Morgan Structural Limited
Blending Structure with Architecture

UYS Storage Facility, Oxford

Drainage Technical Note 01

Client:	Cryer & Coe Architects
Date:	20/03/2024
Project No:	12011
Rev:	0
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1. Introduction:

1.1 Morgan Structural Ltd were instructed by Cryer & Coe Architects to produce a drainage strategy report to support the planning submission for the proposed scheme at UYS, Oxford.

1.2 The proposals are based on an initial site visit and tracing survey completed by Morgan Structural and Drain Technology completed on 24th March 2024.

2. Existing Site Conditions & Drainage:

2.1 The site is currently home to a large industrial unit that was previously used for the storage, distribution and manufacture of car parts.

2.2 The site is located at the end of Garsington Road as part of the Unipart Business Centre, Oxford.

2.3 Currently there is an access road, various concrete service yards, a main building and a temporary building located within a car park.

2.4 To the south and west of the site is a mixture of open scrub land and existing storage areas as part of the Unipart Business Centre. To the east there is open farmland as well as the Hollow Brook. To the north lies an abandoned railway line and woodland before reaching Oxford Road.

2.5 The existing foul drainage system currently drains to a pumping station located to the east of the temporary building in the car park and appears to be out of commission due to the build-up of foul water within the pumping chamber and the surrounding network.

2.6 The existing surface water system drains to wards the south-east corner of the site before discharging towards the Hollow Brook via a 300mm diameter pipe as well as a large petrol interceptor.

2.7 The roof water from the main building is collected internally at high level before discharging at points along the perimeter of the building.

2.8 For an indicative layout of the existing system see Morgan Structural drawing: *MSL-120131-XX-DR-C-3000_P01 - Drainage Strategy*

3. Proposed Development & Surface Water Drainage:

3.1 It is proposed to demolish the existing buildings on site and to provide a secure, fenced open storage facility.

3.2 The intention is to maintain as much of the existing system as possible and continue discharging to the Hollow Brook but at a reduced discharge rate and provide attenuation storage in the form of a buried crate system.

3.3 Greenfield runoff rates have been calculated based on the proposed impermeable areas (same as current) and Causeway Flow Software's internal IH124 Method. These calculations are summarised below.

Return Period (Years)	Flow Rate (l/s)
1	8.3
30	19.1
100	24.2
QBar	**9.8**

3.4 Given the intention of the site is to keep the impermeable area as per current and keep works to a minimum to avoid intense workings to remove concrete, providing suitable mitigation to achieve greenfield discharge from site will not be possible.

3.5 It is therefore proposed that a reasonable betterment be provided to existing discharge rates presently produced from site.

3.6 Based on the present impermeable areas, Causeway Flow calculations have been undertaken to confirm the brownfield rates generated from site and are included in **Appendix 1**. These are summarised as follows:

Return Period (Years)	Flow Rate (l/s)
1	314.0
30	763.0
100	990.5

3.7 Whilst these are the calculated brownfield rates from site, it is acknowledged that outfall from site is currently provided by a 300mm diameter pipe, which is assumed to connect to the Hollow Brook in the southeast.

3.8 Given the flatness of the site and surrounding area, it is assumed this outfall pipe will be laid at a gentle gradient. Assuming the 300mm diameter pipe has been laid to achieve a self-cleanse velocity of 1l/s, the gradient of the pipe should be 1:238.

3.9 On this basis, HR Wallingford *"Tables for the hydraulic design of pipes, sewer and channels"* states that the maximum flow through the pipe is 71.6l/s.

3.10 Betterment will be provided on this value, as opposed to calculated brownfield rates, and it is proposed to restrict flows by 50% to 35.8l/s.

3.11 Through restriction of flows to 35.8l/s from site, it has been calculated an attenuation tank of 1000m^2 x 0.8m depth is required to provide suitable storage for storm events up to the 1 in 100Year storm with 40% Climate Change.

3.12 The proposed attenuation calculations from Causeway Flow are included in **Appendix 2**.

3.13 A Drainage Strategy has been produced by Morgan Structural, ref *MSL-120131-XX-DR-C-3000_P01,* and is included in **Appendix 3**.

