Below Ground Drainage Strategy

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Submitted on behalf of Lab Selkirk House Ltd

Selkirk House, 166 High Holborn and 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street, London, WC1A 1JR

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1. Introduction

This Flood Risk Assessment (FRA) and SuDS Strategy Report has been prepared by Heyne Tillett Steel to support the planning application submitted to the London Borough of Camden (LBC) in relation to the redevelopment taking place at 1 Museum Street, WC1A 1JR.

A planning application for the development site was previously submitted to LBC for approval in 2022 (ref. 2021/2954/P). A new submission is now required due to part of the existing buildings becoming listed during the determination period. There is no meaningful change to the agreed drainage arrangements proposed.

Meinhardt compiled the drainage strategy report which supported the 2022 planning application and as part of the pre-app discussions agreed the SuDS measures with both LBC and Thames Water. The SuDS measures and run-off rates set out in this report are in line with what was agreed previously.

The report aims to incorporate and demonstrate compliance with the following national, regional and local planning policy guidance and statutory requirements as far as reasonably possible.

- + National Planning Policy Framework (NPPF), July 2021
- + The London Plan, 2021
- + London Borough of Camden's Strategic Flood Risk Assessment (SFRA), 2014
- + Camden Planning Guidance Water and Flooding, 2019
- + Camden Local Plan, 2017

2. The Site

2.1 Site Location

The Site is bound by High Holborn to the south, buildings front onto Grape Street with a predominantly retail use to the west, New Oxford Street to the north and Museum Street to the east. The surrounding uses are primarily office and retail. It has a postcode of WC1A 1JR and is located at the National Grid reference of 530186E, 181385N. The site location and red line boundary is presented in Image 1.



Image 1 - Site Location Plan

2.2 Existing Development

The Site comprises two buildings which are separated by adopted highway, West Central Street. The red line boundary and the area under private ownership is shown in Image 2. The area of land within private ownership is 0.412 hectares, while the Site has a total area of 0.520 hectares.

Image 2 shows that the site consists of the Museum Street site to the south and the West Central Street site to the north. The existing Museum Street site includes Selkirk House which is a 17 storey building with two basement levels and a further partial basement. From basement level up to second floor, Selkirk House is occupied by an NCP car park. The remainder of the building was occupied by Travelodge and offered overspill accommodation for the nearby Travelodge outside the site boundary to the south. It has not been used as a hotel since mid-2020.

The West Central Street site comprises predominantly of retail premises at the ground floor level opening onto New Oxford Street. The remaining floors are a combination of office and residential use, with a nightclub located in the south west of the boundary area. Within the West Central Street site 35-37 New Oxford Street and 10-12 Museum Street have recently become Grade II listed.



Image 2 - Existing Site Plan



2.3 Proposed Development

Redevelopment of Selkirk House, 166 High Holborn and 1 Museum Street following the substantial demolition of the existing NCP car park and former Travelodge Hotel to provide a mixed-use scheme, providing office, residential, and town centre uses at ground floor level. Works of part-demolition and refurbishment to 10-12 Museum Street, 35-41 New Oxford Street, and 16A-18 West Central Street to provide further town centre ground floor uses and residential floorspace, including affordable housing provision. Provision of new public realm including a new pedestrian route through the site to link West Central Street with High Holborn. Relocation of cycle hire docking stations on High Holborn (Phased Development).

Refer to the architects and landscape architects drawings which have been submitted separately as part of the planning application.

2.4 Site Topography

The site falls from north to south with a high point of c. 25.500 mAOD in the north east corner at the junction of New Oxford Street and Museum Street. The lowest point on site is located along the south boundary near the junction of High Holborn and Grape Street with a level of 23.700 mAOD. The central part of the site has an existing ground level of approximately 25.150 to 25.440 mAOD.

A copy of the topographical survey for the site is contained in Appendix A. The Exceedance Plan for the proposed development is contained in Appendix G.

