



Westminster City Council

STRATEGIC FLOOD RISK ASSESSMENT

Level 2





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1 INTRODUCTION

1.1 OVERVIEW

- 1.1.1 This Westminster City Level 2 Strategic Flood Risk Assessment (SFRA) builds on the already published Level 1 SFRA and provides a more detailed assessment of flood risk at a number of strategic and emerging development sites located within Westminster. This Level 2 SFRA has been completed in accordance with the National Planning Policy Framework (NPPF) and its supporting Planning Practice Guidance (PPG). It is a living document and will be updated periodically to reflect any changes to flood risk information.
- 1.1.2 The Level 1 SFRA assesses the risk of flooding within Westminster from all sources, now and in the future, taking into account climate change. The Level 1 SFRA provides the basis for the application of the Sequential Test and, where required, the Exception Test, and summarises key development control policies for the management of flood risk and surface water runoff.
- 1.1.3 This Level 2 SFRA applies the recommendations of the Level 1 SFRA to specific site locations and considers their vulnerability in accordance with the requirements of the Sequential and Exception Tests, subsequently providing advice on appropriate policies for each site that should be demonstrated as part of any subsequent planning application.
- 1.1.4 The sites assessed in this Level 2 SFRA (and shown in Figure 1-1) include:
- Grosvenor Sidings
 - Land at Royal Oak Underground Station
 - Westbourne Park Bus Garage
 - St. Mary's Hospital
- 1.1.5 Following initial review, St Mary's Hospital is not considered to have sufficient flood risk to trigger the requirement of a full level 2 site assessment. St Mary's only has a few isolated areas of surface water ponding, compared to the other sites which have more significant extents of surface water flooding. For completeness for the site allocation process, a short proforma has been included for this site in section 2 following more detailed site assessments for Grosvenor Sidings, Westbourne Park bus garage and Land at Royal Oak Underground station.
- 1.1.6 All of the sites assessed for this Level 2 SFRA are appropriate for development, subject to the appropriate mitigation in accordance with the recommendations provided in each site assessment. The recommendations provided should be adhered to when any plans for development are brought forward as part of a planning application.

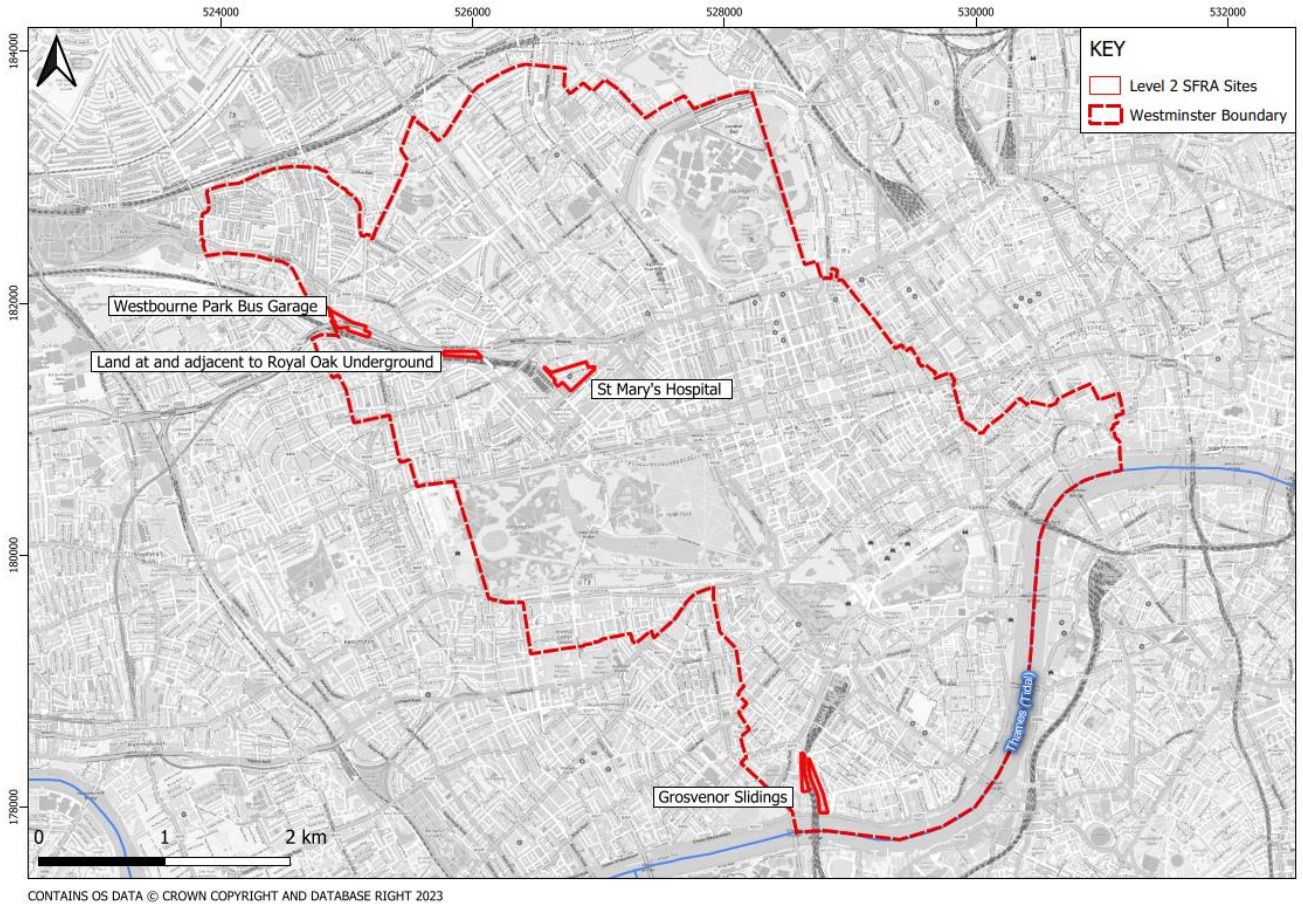


Figure 1-1 - Level 2 SFRA Sites

1.2 THE SEQUENTIAL AND EXCEPTION TEST

- 1.2.1 The risk of flooding is most effectively addressed through avoidance, which in very simple terms means guiding future development away from areas at risk. The application of the Sequential and Exception Tests form the most important consideration in the allocation of land for development. The purpose of the Sequential Test is to direct development towards areas of lowest flood risk, from all sources.
- 1.2.2 Although there are a number of potential sources of flooding in Westminster, it is not practicable to apply the Sequential Test to differentiate potential development sites. There are several development pressures on Westminster due to the existing highly built form and shortage of land. Policy 8 of the City Plan identifies the housing need for Westminster, with the number of new homes built by 2040 to exceed 20,685. In order to achieve this target, it is necessary to fully optimise the delivery of new provision across Westminster, using land efficiently. Due to this shortage of options, some sites at risk of flooding will need to be considered. However, the sequential approach is still required to be adopted throughout all future developments to steer the most vulnerable uses away from areas of flood risk.
- 1.2.3 Within Westminster the only tidal and fluvial source of flooding is the River Thames, however the River Thames benefits from significant tidal flood defence infrastructure, and under normal conditions, is not at risk of flooding from the Thames. It is therefore considered appropriate to assess flood risk from tidal and fluvial sources within Westminster as low. However, some areas are considered at greater

residual risk where located in a Rapid Inundation Zone (RIZ) (refer to Level 1 SFRA for strategic maps). These areas will therefore require greater consideration of factors such as flood resilience and safe access and egress.

- 1.2.4 Canals are not considered a source of fluvial flood risk as they are heavily managed and do not behave like rivers nor have a floodplain. The risk of flooding from canals in Westminster is considered to be low.
- 1.2.5 Brownfield redevelopment provides the opportunity to reduce surface water flood risk locally in a sustainable way by implementing Sustainable Drainage Systems (SuDS) and reducing the peak rate and volume of surface water run off when compared to the existing situation. Redevelopment within areas of existing surface water flood risk must include appropriate mitigation measures to reduce flood risk.
- 1.2.6 Groundwater flood risk is highly dependent on localised conditions and cannot be robustly assessed without detailed ground investigation information. It is therefore considered that groundwater flood risk should not impact the application of the Sequential Test.

The pressure of land availability means that development in Flood Zone 2 and 3 will be considered although preference is given to Flood Zone 1. Proposals for development within Flood Zone 2 and 3 will only be acceptable depending on the level of vulnerability, (as per Table 1-1), as well as meeting the requirements of the Exception Test.

