New Oxford Street Ltd

# 21- 31 New Oxford Street

# Flood Risk Statement

RP/230602/006

Planning | 5 September 2014



Job number 230602

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ARUP

# Contents

# 1 Introduction

## 1.1 Scope of Study

Ove Arup and Partners Limited (Arup) have been commissioned by New Oxford Street Ltd to carry out full multi-disciplinary design (SMEP) in connection with the refurbishment of 21-31 New Oxford Street for a combined retail, residential and predominantly commercial usage. The proposed development ins situated in the London Borough of Camden (LBC).

The commission includes the provision of a Flood Risk Statement in response to POL3 (Flood Risk) for the BREEAM 2011 Environmental Assessment process.

It should be noted that, in accordance with the relevant local authority policy, the location and size of the site are such that a formal Flood Risk Assessment is not required. This document has been prepared in order to substantiate the flood risk review carried out for the purposes of the BREEAM assessment only.

Notwithstanding this, the local authority has requested a copy of this document be submitted. This has been provided for information purposes only.

## 1.2 Site Background

The site is constrained by Museum Street to the west, High Holborn to the South and New Oxford Street to the North. To the east the site is bounded by Dunns Passage and is immediately adjacent to Commonwealth House. An aerial view of the site is shown below in Figure 1.

The building consists of a 1960's era large hybrid concrete and steel framed structure with concrete floors. The building was designed by the Ministry of Works for the General Post Office. It comprises of basement and ground floor loading and parking areas for large vehicles, mail sorting floors at levels 1, 2 and 3 and ancillary support facilities at levels 4, 5 and 6 with plant at level 7.

The building was originally connected to the Royal Mail 'Mail Rail' system by a series of shafts and connecting tunnels. Access from the building to the Mail Rail system was capped at the time Royal Mail disposed of the building.

## 1.3 Development Proposals

The proposed development is for the remodelling, refurbishment and extension of the existing building in connection with the change of use to offices, retail and affordable housing along with associated highway, landscaping and public realm improvement works as described below.

The development includes the retention and recladding of the lower three floors of the building. The existing set back upper floors are proposed to be removed and reconstructed.

The majority of the building is proposed to be for flexible office use taking advantage of the existing double height internal spaces and inserting mezzanines around a new core.

The development will include the provision of active public uses at ground and lower ground floor levels to reactivate street frontages, with a mix of uses such as shops, cafés, galleries and restaurants.

The proposed development includes up to 21 new affordable homes in the south east corner of the site fronting High Holborn.

The development includes public realm enhancement works including reopening Dunn's Passage, creating a new public open space on Museum Street and improving the surrounding public highway.

