Tully De'Ath consultants

Feasibility Research

EIA, Flood Risk & Transport Assessments

Urban Planning and Design

Integrated Transport Solutions

Infrastructure Development

Structural Design

Eco and MMC Focused

Surface Water Drainage Statement
Abacus School
Camden
For Kier Construction
11349

Engineering at its Best

Report For

Scheme No: 11349

Kier Construction

Abacus School - Camden

Surface Water Drainage Statement

Main Contributors

23rd March 2016

Julian Turner

Issued By

Julian Turner

Approved By

Andrew Picton

Tully De'Ath Consultants, Sheridan House, Forest Row, East Sussex, RH18 5EA
Tel: 01342 828000 Fax: 01342 828001 Email: info@tullydeath.com Web: **www.tullydeath.com**

Contents

↘ **Flood Risk Assessment**

1.0 Introduction

2.0 The Site

3.0 Development Proposals

4.0 Existing Drainage

5.0 Proposed Drainage

6.0 Conclusions

↘ **Appendix A – Location and Site Plan**

↘ **Appendix B – Greenfield Run-Off Calculations**

↘ **Appendix C – Surface Water Calculations**

↘ **Appendix D – Camden Drainage Pro Forma**

Surface Water Drainage Statement

1.0 Introduction

Tully De'Ath have been commissioned by Kier Construction to provide a Drainage Statement to accompany a planning application for the re-development of the former Hampstead Police Station at Rosslyn Hill, Camden.

The purpose of the report is to demonstrate to the Planners that the proposed development is subject to an acceptable level of flood risk and should not increase the likelihood of flooding elsewhere. The report has been prepared in accordance with the guidance set out within the National Planning Policy Framework (NPPF) and makes reference to North London Strategic Flood Risk Assessment and Camden's Strategic Flood Risk Assessment (SFRA) 2014.

2.0 The Site

The Site address is former Hampstead Police Station, 26 Rosslyn Hill, London NW3 1PD. The centre of the site has a national grid reference of TQ26881 85560 and covers an area of approximately 0.14ha. The existing building covers approximately 550m^2 with the remaining 850m^2 of the site being hard paved. Refer to Appendix A for location plan and site plan.

The site is currently occupied by the former Hampstead Police Station. The building occupies the southern end of the site with surrounding hard landscaping up to the site boundary. The existing site is accessed is from Rosslyn Hill (pedestrians) and Downshire Hill (vehicles).

The Site is located within Flood Zone 1 and therefore flood risk is considered as low. The North London Strategic Flood Risk Assessment also shows that the proposed development is not located on or near any historic flooding occurring on streets and is not within an area identified with the potential to be at risk of surface water flooding.

3.0 Development Proposals

Change of use from police station (sui generis) to school (Use Class D1), including works to a Listed Building in a Conservation Area (partial demolition, extension, alterations).

4.0 Existing Drainage

Surface Water Run-Off Rates

The site area is approximately 1400m^2 (0.14 ha), of which 100% is currently impermeable. The existing run-off rate for the 1 in 100 year storm event was calculated using the modified rational method for the impermeable areas as shown below:

$Q_{100\ HARD}$ = 2.78 x A x i (where A is the catchment area in ha and i is the rainfall intensity in mm/hr as estimated using Micro Drainage software).

The total run-off rate for the existing site is:

$Q_{100\ HARD}$ = 2.78 x 0.14 x 106.93 = 41.62 l/sec

The same calculation was carried out using rainfall intensity values 'i' from Micro Drainage software for the 1 in 1 year and 1 in 30 year rainfall events. The flow rates for these storm events were found to be as follows:

Q1 = (2.78 x 0.14 x 33.45) = 13.02 l/sec

Q30 = (2.78 x 0.14 x 82.17) = 31.98 l/sec

Surface Water Run-Off Volume

Micro Drainage software was used to determine the depth of rainfall for the 1 in 100 year 6 hour rainfall event. This was found to be 63.24mm. The pre-development volume of run-off (V) can therefore be calculated for the 1400m^2 impermeable site area as below:

V_{100} = 0.06324 x 1400 = 88.53m^3

On-Site Network

There is currently separate foul and surface water drains serving the building and external hard landscaped areas which join at a manhole, close to the Downshire Hill site entrance, to form a combined drain which then discharges to a combined public sewer in Downshire Hill.

