150 Holborn, Underground Drainage Design Statement

Project: 1036010 Holborn
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Existing Site Drainage

CNM have obtained Thames Water asset maps of the streets surrounding the site via Watkins Payne, utility supplier information document.

They indicate that there is an 1219mm x 762mm Thames Water combined sewer in Brooke Street and 1219mm x 762mm combined sewer in Holborn that appears to stop outside the site on the pavement. The two sewers connect to the main sewer 1676mm x 1372mm Thames Water combined sewer running along High Holborn and Holborn, A40. There is a 1219 x 813 Combined sewer in Grays Inn Road which is heading north away from Holborn

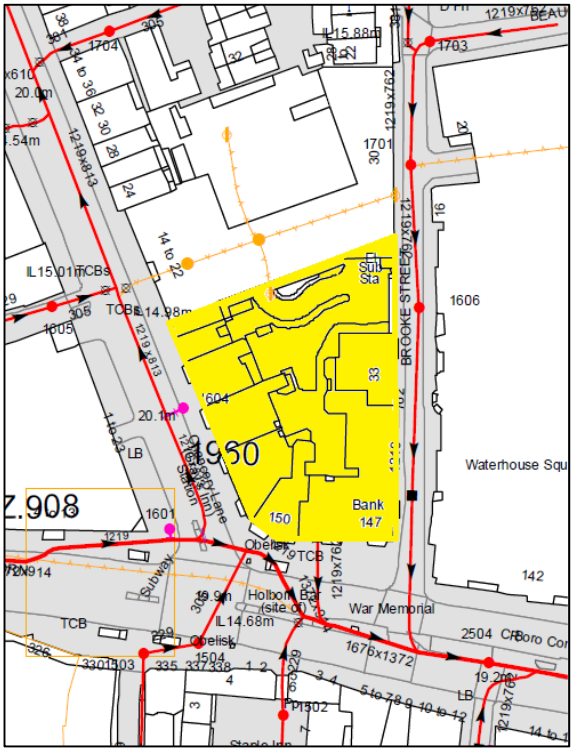

Figure 9.1 Thames Water Asset Map

CCTV Surveys

CNM commissioned UKDN Waterflow Ltd to carry out a full conditional survey of the basement drainage and in particular establish the locations sizes and depths of existing outfalls to sewer.

The surveys were carried out on 31.5.2016, 1.6.16, 3.6.2016, and 4.6.2016.

An electronic version of the report has just been received by CNM and whilst we continue to review this the two main headlines are:

- That there appears to be just two 150dia outfalls from the site one connecting to the sewer in Brooke St from with Barclays Bank and the other into Grays Inn Road from EAT.

- That the outfall manholes appear to be approx. 1.3M deep and they both sit in areas where the basement floor level is to be lowered by 1.4M

It is noted that there is a small amount of drainage that has not yet been surveyed due to access restrictions, CNM will review this with Helix to see whether it is required or otherwise. This could possibly connect to the sewer stopped off in Holborn

It was envisage that the existing private connections to the public sewer would be re-used however this may not suit the proposed layout as the outfall drain points will be above the new basement SSL and will be in tenanted areas rather than landlord areas.

We do not know at this point whether it might be possible to lower the existing sewer connections to better suit the proposed floor levels, but as the design information increases we can discuss this and other possibilities with Thames Water to suit.

However it may be prudent to seek new connections at the size and position that suits the current proposals rather than expand and lower existing connections to suit new floor levels.

The existing connections will need to be capped off and protected from the demolition and new construction works until their fate is decided.

Flood Risk

The site is not located within an LFRZ and is on land that is the lowest classification of areas at risk from surface water.

New Drainage Design

The proposed drainage is to be designed using BS EN 752, BS EN12056, Building Regulations Document Part H and Sewers for Adoption 7th Edition as the minimum standard, taking into account relevant local authority guidance.

Separate foul and surface water drainage systems will be designed onsite, combing at the outfall manholes or discharge points.

If possible, existing connections to the Thames Water sewers will be kept and re-used. However it is likely that new connections will still be required to serve fire fighters lift drainage. This occurs in two separate locations and generates approx 25l/sec each, this is a current requirement which was not considered necessary when the building was built and therefore there is not the capacity within the existing two 150dia outfalls.

There is also some debate as the usefulness of the existing outfalls if they are; a), actually above basement floor level and b), within areas which will become tenant demise and not landlord areas.

These will need to be agreed under a section 106 agreement with Thames Water.

Foul Water Drainage

The foul drainage strategy will need to be discussed further with the above ground drainage engineers, Elementa.

However the current understanding is that all the foul water drainage at ground floor and above will be arranged to be discharged by gravity to the sewer connections (provided by CNM), by the MEP Engineer. The MEP will set out the drainage points required within the basement and the underslab drainage will be designed by CNM and provided with suitable pumps.
It is assumed that the retail units within the basement area will be food outlets and the drainage and pump sets sized to cater for restaurants

Basement foul water drainage will be isolated from Thames Water sewers by pump sets and suitable non return valves. This will reduce the risk from surcharge from the surrounding sewers which Thames Water will confirm we should allow to surcharge to ground level.

Refer to the attached sketches which further set out the strategy

The MEP will confirm FW flows as their schemes develop so that we can carry out a capacity check with Thames Water, however we trust that this will not be an issue as we plan to reduce SW run-off

As noted above, existing connections to the Thames Water sewer will be re-utilised where possible. Otherwise new sewer headings will be required to provide the new outfalls .

