The Diorama Regents Park, London

Flood Risk Assessment

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1.1 Glossary

Table 1: Glossary Table

Term	Definition
AEP	Annual Exceedance Probability – The probability of flooding in any one year, which are commonly referred to as follows: • 5% (1 in 20 annual chance) • 1% (1 in 100 annual chance) • 0.5% (1 in 200 annual chance) • 0.1% (1 in 1000 annual chance)
Design Standard	The required standard to which fluvial and tidal flood defences should be constructed to adequately defend the communities that benefit from those defences.
Designated Main River	A watercourse designated on the statutory main river map, which is maintained by Defra. The Environment Agency has permissive powers to maintain and construct defences on main rivers.
Flood Resilience	Flood resilience is the process of ensuring that, if a property is to flood, the amount of damage caused is kept to a minimum and that the recovery time and cost is reduced as much as possible. A property can be made flood resilient by using concrete/sealed floors, resilient plasters and grouts, lightweight internal doors and by raising electrics, power points and appliances.
Flood Resistance	A flood-resistant building will seek to reduce the damage caused by flooding through the use of temporary and permanent defence measures to restrict the ingress of water into the property. These measures include, but are not limited to; flood gates on doors, air brick covers and works to ensure the structure is watertight
Flood Zone 3 High Probability	An area with a 1% or greater annual probability of fluvial flooding or a 0.5% or greater annual probability of tidal flooding.
Flood Zone 2 Medium Probability	An area with between a 1% and 0.1% annual probability of fluvial flooding, or an area with between a 0.5% and 0.1% annual probability of tidal flooding.
Flood Zone 1 Low Probability	An area with less than a 0.1% annual probability of tidal or fluvial flooding.
Fluvial Flooding	Flooding from non-tidally influence rivers
FRA	Flood Risk Assessment
Groundwater flooding	Flooding from groundwater and aquifers. Usually occurs are the junction between permeable and impermeable rock strata, or in valleys sited within an area of permeable rock strata.
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework. See https://www.gov.uk/government/publications/national-planningpolicy-framework--2 for more information.
SuDs	Sustainable Drainage Systems
Tidal Flooding	Flooding from the sea or tidally-influenced sections of the river

1.2 Introduction

This Flood Risk Assessment (FRA) has been carried out by Form to support the planning application for new development.

In preparation for this flood risk assessment, consultation has been had with the Environment Agency. This FRA has also been carried in accordance with the guidance set out in the National Planning Policy Framework (NPPF). Consideration has been given to the vulnerability of the development and whether it is appropriate in this location.

Flood resilience and mitigation measures have been discussed to show that residual risk has been considered and can be mitigated through careful planning, flood warnings and action plans as required.

This report is an FRA and, therefore, deals with environmental issues only in as much as they are impacted by flooding. The report is the property of Form and is produced for the exclusive use of our Client. The contents may not be made use of by any third party without the express written consent of Form. Without such consent, Form can accept no responsibility to any third party. By receiving this report and acting on it, the client, or any third party relying on it, accepts that no individual is personally liable in contract, tort, or breach of statutory duty (including negligence).

1.3 Scope of Report

This report assesses the Site in regards to the risk of flooding, taking into consideration tidal, fluvial, groundwater, pluvial and artificial sources.

1.4 Site Description

1.4.1 Site Location

The Site is located between Park Square East and Peto Place and is located to the immediate east of Regents Park. The address of the Site is 17 – 19 Park Square East, NW1 4LH. The existing site (hereafter referred to as the "Site") comprises an existing building and is approximately 1,000m² in size.

The Site is centred on National Grid Reference 528775,182275 and is shown in Figure 1.

Figure 1: Site Location Plan and Aerial View

1.5 Existing Site

17-19 Park Square East is currently arranged as office space over six levels, including a basement level and a lower and upper ground floor.

Figure 2: Existing Site Plan

1.6 The Proposed Development

The development proposes internal refurbishment of the existing building to reinstate the residential units at 17 and 19 Park Square East. In addition to this, 18 Park Square East would be refurbished as commercial office space.

