Our Ref: 20180718/SS/YK

Your Ref:

24 September 2018

Mr N Bond
Flat 1, 9/10 Regent Square
London, WC1H 8HZ

Dear Sir,

9/10 Regent Square, London WC1H 8HZ
Basement Impact Assessment
Surface Water: Screening and Scoping and Modelling

Kaya Consulting Limited were commissioned by Ground and Project Consultants to provide a surface water/flooding assessment for a BIA for a proposed basement extension at the above site in accordance with Camden Planning Guidance – Basements, March 2018. As per the guidance, the first stages of the BIA comprise screening and scoping, as follows. Subsequently, the commission was extended by Caneparo Associates to include surface water modelling to assess surface water risk in more detail.

Stage 1: Screening

Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?

No. Reference to Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study (ARUP, 2010) which identifies Hampstead Heath surface water catchments and drainage, shows that the site is not within the catchment.

Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?

No. The extension extends into the existing back garden area covering an area of 18 m^2. The existing back garden is steeply steeped down towards the existing building at lower ground floor level (see Photo 1) and based on the site visit is mainly hardstanding. There are six small patches of soft landscaping which line the side of the steps. The total garden area is estimated to be 63 m^2 of which 44.5 m^2 is currently hardstanding. Based on available information, the extension will not substantially increase the amount of hardstanding on the site.

Current draft drainage proposals from the architect include:

- Permeable paving area to the patio space (circa. 6.5 m^2) – easiest solution subject to increased volume of surface water
- Rainwater harvesting system
- Domestic filter strips

Once the proposed extension is in place, rainfall will fall onto the roof of the extension and will drain via gutters to the existing storm water drainage system or will fall onto the patio space.

At present, runoff will fall towards the existing buildings and enter the storm water drainage system with minimal attenuation due to existing hardstanding. Hence, the existing route of rainfall and peak run-off will not be materially changed as a result of the proposed development.

Photo 1: Existing stepped back garden of property. Note the garden is mainly hardstanding.

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?

Yes, although minimal. The proposed extension extends into the existing back garden area covering an area of 18 m^2. The existing back garden is steeply stepped down towards the existing building at lower ground floor level (see Photo 1) and is mainly hardstanding. There are six small patches of soft landscaping which line the side of the steps. The total garden area was estimated to be 63 m^2 of which 44.5 m^2 is currently hardstanding. Based on available information, the proposed extension will slightly increase the proportion of hardstanding on the site. Thus, it is recommended that SUDS (sustainable urban drainage systems) are incorporated into the design of the extension to mitigate the effect on infiltration capacity. Current proposals from the architect are listed above in response to question 2.

Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?

No. Although there is a minimal increase in the proportion of hard-standing at the site (see answer to Q3 above) this will be mitigated by the SUDS described above. Hence, it is considered that the profile of inflows of surface water will be unchanged.

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

No. There will be no change in the quality of surface water downstream. Surface water will now drain via the roof of the extension to the existing storm water drainage system, as opposed to the existing case where it drains over the garden (mainly hardstanding) towards the existing building. Thus, there will be no change in the quality of surface water.

Question 6: Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?

Yes.

EA Flood Mapping from rivers and the sea shows the site is **not** at risk of flooding from rivers and the sea and is in Flood Zone 1. There are no open watercourses (or underground watercourse) near the site.

However, EA Flood Maps for surface water indicate that the site is close to or within an area that is considered to be at 'low' risk of surface water flooding (see Figure 1). Low risk means that each year this area has a chance of flooding of between 0.1% and 1% from surface water (Environment Agency). Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast.

Results of surface water modelling presented in Figure 3i URS (2014) London Borough of Camden Strategic Flood Risk Assessment show that the site is close to or within an area identified to be at low risk of surface water flooding (i.e. 1 in 1000 years) (very light blue in Figure 2). It is noted that the predicted area of low surface water flood risk in the EA Flood Maps close to the site is similar to that predicted in the URS (2014) modelling.

The site is not in a Critical Drainage Area (CDA) or a Local Flood Risk Zone (based on Figure 6 in URS (2014) London Borough of Camden Strategic Flood Risk Assessment). The site was not reported as being flooded in either of the 1975 or 2002 floods of Camden (Figure 15, ARUP 2010 and Appendix 4, London Borough of Camden (2003) Floods in Camden).

Therefore, based on the screening assessment, further information on surface water flooding risk is required for the site.