5.0 Proposed Drainage

Surface Water Run-Off

The proposed development, albeit minimally, will decrease the impermeable areas on the site (0.137ha) due to the introduction of soft landscaped planting areas. However, once an allowance for climate change has been added to this lower total impermeable area, the peak surface water flow rate and volume to the public sewer will be increase. The proposed run-off rate for the 1 in 100year storm event was calculated using the modified rational method for the proposed impermeable area as shown below:

$Q_{100\ PROPOSED} = 2.78 \times 0.137 \times 139.01 = 52.94$ l/sec

Micro Drainage software was used to determine the depth of rainfall for the 1 in 100 year 6 hour rainfall event. This was found to be 63.24mm. The pre-development volume of run-off (V) can therefore be calculated as below:

$V_{100} = (0.06324 \times 1370) = 86.63\ m^3$

$V_{100+cc} = (86.63)1.3 = 112.61\ m^3$ (1.3 = 30% allowance for climate change)

The surface water drainage system will be designed for the 1 in 100 year + 30% for climate change storm event to reduce the flood risk on site and the public sewer network downstream of the site outfall.

SuDS Assessment

The London Plan states that new developments should aim to achieve Greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the Sustainable Drainage Systems (SuDS) hierarchy. SuDS can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharge of groundwater in a manner that mimics natural conditions. The SuDS hierarchy states that storing rainwater for reuse within the building should be prioritised, followed by infiltration techniques. However, published information confirms that the site is underlain by London Clay which is unsuitable for the use of infiltration techniques.

Therefore, in accordance with the London Plan, surface water should be attenuated to Greenfield run-off rates before draining to the public sewers. The Greenfield run-off rate for the site was calculated using Micro Drainage software which derived a rate of 0.5l/s. Refer to Appendix B for calculations.

However, the joint Defra and EA R&D Technical Report (Preliminary Rainfall Runoff Management for Developments) states that the minimum limiting discharge for attenuation systems in 5 l/sec, as lower flow rates require small diameter flow control devices which are at risk of blockages. Therefore, surface water from the site will be attenuated to 5 l/sec before draining to the public sewers. Preliminary calculations (Appendix C) show that a storage volume of 46.5m3 is required to attenuate surface water to 5 l/sec for the 1 in 100 year plus 30% (climate change) storm event. This volume will be provided in a below ground attenuation tank. Refer to Appendix C for calculations

A flow control device and surface water attenuation tank will be provided on site and it is proposed that the attenuated flows will then discharge via gravity to public sewer in Downshire Hill. CCTV Survey information will be required to determine if an existing connection to the public sewer can be utilised or if a new direct connection is required.

The installation of a rainwater harvesting system is an option that will be considered as part of the detailed design however due to the layout and nature of the existing building to be refurbished this may prove impractical/uneconomical.

Further details of the SuDS strategy are provided in the Camden drainage proforma document in Appendix D.

SUDS Maintenance

It is the responsibility of the site owners to ensure that the SUDS are maintained throughout their life. Maintenance and cleaning of gullies, drain manholes (including catchpits) and attenuation tanks will assure adequate performance. A maintenance program is outlined in the table below.

SuDS Element	Maintenance		
Attenuation Storage	Maintenance Issues	Failure of Components, blockage from Debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly.	Monthly for three months, then six monthly or as required
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/ debris from catchpits/ gullies and control structures	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflow and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms

Foul Water

Guidance has been taken from BSEN 12056-2 to establish the flow rate for the proposed development based on the unit discharge method. Using Micro Drainage software the foul water discharge rate has been calculated to be 6.7l/s.

It is proposed that foul water discharges from the site to the combined public sewer in Downshire Hill.

A S106 application will need to be made to Thames Water to permit the proposed connection.

6.0 Conclusions

It has been demonstrated that the surface water flows will increase as a result of the proposed development.

