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BLOCK A, THE CRESCENT, NEWPORT

SAB COMPLIANCE REPORT

prepared for

Newport City Homes

Date: November 2023

Document ref no.

21326-R-651-A



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SAB COMPLIANCE STRATEGY

21326-R-651

Document Control

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Approval	Director	Andrew Villis	15 November 2023	
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Signatories in this approval box have checked this document in line with the requirements of QuadConsult QMS Procedures				

Revision History

Revision	Date	Purpose/Status	Approved
0	15-11-23	PRELIMINARY	
A	14.08.25	PreSAB	
B			
C			
D			
E			
F			

Distribution

	Function Title	Company	Name
1	PreSAB Application	Newport Council	
2			
3			

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References

- 1 CIRIA – The SuDS Manual (C753)
- 2 UK SUDS (www.uksuds.com)
- 3 Welsh Water Asset Plans
- 5 Google Maps
- 6 Ordnance Survey Mapping
- 7 BRE Digest 365 Soakaway Design
- 8 National Soil Resources Institute (SoilScapes)
- 10 NRW Flood Risk Map for Planning
- 12 Soilscape Soil Type Mapping

Abbreviations

DCWW	DWR Cymru Welsh Water
A.O.D.	Above Ordnance Datum
NRW	Natural Resources Wales
FW	Foul Water
SW	Surface Water
SuDS	Sustainable Drainage Systems
l/s	Litres Per Second
CSO	Combined Sewer Overflow
SSI	Site of Special Scientific Interest
SuDs	Sustainable Drainage Systems
SAB	SuDs Approval Body

This document has been created during the design stage of the project and should not be used as a replacement for the final operation and maintenance requirements of the proposed works. It shall remain relative only to those features identified on the attached plan. This document is intended to support the development of the official operation and maintenance document which shall be the responsibility of the principal contractor.

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1.0 INTRODUCTION

- 1.1 QuadConsult Ltd have been commissioned to produce a drainage strategy for Newport City Homes.
- 1.2 This report will draw upon information supplied by the Client, Welsh Water and that available within the public domain including the local authority Planning Portal.
- 1.3 The aim of this report is to demonstrate that a suitable site-specific surface and foul water drainage strategy can be implemented to service the proposed development.

2.0 SITE LOCATION & DESCRIPTION

- 2.1 Block A forms an additional phase of the wider proposed scheme totalling 6 blocks. Block B-F have formed a previous planning application and site outside of SAB approval. The former Transport Yard site is brownfield, approximately 0.9 ha in area and previously comprised buildings, concrete slabs and hardstanding's which have subsequently been demolished either wholly or in part.
- 2.2 A review of the pre-demolition survey indicates the presence of surface water drainage infrastructure although the current standing and status of this is not known. In more recent times the site has been infilled and plateaued in an engineered manner, the bund along the southern and western boundary's form part of the wider strategic flood defence program.
- 2.3 Existing Dŵr Cymru Welsh Water (DCWW) services within the site have also been subject to protection measures as part of the development works.