Stage 2: Scoping

A further assessment of flood risk is required for the site, as the screening assessment identified that the site is at low risk of surface water flooding. The key impacts that will be covered in the scope of the further assessment are:

- Risk of flooding from surface water. This will be carried out using LiDAR topographic data for watershed analysis to assess surface water flow paths.
- Assessment of increased area of hardstanding and effect on surface water flows, including recommendations for any attenuation required.
- A flood risk assessment for the site may need to be carried out in accordance with the National Planning Policy Framework (NPPF) and Planning Practice Guidance to ensure that flood risk is not increased. It is recommended this be carried out as part of Stage 3 – Surface Water Modelling.

The topography of the site and surrounds is shown in Figure 3, based on 1m LiDAR DTM (digital terrain model) data available for the area. LiDAR DTM data has been pre-filtered using algorithms to remove buildings and trees and other surface expressions (e.g. cars) to provide a terrain model of the ground surface. 'Ground' levels at the site are shown to be around 19 m AOD (Above Ordnance Datum) and the LiDAR indicates there is a low area in the vicinity of the site and along the row of houses on the south side of Regent Square (Figure 3) reflecting the lower ground level of the buildings. Regent Square to the north and St Georges Gardens to the south of the site are higher than the site at around 21 m AOD (Figure 3). In general, the surrounding area slopes gently down towards the east and the road immediately north of the site falls to the east.

Watershed analysis was undertaken using the LiDAR data in Global Mapper GIS software to map surface water flow-paths and catchments within and around the site (Figure 4). The analysis indicates that there is a potential surface water flow path from west to east towards and through the site. There is a risk of surface water flooding along the low back gardens of the properties on Regent Square and from water on Regent Square. This area to the rear of the site is low in the LiDAR, and ground levels slope down from the road to the site. However, the catchment area able to flow to the site is low and as this is an urban area and the surface water drainage will be modified by existing urban and road drainage systems which are not accounted for in the GIS analysis. In reality, it is likely that most of the 0.6 ha catchment area that could potentially flow towards the site (shown in light pink in Figure 4) is captured within the existing drainage system on the road to the north of the site and would flow away from the site. However, during a 1 in 1000 year event it would be expected that the local drainage system would be overwhelmed. Cognisance of this surface water flow path should be taken into account during development of drainage design of the site and a flow path should be maintained in a similar location to allow surface water flows to pass through the site without affecting properties. In addition, it is likely that property level flood protection measures may be required to limit flows able to enter the basement area.

Based on the above screening and scoping exercise and consistent with guidance, it is considered prudent to undertake further surface water modelling work to assess flooding risk in more detail.

Stage 3: Surface Water Modelling

Based on initial scoping, it appears that only a small catchment can potentially generate surface water flows that could flow towards the site and that flood risk at the site is relatively low. However, as per Camden's 2018 guidance given the uncertainties, it is recommended that further modelling work is carried out to assess flooding risk of the site from surface water. This section gives a summary of such modelling work which was undertaken as part of this assessment.

A 2D surface water model was set up of an area surrounding the site covering all the areas which could potentially drain towards the site. The model was based on Flood Modeller Pro software package and LiDAR DTM. The area was modelled based on a 2m regular grid. Rainfall data for the area was obtained from FEH Web Service (2013 rainfall data) for 100 and 1000 year return periods and for a range of durations (i.e. 3, 5, and 7 hours).

The model was run over a period of at least 3 hours longer than the assumed storm duration. All rainfall falling on the ground was assumed to convert to runoff (i.e. no loss to local drainage system and infiltration). This is a conservative approach.

Model runs were carried out were based on:

a) Existing DTM (i.e. all buildings, trees, and any other man-made structures and trees and vegetation removed); and
b) All buildings in the immediate vicinity of the site included in the model. This allowed surface flows to go around the building (instead of through the buildings) and was considered more realistic considering the area densely developed.
c) Summer rainfall profile was used as this produced higher rainfall values and resulted in more conservative flood extent.

Model results for the 100 and 1000 year storms and 5 hour duration are shown in Figure 5 (a and b). These indicate that surface water runoff from a small area to the west and north-west could drain towards the site (like that shown in Figure 4).

Figure 6 shows the predicted surface water runoff for 100 year storm and 3, 5 and 7 hour durations with the buildings in the vicinity of the site included in the model. Again, summer rainfall profile was assumed as this gives higher values. These show that buildings block the previously predicted flow path from the west and north-west and only the back gardens of the properties at Regent Square contribute to flooding risk of the site. All three figures show that the extent of inundation does not change significantly with storm duration (i.e. between 3, 5 and 7 hours).

Figure 7 shows the predicted surface water runoff for a 1000 year storm and 5 hour duration. This also shows a similar flood extent to the 100 year storm (Figure 6), indicating that flood extents at site corresponding to storms in excess of 100 year return period do not change significantly.