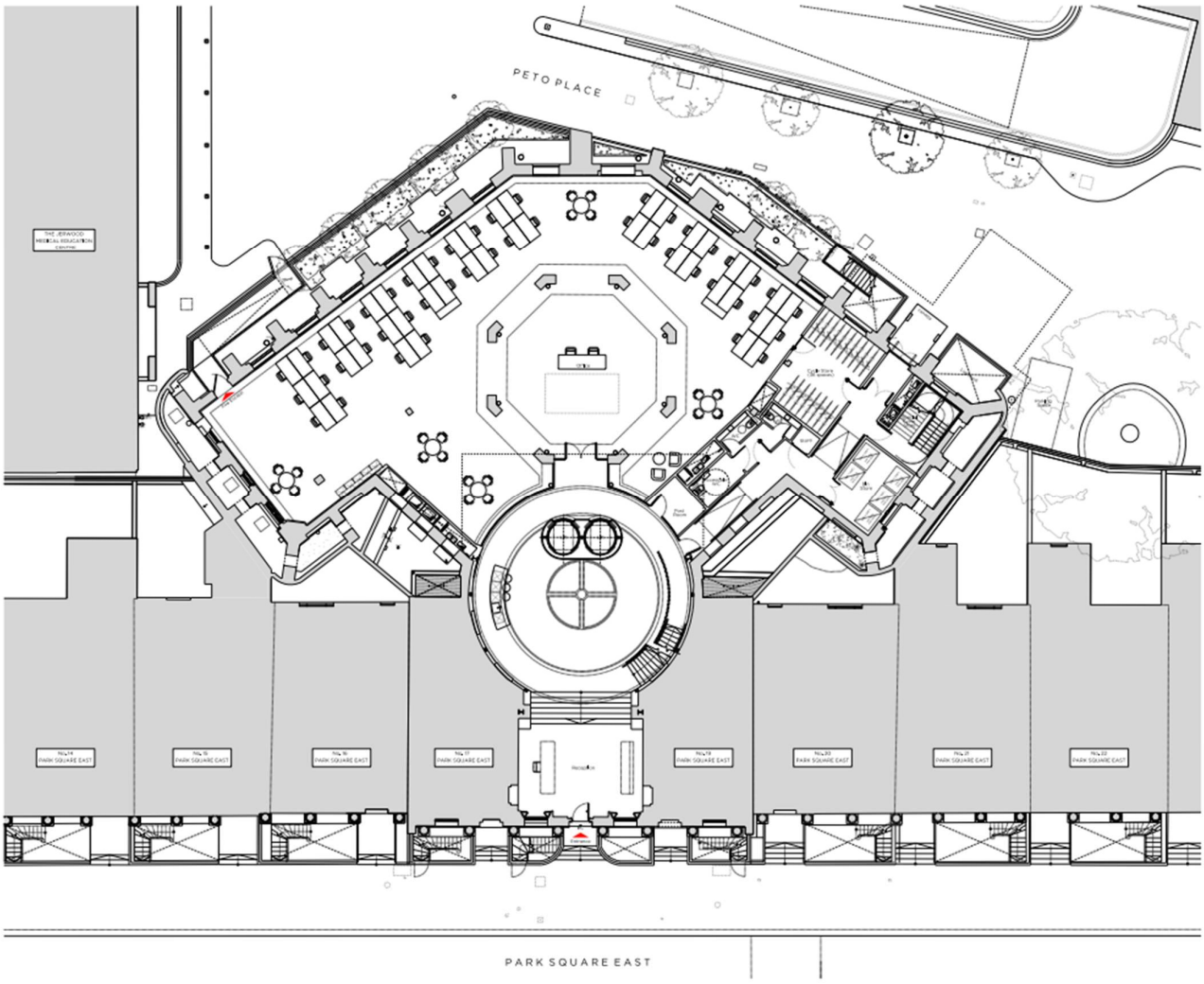

Figure 3: Proposed ground floor Site Plan

1.7 Local Topography

The site is flat, with ground levels generally being between 28.930 and 29.830. The land rises by approximately 1 metre up from Park Square East to the front boundary via hard paved slopes with a low gradient.

