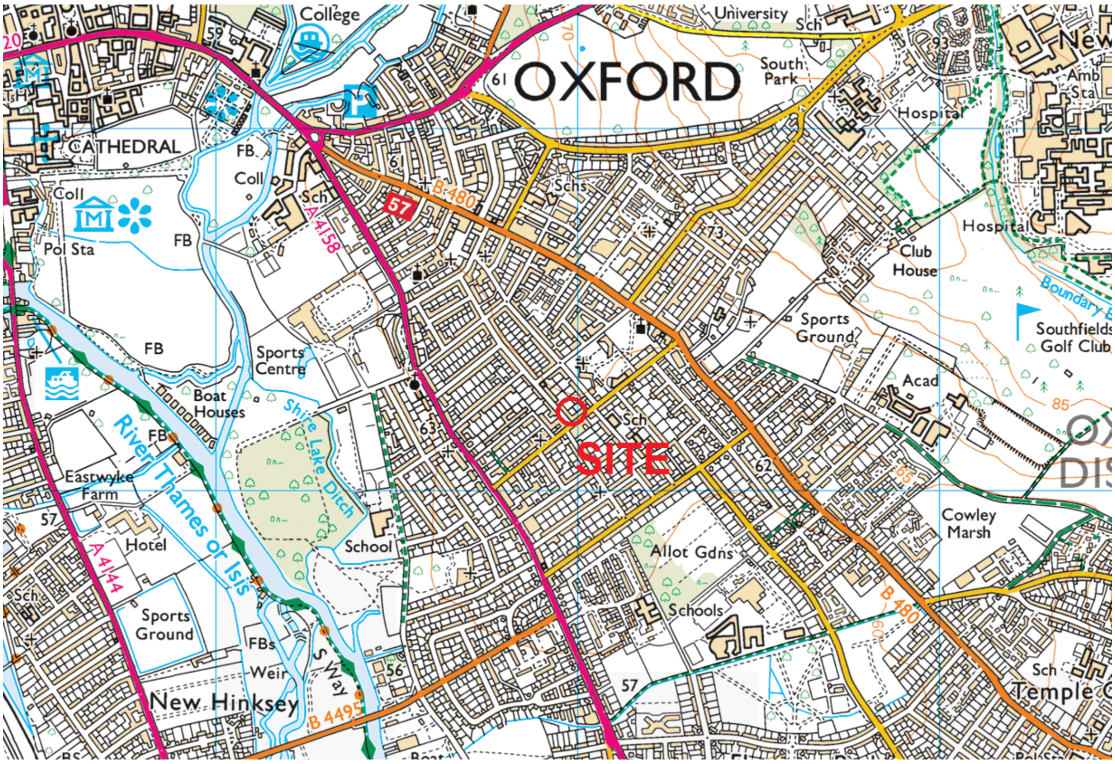


Figure 1.1 – Site Location

1.2 Scope

1.2.1 This report will consider the proposed drainage strategy for the site and flood risk, it will assess the site's current Greenfield and Brownfield runoff rates, suitable methods of discharging the runoff from the development and set the drainage strategy for the proposed development, including discharge rates and any requirements for attenuation.

1.2.2 The information and details within this report will be refined, modified and updated as the detailed design is progressed, post planning. The scope of works for this drainage strategy report is outlined below:

- Review available data relating to existing on-site drainage and other drainage networks in the vicinity of the site.
- Review of the site's ground conditions for suitability of SuDS.
- Consider the use of Sustainable Drainage Systems as an option for disposal of surface water runoff from the proposed development.
- Undertake drainage assessments of proposed buildings to establish discharge rates and attenuation requirements to deal with any increased surface water runoff.

2 EXISTING SITE AND PROPOSED DEVELOPMENT

2.1 Existing Site

2.1.1 The site is located at the junction of Magdalen Road and Hurst Street, Oxford in an area with a mixture of residential and commercial units. The site is currently comprised of a group of two units consisting of 2 and 2.5 storeys. The buildings are currently derelict with the ground floor of 27 Magdalen Road previously being occupied by a hardware shop.