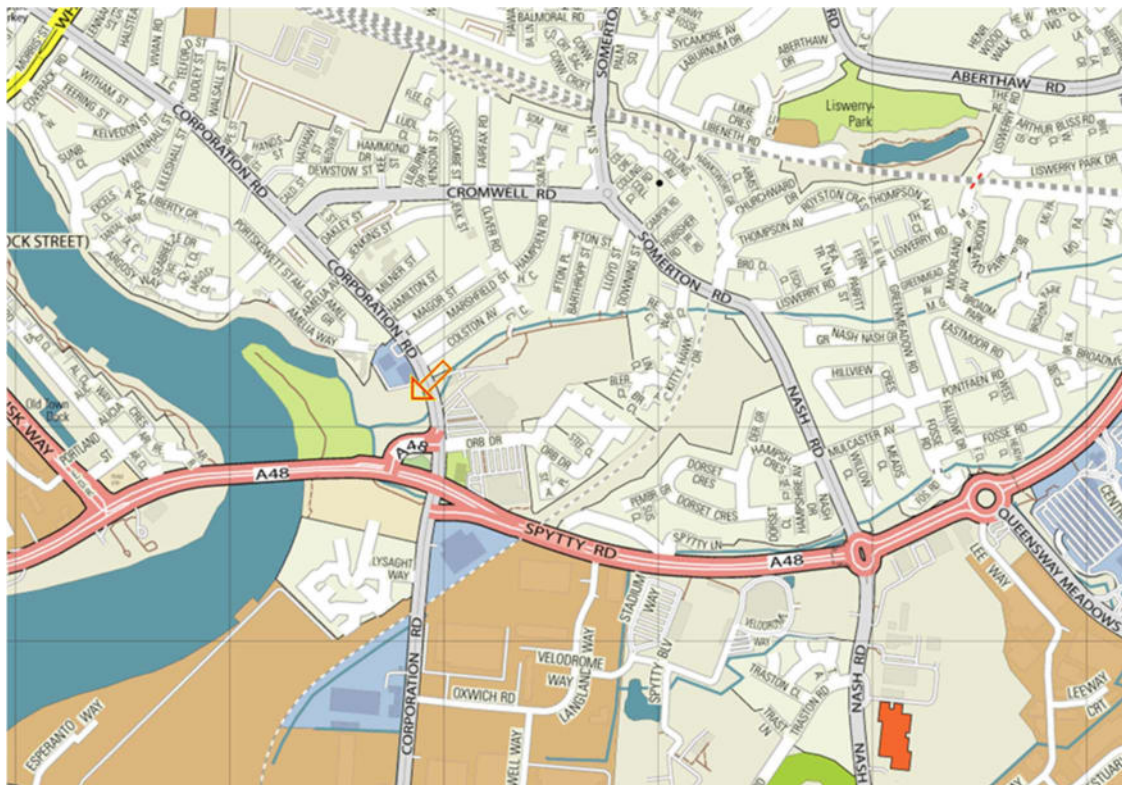


Figure 1 – Site Location Plan

3.0 EXISTING DRAINAGE

3.1 Land Drainage

No existing land drainage is evident within the site boundary. Heavy rainfall is likely to permeate through the shallow top layer of fill material and move laterally along the capping layer.

3.2 Overland Flow & Exceedance Routes

The existing overland flow paths would direct exceedance event flows onto the adjacent access road (and/towards) the wider highway network located in Corporation Road. More extreme events would direct some flows into the Spyttty Pill / River Usk. The proposed works would maintain the existing exceedance flow paths.

3.3 Surface Water Drainage Network

DCWW records have confirmed no viable surface water assets within the proximity of the development.

3.4 Foul Water Drainage Network

A review of the Dwr Cymru Welsh Water drainage records indicates the presence of a combined sewer within corporation road, an offline / possibly redundant 21in rising main crossing the site from the adjacent Liswerry pump station compound. DCWW will be required to confirm if their asset crossing the site is now redundant as a replacement 36in main now runs south along Corporation Road. An historic CSO (Combined Sewer Overflow) also crosses the site serving the greater combined network. DCWW have confirmed that this asset is now redundant and can be removed from their records following a Deed of release application. A combined sewer overflow (CSO) intersects the site at the southwest corner discharging into the adjacent Spyttty Pill and on into the river Usk.

3.5 Combined / Other Drainage

DCWW records along with discussions have identified a combined sewer adjacent to the site running in Corporation Road. DCWW have agreed to allow a connection at greenfield discharge rates if a connection into the Spyttty Pill is proved to be unviable.

4.0 EXISTING FLOOD RISK

4.1 Flood Risk from Rivers

NRW Flood mapping (Figure 2), Indicates site within Flood zone 1 (little to no risk)

4.2 Flood Risk from Sea

NRW Flood mapping (Figure 2), indicates site within Flood Zones 2 & 3 (Defended)

4.3 Flood Risk from Surface Water & Small Watercourses

NRW Flood mapping (Figure 2), site within Flood Zone 1 (little to no risk)

4.4 Flood Risk from Reservoir

NRW Flood mapping (Figure 2), indicates site within Flood Zone 1 (little to no risk)

NRW Flood Risk Definitions

Rivers – Flood Zone 2

Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.

Rivers – Flood Zone 3

Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.

Rivers & Sea – Flood Zone 2

The combined 0.1% risk of flooding from rivers and the sea including climate change.

Rivers & Sea – Flood Zone 3

The combined 1% risk of flooding from rivers and the sea including climate change.

Sea – Flood Zone 2

Areas with 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.

Sea – Flood Zone 3

Areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.

Surface Water and Small Watercourses – Flood Zone 2

Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

Surface Water and Small Watercourses – Flood Zone 3

Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change

TAN15 Defended Zones

Area that benefits from Risk Management Authority flood defences with the following minimum Standard of Protection:

1 in 100 year (present day) for rivers

1 in 200 year (present day) for the sea

For flood defences built from 2016 onwards there must be allowance for climate change and design freeboard to be mapped as a Defended Zone. Defences constructed before 2016 do not have to include climate change/freeboard to qualify as a TAN15 Defended Zone but still offer a good present day standard of protection.

The Standard of Protection is our best estimate based on the most recent assessment data. In some cases, this may be several years old. You will probably need to re-evaluate this as part of any Flood Consequences Assessment submitted to support a development proposal. Hydraulic modelling may also be required to determine their current standard of protection.

TAN15 Defended Zones act as a screening tool to enable planning authorities to consider development in areas which may otherwise be mapped as Flood Zone 3 / Flood Zone 2 and could limit development opportunities.

They should not be considered automatically suitable for development. The risks and impacts, including a breach assessment must be demonstrated through an FCA to determine whether development can be made flood free and safe over its lifetime.



5.0 APPLICATION OF DRAINAGE HIERARCHY

5.1 Discharge to Ground

The development plateau is formed from granular made-ground and whilst contamination is not thought to be a major issue it cannot be ruled out. The interface between the made ground and original pre-demolition surface will form a relatively impermeable barrier; as such disposal to ground would not occur as flows would simply move laterally and not percolate into the substrate. Consequently, disposal via infiltration is not believed to be a viable option due to existing ground conditions. Soilsmap (Figure 3) indicates ground conditions as clayey soil of coastal flats with natural high groundwater.

5.2 Discharge to Surface Water Body

The site is immediately adjacent the Liswerry Pill, a tidal tributary of the River Usk. A section of this watercourse is culverted beneath Corporation Road although there is no evidence of any SW connections into this asset. Additional survey work has been carried out on site to locate possible historic drainage. Unfortunately, none has been located. It is assumed that all historic drainage was grubbed up and removed as part of the remediated works carried out previously. The southern and western banks of the Pill are designated as SSSI, so construction of a new dedicated SW outfall will need to be agreed with NRW. Initial discussions have taken place with Newport SAB with unlimited discharge rates from the site confirmed.

