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New Residential Development
At
16 Avenue Road
London NW8

Discharge of Planning Condition for SUDS

Application Ref: 2016/5375/P

Document History and Status

Revision	Status	By	Approved	Date
00	draft	ad		25 01 2020
01	Issued for discharge of Planning	ad	mor	06 02 2020
02	Updated for Officer Comments	GW	mor	22 04 2020

All Revisions Highlighted in Yellow

Contents

Introduction

Planning permission was granted in 2016 for the redevelopment of the residential property at 16 Avenue Road, London NW8.

The new property will comprise of a detached residence arranged over sub-basement, basement, ground, first and second floors.

The planning permission approved a SUDS strategy that included:

- Green roofs
- Rainwater reuse
- Attenuation storage tank

The Planning Condition is as follows:

No	Condition	Reason
6	Prior to commencement of development **details of a sustainable urban drainage system** shall be submitted to and approved in writing by the local planning authority. Such system shall be based on a 1:100 year event with 30% provision for climate change and demonstrating 50% attenuation of all runoff. The system shall be implemented as part of the development and thereafter retained and maintained.	**Reason:** To reduce the rate of surface water run-off from the buildings and limit the impact on the stormwater drainage system in accordance with policies CS13 and CS16 of the London Borough of Camden Local Development Framework Core Strategy and policies DP22, DP23 and DP32 of the London Borough of Camden Local Development Framework Development Policies.

The purpose of this report is to confirm the drainage design meets the condition.

Surface water drainage has been designed for a 1 in 100 year event plus 30% climate change allowance and provides 50% attenuation of peak surface water flows of the site prior to redevelopment; in accordance with the London Plan SPG Cl 3.4.8. this equates with the target set in the Planning Condition.

Terms of Reference

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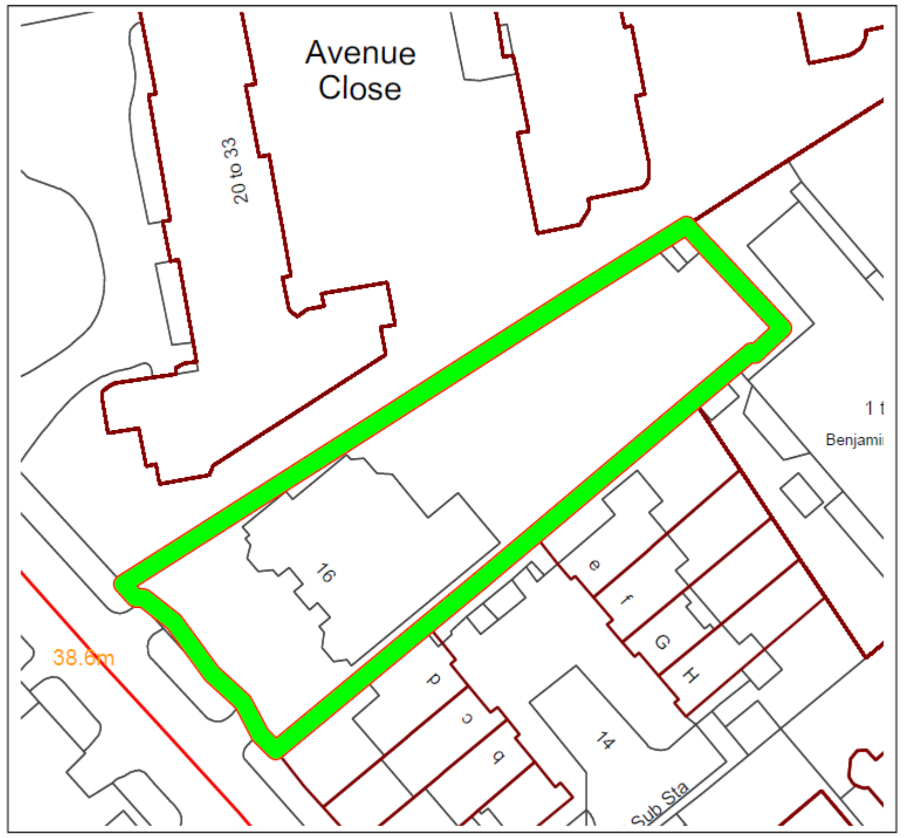
Ross and Partners are working within a design team of co-consultants to develop the project. The information contained within the report is based upon design team meetings with our co-professionals, desk top studies and design calculations.

The Site

The existing site is broadly rectangular in plan and relatively level such that there are no significant slopes. The longitudinal axis of the site runs from west to east.

The property/site can only be accessed from the Avenue Road entrance. The remainder of the site is contained within boundary "garden" walls.

There are existing residential homes on either side. To the north is a residential apartment block; to the south are several dwelling houses. These properties fall within the requirements of the Party Wall Act.



Site Geology

A specific geotechnical site investigation and desk study has been carried out by Soil Consultants and is presented in their report 9911A/AW/KOG dated February 2016. The reader is invited to refer to this report for further and more specific matters relating to the site geology.

The investigations reveal the following general ground conditions

Made Ground

Within older urban areas, much of the surface has been partially or wholly disturbed by human activity and is known as Made Ground.
Made Ground depths encountered to date extend to a thickness of up to 0.5m.

Terrace Gravels

Lynch Hill Gravel is a post-diversionary Thames River Terrace deposit and generally consists of gravel, which is sandy and clayey in parts. Terrace Gravel is a mixture of quartz sand, comminuted quartz and mainly brown flint and chert gravel. Terrace gravels are not documented to exist locally at shallow depths.

London Clay

London Clay is well documented locally and is generally a weathered bluish to brownish clay with silty sandy bands and Limestone nodules, becoming firm grey fissured silty clay with
depth. It is generally characterised by a high plasticity, high shrinkage potential, low to very low compressibility and low hydraulic conductivity.
The base of this strata was not proven.