3. Existing Drainage Arrangements

3.1 Public Drainage Network

Thames Water provides the public wastewater services for the site. The site is served by combined sewers under all nearby streets.

A 1219x787mm ovoid sewer crosses the site under West Central Street. This sewer has an invert level of approximately 21.700mAOD (~3.5m below ground level). There are trunk sewers running north-south under Museum Street and running west-east under New Oxford Street. The trunk sewer under Museum Street varies in size but is approximately 1700x914mm and has an invert level of c. 20.600mAOD. The trunk sewer under New Oxford Street is 1676x914mm and has an invert level of c. 19.350mAOD. Further combined sewers are also located within High Holborn, Grape Street and Shaftesbury Avenue.

A copy of the sewer records is contained in Appendix B and an extract is shown in Image 3.

3.2 Existing On-site Drainage

A CCTV survey has been completed for the site. This confirms that there are 4 no. existing sewer outfalls from the West Central Street site and at least one from the Museum Street site. The survey also identified a number of pumping stations at basement level in the Museum Street site.

A number of manhole chambers were not surveyed and it is unclear from the survey how some parts of the site drain in the existing situation. A further CCTV survey will be required at the next design stage to confirm how the existing site drains and whether the existing network is in adequate condition to be reused.

A copy of the CCTV survey drawings are contained in Appendix C.



Image 3 - Extract from Thames Water Asset Map

3.3 Existing Surface Water Rates

Only land within private ownership has been considered for the calculation of existing surface water run-off rates as the adopted land is expected to drain as existing. The existing peak run-off has been calculated using the Modified Rational Method in accordance with the following formula:

$Q = 3.61 C_v x i x A$

where C_v is the volumetric runoff coefficient (0.950), A is the catchment area in hectares and i is the peak rainfall intensity in mm/ hr which was obtained using FSR data and Microdrainage software.

Table 1 summarises the existing peak run-off rate for the West Central Street site (850m²) for each storm event, while Table 2 presents the same for the Museum Street Site (3,270m²).

Rainfall event	Rainfall Intensity	Existing Rates
Q ₁	33.37 mm/hr	9.89 l/s
Q ₃₀	81.97 mm/hr	24.29 l/s
Q ₁₀₀	106.66 mm/hr	31.61 l/s
Q _{100+40%}	149.32 mm/hr	44.25 l/s

Table 1 - West Central Street Site Existing Surface Water Run-off Rates

Rainfall event	Rainfall Intensity	Existing Rates
Q ₁	33.37 mm/hr	37.42 l/s
Q ₃₀	81.97 mm/hr	91.92 l/s
Q ₁₀₀	106.66 mm/hr	119.61 I/s
Q _{100+40%}	149.32 mm/hr	167.45 I/s

Table 2 - Museum Street Site Existing Surface Water Run-off Rates

3.4 Existing Foul Water Rates

Guidance from Flows and Loads 3 and the Design & Construction Guidance for Foul & Surface Water Sewers have been referenced to determine the foul water flow rates from the existing buildings. The following flow rates have been used in these calculations:

- + Hotel Rooms: 250 l/person/day
- + Residential Properties: 4000 I/dwelling/day
- + Remaining land (where details of flows are unknown): 0.6 l/s per hectare

For the West Central Street site, the building uses at play are residential (2 units), office space (c. 735 m^2), a retail unit (c. 585 m^2) and a nightclub (c. 890m^2).

The flow rate from the residential units has been calculated as 8000 I/day which converts to 0.093 I/s, while the flow rate from the remainder of the building works out at 0.133 I/s

The total existing foul water discharge rate for the West Central Street site is 0.23 $\mbox{I/s}$

For the Museum Street site, the building uses at play are car parking, commercial use and hotel. From a review of the existing drawings, it is understood that there is c. 1,570m² of commercial space and 184 hotel rooms.