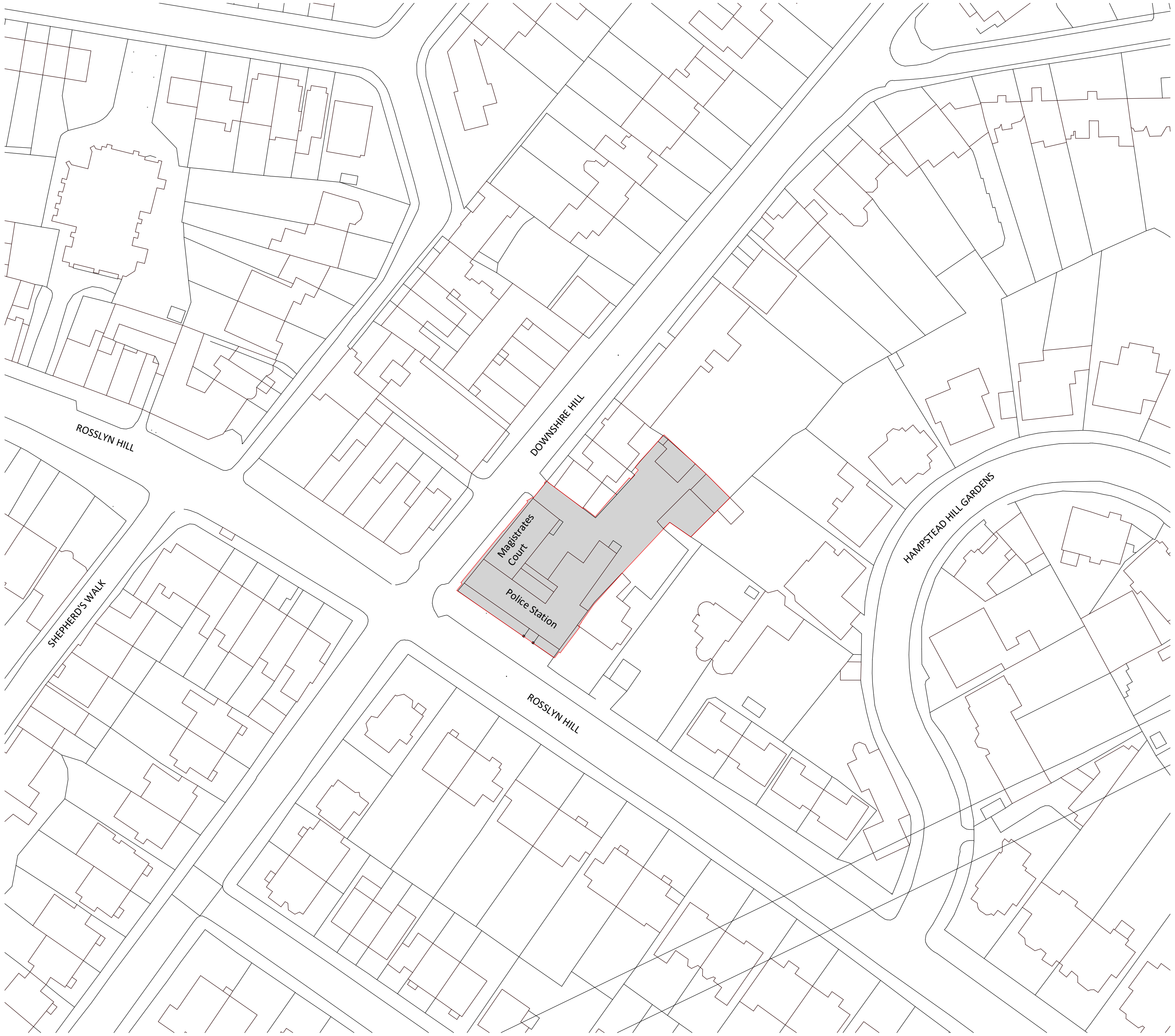
The London Plan states that new developments should aim to achieve Greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the Sustainable Drainage Systems (SuDS) hierarchy.

By introducing mitigation measures in the form of SuDS to limit the peak run-off rate to the minimum practicable of 5l/s this will reduce pressure on the combined sewer network in accordance with Camden Planning Policy DP23 - Water

Foul water flows may increase minimally form the Site's previous use however the effect of significantly reducing surface water flows will still provide a much reduced overall flow to the to the combined sewer.