5.3 Discharge to Surface Water Sewer (1. Highway Sewer, 2. Other SW Sewer)

DCWW drainage records indicate the presence of a combined sewer overflow (CSO) to the southeast boundary of the site. This outfall can be seen clearly from aerial photographs and OS data and would provide the most appropriate route to the tidal reaches without any need to disrupt the SSSI status embankment. Whilst the diameter of the overflow is stated to be 1800mm it is only likely to become 'live' during the most intensive storm events. Discussions have been held with DCWW and they have confirmed that a connection will NOT be permitted into their CSO asset. No other viable surface water / highway sewer has been identified within the local area.

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6.0 PROPOSED DRAINAGE STRATEGY**6.1 Surface Water**

SuDs Interception criteria for block A will be achieved by permeable paving located on the external paving of the block. Block A has also incorporated the use of rain gardens surrounding the block with land filter drains and planting. By effectuating this, it will help the catchment of the 5ml flush as outlined in the Welsh government guide.

The proposal is to utilise the adjacent tidal River Usk / Spyttt Pill, initial discussion with Newport SAB have confirmed unlimited discharge rates from the site as acceptable. An enquiry has been raised with NRW regarding the siting of a new outfall within the Spyttt Pill corridor as it will be required to cross an existing SSSI and no objections have been declared. The proposed rates indicated below are based on a full capture, worst case scenario. The introduction of permeable surfacing and rain gardens on block A will slow discharge rates. Blocks B-F fall under a previous approved planning approval and not subject to SAB approval. Permeable surfacing will still be proposed for these blocks to help improved water quality and reduce flow rates / time on entry into the wider network. Block A is subject to SAB approval and as such will follow the design principles as set out in section 7.0.

Proposed Catchments

Block A	-	855m ²	(0.09Ha)
Block B-E	-	4,700m ²	(0.47Ha)
Block F	-	750m ²	(0.08Ha)
Total	-	6,340m ²	(0.64Ha)

Initial discharge rates based on the above catchments plus 10% urban creep allowance.

2yr	-	78.9 l/s
30yr	-	150.1 l/s
100yr	-	196 l/s
100yr +40%	-	267.2 l/s

6.2 Foul Drainage

Final Foul flows are to be confirmed; foul discharge rates will be based on Sewers for adoptions guidance (average 222 litres per person per day) with a peak factor of x6.

6.3 Land Drainage

No alternations to existing land drainage are proposed as part of the proposal

7.0 COMPLIANCE WITH NATIONAL SUDS STANDARDS

7.1 Standard S1 – Surface Water Destination

Priority Level 1 – Reuse of Rainwater

The level of occupation of the medium rise apartment blocks in relation to the roof area and likely yield of runoff volume associated with this, is deemed too low to make the harvesting of rainwater a viable option for non-potable supply. A rainwater viable statement is included in Appendix 10.

Priority Level 2 – Infiltration to Ground

As outlined in section 5.1, infiltration to ground is deemed as unviable.

Permeable surfacing for the proposed development to offer treatment and SuDS benefits will be utilised although with positive outlets into the wider surface water system.

Priority Level 3 – Discharge to Water Body

Discharge into the adjacent tidal River network is deemed to be the primary option,

Priority Level 4 – Discharge to Surface Water Sewer, Highway Drain, or other System

Extensive research and investigations have failed to identify a suitable surface water sewer to offer a connection.

Priority Level 5: Discharge to a Combined Sewer

Discussions with DCWW have identified a combined sewer within Corporation Road that could be utilised as a secondary option.

7.2 Standard S2 – Surface Water Runoff Hydraulic Control

It is proposed that the system be designed such that it is sufficient to convey critical storm duration flows in the 100yr+40% event. An urban creep allowance of 10% has been included in proposed flow calculations to future proof and offer a worst-case scenario. Proposed discharge calculations are noted in section 6.1.

First 5mm Interception

Interception mechanisms will be required to ensure compliance with the requirement of zero runoff for the first 5mm rainfall for 80% of storm events during the summer and 50% in winter.

The provision for some flows to pass through permeable drive subbase will contribute to the objective of first 5mm interception. Deemed to comply with the SAB standards.

Exceedance/Blockage

Any exceedance flows will follow surface topography. The topography is such that any excess flows will be directed towards existing highway surface water infrastructure.

7.3 Standard S3 – Water Quality

The proposed SuDS treatment train devices of bio retention planters (Block A) and permeable surfacing will deliver the requisite cleansing and filtration of runoff for this residential (low pollution hazard level) development.

7.4 Standard S4 – Amenity

The soft landscaping and open areas will be carefully designed and integrated into the landscaping scheme for the development, to promote aesthetics and biodiversity.

7.5 Standard S5 – Biodiversity

The open spaces and soft landscaping features will be carefully designed and integrated into the landscaping scheme for the development and enhance the adjacent SSSI area, to promote aesthetics and biodiversity.

These proposals will augment the green infrastructure element of the design proposals to demonstrate a robust response to this Standard.

7.6 Standard S6 - Construction, Operation and Maintenance and Structural Integrity

All of the infrastructure maintenance will be dealt with through Newport City Homes maintenance division as all of the systems employed are contained within a single curtilage application. All of the proposed SuDS infrastructure is in accessible areas for ease of maintenance.