- 1.2.7 Both elements of the Exception Test should be satisfied, where applicable, for a development to be allocated or permitted.
- 1.2.8 For the Exception Test to be satisfied it must be demonstrated that:
 - the development will provide wider sustainability benefits to the community that outweigh flood risk; and
 - the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Self-contained basements or basement flats wholly or partially below ground without freely available access at all times to a habitable space above ground level within the same dwelling are considered 'highly vulnerable' uses and in accordance with Table 1-1 are not acceptable within Flood Zone 3.

- 1.2.9 Any dwellings wholly or partially below ground with freely available internal access at all times to a habitable space above the maximum likely water level during a breach, are considered 'more vulnerable' and the Exception Test will apply to such sites. However, these sites will not be acceptable if located within the Rapid Inundation Zone which is defined as part of the River Thames Tidal Breach modelling.

Table 1-1 - Vulnerability Classification and Appropriate Flood Zone Designations

Vulnerability Classification	Development Types	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Essential Infrastructure	Essential transport infrastructure / essential utility infrastructure / wind turbines	✓	✓	ET	✗ (None present)
Highly Vulnerable	Police, ambulance and fire stations, command centres, telecommunications installations (that need to be operational in a flood), emergency dispersal points, basement dwellings and caravans / mobile homes.	✓	ET	✗	✗ (None present)
More Vulnerable	Hospitals, residential institutions, buildings used for dwelling houses, drinking establishments, nightclubs and hotels, non-residential health services, landfill and waste management facilities, sites used for holiday caravans and camping (subject to specific warning and evacuation plan).	✓	✓	ET	✗ (None present)
Less Vulnerable	Police, ambulance and fire stations (not required to be operational during a flood), buildings used for shops, offices, general industry, storage and distribution, other non-residential uses, land and buildings for agriculture / forestry, waste treatment, minerals working and processing, water treatment works (not required to be operational during a flood) and sewage treatment works (if adequate measures in place to control pollution during a flood is in place)	✓	✓	✓	✗ (None present)
Water Compatible	Flood control infrastructure, water transmission infrastructure, sewage transmission infrastructure, sand and gravel working, docks / marinas / wharves, navigation facilities, ship building, water based recreation (excluding sleeping accommodation), lifeguard and coastguard stations, amenity open space and essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).	✓	✓	✓	✓

✓ - Development is appropriate.

✗ - Development is not appropriate.

ET – Exception Test required.

1.3 DATA SOURCES

- 1.3.1 This Level 2 SFRA has been informed through the data sources summarised within the Level 1 SFRA which included data sourced from Westminster City Council, the Environment Agency and Thames Water.
- 1.3.2 Key data sources include the River Thames Breach Inundation Assessment (May 2017), which simulated breaches at a number of locations along the Thames and produced results for present day (2005) and 2100 scenarios including flood extent, depth, hazard rating and rapid inundation zones and updated surface water modelling (WSP 2023) which models surface water flood risk including climate change, considering tide-locking scenarios and the influence of the Thames Water sewer system.
- 1.3.3 Vulnerability to groundwater flooding has been assessed using British Geological Survey (BGS) data which identifies potential for groundwater flooding. An earlier dataset known as the 'increased potential for elevated groundwater flooding' has also been used to inform the risk of groundwater flooding and at each of the sites within the Level 2 SFRA. It should be noted that a ground investigation should be undertaken for any forthcoming planning application to assess the risk of groundwater flooding.
- 1.3.4 Thames Water has maintained a database of sewer flooding incidents over the last 20 years. These records have been used within the Level 2 SFRA to inform the site assessments.

1.4 DEVELOPMENT CONTROL

- 1.4.1 If after the application of the Sequential and Exception Tests the development is considered appropriate at the proposed location identified flood risks can be managed through implementation of recommended development control policies and guidance, as well as mitigation measures.
- 1.4.2 These recommendations are presented in detail in Section 5 of the Level 1 SFRA. A brief summary of key recommendations is provided below for reference for this Level 2 SFRA:
- Site-specific Flood Risk Assessments (FRAs) will need to be prepared by prospective developers for specific development sites. These sites are the following:
 - Development in Flood Zone 2 and 3 including minor development and change of use;
 - Development of more than 1 hectare;
 - Development of less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g., surface water flooding, reservoirs); and
 - Development in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency, or within a Surface Water Management Zone.
 - The detail provided in the FRA should be based on up-to-date existing flooding information (e.g. Environment Agency's Flood Map for Planning, breach modelling results from the River Thames Tidal Breach Inundation Assessment and history of flooding at the site) and be commensurate to the probability and associated risk of flooding for the proposed development.
 - The FRA must demonstrate how flood risk will be managed for a proposed development, without increasing flood risk to the surrounding areas; any associated surface water drainage strategy

should utilise SuDS, unless there are practical reasons for not doing so, to ensure the sustainable management of surface water runoff. Westminster will make their decision based on the evidence within the FRA as to whether the development is acceptable.

- Sites within Flood Zone 3 are not suitable for Highly Vulnerable Uses including self-contained basement dwellings.
- Dwellings wholly or partially below ground with freely available internal access at all times to a habitable space above the maximum likely water level in case of a breach, are considered 'more vulnerable' and the Exception Test will apply to such sites. Within the Rapid Inundation Zone such uses will not be acceptable.
- A Flood Warning and Evacuation Plan is generally required for 'more vulnerable' development within areas at risk of tidal breach flooding, especially if located within the Rapid Inundation Zone, and areas within surface water flood risk management zones. Consultation should be undertaken with Westminster City Council during the FRA process to determine whether a Flood Warning and Evacuation Plan is required as part of the flood risk mitigation.
- An evacuation route to land outside of the floodplain should be provided if feasible. Where this is not possible, 'more vulnerable' developments and, where possible, development in general (including basements especially those within a surface water flood risk management zone), should have internal stair access to a safe haven within the building to a level higher than the maximum likely water level.
- Ground level of new 'more vulnerable' developments (e.g. residential dwellings) within the modelled tidal breach flood extents, should be above the maximum likely water level (this level will be site specific).
- Property Flood Resilience (PFR) measures should be considered in the areas at risk of tidal breach flooding, and surface water flood risk management zones. PFR measures should be considered for basement development within Flood Zone 2 and 3.
- All drainage connections from basements to sewers should be fitted with a one way valve to prevent drains flooding the basement if they surcharge. A pumped sewerage system should also be considered within the basement design. The engineering design should take account of the specific combinations of geo-hydrological conditions on the site. Flood resilience and resistance measures are encouraged to be used within all basement developments.
- All developments must be safe from surface water flooding and, unless there are practical reasons for not doing so, SuDS should be used to manage surface water runoff and ensure surface water is managed as close to its source as possible.
 - Permeable paving, green/blue roofs, rainwater harvesting systems and other appropriate SuDS measures should be used to reduce run off rates.



