

SITE ASSESSMENT - Osidge Lane Community Halls

Address: Osidge Lane, Southgate, N14 5DU	Area: 0.45 Ha
	Site Reference: 3

Current Use	Proposed Use
Community facilities, associated car park, access road to primary school	Residential with 75% community uses, school access and retained parking

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	94.0	% of Site	<25	100	% of Site
FZ3a	4.9	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	0.4	% of Site	Artificial		
1% AEP	5.2	% of Site	Reservoir	N	At risk?
0.1% AEP	94.2	% of Site	Canal	N	At risk?
Sewer Flooding			Other	N	At risk?
No. Incidents		30			

Flood Defences
The site is not in an area benefitting from flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	13	12	Hrs
Min. Depth	N/A	0	0	m
Max. Depth	N/A	0.3	1.1	m
Max. Velocity	N/A	0.1	1.2	m/s
Max Flood Level	N/A	39.01	39.78	m AOD
Max Ground Level	38.67	38.67	38.67	m AOD
Min Ground Level	40.08	40.08	40.08	m AOD
Flood Hazard	N/A	N/A	Danger for most	N/A
Duration of Flood	N/A	21.5+	22.5+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism

- The site is at risk of flooding from the Pymmes Brook. It is culverted underneath East Walk / Osidge Lane, before running past the eastern boundary of the site.
- Flooding originates from the Pymmes Brook, inundating the site from the north. The flooding extent covers a small segment of the site, inundating the northern and north-western regions of the site.
- The predicted flood risk extent for the climate change scenario is much greater, covering most of the site. A small area in the southern region of the site is not at predicted risk of fluvial flooding under the climate change scenario. maximum flood depths and velocities are both greater under the climate change scenario.
- The predicted fluvial flood extent for the 1% AEP + Climate Change event is 92.3%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress

- The north and north-western regions of the site are flooded in the 1% AEP scenario.
- Safe egress routes from the site should be routed towards the north-east corner of the site, where the risk of flooding is lower on Osidge Lane. A safe egress route could also be routed to the south-west of the site.
- Safe refuge areas should also be provided on site to account for the predicted impact of climate change on flooding at the site.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements

- To mitigate against predicted flooding in the 1% AEP + Climate Change event, development should be restricted to areas of lower flood risk and directed away from the north and north-western regions of the site.
- Basement developments should be limited to less vulnerable / water compatible uses.
- See SFRA - Level 2 Report mitigation requirement number 4.2, 4.3 and 4.4 for further development stipulations.
- See SFRA - Level 2 Report mitigation requirement number 4.6 for Main River stipulations.
- Develop a Flood Emergency and Evacuation Plan for the site.
- Site users should be signed up to EA's Flood Warning Service.

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.15 - 0.30	0.30 - 0.60	> 1.20	m
Max. Velocity	0.50 - 1.00	1.00 - 2.00	> 2.00	m/s
Max. Hazard	0.50 - 0.75	0.75 - 1.25	> 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism

- Surface water flows from the west along Osidge Lane and enters the site from the north / north-west. Water ponds along Osidge Lane, just north of the site.
- Climate Change is predicted to increase the flood extent, depth, maximum velocity, and flood hazard rating. This site lies within Barnet's CDA 029.

Site Access / Egress

- Safe access and egress routes should be directed towards the south-west or north-west corner of the site, where the risk of flooding is lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements

- Developments should be restricted to areas of lower flower risk and directed away from the north and north-western regions of the site.
- See SFRA - Level 2 Report mitigation requirement number 4.2, 4.3 and 4.4 for further development stipulations.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage

- A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS.
- The site is underlain by Taplow Gravel Member superficial deposits and London Clay bedrock geology - ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Osidge Lane Community Halls

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. The site falls within a postcode area where there are 30 reported flood incidents from sewer flooding. 	<ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. The site is in close proximity to the Pymmes Brook, which is underlain by a Taplow Gravel Member (sand and gravel) superficial deposit geology. 	<p>There is no risk from artificial flooding.</p>
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Thames Water must be consulted to confirm if the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. The development must implement SuDS to reduce the runoff to sewer to greenfield rates or as close as possible to greenfield rates. 	<p>No mitigation measures required.</p>	<p>No mitigation measures required.</p>

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development land use is changing from the 'Less Vulnerable' to 'More Vulnerable' classification. The site is proposed to be used for residential purposes. The site is currently a brownfield site with hardstanding areas. However, there are areas of green space on the site. Development must mitigate any increase in impermeable area to the site with flood plain compensation and runoff storage to prevent any increase in flood risk. An increase in impermeable area coverage on site will increase surface water runoff and flood risk if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Directing development away from the north and north-western regions of the site. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). Basements developments, that are in the less vulnerable or water compatible use categories, may be appropriate onsite, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP year fluvial event. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - the site is within 8m of the Pymmes Brook. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
<ul style="list-style-type: none"> Development should be directed away from the north and north-western regions of the site. Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. 	<p>A safe egress route from the site should be directed towards the north-east corner of the site, where the risk of flooding is lower on Osidge Lane.</p>
Surface Water	
<p>Developments within the 0.1% AEP surface water extent require finished floor levels of at least 0.3m above the predicted flood level at that point.</p>	<p>Introduce SuDS to reduce surface water runoff to greenfield rates.</p>
Sewer	
<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p>	<p>Development must reduce the runoff to sewer to greenfield rates.</p>
Groundwater	
<p>No mitigation measures required.</p>	
Artificial	
<p>No mitigation measures required.</p>	

Figure 1 - Fluvial Flood Depth Map

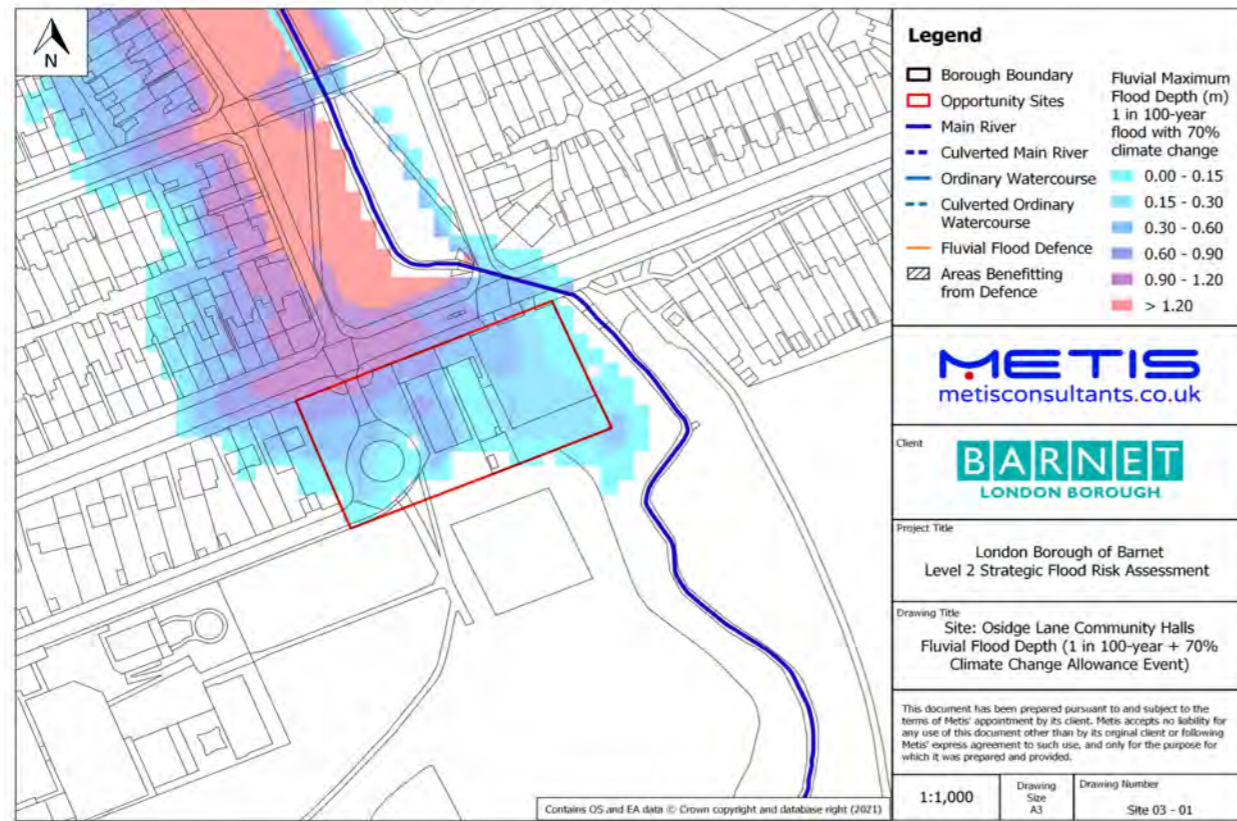


Figure 2 - Fluvial Flood Hazard Map

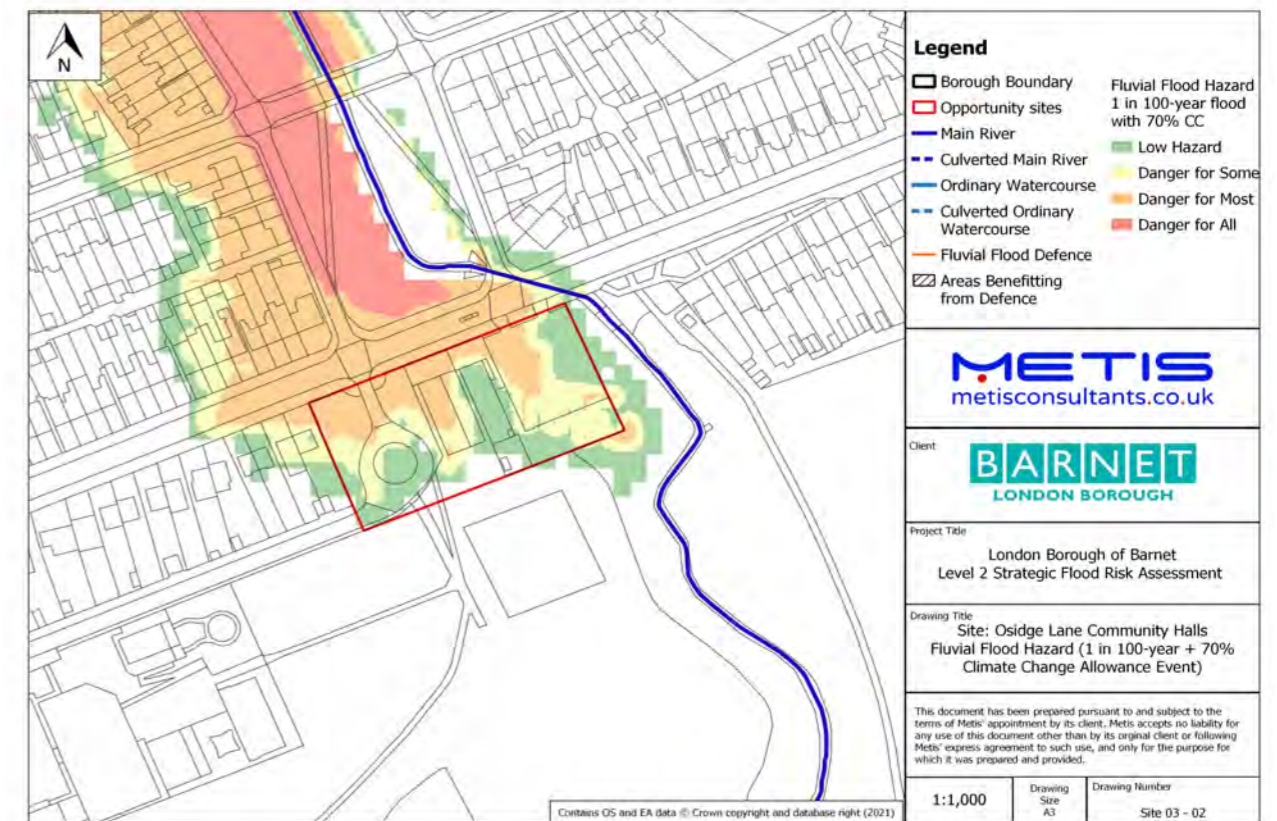


Figure 3 - RoFSW Flood Depth Map

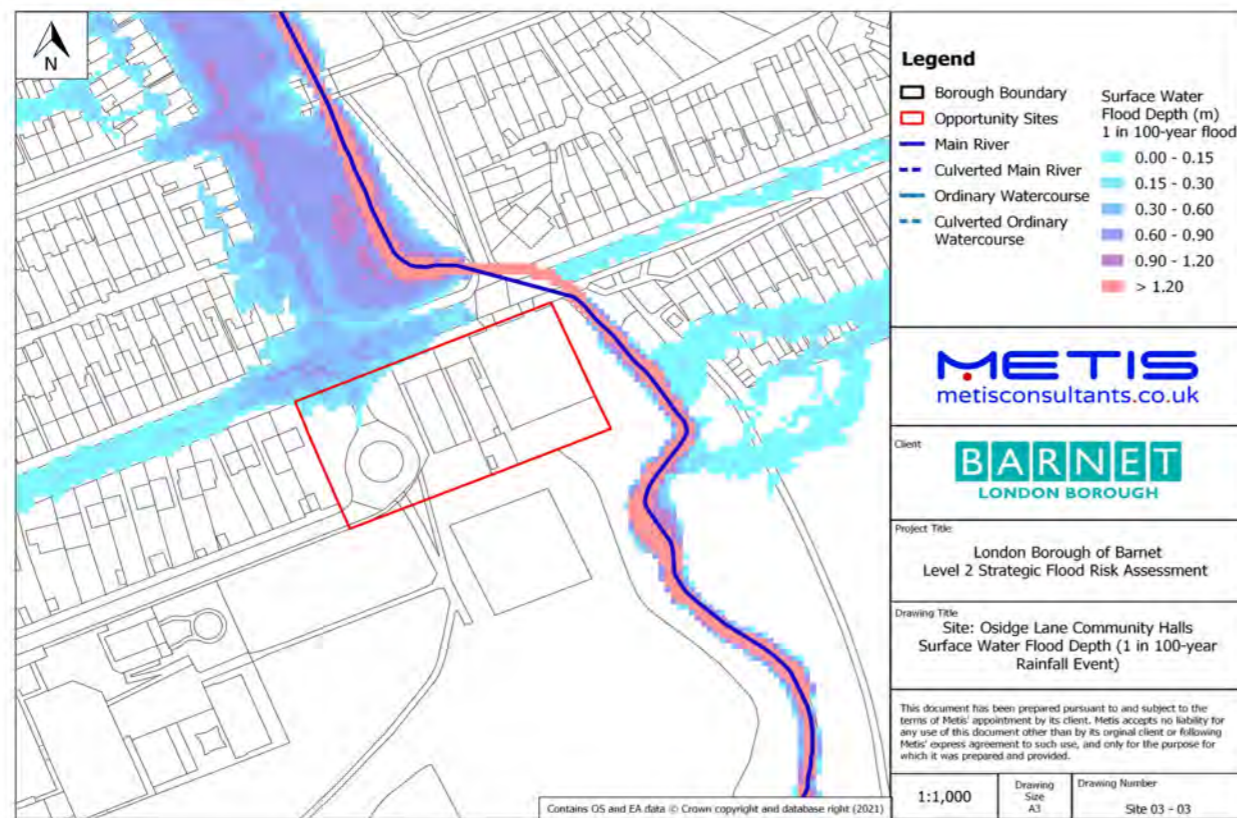


Figure 4 - RoFSW Flood Hazard Map

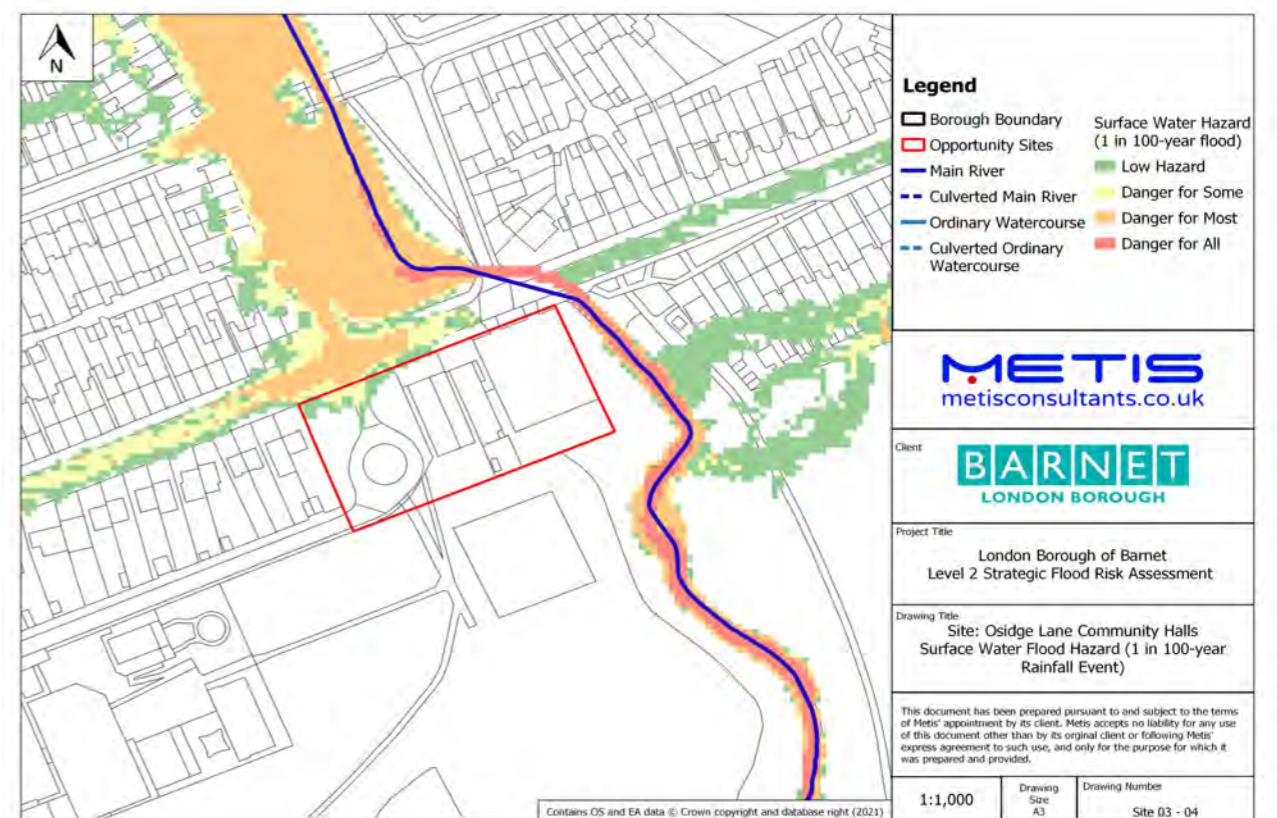


Figure 5 - Thames Water Sewer Flood Map

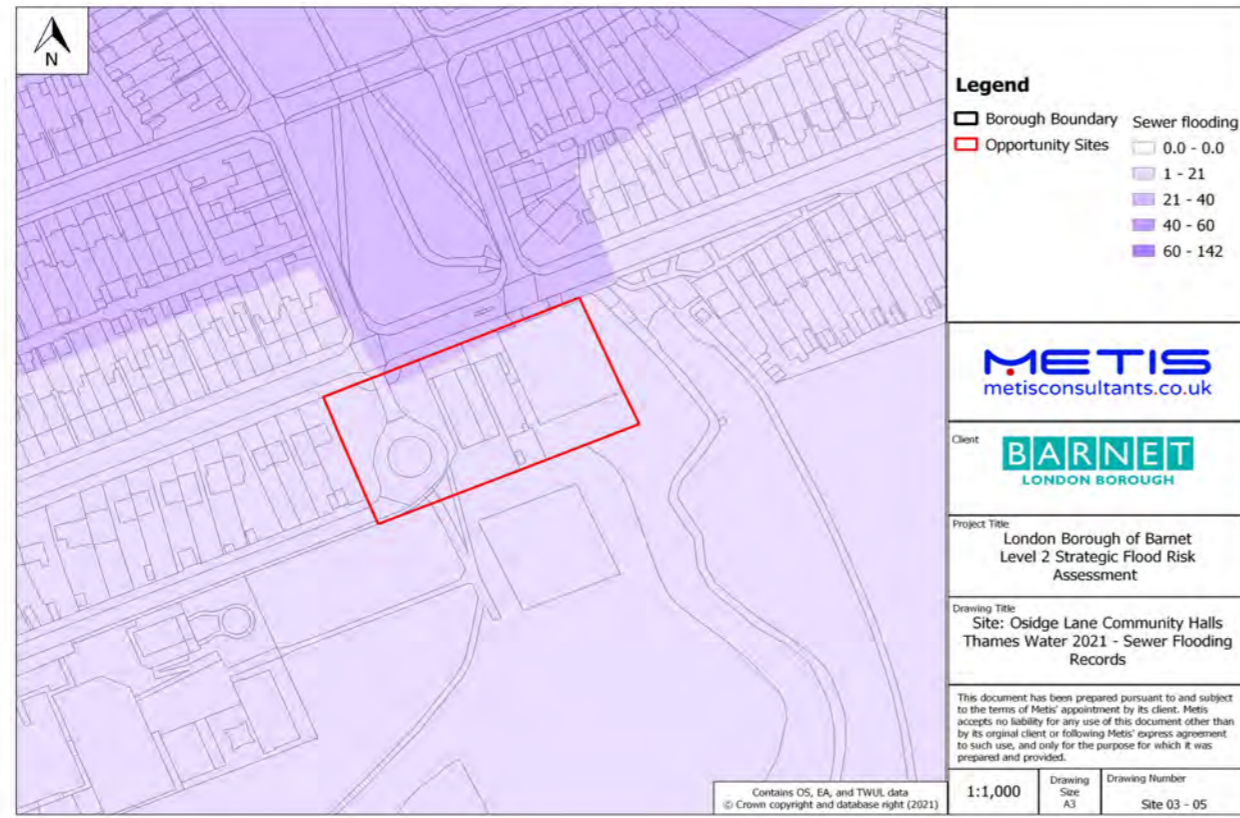


Figure 6 - Areas Susceptible to Groundwater Flooding Map

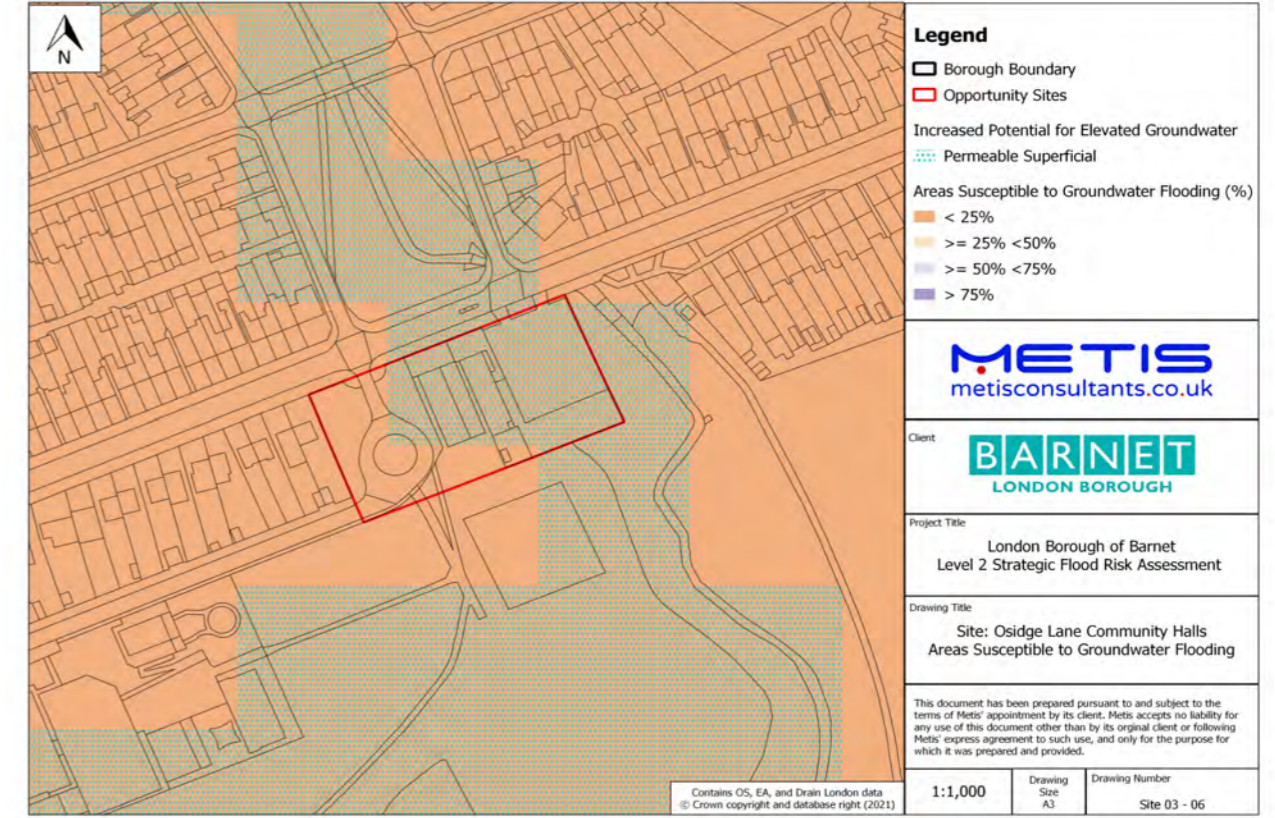
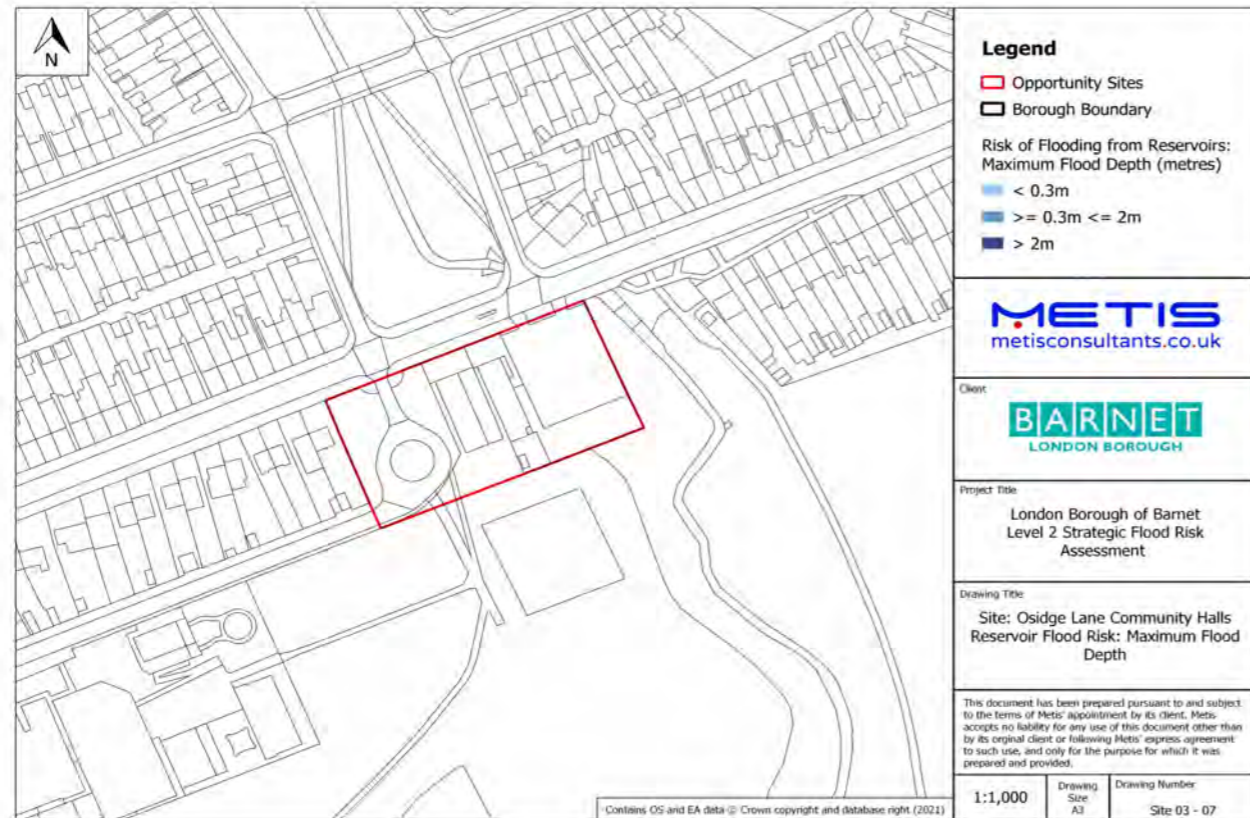


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Edgware Hospital

Address: Edgware Hospital, Edgware Road, Burnt Oak, HA8 0AD	Area: 6.40 Ha
	Site Reference: 5

Current Use	Proposed Use
Hospital	Hospital continuing in use, with associated car parking; with 25% of site residential

Current Vulnerability Classification	Proposed Vulnerability Classification
More Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	70.3	% of Site	<25	97	% of Site
FZ3a	47.3	% of Site	25-50	0	% of Site
FZ3b	18.8	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	25.7	% of Site	Artificial		
1% AEP	50.5	% of Site	Reservoir	Y	At risk?
0.1% AEP	72.2	% of Site	Canal	N	At risk?
Sewer Flooding			Other	Y	At risk?
No. Incidents	70				

Flood Defences
<ul style="list-style-type: none"> There are no flood defences located either on or within the immediate vicinity of the site. A small area in the north of the site benefits from flood defences, located upstream in Edgwarebury Park for the Silk Stream.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	1	0.75	0.5	Hrs
Min. Depth	0	0	0	m
Max. Depth	3.5	4.0	4.2	m
Max. Velocity	1.7	1.8	1.8	m/s
Max Flood Level	48.34	48.61	48.80	m AOD
Max Ground Level	44.98	44.98	44.98	m AOD
Min Ground Level	55.72	55.72	55.72	m AOD
Flood Hazard	Danger to all	Danger to all	Danger to all	N/A
Duration of Flood	17.75+	18+	18.25+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Silk Stream and the Dean's Brook. They flow towards the site from the north, with the Silk Stream and Dean's Brook flowing from the north-west and north-east respectively. The two main rivers converge in the north of the site, flowing southward as the Silk Stream. Flooding is predicted to originate from the open channel sections of the Silk Stream and Dean's Brook. This is predicted to flood the eastern half of the site. Climate Change is predicted to place the site at greater risk of fluvial flooding, increasing the extent and maximum flood depth. An area in the west of the site is not at predicted risk of fluvial flooding under the climate change scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 59.1%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> The northern region and eastern half of the site is flooded in the 1% AEP scenario. Safe access and egress routes from the site should be routed towards the west on Burnt Oak Broadway and/or the south-west on Fortune Avenue. These areas are not at predicted risk of flooding in the 1% AEP + Climate Change scenario. Safe refuge areas should also be provided on site to account for the predicted impact of climate change on flooding at the site, particularly for developments in the eastern half of the site.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP + Climate Change event, 'More Vulnerable' developments should be restricted to the western half of the site. Proposed developments on the site should be restricted to locations outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream or Dean's Brook. Developments within 20m of either Main River require consultation with the EA. Basements are not permitted in Flood Zone 3b. Outside of the Flood Zone 3b extent, basement developments should be limited to less vulnerable / water compatible uses. See SFRA - Level 2 Report mitigation requirement number 4.2, 4.3, 4.4, and 4.5 for further development stipulations. See SFRA - Level 2 Report mitigation requirement number 4.6 for Main River stipulations. Develop a Flood Emergency and Evacuation Plan for the site. Site users should be signed up to EA's Flood Warning Service.