The SuDS devices are low maintenance surface/shallow items with established regular maintenance regimes.

The proposed design solution has been designed in accordance with the SuDS manual and is generally served by shallow SuDs features and accessible details. There are no inherent safety issues with the proposed ground level scheme.

8.0 SUMMARY & RECOMMENDATIONS

8.1 SUMMARY

It is proposed that all phases, Block A-F will be serviced by a single outlet into the adjacent Spyttý Pill. Initial discussions with Newport Sab have been positive with an unlimited discharge into the tidal river agreed. Ongoing discussions with NRW to confirm buildability and application requirements. Blocks B-F have existing planning approval and are not subject to SAB approval but will include Suds features in the form of permeable paving to improve water quality and reduce flow rates. Block A is subject to SAB approval and will be subject to the full SAB application and approval process. Through discussions, NRW have confirmed a new outfall in the proposed location is viable although a Flood Risk Activity Permit (FRAP) will be required.

This strategy will be included in a PreSab and Full Sab application to Newport SAB.

8.2 RECOMMENDATIONS

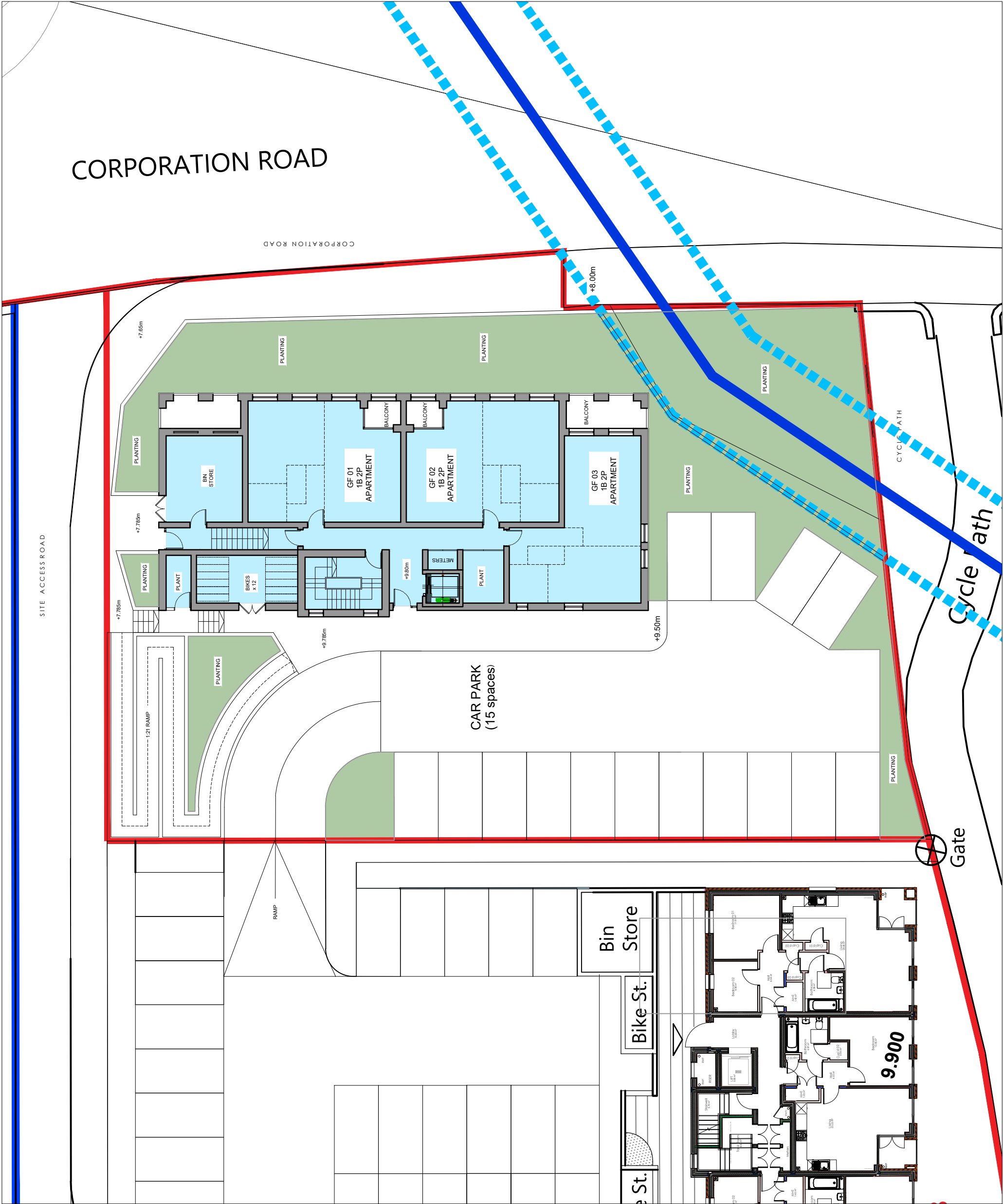
- Submit a PreSAB application and action any comments prior to full SAB application submission- PreSAB submitted and comments received and drawings updated to suit.
- Complete and submit FRAP as soon as possible providing required information is available.