Lambeth Group

These can be described as a variable series of clay, loam, sand and pebble beds which are locally cemented into sandstone or conglomerate. The sands are generally yellow, greenish, or brown and contain layers of mottled clay occasionally with bands of lignite. The base of this stratum is formed of greenish sand with flint pebbles where Thanet Sands are present below. It is anticipated that the Lambeth Group will be underlain by Thanet Sands.

Soil Infiltration Potential

A falling head test was carried out to determine the potential for using infiltration for surface water disposal. Unfortunately infiltration rates are poor (5.15 x 10^{-7} m/s) and infiltration is not viable on this site.

Existing Site Drainage

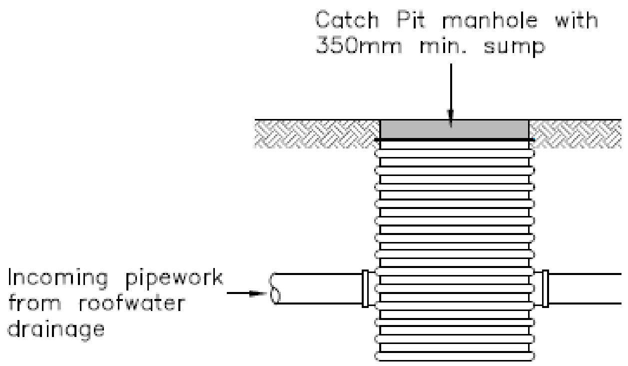
Site CCTV surveys reveal the existing property drains via a single 150 mm diameter drain which conveys both foul and surface water drainage into the combined 1372 x 914mm combined sewer located in Avenue Road.

SUDS Features

The following SUDS features are incorporated in the design.

Surface Water Management for Roofs

Flat roof areas will be living roofs that will reduce the amount of impermeable surface within the development and will be able to attenuate some of the initial storm runoff. The green roofs will reduce the rainwater run-off through evapotranspiration and the rate of run-off is slowed down through having to pass through the drainage systems, vegetation and substrate. This will bring biodiversity benefit.



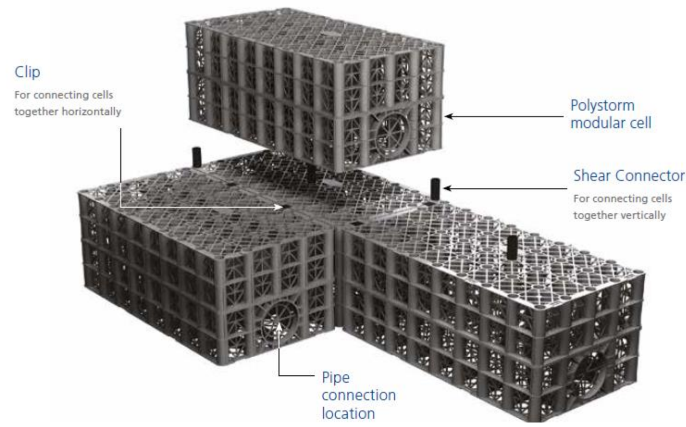
Rainwater falling on roofs shall be collected and conveyed via the above ground rainwater system into rainwater downpipes. These will discharge into the below ground surface water drains via a catch pit to filter out silt.

Surface Water Management for hard-standings

All surfaces are proposed as impermeable. Within carparking areas, the surface will fall towards slotted drainage channels. These will be "Permachannel" units manufactured by Polypipe. Permachannel are designed to provide stormwater collection as well as an oil/silt interceptor and treatment system.

Attenuation

Surface water from roofs and hard-standings are conveyed into a below ground geo-cellular storage system. The outflow from the tanks are limited to 5l/s via flow control chamber. When the amount of rainfall exceeds the 1.32l/s maximum permitted rate of discharge, stormwater will temporarily back up within the void and discharge over an elongated period of time. This will significantly reduce the peak run-off rates that presently discharge from the site into the public sewer.



Pollution Control

It is proposed that this is achieved from roof runoff via silt traps that filter sediment prior to infiltration.
Surface runoff from residential carparking areas is collected in the slotted permachannel system. This provides gravity separation of oils and silts at source, whilst trapped effluent is naturally treated by aerobic digestion.

It is proposed that cellular storage system incorporates an integral biomat which provides oil retention and water treatment. Permavoid Biomat has been specifically designed to remove hydrocarbon pollutants from surface water run-off. It comprises of a buoyant geocomposite located inside the Permavoid unit. The composite interacts with oil deposits, allowing formation of a 'biofilm' on its solid surface and providing the opportunity for nutrient recycling which would allow active biofilm development. The system provides an environment which encourages the growth of oil-degrading microorganisms as moisture, oil and oxygen from the atmosphere are all present supplied with a large surface area for oil absorption and biofilm attachment.

Discharge rainwater to the combined sewer

It is proposed the site foul and surface water drainage are kept separate and are discharged separately into the Thames Water Sewer in Avenue Road. The existing outfalls will be retained.

Store Rainwater for Reuse

A rainwater harvesting system will be provided to provide water for irrigating the garden. This will be "off-line".
As the tank could be full at the time of a significant storm event, it has been disregarded in terms of SUDS storage.

Suds System

The following SUDS features are incorporated in the design.