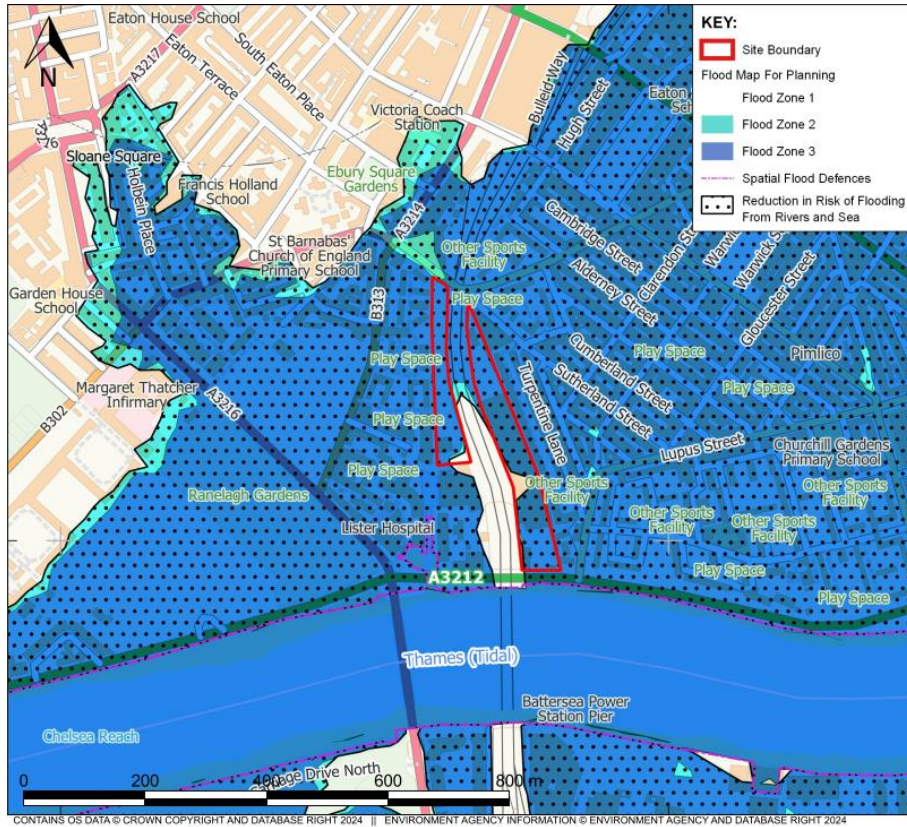
- The surface water drainage strategy should aim to achieve greenfield run-off rates, where this is not possible it should be demonstrated how all opportunities to minimise site run off have been taken to get as close to greenfield as possible.
- Regular management and maintenance checks should be carried out on any SuDS scheme to ensure that the system remains fully operational at all times. Adoption and future maintenance responsibilities should be identified during the planning application.

2 SITE ASSESSMENTS

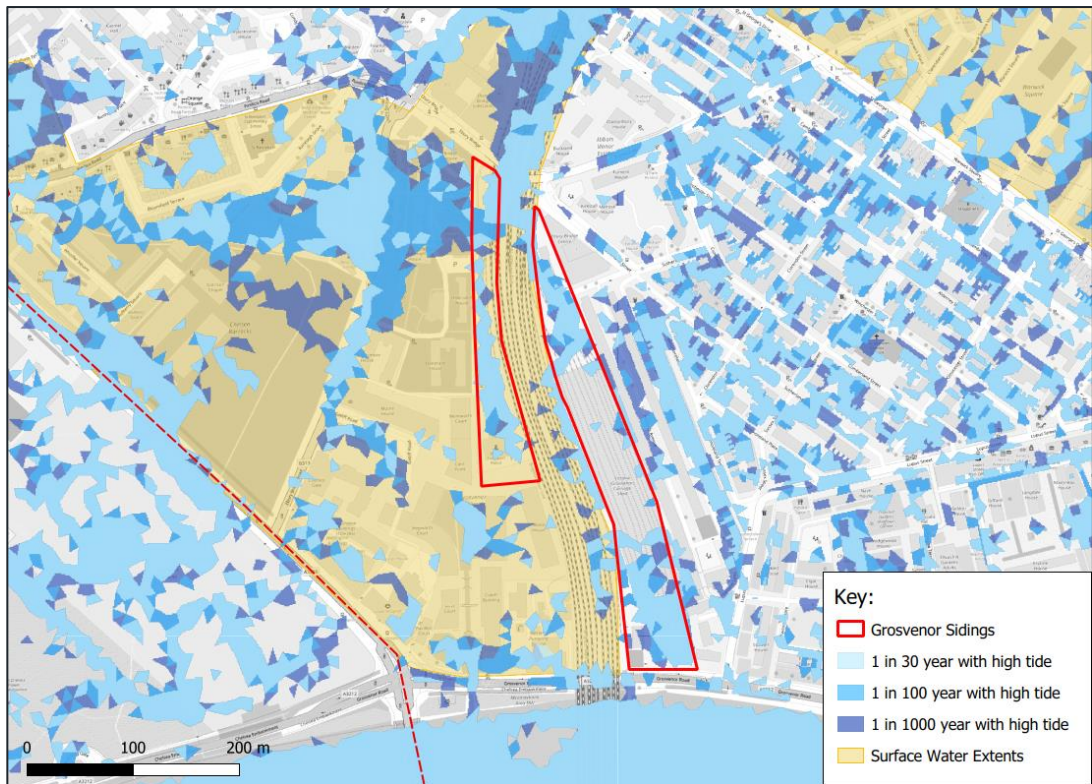
2.1 GROSVENOR SIDINGS

SITE 3 – GROSVENOR SIDINGS			
Site Area (ha)		2.85	
Existing Site Use		Railway Depot	
Current Risk Summary			
Source of Flooding	Risk Level	Area at Risk	Dataset
Fluvial/Tidal	Flood Zone 1	0.2ha	Flood Map for Planning
	Flood Zone 2	0.06ha	
	Flood Zone 3	2.59ha	
<i>The site is in an area that benefits from flood defences.</i>			
Surface Water	1 in 30	0.07ha	WSP modelled surface water extents
	1 in 100	0.18ha	
	1 in 1000	0.48ha	
Source of Flooding	Risk Level	Dataset	Justification
Groundwater	Medium (to basements), Low (surface flooding)	BGS susceptibility to groundwater flooding	Southern section of the site is within the BGS mapping extents for potential groundwater flooding of property situated below ground level.
Sewer	Medium	Thames Water flooding incidents	There are no recorded flooding incidents on the site, however there are two nearby incidents (within 150m of the boundary).
Reservoir	At Risk	EA Reservoir Flood Maps	Majority of the site is shown to be within the 'wet day' extents'
Canal	Not at Risk	N/A	Site is not in the vicinity of any canals

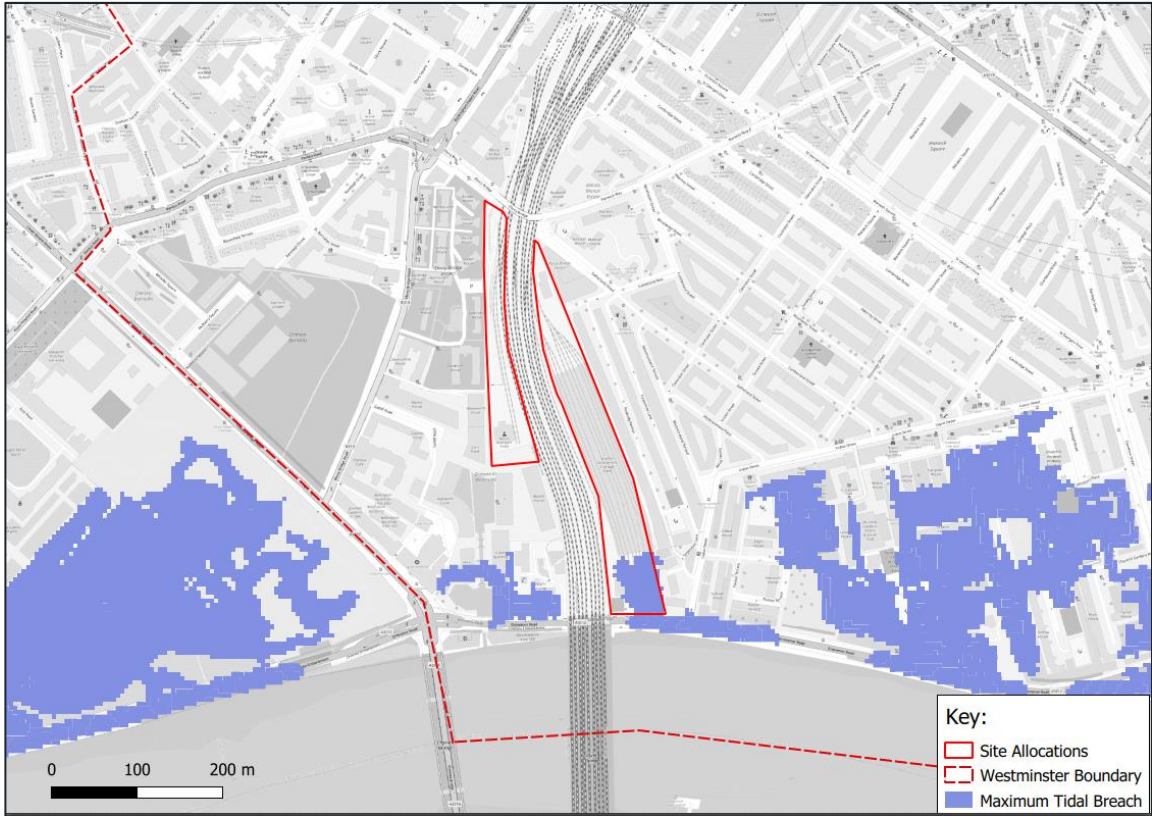
Flood Map for Planning (Rivers and Sea)