1.8 Geology

The risk from groundwater flooding in Camden is uncertain and more information is required to build up an understanding of it. Groundwater flooding occurs when the water table rises to the ground surface and inundates low lying areas. However, there are no known previous site-specific groundwater studies or flooding for the site.

1.9 Watercourses

The River Thames is approximately 2.5 Kilometres to the South-West and runs West-East towards London.

1.10 Existing Drainage

The Existing Sewer records show there are currently existing sewers within Park Square East, therefore, It is assumed Foul and surface water is currently discharged via below ground drainage, joining up with the sewer mains located in Park Square East.

As the land is a brownfield redevelopment site the existing areas are calculated to generate a surface water run-off of 17.7 litres/sec based on the existing 150dia pipe with a gradient of 1:100 connecting into the existing sewers within Park Square East. The flow of 17.7l/s is based on the parameters specified within the Hydraulic water table flow gradients at full bore conditions. A CCTV survey is required to confirm invert levels and gradients.

1.11 Proposed Drainage

For the purposes of this assessment, the report will demonstrate how the run-off will be disposed of, and that the system will be capable of withstanding a 1:100-year (including an additional 40% as an allowance for climate change) rainfall event.

To dispose of the surface water run-off generated by the redevelopment scheme, it is anticipated that the run-off will be directed to a nearby public surface water sewer network, via an existing connection present on-site, in the absence of suitable soil conditions for infiltration or a watercourse/ditch.

In summary, it is established the HR Wallingford Web site (Greenfield runoff rates) states “Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements”. Therefore taking into account the location and its surrounding it is proposed that blockages from vegetation and other materials are possible the site peak discharge rate will be restricted for all events (up to and including the 1:100-year plus 40% climate change rainfall event) to 5.0 litres/sec.

This will be managed by a Hydrobrake flow device located downstream of the last manhole within the site boundary.

Provide sufficient storage to ensure no off-site flooding as a result of the development during all storm events up to and including the 1 in 100 years plus 40% climate change event.

This has been demonstrated via Source Control (Micro Drainage) Storage estimate (Figure 4). A storage volume of between 31m³ and 47m³ will be used to ensure no offsite flooding will occur as a result of the development's implementation for all storm events up to and including the 1:100 year plus 40% for climate change.

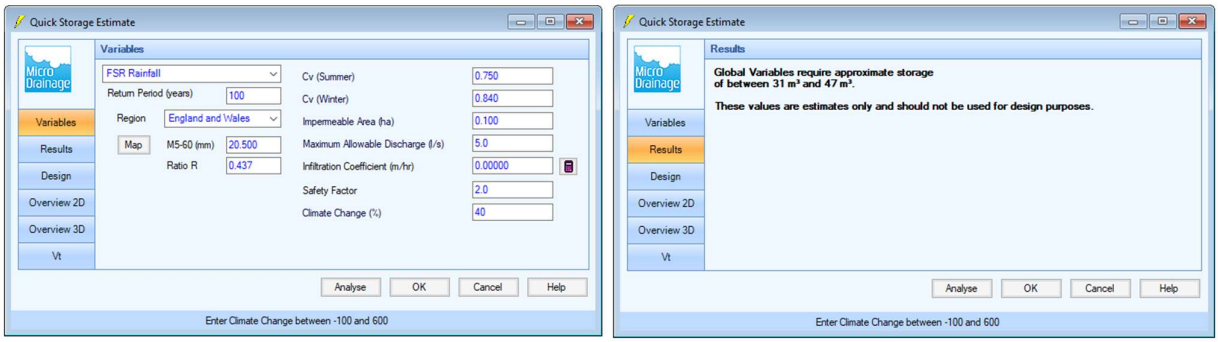

Figure 4: Micro Drainage Software Output of Storage Estimate

1.12 Previous Studies

There are no known previous site-specific Flood Risk studies for the site.

The 2014 London Borough of Camden Strategic Flood Risk Assessment (SFRA) has amalgamated wealth of information on flooding. There are detailed maps and historical flooding events as well as other information on the local flood risk.