APPENDIX 1 – EXISTING SITE SURVEY



**APPENDIX 2 – Spytty Pill Survey
(To follow)**

APPENDIX 3 – PROPOSED SITE LAYOUT



REV.	DESCRIPTION	DATE
CLIENT		
Newport City Homes		
JOB TITLE		
Block A, Corporation Road		
DRAWING TITLE		
Block A		
Ground Floor Plan		
SCALE @ A3		
1:200	DATE	DRAWN BY
	October '19	SC
JOB NO.		
2119	DRAWING NO.	REVISION
	S01 BLA_MP_GF_00_A	



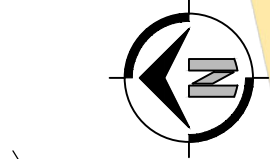
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APPENDIX 4 – PROPOSED DRAINAGE STRATEGY PLAN



GENERAL NOTES

1. This drawing is to be read in conjunction with and checked against all other drawings, engineering details, specifications and any structural, geotechnical or other specialist documents provided.
2. Any discrepancies within all relevant drawings are to be reported to QuadConsult Ltd immediately.
3. All dimensions and levels are in metres, U.N.O..
4. Do not scale from this drawing – use figured dimensions only.
5. This drawing is schematic for clarity only, positions of pipe runs and manholes may vary on site due to site conditions.

Key:

Rain Garden

Bioretention Area

Permeable Paving

SW Drainage

Proposed ACO Swale Outlet

Proposed Permeavoid Diffuser Unit

Aquacell 450mm Dia Silt Trap Chamber

Perforated pipe

FW Drainage

Spot Levels

Retaining wall

Exposed Brickwork

- PRELIMINARY -

Rev.	Date	Description	By
A	29.07.25	Updated to suit new layout	KE

Dimensions to be verified on site.
This drawing should not be used for construction purposes without the approval of the Engineer prior to work being put in hand.
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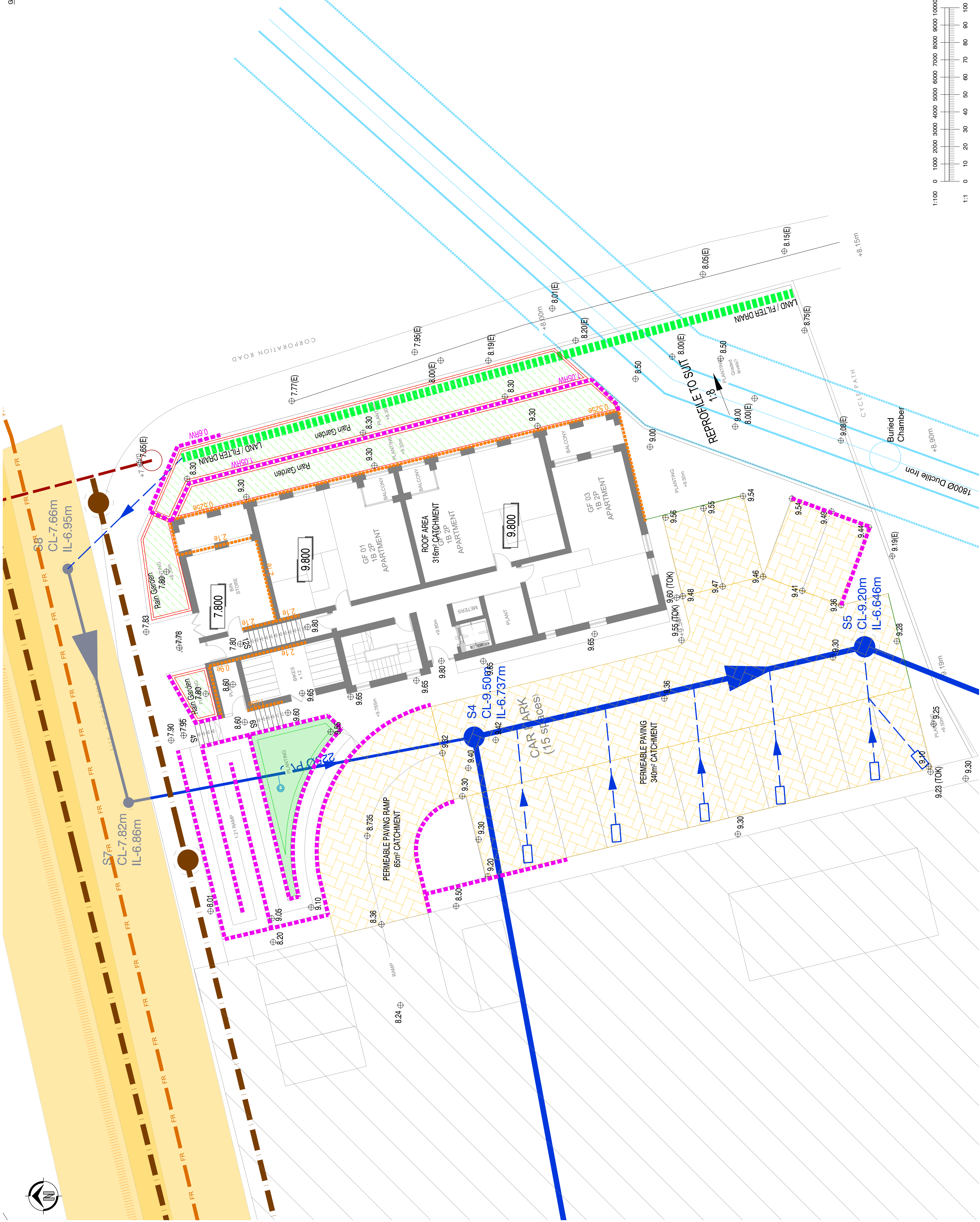
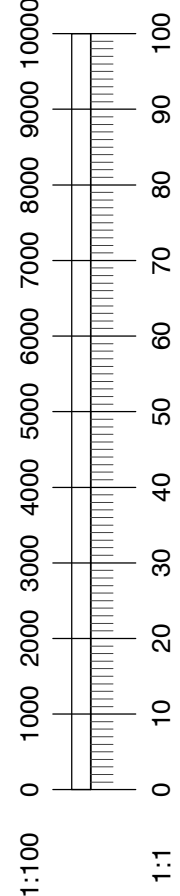
Project
CORPORATION ROAD