4. Water Quality:

4.1 The SuDS Manual (CIRIA C753) states that the design of surface water drainage should consider minimising contaminants in surface water runoff discharged from site. The level of treatment required depends on the proposed land use, according to the pollution hazard indices.

4.2 During the survey of the existing drainage system, an existing petrol and oil interceptor was found at the site located beneath existing trees. As part of the proposals this will be replaced with a new interceptor as specified on the drainage strategy drawing.

4.3 The new petrol and oil separator will remove the majority of contaminants from site surface water runoff.

4.4 Additional methods of good practise will be utilised across the site including:

- All gullies having suitable silt traps/catchpits to reduce sediments entering the system.
- Upstream and downstream chambers of attenuation features have suitable catchpits to reduce sediments/particles and their associated risk of blockage.

4.5 Further measures recommended for incorporation are channel drains which incorporate filter mediums, such as Meaclean Pro, to treat runoff at source.

5. Proposed Foul Water Drainage:

5.1 It is proposed to drain the foul sewerage utilising the existing foul pumping station subject to a detailed condition survey and re-commissioning.

APPENDIX 1

Causeway Flow Brownfield Runoff Calculations

Design Settings

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	40
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	1.140	5.00	76.500	1200	456906.075	204299.508	1.800
S2	1.140	5.00	76.500	1200	456901.359	204278.412	1.800
S3	0.000		76.500	1200	456931.257	204277.319	2.017
OUTFALL	0.000		76.500	1200	456939.038	204271.333	2.030

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	S3	33.563	0.600	74.700	74.633	0.067	500.0	600	5.52	50.0
2.000	S2	S3	29.918	0.600	74.700	74.640	0.060	500.0	600	5.46	50.0
1.001	S3	OUTFALL	9.817	0.600	74.483	74.470	0.013	755.2	750	5.68	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.082	305.9	216.3	1.200	1.267	1.140	0.0	374	1.169
2.000	1.082	305.9	216.3	1.200	1.260	1.140	0.0	374	1.169
1.001	1.010	446.3	432.6	1.267	1.280	2.280	0.0	600	1.142

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	33.563	500.0	600	Circular	76.500	74.700	1.200	76.500	74.633	1.267
2.000	29.918	500.0	600	Circular	76.500	74.700	1.200	76.500	74.640	1.260
1.001	9.817	755.2	750	Circular	76.500	74.483	1.267	76.500	74.470	1.280

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S3	1200	Manhole	Adoptable
2.000	S2	1200	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.001	S3	1200	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
Summer CV	0.750
Winter CV	0.840
Analysis Speed	Normal
Skip Steady State	x
Drain Down Time (mins)	240
Additional Storage (m³/ha)	20.0

Simulation Settings

Check Discharge Rate(s)	✓	100 year (l/s)	2.0
1 year (l/s)	0.5	Check Discharge Volume	x
30 year (l/s)	1.5		

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 %)
1	0	0	0
30	0	0	0
100	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	2.280	Betterment (%)	0
SAAR (mm)	632	QMed	0.6
Host	1	QBar	0.6
BFIHost	0.980	Q 1 year (l/s)	
Region	6	Q 30 year (l/s)	
QBar/QMed conversion factor	1.136	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	75.008	0.308	160.5	4.2506	0.0000	OK
15 minute winter	S2	10	75.005	0.305	160.5	4.2092	0.0000	OK
15 minute winter	S3	11	74.894	0.411	310.7	0.4651	0.0000	OK
15 minute winter	OUTFALL	11	74.812	0.342	314.0	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 winter	S1	1.000	S3	155.5	1.191	0.508	4.3930	
15 minute winter	S2	2.000	S3	155.4	1.218	0.508	3.8393	
15 minute winter	S3	1.001	OUTFALL	314.0	1.419	0.703	2.1723	148.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	75.325	0.625	394.4	8.6179	0.0000	SURCHARGED
15 minute winter	S2	10	75.317	0.617	394.4	8.5134	0.0000	SURCHARGED
15 minute winter	S3	10	75.182	0.699	763.5	0.7904	0.0000	OK
15 minute winter	OUTFALL	11	75.012	0.542	763.0	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 winter	S1	1.000	S3	381.5	1.366	1.247	9.2608	
15 minute winter	S2	2.000	S3	382.4	1.372	1.250	8.2198	
15 minute winter	S3	1.001	OUTFALL	763.0	1.962	1.709	3.7675	362.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute winter	S1	10	75.587	0.887	511.6	12.2369	0.0000	SURCHARGED
15 minute winter	S2	10	75.568	0.868	511.6	11.9749	0.0000	SURCHARGED
15 minute winter	S3	10	75.329	0.846	989.6	0.9566	0.0000	SURCHARGED
15 minute winter	OUTFALL	11	75.084	0.614	990.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute winter	S1	1.000	S3	495.1	1.758	1.618	9.4539	
15 minute winter	S2	2.000	S3	494.5	1.756	1.617	8.4272	
15 minute winter	S3	1.001	OUTFALL	990.5	2.282	2.219	4.0530	470.3