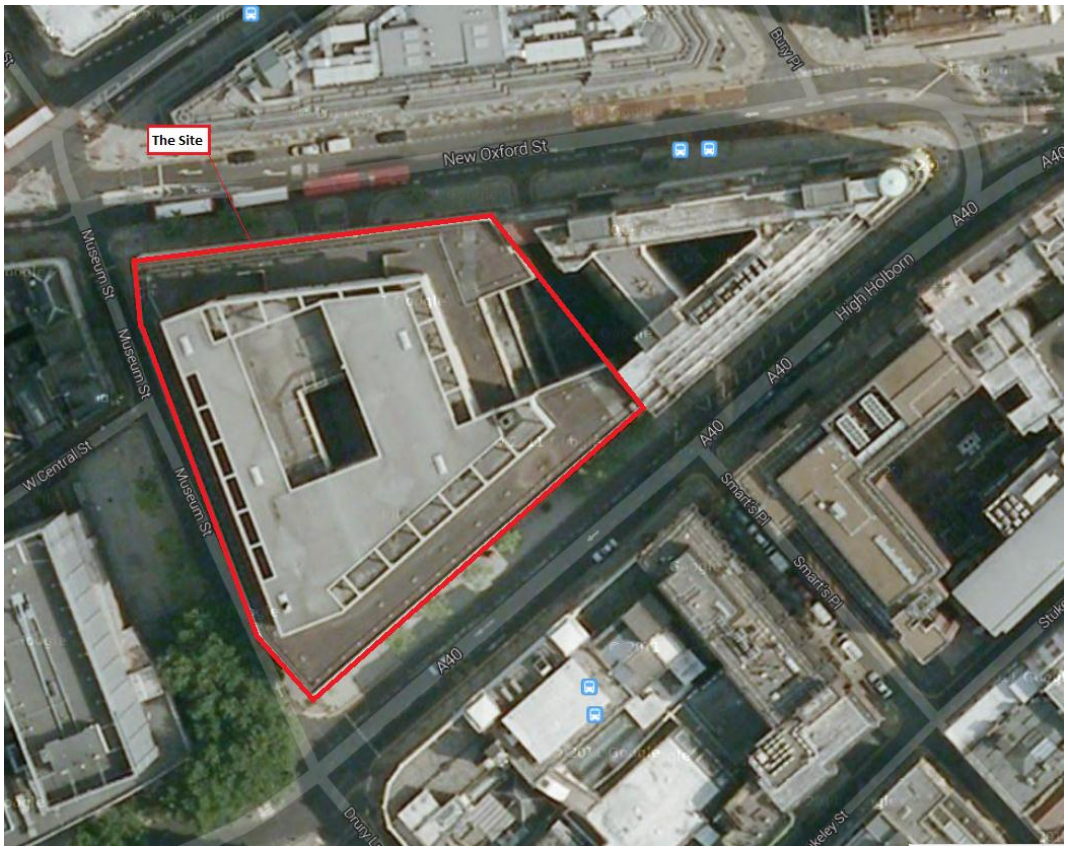


Figure 1 Site Location

# 2 BREEAM POL 03 (Flood Risk)

The relevant BREEAM credit **(POL 03 – Flood Risk)** is formed by awarding the site 1 or 2 credits depending on certain criteria. The aim of these credits is to encourage development in low flood risk areas (2 credits), or to take measures to reduce the impact of flooding on buildings in areas with a medium or high risk of flooding (1 credit).

In order to earn one credit a site must have the following:-

- A site specific flood risk assessment carried out in accordance with best practice and planning policy.

- Planned ground level of the buildings and access to the buildings and the site designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located.
- In medium or high risk flooding areas, the development should be designed to minimise flood risk on and off site using current best practice and planning policy.

In order to earn two credits a site must have the following:-

- A site specific flood risk assessment carried out in accordance with best practice and planning policy.
- A low risk of flooding to have been demonstrated for the whole development.

# 3 Assessment of Flood Risk

The site has a total area of less than 1 hectare and falls within Flood Risk zone 1. This flood zone has been assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

The different sources of flood risk have been assessed and summarised in this statement.

The key sources of flooding areas are as follows:

- Fluvial and Tidal
- Surface Water
- Ground Water
- Infrastructure failure

## 3.1 Sources of information

To undertake this assessment the following sources of information have been used:

- Environment Agency Website (http://maps.environment-agency.gov.uk ).
- City of Westminster Strategic Flood Risk Assessment, dated May 2010
- City of Westminster Preliminary Flood Risk Assessment, dated 7th June 2011.
- Thames Water Utilities data.
- Condition Survey 21-31 New Oxford Street, London, WC1 conducted by EC HARRIS, 31 July 2013
- Camden Flood Risk Management Strategy

In several cases information was taken from the City of Westminster Preliminary Flood Risk Analysis rather than from Camden Council's Flood Risk Management Strategy as it provided more comprehensive data on extreme flood conditions.

## 3.2 Fluvial and Tidal Flood Risk

Figure 2 taken from the EA's Flood map for planning (Rivers and Sea) shows the site situated in an area where flooding from rivers and the sea is very unlikely. Ignoring any flood defences, there is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year; therefore the site is not shown to be at significant risk.


Figure 2 - Flood map of site

Figure 3 (below) shows a summary map assembled for a preliminary Flood Risk Assessment (PFRA) of the City of Westminster. Although the site is outside the LB boundary, the figure also shows data for the Camden area around the site. The figure documents all the flooding that has occurred in the vicinity of the site from a variety of different sources.


Figure 3 - Summary map

Figure 3 shows that the site is not within the extents of any previous fluvial flooding. With the construction of the Thames Barrier and associated flood defences the risk would be reduced further. The site also does not fall within the extents of any locations of previous flooding from surface water, with the nearest

Groundwater Flood incident (EA records) approximately 400m away, making the site at minimal risk.


Figure 4 – Risk of flooding from River and Sea

Figure 4 shows the flood risk map that has been prepared by the EA based on the predicted extreme water levels and the condition of the flood defences. It illustrates that the site is in a low flood risk area in relation to fluvial and tidal flooding. “Low” means that each year, this area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%). This takes into account the effect of any flood defences that may be in this area. Flood defences reduce, but do not completely stop, the chance of flooding as they can be overtopped or fail.

A study produced by Halcrow in August 2005 shows the Tidal Thames Extreme Water Levels. The study considered the current flood defences and the Thames Barrier in place and assessed the risk of a tidal event overtopping the defences. The study concluded that the site showed a risk of less that 0.1% (1 in 1,000 year) and is therefore not a risk. However, breaching of the tidal flood defences remains a residual risk and needs to be assessed.

The assessment has been undertaken in the “Draft Strategic Flood Risk assessment” November 2009, undertaken by City of Westminster. Figure 5 is taken from this report.