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	>1.20	>1.20	>1.20	m
Max. Velocity	>2.00	>2.00	>2.00	m/s
Max. Hazard	>2.00	>2.00	>2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism

- The Silk Stream and Dean's Brook are topographical low points and flow through the site. Surface water flows from the north, west and south towards the rivers.
- Climate Change is predicted to increase the extent and maximum flood depth. The maximum velocity and maximum flood hazard rating is predicted to remain the same.

Site Access / Egress
Safe access and egress routes from the site should be routed towards the west on Burnt Oak Broadway and/or the south-west on Fortune Avenue. This area of the site is not at predicted risk of surface water flooding.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 0.1% AEP surface water event, more vulnerable developments should be directed towards the western half of the site where possible. See SFRA - Level 2 Report mitigation requirement number 4.2, 4.3 and 4.4 for further development requirements.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by Alluvium superficial deposits and London Clay bedrock geology - ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Edgware Hospital

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. A majority of the site falls within the HA8 0 postcode district, where there have been 2 reported flood incidents from sewer flooding. Part of the site also falls within the HA8 9 postcode district, where there have been 68 reported flood incidents from sewer flooding. 	<ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. This is associated with the Silk Stream and Dean's Brook, two main rivers flow through and confluence within the site boundary. These main rivers are underlain by a Alluvium (clay, silt, sand, and gravel) superficial deposit geology. The site overlays the Thames Group aquifer, "rocks with essentially no groundwater". 	<p>The site is at risk of artificial flooding. This risk of flooding is primarily from the Lake (Fish Pond) in Lake Grove Park. The Stoney Wood Lake and the Edgwarebury Brook by Edgwarebury Park also place the site at risk of artificial flooding.</p> <ul style="list-style-type: none"> The artificial flooding extent predicts the north and eastern half of the site are at risk. The site is predicted to flood between 0.3-2m. Reservoir failure flood speeds are predicted to be between 0.5 and 2m/s maximum, and below 0.5 m/s for the majority of the site.
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<p>Consultation is required with Thames Water to ensure sufficient capacity exists in the surface water sewer network.</p>	<p>No mitigation measures required.</p>	<ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development vulnerability is not changing. The site is currently a brownfield site with hardstanding areas. However, there are landscaped and areas of green space throughout the site. Development must mitigate any increase in impermeable area to the site with flood plain compensation and runoff storage to prevent any increase in flood risk. An increase in impermeable area coverage and change in topography on site will increase surface water runoff and flood risk if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Directing development towards the western half of the site where possible. Proposed developments on the site should be restricted to locations outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream or Dean's Brook. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). Basements are not permitted in Flood Zone 3b. Basements developments outside of the Flood Zone 3b extent, that are less vulnerable or water compatible uses, may be appropriate on the west of the site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP event. Non-dwelling basement developments within the 1% AEP fluvial and surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - the Silk Stream and Dean's Brook (both Main Rivers) flow through the site. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
<ul style="list-style-type: none"> 'More Vulnerable' development should be restricted to the western half of the site. Proposed developments on the site should be restricted to locations outside of the 8m Main River buffer zone. 	<ul style="list-style-type: none"> Tall buildings should not be located within the 20m of the Silk Stream or Dean's Brook. Safe egress routes from the site should be directed towards the west and south-west areas of the site.
Surface Water	
<p>Developments within the 0.1% AEP surface water extent require finished floor levels of at least 0.3m above the predicted flood level at that point.</p>	<p>Introduce SuDS to reduce surface water runoff to greenfield rates.</p>
Sewer	
<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p>	<p>Development must reduce the runoff to sewer to greenfield rates.</p>
Groundwater	
<p>No mitigation measures required.</p>	
Artificial	
<p>Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.</p>	

Figure 1 - Fluvial Flood Depth Map

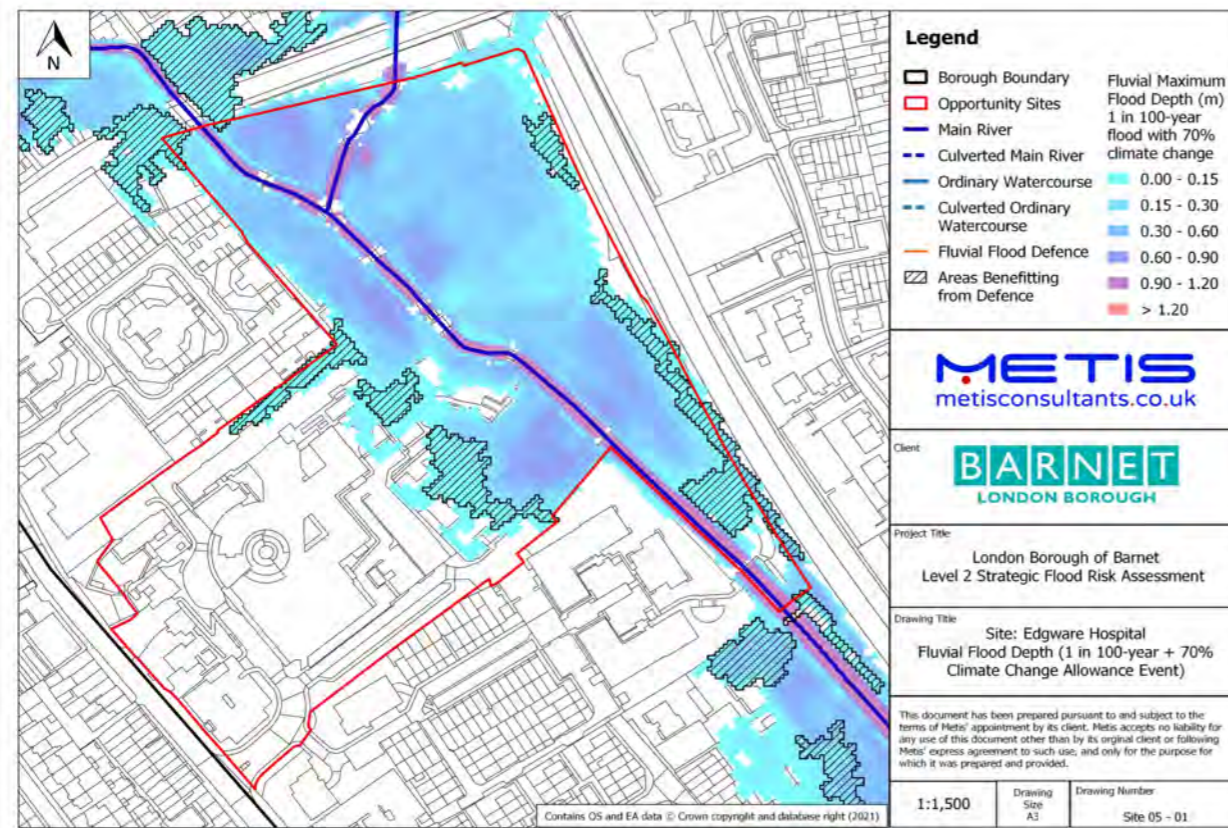


Figure 2 - Fluvial Flood Hazard Map

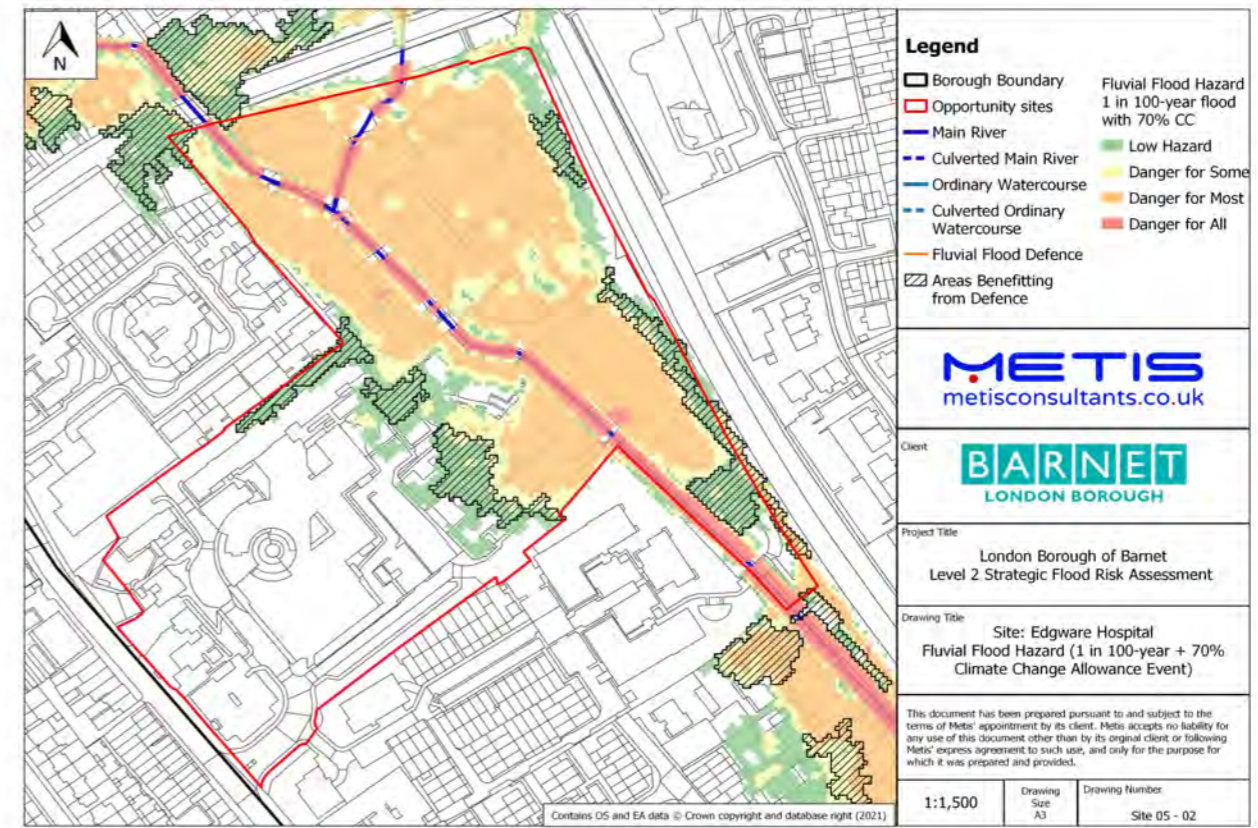


Figure 3 - RoFSW Flood Depth Map

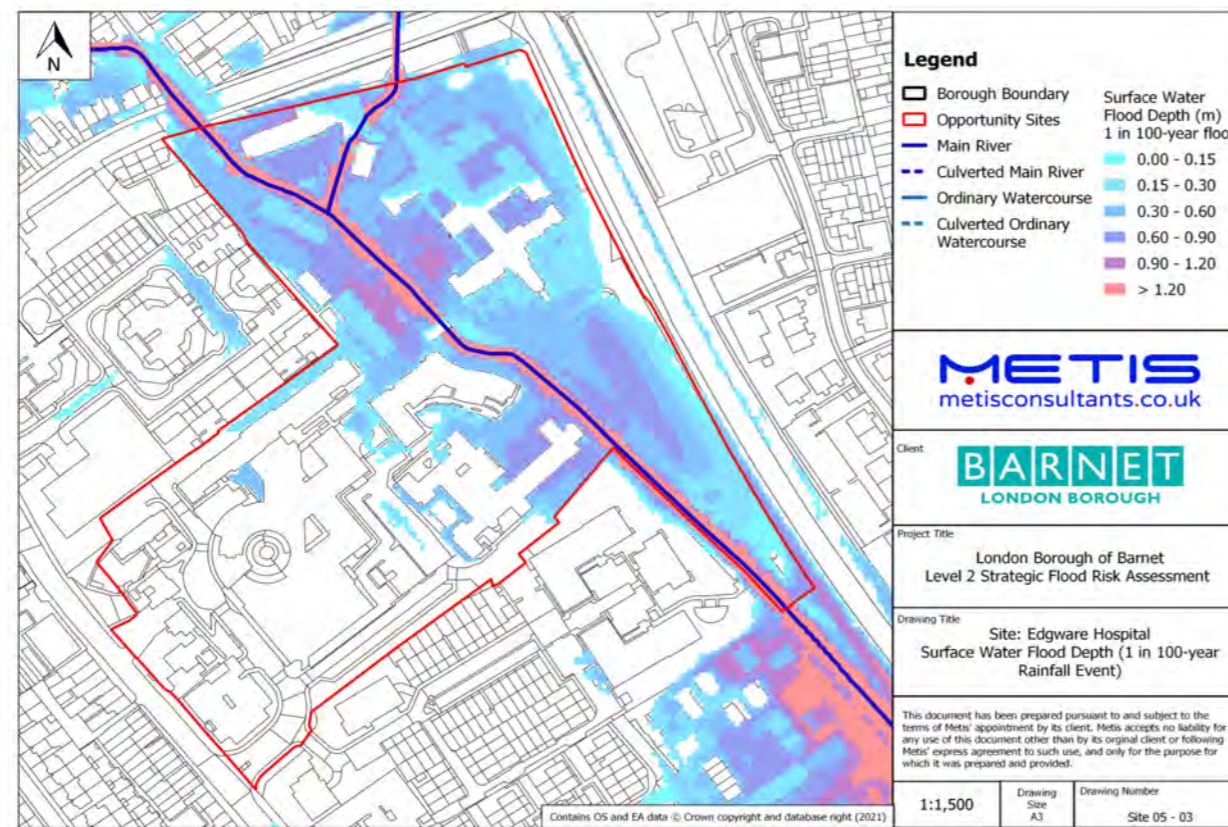


Figure 4 - RoFSW Flood Hazard Map

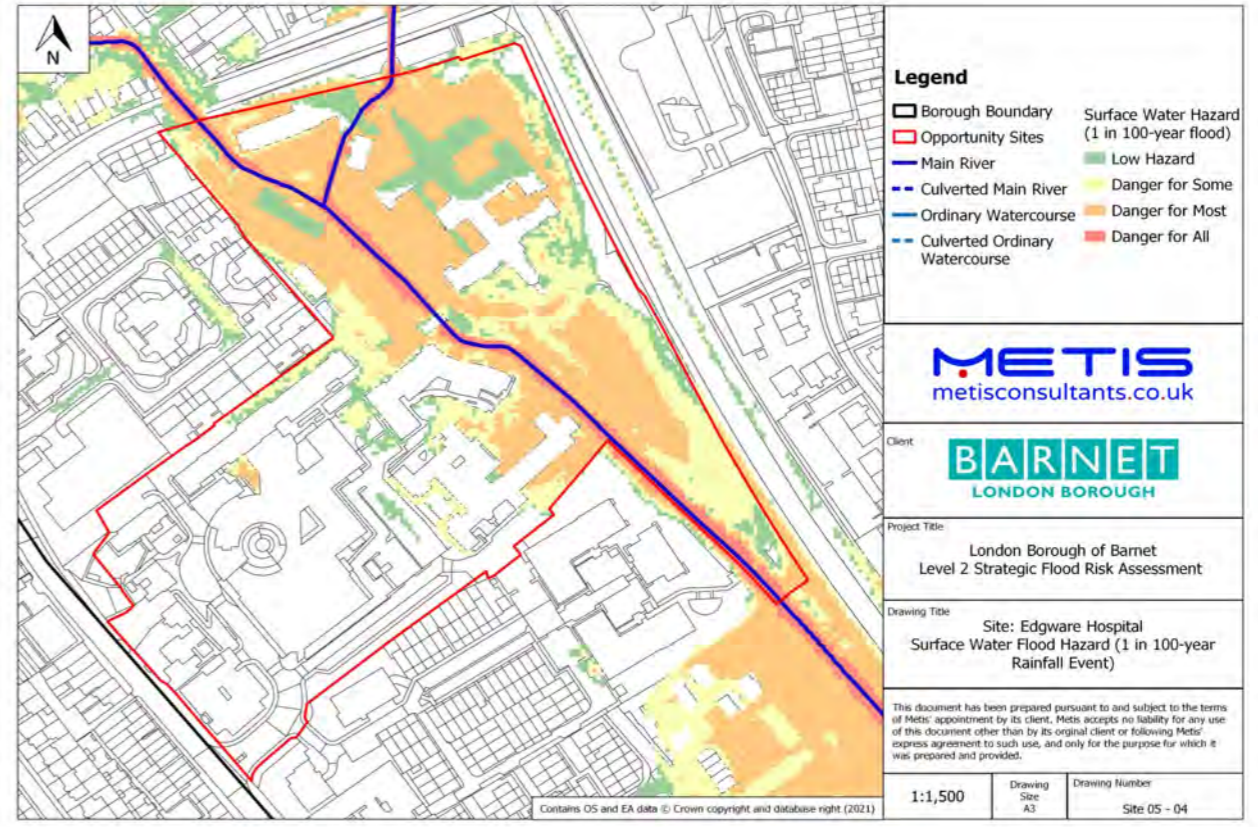


Figure 5 - Thames Water Sewer Flood Map

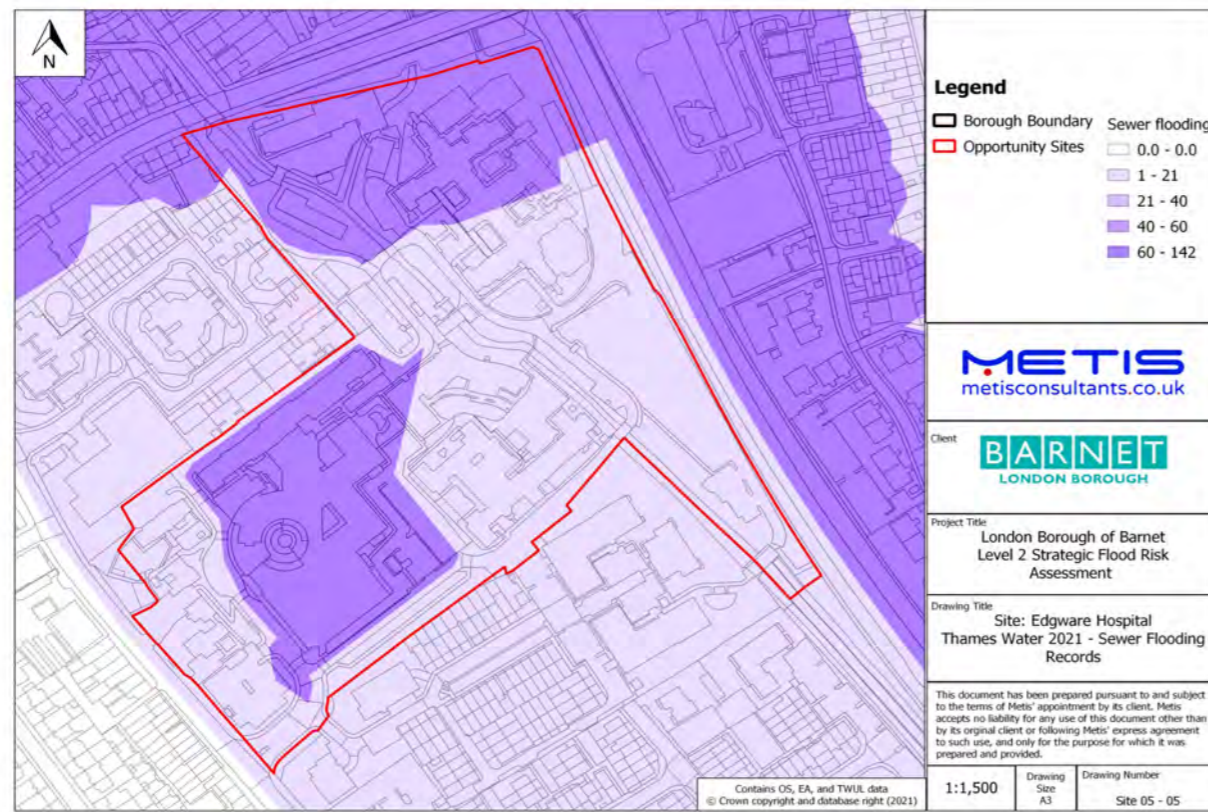


Figure 6 - Areas Susceptible to Groundwater Flooding Map

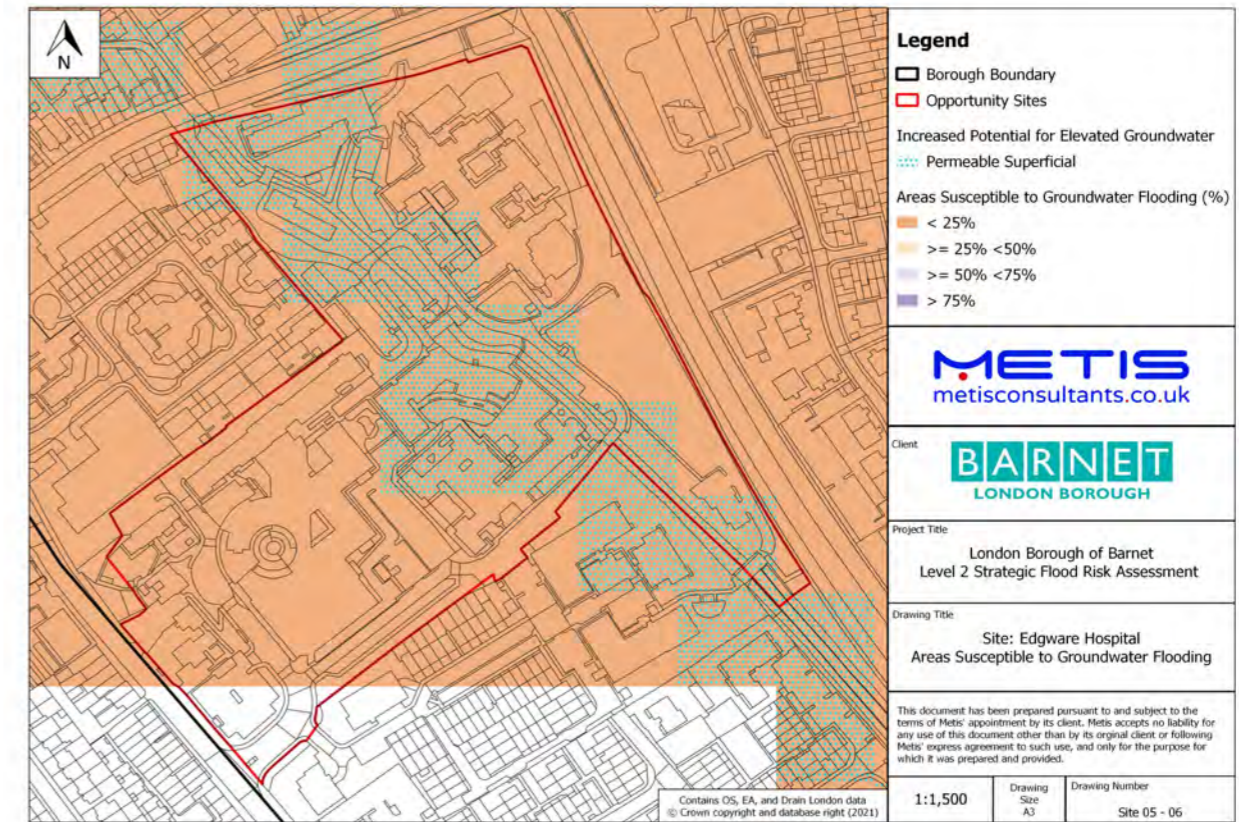
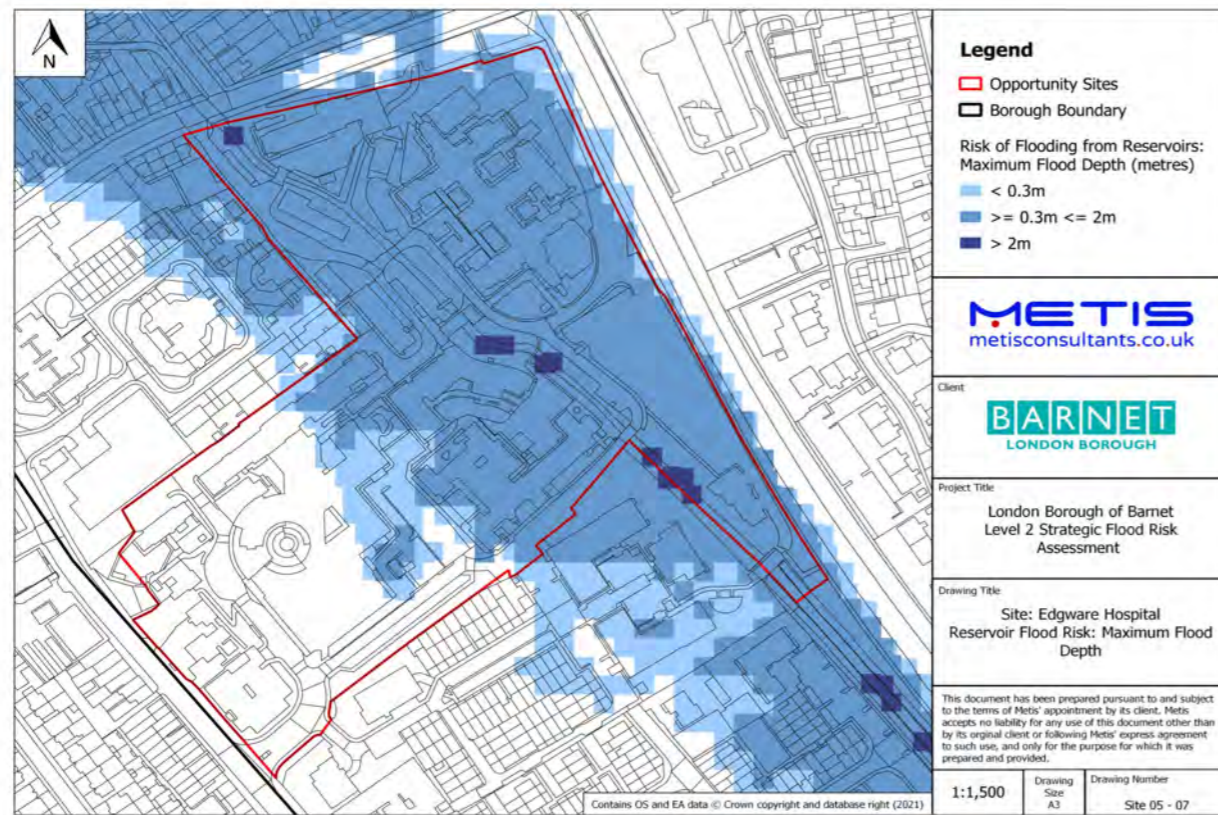


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Watling Avenue Carpark and Market

Address: Barnfield Road, Burnt Oak, HA8 0AY	Area: 1.47 Ha
	Site Reference: 6

Current Use	Proposed Use
Car park, station building, shopping parade and market	Residential with 40% mixed uses (station building, retail and car parking)

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	98.6	% of Site	<25	100	% of Site
FZ3a	75.6	% of Site	25-50	0	% of Site
FZ3b	37.8	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	62.6	% of Site	Artificial		
1% AEP	95.7	% of Site	Reservoir	Y	At risk?
0.1% AEP	97.4	% of Site	Canal	N	At risk?
Sewer Flooding			Other	Y	At risk?
No. Incidents		2			

Flood Defences
<ul style="list-style-type: none"> There are no flood defences located either on or within the immediate vicinity of the site. The station and two small areas by the border with the railway line benefit from flood defences. The defences are located upstream in Edgwarebury Park for the Silk Stream.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	1.25	1	0.75	Hrs
Min. Depth	0	0	0	m
Max. Depth	3.1	3.5	4.3	m
Max. Velocity	1.5	1.6	1.1	m/s
Max Flood Level	46.29	46.65	47.35	m AOD
Max Ground Level	51.10	51.10	51.10	m AOD
Min Ground Level	44.83	44.83	44.83	m AOD
Flood Hazard	Danger to all	Danger to all	Danger to all	N/A
Duration of Flood	17.5+	17.75+	18+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Silk Stream. The river runs along the western and southern boundaries of the site, briefly crossing the site in the south-east corner. Ground levels are lower on the northern bank of the river (site-side) than the southern bank. The site is predicted to flood as a result of the Silk Stream bursting its banks, inundating the site from the south/west. The predicted flood risk extent for the climate change scenario is greater, leaving the entire site, bar a small region in the north-east, at risk of flooding. The predicted maximum flood depth is greater under the climate change scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 95.6%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> All areas except for the northeast region and the south-easternmost corner of the site are flooded in the 1% AEP scenario. Safe egress routes should be routed towards the south on Barnfield Road. Evacuation needs to occur before the site is inundated from the Silk Stream. An alternate route by the railway boundary to the east of site should be sought if possible. Safe refuge areas should be provided on site.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> Development should not take place in Flood Zone 3b extent unless it is 'Essential' or 'Water Compatible' Infrastructure. Undeveloped areas within Flood Zone 3b should be protected as the Functional Floodplain. In addition, no development should be permitted in the extent if it results in intensification of use. Developments should be restricted to the east and north-eastern regions of the site. The ground level development outside of the Flood Zone 3b extent should be restricted to 'Less Vulnerable' developments. Developments should not take place within the 8m buffer zone of the Silk Stream. See SFRA - Level 2 Report section numbers 4.1, 4.2, 4.3 and 4.4 for further requirements. See SFRA - Level 2 Report section number 4.6 for Main River requirements. Develop a Flood Emergency and Evacuation Plan for the site. Site users should be signed up to EA's Flood Warning Service.