APPENDIX 2

Proposed Attenuation Calculations – Causeway Flow

Design Settings

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	40
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00

Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	1.140	5.00	76.500	1200	456906.075	204299.508	1.500
S2	1.140	5.00	76.500	1200	456901.359	204278.412	1.500
S3	0.000		76.500	1800	456931.257	204277.319	1.567
OUTFALL	0.000		76.500	1200	456939.038	204271.333	1.608

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	S3	33.563	0.600	75.000	74.933	0.067	500.0	600	5.52	50.0
2.000	S2	S3	29.918	0.600	75.000	74.940	0.060	500.0	600	5.46	50.0
1.001	S3	OUTFALL	9.817	0.600	74.933	74.892	0.041	239.4	300	5.68	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.082	305.9	216.3	0.900	0.967	1.140	0.0	374	1.169
2.000	1.082	305.9	216.3	0.900	0.960	1.140	0.0	374	1.169
1.001	1.011	71.5	432.6	1.267	1.308	2.280	0.0	300	1.025

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	33.563	500.0	600	Circular	76.500	75.000	0.900	76.500	74.933	0.967
2.000	29.918	500.0	600	Circular	76.500	75.000	0.900	76.500	74.940	0.960
1.001	9.817	239.4	300	Circular	76.500	74.933	1.267	76.500	74.892	1.308

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S3	1800	Manhole	Adoptable
2.000	S2	1200	Manhole	Adoptable	S3	1800	Manhole	Adoptable
1.001	S3	1800	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
Summer CV	0.750

Winter CV	0.840
Analysis Speed	Normal
Skip Steady State	x
Drain Down Time (mins)	240
Additional Storage (m^3/ha)	20.0

Simulation Settings

Check Discharge Rate(s)	✓	100 year (l/s)	2.0
1 year (l/s)	0.5	Check Discharge Volume	x
30 year (l/s)	1.5		

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 %)
1	0	0	0
30	0	0	0
100	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	2.280	Betterment (%)	0
SAAR (mm)	632	QMed	0.6
Host	1	QBar	0.6
BFIHost	0.980	Q 1 year (l/s)	
Region	6	Q 30 year (l/s)	
QBar/QMed conversion factor	1.136	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node S3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0258-3580-0800-3580
Invert Level (m)	74.933	Min Outlet Diameter (m)	0.300
Design Depth (m)	0.800	Min Node Diameter (mm)	1500
Design Flow (l/s)	35.8		

Node S3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	74.933
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	192

