5.3 Groundwater

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata and is often highly localised in low lying areas which are underlain by permeable aquifers. After a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time.

The Environment Agency website shows that the site is not within a Source Protection Zone (SPZ). The EA Groundwater aquifer designation map shows the site to be underlain by unproductive bedrock and superficial strata. The London Clay formation which is a Non-productive strata is dominated by low permeability clay which is unlikely to hold any significant quantity of water and of no significant permeability. Extracts of the EA Groundwater SPZ and superficial aquifer maps are shown in Fig. 5.2. and 5.3 respectively.

The Surface Water Management Plan (SWMP) *Drain London* for the London Borough of Camden contains an "Increased Potential for Groundwater" map which shows those areas within the Borough 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. This mapping indicates that the site is not located in one of these areas. An extract of this map is contained in Appendix F for information.

The SWMP indicates that there are no records of actual groundwater flooding in the Borough and an overall assessment indicates that groundwater flooding is considered to be a relatively low risk in the London Borough of Camden.

Using all the available evidence it is considered that the site has a very low probability of flooding from groundwater.

5.4 Sewers and Local Drainage Network

Sewer and highway drainage flooding occurs when the capacity of systems are exceeded, or the function of the system is impeded (e.g. tide locking), which results in the surcharging of the system and water being forced to the surface via gullies, manholes, foul water appliances such as toilets or other dedicated overflows.

The available Thames Water record plans indicate that there are a number of combined public sewers crossing or adjacent to the site (Fig. 5.4). The sewer record plan also indicates the presence of a 2134mm dia culvert crossing the site close to the eastern boundary which contains the River Fleet. The SWMP records that the combined Thames Water sewer in the London Borough of Camden drain south towards the river and transports all flows to Beckton sewage treatment works in East London.

Thames Water is responsible for the removal of frequent sewer flooding. Property flooding incidents that occur once every ten years or more frequently are placed in the 'DG5' register. Sewer flooding resulting from extreme events in severe weather is excluded from the DG5 register.

As the majority of the drainage infrastructure in the area is combined sewers, the consequences of sewer flooding may be potentially high due to the limited inflow capacity of the road drains in the event of an extreme storm. This may be worsened by blocked drains and gullies. However, the SFRA indicate that the Borough's drainage infrastructure is in good working order and is regularly cleaned and maintained. Futhermore, Map 13 of the SFRA (Sewer Flooding Incidents by Postcode) contained in Appendix C indicates that there have been no recorded incidents of flooding from sewers in the vicinity of the site.

A Sewer Flooding History Enquiry has also been lodged with Thames Water who have confirmed that there is no recorded history of sewer flooding in the area. Their response is enclosed in Appendix G for reference.

In the proposed scheme, it is recommended that the building's thresholds should be designed to be located at a higher level than the pavement so that they are protected to some degree from the ponding of water in this area resulting from any future blockage of drains that may occur through a lack of maintenance.

Using all the available evidence it is considered that the site has a low probability of flooding from sewers and the local drainage network, as long as they are adequately maintained as required.