The other document published by Camden is Managing flood risk in Camden (The London Borough of Camden flood risk management strategy). The document is detailed with maps and historical flooding events as well as surface water flooding.

The risk from groundwater flooding in Camden is uncertain and more information is required to build up an understanding of it. Groundwater flooding occurs when the water table rises to the ground surface and inundates low lying areas.

There is also a low risk of flooding from the Regent's Canal and the Hampstead Heath Ponds although if there was a breach in the ponds the effects would be severe. Responsibility for maintaining the Canal and the Ponds lies with the Canal & River Trust and the City of London Corporation respectively. Camden is at no risk of flooding from rivers or the sea.

It is primarily at risk from surface water runoff (i.e. rainwater that is on the surface of the ground and has not entered a watercourse, drainage system or public sewer), groundwater or flooding from sewers which have been filled beyond capacity due to heavy rainfall. All of these situations are only likely to occur in extreme rainfall events such as 1975 and 2002.

1.13 Methodology

This is a desk-based study that utilises existing information in the form of mapping and previously undertaken modelling. Conclusions made about the behaviour of flooding on site have been made using expert judgement and knowledge of similar events.

The sources of information used for this study include:

- The Environment Agency's Flood Map
- The 2014 London Borough of Camden Strategic Flood Risk Assessment (SFRA)
- Managing flood risk in Camden (The London Borough of Camden flood risk management strategy).
- Environment Agency Product 4 flood data.
- Discussions with the Environment Agency

1.14 Flood Risk Assessment

The Environment Agency's Flood Map for Planning gives an indicative prediction of areas at risk of flooding from fluvial or tidal flooding. The mapping is an amalgamation of historical flooding events and modelled flood levels projected onto topographical maps.

The Flood Map shows the extent of the natural floodplain if there were no defences or other man-made structures. They do not provide a definitive picture of where flooding would occur; rather, they provide an indicative prediction of areas at risk.

1.14.1 Tidal and Fluvial

The River Thames is located approximately 2.5km southwest of the Site. According to the Environment Agency Flood Zone Maps, as seen in Figure 5, the Site is located within Flood Zone 1 which denotes a low probability of tidal and fluvial flooding.