Assuming there are 1.5 occupants in each hotel room on average, this gives a foul water discharge rate of 69000 I/day for the hotel which converts to 0.799 I/s and a foul water discharge rate of 0.094 I/s for the commercial space.

The total existing foul water discharge rate for the Museum Street site is 0.89 $\ensuremath{\text{I/s}}$

4. Proposed Drainage Arrangements

It is proposed to re-use existing outfalls to the public sewers where possible. Separate foul and surface water networks will be provided to serve the building and will be designed in accordance with Building Regulations Part H.

4.1 Policy Context

In accordance with the London Plan and LBC's SuDS policy the surface water drainage proposals aim to maximise the opportunities to incorporate SuDS into the landscaping and buildings. As such the provision of blue roofs and blue-green roofs has been maximised through coordination with the design team, with attenuation tanks used a supplementary measure only.

There are limited opportunities for landscape SuDS or permeable paving as the proposed building occupies the entire area of private land within the red line boundary.

A SuDS Assessment has been carried out using guidance set out in the London Plan. LBC's SuDS Proforma has also been completed and acts as a summary for the evidence set out in this report. Refer to Appendix D for a copy of the proforma.

Table 2 presents the drainage hierarchy, taken from Policy SI13 of the London Plan, which shows which SuDS are proposed to be incorporated into the development.

	SuDS Technique	Feasibility	
1	Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)	\checkmark	Both blue and greer roof and terrace leve h
2	Rainwater infiltration to ground at or close to source	×	Infiltration features The building occupi
3	Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	\checkmark	Green roo
4	Rainwater discharge direct to a watercourse (unless not appropriate)	×	There are no wate
5	Controlled rainwater discharge to a surface water sewer or drain	×	There are no si
6	Controlled rainwater discharge to a combined sewer	\checkmark	It is proposed to combined pu

Table 3 - Surface Water Drainage Hierarchy (Policy SI13 London Plan)



Use in the Proposed Site

n roofs are proposed for the majority of the building at els. The areas of green roof will provide some rainwater arvesting through passive irrigation.

must be located a minimum of 5m from any structure. ies the entire site, therefore there is inadequate space for any form of infiltration.

fs are proposed across much of the building.

ercourses within proximity of the site to facilitate this means of surface water disposal.

urface water sewers within the vicinity of the Site.

b discharge surface water from SuDS features to the blic sewers via existing / proposed connections.

4.2 Greenfield Run-off Rates

Greenfield run-off rate has been calculated using the calculation tool available on <u>www.uksuds.com</u>, and is provided in Appendix E. This established that the greenfield run-off for the West Central Street site is 0.13 I/s for Q_{BAR} and 0.42 I/s for the 1 in 100 year rainfall event. For the Museum Street site, it gave a greenfield run-off rate of 0.51 I/s for Q_{BAR} and 1.62 I/s for the 1 in 100 year event.

It is proposed to reduce the peak surface water run-off rate to as close to greenfield rates as feasible within the site constraints. However it is noted that the greenfield rates are very low and could result in a system which poses a blockage risk as self-cleansing velocities would not be met.

Due to the low greenfield rates obtained, Meinhardt approached LBC and Thames Water prior to the previous planning submission and agreed an approach to the SuDS for the site which would both result in a significant betterment over the existing situation in terms of run-off rates but would not pose a blockage or maintenance risk.

4.3 Consultation with LBC and Thames Water (by Meinhardt)

As part of the pre-app discussions for the previous application (ref. 2021/2954/P0), Meinhardt consulted both LBC and Thames Water to agree the principles of the SuDS proposals.

Through discussions with LBC, Meinhardt set out a proposal of restricting both the West Central Street site and the Museum Street site to a peak surface water run-off rate 5 l/s each while prioritising the use of blue and green roofs. It was also set out that adopted land will drain as it does in the existing case and as such is discounted from any SuDS assessment.