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	> 1.20	> 1.20	> 1.20	m
Max. Velocity	1.25 - 2.00	> 2.00	> 2.00	m/s
Max. Hazard	1.25 - 2.00	> 2.00	> 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Most of the site is topographically lower than the northern bank of the Silk Stream. Surface water that flows on to the site pools, leaving most of the site at risk of surface water flooding in a 1% AEP event. Climate Change is predicted to slightly increase the risk of surface water flooding, increasing the extent and maximum flood depth. The maximum velocity and maximum flood hazard rating is not predicted to increase.

Site Access / Egress
<ul style="list-style-type: none"> The options for a safe egress route is limited as most of the site and surrounding area is predicted to flood. Access / egress should be routed towards the south on Barnfield Road. Evacuation needs to occur before the route and site is inundated. Safe refuge areas should be provided on site. Water surrounds the site that borders the Silk Stream in the 0.1% AEP RoFSW event. For these events, emergency evacuation plans must be put in place as per the PPG (Flood Risk and Coastal Change, paragraph 039).

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> Most of the site is predicted to flood in the 1% AEP event. See SFRA - Level 2 Report section numbers 4.2, 4.3 and 4.4 for further development requirements.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by Alluvium superficial deposits and London Clay bedrock geology - ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Watling Avenue Carpark and Market

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. The site falls within the HA8 0 postcode area, where there are 2 reported flood incidents from sewer flooding. 	<ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. This is associated with the Silk Stream, which borders the site to the west and south. The river is underlain by a Alluvium (clay, silt, sand, and gravel) superficial deposit geology. 	<p>The site is at risk of artificial flooding. This risk of flooding is primarily from the Lake (Fish Pond) in Lake Grove Park. The Stoney Wood Lake near the Mill Hill golf course and the Edgwarebury Brook by Edgwarebury Park also places the site at risk of artificial flooding.</p> <ul style="list-style-type: none"> The artificial flooding extent is predicted to leave most of the site at risk of flooding. The site is predicted to flood between 0.3-2m. Reservoir failure flood speeds are predicted to be between 0.5 and 2m/s.
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Thames Water must be consulted to confirm if the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. The development must implement SuDS to reduce the runoff to sewer to greenfield rates or as close as possible to greenfield rates. 	No mitigation measures required.	<ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. The number of 'More Vulnerable' use developments should be limited. They should be located outside of the Flood Zones 3b extent and must have their floor levels raised 0.3m above the predicted flood level of a fluvial Flood Zone 3a + CC and the 1 in 1000 year (0.1% AEP) surface water event (whichever is higher). Alternatively they should be restricted to the upper floors of the development blocks. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development vulnerability is changing from 'Less Vulnerable' to 'More Vulnerable'. However, the predicted extent of fluvial and surface water flooding would place 'More Vulnerable' developments at greater risk. Therefore ground level development outside the Flood Zone 3b extent of the site should be restricted to 'Less Vulnerable' infrastructure and directed towards the eastern and north-eastern extent of the site. The site is currently a brownfield site with hardstanding areas. However, there is a large area of green space in the north of the half of the site. Development must mitigate any increase in impermeable area to the site with flood plain compensation and runoff storage to prevent any increase in flood risk. An increase in impermeable area coverage and change in topography on site will increase flood risk and flood depths if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Proposed developments on the site should be located outside of the 8m Main River buffer zone. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). Basements are not permitted within the FZ3b extent. Basements developments outside of the Flood Zone 3b extent, that are less vulnerable or water compatible uses, may be appropriate but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP event. Non-dwelling basement developments within the 1% AEP fluvial and surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - the Silk Stream borders the site. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
<ul style="list-style-type: none"> Developments should be restricted to the east and north-eastern regions of the site. The ground level development outside of the Flood Zone 3b extent is restricted to 'Less Vulnerable' developments. Developments restricted within the 8m Main River buffer zone. 	<ul style="list-style-type: none"> Undeveloped areas within Flood Zone 3b should be protected as the Functional Floodplain. Safe egress routes from the site should be directed towards the west and south-west areas of the site.
Surface Water	
Developments within the surface water flood extents within the 0.1% AEP flood extent requires finished floor levels of at least 0.3m above the predicted flood level at that point.	Introduce SuDS to reduce surface water runoff to greenfield rates.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.	

Figure 1 - Fluvial Flood Depth Map

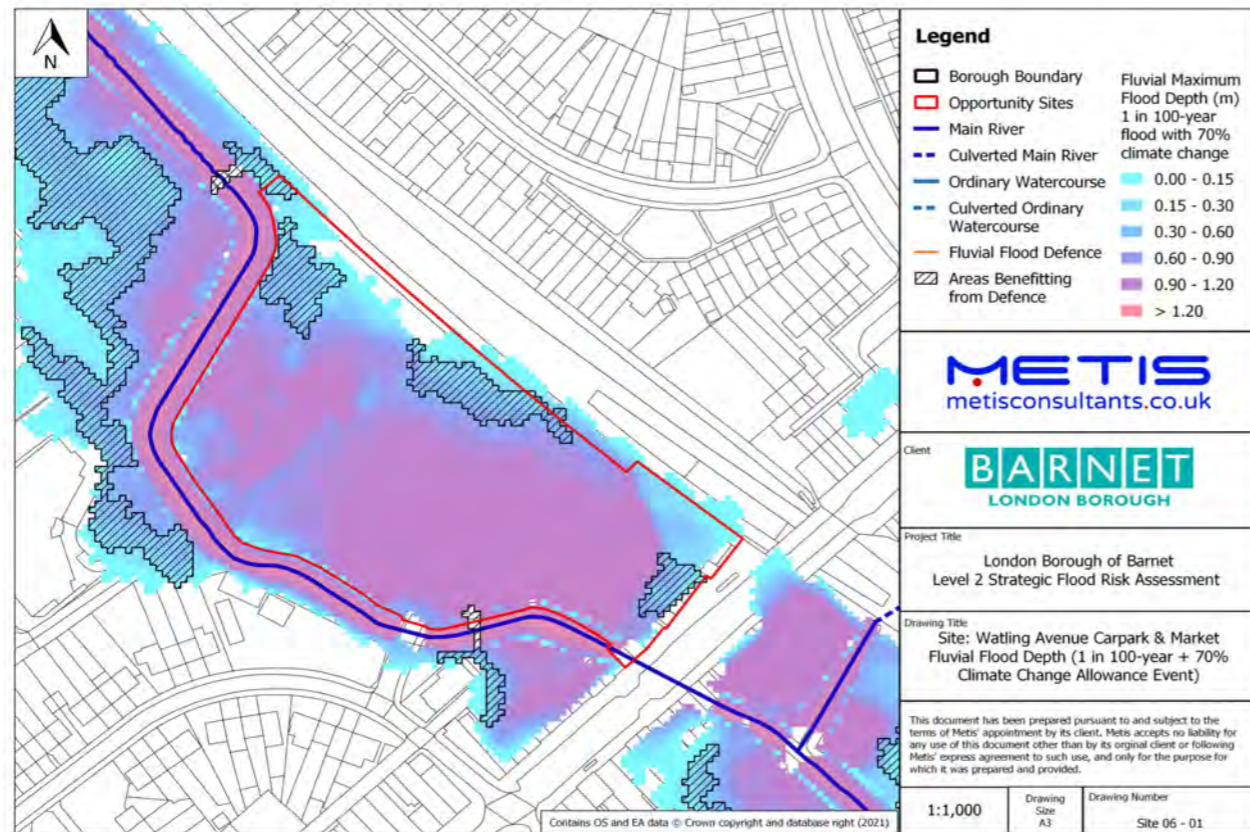


Figure 2 - Fluvial Flood Hazard Map

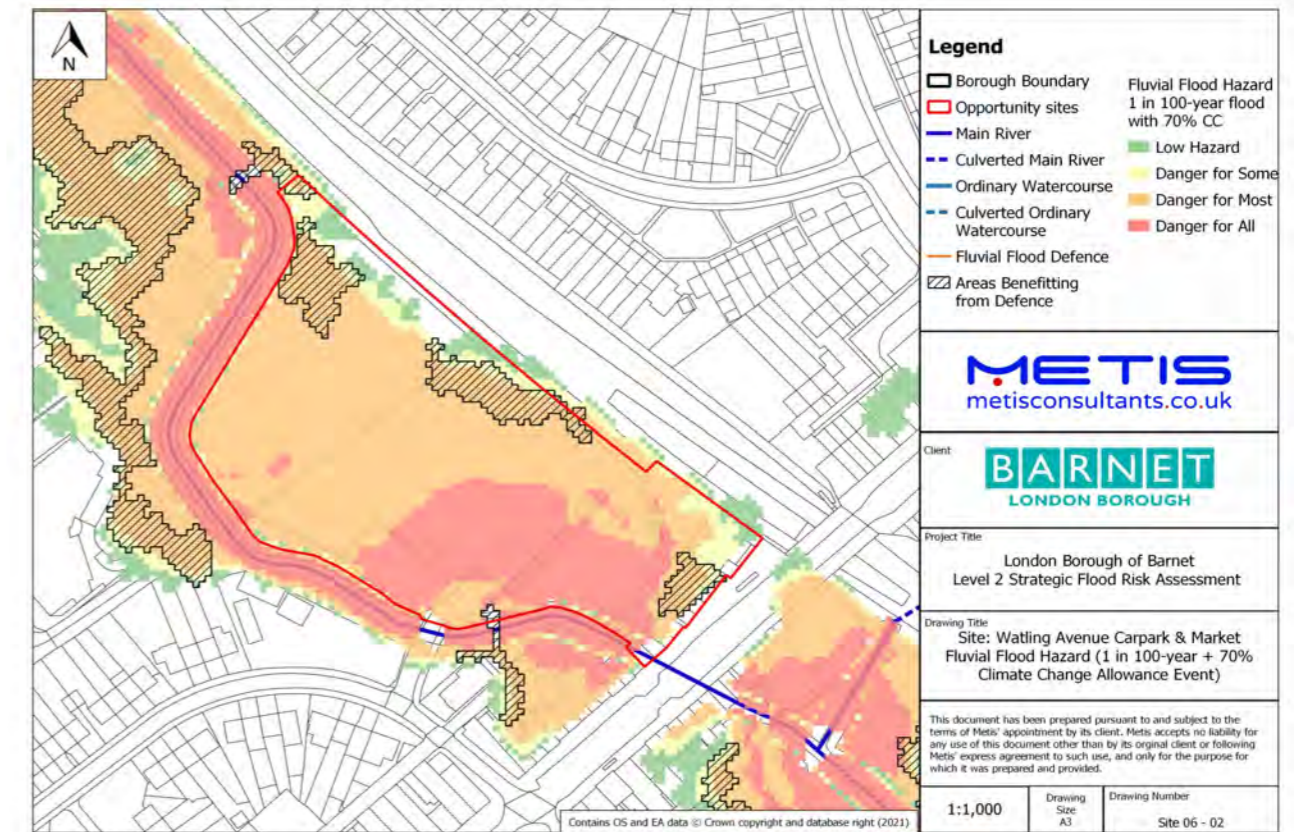


Figure 3 - RoFSW Flood Depth Map

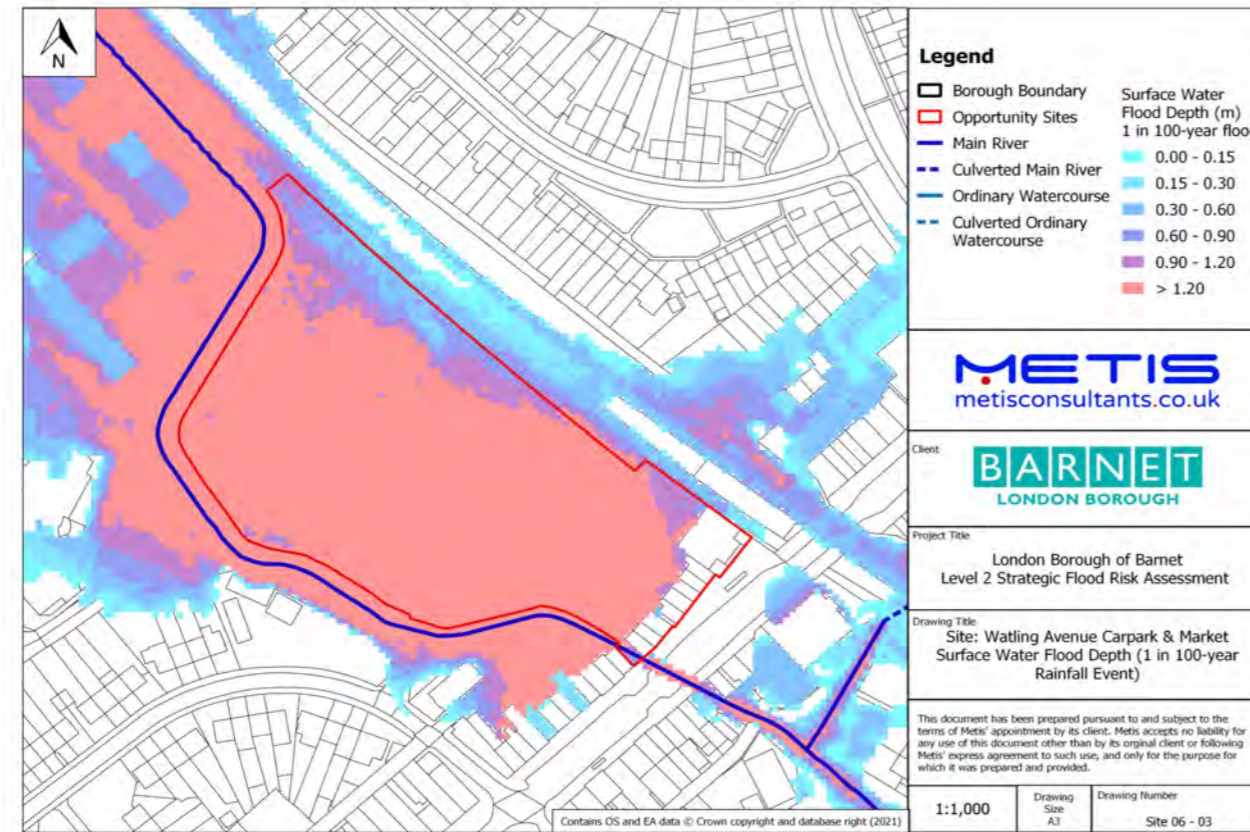


Figure 4 - RoFSW Flood Hazard Map

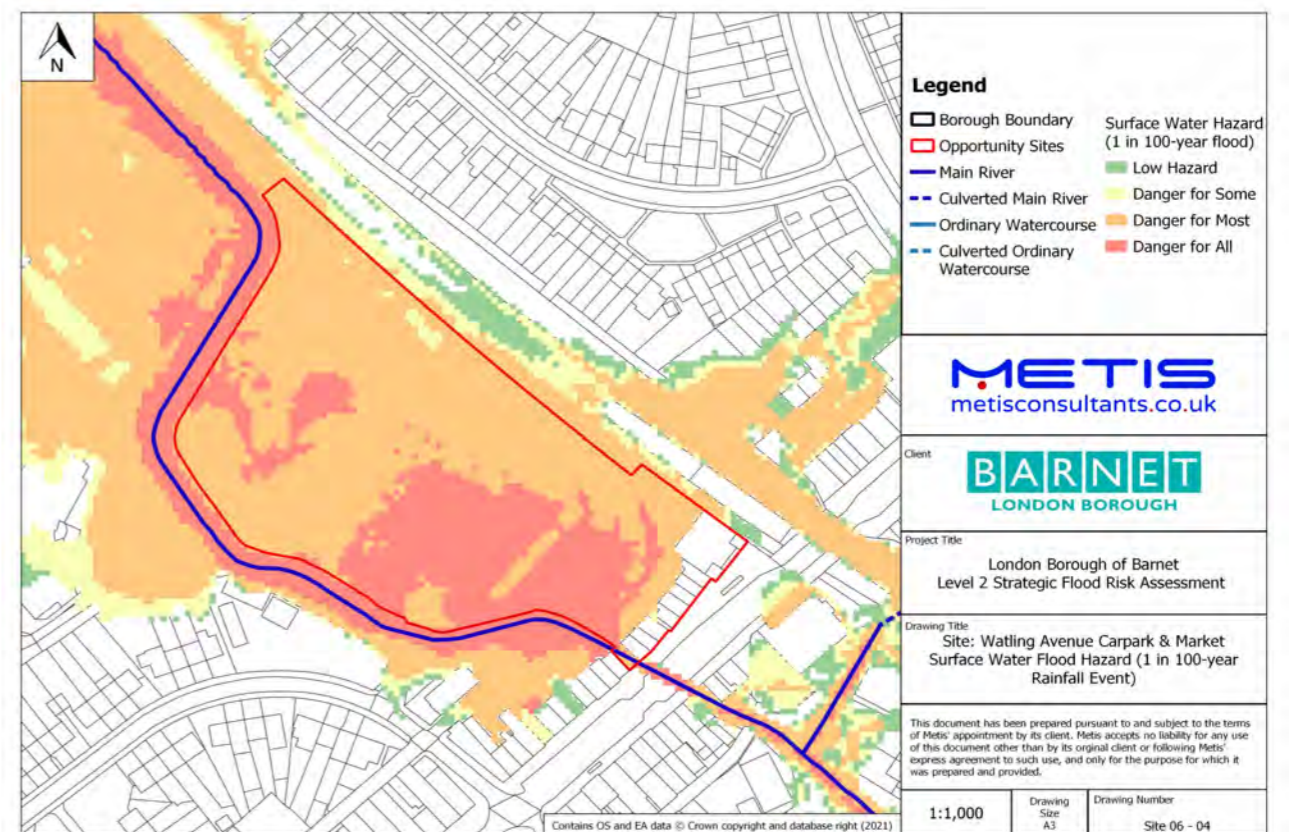


Figure 5 - Thames Water Sewer Flood Map

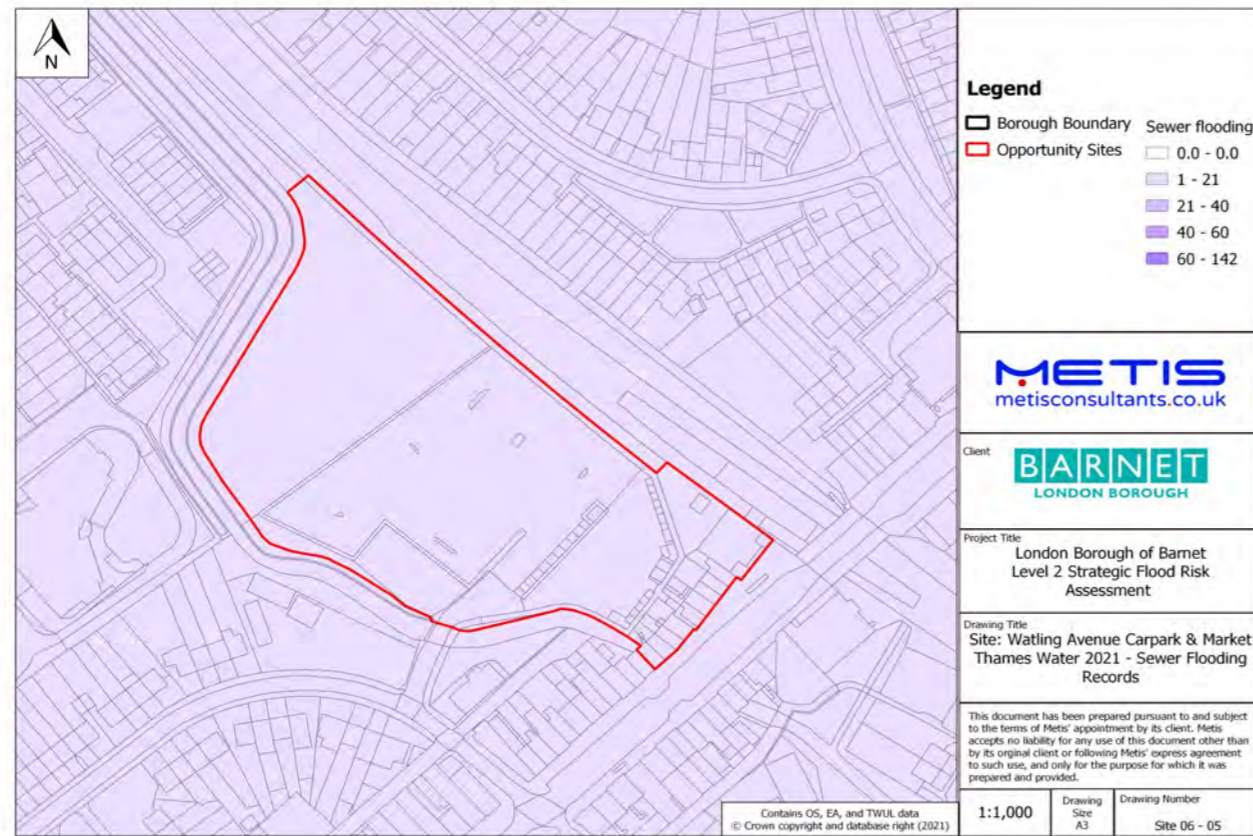


Figure 6 - Areas Susceptible to Groundwater Flooding Map

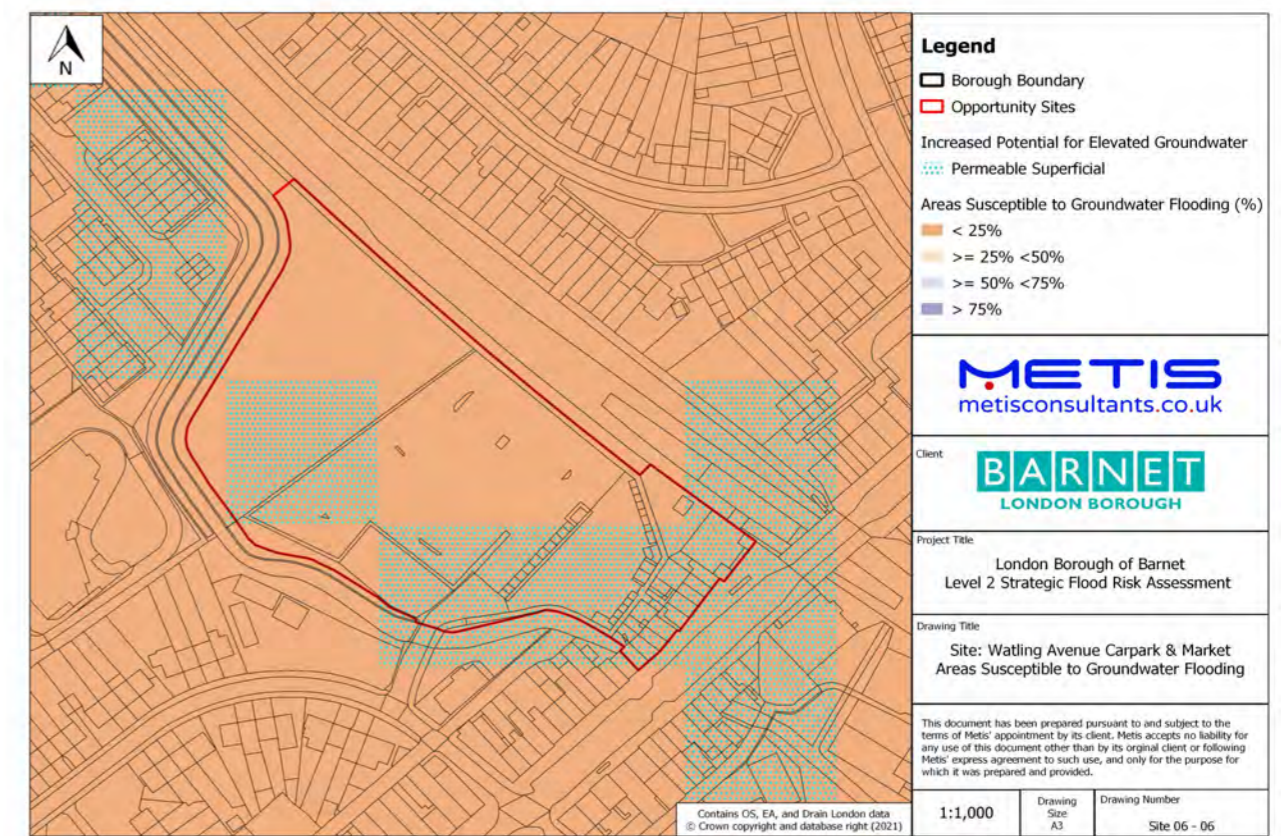
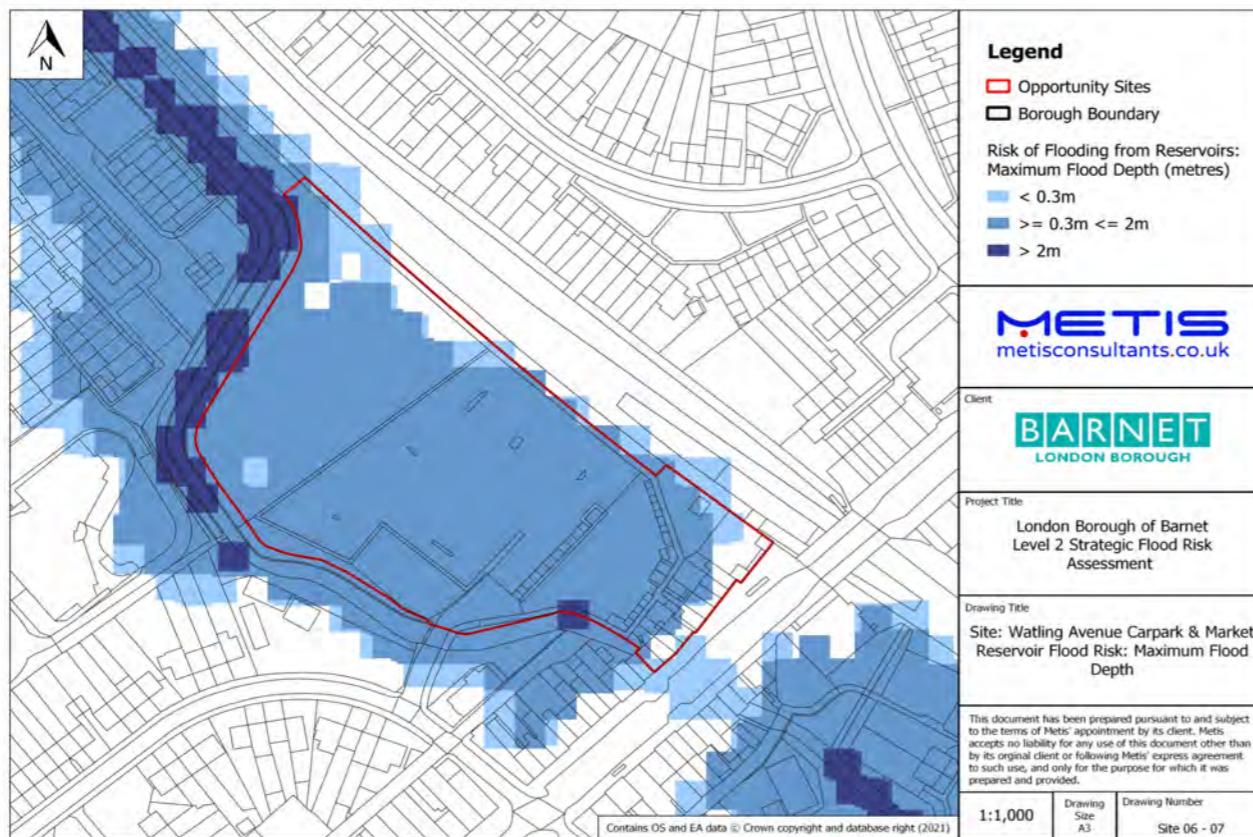


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Beacon Bingo

Address: 200 Cricklewood Broadway, Cricklewood, NW2 3DU	Area: 0.47 Ha
	Site Reference: 7

Current Use	Proposed Use
Bingo hall	Residential with 30% leisure use

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	No data	% of Site
FZ3a	0	% of Site	25-50	No data	% of Site
FZ3b	0	% of Site	50-75	No data	% of Site
Surface Water			>75	No data	% of Site
3.33%*	1.3	% of Site	Artificial		
1% AEP	4.8	% of Site	Reservoir	No	At risk?
0.1% AEP	24.2	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		0			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.60 - 0.90	0.60 - 0.90	m
Max. Velocity	0 - 0.25	0 - 0.25	0.25 - 0.50	m/s
Max. Hazard	0.75 - 1.25	1.25 - 2.00	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> The main area at risk is along the site's north-eastern boundary. CC will increase flood extent and velocity, but not maximum depth or hazard.