Title
SUDS LAYOUT PLAN

Drawing Status
PRELIMINARY

Drawn By	Checked By	Design No	Scale
KE	ML	NOV23	1:100

Project No	Drawing No
21326	C-007-A



APPENDIX 5 – PROPOSED LANDSCAPE ARCHITECTS LAYOUT

APPENDIX 6 – NRW CORRESPONDENCE

A map of the Llanwerry Pill area. The River Llanwerry Pill flows from the top left towards the bottom right. A yellow star marks a location on the riverbank near the Llanwerry Pill Bridge. Other features include a pipeline, a shelter, a pumping station, ESSs, and a drainage system. The map also shows a road, a railway line, and a high water mark.

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APPENDIX 7 – WELSH WATER ASSET MAPS



APPENDIX 8 – PROPOSED SURFACE WATER CALCULATIONS

		Quadconsult Ltd	File: 21326-CA-750-.pfd Network: Storm Network Mark Llewellyn 18/04/2023	Page 1							
Design Settings											
Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00								
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0								
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00								
FSR Region	England and Wales	Connection Type	Level Soffits								
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200								
Ratio-R	0.300	Preferred Cover Depth (m)	1.200								
CV	0.750	Include Intermediate Ground	✓								
Time of Entry (mins)	10.00	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	0.080	10.00	9.500	1200	332846.878	187109.603	2.500				
S2	0.094	10.00	8.400	1200	332858.628	187089.915	1.786				
S3	0.094	10.00	7.800	1200	332865.485	187071.098	1.598				
S4	0.094	10.00	7.900	1200	332901.519	187079.693	2.161				
S5	0.094	10.00	8.200	1350	332902.795	187074.343	2.680				
S6	0.094	10.00	9.300	1350	332934.417	187081.885	4.186				
S7	0.090	10.00	9.500	1350	332939.408	187075.022	4.492				
S8			9.200	1350	332945.717	187046.971	4.551				
OUTFALL			5.000	1350	332940.575	187024.092	0.644				
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)
S1.000	S1	S2	22.928	0.600	7.000	6.614	0.386	59.4	225	10.22	44.3
S1.001	S2	S3	20.027	0.600	6.614	6.277	0.337	59.4	225	10.42	43.9
S1.002	S3	S4	37.045	0.600	6.202	5.739	0.463	80.0	300	10.77	43.1
S1.003	S4	S5	5.500	0.600	5.739	5.670	0.069	80.0	300	10.82	43.0
S1.004	S5	S6	32.509	0.600	5.520	5.114	0.406	80.0	450	11.06	42.6
S1.005	S6	S7	8.486	0.600	5.114	5.008	0.106	80.0	450	11.12	42.4
S1.006	S7	S8	28.752	0.600	5.008	4.649	0.359	80.0	450	11.34	42.1
S1.007	S8	OUTFALL	23.450	0.600	4.649	4.356	0.293	80.0	450	11.51	41.7
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)		
S1.000	1.700	67.6	9.6	2.275	1.561	0.080	0.0	57	1.207		
S1.001	1.699	67.6	20.7	1.561	1.298	0.174	0.0	85	1.495		
S1.002	1.759	124.3	31.3	1.298	1.861	0.268	0.0	102	1.473		
S1.003	1.759	124.3	42.2	1.861	2.230	0.362	0.0	120	1.596		
S1.004	2.274	361.7	52.6	2.230	3.736	0.456	0.0	115	1.638		
S1.005	2.274	361.7	63.3	3.736	4.042	0.550	0.0	126	1.724		
S1.006	2.274	361.7	73.0	4.042	4.101	0.640	0.0	136	1.793		
S1.007	2.274	361.7	72.4	4.101	0.194	0.640	0.0	136	1.793		
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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
MS-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
30	0	10	0
100	0	10	0
100	40	10	0

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File: 21326-CA-750-.pfd

Network: Storm Network

Mark Llewellyn

18/04/2023

Page 3

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	13	7.058	0.058	9.9	0.1063	0.0000	OK
15 minute winter	S2	13	6.705	0.091	21.5	0.2090	0.0000	OK
15 minute winter	S3	13	6.307	0.105	33.1	0.2538	0.0000	OK
15 minute winter	S4	13	5.885	0.146	44.7	0.3040	0.0000	OK
15 minute winter	S5	13	5.641	0.121	56.3	0.2657	0.0000	OK
15 minute winter	S6	13	5.267	0.153	67.8	0.2949	0.0000	OK
15 minute winter	S7	13	5.157	0.149	78.9	0.2793	0.0000	OK
15 minute winter	S8	14	4.801	0.152	78.8	0.2174	0.0000	OK
15 minute winter	OUTFALL	14	4.496	0.140	78.9	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	S1.000	S2	9.9	0.863	0.146	0.2656	
15 minute winter	S2	S1.001	S3	21.5	1.474	0.318	0.2922	
15 minute winter	S3	S1.002	S4	33.1	1.190	0.266	1.0328	
15 minute winter	S4	S1.003	S5	44.7	1.464	0.359	0.1679	
15 minute winter	S5	S1.004	S6	56.2	1.381	0.155	1.3276	
15 minute winter	S6	S1.005	S7	67.8	1.452	0.187	0.3964	
15 minute winter	S7	S1.006	S8	78.8	1.698	0.218	1.3351	
15 minute winter	S8	S1.007	OUTFALL	78.9	1.769	0.218	1.0461	53.9