Existing Rate of Surface Water Run Off

The existing run off rate is calculated for various storm events using the modified rational method where:

Q =2.78 Ai

Where A = Catchment Area and i = rainfall intensity

Existing Impermeable Area of the site that positively drains into the public sewer has been electronically recalculated= 764m²

The surface water run of that discharges into the public sewer based upon a 1 year, 30 year and 100 year storm event is:

Q_1	= 2.78 x 0.0764 x 32mm/ hr	=	6.796	l/s
Q_{30}	= 2.78 x 0.0764 x 79mm/ hr	=	16.779	l/s
Q_{100}	= 2.78 x 0.0764 x 101mm/ hr	=	21.452	l/s

Target Rate of Surface Water Run Off

The London Plan Policy 5.13 and Sustainable Design and Construction Supplementary Planning Guidance 2014 (SPG) sets out Sustainable Drainage aspirations for developments and requires developers to aim for greenfield runoff rate from their developments. Greenfield runoff rates are defined as the runoff rates from a site, in its natural state, prior to any development. Typically, this is between 2 l/s/ha and 8 l/s/ha. On previously developed sites **SPG Cl 3.4.8** sets minimum expectation targets of 50% attenuation of peak surface water flows of the site prior to redevelopment Cl 3.4.8. this equates with the target set in the Planning Condition

This equates to 50% x 21.452 l/s = 10.726 l/s

Proposed Rate of Surface Water Run Off

Proposed Impermeable Area of the site has been electronically recalculated: 944m²

Of this the front 170 m² cannot be attenuated due to space restrictions. The quantity of surface water run off from the front area based upon an 1 in 100 year storm plus 30% allowance for climate change is:

Q = 2.78 x 0.0170 x 135mm/ hr = 6.38 l/s

It follows therefore the remaining 774 m² must be limited to a maximum discharge rate of 4.345 l/s. This will be achieved via an orifice controlled hydrobrake.

Therefore total surface water discharge rate from the proposed development based upon a 1 in 100 year storm event plus a 30% climate change allowance is:

$Q_{100 + 30\%\ cc}$ = 10.72 l/s

The volume of attenuation storage = 52 m³. This will be achieved via proprietary attenuation storage crates within the rear garden.

LLFA Email Feedback

The narrative below directly answers the queries raised by Camden Sustainability Officer.

	Approved Strategy – Drainage Statement rev. P3 (Elliott Wood, Nov 16)	***Proposed pre-implementation – 'Discharge of Planning Condition for SUDS' rev. 01 (Ross & Partners, Feb 2020)***	***LLFA queries / issues***	***R&P Feedback Proposal***
Submissions	Drainage statement Drainage drawings Drainage pro-forma CCTV survey Thames Water enquiry MicroDrainage calculations	Drainage statement Drawings	Missing updated docs including - SuDS pro-forma - MicroDrainage calculations - Thames Water acceptance letter	-Revised pro-forma attached, -Detailed Microdrainage calculations attached and drawings included. Consultation with TWU is underway, however due to the current lockdown situations TWU have altered their feedback timings and therefore this element is pending.
Proposed impermeable area	785 m2	800 m2	Slight (2%) increase	944sq.m representing a complete electroninc remeasure. Note existing impermeable area also is larger than previous estimations.
Proposed discharge rate (% change vs existing)	1:1yr 4.86 l/s (+0.2%) 1:30yr 4.86 l/s (-59%) 1:100yr 4.86 l/s (-69%) 1:100yr+CC 4.86 l/s	1:1yr 1:30yr 1:100yr 1:100yr+CC 7.44 l/s	Site discharge rate increased Rates missing for less severe scenarios	Defined within the pro-forma
Volume of storage required	32 m3	47 m3		52 cu.m
Proposed SuDS	Green roof Rainwater reuse (catchpits on surface water manholes, to grounds irrigation system) Permeable paving (front of site, drained to onsite network) Tank attenuation via below-ground geocellular crates (32 m3, rear garden) Vortex flow control (discharge restricted to 2.5 l/s)	Proprietary attenuation storage crates (47 m3, rear garden) Orifice controlled hydrobrake (1.06 l/s)	No information on area, soil depth & storage capacity of green roofs Permeable paving deleted & replaced with impermeable hardstanding with slotted drainage channels Hydrobrake discharge rate is expected to be lower than practically maintainable	Defined within the pro-forma Brown roof with delineated storage capacity. The front entrance Area was always positively drained with slotted drainage channels. Attenuation tank in rear garden. Hydrobrake system available to suitability reduce the flow rate. Refer to hierarchy schedules and SuDs Measures schedules. Modern Hydrobrakes can now manage flows as little as 1.0 l/s

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Goldlay House Parkway Chelmsford CM2 7PR	11488 16 avenue road nw8	
Date 22/04/2020 13:43 File 11488-COM-NET01-01.MDX	Designed by garethw Checked by	
Innovyze	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.600	Add Flow / Climate Change (%)	0
Ratio R	0.437	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.100	0.505	20.0	0.077	3.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	9.850	0.493	20.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	11.770	0.059	199.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	4.570	0.114	40.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	49.170	0.328	149.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	18.800	0.235	80.0	0.017	3.00	0.0	0.600	o	100	Pipe/Conduit	
1.005	2.800	0.019	147.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	3.07	38.400	0.077	0.0	0.0	0.0	2.26	40.0	10.4
1.001	50.00	3.15	37.895	0.077	0.0	0.0	0.0	2.26	40.0	10.4
1.002	50.00	3.42	37.402	0.077	0.0	0.0	0.0	0.71	12.5	10.4
1.003	50.00	3.47	37.343	0.077	0.0	0.0	0.0	1.59	28.2	10.4
1.004	50.00	4.47	37.229	0.077	0.0	0.0	0.0	0.82	14.5	10.4
2.000	50.00	3.36	37.600	0.017	0.0	0.0	0.0	0.86	6.8	2.3
1.005	50.00	4.53	34.770	0.094	0.0	0.0	0.0	0.83	14.6	12.7