Appendix A – Location and Site Plan

NOTE
DO NOT SCALE FROM THIS DRAWING. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED;
CONTRACTOR TO CHECK AND CONFIRM ALL DIMENSIONS AND SETTING OUT ON SITE. REPORT ANY ERRORS OR OMISSIONS TO WGI;
EXISTING INFORMATION BASED ON SURVEY MODEL RECEIVED 2015-10-20 (MODEL REF "32624RM-01-WIP", "32624RM-02-WIP", "32624RM-03-WIP", "32624RM-04-WIP") SURVEY MODEL IS PARTIALLY INCOMPLETE AND REQUIRES UPDATE FROM SURVEYOR. PROPERTY LINE SHOWN IS TO BE CONFIRMED
CURRENT MODEL FILE NAME - 114031-WGI-00-ZZ-M3-A-0001
CURRENT MODEL REVIEION - 1



Location Plan
1 : 1250

Legend

Site Boundary

0m 20m 40m 60m 80m 100m

Scale 1:1250

N

REV	DATE	BY	NOTE
-	2016-03-22	ER	Issued For Planning

Planning

PROJECT NUMBER
114031

PROJECT
Abacus Belsize Primary School
26a Rosslyn Hill, London NW3

DRAWING NAME
Location Plan

DRAWING TYPE
P - PLANNING

DRAWING NUMBER
114031 - P000

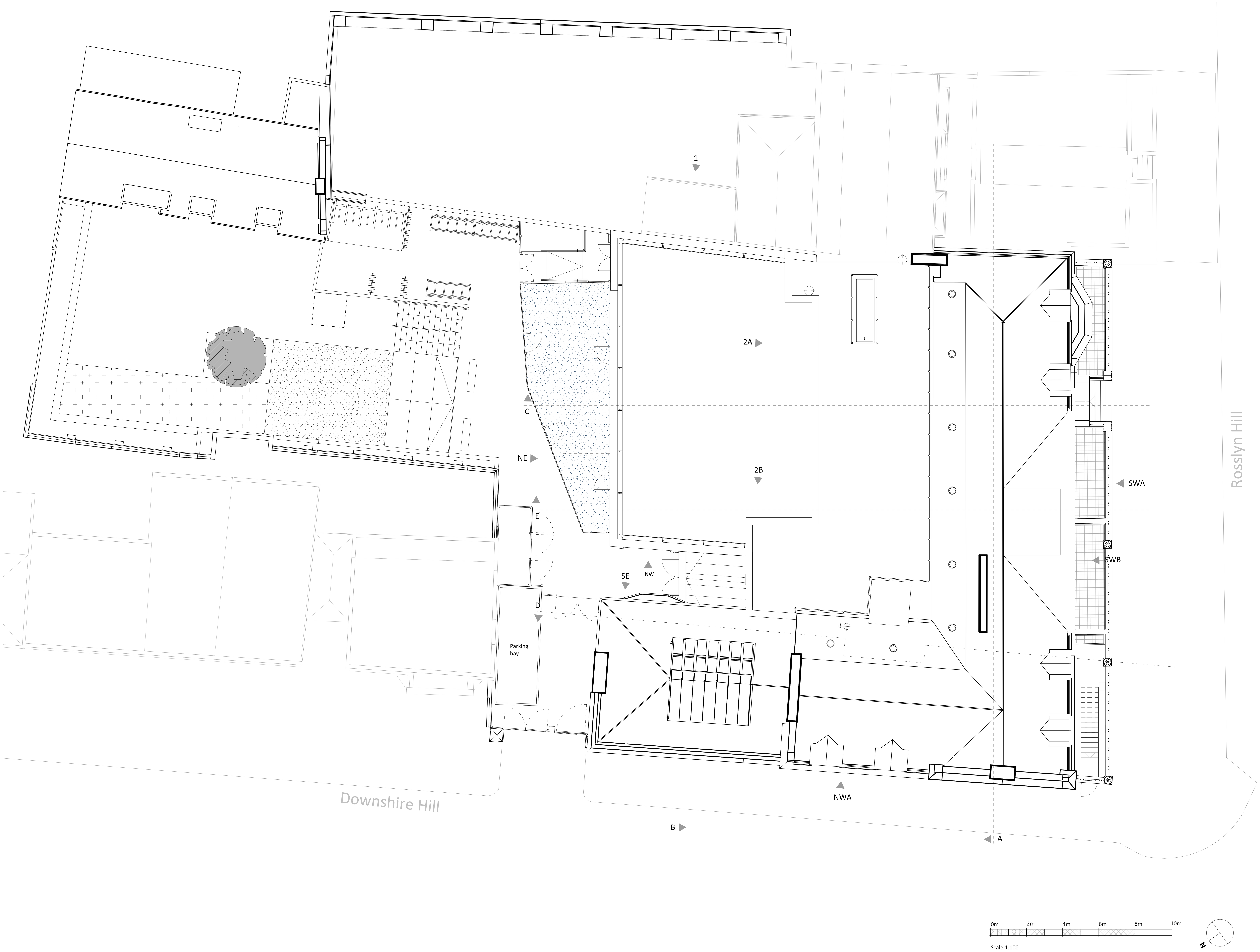
DATE	22.03.2016
SCALE	1 : 1250
DRAWING SIZE	A3
DRAWN BY	AR
CHECK	RM
REVISION	-