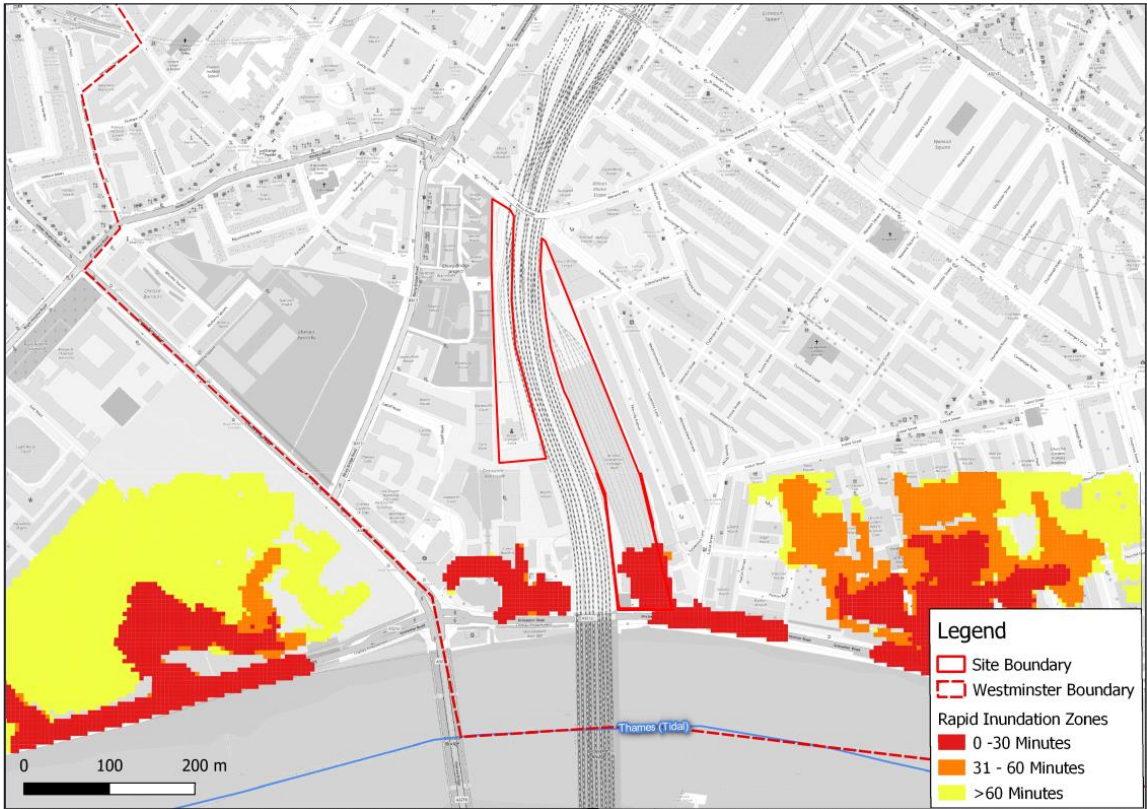
Surface Water Modelled Extents



Tidal Breach Flood Extent Map



Tidal Breach Rapid Inundation Zone



Flood Risk Issues and Considerations

The site is situated predominantly in Flood Zone 3 (high risk) as shown on the Environment Agency's Flood Map for Planning. The area shown at flood risk is also in an area where there is a reduction in the risk of flooding from rivers and sea due to the defences. The protection provided by the Thames Flood Defences mean that Flood Zone 3 in Westminster has an Annual Expected Probability (AEP) of flooding lower than 0.1% equivalent to Flood Zone 1 (without breach).

The Thames Tidal Breach Assessment shows the maximum extent of flooding that may occur from breaching of the River Thames. At present the southern section of the site is at risk if a breach was to occur.

Surface water modelling, undertaken by WSP, indicates that the site is partially at risk of surface water flooding during the 3.33% Annual Exceedance Probability (AEP) event, 1% AEP and 1% AEP plus climate change. Surface water flooding is indicated to the south of the carriage shed and along the north and western boundaries. The site is also partially within a Surface Water Management Zone as identified within the Level 1 SFRA.

The BGS susceptibility to groundwater flooding dataset indicates that southern section of the site is within an area with the potential for groundwater flooding below ground level – this means basements in that area could be at risk.

The Environment Agency Recorded Flood Outlines and Historic Flood Map does not indicate any known historic flooding on the site.

The Environment Agency reservoir flood mapping indicates that the majority of the site is at risk during a 'wet day' scenario (when there is also flooding from rivers).

Development must be located sequentially within the site locating the most vulnerable uses in the lowest risk parts of the site from any source of flooding.

Is the site required to pass the Exception Test?

As the site is located within Flood Zone 2 and 3, more vulnerable uses will only be permitted if the Exception Test is satisfied, demonstrating that:

- a) the development will provide wider sustainability benefits to the community that outweigh flood risk; and
- b) the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The NPPF makes clear that both aspects of the test must be satisfied and that the test can be applied at the plan production or planning application stage. It also makes clear that where more information becomes available at the planning application stage that was not considered at the plan production stage, the test will need to be re-applied.

As the Site Allocation for Grosvenor Sidings promotes residential-led development on the site, the Exceptions Test initially applies at the plan-making stage.

In terms of part (a) of the test, the site represents a rare opportunity within Westminster for residential development on significantly underutilised brownfield site that can occur without substantial demolition of existing buildings. The site is in a highly sustainable location in close proximity to Victoria Station and can make a significant contribution towards challenging targets for the delivery of over 20,685 new dwellings across the city by 2040 – thus reducing pressure for high levels of residential intensification at other sites, which may be less sustainable, necessitate high levels of demolition to facilitate, and could have greater heritage sensitivities.

In terms of part (b) of the test, a Site-Specific Flood Risk Assessment will need to accompany any planning application when the detailed design and layout of a scheme are known, demonstrating accordance with the requirements below regarding:

- The raising of finished floor levels;
- The incorporation of sustainable drainage systems;
- The incorporation of flood resistant and flood resilient measures; and
- The incorporation of safe access and egress routes from new dwellings.

Highly Vulnerable uses are not suitable with Flood Zone 3 which includes self-contained basement dwellings; police, ambulance and fire stations and command centres and telecommunications installations that would be required to be operational during flooding and emergency dispersal points.

Dwellings wholly or partially below ground with freely available internal access at all times to a habitable space above the maximum likely water level in case of a breach, are also considered 'More Vulnerable'. As the site is partially located within the River Thames Tidal Rapid Inundation Zone basement dwelling developments will not be acceptable in line with WCC's Basement Supplementary Planning Document. Basements may be acceptable for Less Vulnerable uses provided flood resistance and resilience measures are incorporated and there is both internal and external stair access to a safe level which is above the maximum likely water level.

Any reduction in flood risk to the wider community through provision or financial contribution to flood risk management infrastructure must be considered as well as the provision of sustainable drainage systems and incorporating green infrastructure in support of passing the Exception Test.

Management of Fluvial / Tidal Flood Risk

Although the site is protected by the Thames Tidal Flood Defences, finished floor levels of any new buildings should be raised by a minimum of 300mm above the modelled breach level.

Management of Surface Water Flood Risk and Overland Flow

During the design of the development the location of buildings and other more vulnerable uses should be located away from areas at risk of surface water flooding and sustainable drainage systems should be incorporated to manage surface water flows on site.

Any overland flow paths should be incorporated into the masterplan and preserved where possible, ensuring flows are not diverted or rates increased to third parties.

Finished floor levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

Management of Groundwater Flood Risk

Groundwater monitoring should be undertaken to support the planning application of the development to understand the likely maximum groundwater level to ensure that the capacity of the drainage systems are not reduced.

Groundwater monitoring may also be required for developments incorporating new basement levels. If basements are proposed (non-habitable) it is recommended that two separate accesses are provided (one internal and one external) to a safe space and potentially incorporated with other flood resilience/resistance measures to ensure surface water flows cannot enter the basement level.