It should be noted that there are boundary walls separating back gardens of properties and these walls are not included in the model. Therefore, Figures 6 and 7 suggests that these boundary walls would prevent surface water reaching the site from the area to the west and therefore flooding risk of the site would be limited to runoff generated from the back garden of the property.

It was predicted that the road in front of the site would flood to a depth of the order of 0.1m during a 1000 year storm. This would be at or just below the kerb level. The entrance to the property is higher than this.

Conclusions

Initial scoping indicated that there is potential for surface water flooding risk of the site. Detailed surface water modelling indicated that the risk is limited to surface water runoff from the back garden of the property. This risk is considered small providing that existing local drainage system is not blocked. It should be noted that surface water modelling undertaken as part of this study does not include local drainage system.

Yours faithfully,

Dr Yusuf Kaya
Managing Director
BSc, PhD, CEng, MICE

References

ARUP (2010) London Borough of Camden: Camden geological, hydrogeological and hydrological study: Guidance for subterranean development, November 2010

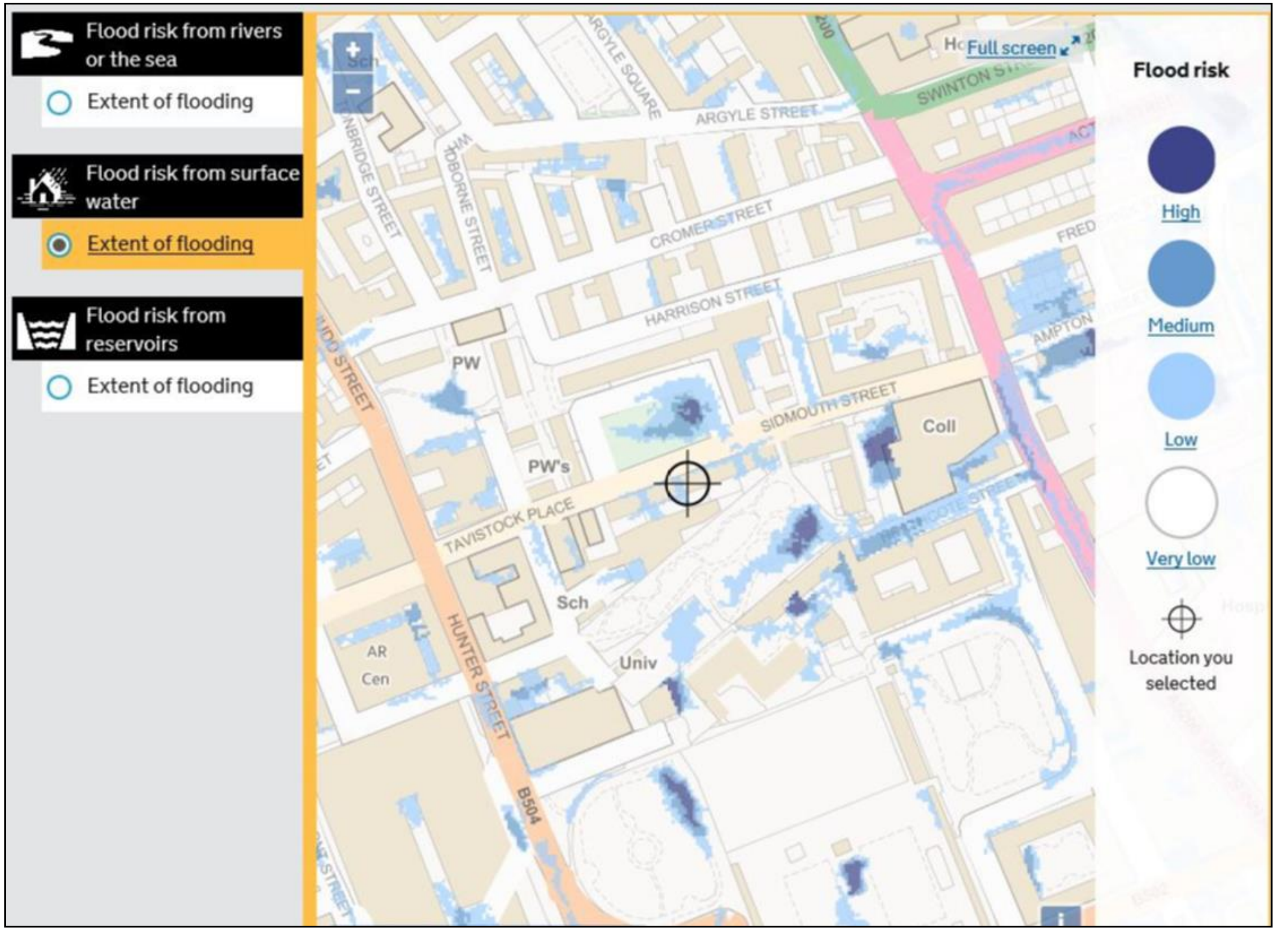
London Borough of Camden (2018) Camden Planning Guidance Basements, March 2018