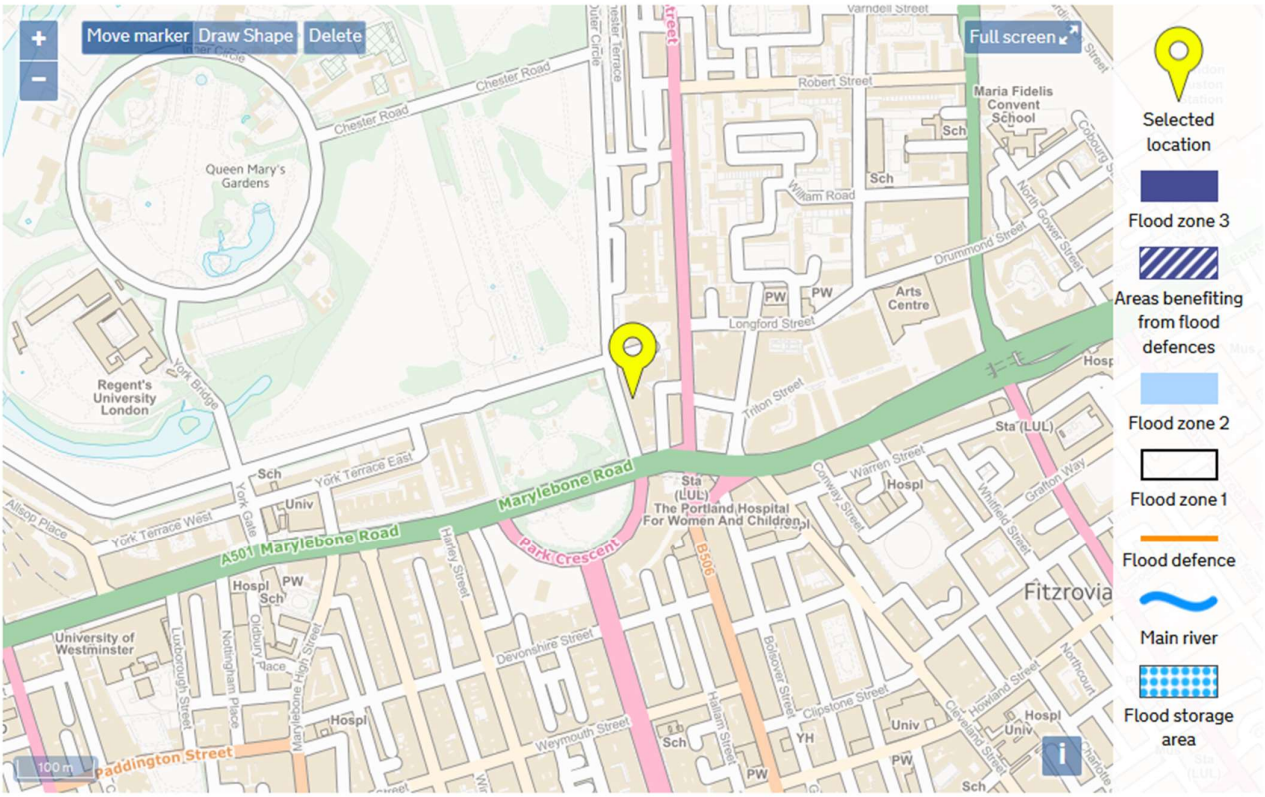

Figure 5: EA Tidal and Fluvial Flood Map with Site Indicated, October 2019

The Environment Agency has not provided any modelled flood levels as the River Thames is located so far away from the Site. However the 1 in 1000 year flood level is likely to be in the order of 5m AOD which is significantly less than the 29m AOD approximate Site levels. It is therefore confirmed that no flood risk is posed to the Site from the River Thames.

1.14.2 Pluvial

Pluvial flooding occurs when natural and engineered drainage systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems, or in rural areas during medium intensity, long-duration events where saturated ground conditions prevent infiltration into the subsoil. This localised floodwater would then be conveyed via overland flow routes dictated by the local topography.

Mapping included within the Strategic Flood Risk Assessment (SFRA, Map 22) shows that the Site was not subject to flooding during severe storm events that occurred in 1975 and 2002. Furthermore, Map 20 of the SFRA shows that the London Fire Brigade has not reported any incidents of flooding in the vicinity.

The 'Flood Maps for Surface Water' provided by the Environment Agency below indicates potential overland flow routes. This map confirms that some flooding may occur on Park Avenue East during the 1 in 200-year rainfall event, however, the Site itself would not be subject to overland flows in a 1 in 30 or 1 in 200-year event.