Site Access / Egress
<ul style="list-style-type: none"> Egress routes should be located to the north-west, along Kara Way and behind the Tesco Express. These are the areas at lowest risk of flooding within the site.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against the 0.1% AEP surface water event, more vulnerable development should be restricted to the west of the site. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Beacon Bingo		
SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been no reports of sewer flooding in this site's postcode region (NW2 3). 	<ul style="list-style-type: none"> The site is not susceptible to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	<p>There is no risk from artificial flooding.</p>
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
No mitigation measures are required.	No mitigation measures are required.	No mitigation measures are required.

PLANNING CONSIDERATIONS	
Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. The site's western half should be prioritised for development, as it is not predicted to flood considering climate change. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing to a more vulnerable risk category. This may increase flood risk on the south-western corner of the site, which is at a slightly lower elevation. A SuDS installation to manage runoff may be appropriate at this location. The site is currently a brownfield with hardstanding to the east. Development may result in the loss of flood storage; thus, flood plain compensation must be implemented. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> The immediate north and east of the existing bingo hall, which are at higher flood risk, should hold less vulnerable development. Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. It is anticipated that runoff from the site is currently at an uncontrolled rate. SuDS should be introduced to manage this. (See Mitigation - Surface Water Drainage). <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, as there are no Ordinary Watercourses or Main Rivers near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	<ul style="list-style-type: none"> Flood resistant / resilient buildings required.
Sewer	
No mitigation measures required.	
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

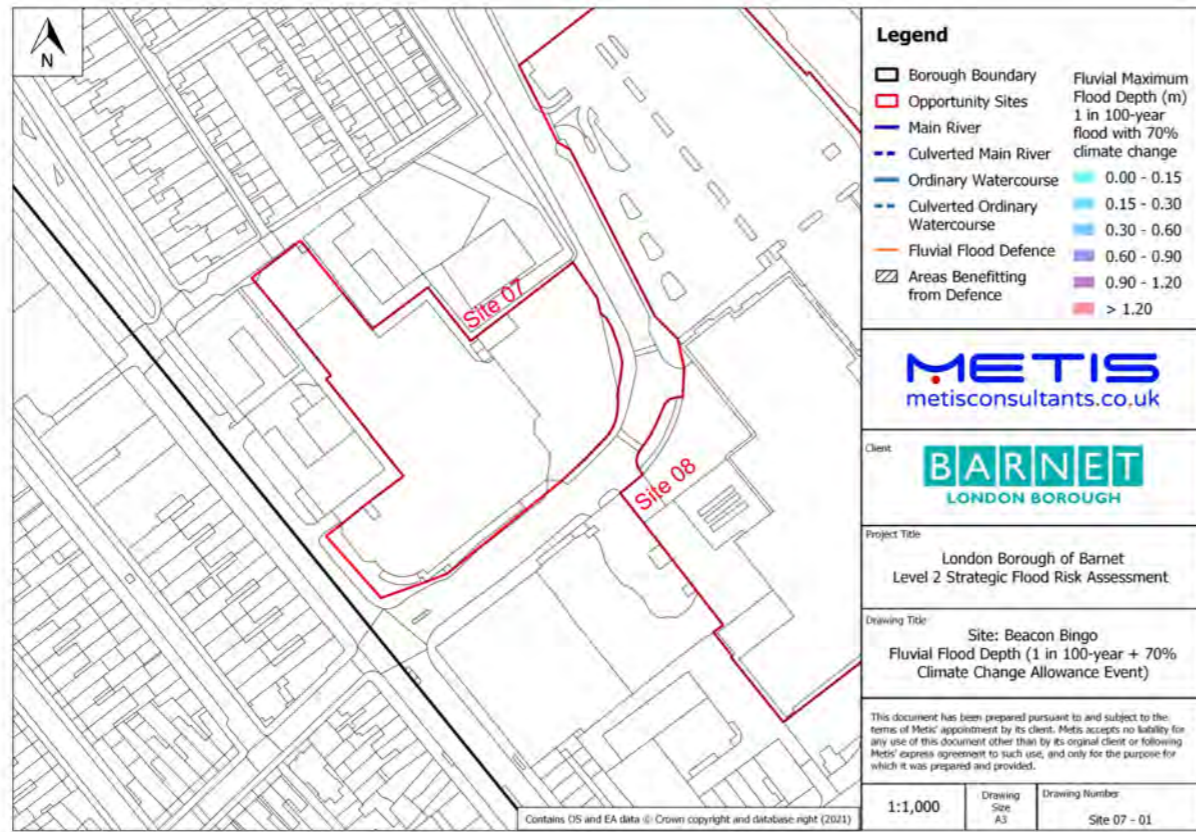


Figure 2 - Fluvial Flood Hazard Map

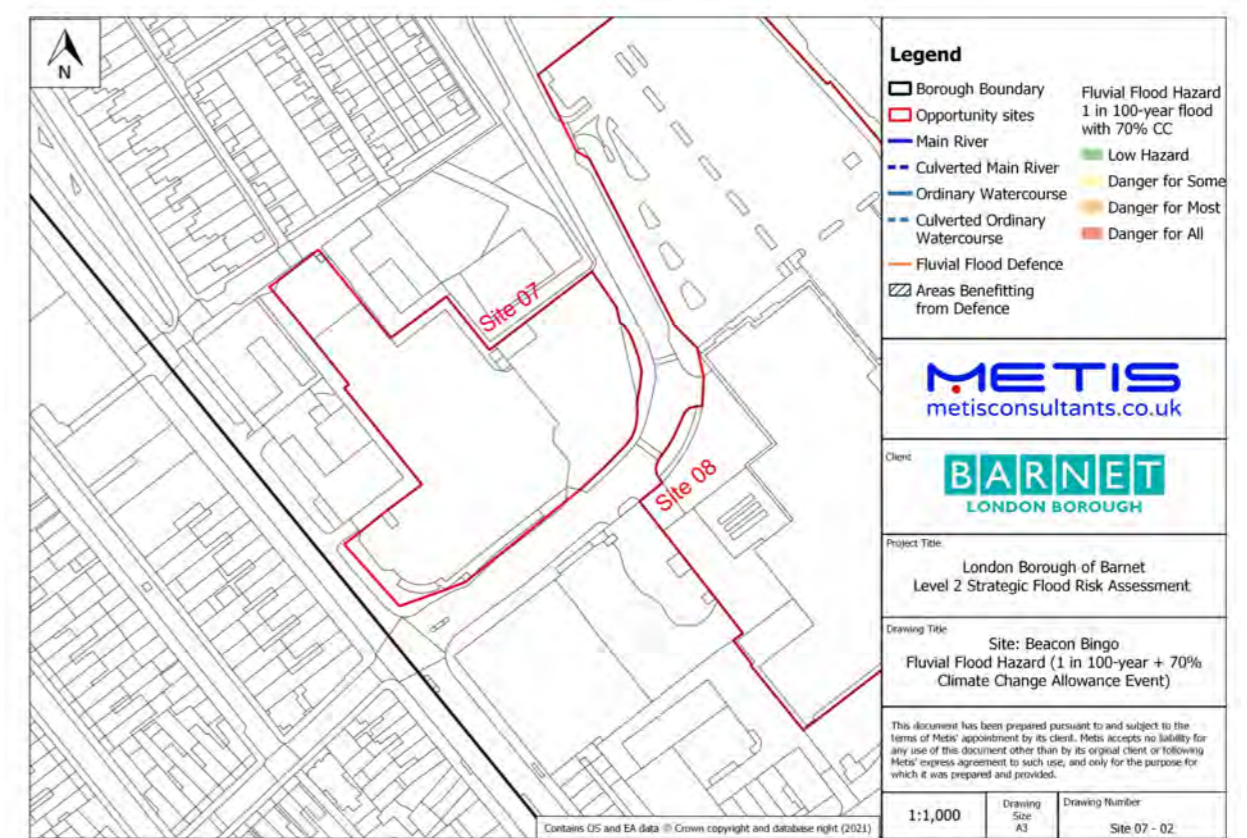


Figure 3 - RoFSW Flood Depth Map

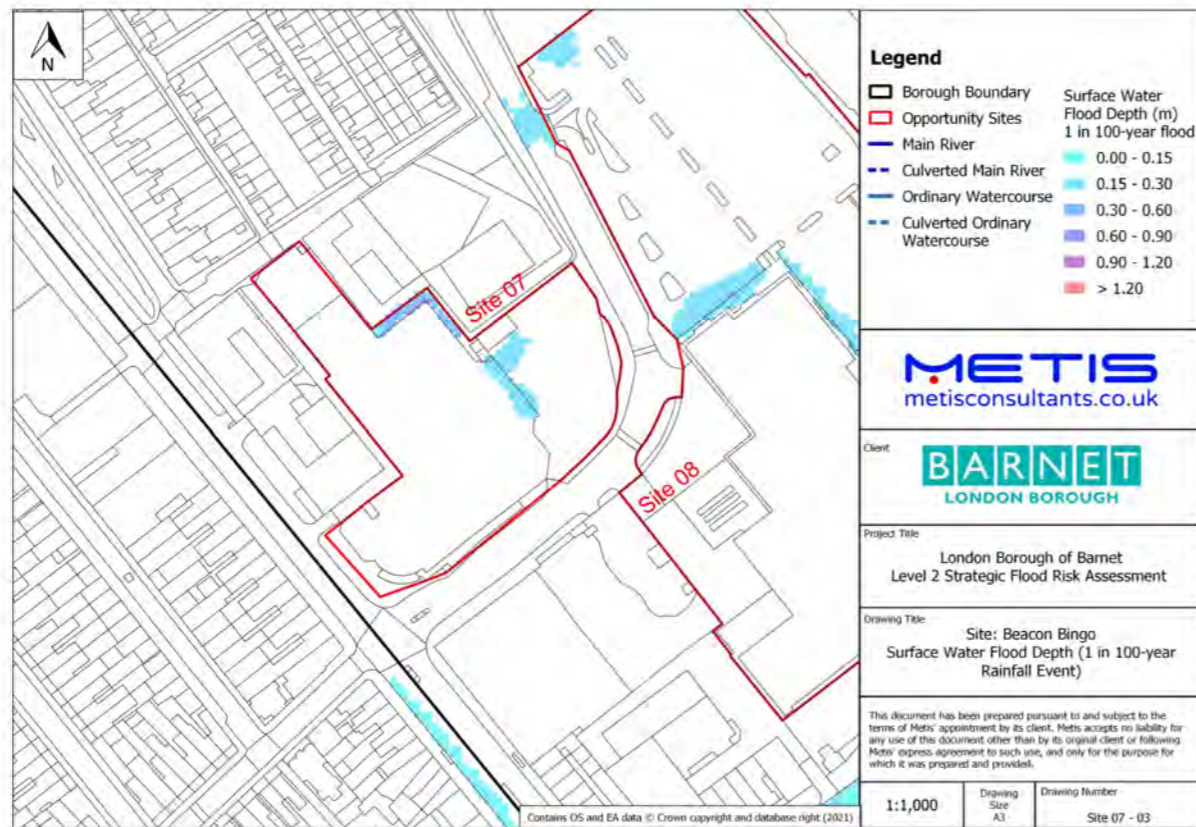


Figure 4 - RoFSW Flood Hazard Map

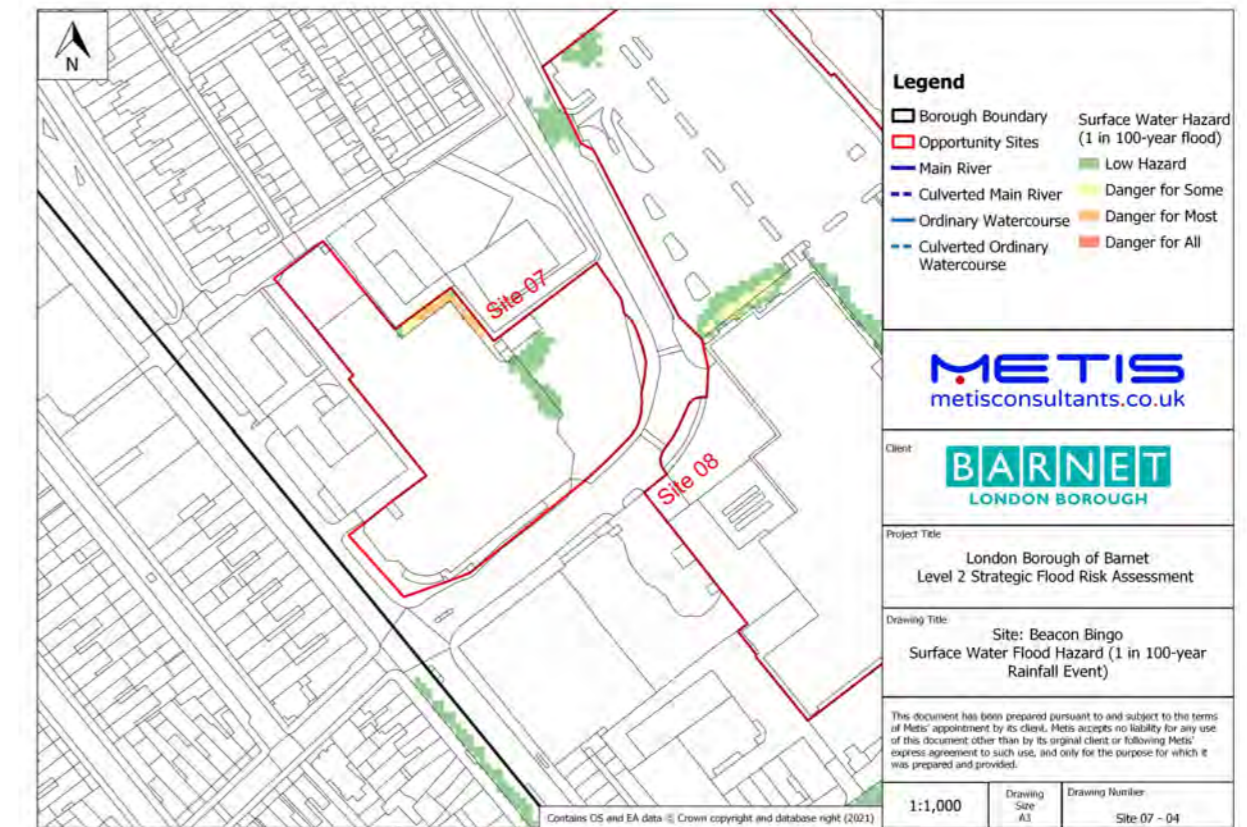


Figure 5 - Thames Water Sewer Flood Map

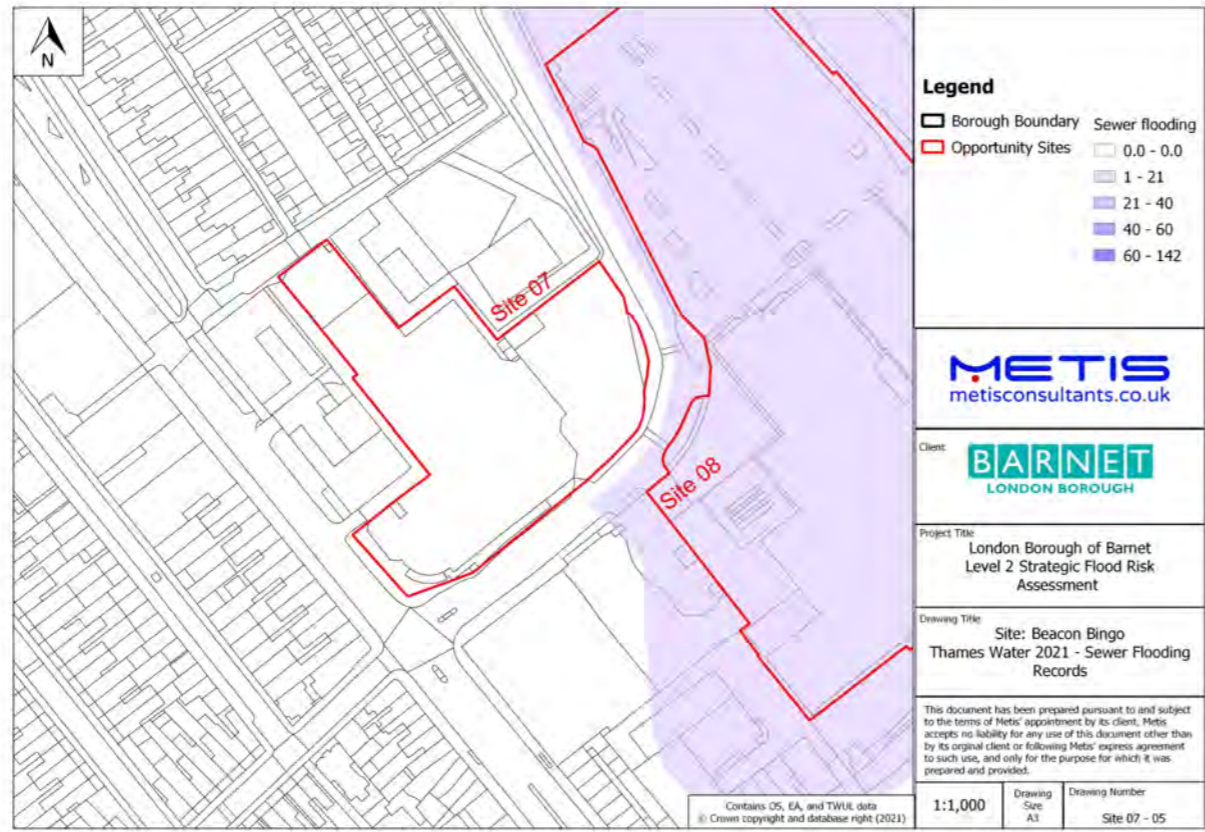


Figure 6 - Areas Susceptible to Groundwater Flooding Map

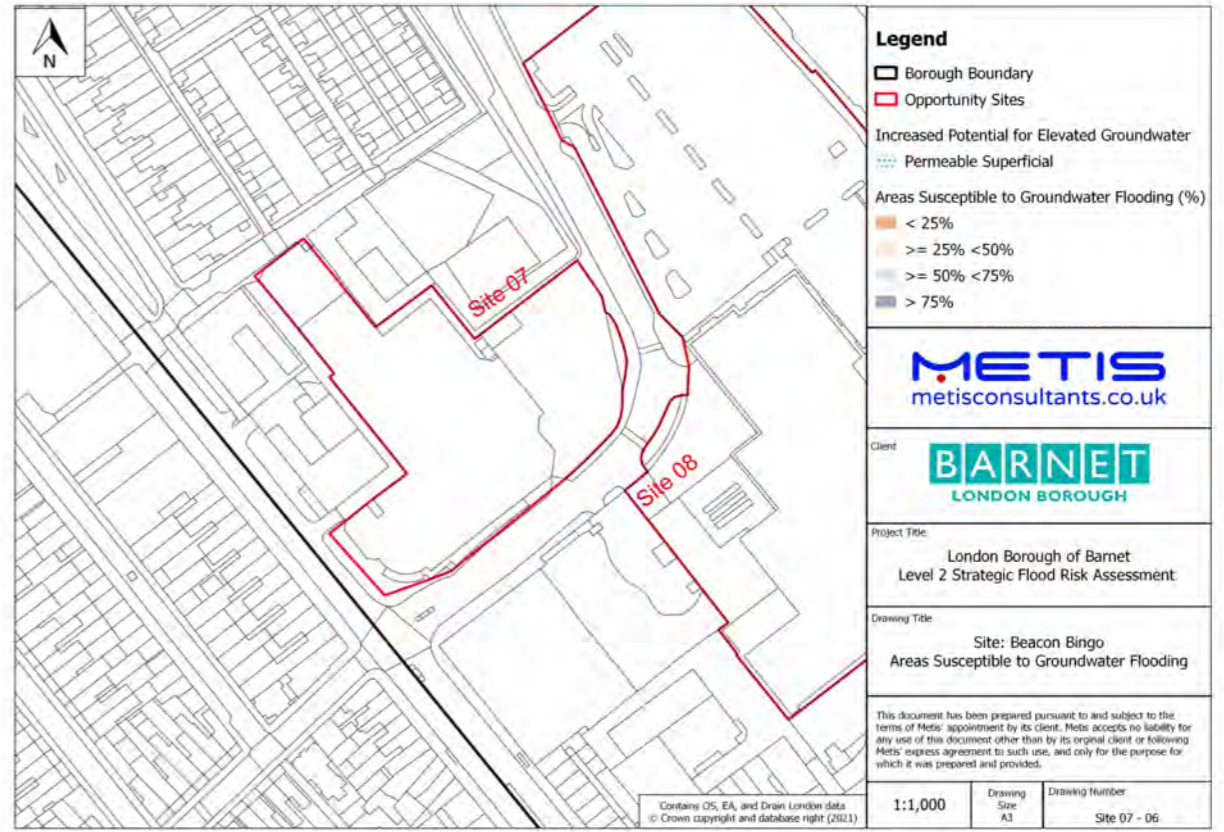
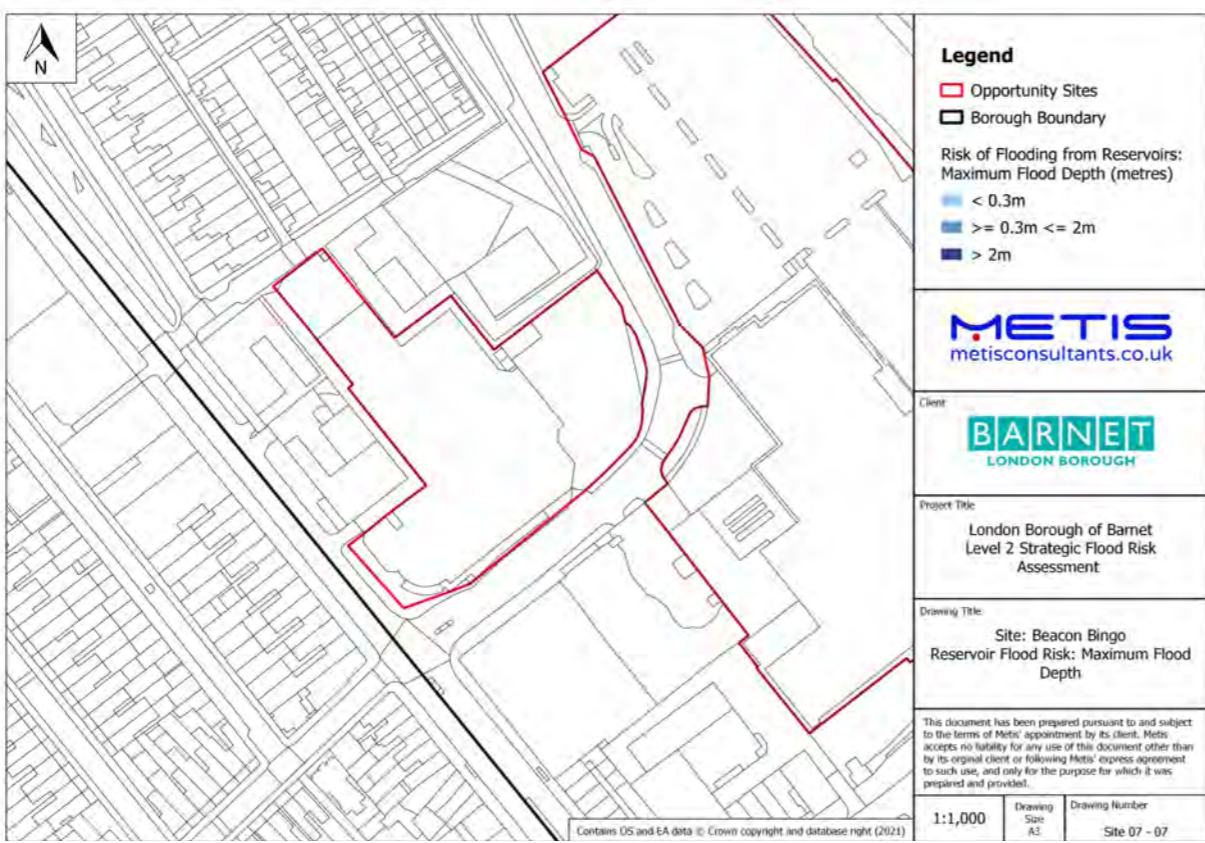


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Broadway Retail Park

Address: Cricklewood Lane, Cricklewood, NW2 1ES	Area: 2.77 Ha
	Site Reference: 8

Current Use	Proposed Use
Retail and associated car parking	Residential-led with 10% mixed uses (retail and community)

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	No data	% of Site
FZ3a	0	% of Site	25-50	No data	% of Site
FZ3b	0	% of Site	50-75	No data	% of Site
Surface Water			>75	No data	% of Site
3.33%*	1.11	% of Site	Artificial		
1% AEP	4.13	% of Site	Reservoir	No	At risk?
0.1% AEP	10.35	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		20			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.15 - 0.30	0.30 - 0.60	0.30 - 0.60	m
Max. Velocity	0 - 0.25	0 - 0.25	1.00 - 2.00	m/s
Max. Hazard	0.75 - 1.25	0.75 - 1.25	0.75 - 1.25	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Surface water pools to the north and west of the superstore. Some water also collects at the far north of the site. Climate change is predicted to increase flood extent, velocity and hazard, but not maximum depth.