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Goldlay House Parkway Chelmsford CM2 7PR	11488 16 avenue road nw8	
Date 22/04/2020 13:43 File 11488-COM-NET01-01.MDX	Designed by garethw Checked by	
Innovyze	Network 2020.1	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN (Pipe Out)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN (Pipes In)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	39.400	1.000	Open Manhole	450	1.000	38.400	150				
2	39.400	1.505	Open Manhole	450	1.001	37.895	150	1.000	37.895	150	
3	39.000	1.598	Open Manhole	600	1.002	37.402	150	1.001	37.402	150	
4	39.400	2.057	Open Manhole	600	1.003	37.343	150	1.002	37.343	150	
5	39.400	2.171	Open Manhole	1200	1.004	37.229	150	1.003	37.229	150	
6	38.800	1.200	Open Manhole	1200	2.000	37.600	100				
6	38.770	4.000	Open Manhole	450	1.005	34.770	150	1.004	36.901	150	2131
								2.000	37.365	100	2545
	38.770	4.019	Open Manhole	0		OUTFALL		1.005	34.751	150	

No coordinates have been specified, layout information cannot be produced.

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	1	39.400	38.400	0.850	Open Manhole	450
1.001	o	150	2	39.400	37.895	1.355	Open Manhole	450
1.002	o	150	3	39.000	37.402	1.448	Open Manhole	600
1.003	o	150	4	39.400	37.343	1.907	Open Manhole	600
1.004	o	150	5	39.400	37.229	2.021	Open Manhole	1200
2.000	o	100	6	38.800	37.600	1.100	Open Manhole	1200
1.005	o	150	6	38.770	34.770	3.850	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	10.100	20.0	2	39.400	37.895	1.355	Open Manhole	450
1.001	9.850	20.0	3	39.000	37.402	1.448	Open Manhole	600
1.002	11.770	199.5	4	39.400	37.343	1.907	Open Manhole	600
1.003	4.570	40.1	5	39.400	37.229	2.021	Open Manhole	1200
1.004	49.170	149.9	6	38.770	36.901	1.719	Open Manhole	450
2.000	18.800	80.0	6	38.770	37.365	1.305	Open Manhole	450
1.005	2.800	147.4		38.770	34.751	3.869	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		38.770	34.751	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Storm Duration (mins)	30
Ratio R	0.437		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference	MD-SHE-0043-1000-1400-1000
Design Head (m)	1.400
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	43
Invert Level (m)	37.229
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	1.0	Kick-Flo®	0.383	0.6
Flush-Flo™	0.189	0.7	Mean Flow over Head Range	-	0.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.8	2.000	1.2	4.000	1.6	7.000	2.1
0.200	0.7	1.000	0.9	2.200	1.2	4.500	1.7	7.500	2.1
0.300	0.7	1.200	0.9	2.400	1.3	5.000	1.8	8.000	2.2
0.400	0.6	1.400	1.0	2.600	1.3	5.500	1.9	8.500	2.3
0.500	0.6	1.600	1.1	3.000	1.4	6.000	1.9	9.000	2.3
0.600	0.7	1.800	1.1	3.500	1.5	6.500	2.0	9.500	2.4

Storage Structures for Storm

Cellular Storage Manhole: 3, DS/PN: 1.002

Invert Level (m) 37.403 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	64.0	0.0	3.600	0.0	0.0	7.200	0.0	0.0
0.400	64.0	0.0	4.000	0.0	0.0	7.600	0.0	0.0
0.800	64.0	0.0	4.400	0.0	0.0	8.000	0.0	0.0
0.801	0.0	0.0	4.800	0.0	0.0	8.400	0.0	0.0
1.600	0.0	0.0	5.200	0.0	0.0	8.800	0.0	0.0
2.000	0.0	0.0	5.600	0.0	0.0	9.200	0.0	0.0
2.400	0.0	0.0	6.000	0.0	0.0	9.600	0.0	0.0
2.800	0.0	0.0	6.400	0.0	0.0	10.000	0.0	0.0
3.200	0.0	0.0	6.800	0.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750
Region England and Wales Ratio R 0.437 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	1	15 Summer	1	+0%	100/15 Summer				38.466	-0.084	0.000
1.001	2	15 Summer	1	+0%	30/1440 Summer				37.961	-0.084	0.000
1.002	3	120 Winter	1	+0%	30/15 Summer				37.509	-0.043	0.000
1.003	4	180 Winter	1	+0%	1/60 Winter				37.513	0.020	0.000
1.004	5	180 Winter	1	+0%	1/15 Summer	30/1440 Summer			37.512	0.133	0.000
2.000	6	15 Summer	1	+0%	30/15 Summer				37.649	-0.051	0.000
1.005	6	15 Summer	1	+0%					34.827	-0.093	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.39			13.8	OK	
1.001	2	0.38			13.5	OK	
1.002	3	0.12		108	1.3	OK	
1.003	4	0.04			0.9	SURCHARGED	
1.004	5	0.05			0.7	SURCHARGED	
2.000	6	0.45			3.0	OK	
1.005	6	0.30			3.3	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750
Region England and Wales Ratio R 0.437 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Summer	30	+0%	100/15 Summer				38.519	-0.031
1.001	2	1440 Winter	30	+0%	30/1440 Summer				38.483	0.438
1.002	3	1440 Winter	30	+0%	30/15 Summer				38.496	0.944
1.003	4	1440 Winter	30	+0%	1/60 Winter				39.011	1.518
1.004	5	1440 Winter	30	+0%	1/15 Summer	30/1440 Summer			39.357	1.978
2.000	6	15 Summer	30	+0%	30/15 Summer				37.725	0.025
1.005	6	15 Summer	30	+0%					34.862	-0.058