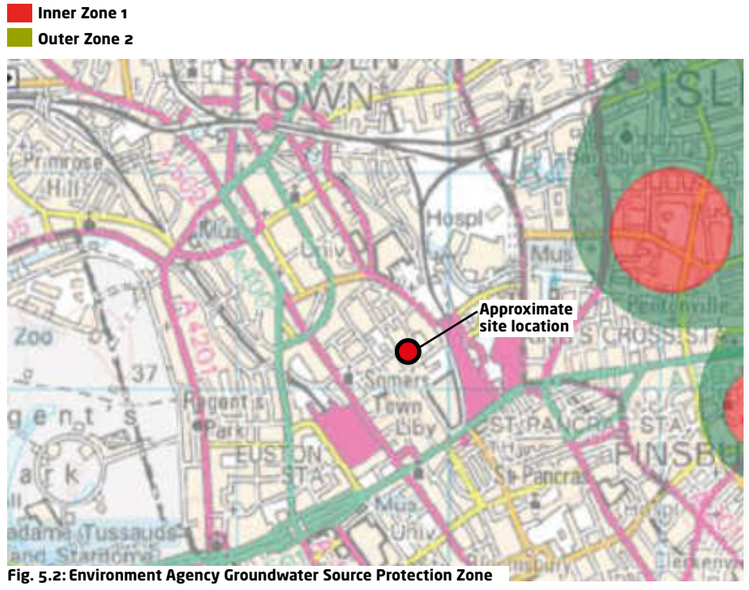

Fig. 5.2: Environment Agency Groundwater Source Protection Zone

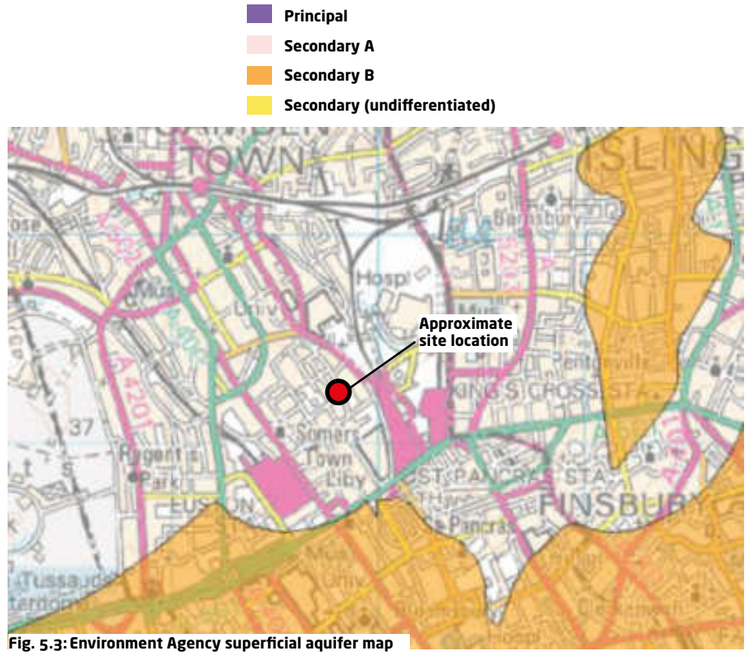

Fig. 5.3: Environment Agency superficial aquifer map

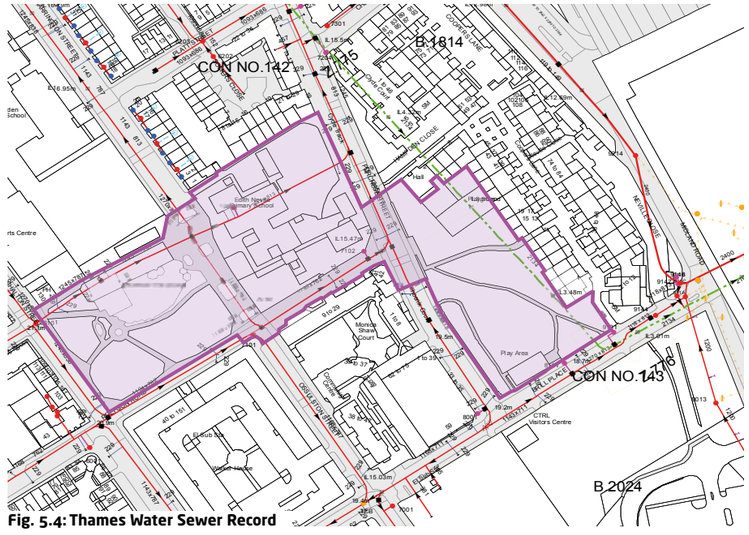

Fig. 5.4: Thames Water Sewer Record

5.5 Surface Water

Surface water flooding can occur as a result of either overland flow or ponding. Overland flow occurs following heavy or prolonged rainfall or snow melt, where intense rainfall is unable to soak into the ground or enter drainage systems due to blockages or capacity issues. Unless it is channelled elsewhere, the run-off travels overland, following the gradient of the land. Ponding occurs as the overland flow reaches low lying areas in the local topography. These flood events tend to have a short duration and depends on a number of factors such as geology, topography, rainfall, saturation, extent of urbanisation and vegetation.