An extract from LBC's SuDS Officer's response is set out below:

"You would need to demonstrate that you have exhausted the roof and landscape opportunities, regarding maximising SuDS to deal with extra volumes. If so, I think it would be reasonable to accept the approach below."

Thames Water were also consulted by Meinhardt both in 2022 and prior to this in 2020. In 2020, Thames Water confirmed that they had sufficient capacity to accommodate the foul and surface water flows from the development. They reconfirmed this for the West Central Street site in July 2022 but Thames Water did not respond in time to reconfirm their stance for the Museum Street site.

HTS have contacted Thames Water and they have confirmed that their position is unchanged for the Museum Street site and there is sufficient capacity to accommodate the foul and surface water flows from the development.

Refer to Appendix F for a copy of the relevant correspondence.

4.4 West Central Street SuDS Proposals

While it was endeavoured to reduce the peak surface water runoff from the West Central Street site to as close to greenfield rates as possible, this was not feasible and it was agreed with LBC and Thames Water that the peak run-off rate would be restricted to 5 I/s.

Priority was given to above ground SuDS which are incorporated into the fabric of the building. Approximately 160m² will be covered in blue roof with additional areas having green roofs. Due to the listing of parts of the building and the retention of some existing roofs, it was not possible to increase the blue roof provision.

Any areas which cannot drain via a blue roof will be directed to a basement level attenuation tank, before being pumped to the internal MEP drainage network to discharge into the public sewer via gravity. Pumping will be necessary due to the level of the basement in relation to the Thames Water sewer which does not allow for gravity discharge. The proposed attenuation tank is being built above the existing basement slab and therefore space is very constrained, and the volume of the attenuation tank is very restricted. Through coordination with the design team, a tank with a effective storage volume of 20 cubic metres is proposed.

A summary of the SuDS provision is set out in Table 4. Refer to Appendix G for a copy of the SuDS layout and Appendix E for the preliminary drainage calculations.

SuDS Measure	Location	Volume	Run-off Rate
Blue Roof A1	Courtyard	9.0 m ³	0.30 l/s
Blue Roof A2	Roof 18	8.8 m ³	0.30 l/s
Attenuation Tank	Basement	20.1 m ³	4.40 l/s
То	təl	37.8 m³	5 1/s

Table 4 - Summary of SuDS Proposals at West Central Street site

While the rates set out in Table 4 are in excess of the Greenfield rates, they give a 87% reduction from the run-off in the existing scenario for the 1 in 100 year storm event. This is significant intervention and is expected to have a positive impact on the surrounding sewer network and in turn offsite flood risk.



4.5 Museum Street SuDS Proposals

While it was endeavoured to reduce the peak surface water runoff from the Museum Street site to as close to greenfield rates as possible, this was not feasible, and it was agreed with LBC and Thames Water that the peak run-off rate would be restricted to 5 I/s.

Priority was given to above ground SuDS which are incorporated into the fabric of the building. Approximately 810m² will be drained via blue roofs with additional areas having green roofs. Due to the listing of parts of the building and the retention of some existing roofs, it was not possible to increase the blue roof provision.

Any areas which cannot drain via a blue roof will be directed to a basement level attenuation tank and pumped to the internal MEP drainage network to discharge into the public sewer via gravity. Pumping will be necessary due to the level of the basement in relation to the Thames Water sewer which does not allow for gravity discharge. The proposed attenuation tank is being built below the basement slab, with close coordination with the structural engineers to ensure it will not impact the foundation design. Through coordination with the design team, a tank with a effective storage volume of 138 cubic metres is proposed.

A summary of the SuDS provision is set out in Table 5. Refer to Appendix G for a copy of the SuDS layout and Appendix E for the preliminary drainage calculations.