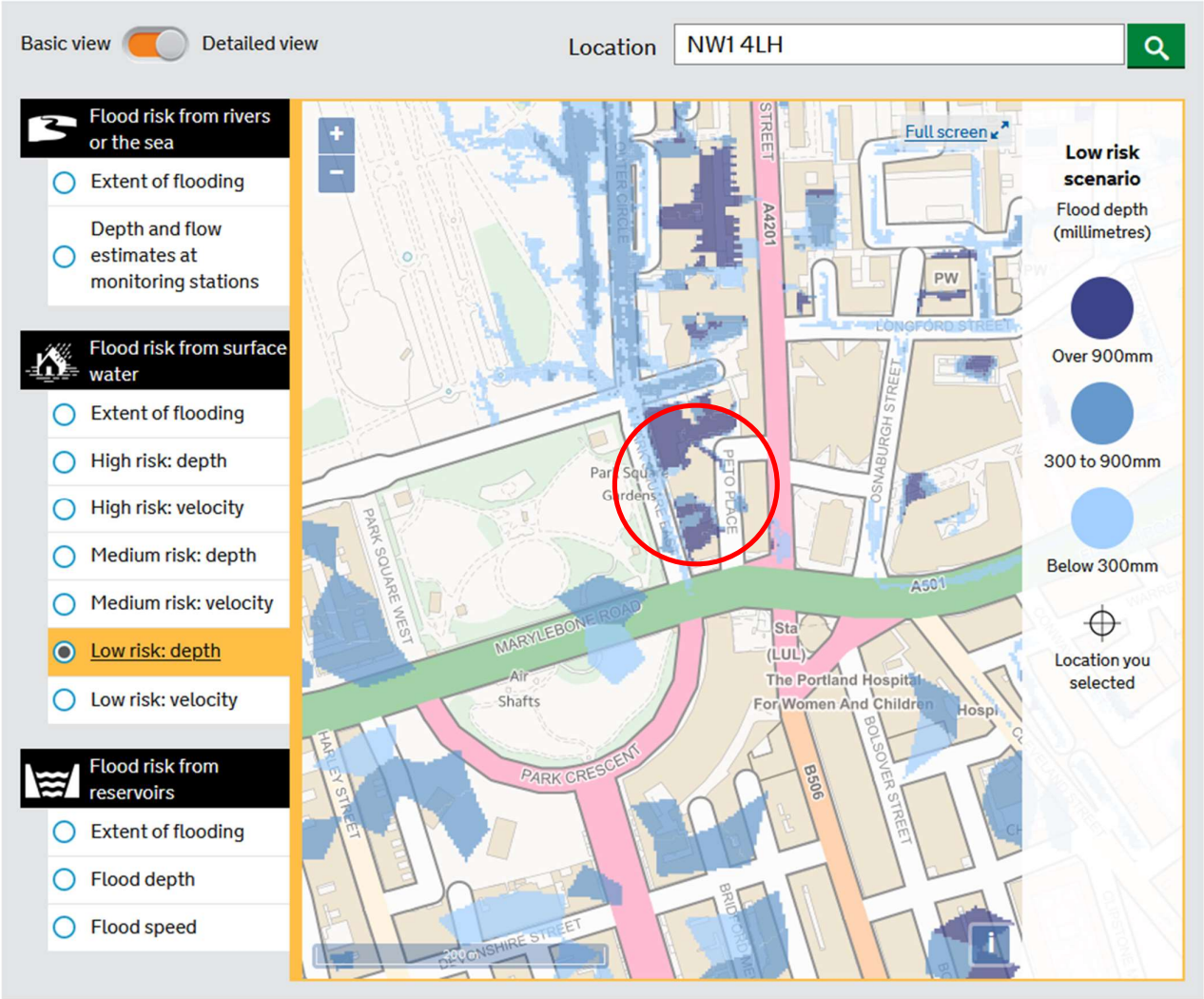

Figure 6: EA Pluvial Flood Map with Site Indicated, October 2019

Ordnance Survey (OS) spot levels indicate that any overland flow along Park Square East would occur in a north to south direction. The topographic survey of the Site indicates that the street entrances to The Diorama building would be 1m above the main carriageway, and it is expected that any overland flows would be contained between the kerbs and would not flood the Site.

It is therefore considered that the pluvial flood risk posed to the Site would be low.

1.14.3 Groundwater

Based on the available information, the depth to the groundwater table cannot be confirmed, however, it is not expected that it would adversely impact on the Site or the development proposals. Form has no knowledge of

previous incidents of above ground flooding in the area caused by a high groundwater table and it is considered very unlikely that such a risk would actually occur. In the unlikely event that flooding caused by a high groundwater table did occur, as with the pluvial flood risk discussed above, floodwater is likely to be confined to the main carriageway providing a 1m freeboard to the entrances of the Site.

The development proposals include the use of the existing basement which may well be below the groundwater table. However, it is expected that the basement is fully tanked and would mitigate the risk against any ingress of groundwater. It is envisaged that the integrity of the waterproofing would be investigated as part of the detailed design to allow any necessary mitigative works to be undertaken as part of the scheme, and ensure that it would be in line with current building standards.

A review of the British Geological Survey online GIS indicates that the geology beneath the Site is likely to comprise Made Ground over Lynch Hill Park Gravel over Taplow Gravel over London Clay.