Watkins Gray International LLP
Colechurch House
1 London Bridge Walk
London SE1 2SX
United Kingdom
t: +44 (0)20 7940 8400

22/03/2016 09:12:08
C:\Revit Local Files\114031-WGI-00-ZZ-M3-A-0001_eimhinraffertyWGI.rvt

NOTE
DO NOT SCALE FROM THIS DRAWING. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED;
CONTRACTOR TO CHECK AND CONFIRM ALL DIMENSIONS AND SETTING OUT ON SITE. REPORT ANY ERRORS OR OMISSIONS TO WGI;

EXISTING INFORMATION BASED ON SURVEY MODEL RECEIVED 2015-10-20 (MODEL REF "32624RM-01-WIP", "32624RM-02-WIP", "32624RM-03-WIP", "32624RM-04-WIP") SURVEY MODEL IS PARTIALY INCOMPLETE AND REQUIRES UPDATE FROM SURVEYOR. PROPERTY LINE SHOWN IS TO BE CONFIRMED
CURRENT MODEL FILE NAME - 114031-WGI-00-ZZ-M3-A-0001
CURRENT MODEL REVISION - 1



Rev	Date	By	Note
-	2016-03-22	ER	Issued For Planning

Planning

PROJECT NUMBER
114031

PROJECT
Abacus Belsize Primary School
26a Rosslyn Hill, London NW3

DRAWING NAME
Proposed Site Plan

DRAWING NUMBER
114031 - P101

DATE	22.03.2016
SCALE	1 : 100
DRAWING SIZE	A1
DRAWN BY	AR
CHECK	RM
REVISION	-

Watkins Gray International LLP
Colechurch House
1 London Bridge Walk
London SE1 2SX
United Kingdom
t: +44 (0)20 7940 8400

Appendix B – Greenfield Run-Off Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	0.130	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.5
QBAR Urban	0.5
Q1 year	0.4
Q1 year	0.4
Q30 years	1.1
Q100 years	1.5