Sustainable Drainage Systems (SuDS)

A review of British Geology Survey data indicates that the site is underlain by superficial deposits of Alluvium comprising Clay, Silt, Sand and Peat and as such the site may be suitable for infiltration of surface water runoff. However, infiltration testing, along with groundwater monitoring, should be undertaken to support the planning application for the site to confirm if this is suitable.

The surface water drainage system for any proposed development should manage surface water onsite for all events up to and including the 1% annual probability event plus climate change and achieve pre-development greenfield runoff rates of either Qbar or the relevant corresponding design storm event with long term storage to ensure surface water runoff volumes as well as rates are not increased. Development of the site may also provide opportunities for the site surface water drainage system to reduce offsite surface water flood risk. The drainage strategy should comply with policy SI13 (Sustainable drainage) from the London Plan, Policies 34 (Green infrastructure) and 35 (Flood risk) from the Westminster City Plan and the Non-Statutory Technical Standards for SuDS. Any proposed system should aim to remove surface water from the combined sewer network and provide water quality treatment. The implementation of water reuse to capture rainfall at source, as well as the use of green infrastructure (e.g., green roofs, rain garden planters) should be investigated to aid in achieving this aim (this will also provide important biodiversity and amenity benefits).

Flood Resilience and Resistance Measures

Flood resilience and resistance measures must be incorporated into development in Flood Zone 2 and 3 or within any source of flood risk to ensure the development is designed to account for the impact of climate change.

The site lies within a Flood Warning Area (Tidal Thames from Vauxhall Bridge to Battersea Bridge). A Flood Warning Evacuation Plan for More Vulnerable development will be required alongside a planning application, this will also need to cover any other sources of flood risk that may affect the site to ensure the site remains safe for the relevant design storm.

Property Flood Resilience (PFR) measures should also be considered including (but not limited to) low permeability materials, air vents and fixtures/fittings located at a higher level and flood resistant internal wall linings.

For further information on flood resilience and resistance measures refer to [Improving the flood performance of new buildings: flood resilient construction](#)¹ and the [Flood Risk and Coastal Change Planning Practice Guidance](#)².

Access / Egress Constraints

Safe access looks to be viable at several locations. Further investigation should be carried out to assess the availability of safe access and egress during a design flood event from any source in a site-specific FRA.

For further information on Safe access and egress please refer to [Flood Risk Assessment Guidance for New Development](#) and [ADEPT/EA Flood Risk Emergency Plans for New Development](#)

Summary

In accordance with paragraph 165 of the NPPF, the site has passed the Exception Test at a strategic level as the above mitigation measures, which must be incorporated in any future development at a planning application stage will ensure the development is safe from flooding and does not increase flood risk to the site or surrounding area.

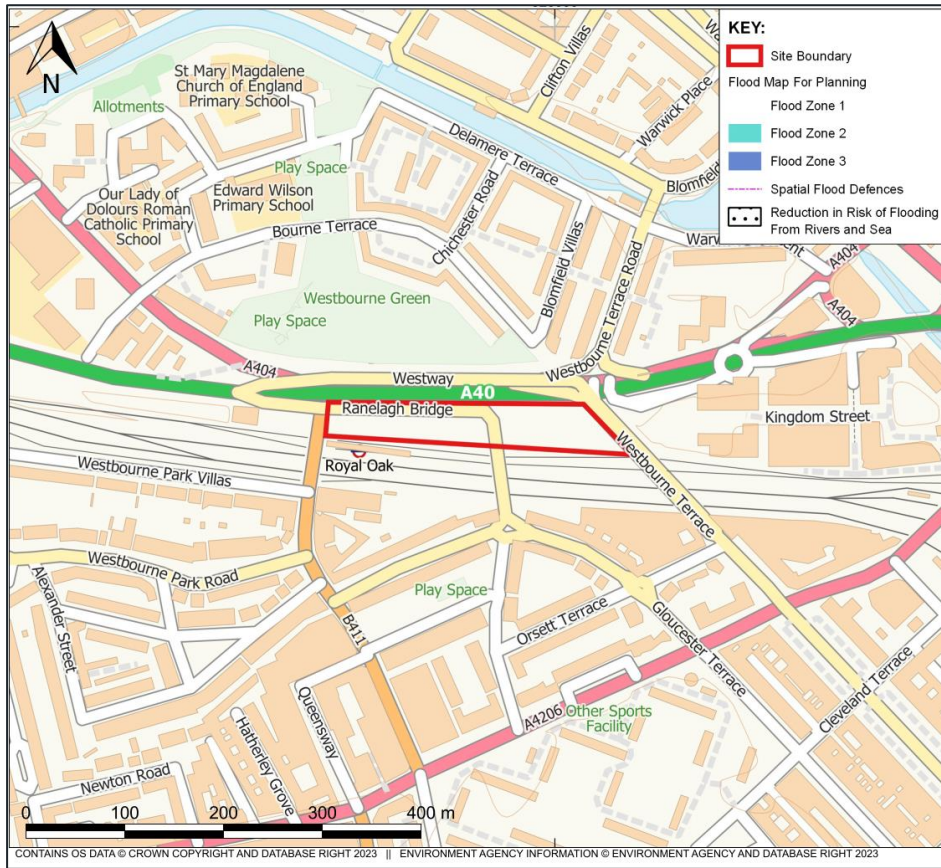
¹ Department for Communities and Local Government (2007) Flood resilient construction of new buildings, available online at: <https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings>

² Department for Communities and Local Government (2016) Flood Risk and Coastal Change Planning Practice Guidance, available online at: <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

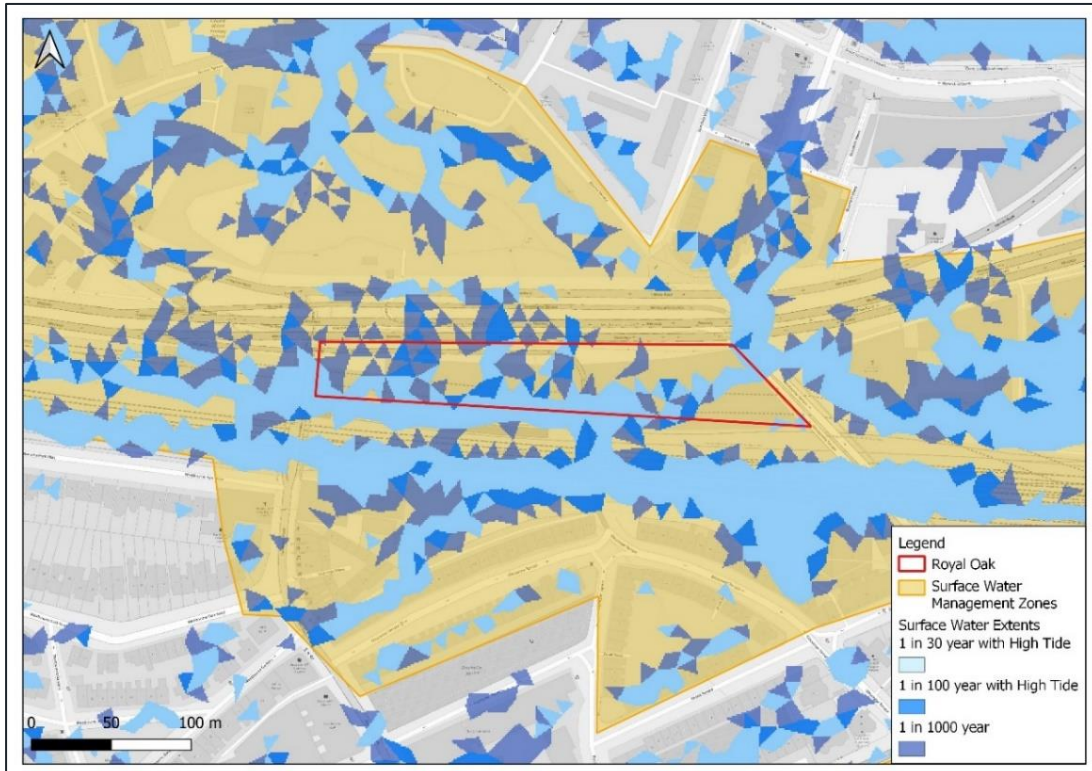
2.2 LAND AT ROYAL OAK UNDERGROUND STATION

SITE 4 – LAND AT ROYAL OAK UNDERGROUND STATION			
Site Area (ha)		1.18	
Existing Site Use		Underground station and adjacent land	
Current Risk Summary			
Source of Flooding	Risk Level	Area at Risk	Dataset
Fluvial/Tidal	Flood Zone 1	1.18ha	Flood Map for Planning
	Flood Zone 2	0.00ha	
	Flood Zone 3	0.00ha	
<i>The site is not in an area that benefits from flood defences.</i>			
Surface Water	1 in 30	0.13 ha	WSP modelled surface water extents
	1 in 100	0.19 ha	
	1 in 1000	0.25 ha	
Source of Flooding	Risk Level	Dataset	Justification
Groundwater	Low	BGS susceptibility to groundwater flooding	The site is not within the BGS susceptibility to groundwater flooding extents.
Sewer	Low	Thames Water flooding incidents	There are no recorded flooding incidents within the vicinity of the site.
Reservoir	Not at Risk	EA Reservoir Flood Maps	Site is not within the flood extents from the EA reservoir mapping.
Canal	Not at Risk	N/A	Site is not in the vicinity of any canals.