London Borough of Camden (June 2003) Floods in Camden: Report of the Floods Scrutiny Panel

URS (2014) London Borough of Camden Strategic Flood Risk Assessment

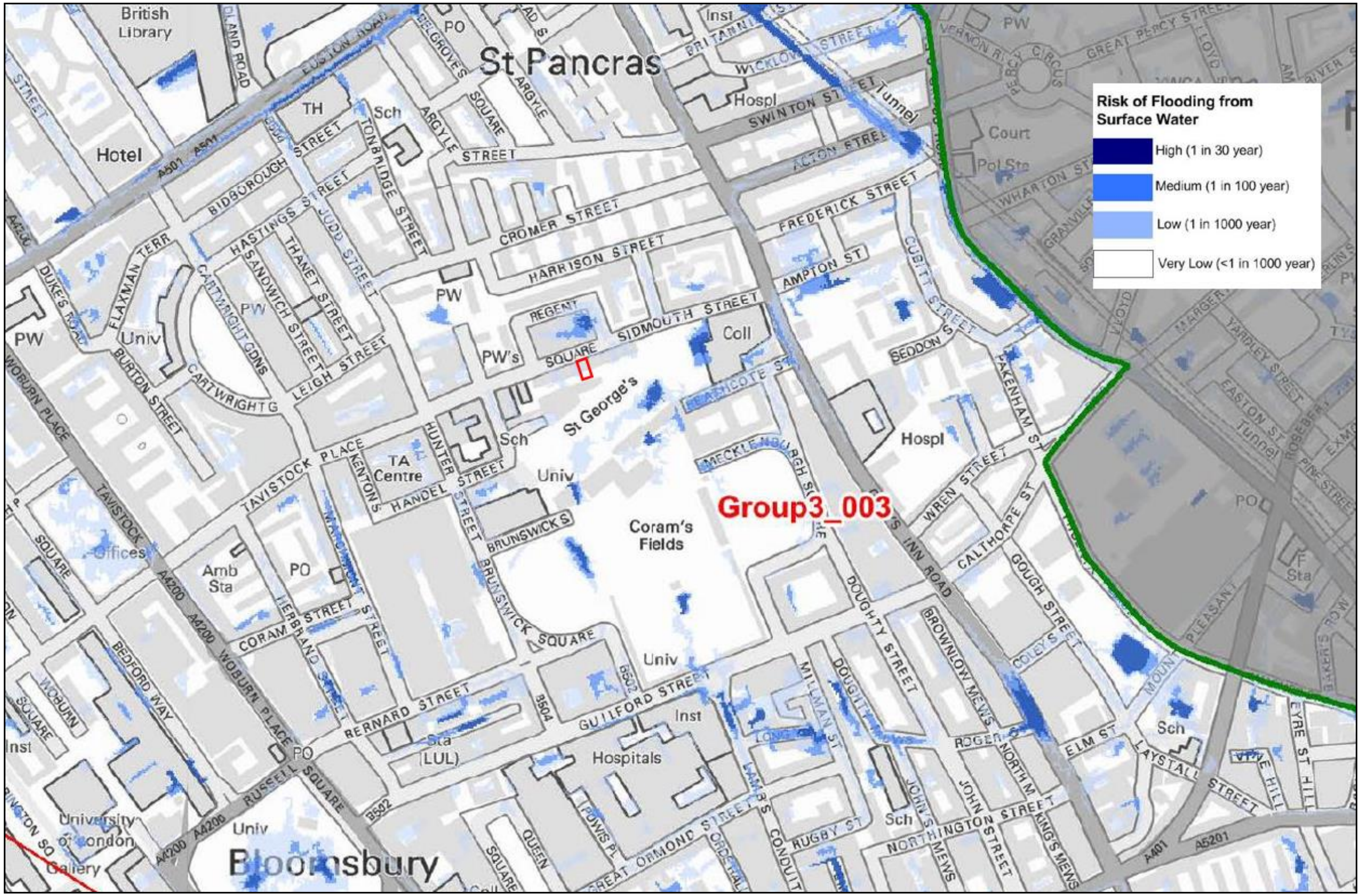
Figures

Figure 1: Extract from Environment Agency Flood Map (surface water). Site location is shown by cross-hair.