The Environment Agency has undertaken national scale surface water flood modelling which identifies areas at risk of surface water flooding resulting from the 1 in 30 year and 1 in 200 year rainfall events as shown in Fig. 5.5 below. The Environment Agency (EA) Surface Water Flood Map indicates localised areas of flooding within the site which are consistent with the two low lying areas identified in Section 3.2 - the play area in front of Edith Neville primary school on Polygon Road and the area in the north east corner of the site adjacent to the rear of the properties on Coopers Lane.

The surrounding area is highly developed and comprises of 40% green area and 60% impermeable hardstanding area which, during high intensity rainfall storms, will potentially generate large surface water runoff flows.

Surface water flooding generally results in localised short term flooding caused by intense rainfall events which overload the capacity of sewers or run off adjacent as sheet flow. The current masterplan indicates that the proposed development will reduce the impermeable area from approximately 12,860m² to 10,120m². However, surface runoff is expected to increase by up to 30% due to climate change, which must be taken into account in the proposed drainage design and will offset the reduction in hard standing meaning that there is no net increase or reduction in the potential volume of surface water. The current proposed site layout is included in Appendix B for reference.

A general surface water flow assessment for the surrounding area has been undertaken as part of this flood risk assessment to assess how the topography would affect the site risk of flooding and the impact of the site on surface water flow during extreme rainfall events, with the findings illustrated in Figures 5.6 and 5.7 below.

The topographical survey drawing contained in Appendix A suggests that the site currently slopes from north west to south east with levels ranging from 21.19m AOD to 17.60m AOD. The existing building entrance levels are set approximately 100mm higher than the adjacent pavement levels affording them an element of protection from surface flooding. A similar approach should be adopted with the proposed buildings

In extreme overland flow events it is considered that, due to the topography of the existing site, there would be ponding of surface water in the two low lying areas identified earlier in Sections 3.2 and 5.5 which is consistent with FIgures 5.5 and 5.6.

In the proposed scheme the topography will be significantly altered although the low point in the north east corner to the rear of Cooper's Lane will remain. The development of the Lot 1 blocks adjacent to this will remove a large proportion of the potential overland flow reaching this area and so any ponding in this area will be greatly reduced and will also be more formally managed as it will be part of the Community Garden.

Surface water within building plots will be collected into new drainage systems which will be designed not to surcharge in events up to the 100 year event and so will not generate any overland flow.

The park areas will incorporate swales to collect and formally manage any overland flow and dispose of it into the ground in lower storm events and the sewer in more extreme events. There are also potential proposals to incorporate wetland areas in some locations where swales could also direct water to in extreme events to control overland flow.

Therefore, the risk of surface water flooding due to the failure of existing drainage systems will be greatly reduced by the introduction of new drainage systems on site and, in the event of failure, the site-wide SuDS strategy will be designed to ensure that any overland flow is directed away from buildings in a controlled manner. Notwithstanding this, it is recommended that all existing and proposed external drainage gullies, manholes and pipework are adequately maintained.

Once the proposed topography has been developed further this should be reassessed to ensure that the level of risk has not been increased.

In addition to this, the Camden Surface Water Management Plan (*Drain London)* identifies a number of critical drainage areas (See extract contained in Appendix F) and the development site area has not been identified amongst these.

Using all the available evidence, it is therefore considered that the site has a low probability of flooding from surface water.