Flood Map for Planning (Rivers and Sea)



Surface Water Modelled Extents



Flood Risk Issues and Considerations
<p>The site is entirely situated in Flood Zone 1 (low risk), as shown on the Environment Agency's Flood Map for Planning, and therefore, has an Annual Expected Probability (AEP) of flooding lower than 0.1%. The site is over 4km north of the Thames and is not affected by tidal breach risk.</p> <p>Surface water modelling, undertaken by WSP, indicates that there is a flow pathway of high risk (>3.3% AEP) through the site with areas of medium (1% - 3.3% AEP) and low (0.1% - 1.0% AEP) risk. Any development of the site must consider the impact on existing flow-paths. Flood risk should not be displaced offsite as result of development.</p> <p>The site is at a low risk of groundwater flooding according to the BGS susceptibility to groundwater flooding.</p> <p>The Environment Agency Recorded Flood Outlines and Historic Flood Map does not indicate any known historic flooding on the site.</p>
Is the site required to pass the Exception Test?
<p>As the site is not located within Flood Zone 2 and 3, an Exception Test is not required.</p>
Management of Surface Water Flood Risk and Overland Flow
<p>During the design of the development the location of buildings and other more vulnerable uses should be located away from areas at risk of surface water flooding and sustainable drainage systems should be incorporated to manage surface water flows on site.</p> <p>Any overland flow paths should be incorporated into the masterplan and preserved where possible, ensuring flows are not diverted or rates increased to third parties.</p> <p>Finished floor levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.</p>
Sustainable Drainage Systems (SuDS)
<p>A review of British Geology Survey data indicates that the site is underlain by bedrock of London Clay Formation, comprising clay, silt and sand. Due to the impermeability of London Clay, the site may not be suitable for infiltration of surface water runoff. However, infiltration testing, along with groundwater monitoring, should be undertaken to support the planning application for the site to confirm if this is suitable.</p> <p>The surface water drainage system for any proposed development should manage surface water onsite for all events up to and including the 1% annual probability event plus climate change and should aim to achieve pre-development greenfield runoff rates of either Qbar or the relevant corresponding design storm event with long term storage to ensure surface water runoff volumes as well as rates are not increased. Development of the site may also provide opportunities for the site surface water drainage system to reduce offsite surface water flood risk. The drainage strategy should comply with policy S113 (Sustainable drainage) from the London Plan, Policies 34 (Green infrastructure) and 35 (Flood risk) from the Westminster City Plan and the Non-Statutory Technical Standards for SuDS. Any proposed system should aim to remove surface water from the combined sewer network and provide water quality treatment. The implementation of water reuse to capture rainfall at source, as well as the use of green infrastructure (e.g., green roofs, rain garden planters) should be investigated to aid in achieving this aim (this will also provide important biodiversity and amenity benefits).</p>
Flood Resilience and Resistance Measures
<p>Flood resilience and resistance measures must be incorporated into development in Flood Zone 2 and 3 or within any source of flood risk to ensure the development is designed to account for the impact of climate change.</p> <p>A Flood Warning Evacuation Plan for More Vulnerable development will be required alongside a planning application, this will also need to cover any other sources of flood risk that may affect the site to ensure the site remains safe for the relevant design storm.</p>



Property Flood Resilience (PFR) measures should also be considered including (but not limited to) low permeability materials, air vents and fixtures/fittings located at a higher level and flood resistant internal wall linings.

For further information on flood resilience and resistance measures refer to Improving the flood performance of new buildings: flood resilient construction and the Flood Risk and Coastal Change Planning Practice Guidance.

Access / Egress Constraints

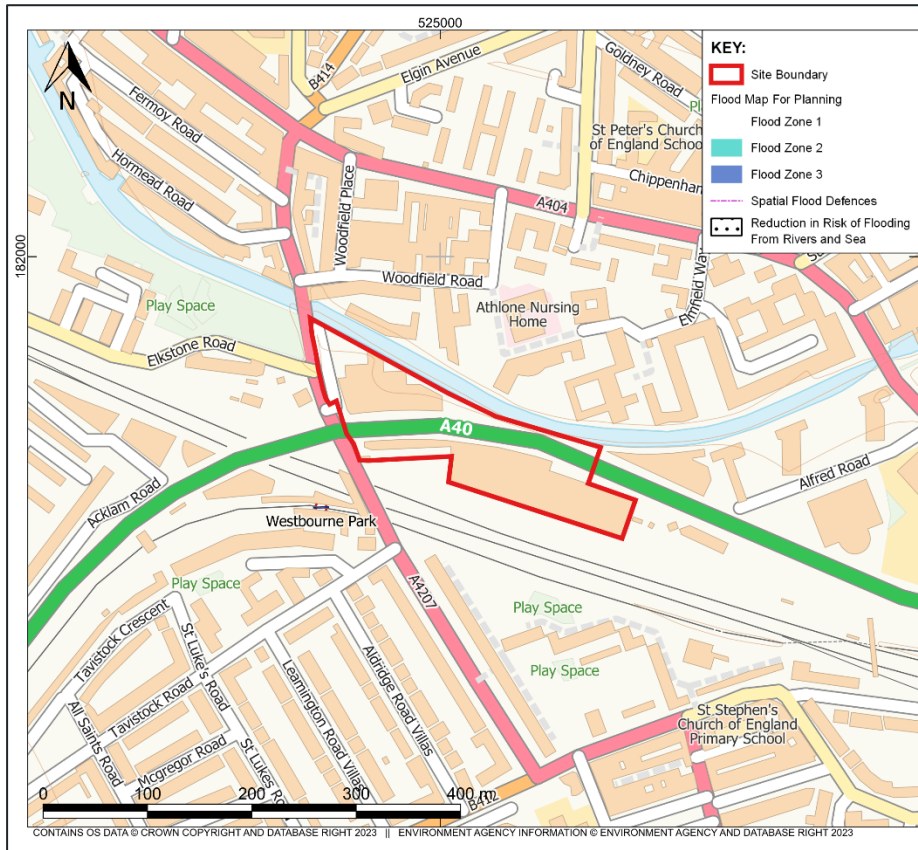
Safe access/egress routes for pedestrians should be available in areas outside the risk of flooding. Given the nature of this site location, lack of safe access and egress routes would not be acceptable.