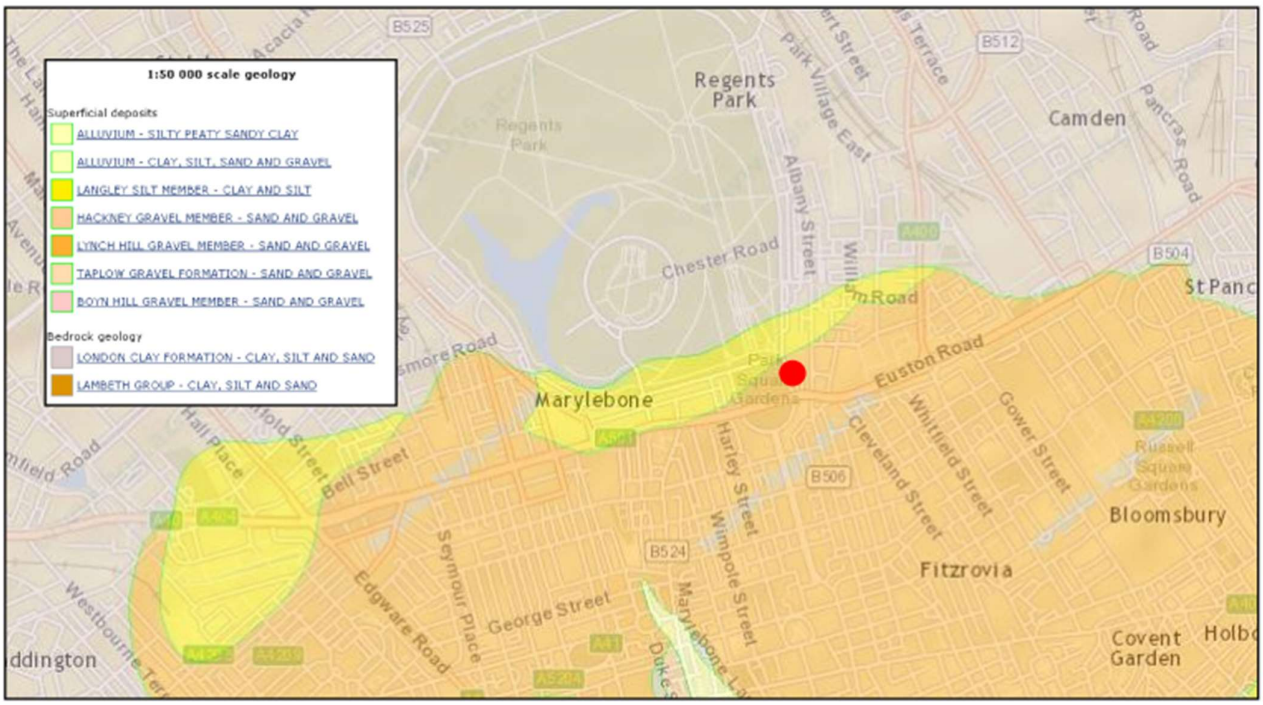

Figure 7: British Geological Survey Map with Site Indicated, November 2019

SFRA mapping (Map 12) shows that groundwater would be approximately 70m below ground level (bgl). However, shallow groundwater may be present within the gravels, perched above the impermeable clay.

As no additional below ground structures are proposed as part of the scheme, there would be no potential for the development to divert the flow of groundwater or increase flood risk to others. The risk of groundwater flooding to the Site itself and also elsewhere is therefore considered low.

1.14.4 Artificial Sources

The mapping shown on the Environment Agency website indicates the area that may be affected by flooding if a reservoir were to fail. The Environment Agency notes that this is a worst-case prediction and any flood event is unlikely to be this large.

Environment Agency mapping below shows that the Site would not be subject to flooding due to failure of any reservoirs in the area. The risk of flooding from artificial sources is therefore considered to be low.