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Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.98%								
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1	20	7.081	0.081	18.9	0.1482	0.0000	OK
30 minute winter	S2	20	6.750	0.136	41.0	0.3102	0.0000	OK
30 minute winter	S3	20	6.355	0.153	63.0	0.3720	0.0000	OK
30 minute winter	S4	21	5.960	0.221	85.0	0.4606	0.0000	OK
30 minute winter	S5	20	5.694	0.174	106.7	0.3828	0.0000	OK
30 minute winter	S6	21	5.342	0.228	128.6	0.4392	0.0000	OK
30 minute winter	S7	21	5.226	0.218	149.8	0.4072	0.0000	OK
30 minute winter	S8	21	4.871	0.222	150.0	0.3171	0.0000	OK
30 minute winter	OUTFALL	21	4.554	0.198	150.1	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)
30 minute winter	S1	S1.000	S2	18.9	1.000	0.279	0.4331	
30 minute winter	S2	S1.001	S3	40.8	1.714	0.604	0.4771	
30 minute winter	S3	S1.002	S4	62.8	1.361	0.505	1.6977	
30 minute winter	S4	S1.003	S5	84.8	1.701	0.682	0.2735	
30 minute winter	S5	S1.004	S6	106.8	1.561	0.295	2.2278	
30 minute winter	S6	S1.005	S7	128.9	1.647	0.356	0.6641	
30 minute winter	S7	S1.006	S8	150.0	1.954	0.415	2.2077	
30 minute winter	S8	S1.007	OUTFALL	150.1	2.071	0.415	1.7008	139.1

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Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.98%								
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1	20	7.093	0.093	24.6	0.1710	0.0000	OK
30 minute winter	S2	20	6.779	0.165	53.6	0.3772	0.0000	OK
30 minute winter	S3	20	6.385	0.183	82.2	0.4438	0.0000	OK
30 minute winter	S4	21	6.013	0.274	111.1	0.5728	0.0000	OK
30 minute winter	S5	20	5.726	0.206	139.4	0.4534	0.0000	OK
30 minute winter	S6	21	5.388	0.274	168.1	0.5267	0.0000	OK
30 minute winter	S7	21	5.267	0.259	195.7	0.4849	0.0000	OK
30 minute winter	S8	21	4.912	0.263	196.0	0.3763	0.0000	OK
30 minute winter	OUTFALL	21	4.588	0.232	196.2	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)
30 minute winter	S1	S1.000	S2	24.6	1.046	0.363	0.5352	
30 minute winter	S2	S1.001	S3	53.2	1.802	0.788	0.5917	
30 minute winter	S3	S1.002	S4	82.1	1.426	0.660	2.0835	
30 minute winter	S4	S1.003	S5	110.8	1.794	0.891	0.3357	
30 minute winter	S5	S1.004	S6	139.6	1.627	0.386	2.7864	
30 minute winter	S6	S1.005	S7	168.4	1.725	0.466	0.8287	
30 minute winter	S7	S1.006	S8	196.0	2.057	0.542	2.7403	
30 minute winter	S8	S1.007	OUTFALL	196.2	2.199	0.542	2.0918	181.8
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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.98%								
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1	22	7.173	0.173	34.5	0.3167	0.0000	OK
30 minute winter	S2	22	7.090	0.476	73.7	1.0889	0.0000	SURCHARGED
30 minute winter	S3	21	6.617	0.415	110.2	1.0053	0.0000	SURCHARGED
30 minute winter	S4	21	6.177	0.438	149.6	0.9138	0.0000	SURCHARGED
30 minute winter	S5	21	5.776	0.256	189.4	0.5644	0.0000	OK
30 minute winter	S6	21	5.461	0.347	229.2	0.6687	0.0000	OK
30 minute winter	S7	21	5.335	0.327	267.3	0.6119	0.0000	OK
30 minute winter	S8	21	4.977	0.328	267.3	0.4694	0.0000	OK
30 minute winter	OUTFALL	21	4.638	0.282	267.3	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)
30 minute winter	S1	S1.000	S2	33.8	1.073	0.500	0.8307	
30 minute winter	S2	S1.001	S3	71.2	1.866	1.054	0.7965	
30 minute winter	S3	S1.002	S4	110.0	1.562	0.885	2.6087	
30 minute winter	S4	S1.003	S5	149.5	2.123	1.202	0.3821	
30 minute winter	S5	S1.004	S6	189.3	1.685	0.523	3.6491	
30 minute winter	S6	S1.005	S7	229.1	1.802	0.633	1.0806	
30 minute winter	S7	S1.006	S8	267.3	2.163	0.739	3.5530	
30 minute winter	S8	S1.007	OUTFALL	267.3	2.340	0.739	2.6747	254.7
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APPENDIX 9 – RAINWATER HARVESTING VIABILITY STATEMENT

Rainwater Harvesting Viability Assessment

The developer has confirmed there is no requirement for rainwater harvesting for the proposed development from the point of construction or throughout the design life of the development.