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1000.0	0.0	0.800	1000.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	8	75.468	0.468	160.6	7.6367	0.0000	OK
15 minute winter	S2	10	75.304	0.304	160.6	4.9716	0.0000	OK
180 minute winter	S3	128	75.154	0.221	79.0	210.5869	0.0000	OK
15 minute summer	OUTFALL	1	74.892	0.000	13.0	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 winter	S1	1.000	S3	186.7	2.325	0.610	4.0062	
15 minute winter	S2	2.000	S3	156.4	1.221	0.511	3.8340	
180 minute winter	S3	Hydro-Brake®	OUTFALL	30.2				287.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	6	75.552	0.552	394.1	9.0195	0.0000	OK
15 minute winter	S2	10	75.536	0.536	394.1	8.7453	0.0000	OK
120 minute winter	S3	116	75.483	0.550	241.6	523.7673	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	74.892	0.000	35.4	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 winter	S1	1.000	S3	395.1	2.740	1.292	5.1880	
15 minute winter	S2	2.000	S3	382.1	1.622	1.249	6.9976	
120 minute winter	S3	Hydro-Brake®	OUTFALL	35.8				589.3

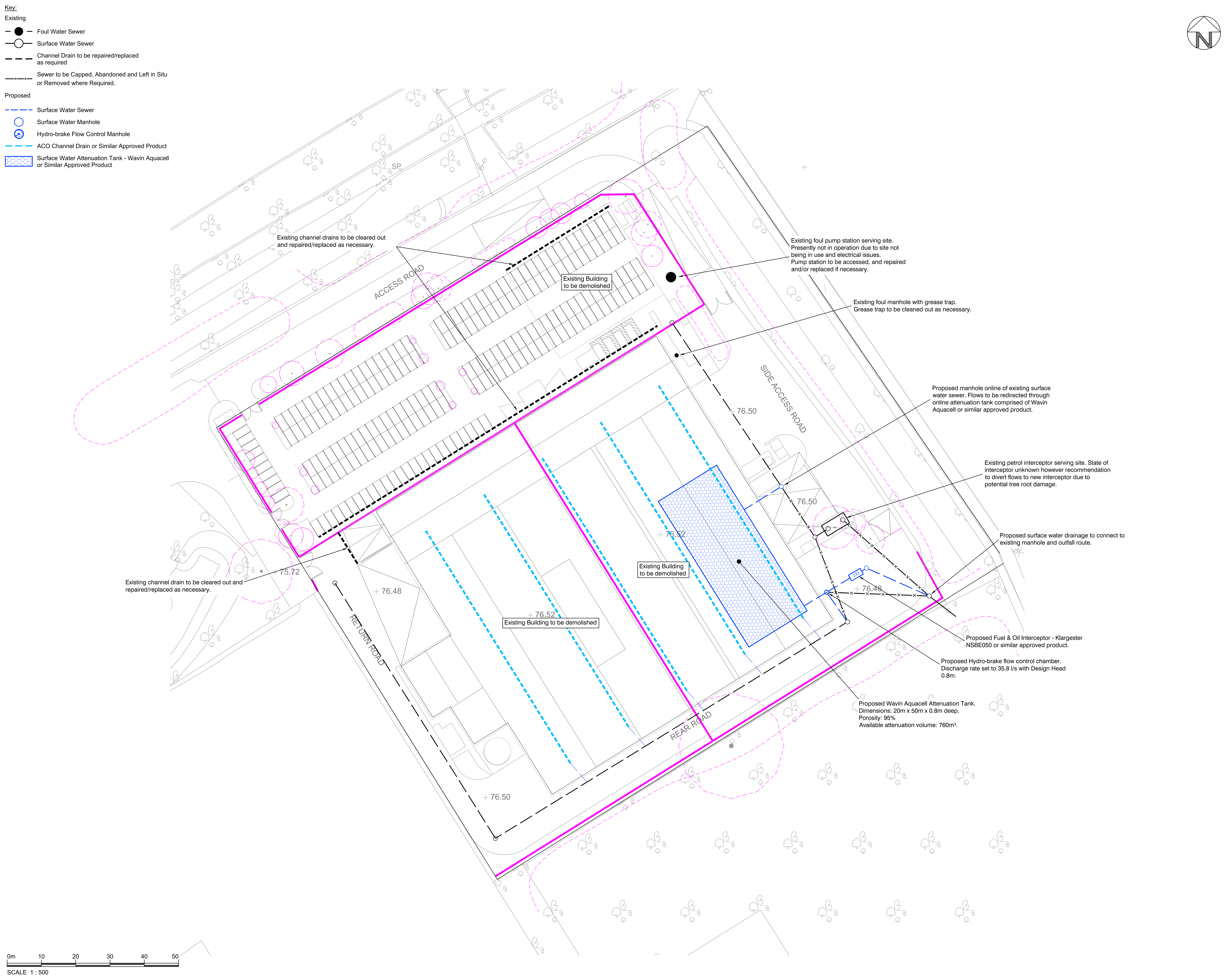
Results for 100 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S1	172	75.708	0.708	119.1	11.5603	0.0000	SURCHARGED
180 minute winter	S2	172	75.708	0.708	119.1	11.5607	0.0000	SURCHARGED
180 minute winter	S3	172	75.708	0.775	229.0	737.8652	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	74.892	0.000	35.8	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)
180 minute winter	S1	1.000	S3	114.4	1.229	0.374	9.4539	
180 minute winter	S2	2.000	S3	114.6	0.873	0.375	8.4272	
180 minute winter	S3	Hydro-Brake®	OUTFALL	35.8				751.8