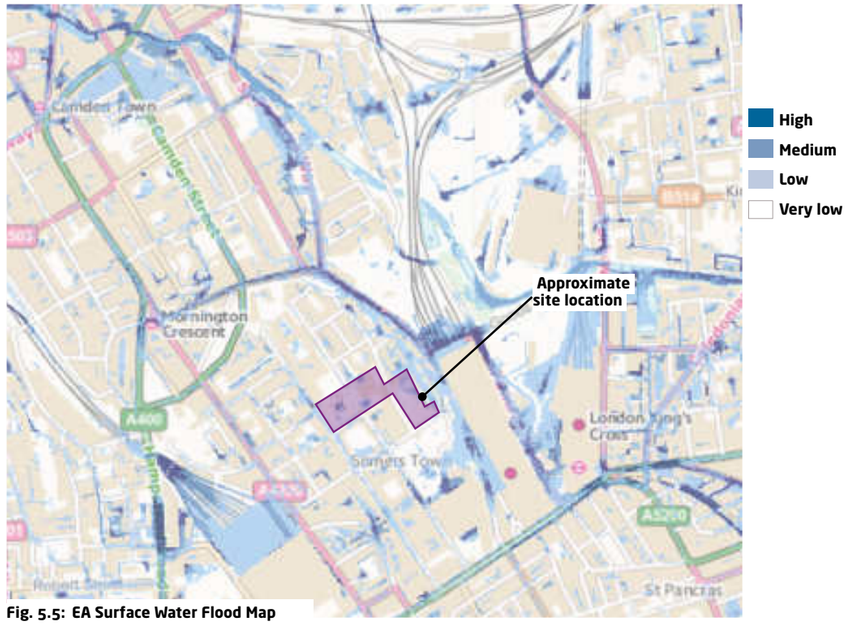

Fig. 5.5: EA Surface Water Flood Map

Fig. 5.6: Overland flowpaths in the vicinity of the existing site during extreme rainfall events

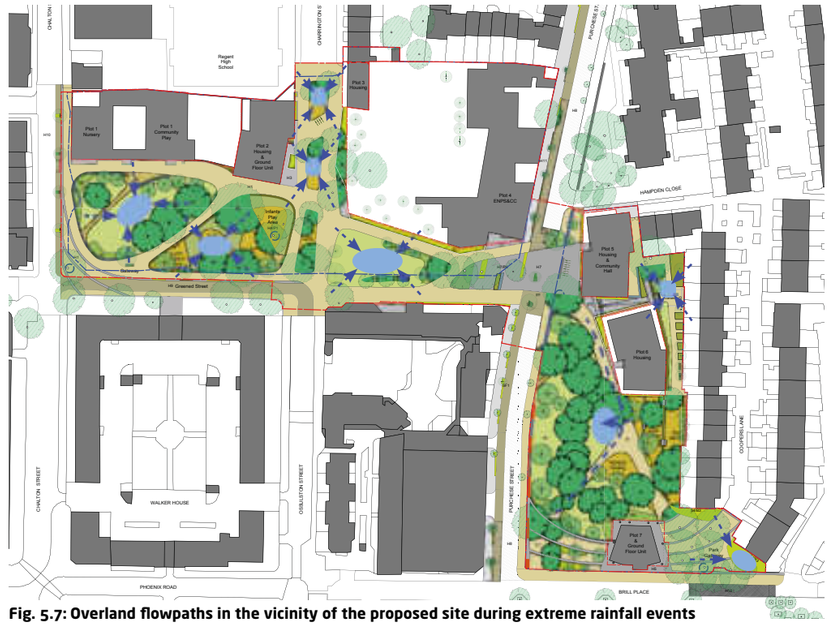

Fig. 5.7: Overland flowpaths in the vicinity of the proposed site during extreme rainfall events

5.6
Reservoirs, Canals and Other Artificial Sources

Where infrastructure exists that retains, transmits or controls the flow of water; flooding may result if there is a structural, hydraulic, geotechnical or mechanical failure of the infrastructure.

The artificial water features located in the vicinity of the site include the Regent Canal located approximately 0.7km east of the site, and the Boating Lake in Regent's Park located approximately 2.5km west of the site. Due to the locations and relative levels of these water features, the risk of the site flooding as a result of them is considered to be very low. Furthermore, Regent's Canal has been identified by the SFRA as having a low risk of flooding.

Historically, Camden had a number of rivers including the Fleet and the Tyburn running through it but these have now been culverted and incorporated into the sewerage system.

In addition, the Environment Agency Flood Map for reservoirs (Fig 5.8) indicates that closest flooding resulting from a reservoir breaching and discharging its contents is approximately 500m north of the site. This is as a result of the Highgate Ponds reservoirs breaching and following a flowpath along the mainline railway heading north from St Pancras station and entering the Regent's Canal where it is then confined.

The Thames Water Asset map shown in Figure 5.9 indicates that a 180mm diameter trunk water main is located underneath Purchese Street. It also indicates other supply mains are located on all the roads surrounding the site - a 125mm diameter trunk main under Charrington Street, 100mm and 200mm diameter trunk water mains under Chalton Street and a 180mm diameter trunk main beneath Polygon Street. A water main can burst at anytime which can result in the flooding of nearby properties. However, it is considered that the risk of the site flooding from an external burst water main should be low if the local drainage system is adequately maintained. Any initial sign of a burst water main should be reported to Thames Water as soon as possible.