2.2 Site Geology

2.2.1 The British Geological Survey (BGS) indicates that the application site is underlain by Weymouth Member – Mudstone. Sedimentary bedrock was formed between 163.5 and 157.3 million years ago during the Jurassic period. No information was available regarding the superficial geology of the site.

2.3 Proposed Site

2.3.1 The site proposes the demolition of the existing buildings and the construction of 6 flats being contained in a complex of two blocks. The flats will contain a total of 6 bathrooms, 6 bedrooms with the ability to accommodate a total of 10 people. The proposed site plan for the development has been included in Appendix A as drawing P23049/RFT/02/ZZ/DR/A/0101 Rev P02.

3 DRAINAGE STRATEGY

3.1 Existing Drainage Networks

3.1.1 As part of the investigation into the existing drainage regime for the site Thames Water sewer records were obtained to establish whether there are any nearby sewers. The records indicate that there is a foul sewer located in Hurst Street which connects into the sewer in Magdalen Road. The sewer in Hurst Street is indicated to be 225mm, increasing to 375mm in Magdalen Road, and flowing southwest.

3.1.2 There is also a surface water sewer in Hurst Street, and this is also indicated to be 225mm, increasing to 300mm in Magdalen Road, flowing northeast.

3.2 Proposed Foul Water Drainage

3.2.1 The proposed foul drainage for the site will exploit the existing sewer connection and so this will be as per the status quo.

3.3 Proposed Surface Water Drainage

3.3.1 With regards to discharge of surface water runoff from the development, the SuDS hierarchy has been considered when designing the drainage strategy for the site. Since the development will incorporate both pitched and flat roofs, blue roof attenuation was considered to be a viable option on part of the site for the capture and discharge of rainwater. This method of drainage is ideal for densely developed areas, where the potential for ground-level attenuation is restricted.

3.3.2 Rainwater harvesting was also considered, as a means of reusing surface water runoff within the building. However, these systems require a separate network of pipes within the property, as well as tanks and pumps to store the rainwater and distribute it throughout. It was considered impractical to implement rainwater harvesting systems on the site due to site constraints and excessive cost for the development.

3.3.3 In addition, for these systems to be successfully implemented there must be sufficient demand for water reuse otherwise this may lead to water quality issues. Furthermore, rainwater harvesting tanks should not be included in the assessment of attenuation required to store runoff from a development as there is no guarantee that the tank will be sufficiently empty to receive another storm.

3.3.4 Should the rainwater harvesting tank be full at the start of the storm, it will not be able to receive any more runoff, therefore additional storage of a similar size would be required to cater for all storm events and the rainwater harvesting tank will provide no benefit in terms of attenuation. For those reasons, and the excessive cost of providing the system, this method has been discounted.

3.3.5 Next on the SuDS Hierarchy is the use of ground infiltration techniques such as soakaways. The site is located in a densely developed suburban area with limited available land surrounding the property. Were soakaways to be used, the surface water discharge from any soakaway or infiltration system would risk damaging the foundations of the building, and so this method has been discounted.

3.3.6 Discharge to a watercourse is the next option on the Sustainable Drainage Hierarchy, however as the proposed development is not situated near any suitable watercourse, discharging via this method would therefore not be a viable option.