For further information on Safe access and egress please refer to [Flood Risk Assessment Guidance for New Development](#) and [ADEPT/EA Flood Risk Emergency Plans for New Development](#)

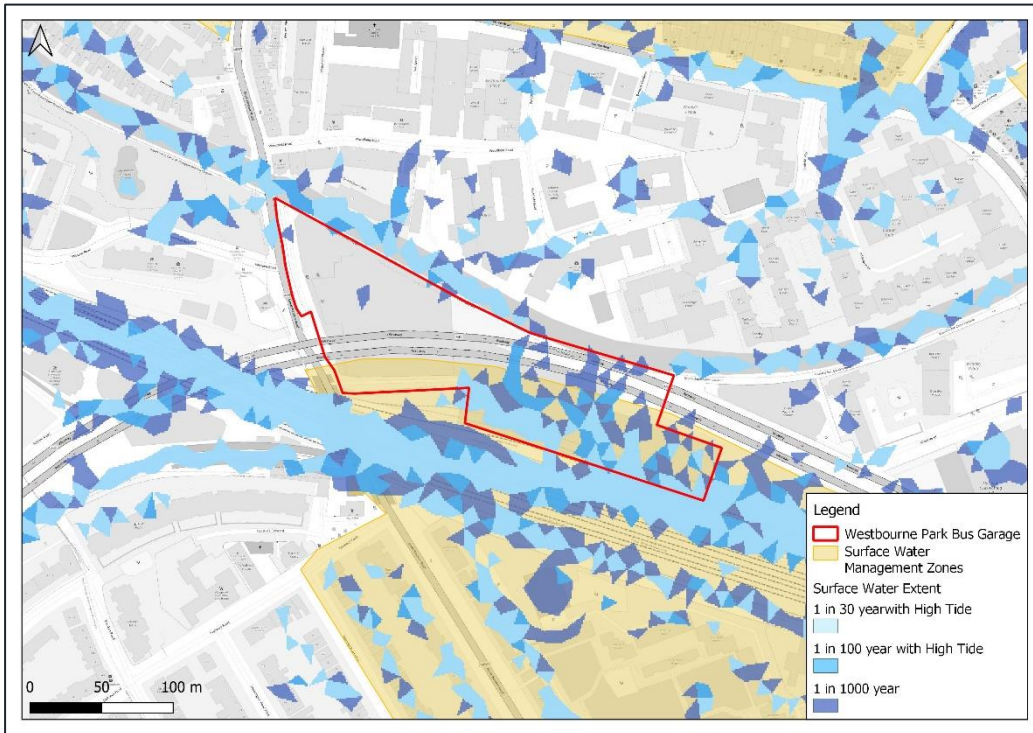
2.3 WESTBOURNE PARK BUS GARAGE

SITE 6 – WESTBOURNE PARK BUS GARAGE			
Site Area (ha)		0.43	
Existing Site Use		Bus Garage	
Current Risk Summary			
Source of Flooding	Risk Level	Area at Risk	Dataset
Fluvial/Tidal	Flood Zone 1	0.43ha	Flood Map for Planning
	Flood Zone 2	0.00ha	
	Flood Zone 3	0.00ha	
<i>The site is not in an area that benefits from flood defences.</i>			
Surface Water	1 in 30	0.27ha	WSP modelled surface water extents
	1 in 100	0.14ha	
	1 in 1000	0.26ha	
Source of Flooding	Risk Level	Dataset	Justification
Groundwater	Low	BGS susceptibility to groundwater flooding	The site is not within the BGS susceptibility to groundwater flooding extents.
Sewer	Low	Thames Water flooding incidents	There are no recorded flooding incidents on the site or in the close vicinity.
Reservoir	Not at Risk	EA Reservoir Flood Maps	The site is not within the flood extents from the EA reservoir mapping.
Canal	At Risk	N/A	The site is subject to residual risk from flooding from the adjacent Paddington Arm of the Grand Union Canal.

Flood Map for Planning (Rivers and Sea)



Surface Water Modelled Extents



Flood Risk Issues and Considerations

The site is entirely situated in Flood Zone 1 (low risk), as shown on the Environment Agency’s Flood Map for Planning, and therefore, has an Annual Expected Probability (AEP) of flooding lower than 0.1%.

Surface water modelling, undertaken by WSP, indicates that there is a flow pathway of high risk (>3.3% AEP) at the southern edge of the site, which may be associated the adjacent railway line. Areas of medium (1% - 3.3% AEP) and low (0.1% - 1.0% AEP) risk also extend into the southern part of the site. Any development of the site must consider the impact on existing flow-paths. Flood risk should not be displaced offsite as result of development. The modelled surface water extents indicate that the northern part of the site is generally at a very low risk of flooding from surface water, with only a very small area in the centre of the site at risk, which may be due to the existing levels. The site also falls partially within a Surface Water Management Zone – sites within these areas are expected to include a greater emphasis on the use of SuDS as they may contribute to areas of higher risk within the zone.

The site does not lie within the BGS susceptibility to groundwater flooding extents and so is considered to be at a low risk of any flooding below ground level or at the surface.

The site is adjacent to the Grand Union Canal, which poses a residual risk of flooding. The risk of flooding from canals is low, however it is recommended that at planning application stage, investigation takes place to determine if any flood resilience measures are required.

Is the site required to pass the Exception Test?

As the site is not located within Flood Zone 2 and 3, an Exception Test is not required.

Management of Surface Water Flood Risk and Overland Flow

Any redevelopment of the site must consider how it may alter how surface water flows through or around the site during heavy rainfall and ensure that any displacement of surface water storage on site is compensated for demonstrating that there is no increase in flood risk to the surrounding area. Sustainable drainage systems should be incorporated to manage surface water flows on site.

Finished floor levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

Sustainable Drainage Systems (SuDS)

A review of British Geology Survey data indicates that the site is underlain by bedrock of London Clay Formation, comprising clay, silt and sand. Due to the impermeability of London Clay, the site may not be suitable for infiltration of surface water runoff. However, infiltration testing, along with groundwater monitoring, should be undertaken to support the planning application for the site to confirm if this is suitable.

Where infiltration is not feasible, the applicant should engage with the Canal and Rivers Trust to investigate feasibility of discharge of clean surface water into the Grand Union Canal as a preference to discharging into the combined sewer system. It should be ensured that discharge rates are reduced to greenfield (or as low as reasonably practicable) to improve the likelihood of the Canals and River Trust granting a permit.

The surface water drainage system for any proposed development should manage surface water onsite for all events up to and including the 1% annual probability event plus climate change and should aim to achieve pre-development greenfield runoff rates of either Qbar or the relevant corresponding design storm event with long term storage to ensure surface water runoff volumes as well as rates are not increased. Development of the site may also provide opportunities for the site surface water drainage system to reduce offsite surface water flood risk. The drainage strategy should comply with policy SI13 (Sustainable drainage) from the London Plan, Policies 34 (Green infrastructure) and 35 (Flood risk) from the Westminster City Plan and the Non-Statutory Technical Standards for SuDS. Any proposed system should aim to remove surface water from the combined sewer network and provide water quality treatment. The implementation of water reuse to capture rainfall at source, as well as the use of green infrastructure (e.g., green roofs, rain garden planters) should be investigated to aid in achieving this aim (this will also provide important biodiversity and amenity benefits).

Flood Resilience and Resistance Measures

Flood resilience and resistance measures must be incorporated into development within any source of flood risk to ensure the development is designed to account for the impact of climate change.

Property Flood Resilience (PFR) measures should also be considered including (but not limited to) low permeability materials, air vents and fixtures/fittings located at a higher level and flood resistant internal wall linings.

For further information on flood resilience and resistance measures refer to Improving the flood performance of new buildings: flood resilient construction and the Flood Risk and Coastal Change Planning Practice Guidance.

Access / Egress Constraints

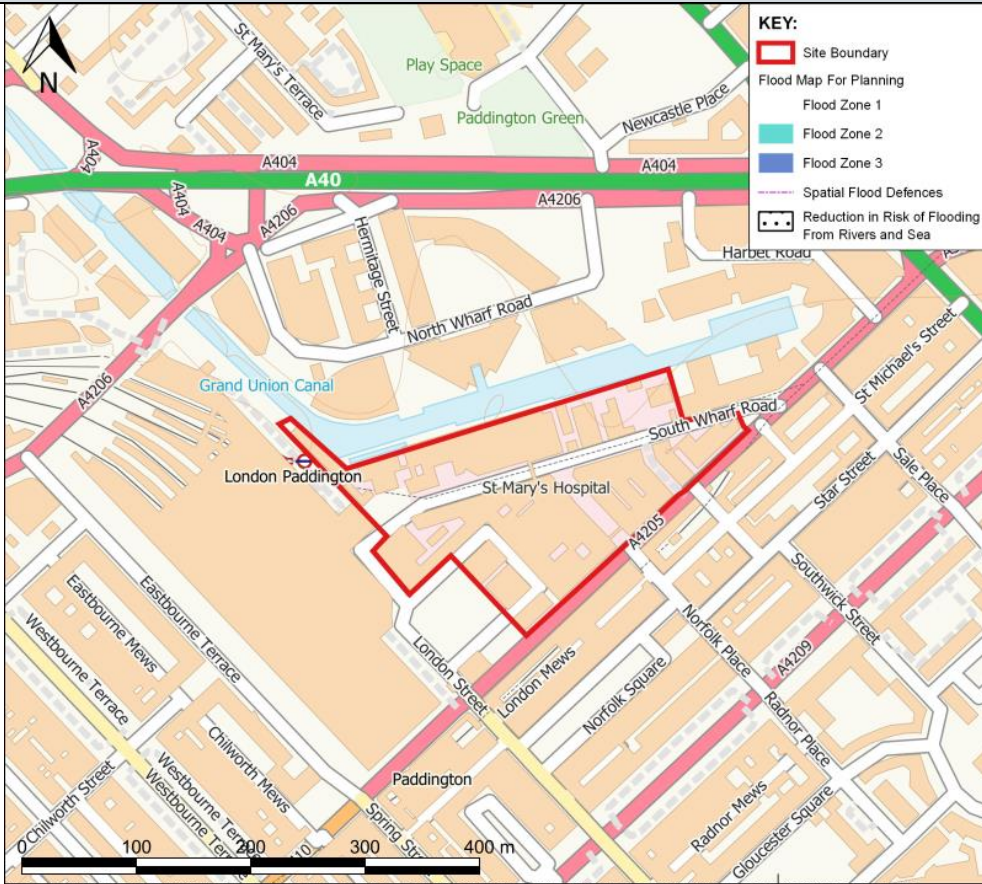
Safe access looks to be viable at several locations. Further investigation should be carried out to assess the availability of safe access and egress during a design flood event from any source in a site-specific FRA.