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	0.95			33.8	OK	
1.001	2	0.000	0.03			1.2	SURCHARGED	
1.002	3	0.000	0.12			1.4	SURCHARGED	
1.003	4	0.000	0.05			1.2	SURCHARGED	
1.004	5	0.221	0.06			0.9	FLOOD	
2.000	6	0.000	1.05			6.8	SURCHARGED	
1.005	6	0.000	0.69			7.5	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750
Region England and Wales Ratio R 0.437 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Summer	100	+30%	100/15 Summer				39.381	0.831
1.001	2	1440 Winter	100	+30%	30/1440 Summer				38.616	0.571
1.002	3	1440 Winter	100	+30%	30/15 Summer				38.701	1.149
1.003	4	1440 Summer	100	+30%	1/60 Winter				38.969	1.476
1.004	5	1440 Summer	100	+30%	1/15 Summer	30/1440 Summer			39.287	1.908
2.000	6	15 Summer	100	+30%	30/15 Summer				38.046	0.346
1.005	6	15 Summer	100	+30%					34.891	-0.029

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	1.33			47.5	FLOOD RISK	
1.001	2	0.000	0.06			2.0	SURCHARGED	
1.002	3	0.000	0.13			1.5	FLOOD RISK	
1.003	4	0.000	0.08			1.6	SURCHARGED	
1.004	5	0.166	0.06			0.9	FLOOD	
2.000	6	0.000	1.54			10.0	SURCHARGED	
1.005	6	0.000	1.00			10.7	OK	

Email capacity query to Thames Water.

Below is a copy of an email query to TWU for a capacity check for the development. In our experience as we are reusing the existing outfall pipe and are reducing flows into the network from our site, TWU will consent. However given the present Covid Lockdown, responses are likely to take some time.

GW Gareth Webber <gareth.webber@brandconsultingltd.co.uk>
To 'DEVELOPER.SERVICES@THAMESWATER.CO.U'

Reply | Reply All | Fo
Tue

To whom it way concern.

Acting on behalf of the current landowner, our Client is currently discharging the final planning conditions for a single dwelling redevelopment in Camden.

The LLFA, have requested confirmation from Thames Water that there are no capacity objections to the following development. Therefore can TWU confirm they have no advise comments to the following single dwelling development, which is proposing to restrict the existing surface water discharge.

Application Ref: 2016/5375/P

	EXISTING SITE	PROPOSED SITE (2016 Planning)
Dwellings	1 No.	1 No.
Surface Water Management	Uncontrolled discharge into combined network.	Restricted discharged into combined network through existing outfall.
Foul Water Management	Uncontrolled discharge into combined network.	Uncontrolled discharge into combined network.
Foul Water Flows	0.04l/s	0.04l/s
Surface Water Flows	7.36l/s	4.86l/s
Combined Flows	7.40l/s	4.90l/s
Differential		-2.5 l/s

Kind Regards

Gareth Webber

Proposed Drainage Drawings

17/02/2020 12:11:48

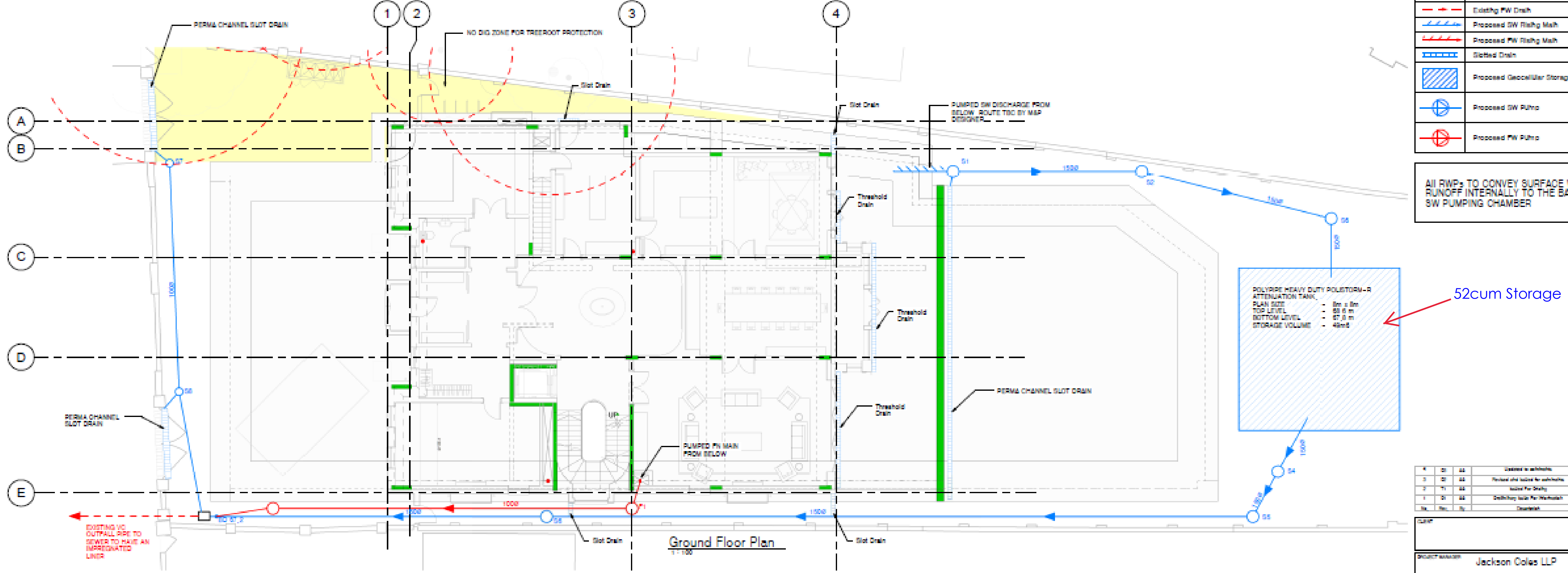
GENERAL NOTES:

1. Do not scale this drawing in either paper or digital form. Use figured dimensions only.
2. All 'Ross & Partners' drawings to be read in conjunction with all relevant Architect's drawings and any discrepancies reported to all relevant parties.
3. This drawing is to be read in conjunction with other 'Ross & Partners' drawings and 'Ross & Partners' Structural Specification documents and any discrepancies reported to all relevant parties.
4. Setting out will be in accordance with the Architect's dimensions and as discussed and agreed between Client, Contractor and the Architects and any discrepancies reported to all relevant parties.
5. For General Notes refer to drawing No. 11940/GN/S-000

DRAINAGE LEGEND

- New SW Drain
- New FW Drain
- New Combined Drain
- Existing SW Drain
- Existing FW Drain
- Proposed SW Rising Main
- Proposed FW Rising Main
- Slotted Drain
- Proposed Geocellular Storage Tank
- Proposed SW Pump
- Proposed FW Pump

ALL RWPs TO CONVEY SURFACE WATER RUNOFF INTERNALLY TO THE BASEMENT SW PUMPING CHAMBER



MANHOLE SCHEDULE						
Manhole Reference	Cover Level	Invert Level	Internal Chamber Size (mm)	Cover Size	Cover Reference	Comments
CMH1	38.77	34.650	800X600	610X450		EXISTING MANHOLE TO BE RETAINED. CDM RISK: CONTRACTOR TO EXERCISE CONFINED ACCESS WORKING AND BREATHING APPARATUS FOR PERSONNEL ENTERING THIS MANHOLE.
S1	39.40	38.80	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S2		38.70	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S3		38.60	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S4		37.78	1200 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S5		37.75	1200 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S6		37.39	1200 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S7	38.60	37.70	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
S8	38.50	37.50	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F1	39.25	38.60	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F2	38.70	38.20	1000 DIA	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F3	34.845	34.14	1500X750	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F4	tbc	34.00	1500X750	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F5	tbc	tbc	1500X750	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F6	tbc	tbc	1500X750	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	
F7	tbc	tbc	1500X750	600x600	BROADSTEL SEALED AND LOCKING INTERNAL RECESSED	

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PROJECT MANAGER: Jackson Coles LLP

ARCHITECT

ROSS & PARTNERS
Consulting Civil & Structural Engineers

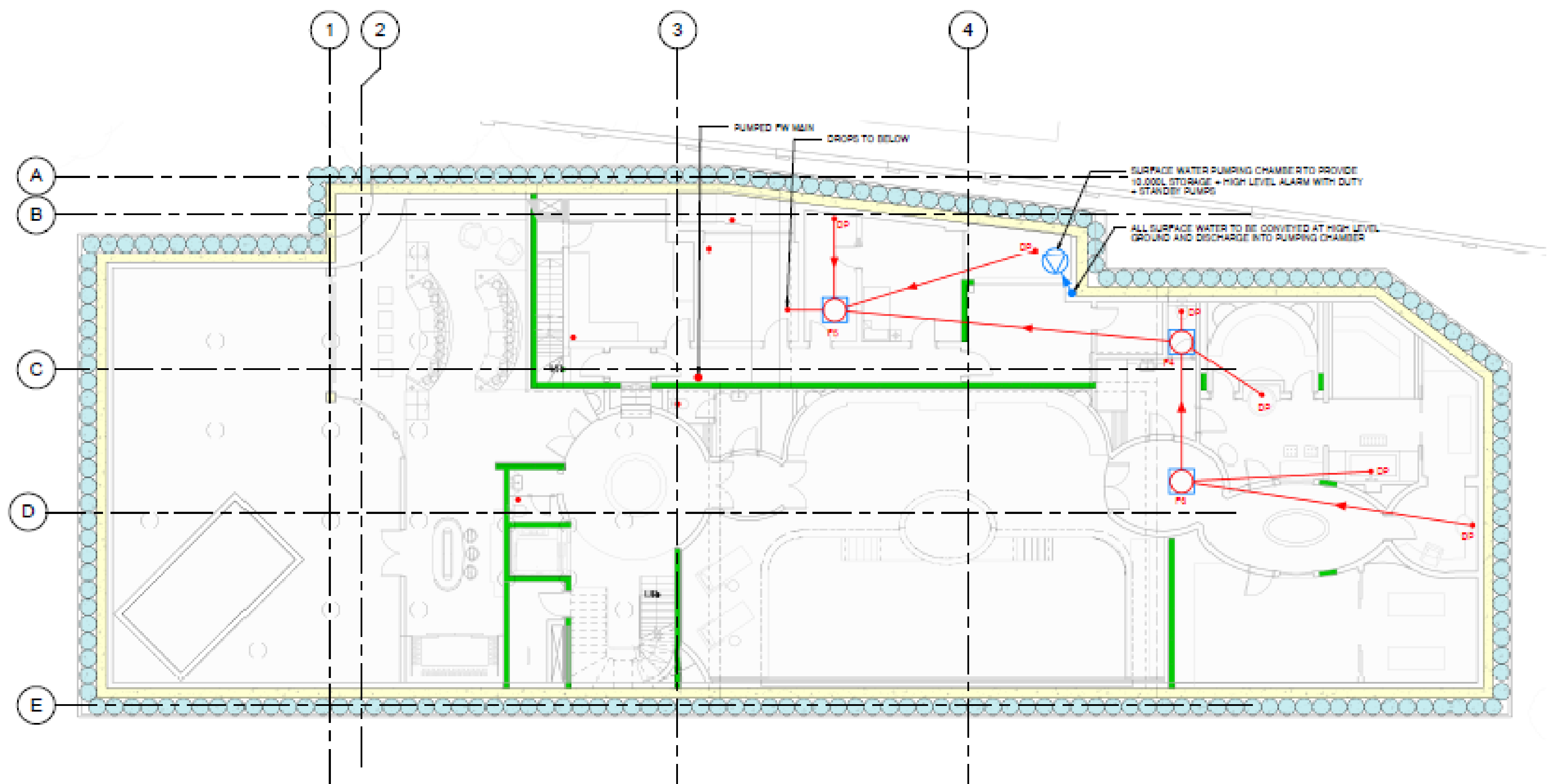
JOB TITLE: 16 Avenue Road, London, NW8 6BP