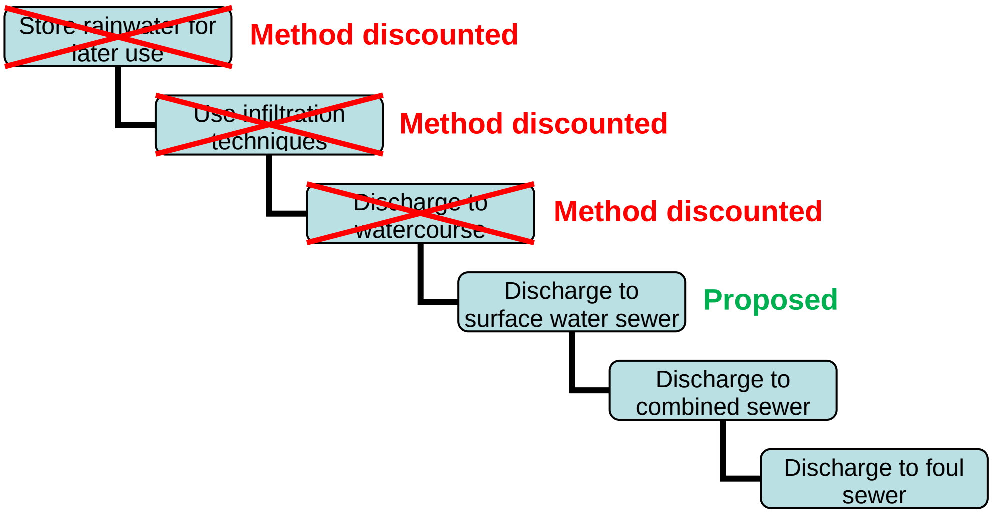


Figure 3.1 – SuDS Hierarchy

3.3.7 Next on the hierarchy is the discharge to a sewer and attenuating the flows. There is a surface water sewer in Hurst Street and so it is proposed to connect into this sewer to discharge surface water runoff from the site.

3.3.8 Calculations have been undertaken to determine the existing Greenfield and Brownfield runoff rates from the site to set the proposed discharge rates. The results are tabled below.

Return Period	Greenfield Rate (l/s)	Brownfield Rate (l/s)	Proposed Discharge		% Reduction
			Water Depth in Blue Roof (m)	Proposed Flow Rate (l/s)	
Q_{BAR}	0.1	-	-	-	-
1 in 1	0.1	2.5	0.047	0.2	92%
1 in 30	0.3	5.8	0.113	0.3	95%
1 in 100	0.4	7.7	0.152	0.4	95%
1 in 100 +40% CC	-	10.7	0.221	0.5	95%

Table 3.1 – Existing and Proposed Flow Rates

3.3.9 A blue roof drainage system with a 300mm deep reservoir will capture rainwater on the main roof of the proposed property, and this will attenuate the flow to the surface water sewer in Hurst Road. The total peak discharge rate from the proposed site for the 1 in 100-year event plus 40% climate change has been calculated at 0.5 l/s, which is a 95% reduction from the existing Brownfield rate.

3.3.10 An indicative drainage layout for the proposed development has been prepared and is included in Appendix C as drawing 231760/DS/01. Drainage calculations using MicroDrainage have been undertaken in order to estimate the depth of water within the blue roof, and to calculate the peak discharge rates from the site. The calculations have been completed for all events up to and including the 1 in 100-year event plus 40% climate change and show there will be a greater than 90% reduction in the peak flow rate for all return periods without resulting in flooding on site or in the surrounding area. Full calculations for the site have been included in Appendix C.

4 SUDS/SURFACE WATER MAINTENANCE

4.1.1 Regularly inspecting the surface water drainage network for blockages and clearing unwanted debris / silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event that road gullies become blocked, high pressure water jets can be used to clear the gully and ensure they are functioning correctly, this should be undertaken by certified trained professionals.

4.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories "regular maintenance", "occasional maintenance" and "remedial maintenance".

4.1.3 Regular maintenance of the drainage and SuDS features will include, inspections, removal of litter / debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

4.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

4.1.5 Following completion of the development a Management Company will be set up to maintain all the communal areas, including the drainage. It will be their responsibility to maintain the drainage network, including the SuDS elements.

4.1.6 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

4.1.7 Pipes are intended to be the main conveyance across the development. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

4.1.8 For manholes and pipes, the following maintenance will be required.

Manhole / Pipe Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 4.1 – Manhole, Catchpit and Pipe Maintenance Schedule

4.1.9 For blue roofs, the following maintenance schedule is recommended:

Blue Roof Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular inspections	Inspect all components including drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms

	Inspect for evidence of erosion at channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Occasional maintenance	Remove debris and litter to prevent clogging of inlet drains and interference	Six monthly and annually or as required
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 4.2 – Blue Roof Maintenance Schedule

4.1.10 For specialist pieces of equipment, maintenance brochures will be provided by the manufacturers. These will set out the frequency of inspections and correct methods of cleaning etc. that should be followed. It is recommended that once installed the facility should be inspected monthly for the first three months and thereafter at six monthly intervals or as advised in the maintenance brochure.