SuDS Measure	Location	Volume	Run-off Rate
Blue Roof B1	Vine Lane: 2 nd Floor North Terrace	9.3 m ³	0.10 l/s
Blue Roof B2	Vine Lane: 2 nd Floor South Terrace	8.8 m ³	0.10 l/s
Blue Roof B3	Vine Lane: 4 th Floor Terrace	16.5 m³	0.10 l/s
Blue Roof B4	Vine Lane: Roof	15.4 m ³	0.10 l/s
Blue Roof B5	Museum Street: 8th Floor Terrace	17.8 m ³	0.10 l/s
Blue Roof B6	Museum Street: 11 th Floor Terrace	31.5 m ³	0.20 l/s
Attenuation Tank	Basement	138.0 m ³	4.30 l/s
То	tal	37.8 m ³	5 l/s

Table 5 - Summary of SuDS Proposals at Museum Street site

While the rates set out in Table 5 are in excess of the Greenfield rates, they give a 96% reduction from the run-off in the existing scenario for the 1 in 100 year storm event. This is significant intervention and is expected to have a positive impact on the surrounding sewer network and in turn offsite flood risk.

4.6 Drainage Inspection and Maintenance Strategy

In accordance with CIRIA C625 it is recommended that a private SuDS maintenance agreement is agreed as a simple contract between the property owner/ tenant (customer) and the maintenance provider (the maintainer). It is mainly to facilitate continuing maintenance of the SuDS that are in private ownership. The maintenance requirements are in accordance with the CIRIA C753 SuDS Manual 2015.

A full Drainage Inspection and Maintenance Strategy is included in Appendix H.

4.7 Multi-functional Benefits of SuDS

The proposed SuDS measures will provide multi-functional benefits in accordance with the requirements of the London Plan and the NPPF. The blue roofs and attenuation tanks will work to reduce the run-off rate from the development in all return periods. The green roofs are proposed to have a minimum depth of 80mm and will provide biodiversity benefits and will also reduce the volume of surface water being discharged to the sewer, in more frequent storm events there may be no run-off from the green roofs. The blue roofs under terraces will also positively contribute to the amenity use.

4.8 Proposed Foul Water Rates

Guidance from Flows and Loads 3 and the Design & Construction Guidance for Foul & Surface Water Sewers have been referenced to determine the foul water flow rates from the proposed development. The following flow rates have been used in these calculations:

- + Residential Properties: 4000 I/dwelling/day
- + Remaining land (where details of flows are unknown): 0.6 l/s per hectare

For the West Central Street site, the building uses at play are residential (21 units) and 692m² of commercial space.

The flow rate from the residential units has been calculated as 84,000 I/day which converts to 0.972 I/s, while the flow rate from the commercial space works out at 0.042 I/s.

The total existing foul water discharge rate for the West Central Street site is 1.01 $\ensuremath{\mathsf{I/s}}$

For the Museum Street site, the building uses at play are residential (23 units) and office space with a total area of c. 23,625 m^2 NIA (net internal area).

Using the numbers outlined above, the residential units will result in a foul water flow rate of 92,000 l/day which converts to 1.065 l/s. The office space results in a foul water flow rates of 1.418 l/s.

The total existing foul water discharge rate for the Museum Street site is 2.48 l/s.

5. Conclusion

This SuDS Strategy report has been prepared in accordance with local and national planning policy and guidance documents including LBC's SFRA, the London Plan 2021 and the NPPF (2021). The development proposals comply with local and national planning policy in relation to sustainable drainage requirements.

The suitability of different SuDS techniques was assessed in accordance with requirements set out in the London Plan and LBC SuDS policy. Surface water attenuation will be provided in the form of blue roofs, green roofs and attenuation tanks.

The proposed drainage system has been designed to reduce the peak surface water run-off rate from the proposed buildings to 5 I/s each which will achieve a betterment of 87% for the West Central Street site and 96% for the Museum Street site in the 1 in 100-year storm event with 40% climate change. All feasible sustainable drainage measures have been incorporated which results in a significant betterment on the existing surface water run-off rates from the total site.