Site Access / Egress
Safe access and egress routes should be directed towards the west of the site along Depot Way, where risk of flooding is lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP surface water event, more vulnerable development should be located along the east of the site parallel to the railway line. Maximum runoff must be restricted to greenfield rates. See also SFRA Level 2 Report mitigation requirements number 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Broadway Retail Park

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 20 reported incidents of sewer flooding in this site's postcode region (NW2 1): 6 internal and 14 external incidents, distributed across the 1 in 5, 1 in 10, and 1 in 20-year rainfall events 	<ul style="list-style-type: none"> The site is not susceptible to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	There is no risk from artificial flooding.
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding has occurred on site and ensure sufficient capacity exists in the surface water sewer network. Development must implement SuDS to reduce runoff to greenfield rates. 	No mitigation measures are required.	No mitigation measures are required.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. The area parallel to the railway line should be prioritised for development as it has low flood risk. However, the site's south-eastern corner is predicted to have high flood velocity under climate change and should hold less vulnerable infrastructure. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing from the 'less vulnerable' to the 'more vulnerable' classification. Changing the existing hardstanding to residential developments could lead to a loss of flood storage. There is a small green space on the south-eastern edge of the site. Building over this will increase the impermeable surface area. This must be mitigated with flood plain compensation and runoff storage. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater runoff management by introducing SuDS (see Mitigation - Surface Water Drainage). These should reduce runoff to sewer to greenfield rates. Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, there are no Main Rivers or Ordinary Watercourses near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	Introduce SuDS to reduce surface water runoff to greenfield rates.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

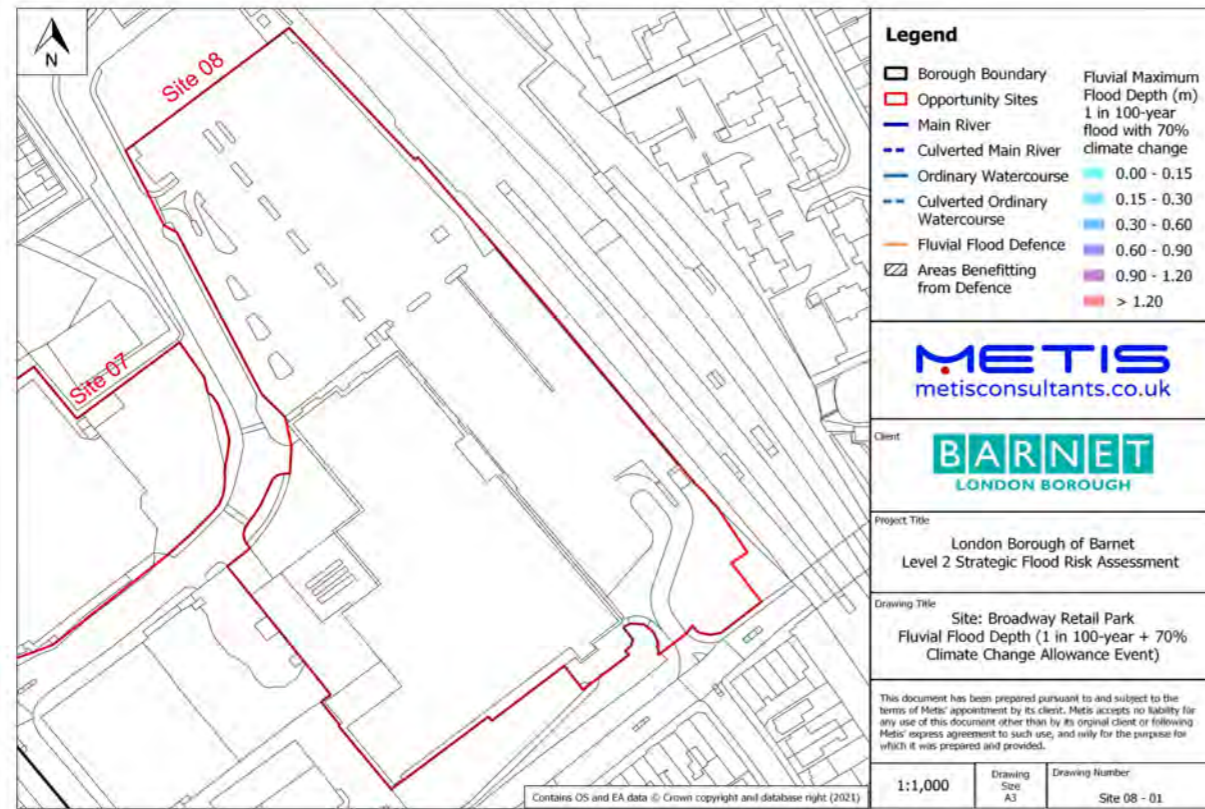


Figure 2 - Fluvial Flood Hazard Map

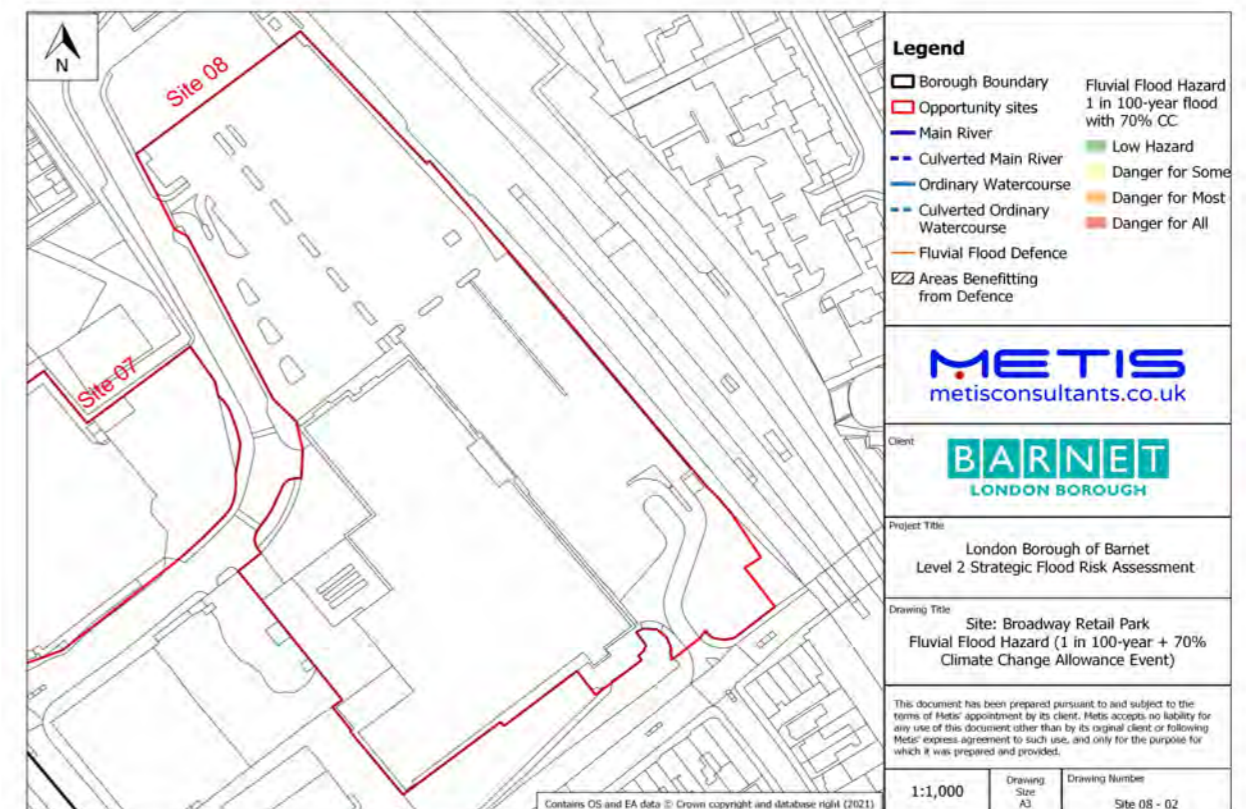


Figure 3 - RoFSW Flood Depth Map

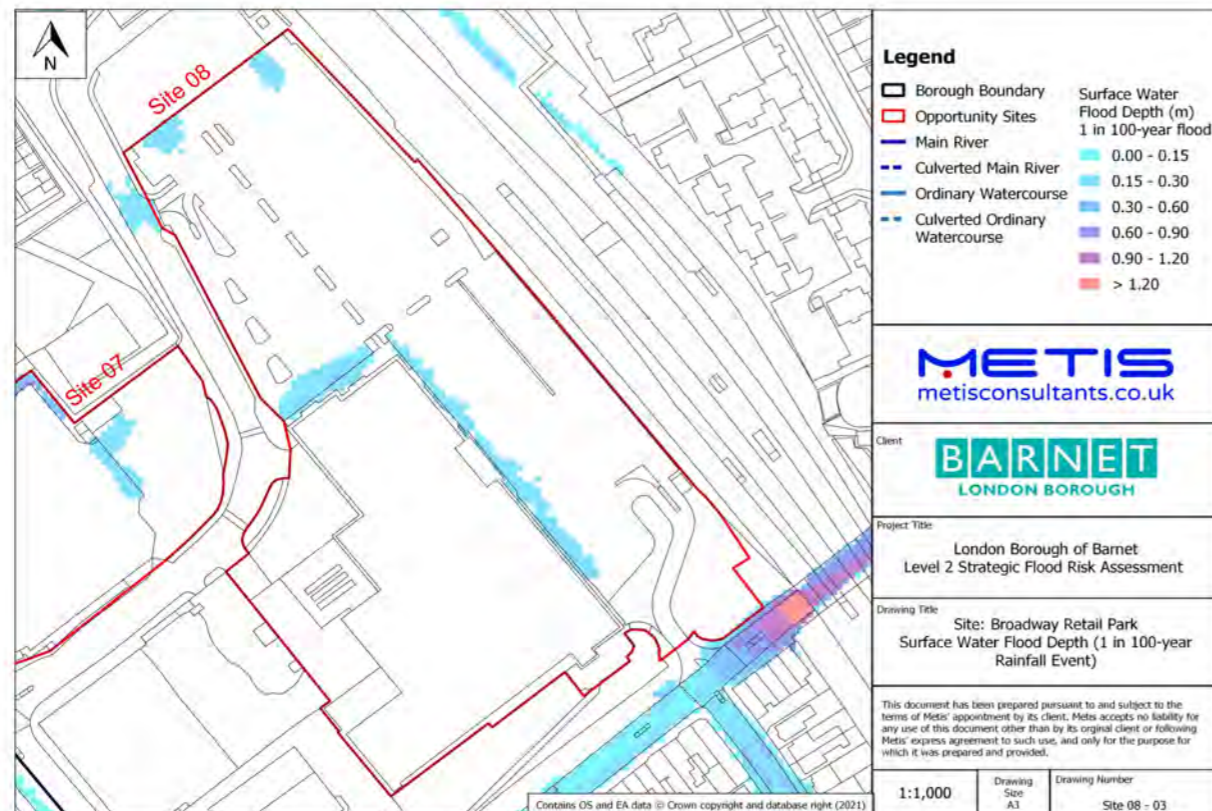


Figure 4 - RoFSW Flood Hazard Map

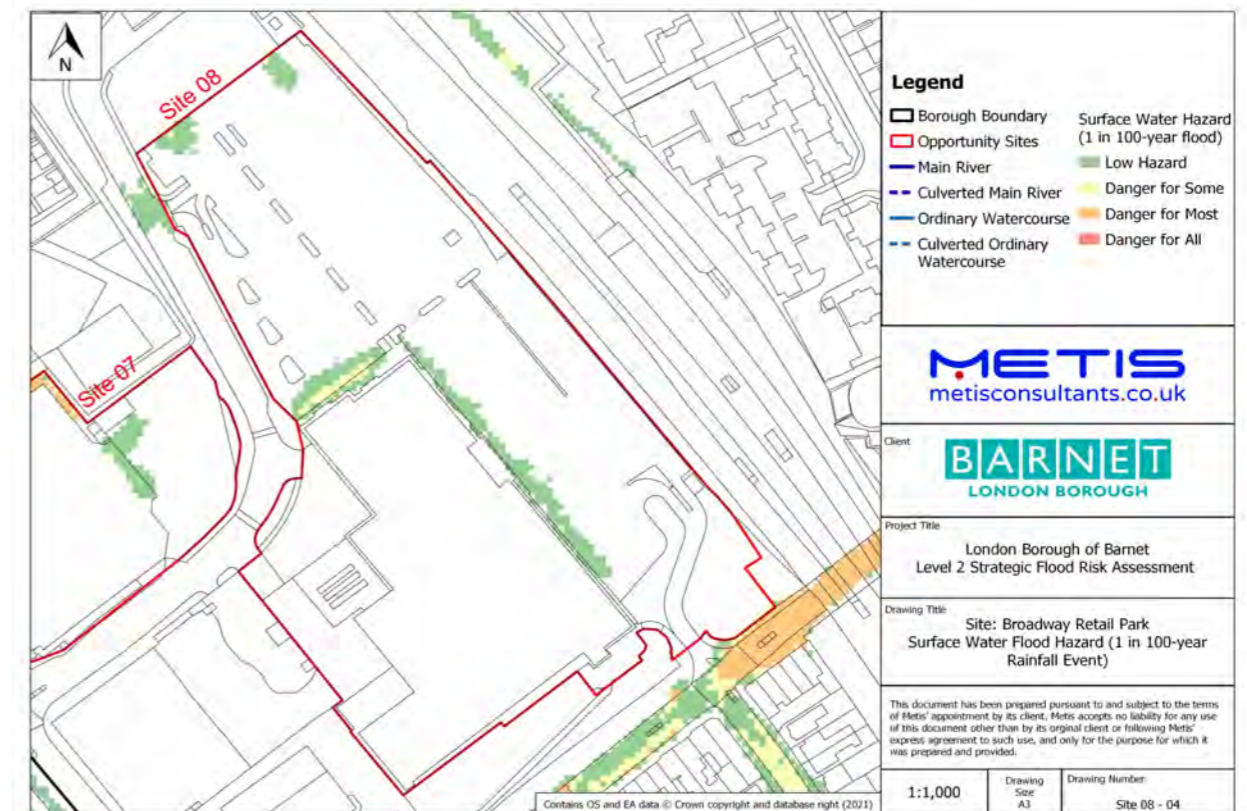


Figure 5 - Thames Water Sewer Flood Map

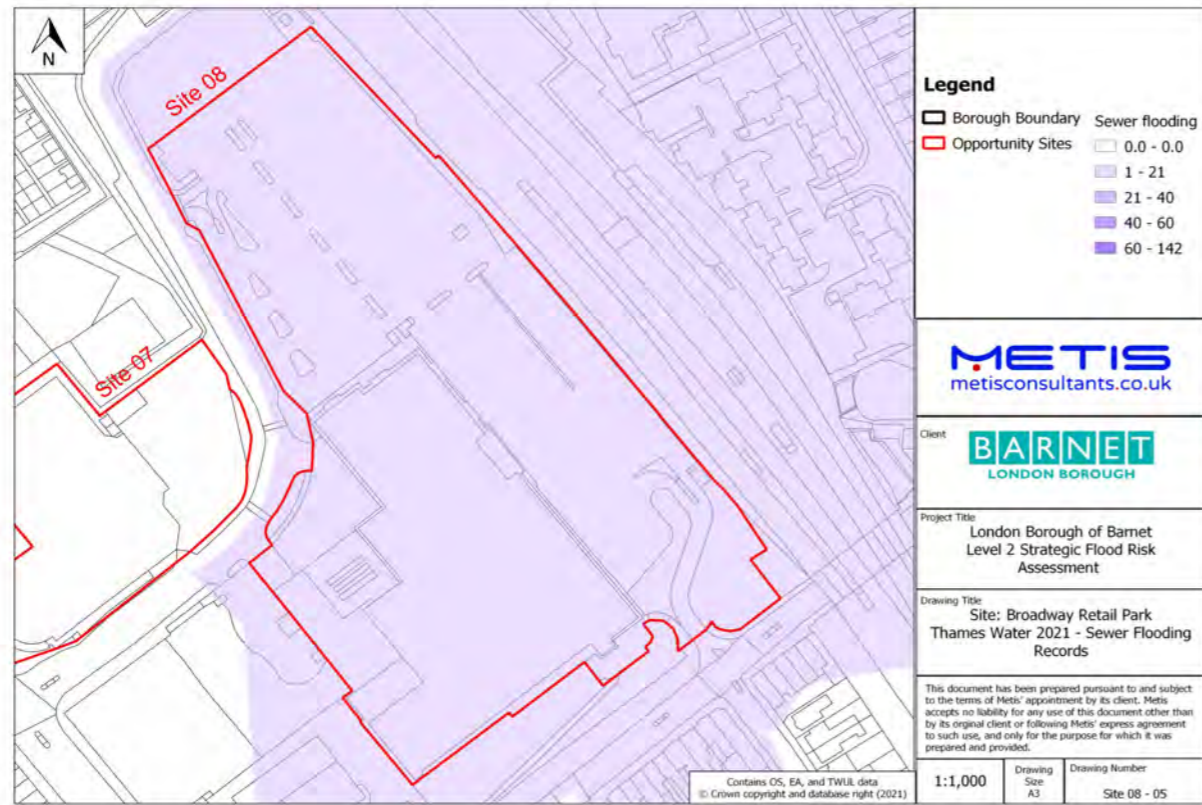


Figure 6 - Areas Susceptible to Groundwater Flooding Map

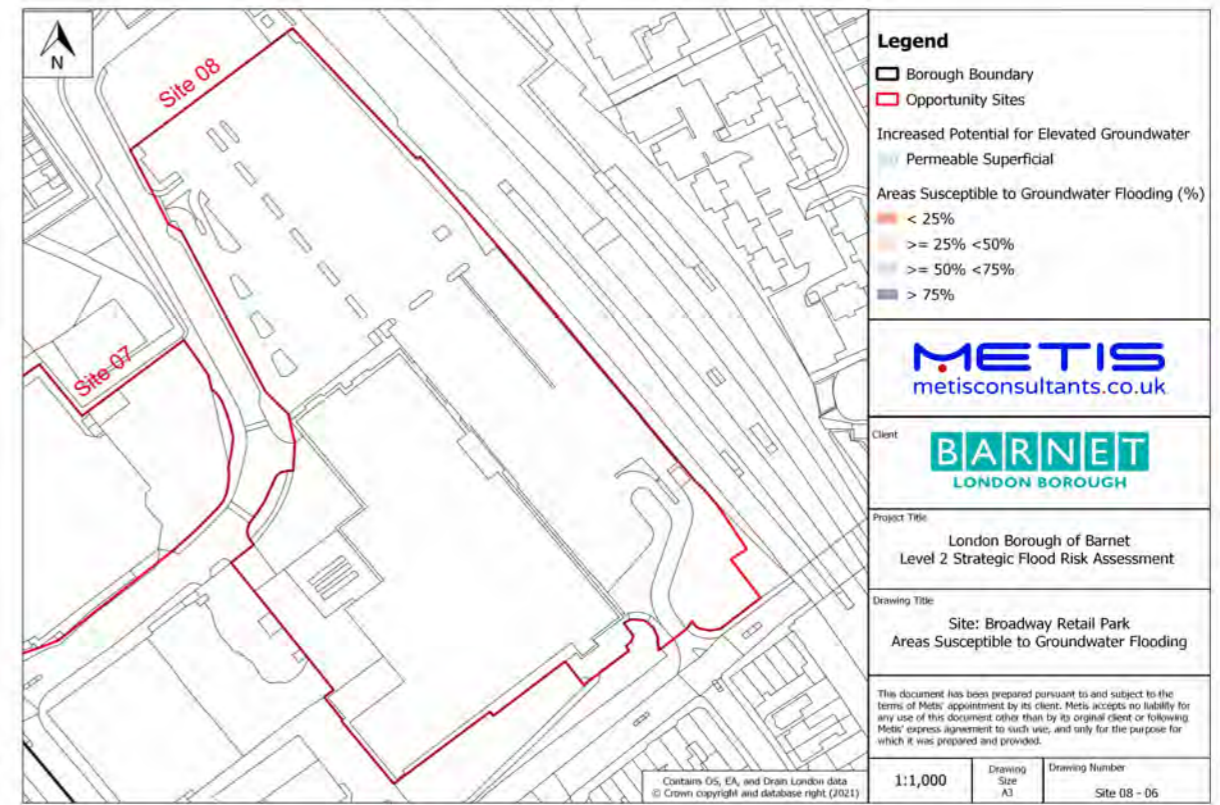
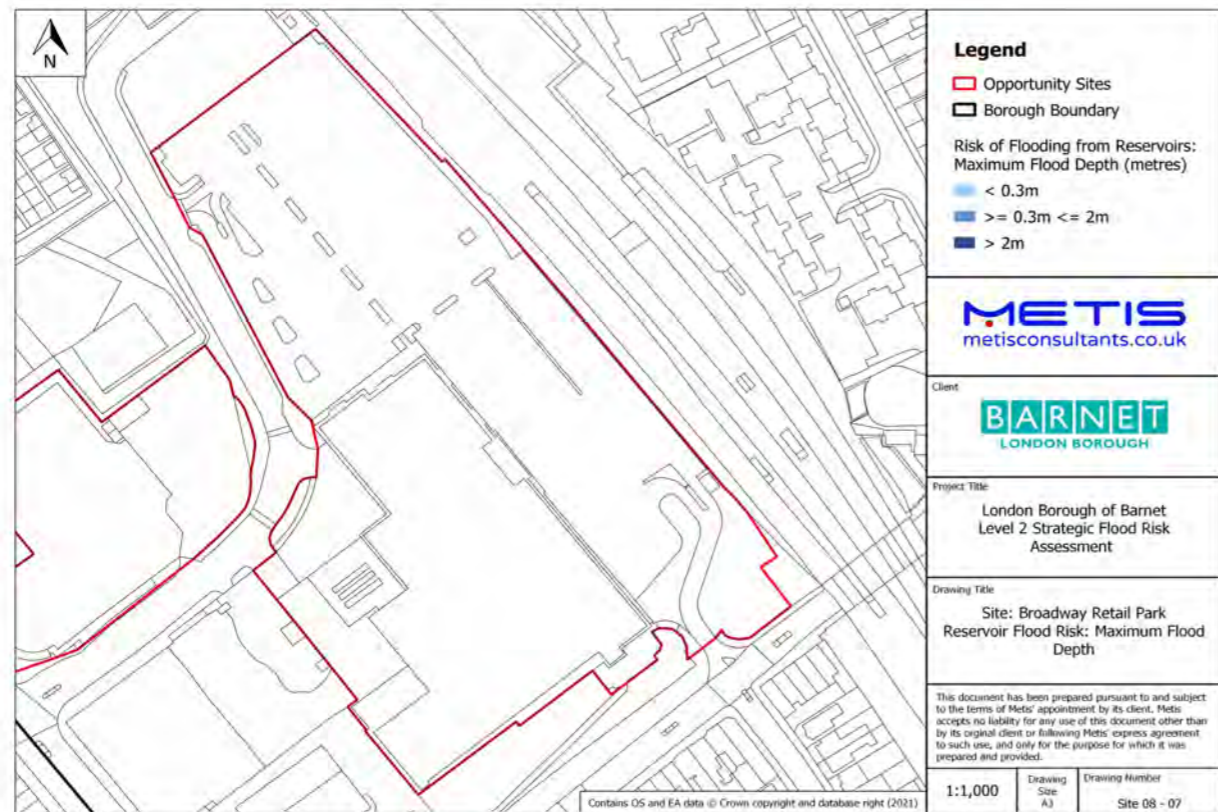


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Colindeep Lane (adjacent to Northern Line)

Address: Colindeep Lane, Colindale, NW9 6RY	Area: 0.85 Ha
	Site Reference: 9

Current Use	Proposed Use
Vacant surplus railway corridor land	Residential only

Current Vulnerability Classification	Proposed Vulnerability Classification
Unclassified	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	33.1	% of Site	<25	100	% of Site
FZ3a	16.2	% of Site	25-50	0	% of Site
FZ3b	7.2	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	1.9	% of Site	Artificial		
1% AEP	3.8	% of Site	Reservoir	Y	At risk?
0.1% AEP	15.9	% of Site	Canal	N	At risk?
Sewer Flooding			Other	Y	At risk?
No. Incidents		5			

Flood Defences
<ul style="list-style-type: none"> There are no flood defences located either on or within the immediate vicinity of the site. A small region towards the north of the site benefits from flood defences, in addition to the local area either side of the Silk Stream. The defences are located upstream in Edgwarebury Park for the Silk Stream.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	3.25	2.5	2	Hrs
Min. Depth	0	0	0	m
Max. Depth	0.5	1.2	1.6	m
Max. Velocity	0.6	1.0	1.2	m/s
Max Flood Level	40.59	41.00	41.41	m AOD
Max Ground Level	44.73	44.73	44.73	m AOD
Min Ground Level	39.55	39.55	39.55	m AOD
Flood Hazard	Danger for some	Danger for most	Danger for most	N/A
Duration of Flood	15.5+	16.25+	16.75+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Un defended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Silk Stream. The river runs within 20m of the site to the south, flowing southward. The site is predicted to flood as a result of the Silk Stream bursting its banks, inundating the site from the south. The predicted flood risk extent for the climate change scenario is greater, leaving most of the site's area by the southern/western boundary at risk of flooding. The predicted maximum flood depth and maximum velocity is greater under the climate change scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 24.8%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> The region by the southern and south-eastern border of the site is flooded in the 1% AEP year scenario. Safe egress routes should be routed north-westward, towards Sheaveshill Avenue. Alternatively, if it not possible to establish a safe egress route towards Sheaveshill Avenue, a safe route should be directed south-east towards Colindeep Lane. Evacuation needs to occur before this region of the site is inundated by the Silk Stream. Safe refuge areas should be provided on site in the north and north-eastern areas of the site.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP + Climate Change event, 'More Vulnerable' developments should be restricted to areas away from the southern/south-western border of the site. Basements are not permitted in Flood Zone 3b. Outside of the Flood Zone 3b extent, basement developments should be limited to less vulnerable / water compatible uses. See SFRA - Level 2 Report section numbers 4.2, 4.3, 4.4, and 4.5 for further development requirements. See SFRA - Level 2 Report section 4.6 for Main River requirements. Develop a Flood Emergency and Evacuation Plan for the site. Site users should be signed up to EA's Flood Warning Service.

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.60 - 0.90	> 1.20	m
Max. Velocity	0.00 - 0.25	0.00 - 0.25	> 2.00	m/s
Max. Hazard	0.75 - 1.25	1.25 - 2.00	> 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site at the north and accumulates along the ordinary watercourse as well as to the south-east. Climate Change will increase the extent, depth, velocity, and hazard rating of the flood.

Site Access / Egress
<ul style="list-style-type: none"> Safe access and egress routes for the 1% AEP event can be towards the north-western edge of the site. This site is surrounded by water on all sides in the 0.1% AEP surface water event. For this event, emergency evacuation plans must be put in place as per the PPG (Flood Risk and Coastal Change, paragraph 039).