Appendix C – Surface Water Calculations

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	7.760	0.760	4.9	30.4	O K
30 min Summer	7.928	0.928	4.9	37.1	O K
60 min Summer	8.012	1.012	4.9	40.5	O K
120 min Summer	7.983	0.983	4.9	39.3	O K
180 min Summer	7.922	0.922	4.9	36.9	O K
240 min Summer	7.854	0.854	4.9	34.2	O K
360 min Summer	7.714	0.714	4.9	28.6	O K
480 min Summer	7.577	0.577	4.9	23.1	O K
600 min Summer	7.467	0.467	4.9	18.7	O K
720 min Summer	7.378	0.378	4.9	15.1	O K
960 min Summer	7.255	0.255	4.8	10.2	O K
1440 min Summer	7.140	0.140	4.3	5.6	O K
2160 min Summer	7.098	0.098	3.3	3.9	O K
2880 min Summer	7.081	0.081	2.7	3.2	O K
4320 min Summer	7.065	0.065	1.9	2.6	O K
5760 min Summer	7.056	0.056	1.5	2.2	O K
7200 min Summer	7.051	0.051	1.3	2.0	O K
8640 min Summer	7.047	0.047	1.1	1.9	O K
10080 min Summer	7.043	0.043	0.9	1.7	O K
15 min Winter	7.859	0.859	4.9	34.4	O K
30 min Winter	8.054	1.054	4.9	42.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
15 min Summer	139.002	0.0	33.9	18
30 min Summer	89.961	0.0	43.8	32
60 min Summer	55.351	0.0	53.9	60
120 min Summer	32.877	0.0	64.1	94
180 min Summer	23.920	0.0	69.9	128
240 min Summer	18.978	0.0	74.0	162
360 min Summer	13.703	0.0	80.1	230
480 min Summer	10.865	0.0	84.7	290
600 min Summer	9.069	0.0	88.4	350
720 min Summer	7.821	0.0	91.5	406
960 min Summer	6.188	0.0	96.5	520
1440 min Summer	4.442	0.0	103.9	748
2160 min Summer	3.184	0.0	111.7	1100
2880 min Summer	2.512	0.0	117.5	1464
4320 min Summer	1.796	0.0	126.1	2180
5760 min Summer	1.414	0.0	132.4	2936
7200 min Summer	1.175	0.0	137.4	3656
8640 min Summer	1.009	0.0	141.7	4400
10080 min Summer	0.887	0.0	145.3	5064
15 min Winter	139.002	0.0	37.9	18
30 min Winter	89.961	0.0	49.1	32

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	8.164	1.164	4.9	46.5	O K
120 min Winter	8.131	1.131	4.9	45.2	O K
180 min Winter	8.051	1.051	4.9	42.0	O K
240 min Winter	7.955	0.955	4.9	38.2	O K
360 min Winter	7.758	0.758	4.9	30.3	O K
480 min Winter	7.539	0.539	4.9	21.6	O K
600 min Winter	7.384	0.384	4.9	15.4	O K
720 min Winter	7.275	0.275	4.9	11.0	O K
960 min Winter	7.157	0.157	4.4	6.3	O K
1440 min Winter	7.099	0.099	3.4	4.0	O K
2160 min Winter	7.076	0.076	2.4	3.1	O K
2880 min Winter	7.066	0.066	1.9	2.6	O K
4320 min Winter	7.054	0.054	1.4	2.1	O K
5760 min Winter	7.047	0.047	1.1	1.9	O K
7200 min Winter	7.042	0.042	0.9	1.7	O K
8640 min Winter	7.000	0.000	0.0	0.0	O K
10080 min Winter	7.000	0.000	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	55.351	0.0	60.4	60
120 min Winter	32.877	0.0	71.8	98
180 min Winter	23.920	0.0	78.4	136
240 min Winter	18.978	0.0	82.9	176
360 min Winter	13.703	0.0	89.8	252
480 min Winter	10.865	0.0	94.9	308
600 min Winter	9.069	0.0	99.0	364
720 min Winter	7.821	0.0	102.5	418
960 min Winter	6.188	0.0	108.1	520
1440 min Winter	4.442	0.0	116.4	736
2160 min Winter	3.184	0.0	125.1	1100
2880 min Winter	2.512	0.0	131.6	1460
4320 min Winter	1.796	0.0	141.2	2200
5760 min Winter	1.414	0.0	148.3	2928
7200 min Winter	1.175	0.0	153.9	3624
8640 min Winter	1.009	0.0	0.0	0
10080 min Winter	0.887	0.0	0.0	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Shortest Storm (mins)	15
Ratio R	0.432	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.130

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.130

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 7.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	40.0	0.700	40.0	1.400	40.0	2.100	40.0
0.100	40.0	0.800	40.0	1.500	40.0	2.200	40.0
0.200	40.0	0.900	40.0	1.600	40.0	2.300	40.0
0.300	40.0	1.000	40.0	1.700	40.0	2.400	40.0
0.400	40.0	1.100	40.0	1.800	40.0	2.500	40.0
0.500	40.0	1.200	40.0	1.900	40.0		
0.600	40.0	1.300	40.0	2.000	40.0		