4.1.11 The above information is only intended as guidance in standard maintenance practise for surface water drainage and SuDS features. The above measures should be reviewed regularly and modified to suit the site conditions.

5 SUMMARY AND CONCLUSION

5.1.1 The site is located on Magdalen Road, Oxford in an area with a good mixture of residential and commercial units. The site proposes the demolition of the existing site and the construction of 6 flats being contained in a complex of two. The flats will contain a total of 6 bathrooms, 6 bedrooms with the ability to accommodate a total of 10 people.

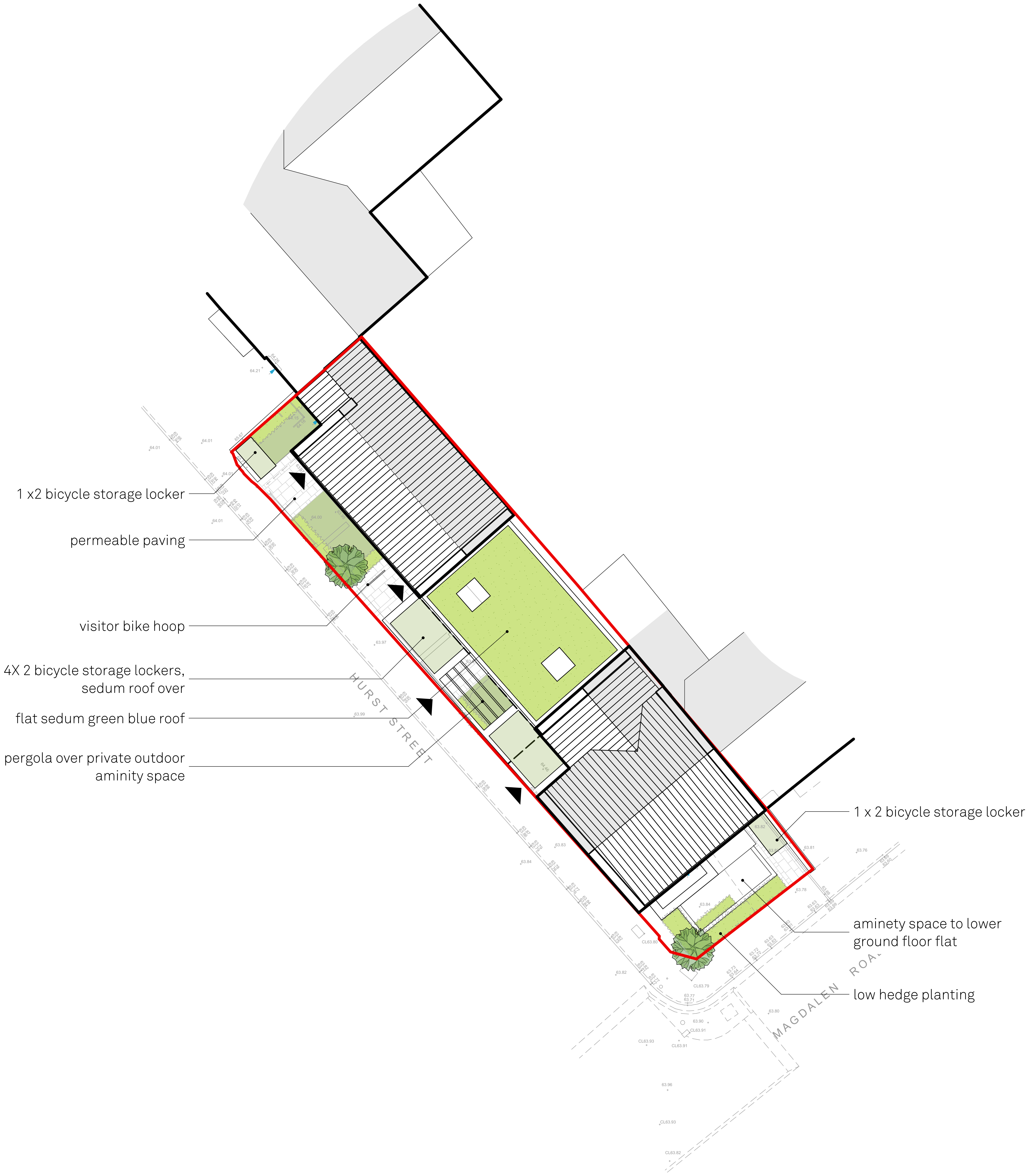
5.1.2 The proposed foul drainage for the site will exploit the existing sewer connection and so this will be as per the status quo. A blue roof drainage system with a 300mm deep reservoir will capture rainwater on the main roof of the proposed property, and this will attenuate the flow to the surface water sewer in Hurst Road.