DRG TITLE: GROUND FLOOR PLAN DRAINAGE

DRN: AA | CHKD: MO'R | DATE: OCTOBER 2019

STATUS: For Pricing | SCALE: 1 : 100 @ A1

Drg No.: 11940/DR/GF/S-223 | Rev.: P3



Basement SSL Plan
1 : 100

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DRAINAGE LEGEND

	New SW Drain
	New FW Drain
	New Combined Drain
	Existing SW Drain
	Existing FW Drain
	Proposed SW Rising Main
	Proposed FW Rising Main
	Slotted Drain
	Proposed Geocellular Storage Tank
	Proposed SW Pump
	Proposed FW Pump

Jackson Coles LLP

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16 Avenue Road
London, NW8 6BP

BASEMENT SSL PLAN
Drainage

AA | MO'R | OCTOBER 2019

For Pricing | 1 : 100 @ A1

11940/DR/B2/S-222 P3

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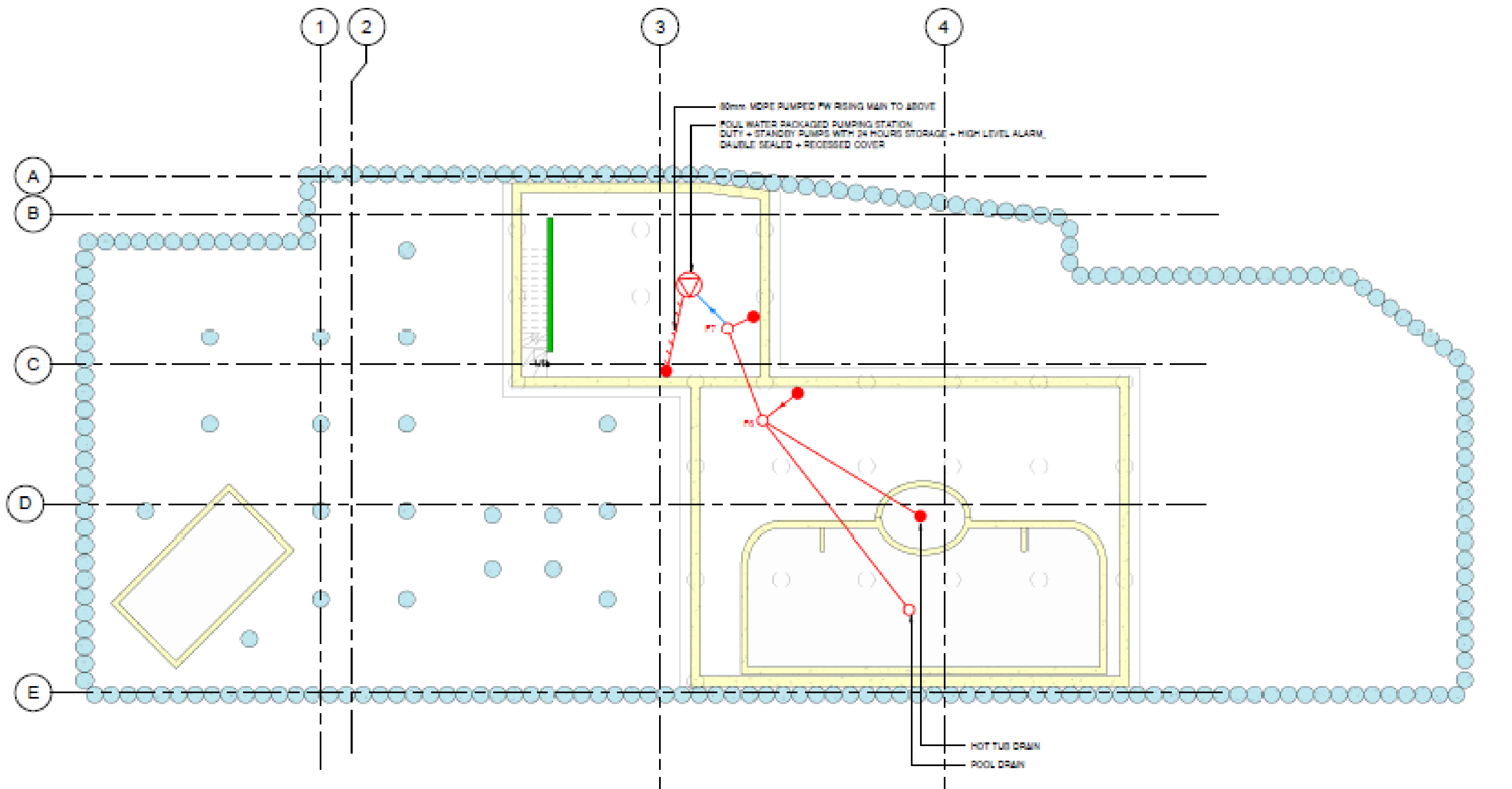
5. For General Notes refer to drawing No. 11940/SN/S-000