The proposed site is currently within easy connectivity to the Welsh Water potable water network. Newport is not currently or likely to be in the future classed as in danger of suffering regular drought water rationing. Welsh Water draft Drought Plan 2020 also states the unlikelihood of any water rationing being realised within the next 30yrs. Welsh Water highlight 2018 as being a very hot year with increased demand on their network but like other parts of the UK did not have to introduce any restriction in the form of hosepipe bans or limited access to the potable water supply.

References:

<https://www.dwrcymru.com/en/our-services/water/water-resources/draft-drought-plan-2020>

APPENDIX 10 – PROPOSED POLLUTION REMOVAL CALCULATIONS

POLLUTION REMOVAL & WATER QUALITY MANAGEMENT SCHEDULE

CIRIA 753 The SuDS Manual Chapter 26, provides design advice to meet water quality standards by adopting the SuDS train treatment mechanism and thereby reduce the risk of pollution by evaluating potential pollution hazards at the outset.

As the proposed drainage strategy proposes to discharge runoff to ground, Chapter 26.3 'Protecting Groundwater' is particularly relevant.

Runoff from residential roofing and pedestrian areas is viewed as low risk (Table 4.3) and the proposed site layout provides the opportunity to introduce SuDS into the scheme to reduce potential contaminant risk still further. For example, the use of porous paving reduces flow velocities and increase retention times promoting a level of absorption into the upper soils (intergranular flow) prior to discharge to ground (fracture flow).

We propose to apply a simple qualitative method to assess the risk (Simple Index Approach) and proposed mitigation measures as defined in Table 26.1 CIRIA SuDS Manual.

Total SuDS Mitigation Index = Mitigation Index₁ + 0.5 Mitigation Index₂

Development Highway only - using a weighted mean:

Weighted value		0.00	0.00	0.00
Residential Roof (100%)	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
	(Very Low)	(0.2)	(0.2)	(0.05)
Weighted value		0.2	0.2	0.05
Residential Parking (100%)	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
	(Low)	(0.5)	(0.4)	(0.4)
Weighted value		0.5	0.4	0.4

Comparing against the mitigation indices shown below.

SuDS Individual Component Mitigation Indices

	Suspended Solids	Metals	Hydrocarbons
Bio Retention System	0.8	0.8	0.8
Pervious Pavement	0.7	0.6	0.7

However, within the outline drainage scheme a multi staged treatment is proposed for the majority of the site where practical, creating a Suds Management Train improving treatment locally and further reducing risk with the best and worst case outlined within Table 4.

Table 4 – Total SuDS Mitigation Index

Total SuDS Mitigation Index = Mitigation Index₁ + 0.5 Mitigation Index₂

Comparison with Hazard Index	ALL PASS >0.7	ALL PASS >0.6	ALL PASS >0.7
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APPENDIX 12 – SURFACE WATER MAINTENANCE SCHEDULE

Maintenance Plan for the surface water system.

To ensure the surface water systems to function as intended it is important appropriate maintenance arrangements are in place.

The surface water from the proposed development will be maintained in accordance to CIRIA C753 Chapter 32.

Storm Water Maintenance Management Schedule (CIRIA C753 – The SuDS Manual)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management ¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

- will be required
- may be required

Notes

- 1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

Proposed Site SuDS Features

1. Pervious Surfacing
2. Piped Network Elements
3. Green Roof

The maintenance management will be highlighted in 3 categories: -

Regular Maintenance

Regular maintenance comprises tasks that are likely to be required regularly to maintain and observe the drainage system typically on a monthly programme.

- Inspection - (Elements - 1, 2, 3)
- Litter and Debris Removal - (Elements - 1, 2, 3)
- Grass Cutting - (Elements – 3)
- Shrub Management - (Elements – 3)

Occasional Maintenance

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks, typically annually.

- Sediment management - (Elements - 1, 2, 3)
- Catchpit / Silt trap cleaning - (Elements – 2)
- Pipe jetting if required - (Elements – 1, 2)
- Vegetation Replacement - (Elements – 3)
- Vacuum Sweeping and Brushing - (Elements - 1)

Remedial Maintenance

Remedial maintenance describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design, construction and regular maintenance activities. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and so timings are difficult to predict.

- Structure Rehabilitation / Repair - (Elements - 1, 2)

Site Specific Maintenance Plan

1. Permeable Surfacing

Maintenance to be carried in accordance with Ciria Suds Manual (Chapter 20 & Table 20.1.5) and to include but not limited to the following actions: -

TABLE 20.15 Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

2. Piped Network

Maintenance to be carried in accordance with Ciria Suds Manual (Chapter 14 & Table 14.2) and to include but not limited to the following actions: -

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

- Gully / catchpit / channel drain cleaning and pipe jetting to be undertaken typically every year. If a blockage is present and flooding occurs, cleaning and clearing the blockage should be undertaken immediately. If item is defective, this should also be repaired or replaced.

3. Green Roof

Maintenance to be carried in accordance with Ciria Suds Manual (Chapter 12 & Table 12.5) and to include but not limited to the following actions: -

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion 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
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	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
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to 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