5.1.3 The total peak discharge rate from the proposed site for the 1 in 100-year event plus 40% climate change has been calculated at 0.5 l/s, which is a 95% reduction from the existing Brownfield rate. Following a SuDS assessment of the site it was concluded that blue roof attenuation followed by discharge to the nearby sewer in Hurst Street was the most sustainable option available to the site.

5.1.4 For the reasons outlined within this report we see no reason to refuse planning permission on the grounds of there being insufficient capacity to discharge runoff from the development.

APPENDIX A

P23049/RFT/02/ZZ/DR/A/0101 Rev P02 – Proposed Site Plan



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AA	
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BB	1:200

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Magdalen Road, Oxford

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Site Plan Proposed

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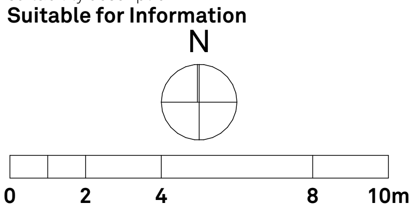
S2	Suitable for Information	P02

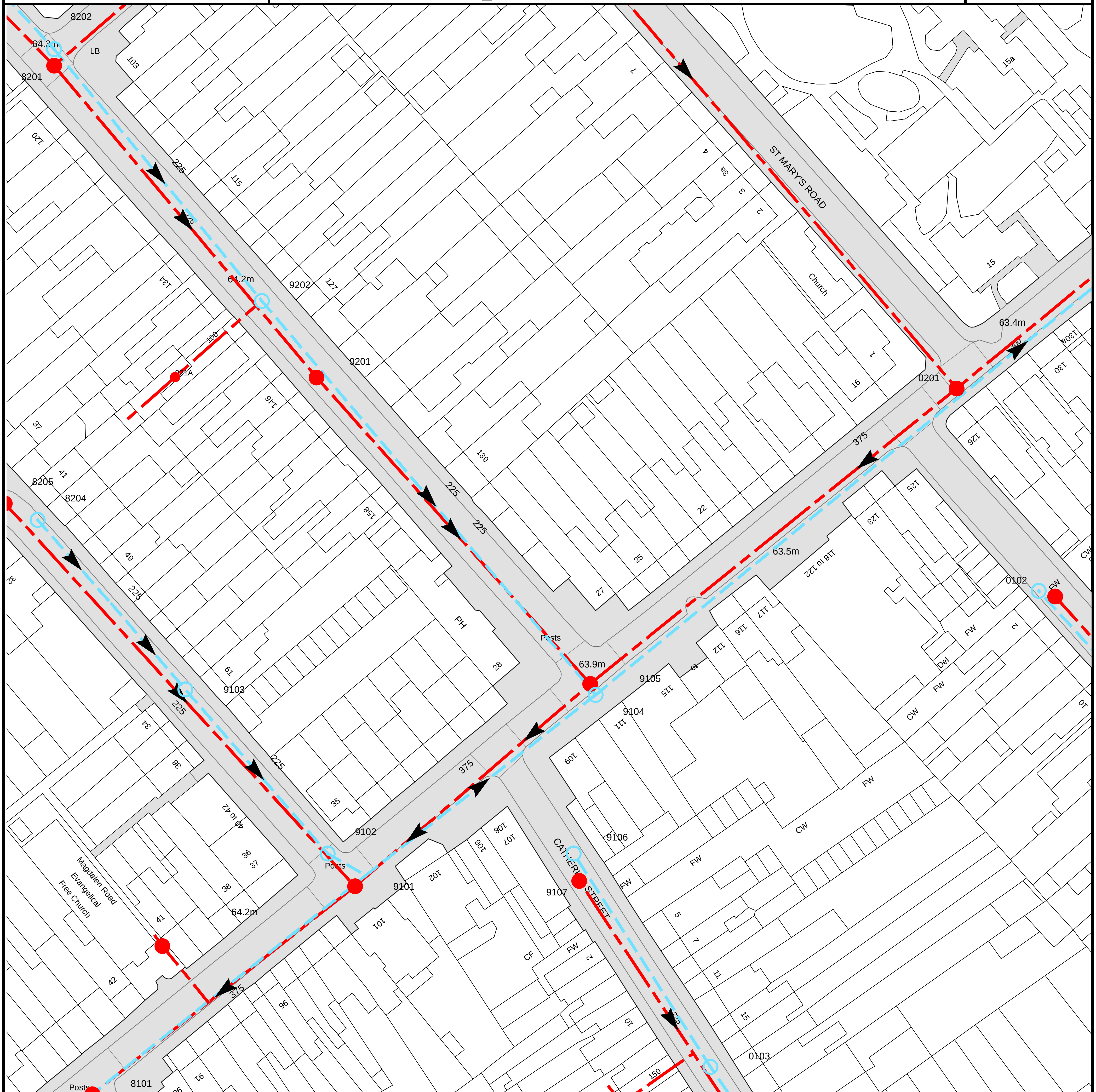
rev.	date	changes description	status	issued by
P02	22/11/2023		S2	
P01	07/09/2023		S2	MD