Using all the available evidence, it is therefore considered that the site has a low probability of flooding from any artificial sources.

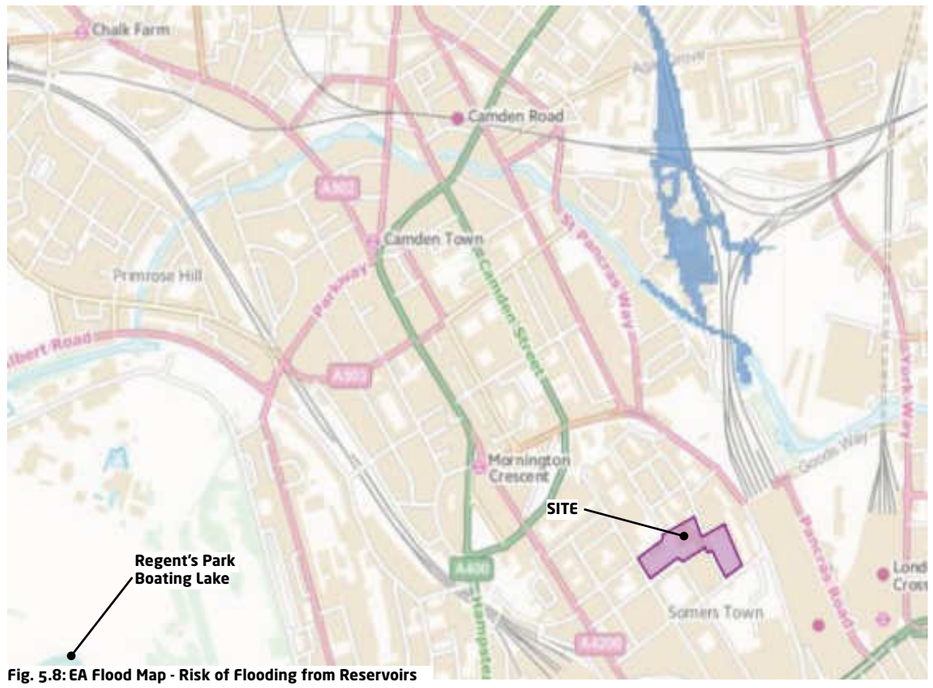

Fig. 5.8: EA Flood Map - Risk of Flooding from Reservoirs

Fig. 5.9: Thames Water Asset Map

6 Conclusions

In accordance with the National Planning Policy Framework, we would categorise the site as lying within Flood Zone 1 - an area of land assessed as having less than 0.1% (1 in 1000) annual probability of flooding from fluvial or tidal sources.

- All land uses proposed across the development are suitable for construction within Flood Zone 1.
- Using all the available evidence, it is considered that the site has a **very low** probability of flooding from fluvial or tidal sources.
- Using all the available evidence, it is considered that the site has a **very low** probability of flooding from groundwater.
- Using all the available evidence, it is considered that the site has a **low** probability of flooding from sewers and other drainage networks as long as they are adequately maintained as required.
- Using all the available evidence, it is therefore considered that the site has a **low** probability of flooding from surface water and overland flow. However, this should be reassessed once the proposed reprofiling of the existing topography has been developed further.
- Using all the available evidence, it is considered that the site has a **low** probability of flooding from artificial sources.
- This report has therefore demonstrated that the site has a **low to very low** probability of flooding from all sources.

7 References

Site Specific Document

- AKT-II Stage 1 report
- DSDHA Stage 1 report
- Topographical Survey, Survey Solutions,
- Thames Water Sewer Map
- Thames Water Asset Map
- Thames Water flood enquiry
- Environment Agency flood maps (web version)

Technical Guidance and Planning Policy Documents

- BS 8533: 2011, Assessing and managing flood risk in development: Code of Practice, October 2011.
- CIRIA Report C624, Development and flood risk: guidance for the construction industry, 2004.
- Camden Draft Strategic Flood Risk Assessment, 2013.
- Camden Draft Surface Water Management Plan, 2011
- North London SFRA, August 2008
- Department for Communities and Local Government, National Planning Policy Framework, March 2012.
- Department for Communities and Local Government, Technical Guidance to the National Planning Policy Guidance, March 2014