Source: Environment Agency Flood Map, accessed online at https://flood-warning-information.service.gov.uk/long-term-flood-risk/map on 18 July 2018

Figure 2: Extract from surface water modelling results presented in Figure 3i URS (2014). Approximate site location is shown by red line.



Source: URS (2014)

Figure 3: Topography of site and surrounds based on 1m LiDAR DTM. 1m contours are shown with 5m contours shown in bold.

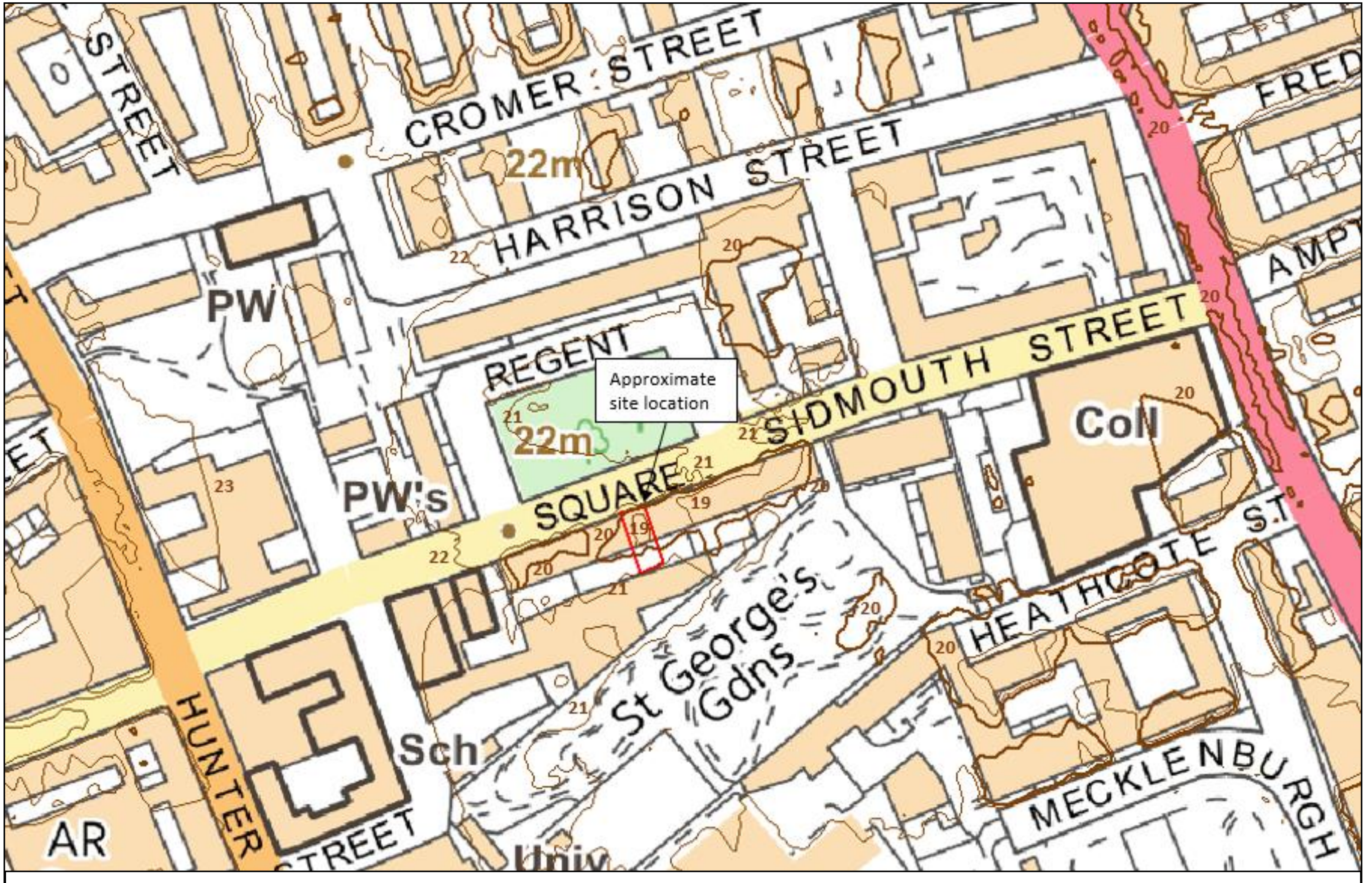