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> More vulnerable development must be directed away from the south-western long edge of the site. Developments should not take place within the 5m buffer zone of the Ordinary Watercourse, located in the north-west region of the site. See also SFRA Level 2 Report mitigation requirements number 4.2, 4.3 and 4.4. See SFRA - Level 2 Report section 4.7 for Ordinary Watercourse requirements.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Colindeep Lane (adjacent to Northern Line)

SEWER	GROUNDWATER	ARTIFICIAL
<p align="center">Risk Assessment</p> <ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. The site falls within the NW9 6 postcode area, where there are 5 reported incidents of sewer flooding. 	<p align="center">Risk Assessment</p> <ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. A majority of the site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. The site is underlain by alluvium superficial deposits, associated with the Silk Stream, and London Clay/Thames Group bedrock geology. 	<p align="center">Risk Assessment</p> <ul style="list-style-type: none"> The south-western edge of the site is at risk of artificial flooding, from flood storage areas at Stoney Wood and Prince Edward Playing Fields, as well as from Seven Acre Lake. The maximum depth of flooding will be 0.3m - 2m. The maximum flood speed will be below 0.5m/s.
<p>Figure 5 - Thames Water Sewer Flood Map</p>	<p>Figure 6 - Areas Susceptible to Groundwater Flooding Map</p>	<p>Figure 7 - Outline Reservoir Flood Map</p>
<p align="center">Mitigation Requirements</p> <ul style="list-style-type: none"> Thames Water must be consulted to confirm if the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. The development must implement SuDS to reduce the runoff to sewer to greenfield rates or as close as possible to greenfield rates. 	<p align="center">Mitigation Requirements</p> <p>No mitigation measures required.</p>	<p align="center">Mitigation Requirements</p> <ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test	
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development vulnerability is changing as the site is being transformed from an undeveloped greenfield site to a 'More Vulnerable' site. Therefore the development must mitigate the increase in impermeable area with SuDS and storage compensation to prevent any increase in flood risk. Proposed changes to the impermeable area coverage and topography will increase flood risk and flood depths if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> The site is currently an undeveloped greenfield area. Development provides an opportunity to manage runoff at greenfield rates and volumes through the introduction of SuDS (See Mitigation - Surface Water Drainage). Basements are not permitted within Flood Zone 3b. Basements developments outside of the Flood Zone 3b extent, that are less vulnerable or water compatible uses, may be appropriate in the north and north-eastern regions of the site by the railway boundary, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP event. Non-dwelling basement developments within the 1% AEP fluvial and surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - an Ordinary Watercourse that serves as a tributary for the Silk Stream falls within the boundaries of the site. The watercourse is located in the north-west region of the site. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>	
	Summary - Site Specific FRA - Key Requirements	
	Fluvial / Tidal	<ul style="list-style-type: none"> 'More Vulnerable' development should be restricted to areas away from the southern/south-western border of the site. Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. <p>Safe egress routes from the site should be directed north-westward towards Sheaveshill Avenue or south-eastward towards Colindeep Lane. If routed towards the latter, evacuation needs to occur before this region of the site is inundated by the Silk Stream.</p>
	Surface Water	<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood resistant/resilient construction is required. <ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Proposed developments should not take place within the 5m buffer zone of the Ordinary Watercourse, located in the north-west region of the site.
	Sewer	<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p> <p>Development must reduce the runoff to sewer to greenfield rates.</p>
	Groundwater	<p>No mitigation measures required.</p>
	Artificial	<p>Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.</p>

Figure 1 - Fluvial Flood Depth Map

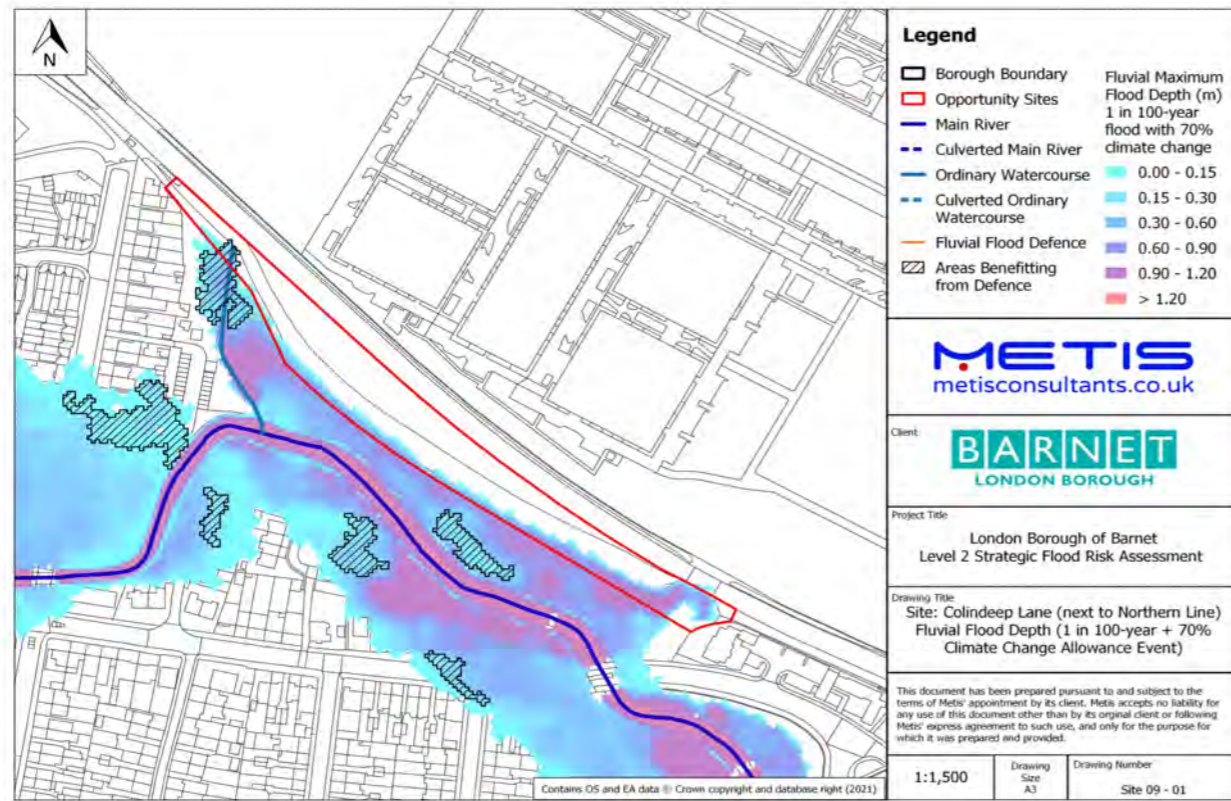


Figure 2 - Fluvial Flood Hazard Map

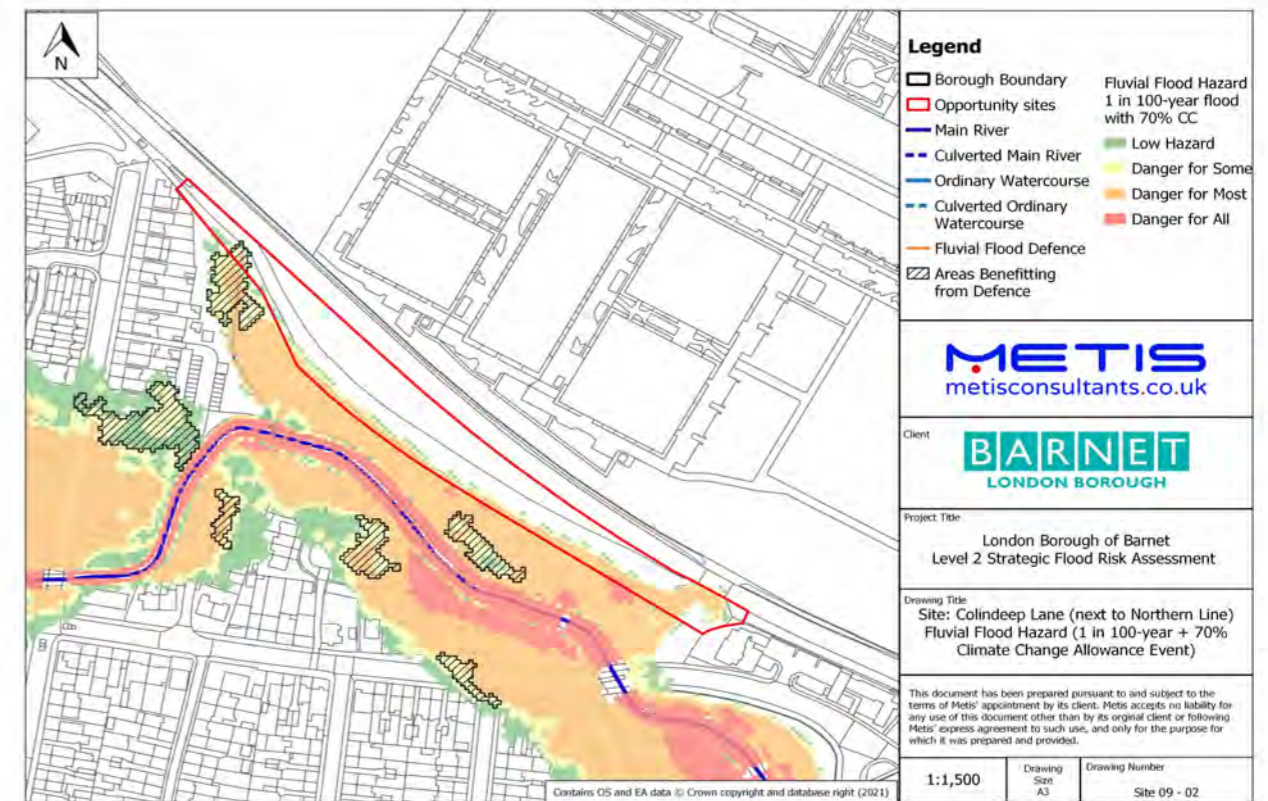


Figure 3 - RoFSW Flood Depth Map

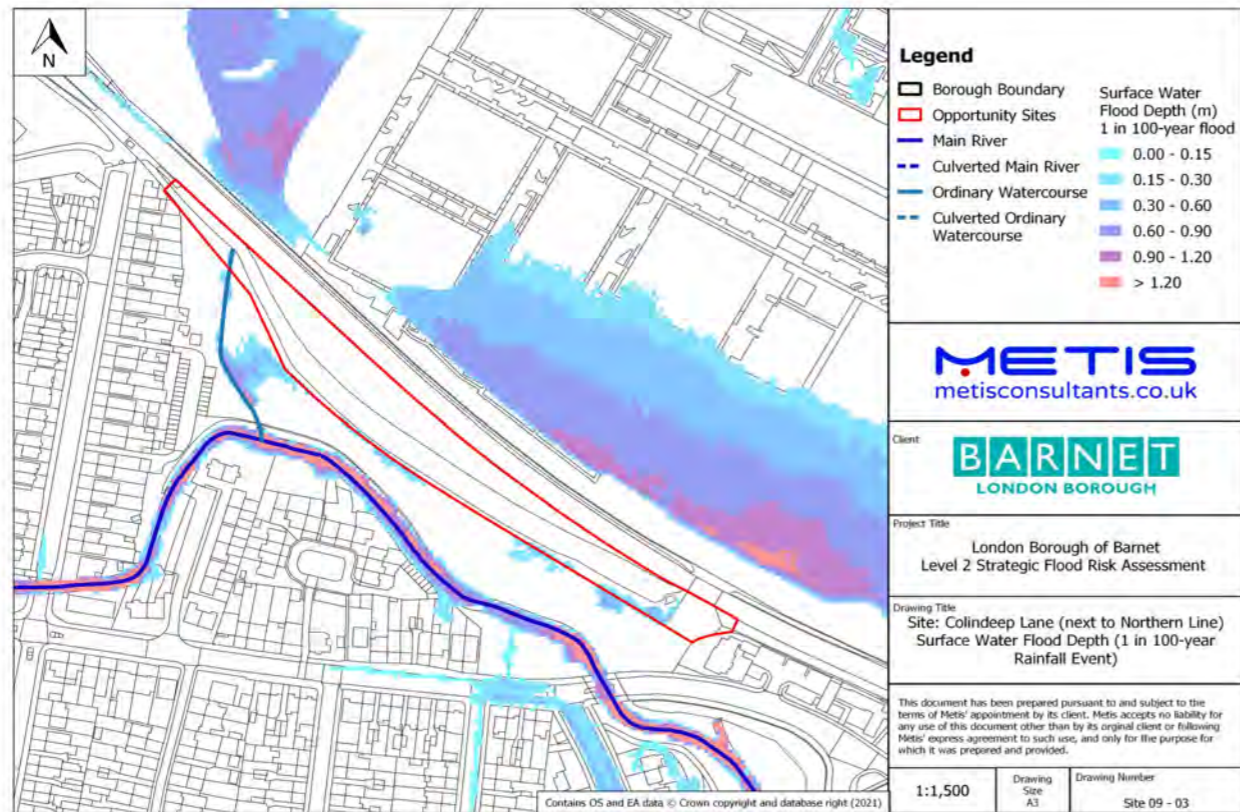


Figure 4 - RoFSW Flood Hazard Map

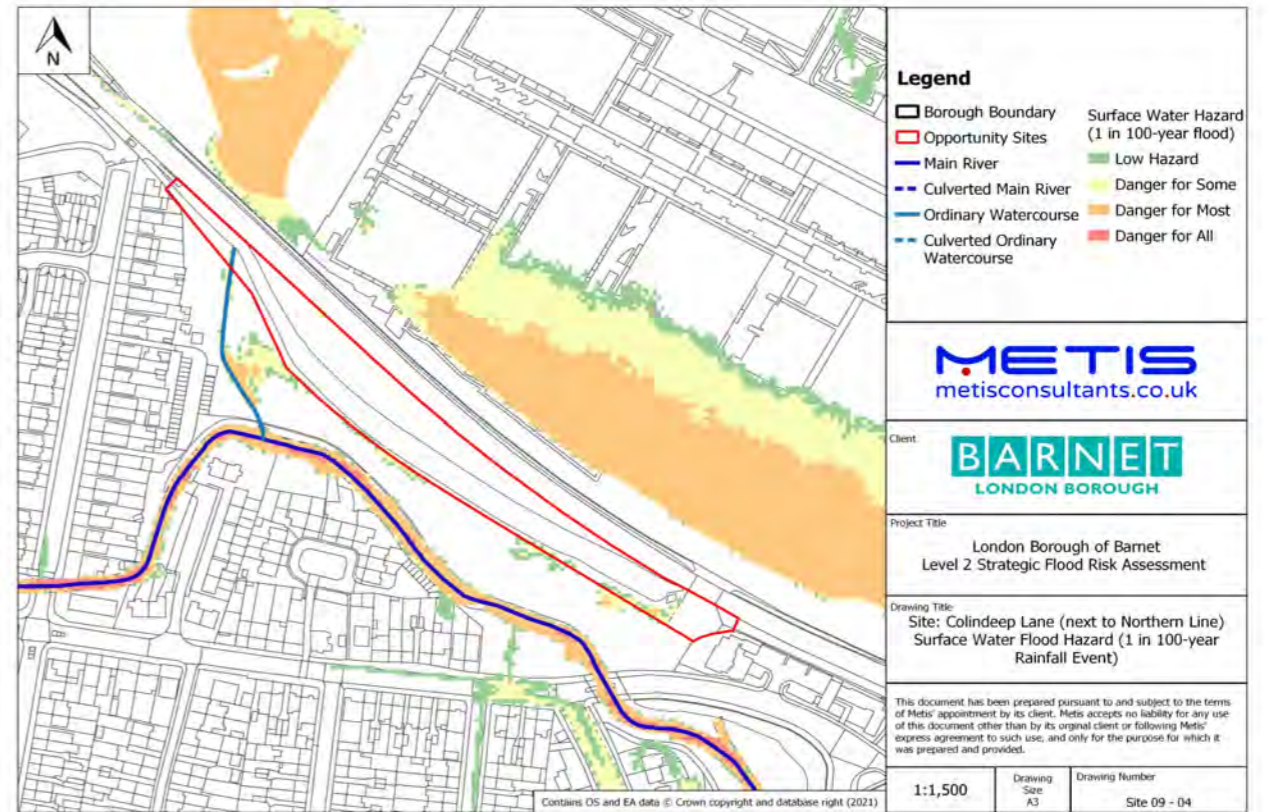


Figure 5 - Thames Water Sewer Flood Map

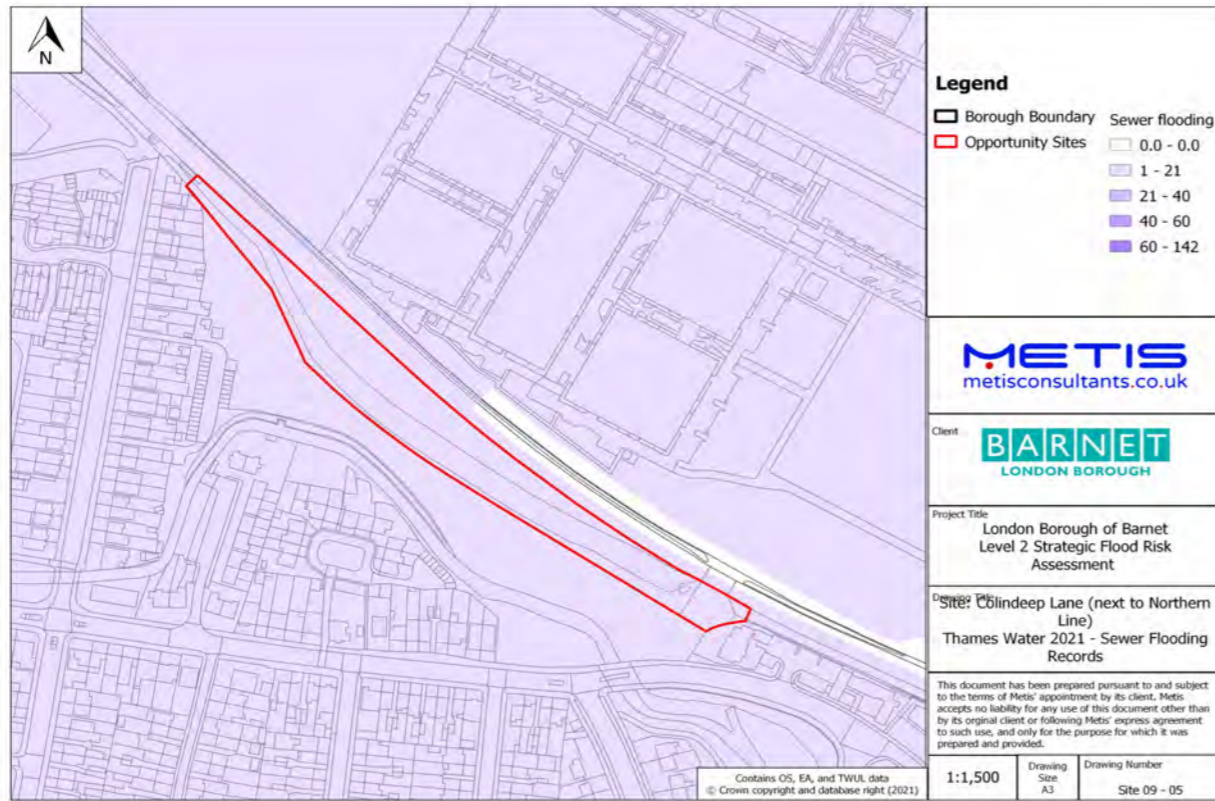


Figure 6 - Areas Susceptible to Groundwater Flooding Map

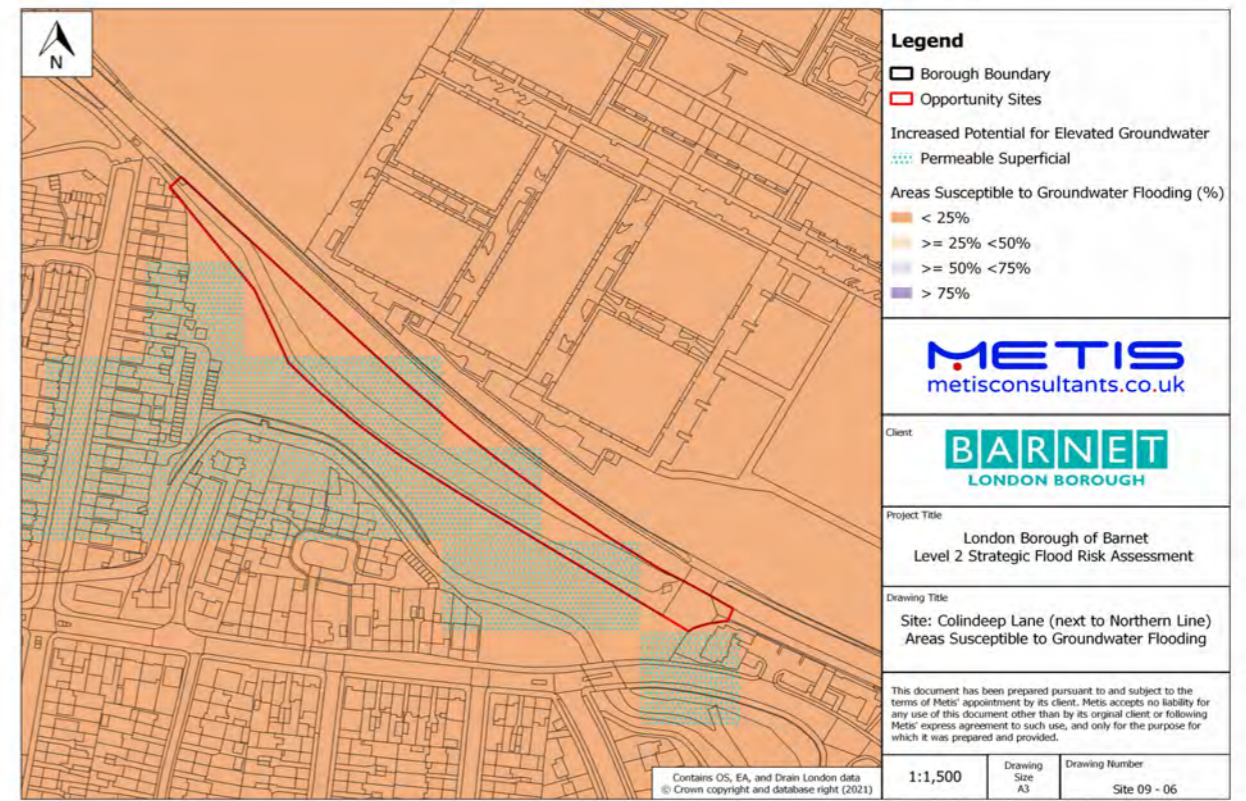
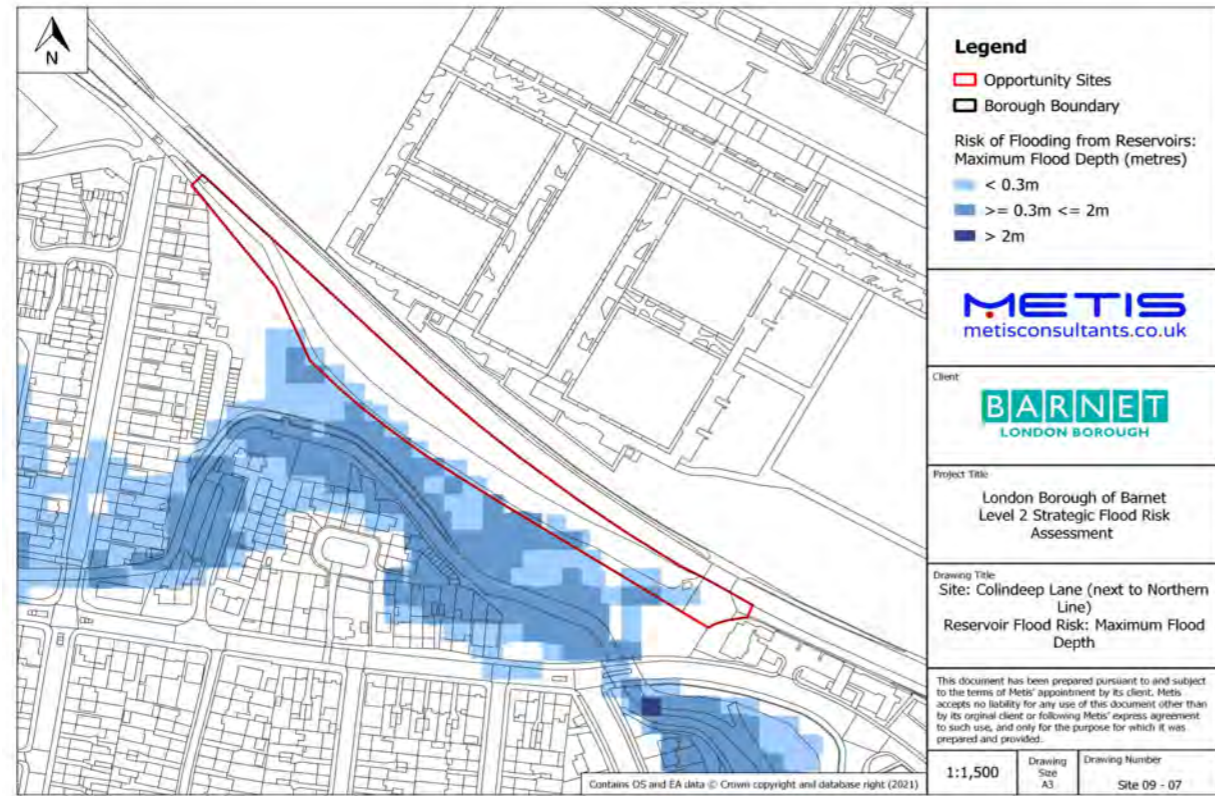


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - KFC / Burger King Restaurant

Address: Edgware Road, NW9 5EB	Area: 0.44 Ha
	Site Reference: 11

Current Use	Proposed Use
Restaurant and car parking	Residential with 10% A3 to A5 uses

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	100	% of Site
FZ3a	0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	0	% of Site	Artificial		
1% AEP	3.0	% of Site	Reservoir	No	At risk?
0.1% AEP	26.7	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		7			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0	0.15 - 0.30	0.30 - 0.60	m
Max. Velocity	0	0.50 - 0.75	0.75 - 1.25	m/s
Max. Hazard	0	0 - 0.25	0.25 - 0.50	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site from Annesley Avenue in the south and accumulates along the north-western edge of the site. CC is predicted to increase flood extent, depth, velocity, and hazard.

Site Access / Egress
Safe access and egress routes should be towards Annesley Road on the south of the site, where the predicted risk of surface water flooding is lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> Limit development on the western edge of the site to less vulnerable uses. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - KFC / Burger King Restaurant

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 7 recorded incidents of sewer flooding in this site's postcode district (NW9 5). All of these were internal and in the 1 in 20-year (5% AEP) event. 	<ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	There is no risk from artificial flooding.
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	No mitigation measures are required.	No mitigation measures are required.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building requirements. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage requirements. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing from the 'less vulnerable' to the 'more vulnerable' classification. This can increase flood risk, especially to the north and west of the site. The site is currently a brownfield that is over half hardstanding. Development may result in the loss of flood storage. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> More vulnerable development should be restricted to the eastern and southern portions of the site, which are predicted to have lower flood risk. Runoff on site is likely to be at an uncontrolled rate. New developments must introduce SuDS to manage this. (See Mitigation - Surface Water Drainage). Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, there are no Main Rivers or Ordinary Watercourses near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	Introduce SuDS to reduce surface water runoff to greenfield rates.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map