APPENDIX B

Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4923128



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 452982,205206

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8202	64.41	62.94
8201	64.42	62.06
0201	63.61	61.12
0102	62.53	n/a
0101	62.5	60.43
8205	64.58	62.75
8204	64.5	62.92
8101	64.54	n/a
9108	n/a	n/a
9103	64.23	62.75
9202	64.29	62.85
9201	64.33	61.72
9102	64.06	62.54
9101	64.21	61.1
9106	63.81	n/a
9107	63.84	61.45
9105	63.86	61.23
9104	63.78	62.44
0103	63.59	62.33
921A	n/a	n/a

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Storm Sewer

Sludge Sewer

Foul Trunk Sewer

Surface Trunk Sewer

Combined Trunk Sewer

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Vacuum

Thames Water Proposed

Vent Pipe

Gallery

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

Sewer

Culverted Watercourse

Proposed

Decommissioned Sewer

Content of this drainage network is currently unknown

Ownership of this drainage network is currently unknown

Sewer Fittings

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

Air Valve

Meter

Dam Chase

Vent

Fitting

Operational Controls

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

Ancillary

Drop Pipe

Control Valve

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.

Inlet

Outfall

Undefined End

Other Symbols

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

Change of Characteristic Indicator

Public / Private Pumping Station

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Chamber

Operational Site

Ducts or Crossings

Casement

Ducts may contain high voltage cables. Please check with Thames Water.