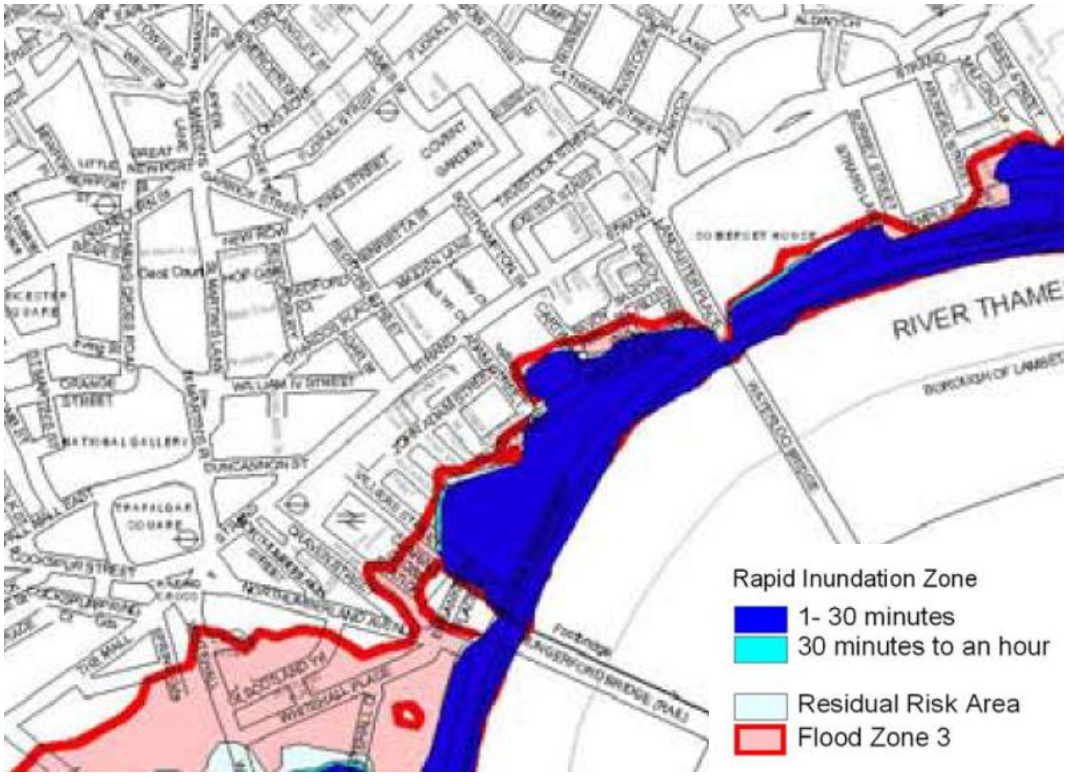


Figure 5 - Extent of flooding from Breach Modelling

Figure 5 shows that the zone predicted to be prone to flooding should the flood defences on the west embankment be breached. The area is limited close to the River and hence the risk to the site due to tidal breach insignificant.

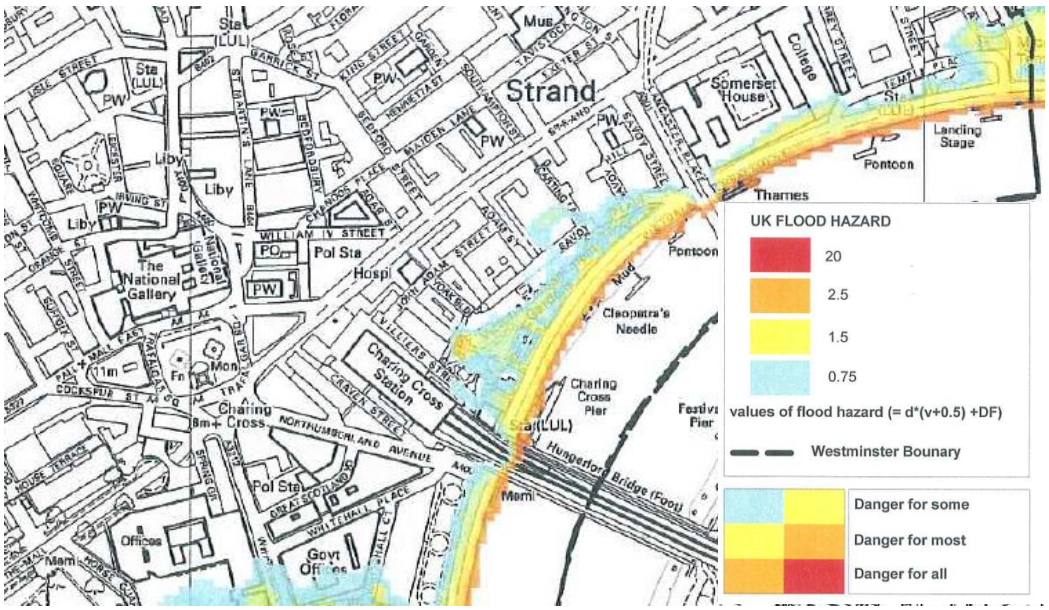


Figure 6 UK Flood Hazard - City of Westminster

The flood map above (Figure 6) shows the UK Flood Hazard map. It shows the areas of flooding and colour codes them by how much danger a location is deemed to be in due to flooding. The area subject to flooding is limited to low lying areas close to the river. The site is a significant distance away from any flood hazard and is therefore not at risk.

## 3.3 Surface Water Flood Risk

Surface water flooding is typically the result of high intensity rainfall that is unable to infiltrate into the ground or enter the drainage system, ultimately following overland flow paths. In an urban environment, surface water runoff is disposed of almost entirely via formal drainage systems, and consequently sewer flooding and surface water flooding needs to be considered in tandem in this instance due to the site's urban nature.

It is reasonable to assume that the adopted sewers have been designed to somewhere between the 1 in 10 years to the 1 in 30 years return period, which is considerably lower than the 100 year standard considered for fluvial flooding. As such, surface water flooding is often more frequent but less severe than fluvial flooding.

Figure 7 below, taken from the PFRA produced for the City of Westminster in April 2011, indicates which areas have been affected by flooding from surcharging of the sewer system. Data in Figure 7 was supplied by Thames Water Utilities Ltd (TW) and is it correct as at June 2010.