Figure 2 - Fluvial Flood Hazard Map

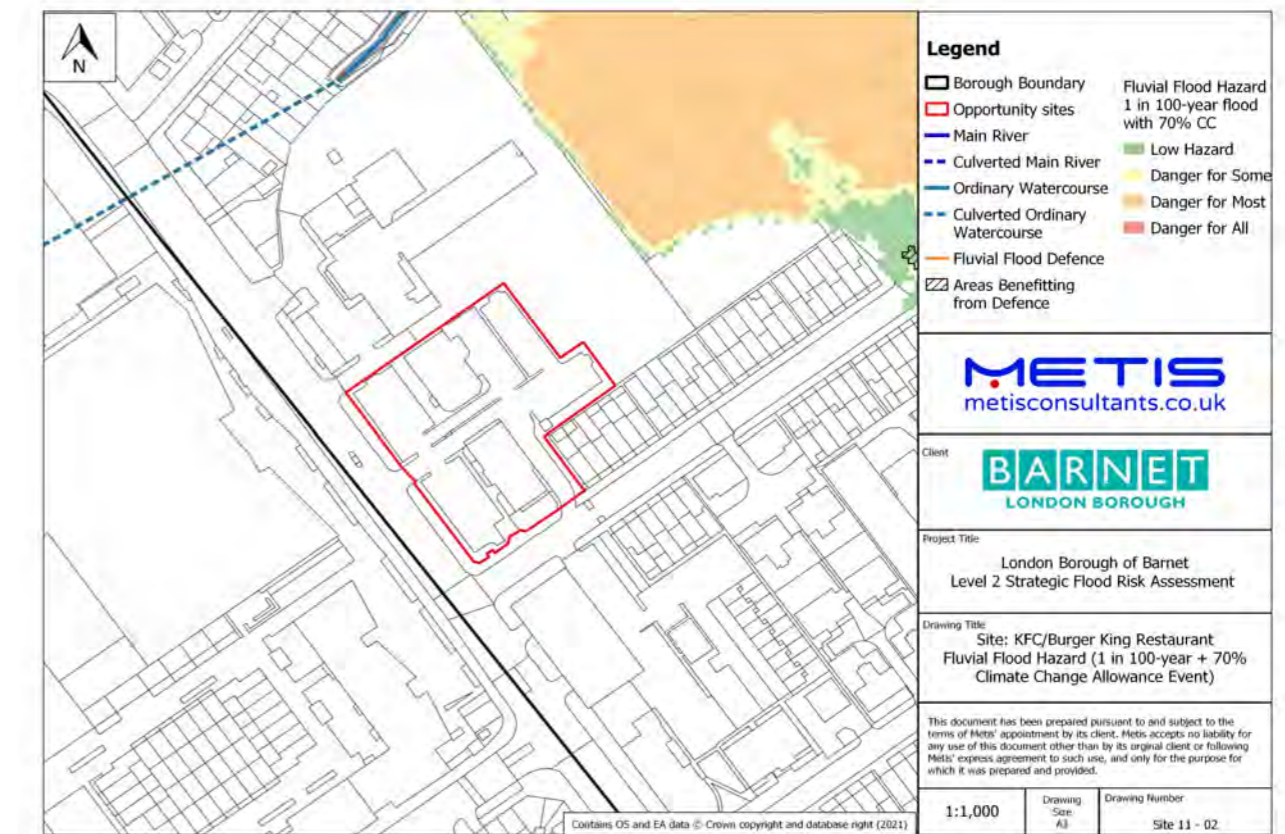


Figure 3 - RoFSW Flood Depth Map

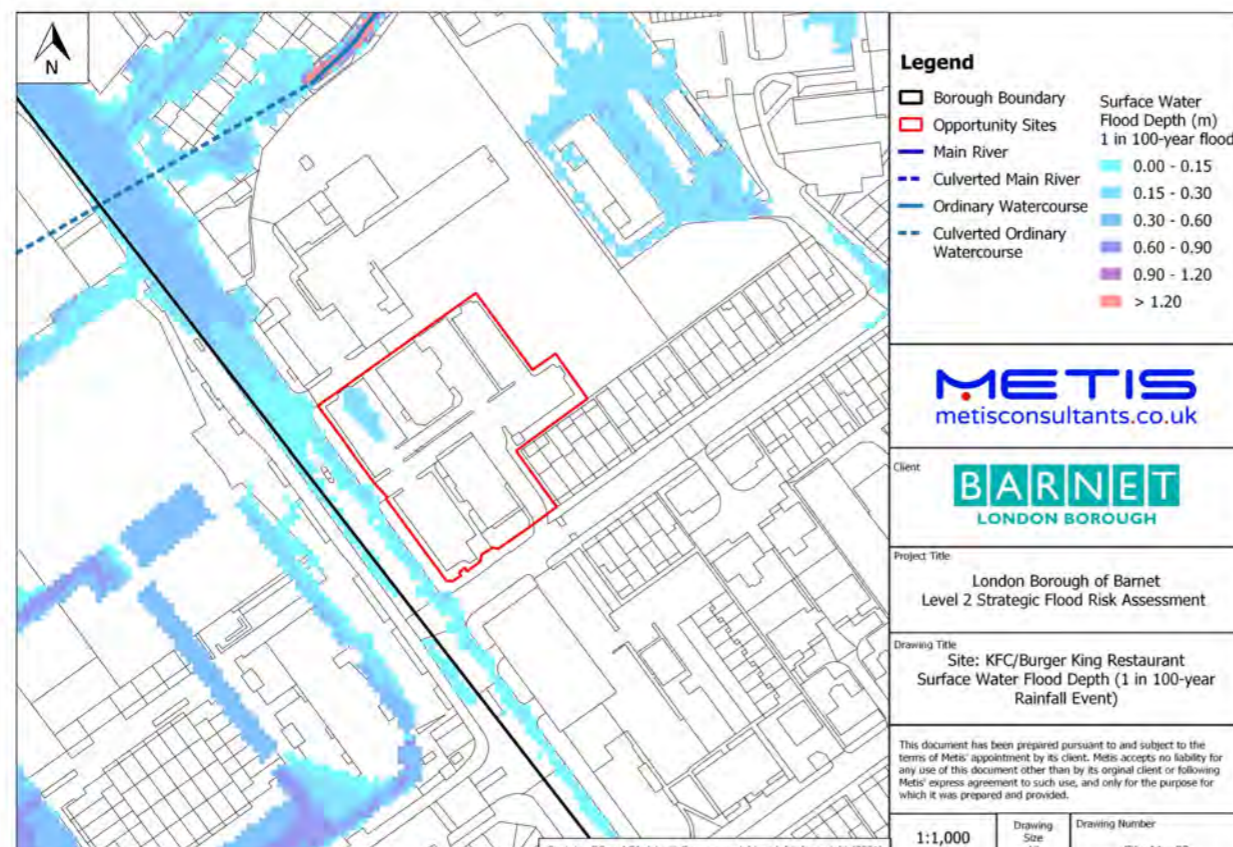


Figure 4 - RoFSW Flood Hazard Map

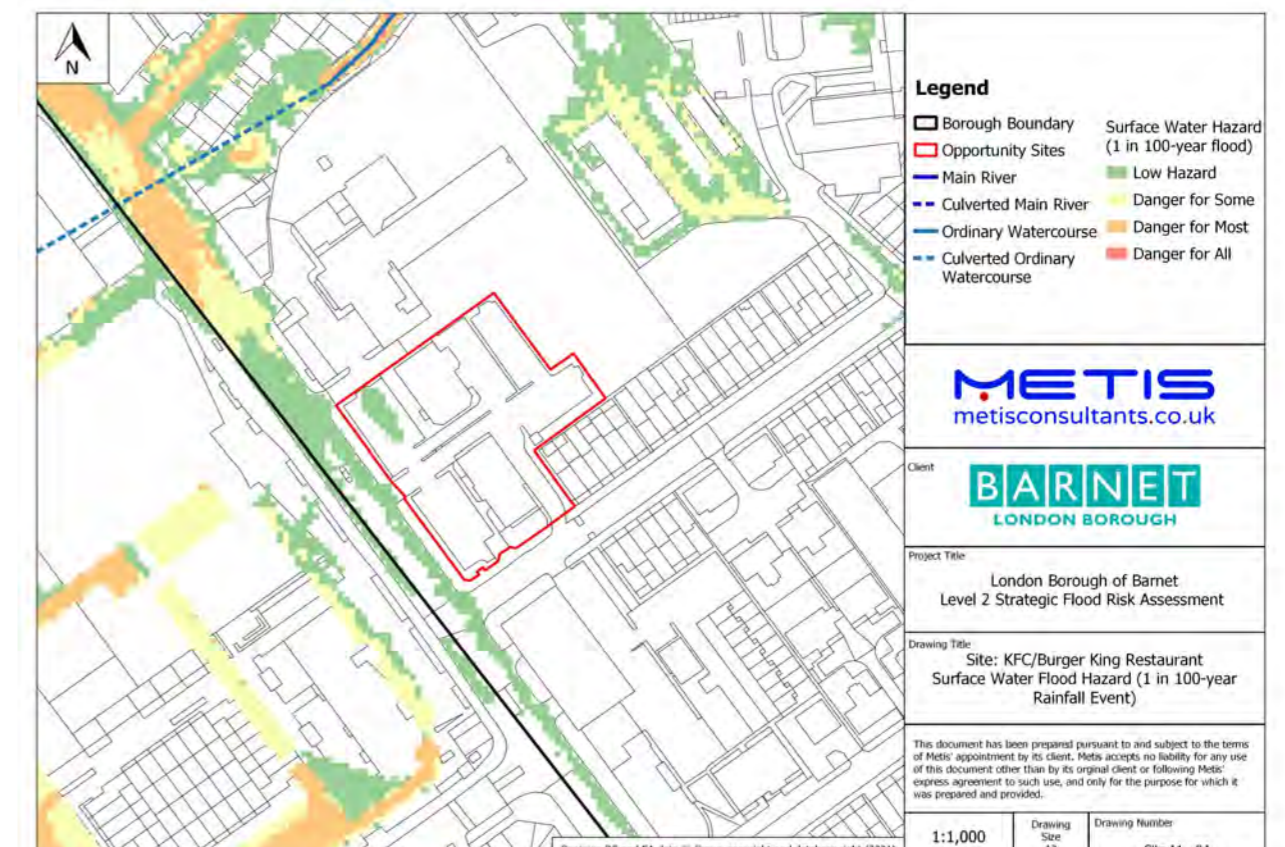


Figure 5 - Thames Water Sewer Flood Map

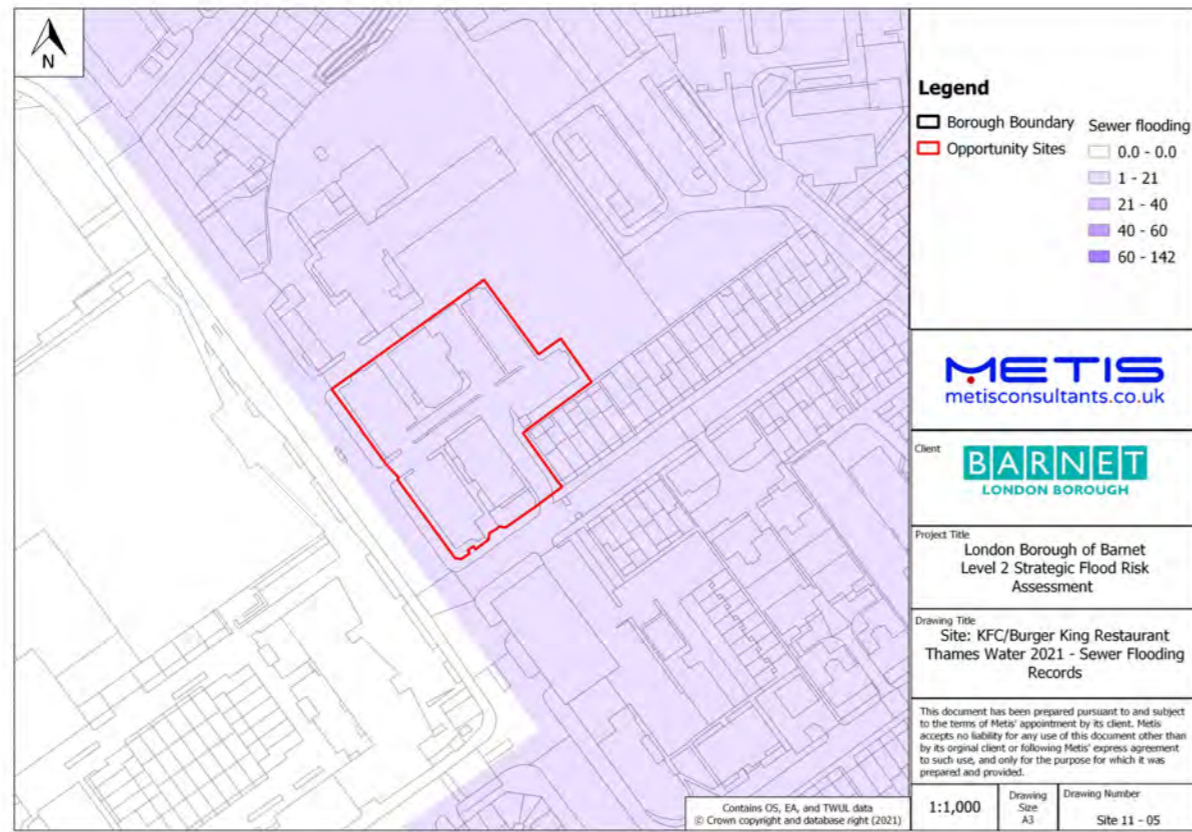


Figure 6 - Areas Susceptible to Groundwater Flooding Map

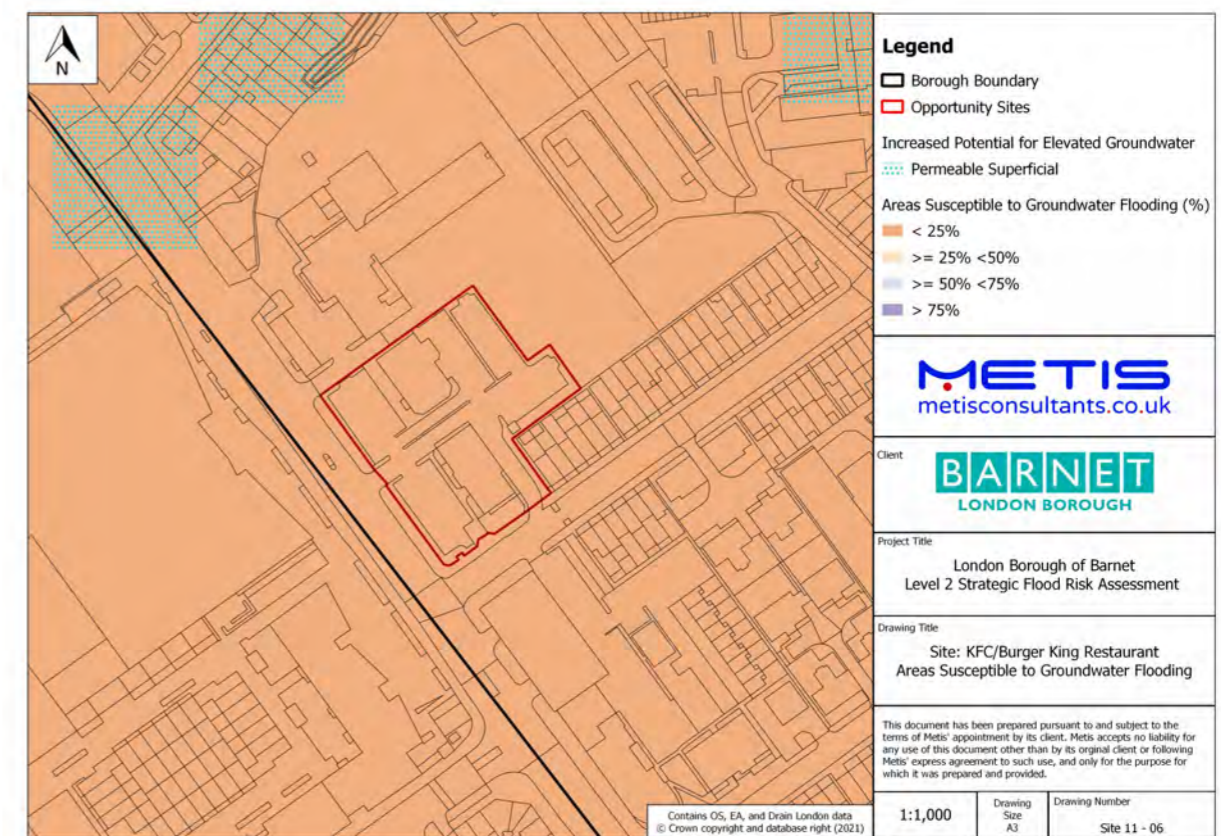
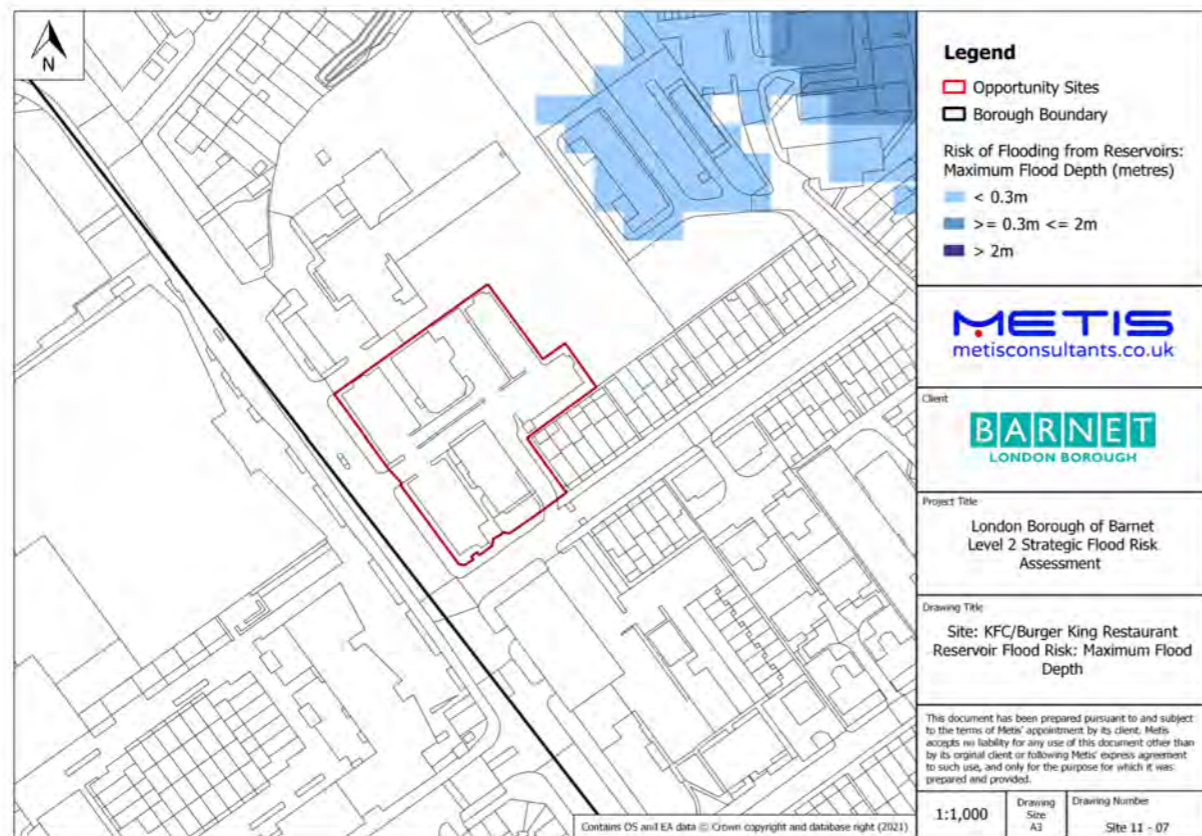


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - McDonald's Restaurant

Address: 157 Colindeep Lane, NW9 6BD	Area: 0.48 Ha
	Site Reference: 12

Current Use	Proposed Use
Restaurant and car parking	Residential with 10% A3 to A5 uses

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	100	% of Site
FZ3a	0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	0	% of Site	Artificial		
1% AEP	0.7	% of Site	Reservoir	No	At risk?
0.1% AEP	46.6	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		5			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0	0 - 0.15	0 - 0.15	m
Max. Velocity	0	0.50 - 1.00	0.50 - 1.00	m/s
Max. Hazard	0	0.50 - 0.75	0.50 - 0.75	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site from the south-west by the A5 and flows diagonally across to accumulate at the north-eastern edge. CC is predicted to increase flood extent, but not maximum depth, velocity, or hazard.

Site Access / Egress
<ul style="list-style-type: none"> In the 1% AEP surface water event, there is little predicted flooding in the site, and egress routes can be towards Colin Park Road on the east. When climate change is accounted for (i.e. 0.1% AEP RoFSW), the current restaurant building is surrounded on all sides by water. For this scenario, an emergency evacuation plan must be put in place.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against the 0.1% AEP surface water event, all development must have raised floor levels. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - McDonald's Restaurant

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 5 recorded incidents of sewer flooding in this site's postcode district (NW9 6). 2 of these were internal and 3 were external incidents, all in the 5% AEP event. 	<ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	There is no risk from artificial flooding.
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	No mitigation measures are required.	No mitigation measures are required.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA Level 2 Report mitigation requirement numbers 4.2 and 4.3 for finished floor level and flood resistant / resilient building regulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA Level 2 Report mitigation requirement number 4.4 for compensatory flood storage requirements. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing from the 'less vulnerable' to the 'more vulnerable' classification. This can increase flood risk, especially on the north of the site. The site is currently a brownfield consisting of mostly hardstanding. Development may result in the loss of flood storage. There is a strip of green space to the west of the restaurant building. Paving over this would result in an increase in impermeable surface and therefore runoff. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. It is anticipated that runoff from the site is currently at an uncontrolled rate. SuDS should be introduced to manage this. (See Mitigation - Surface Water Drainage). A plan must be created for management of residual risks - See SFRA Level 2 Report mitigation requirement number 4.5. This is essential as the current restaurant building is predicted to be surrounded by flood water in the 1% AEP plus climate change (i.e. 0.1% AEP RoFSW) surface water event. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, there are no Main Rivers or Ordinary Watercourses near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood resistant/resilient construction is required. 	<ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