DRAINAGE LEGEND

(symbol)	New SW Drain
(symbol)	New FW Drain
(symbol)	New Combined Drain
(symbol)	Existing SW Drain
(symbol)	Existing FW Drain
(symbol)	Proposed SW Rising Main
(symbol)	Proposed FW Rising Main
(symbol)	Slotted Drain
(symbol)	Proposed Geocellular Storage Tank
(symbol)	Proposed SW Pump
(symbol)	Proposed FW Pump



Sub Basement SSL Plan
1 : 100

No.	Rev.	By	Description	Date
4	C2	AA	Updated to architects	[illegible]
3	C2	AA	Revised and issued for architects	[illegible]
2	T1	AA	Issued For Pricing	[illegible]
1	C1	AA	Preliminary Issue For Information	[illegible]

CLIENT

PROJECT MANAGER: Jackson Coles LLP

ARCHITECT

M&E ENGINEER

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JOB TITLE: 16 Avenue Road
London, NW8 6BP

DWG TITLE: SUBBASEMENT SSL PLAN
Drainage

DRN	CHKD	DATE
AA	MO'R	OCTOBER 2019

STATUS: For Pricing | SCALE: 1 : 100 @ A1

Project/DWG No.: 11940/DR/B1/S-221 | Rev.: P3

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SUDS Maintenance

This section sets out the recommendations for the maintenance of the surface water drainage systems for the development. Regular maintenance is required to ensure that the surface water drainage system operates efficiently and does not cause flooding to the property or surrounding buildings and land.

Such work is part of the day-to-day responsibility of all owners and occupiers.

Maintenance is most effective when carried out regularly, on a planned cycle.

Good maintenance needs the regular investment of small amounts of time and money, but the cost of preparing and carrying out a planned maintenance programme should be far less than the costs resulting from a series of unplanned major repairs, and will help plan future financial commitments.

Maintenance is the routine work which is necessary to protect the drainage system.

When carried out on a planned basis, maintenance helps to prevent the types of failure which occur predictably within the life drainage system

Maintenance falls into three main categories:

- Inspection to assess condition, report any problems and decide whether repair or other work is necessary.
- Specific tasks such as clearing debris from inspection chambers and pipes.
- Minor repairs such as fixing loose covers.

Maintenance differs from repair which is work carried out to put right defects or damage and work to return the drainage system to a good condition on a long-term basis.

Maintenance Regime

The following pages sets out a recommended regime of :

- Regular and routine maintenance
- Some occasional Tasks
- Likely remedial works

SUDS Feature	Regime	Tasks	Frequency
~~**Permeable Paving**~~	~~Regular Maintenance~~	~~Surface Brushing for appearance and to reduce silt accumulation~~	~~Monthly~~
		~~Brushing and Suction Sweeping or jest wash and suction sweep particularly for block paving in autumn~~	~~Annually~~
		~~Remove weeds and leaves~~	~~As required~~
	~~Ocassional Tasks~~	~~Jetting and suction where silt has accumulated in joints or voids. Replace grit and vibrate surface to lock for permeable block paving~~	~~Monthly~~
	~~Remedial Work~~	~~Where there has been sinkage or surface damage, remove block and grit and reinstate to design profile~~	~~As required~~
Geocellular Tanks	Regular Maintenance	Check Inlets, outlets, vents and overflows	Monthly for 3 months then annually
	Ocassional Tasks	JRemove sediment from pre-treatment catch pits	6 monthly or as required
	Remedial Work	Repair inlets, outlets vents etc	As required
Roofs	Regular Maintenance	Remove all debris from surface and gutters	Monthly for 3 months then every six months particularly in autumn
	Ocassional Tasks	Rodding of down pipes	Annually
	Remedial Work	Repair gutters and outlets	As required
General Drainage	Regular Maintenance	Inspect gullies, channels, inspection chambers to ensure they are in good operative condition	Monthly for 3 months then annually
		Remove sediment from gullies, catch pits and channels	
	Ocassional Tasks	Survey drain runs for sediment build up and other defects and remove where necessary	Every 5 years
	Remedial Work	Repair pipework, gullies, channels and flow controls	As required

SUDS Feature	Regime	Tasks	Frequency
Silt Traps and Catch Pits	Regular Maintenance	Debris removal from catchment surface (where may cause risks to performance)	Every 3 months
		Clear grate or slot	Monthly
	Ocassional Tasks	Inspection of silt accumulation	Monthly and after heavy storms
		Removal of silt	As required but at least annually
	Remedial Work	Repair of inlets/outlets	As required
Flow control chambers and devices	Regular Maintenance	Inspect and identify any areas that are not operating correctly. If necessary take remedial action	Monthly for the first 6 months then every six months
		Inspection of flow control chamber to assess if system is draining down correctly and that the orifice or flow control device is not blocked. Assess if there are any silt accumulations in the chamber sump.	Monthly and after heavy storms
	Ocassional Tasks	Removal of accumulated silt from silt trap and catchpit sumps	Annually or as required
	Remedial Work	Repair and rehabilitation of inlets, outlet overflows and vents	As required
Permachannel	Regular Maintenance	Clear grate or slot	
	Ocassional Tasks	Inspection of silt accumulation	Monthly and after heavy storms
		Removal of silt	Annually or as required
	Remedial Work	Repair of inlets, outlets and gratings	As required

Maintenance Records

It is important to keep a record of the checks that have been completed and the frequency. This will inform planned preventative maintenance schedule. A suggested template is illustrated below.

Date	Action	Inspector	Result	Works required /undertaken
e.g 12/10/2019	Silt traps inspected		Mild silt accumulation	Further review in 1 month