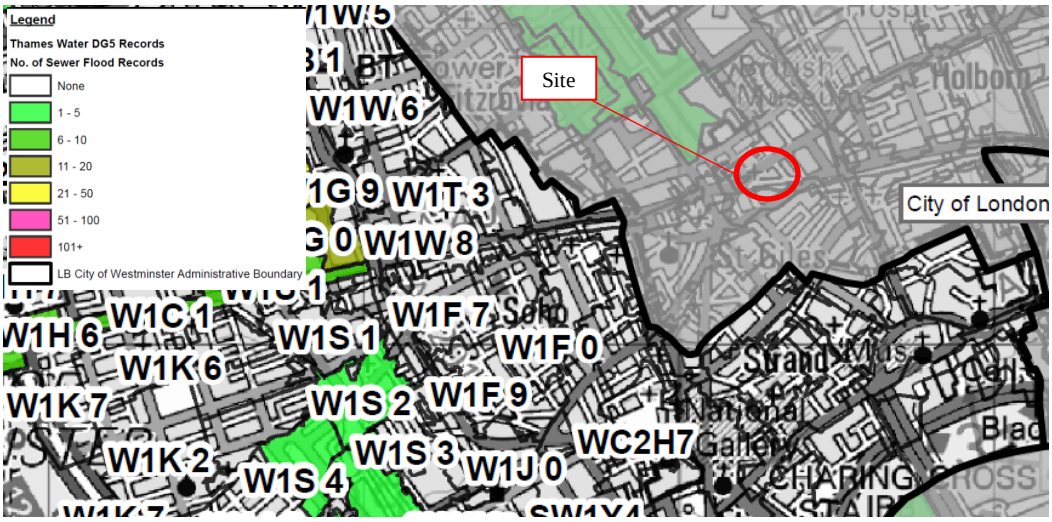

Figure 7 - Sewer Flood Records

Figure 7 shows the site as having no sewer events, and does not present a significant concern, although there were neighbouring areas which were affected.

Surface water flood depths and hazard risk maps have been produced in the PFRA. These maps have been prepared for 1 in 200 and 1 in 100 year rainfall events (1% and 0.5% AEP respectively). Figure 8 and Figure 9 show extracts for the 1 in 200 and 1 in 100 year return period events.

Degree of flood hazard can be interpreted as follows:

- Caution: Flood zone with shallow flowing water or deep standing water.
- Moderate: Flood Zone with deep or fast flowing water. Dangerous for children, the elderly and the infirm.
- Significant: Flood zone with deep fast flowing water. Dangerous for most people.

- Extreme: Flood zone with deep fast flowing water. Dangerous for all (including emergency services)

Figure 8 shows the predicted flooding caused by surface water (this includes flooding from sewers, drains, small watercourses and ditches that occurs in heavy rainfall) in a 1 in 200 year event (Accurate in April 2011). The site is shown to have a flood depth varying between 0.75m – 1.25m in localised spots, making the flood risk a 'Moderate' surface water flood hazard. Due to the coarse nature of the source data used, this is only an approximate projection.

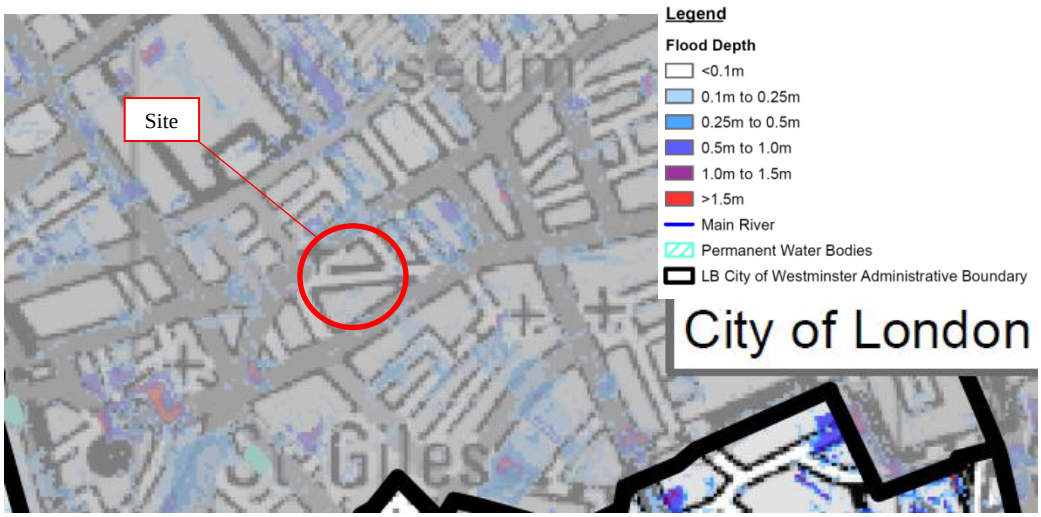


Figure 8- Surface Water Depth 1 in 200 chance of rainfall event occurring in any given year (0.5% AEP)

Figure 9 shows the predicted flooding caused by surface water in a 1 in 100 year event. The site in localised areas is shown to have a flood hazard varying between 0 – 0.25 making the flood risk a 'Caution' flood hazard. However the majority of the site shows no flood hazard. Again due to the coarse nature of the source data used, this is only an approximate projection.