For further information on Safe access and egress please refer to [Flood Risk Assessment Guidance for New Development](#) and [ADEPT/EA Flood Risk Emergency Plans for New Development](#)

2.4 ST MARY'S HOSPITAL

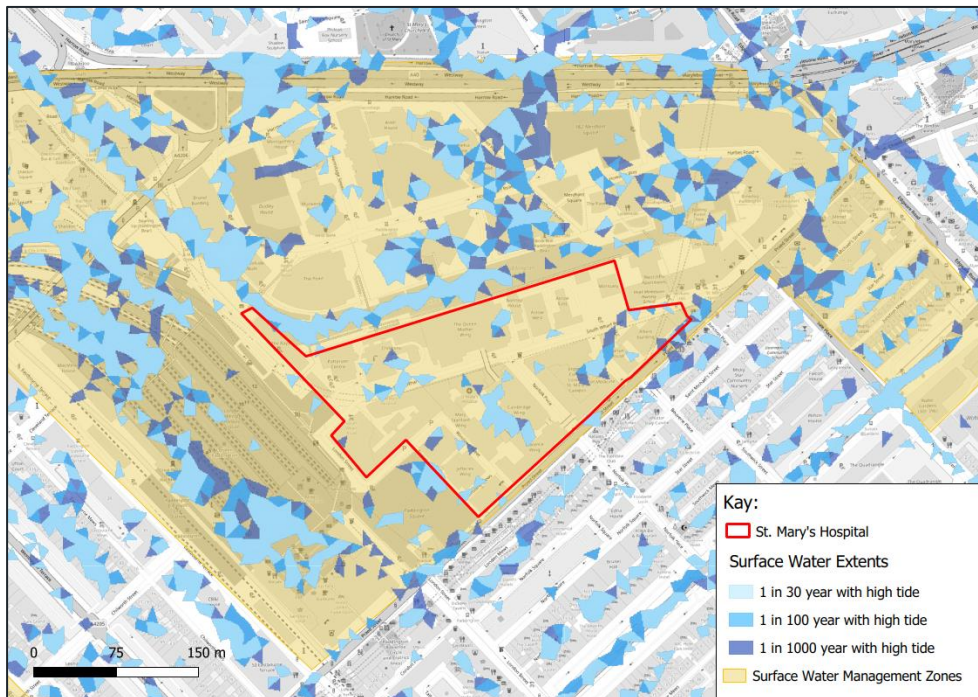
SITE 20 – ST. MARY'S HOSPITAL			
Site Area (ha)		3.8	
Existing Site Use		Hospital	
Current Risk Summary			
Source of Flooding	Risk Level	Area at Risk	Dataset
Fluvial/Tidal	Flood Zone 1	3.8ha	Flood Map for Planning
	Flood Zone 2	0.00ha	
	Flood Zone 3	0.00ha	
<i>The site is not in an area that benefits from flood defences.</i>			
Surface Water	1 in 30	0.05ha	WSP modelled surface water extents
	1 in 100	0.07ha	
	1 in 1000	0.14ha	
Source of Flooding	Risk Level	Dataset	Justification
Groundwater	Low	BGS susceptibility to groundwater flooding	The site is not within the BGS susceptibility to groundwater flooding extents.
Sewer	Medium	Thames Water flooding incidents	There are number of flooding incidents (12) within 100m of the site boundary.
Reservoir	Not at Risk	EA Reservoir Flood Maps	The site is not within the flood extents from the EA reservoir mapping.
Canal	At Risk	N/A	The site is subject to residual risk from flooding from the adjacent Grand Union Canal.

Flood Map for Planning (Rivers and Sea)



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Surface Water Modelled Extents



Flood Risk Issues and Considerations

The site is entirely situated in Flood Zone 1 (low risk), as shown on the Environment Agency’s Flood Map for Planning, and therefore, has an Annual Expected Probability (AEP) of flooding lower than 0.1%.

The modelled surface water extents indicate that the majority of the site is not at risk of flooding from surface water, with a number of isolated areas of possible flooding across the site. The site also falls within a Surface Water Management Zone – sites within these areas are expected to include a greater emphasis on the use of SuDS as they may contribute to areas of higher risk within the zone.

The site does not lie within the BGS susceptibility to groundwater flooding extents and so is considered to be at a low risk of any flooding below ground level or at the surface.

The site is adjacent to the Grand Union Canal, which poses a residual risk of flooding. The risk of flooding from canals is low, however it is recommended that at planning application stage investigation takes place to determine if any flood resilience measures are required.

It is noted that there are 12 recorded Thames Water flooding incidents within 100m of the site, indicating increased risk of sewer flooding in the area. At planning application stage, it is recommended that Thames Water are contacted to see if they hold any further data or additional information on the sewer capacity of the surrounding area.

The Environment Agency Recorded Flood Outlines and Historic Flood Map does not indicate any known historic flooding on the site.

Is the site required to pass the Exception Test?

As the site is not located within Flood Zone 2 and 3, an Exception Test is not required.

Management of Surface Water Flood Risk and Overland Flow

During the design of the development the location of buildings and other more vulnerable uses should be located away from areas at risk of surface water flooding and sustainable drainage systems should be incorporated to manage surface water flows on site.

Any overland flow paths should be incorporated into the masterplan and preserved where possible, ensuring flows are not diverted to third parties.

Finished floor levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

Sustainable Drainage Systems (SuDS)

A review of British Geology Survey data indicates that the site is underlain by superficial deposits of Langley Silt Member, comprising clay and silt. Due to the impermeability of London Clay, the site may not be suitable for infiltration of surface water runoff.

Where infiltration is demonstrated not to be feasible, the applicant should engage with the Canal and Rivers Trust to investigate feasibility of discharge of clean surface water into the Grand Union Canal as a preference to discharging into the combined sewer system. It should be ensured that discharge rates are reduced to greenfield (or as low as reasonably practicable) to improve the likelihood of the Canals and River Trust granting a permit.

The surface water drainage system for any proposed development should manage surface water onsite for all events up to and including the 1% annual probability event plus climate change and should aim to achieve greenfield runoff rates. Development of the site may also provide opportunities for the site surface water drainage system to reduce offsite surface water flood risk.

The surface water drainage system for any proposed development should manage surface water onsite for all events up to and including the 1% annual probability event plus climate change and should aim to achieve pre-development greenfield runoff rates of either Qbar or the relevant corresponding design storm event with long term storage to ensure surface water runoff volumes as well as rates are not increased. Development of the site may also provide opportunities for the site surface water drainage system to reduce offsite surface water flood risk. The drainage strategy should comply with policy SI13 (Sustainable drainage) from the London Plan, Policies 34 (Green infrastructure) and 35 (Flood risk) from the Westminster City Plan and the Non-Statutory Technical Standards for



SuDS. Any proposed system should aim to remove surface water from the combined sewer network and provide water quality treatment. The implementation of water reuse to capture rainfall at source, as well as the use of green infrastructure (e.g., green roofs, rain garden planters) should be investigated to aid in achieving this aim (this will also provide important biodiversity and amenity benefits).



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