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0102-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	102
Invert Level (m)	7.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.353	4.9
Kick-Flo®	0.740	4.0
Mean Flow over Head Range	-	4.3

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)
0.100	3.4	1.200	5.0	3.000	7.6	7.000	11.4
0.200	4.7	1.400	5.3	3.500	8.2	7.500	11.8
0.300	4.9	1.600	5.7	4.000	8.7	8.000	12.1
0.400	4.9	1.800	6.0	4.500	9.2	8.500	12.5
0.500	4.8	2.000	6.3	5.000	9.7	9.000	12.8
0.600	4.6	2.200	6.6	5.500	10.2	9.500	13.2
0.800	4.1	2.400	6.9	6.000	10.6		
1.000	4.6	2.600	7.1	6.500	11.0		

Appendix D – Camden Drainage Pro Forma

<u>Advice Note on contents of a Surface Water Drainage Statement</u>

London Borough of Camden

1. Introduction

1.1 The Government has strengthened planning policy on the provision of sustainable drainage and new consultation arrangements for 'major' planning applications will come into force from 6 April 2015 as defined in the Written Ministerial Statement (18th Dec 2014).

1.2 The new requirements make Lead Local Flood Authorises statutory consultees with respect to flood risk and SuDS for all major applications. Previously the Environment Agency had that statutory responsibility for sites above 1ha in flood zone 1.

1.3 Therefore all 'major' planning applications submitted from 6 April 2015 are required demonstrate compliance with this policy and we'd encourage this is shown in a **Surface Water Drainage Statement**.

1.4 The purpose of this advice note is to set out what information should be included in such statements.

2. Requirements

2.1 It is essential that the type of Sustainable Drainage System (SuDS) for a site, along with **details of its extent and position**, is identified within the planning application to clearly demonstrate that the proposed SuDS can be accommodated within the development.

2.2 It will now not be acceptable to leave the design of SuDs to a later stage to be dealt with by planning conditions.

2.3 The NPPF paragraph 103 requires that developments do not increase flood risk elsewhere, and gives priority to the use of SuDS. Major developments must include SuDS for the management of run-off, unless demonstrated to be inappropriate. The proposed minimum standards of operation must be appropriate and as such, a **maintenance plan** should be included within the Surface Water Drainage Statement,clearly demonstrating that the SuDS have been designed to ensure that the maintenance and operation requirements are economically proportionate Planning Practice Guidance suggests that this should be considered by reference to the costs that would be incurred by consumers for the use of an effective drainage system connecting directly to a public sewer.

2.4 Camden Council will use planning conditions or obligations to ensure that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

2.5 Within Camden, SuDS systems must be designed in accordance with London Plan policy 5.13. This requires that developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve **greenfield run-off rates** and ensure that surface water run-off is managed as close to its source as possible in line with the following **drainage hierarchy**:

1 store rainwater for later use
2 use infiltration techniques, such as porous surfaces in non-clay areas
3 attenuate rainwater in ponds or open water features for gradual release
4 attenuate rainwater by storing in tanks or sealed water features for gradual release
5 discharge rainwater direct to a watercourse
6 discharge rainwater to a surface water sewer/drain
7 discharge rainwater to the combined sewer.

2.6 The hierarchy above seeks to ensure that surface water run-off is controlled as near to its source as possible to mimic natural drainage systems and retain water on or near to the site, in contrast to traditional drainage approaches, which tend to pipe water off-site as quickly as possible.

2.7 Before disposal of surface water to the public sewer is considered all other options set out in the drainage hierarchy should be exhausted. When no other practicable alternative exists to dispose of surface water other than the public sewer, the Water Company or its agents should confirm that there is adequate spare capacity in the existing system taking future development requirements into account.

2.8 Best practice guidance within the non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems will also need to be followed. Runoff volumes from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the **greenfield runoff volume** for the same event.