Figure 9 - Surface Water Flood Hazard Rating 1 in 100 chance of rainfall event occurring in any given year (1% AEP) plus climate change

These results need to be looked at in conjunction with the sewerage system in the area. Figure 10 shows spot heights relative to sea level. The spot heights show channel levels around the building taken from a topographical survey of the site. It shows that rainwater is likely to be carried towards the West of the building at the

southern side of Dunn's passage. From the information on the topographical survey it can be seen that water is likely to fall back to the centre of Dunn's Passage from High Holborn, however it is thought that with regular maintenance of the sewerage system shown in Fig 11, the system would have sufficient capacity to prevent water falling back into the Dunn's Passage. Given the location of a manhole at the bottom of the Northern ramp in Dunn's Passage and a number of gullies at the bottom of the ramp on the footway, it is assumed that provisions have been put in place to allow for the ingress of water into Dunn's Passage.


Figure 10 - Spots heights at channel level around site taken from topographical survey

The flooding from surface water, although classified as 'moderate', is likely to represent a much lower risk due to the surface water drainage capacity around the building shown in figure 11.

A 'Blue Roof' is to be incorporated within the design proposals to attenuate storm water run-off from the building footprint. This system entails water storage at roof level within an 'eggcrate' layer incorporated below the roof finishes. The rate of water run-off is controlled by a valve system. At present there is no attenuation provided.

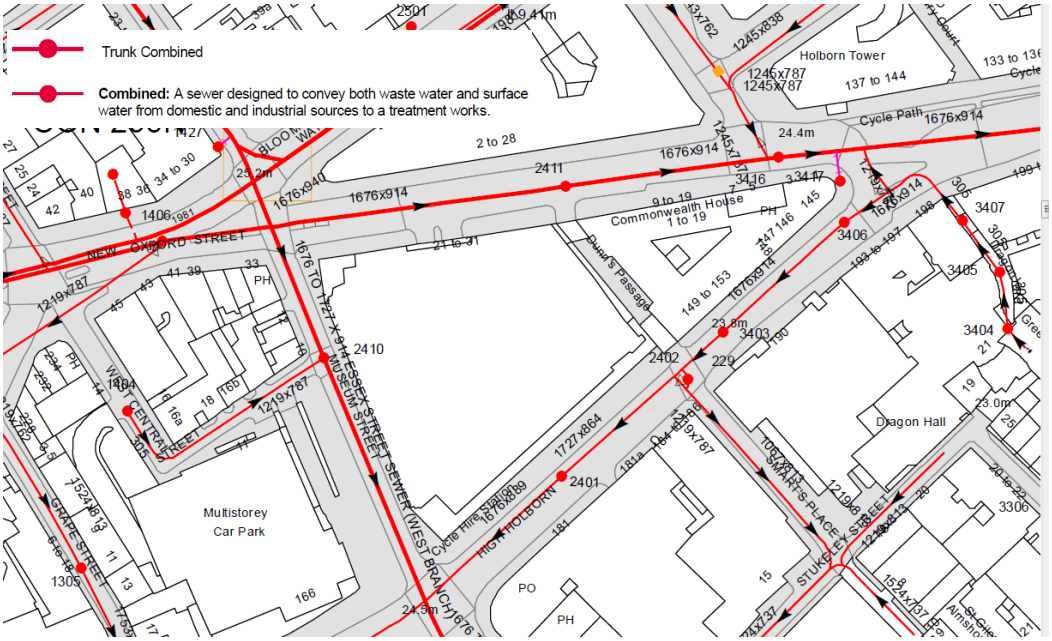


Figure 11 - Asset Location Search Map (Source Thames Water)

Risk of internal flooding at basement level had been highlighted as an issue, with a previous survey (Condition Survey 21-31 New Oxford Street, London, WC1 conducted by EC HARRIS, 31 July 2013) indicating flooding of the Royal Mail 'Mail Rail' connecting tunnel and a number of indications of water ingress in the boiler house areas of the basement. It concluded that the poor condition of the rainwater and foul drainage services are the likely cause of the flooding and that suggested that with the implementation of a number of remedial measures the extent of the flooding would be greatly alleviated. On the assumption that the primary pump system that rids any water at the lower levels remains operational and the following remedial measures as suggested by the survey are implemented it is assumed that the risk of flooding will be reduced to an insignificant level.

- Remedial works to 7 no Non-Return Valves
- Descaling of Suspended Drainage
- Replacement of plate gaskets and fittings
- Descaling of 3 no Manholes
- Installation of new pump assemblies at all sump pump locations at Basement level.
- Installation of new pump assemblies at all foul water pumps locations at Basement level.
- Undertake extensive descaling of the underground cast iron pipework
- Post Survey of all drainage to ensure free flow is achieved.

The extent of the basement and connecting tunnel is indicated in figure 12 below.