CNM (civils) suggested having a dropped floor slab within the basement retail units to provide a floor void for future flexibility for tenants. This is to be reviewed to weigh up costs against future flexibilty

Surface Water Drainage

The proposed surface water drainage system will be designed for a 1:100 year storm plus 30% for climate change.

Critical storm duration for this event dictates the amount of attenuation required on site for surface water drainage design. (six hour events will be considered but the critical storm will be catered for to protect against flooding)

The whole site measures a little under 0.3 hectares in area and remains the same, so there is no increase as such in the potential Surface Water run off from the site. The whole of the site is currently impermeable without any landscaped areas. The whole of the SW drainage discharges currently to Combined Thames Water Sewers.

The new drainage will be designed to comply with the Essential Standard of the Mayors London Plan to reduce the developed sites SW run off by 50% and attenuate the run-off accordingly.

The existing flow rate is calculated as 33.0l/s using the Modified Rational Method based on a site area of 2362m^2 and a rainfall intensity of 50mm/hr.

To meet the essential standard of the Mayors London Plan, the flow rate will be reduced to 16.5L/s before exiting the site into the existing public combined sewer.

Our quick Win-des software calculations to meet the 50% reduction in SW discharge to suit a 1:100 year storm + 30% would require an attenuation volume of between 73-120M^3 depending upon layout. So up until now we have worked on a worst case scenario and to retained 120m^3 WE have now carried out more detailed calculations and determined that the actual storage requirement based on critical storm requirements equal 102M^3 based on the following.

Sustainable Urban Drainage Methods

CNM have investigated the possibility of using Sustainable Urban Drainage (SUDs) techniques which controls surface water run-off from developed sites thereby minimising flooding and other environmental damage.

Infiltration methods, which are a higher ranked part of the SUDs hierarchy, have been considered by CNM. Due to the lack of exposed ground in the proposed development, and the relatively impermeable nature of the underlying London clay, it will not be possible to utilize infiltration methods.

Likewise there are no local streams or Watercourses to connect to and there are no ponds or open waters to discharge to.

This is a central London site that has no discernible external areas for parking (except a couple of disabled parking bays) etc that could easily accept a buried tank or a crated attenuation scheme to contain 120m^3.

The building is essentially built up to its boundaries like most Central London buildings with an existing basement. The basement drains by gravity to Sewer. Parts of which are having their slabs lowered locally to match adjoining area and to provide a flat level basement across the site as a whole.

There are also new and existing pile caps to negotiate. All this will make it impossible to provide an under slab attenuation system without resorting to pumping the whole of the SW discharge from the site. This cannot be considered as it is simply not sustainable.
We therefore believe that it will not be practical to provide underground attenuation for all the site.

The upper levels, which are subject to rainfall include areas of green/brown roof, however these will be insufficient to comprise the entire SUDs provision and therefore an attenuation tank for the remaining retention volume will be required below ground in the existing courtyard but by using the plan area under the Green/Brown roofs the volume required within the ground can be dramatically reduced.

CNM (civils) have recommended the inclusion of shallow permavoid crates, up to 85mm deep, beneath the green roofs.
Although recognised as a suitable SUDs technique, the Environment Agency have suggested that green or brown roofs cannot be used as a form of attenuation volume as the soakage rate is such that there would not be a free storage volume for a repeat storm the following day. However it would be acceptable to provide a flow controlled crate under the substrates of a green/brown roof to get the best of both systems.

The main roof has a usable plan area of 1235m^2 and by using 85mm deep Permavoid crates (which have a clear volume of 95% of the crate) we get 104.98 x 0.95 = 99.73 say **100 m^3** plus whatever capacity there might be in the green roof substrates.

The Residential area has a usable roof area of 130m^2 and by using the same we get 11.05m x 0.95 = **10.5 m^3** again plus any capacity within the Brown roof make-up.

However, using our MicroDrainage calculations we considered that the site would be best served by three separate attenuation areas. So we pro-rated the permissible discharge rate for the separate catchments based on their areas. Refer to the attached sketches and calculations. So each of the three areas, the main roof, the residential roof and Ground have be given their own discharge rate with their own flow restriction and attenuation.

This has led to three separate sets of calculations and the critical storm is not always a 6 hour event.

AREA	Permissible Discharge	Attenuation Required
Main roof	9.0l/sec	64.2 m^3
Residential roof	1.0l/sec	6.9 m^3
Ground	7.0l/sec	30.9 m^3

The discharge pipework will be routed directed to sewer oufall and kept separate.

The attenuation on the roofs will be 85mm thick Permavoid crates as “Polypipe Ltd” as noted before and they will design their crates, flow restriction devices etc accordingly as well as recommending maintenance

The attenuation in the ground will be determined to fit with the other services in the ground but it is likely to be Stormcell crate or similar and will be provided with a suitable hydro-brake or Aco Q-brake to suit.

Maintenance will be reduced by design so that silt traps etc are incorporated, and that a suitable maintenance plan can be employed.

Overflows will be designed into the roofs in case of flow restrictor failure or blockage.

We have downloaded a copy of Camden Councils Surface Water Drainage Pro-Forma which we completed and attached accordingly and this is based on the above.

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For CNM