2.9 Camden Development Policy 23 (Water) requires developments to reduce pressure on combined sewer network and the risk of flooding by limiting the rate of run-off through sustainable urban drainage systems. This policy also requires that developments in areas known to be at risk of surface water flooding are designed to cope with being flooded. Camden's SFRA surface water flood maps, updated SFRA figures 6 (LFRZs), and 4e (increased susceptibility to elevated groundwater) , as well as the Environment Agency updated flood maps for surface water (ufmfsw), should be referred to when determining whether developments are in an area at risk of flooding.

2.10 Camden Planning Guidance 3 (CPG3) requires developments to achieve a greenfield run off rate once SuDS have been installed. Where it can be demonstrated that this is not feasible, a minimum 50% reduction in run off rate across the development is required. Further guidance on how to reduce the risk of flooding can be found in CPG3 paragraphs 11.4-11.8.

2.11 Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.

3. Further information and guidance

3.1 Applicants are strongly advised to discuss their proposals with the Lead Local Flood Authority at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.

3.2 For general clarification of these requirements please Camden's Local Planning Authority or Lead Local Flood Authority

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our advice note on surface water drainage. Developers should complete this form and submit it to the Local Planning Authority, referencing from where in their submission documents this information is taken. The pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management and uses the storage calculator on www.UKsuds.com. This pro-forma is based on current industry best practice and focuses on ensuring surface water drainage proposals meet national and local policy requirements. The pro-forma should be considered alongside other supporting SuDS Guidance.

1. Site Details

Site	former Hampstead Police Station
Address & post code or LPA reference	26A Rosslyn Hill, London NW3 1PD
Grid reference	526883 (easting) 185539 (northing)
Is the existing site developed or Greenfield?	Developed
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding?	No
Total Site Area served by drainage system (excluding open space) (Ha)*	0.14

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0.14	0.137		If proposed > existing, then runoff rates and volumes will be increasing. Section 6 must be filled in. If proposed ≤ existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)			N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Infiltration		X		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		X		e.g. Is there a watercourse near by?
To surface water sewer	X		Existing combined Thames Water sewer	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		X		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	% Difference (difference /existing x 100)	Notes for developers
Greenfield QBAR	0.5	N/A	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1	13.02	5	-8.2	63	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30	31.98	5	-26.98	15	
1in 100	41.62	5	-36.62	12	
1 in 100 plus climate change	N/A	5			The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
GREENFIELD RUN OFF VOLUME		N/A	N/A	
1 in 1	31.08	30.41		Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	68.33	66.86		
1in 100 6 hour	88.53	86.63		
1 in 100 6 hour plus climate change	115.09	112.62		The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m^3)		Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m^3)		Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible] (m^3)	46.5	Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m^3		Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	London Clay	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?		Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	Uknown	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	No	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	Unknown	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	No	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	Option 1 (46.5m3)	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used?	Flow control and attenuation tank	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	Yes	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Drainage system can contain in the 1 in 100 storm event without flooding	Yes	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Drainage system can contain in the 1 in 100 +CC storm event without flooding	Yes	
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	N/A	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters

		must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.
How are rates being restricted (vortex control, orifice etc)	Vortex control	Detail of how the flow control systems have been designed to avoid pipe blockages and ease of maintenance should be provided.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	Abacus School	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	Implementation of SuDs Maintenance Plan	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2		
Section 3		
Section 4		
Section 5		
Section 6		
Section 7		
Section 8		

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By: Julian Turner
Qualification of person responsible for signing off this pro-forma: Civil Engineer

Company: Tully De'Ath (Consultants) Ltd
On behalf of (Client's details): Abacus School
Date: 23.03.16

Feasibility Research

EIA, Flood Risk &
Transportation
Assessment

Urban Planning and
Design

Integrated Transport
Solutions

Infrastructure
Development

Structural Design

Eco and MMC
Focused

Tully De'Ath offers a range of excellent design services to a wide client base. If you want to find out more about the services we offer, please contact your nearest office on the details below.

Sheridan House, Forest Row, East Sussex, RH18 5EA
01342 828000 ph
01342 828001 fax

Unit 4, St Saviours Wharf, Mill Street, London, SE1 2BE
0845 850 8280 ph
0845 850 8281 fax
www.tullydeath.com