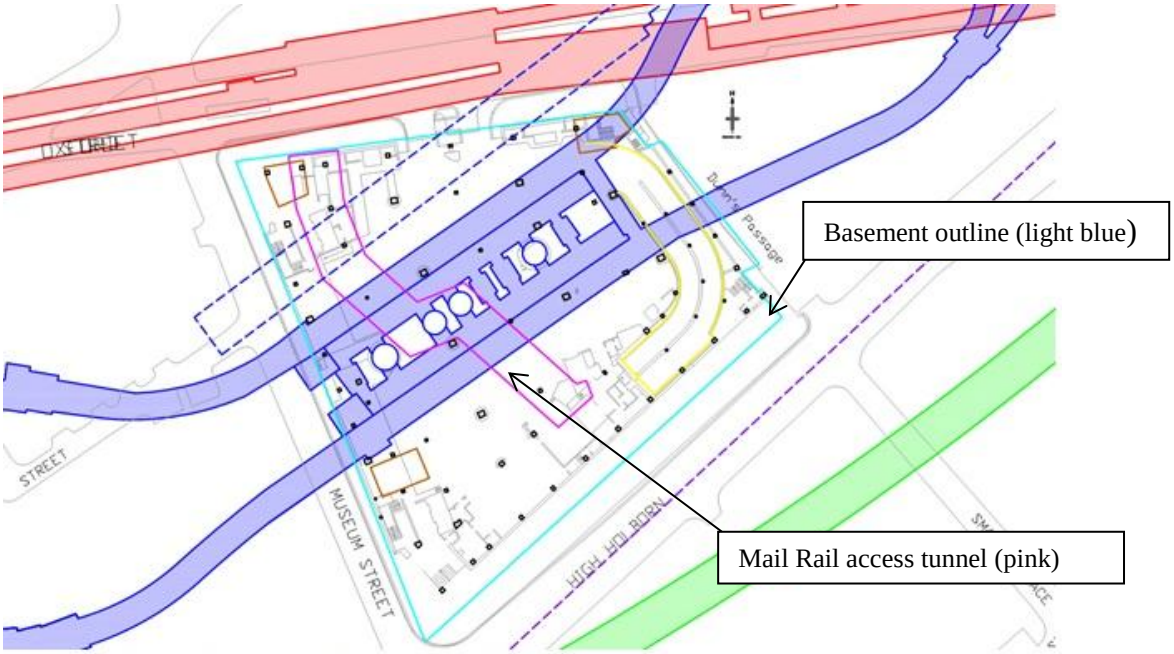


Figure 12 - Location of basement and Mail Rail tunnel

Figure 13 taken from the EA web site shows the risk of flooding from surface water and indicates that the site is at a very low risk of flooding from surface water, meaning that, this area has a chance of flooding of less than 1 in 1000 (0.1%).

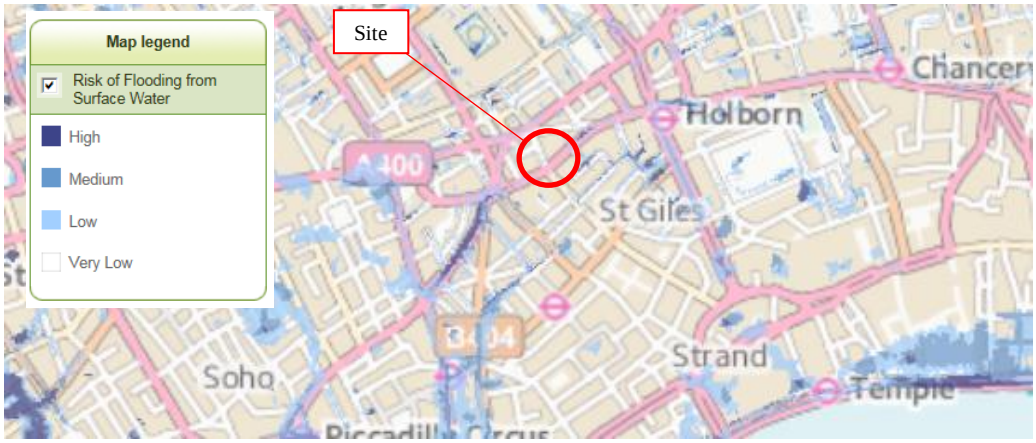


Figure 13 Risk of flooding due to Surface Water

## 3.4 Groundwater Flood Risk

Large areas of London are underlain by permeable substrate and thereby have the potential to store groundwater. Under some circumstances groundwater levels can rise and cause flooding problems in subsurface structures or at the ground surface. The City of Westminster PFRA and Camden Council Flood Risk Management Strategy have produced maps to identify only those areas in which there is the greatest potential for this to happen and in which there is the highest possible confidence in the assessment.

The following four data sources have been utilised to produce the increased Potential for Elevated Groundwater (iPEG) map:

- British Geological Survey (BGS) Groundwater Flood Susceptibility Map;
- Jacobs Groundwater Emergence Maps (GEMs);
- Jeremy Benn Associates (JBA) Groundwater Flood Map; and
- Environment Agency/Jacobs Thames Estuary 2100 (TE2100) groundwater hazard maps.

The iPEG map shows those areas within the City of Westminster where there is an increased potential for groundwater to rise sufficiently to interact with the ground surface or be within 2 m of the ground surface.