Conduit Bridge

Subway

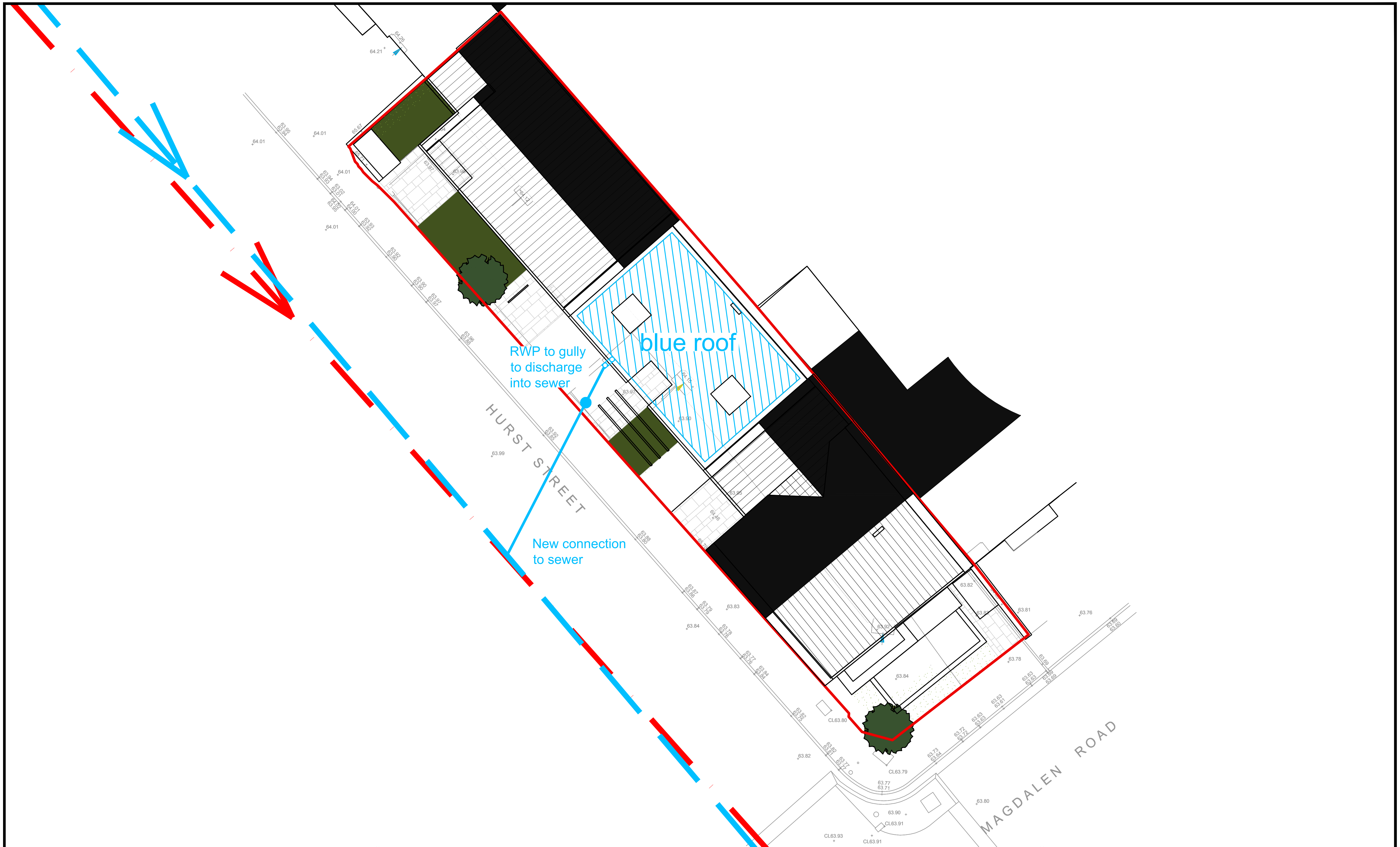
Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

APPENDIX C

231760/DS/01 – Proposed Drainage Strategy



Bice Investments Ltd

27 Magdalen Road
Oxford

Drainage Strategy

SCALE	DRAWN BY	PRJ No.	DWG No.
1:150	RS	231760	231760/DS/01

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MicroDrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	630	Urban	0.000
Area (ha)	0.029	Soil	0.450	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.1
QBAR Urban	0.1
Q100 years	0.4
Q1 year	0.1
Q30 years	0.3
Q100 years	0.4