Figure 4: Indicative surface water flow-paths and catchments, based on LiDAR DTM

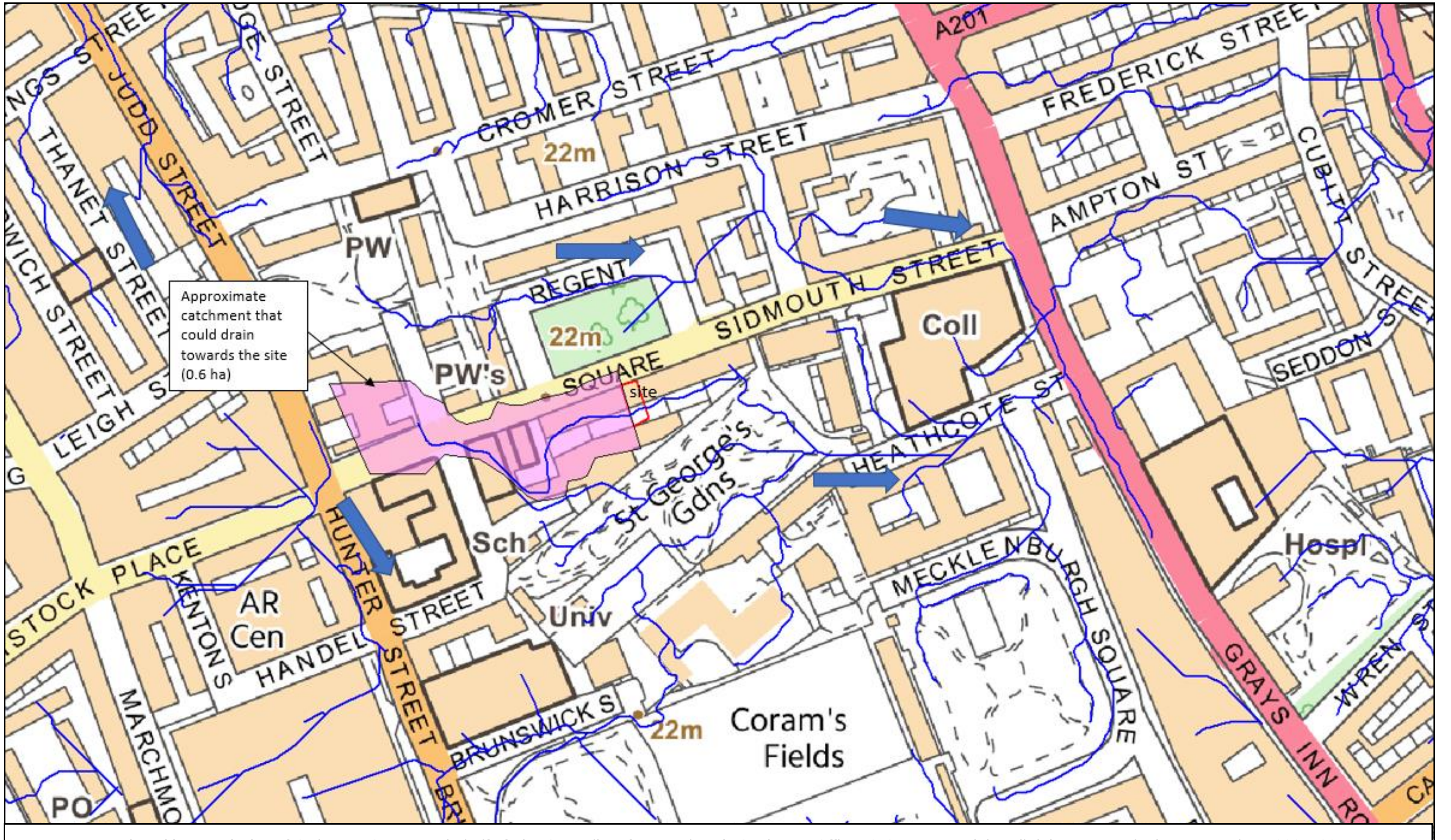
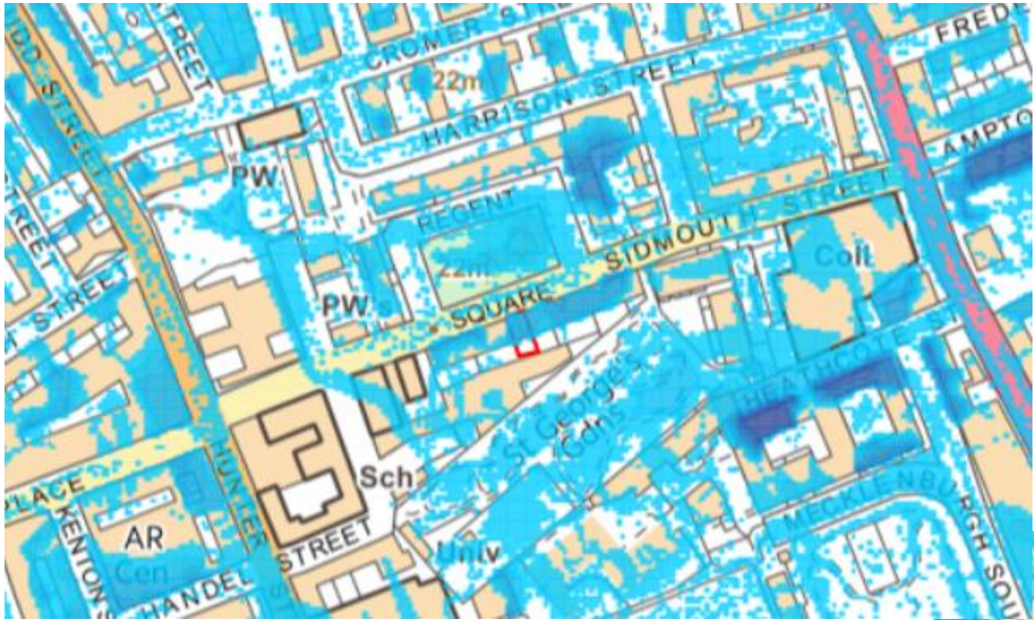
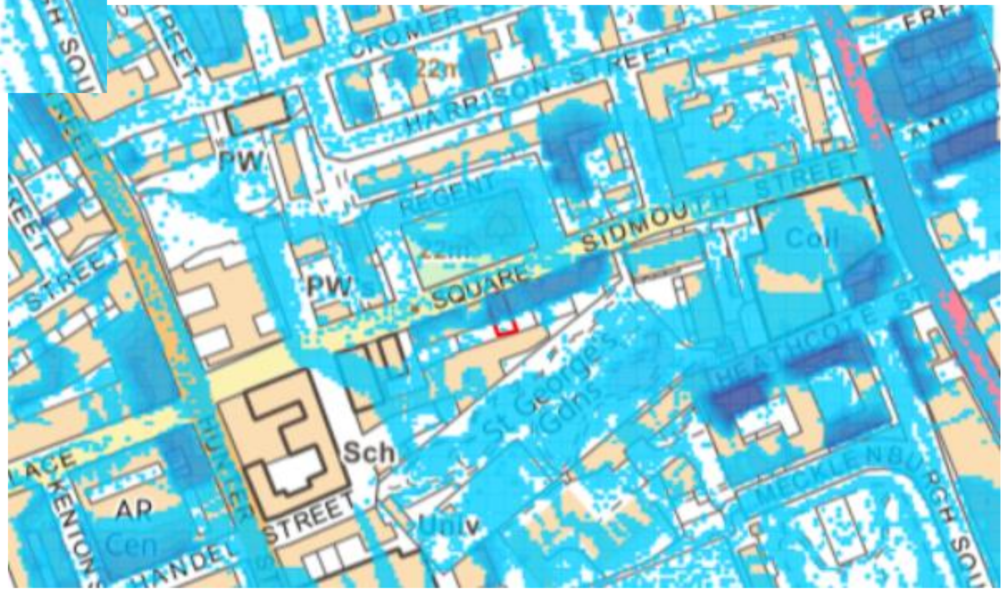