Groundwater may become elevated by a number of means:

- Above average rainfall for a number of months in Chalk outcrop areas;
- Shorter period of above average rainfall in permeable superficial deposits;
- Permeable superficial deposits in hydraulic continuity with high water levels in the river;
- Interruption of groundwater flow paths; and
- Cessation of groundwater abstraction causing groundwater rebound.

Figure 14 taken from the Camden Flood Risk Management Strategy shows the areas believed to be vulnerable to groundwater flooding showing the site included within this area. However when looked at with Figure 15 showing increased potential for elevated groundwater, it can be seen that no groundwater flood incidents have occurred on the site. It is assumed that should groundwater reach the surface near the site, the existing surface water drainage network would handle the slow seepage of water and prevent flooding at and near the site.

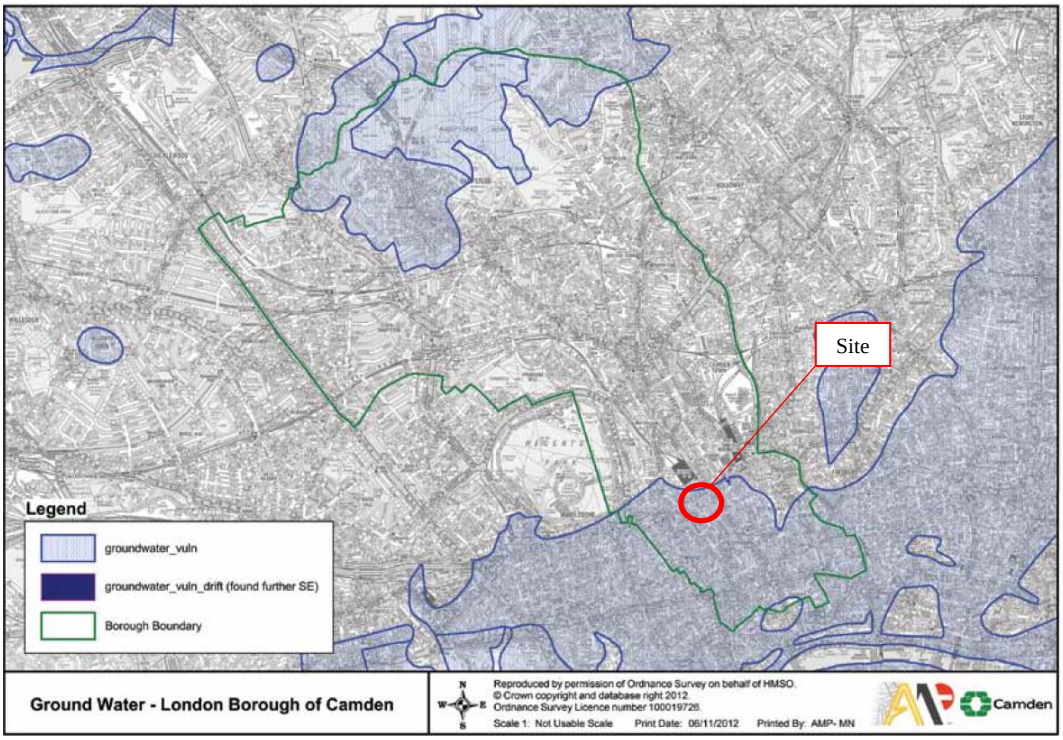


Figure 14- Areas vulnerable to groundwater flooding (Camden Flood Risk Management Strategy)

Within the areas delineated, the local rise of groundwater will be heavily controlled by local geological features and artificial influences (e.g. structures or conduits) which cannot currently be represented. This localised nature of groundwater flooding compared with, say, fluvial flooding suggests that interpretation of the map should similarly be different. The map shows the area within which groundwater has the potential to emerge but it is unlikely to emerge uniformly or in sufficient volume to fill the topography to the implied level. Instead, groundwater emerging at the surface may simply runoff to pond in lower areas.

Figure 15 shows the increased Potential for Elevated Groundwater map. It shows those areas within the London Boroughs where there is an increased potential for groundwater to rise sufficiently to interact with the ground surface or be within 2m of the ground surface.

The extract taken from an iPEG map with the site in red shows the site location to be outside of any permeable superficial deposits or any groundwater flood incidents (according to EA records).