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.113	0.113	0.3	5.0	Flood Risk
30 min Summer	0.145	0.145	0.4	6.4	Flood Risk
60 min Summer	0.173	0.173	0.4	7.6	Flood Risk
120 min Summer	0.191	0.191	0.4	8.4	Flood Risk
180 min Summer	0.194	0.194	0.4	8.5	Flood Risk
240 min Summer	0.194	0.194	0.4	8.5	Flood Risk
360 min Summer	0.191	0.191	0.4	8.4	Flood Risk
480 min Summer	0.186	0.186	0.4	8.2	Flood Risk
600 min Summer	0.180	0.180	0.4	7.9	Flood Risk
720 min Summer	0.174	0.174	0.4	7.7	Flood Risk
960 min Summer	0.162	0.162	0.4	7.1	Flood Risk
1440 min Summer	0.140	0.140	0.4	6.1	Flood Risk
2160 min Summer	0.114	0.114	0.3	5.0	Flood Risk
2880 min Summer	0.096	0.096	0.3	4.2	Flood Risk
4320 min Summer	0.071	0.071	0.2	3.1	Flood Risk
5760 min Summer	0.056	0.056	0.2	2.5	Flood Risk
7200 min Summer	0.046	0.046	0.2	2.0	Flood Risk
8640 min Summer	0.039	0.039	0.2	1.7	Flood Risk
10080 min Summer	0.034	0.034	0.2	1.5	Flood Risk
15 min Winter	0.127	0.127	0.3	5.6	Flood Risk
30 min Winter	0.163	0.163	0.4	7.2	Flood Risk
60 min Winter	0.195	0.195	0.4	8.6	Flood Risk
120 min Winter	0.217	0.217	0.5	9.5	Flood Risk
180 min Winter	0.221	0.221	0.5	9.7	Flood Risk
240 min Winter	0.219	0.219	0.5	9.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	5.1	18
30 min Summer	90.705	0.0	6.7	33
60 min Summer	56.713	0.0	8.5	62
120 min Summer	34.246	0.0	10.2	120
180 min Summer	25.149	0.0	11.3	154
240 min Summer	20.078	0.0	12.0	184
360 min Summer	14.585	0.0	13.1	250
480 min Summer	11.622	0.0	13.9	318
600 min Summer	9.738	0.0	14.5	386
720 min Summer	8.424	0.0	15.1	456
960 min Summer	6.697	0.0	16.0	588
1440 min Summer	4.839	0.0	17.3	852
2160 min Summer	3.490	0.0	18.8	1232
2880 min Summer	2.766	0.0	19.9	1588
4320 min Summer	1.989	0.0	21.4	2332
5760 min Summer	1.573	0.0	22.6	3048
7200 min Summer	1.311	0.0	23.6	3744
8640 min Summer	1.129	0.0	24.3	4488
10080 min Summer	0.994	0.0	25.0	5144
15 min Winter	138.153	0.0	5.7	18
30 min Winter	90.705	0.0	7.5	32
60 min Winter	56.713	0.0	9.5	60
120 min Winter	34.246	0.0	11.4	118
180 min Winter	25.149	0.0	12.6	170
240 min Winter	20.078	0.0	13.4	192

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	0.214	0.214	0.5	9.4	Flood Risk
480 min Winter	0.206	0.206	0.4	9.1	Flood Risk
600 min Winter	0.197	0.197	0.4	8.7	Flood Risk
720 min Winter	0.187	0.187	0.4	8.2	Flood Risk
960 min Winter	0.169	0.169	0.4	7.4	Flood Risk
1440 min Winter	0.138	0.138	0.4	6.1	Flood Risk
2160 min Winter	0.105	0.105	0.3	4.6	Flood Risk
2880 min Winter	0.083	0.083	0.3	3.6	Flood Risk
4320 min Winter	0.056	0.056	0.2	2.5	Flood Risk
5760 min Winter	0.042	0.042	0.2	1.8	Flood Risk
7200 min Winter	0.033	0.033	0.2	1.5	Flood Risk
8640 min Winter	0.030	0.030	0.1	1.3	Flood Risk
10080 min Winter	0.027	0.027	0.1	1.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	14.585	0.0	14.6	268
480 min Winter	11.622	0.0	15.6	344
600 min Winter	9.738	0.0	16.3	418
720 min Winter	8.424	0.0	16.9	492
960 min Winter	6.697	0.0	17.9	634
1440 min Winter	4.839	0.0	19.4	896
2160 min Winter	3.490	0.0	21.1	1280
2880 min Winter	2.766	0.0	22.3	1644
4320 min Winter	1.989	0.0	24.0	2376
5760 min Winter	1.573	0.0	25.4	3056
7200 min Winter	1.311	0.0	26.4	3752
8640 min Winter	1.129	0.0	27.3	4392
10080 min Winter	0.994	0.0	28.0	5112

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.020

Time From:	(mins) To:	Area (ha)
0	4	0.020

Model Details

Storage is Online Cover Level (m) 0.300

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	**Area (m²)**
0.000	44.0

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 0.000

Event: 180 min Winter