Figure 5: Predicted surface water runoff for 100 and 1000 year storms (both 5 hour duration)



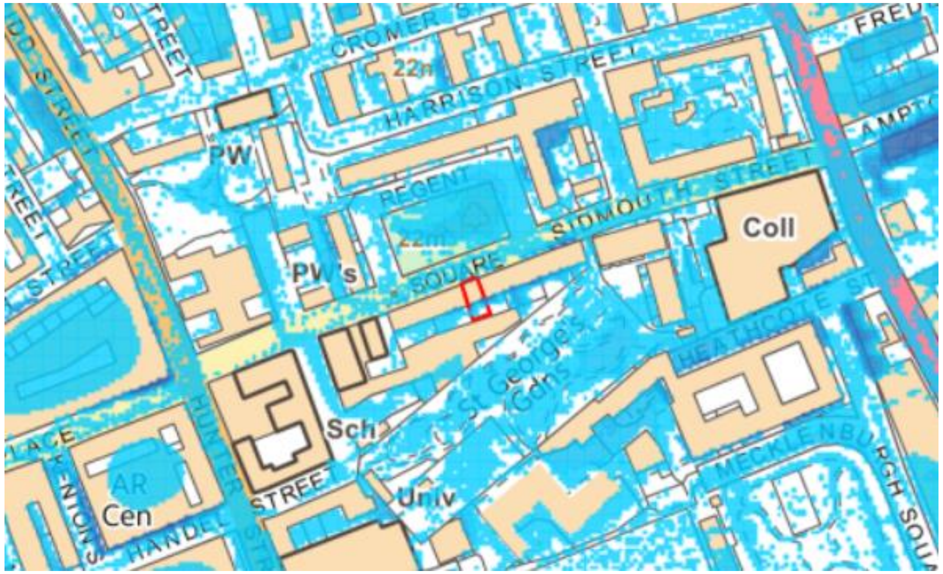
a) 100 year



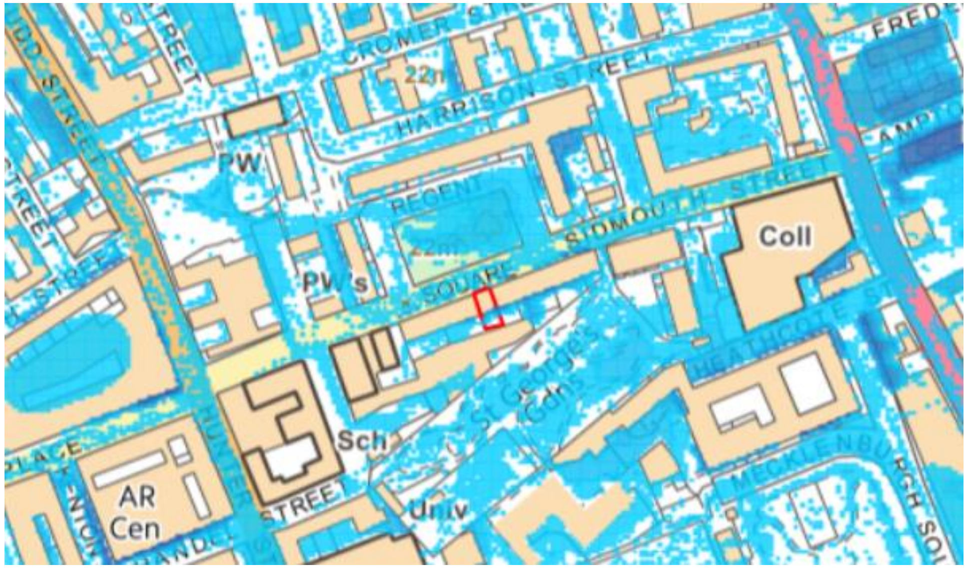
b) 1000 year

Figure 6: Predicted surface water runoff for 100 year storm and 3, 5 and 7 hour storm durations (with buildings included)

a) 3 hours



b) 5 hours



b) 7 hours

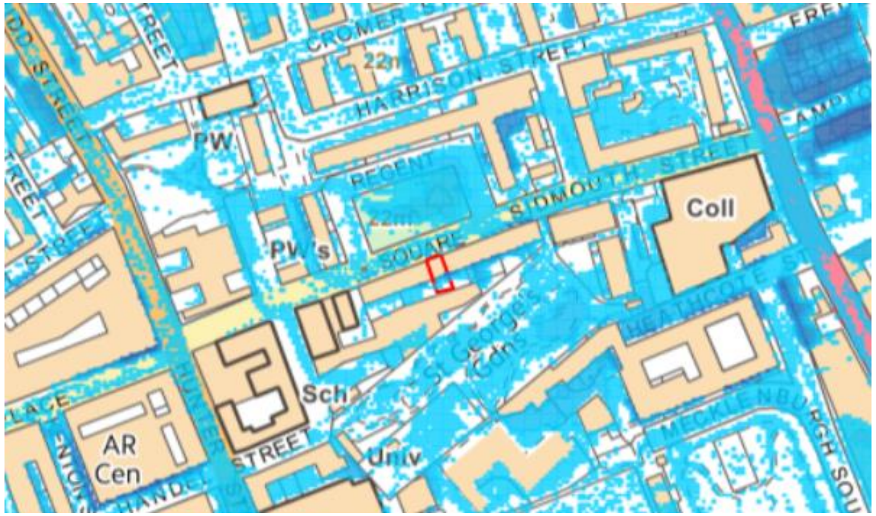


Figure 7: Predicted surface water runoff for 1000 year storm and 5 hour storm duration (with buildings included)