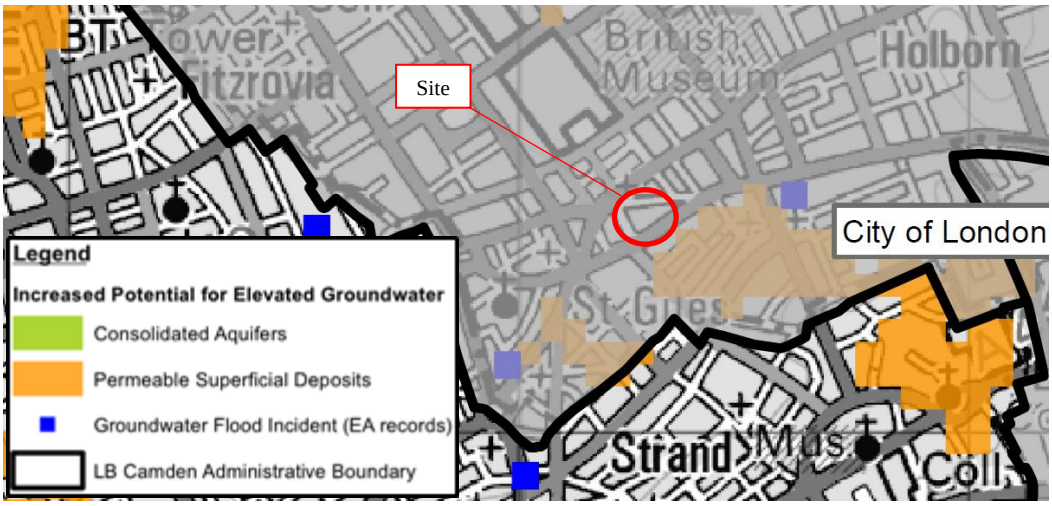


Figure 15 Increased Potential for Elevated Groundwater Map (Source: Westminster PFRA)

## 3.5 Infrastructure Failure

### 3.5.1 Reservoir failure

There is potential for the flooding to occur due the failure of reservoir. Figure 16 is a flood map of the area produced by the EA showing the effects of 25,000 $m^3$ of water being released to simulate a failure of a large reservoir. It shows the site well outside of the flood risk zone indicated by the dark blue, and therefore not at risk due to reservoir failure.


Figure 16 – Extents of flooding from failed reservoirs (EA map)

## 3.5.2 Water Main Burst

According to the Asset Location Search Water Map from Thames Water Utilities Ltd shown in Figure 17 below, there is one water pipe feeding the building with an unspecified diameter. The pipe runs off a 180mm HPPE pipe on High Holborn to south of the building. Although the size of the pipe is unknown it is likely the pipe will be of a small diameter. Considering the size, location and alignment of the pipes, the risk of flooding from distribution main burst is low, although further investigation would be needed to confirm the diameter of the pipe. If the distribution main did burst, it is expected that the existing surface water drainage network would handle the water and control flooding adjacent to the site. Therefore, the risk of flooding from water main burst is not considered significant.

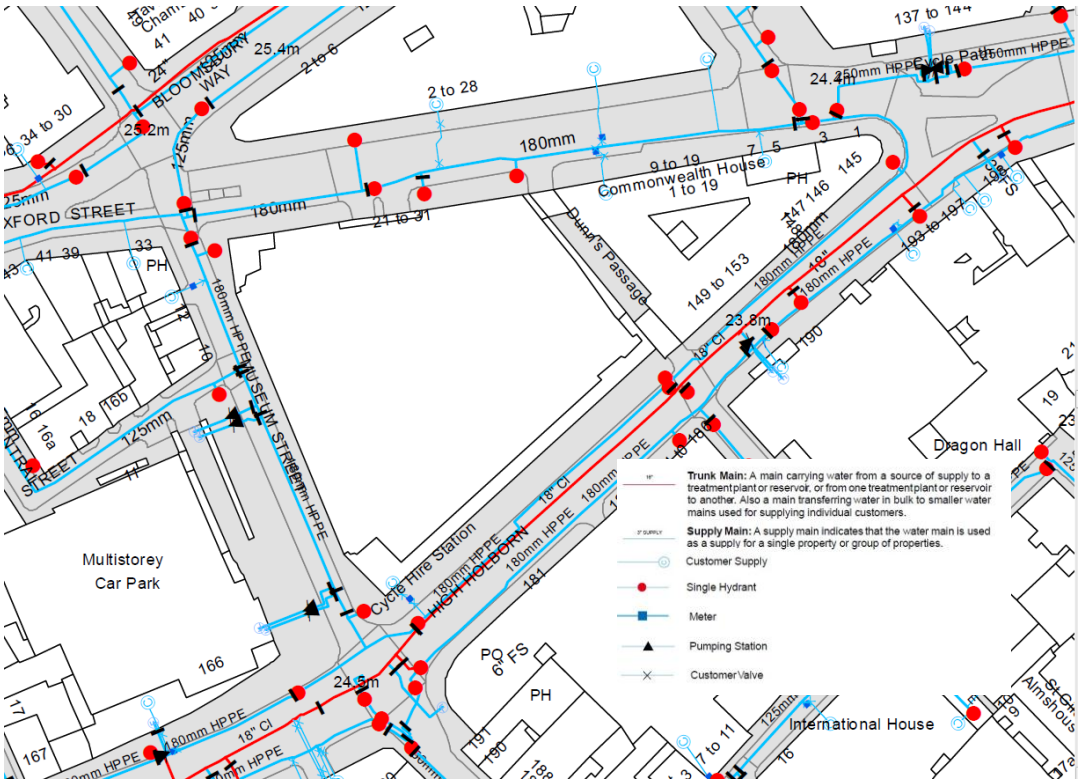


Figure 7 Asset location map - Thames Water Utilities Ltd

# 4 Summary

This report summarises the BREEAM (2011 NC) assessment undertaken to assess if Flood Risk credits under POL 03 can be achieved for the refurbishment of the 21- 31 New Oxford Street site.

All the sources of flooding have been assessed, and they present a low risk of flooding to the development, provided the suggested remedial works in the basement take place.

The Flood Risk assessment concludes that Requirement 2 of POL3 has been met. Therefore the refurbishment works proposed at 21- 31 New Oxford Street site are eligible for two Flood Risk credits.