APPENDIX 3

Proposed Drainage Strategy Drawing
MSL-120131-XX-DR-C-3000_P01



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Refer to the relevant Construction (Design and Management) documentation where applicable.
It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drainage Notes

1. All private drainage shall be in accordance with BS8301 and relevant sections of Approved Document H of the Building Regulations.
2. The contractor is to check the level of existing sewers being used as outfalls or crossing proposed drainage runs PRIOR to laying any pipes. Any discrepencies are to be reported to the Engineer
3. For private drains where cover to pipes is less than 900mm in vehicular areas or 600mm in other areas protection in the form of a 100mm thick concrete pad shall be provided over the pipe granular surround.
4. Where drains do not exceed 600mm deep, plastic or clay access fittings minimum diameter 225mm shall be used. Elsewhere proprietary plastic or precast concrete inspection chambers shall be used. Unless shown otherwise FW inspection chambers are to be 750mm below dpc level and SW chambers and rodding eyes to be 600mm below dpc.
5. All gullies and rainwater downpipes connected directly to drains are to be roddable.
6. All drainage shall be laid upstream and each run between manholes shall be laid complete prior to backfilling. Where this is not practical trial holes or other means of identifying the line and level of services shall be carried out prior to works commencing.
7. All branch drains, or connections, are to discharge to the collectors obliquely, and in the direction of the main flow.

Drainage Calculations:

Existing Impermeable Area: 2.28Ha

Brownfield runoff using the Rational Method:

Q = CiA

Q = 2.78 x 50 x 2.28

Q = 316.9 l/s

Greenfield using IH124 via Causeway Flow:

Q1Yr	-	8.3 l/s
Q30Yr	-	19.1 l/s
Q100Yr	-	24.2 l/s
QBar	**-**	**9.8 l/s**

Brownfield using Causeway Flow:

Q1Yr	-	314.0 l/s
Q30Yr	-	763.0 l/s
Q100Yr	-	990.5 l/s

Betterment at 40%:

Q1Yr	-	188.4 l/s
Q30Yr	-	457.8 l/s
Q100Yr	-	594.3 l/s

Betterment at 50%:

Q1Yr	-	157.0 l/s
Q30Yr	-	381.5 l/s
Q100Yr	-	495.2 l/s

Based on the assumption that the existing 300Ø outfall pipe is laid at flattest grade to achieve self cleanse (1:238) this only enables discharge of **71.6 l/s.**

If limited to 50% of the 300Ø pipe discharge rate assumed above, **35.8l/s**, Flow requires:

1000m² x 0.8m deep attenuation tank.

Rev	Date	Description	By
P01	20.03.24	First issue for discussion	NT

Client
Charterhouse

Project
UYS Oxford, Garsington Road, OX4 2BW

Title
Proposed Drainage Strategy

Drawing Status
PRELIMINARY

Drawn	Checked	Approved	Date	Scale @ A1
NT	GW	NT	Mar 2024	1:500

Project No.	Drawing No.	Revision
120131	MSL-120131-XX-DR-C-3000	P01

Morgan Structural Limited
Blending Structure with Architecture
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