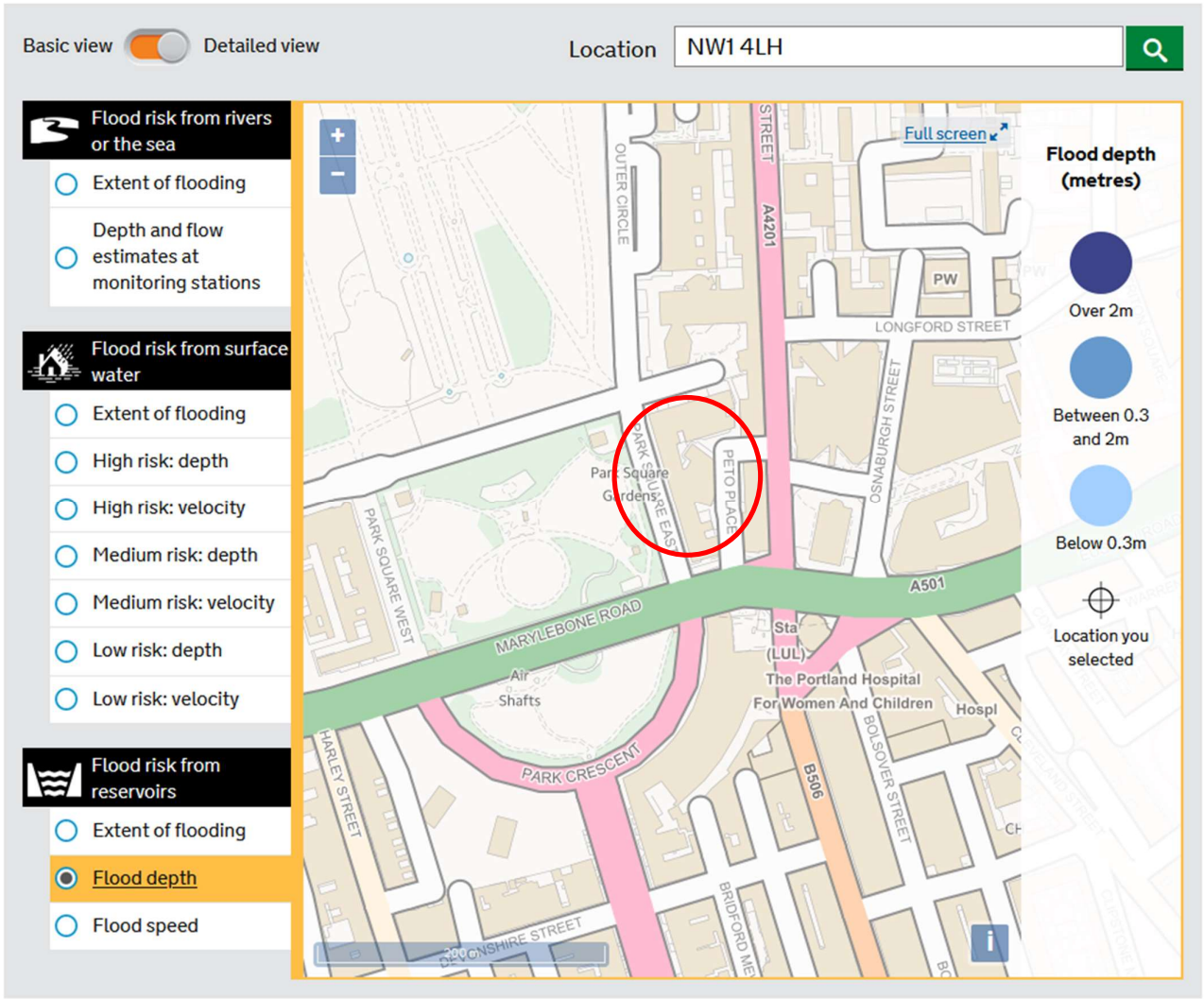

Figure 8: EA Reservoirs Flood Map with Site Indicated, October 2019

1.15 Conclusions

The Site is located within Flood Zone 1 and is therefore considered by the Environment Agency to be at low risk of tidal and fluvial flooding.

The flood risk from pluvial, groundwater and artificial sources has been assessed and found to be low.

The Environment Agency has confirmed that there have been no historic instances of flooding in the vicinity of the Site.

The site is to be designed to have a hydrobrake with a restricted flow of 5l/s and an attenuation tank with a capacity to take a 100 year plus 40% climate.

This report demonstrates that the proposed development is at low risk of flooding. It is therefore considered appropriate that the development meets all the requirements for planning approval.