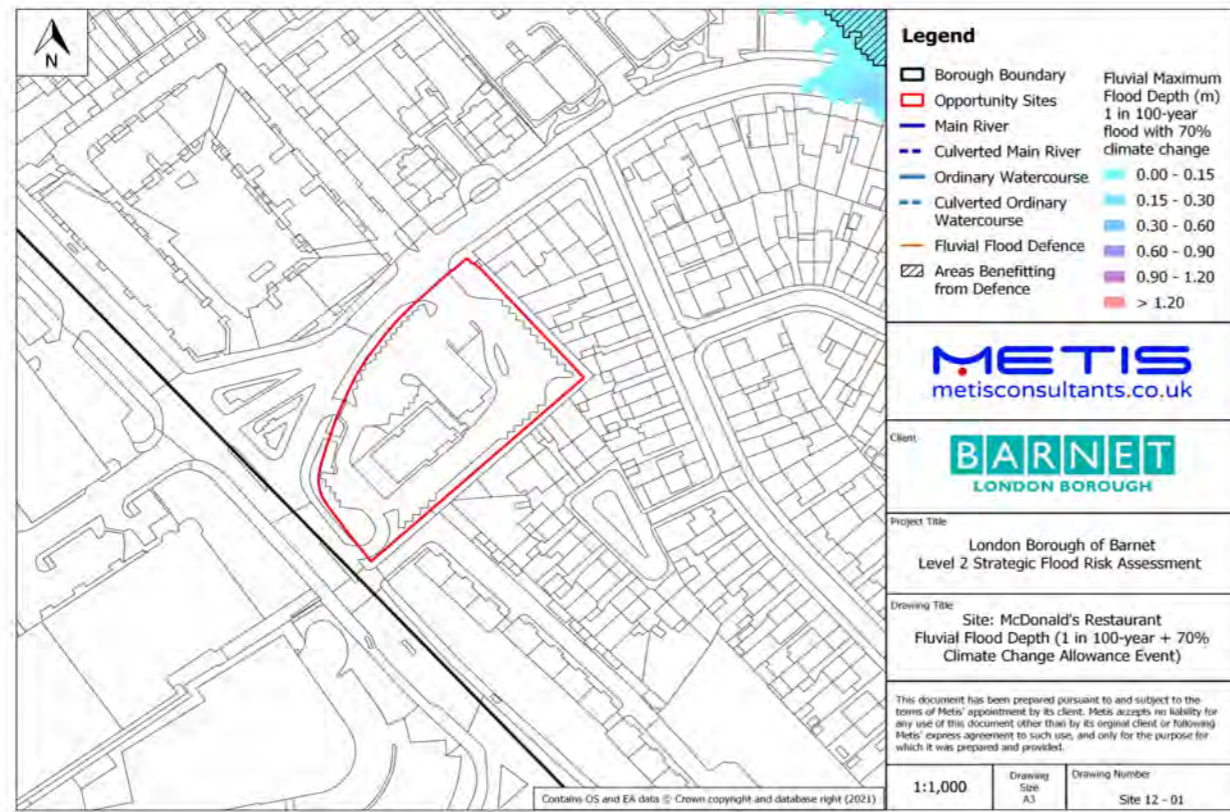


Figure 2 - Fluvial Flood Hazard Map

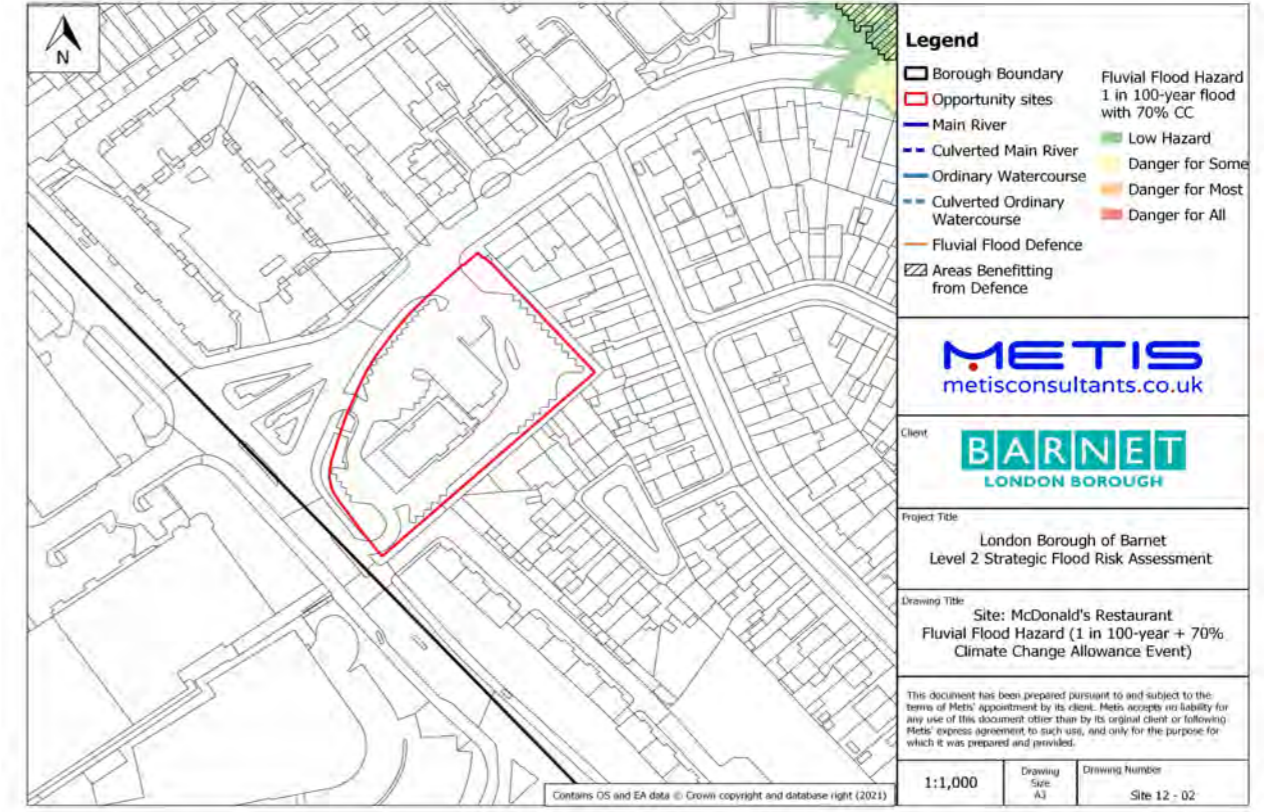


Figure 3 - RoFSW Flood Depth Map

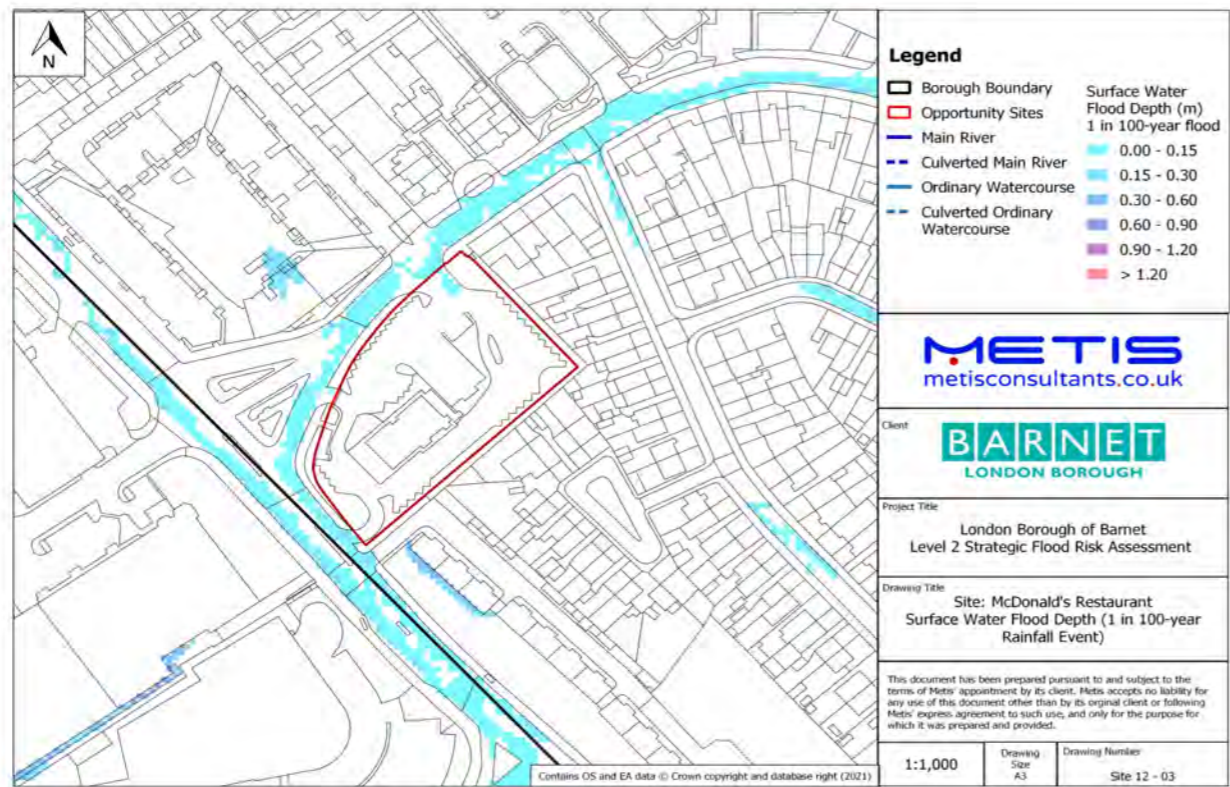


Figure 4 - RoFSW Flood Hazard Map

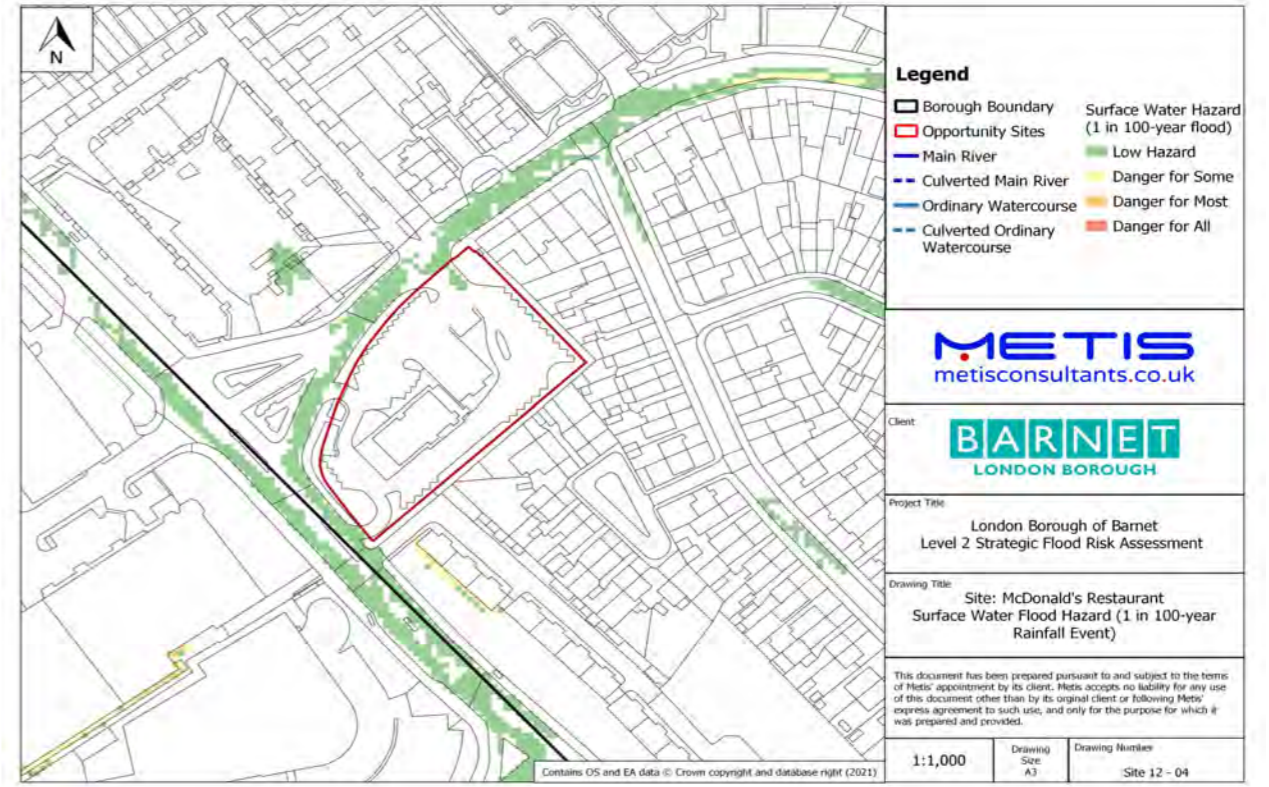


Figure 5 - Thames Water Sewer Flood Map

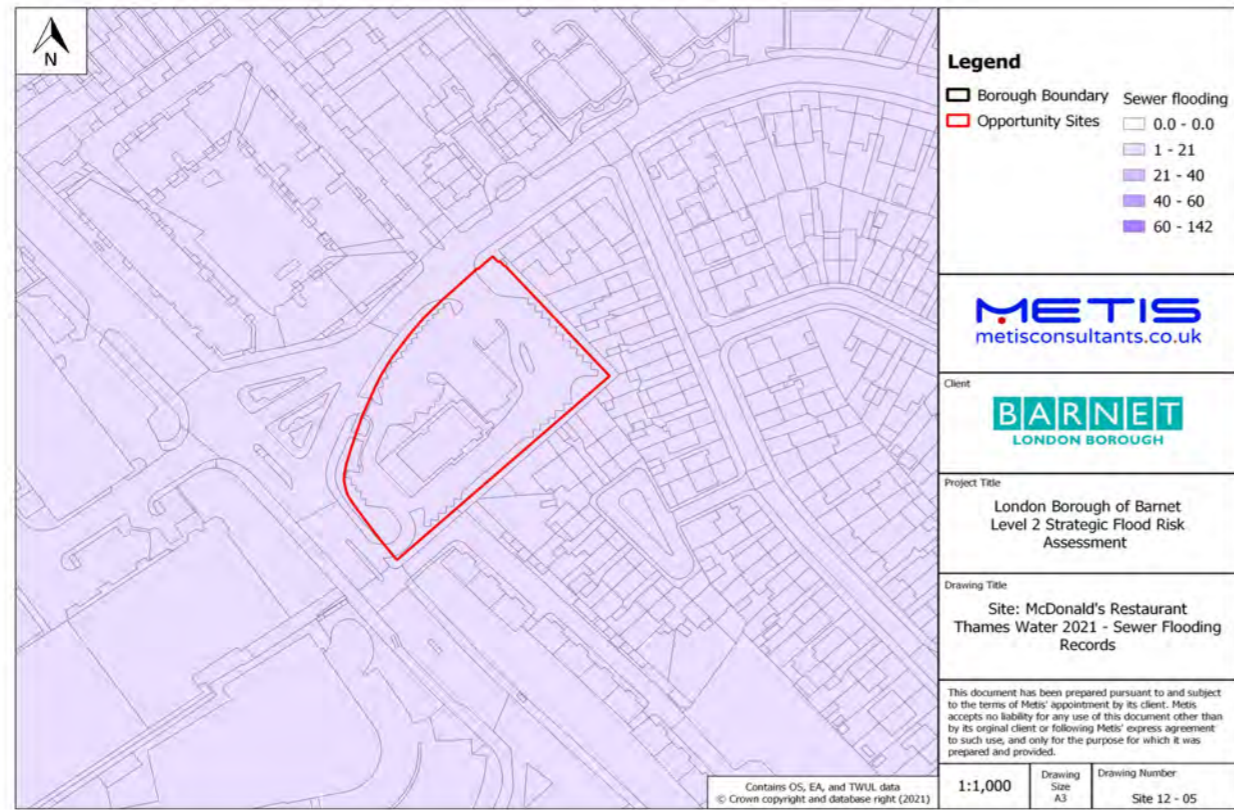


Figure 6 - Areas Susceptible to Groundwater Flooding Map

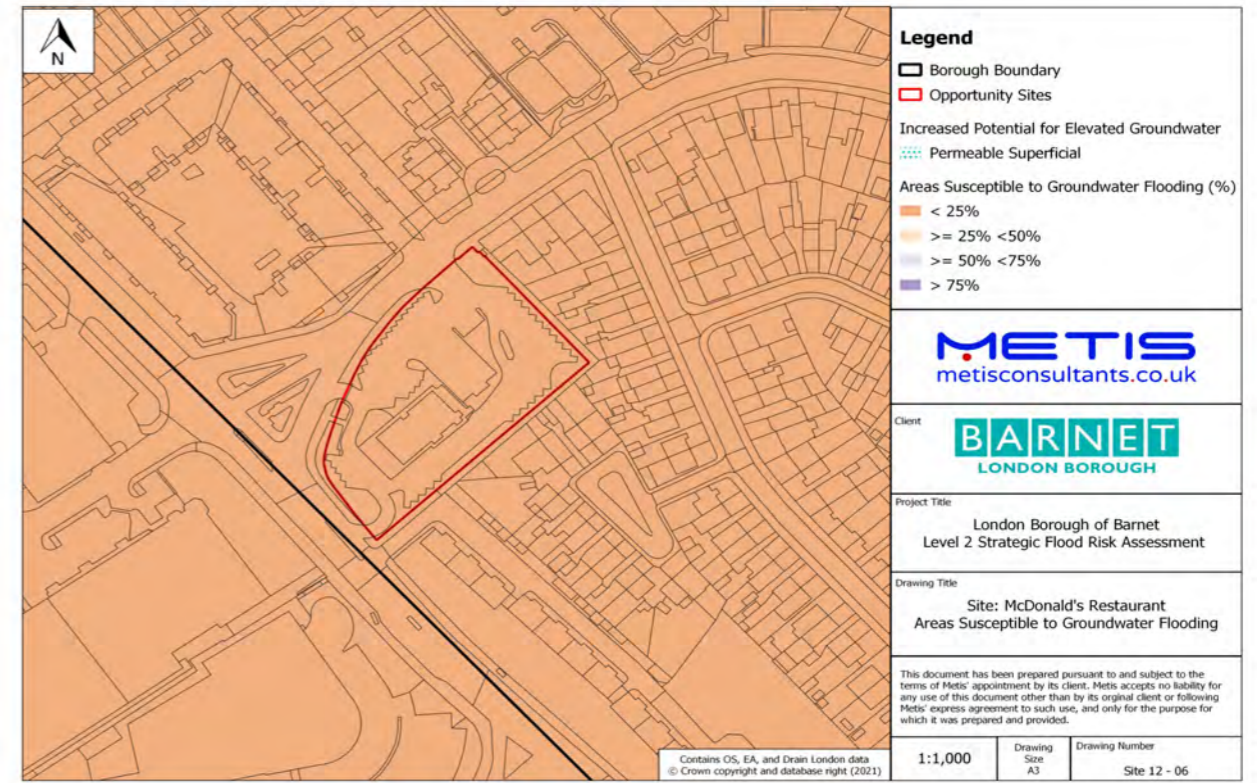
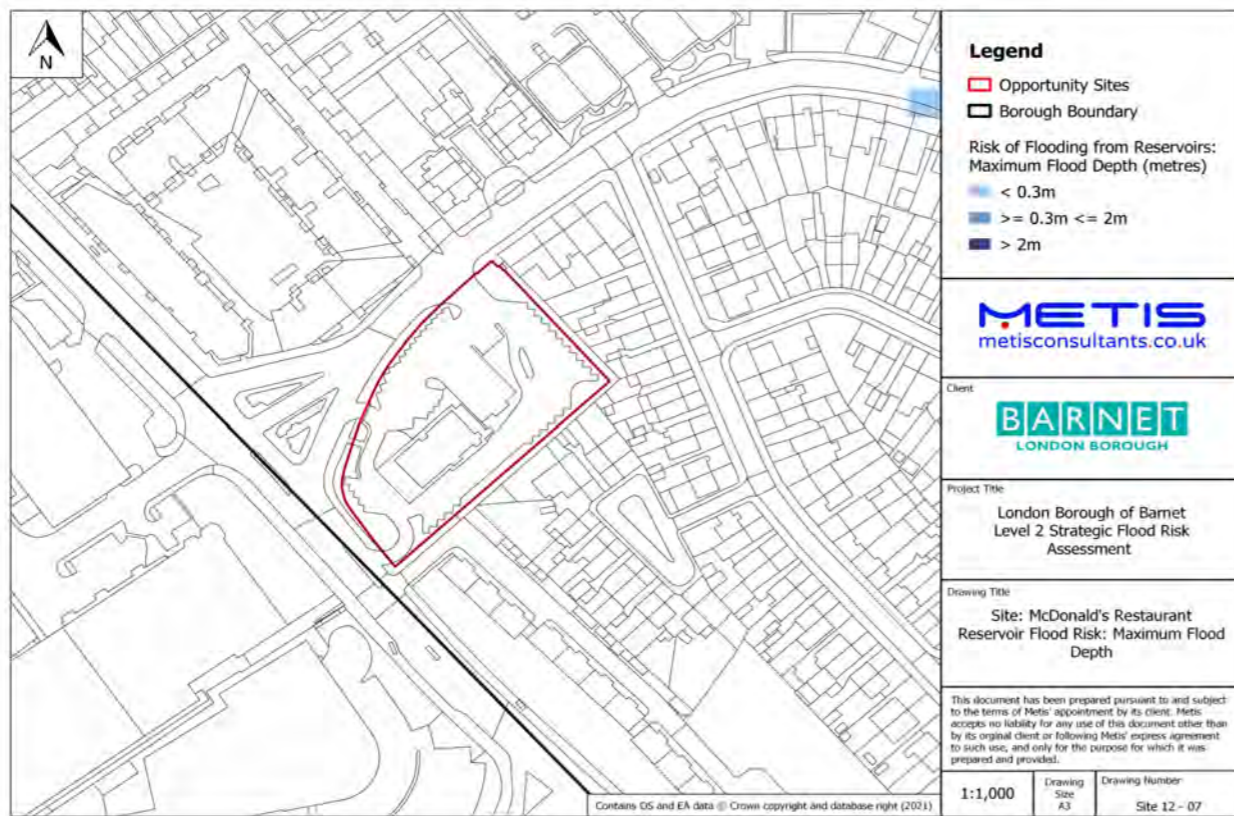


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Public Health England

Address: 61 Colindale Avenue, NW9 5EQ/HT	Area: 3.57 Ha
	Site Reference: 13

Current Use	Proposed Use
Research laboratories	Residential-led with 5% community

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	31.4	% of Site	<25	100	% of Site
FZ3a	26.0	% of Site	25-50	0	% of Site
FZ3b	20.9	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	2.4	% of Site	Artificial		
1% AEP	8.4	% of Site	Reservoir	Y	At risk?
0.1% AEP	27.6	% of Site	Canal	N	At risk?
Sewer Flooding			Other	Y	At risk?
No. Incidents					

Flood Defences
<ul style="list-style-type: none"> The site is not in an area benefitting from flood defences. A small area opposite the site on Annesley Avenue benefits from flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	1	1	0.75	Hrs
Min. Depth	0	0	0	m
Max. Depth	3.7	4.0	4.3	m
Max. Velocity	1.2	1.2	1.3	m/s
Max Flood Level	43.10	43.38	43.62	m AOD
Max Ground Level	49.94	49.94	49.94	m AOD
Min Ground Level	40.24	40.24	40.24	m AOD
Flood Hazard	Danger for All	Danger for All	Danger for All	N/A
Duration of Flood	17.75+	17.75+	18+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Silk Stream. The river runs along the western and southern boundaries of the site. Ground levels are lower on the northern/eastern bank of the river (site-side). The site is predicted to flood as a result of the Silk Stream bursting its banks, inundating the site from south/west. The predicted flood risk extent for the climate change scenario is slightly greater, leaving a larger extent of the site in south-west at risk of flooding. The predicted maximum flood depth and maximum velocity is greater under the climate change scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 29.2%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> The south-western region of the site is flooded in the 1% AEP year scenario. Safe access and egress routes from the site should be routed towards the north on Charcot Road and Lingard Avenue. These areas are not at predicted risk of flooding in a 1% AEP + Climate Change scenario.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP + climate change fluvial event, developments should be restricted to areas towards the northern and eastern regions of the site. Proposed developments on the site should be located outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream. Developments within 20m of the Main River require consultation with the EA. Basements are not permitted in Flood Zone 3b. Outside of the Flood Zone 3b extent, basement developments should be limited to less vulnerable / water compatible uses. See SFRA - Level 2 Report section numbers 4.2, 4.3 and 4.4 for further development requirements. See SFRA - Level 2 Report section numbers 4.6 for Main River requirements. Develop a Flood Emergency and Evacuation Plan for the site. Site users should be signed up to EA's Flood Warning Service.

SURFACE WATER

Risk Assessment*				
Parameter	3.33% AEP	1% AEP	**0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.30 - 0.60	> 1.20	m
Max. Velocity	0.50 - 1.00	0.50 - 1.00	> 2.00	m/s
Max. Hazard	0.75 - 1.25	1.25 - 2.00	> 2.00	N/A

* Site extent encroaches in to the Silk Stream. The values provided are for the extent outside of the Silk Stream channel extent.

** The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site from the north-east and flows south. Climate Change is predicted to increase flood extent, depth, velocity, and hazard.

Site Access / Egress
Safe access/egress can be towards the east of the site, close to Lingard Avenue, which is predicted to have low flood risk. An alternative is the south-eastern corner of the site, towards Colindale Avenue.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> More vulnerable development should be located to the north and middle of the site, but avoiding the access road in between the main buildings (which is predicted to have high flood risk) See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Public Health England

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The site is served by a trade effluent foul sewer. There have been 7 recorded incidents of sewer flooding in the site's post code district (NW9 5). All of these have been internal incidents in the 1 in 20-year (5% AEP) event. 	<ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. The site is underlain by London Clay bedrock geology. The region close to the Silk Stream is underlain by Alluvium (clay, silt, sand, and gravel) superficial deposits. The south and south-western edges of the site fall within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. 	<p>The site is at risk of artificial flooding. This risk of flooding is primarily from the Lake (Fish Pond) in Lake Grove Park. The Stoney Wood Lake near the Mill Hill golf course and the Edgwarebury Brook by Edgwarebury Park also places the site at risk of artificial flooding.</p> <ul style="list-style-type: none"> The artificial flooding extent is predicted to leave the north and eastern half of the site at risk of flooding. The site is predicted to flood between 0.3-2m. Reservoir failure flood speeds are predicted to be between 0.5 and 2m/s.
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm whether the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	No mitigation measures are required.	<ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development land use is changing from a 'Less Vulnerable' to 'More Vulnerable' classification. The site is proposed to be used for residential purposes. The site is currently a brownfield site with hardstanding areas. However, there are landscaped and areas of green space throughout the site. Development must mitigate any increase in impermeable area to the site with flood plain compensation and runoff storage to prevent any increase in flood risk. An increase in impermeable area coverage and change in topography on site will increase surface water runoff and flood risk if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Restricting development to areas towards the northern and eastern regions of the site. Proposed developments on the site should be located outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). Basements are not permitted in Flood Zone 3b. Basements developments outside of the Flood Zone 3b extent, that are less vulnerable or water compatible uses, may be appropriate onsite, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP event. Non-dwelling basement developments within the 1% AEP fluvial and surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - the Silk Stream borders the site. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against fluvial flooding, including deep maximum fluvial flood depths, can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	Fluvial / Tidal
<ul style="list-style-type: none"> Development should be restricted to areas towards the northern and eastern regions of the site . Proposed developments on the site should be located outside of the 8m Main River buffer zone. 	<ul style="list-style-type: none"> Tall buildings should not be located within the 20m of the Silk Stream. Safe egress routes from the site should be directed towards the north of the site.
Surface Water	Surface Water
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. More vulnerable development should be restricted to the north and centre of the site. 	<ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Flood resistant / resilient buildings required.
Sewer	Sewer
Consult Thames Water to confirm whether the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	Groundwater
No mitigation measures are required.	
Artificial	Artificial
Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.	

Figure 1 - Fluvial Flood Depth Map

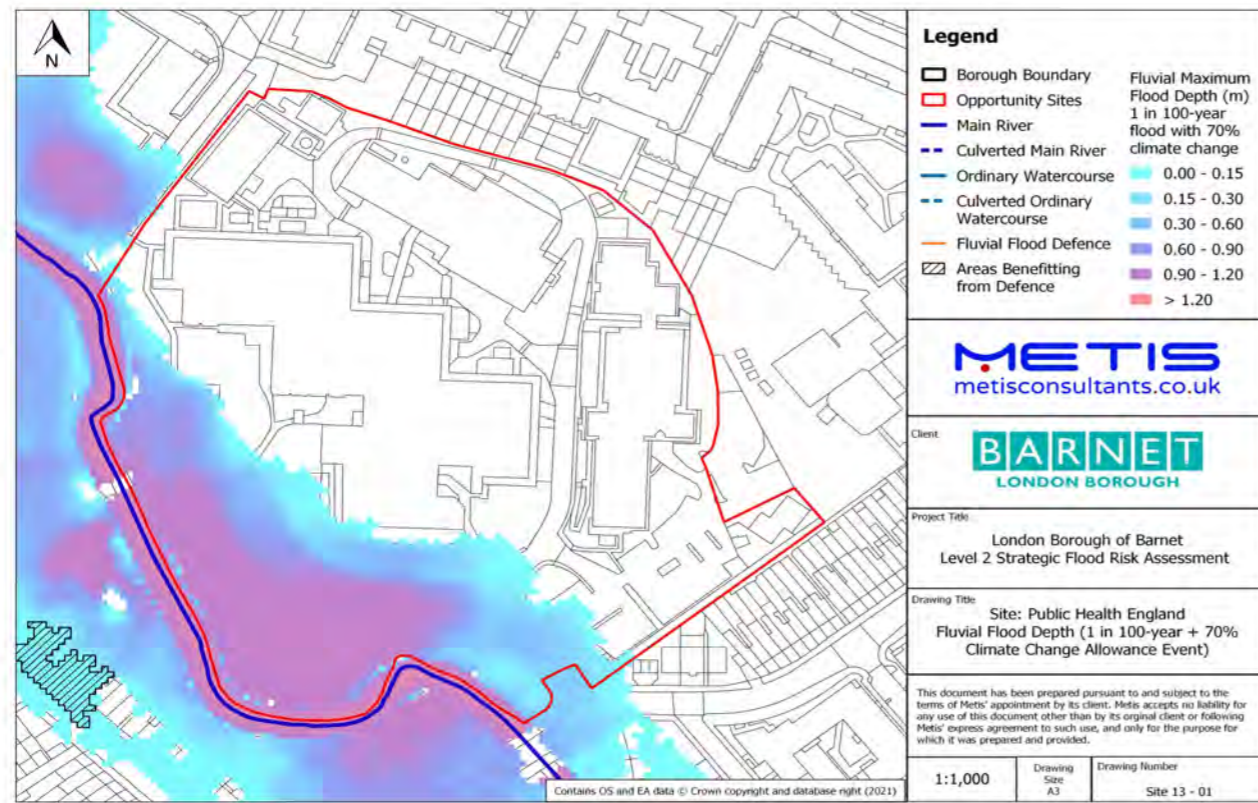


Figure 2 - Fluvial Flood Hazard Map

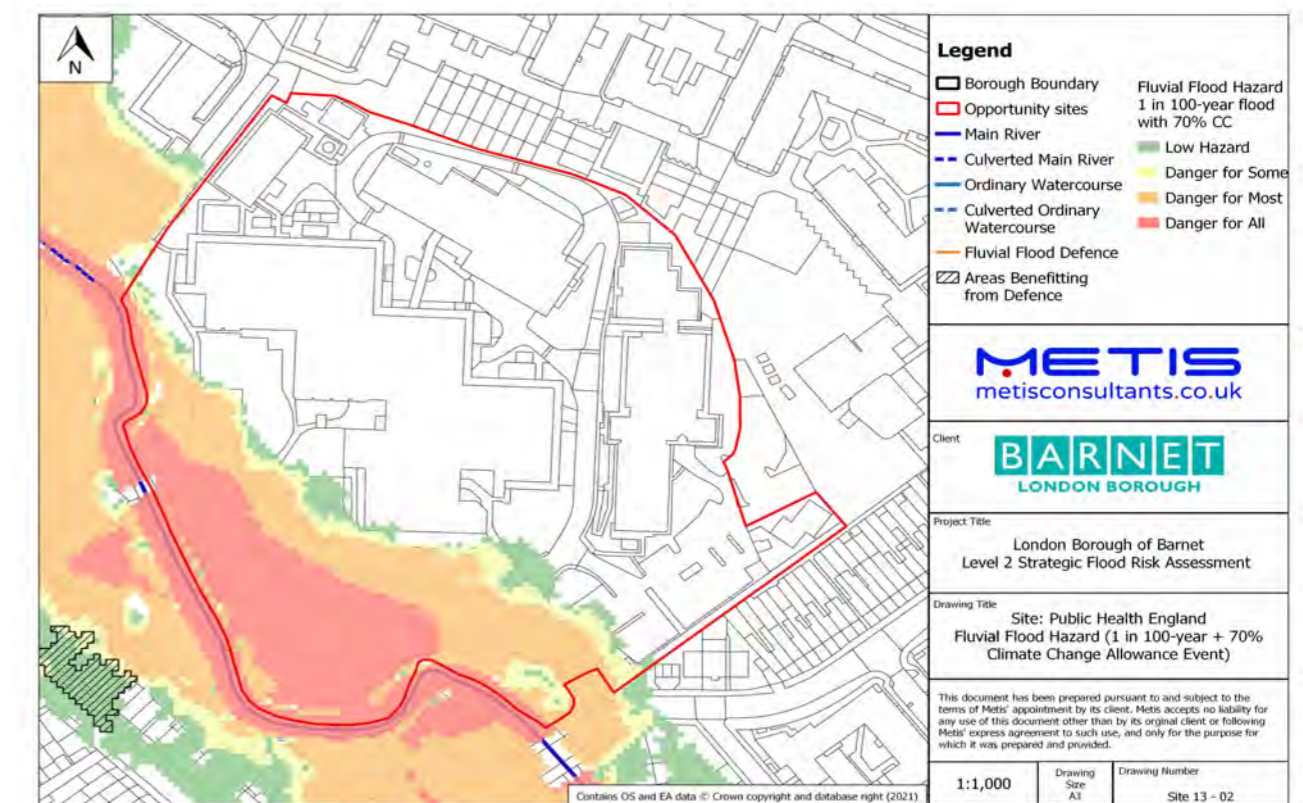


Figure 3 - RoFSW Flood Depth Map

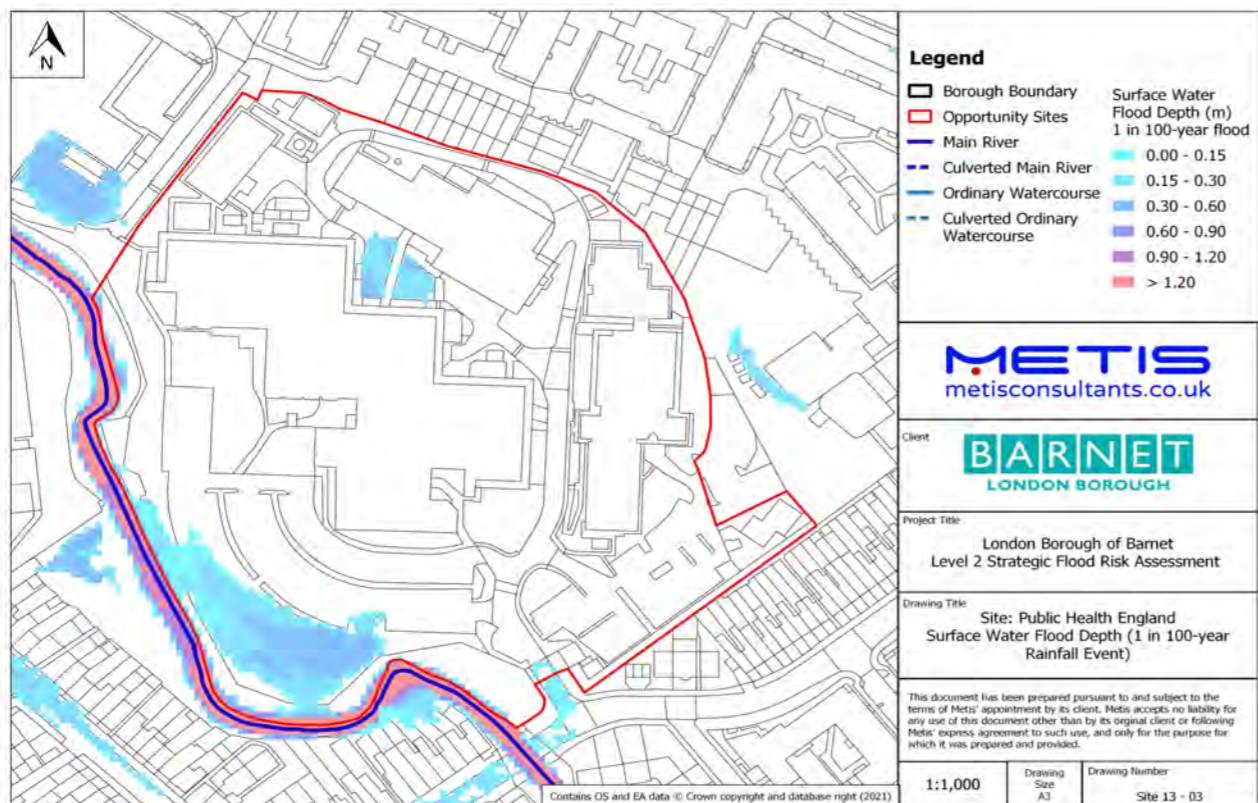


Figure 4 - RoFSW Flood Hazard Map

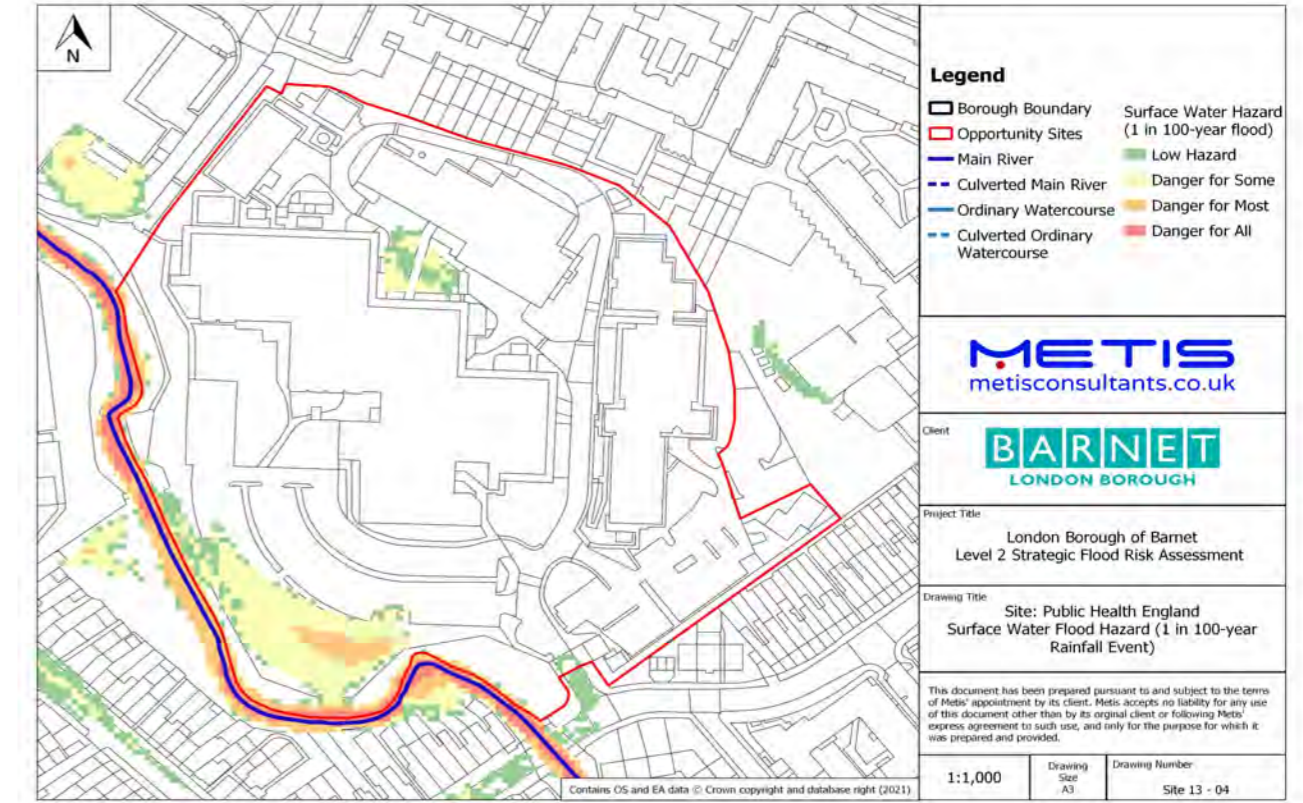


Figure 5 - Thames Water Sewer Flood Map

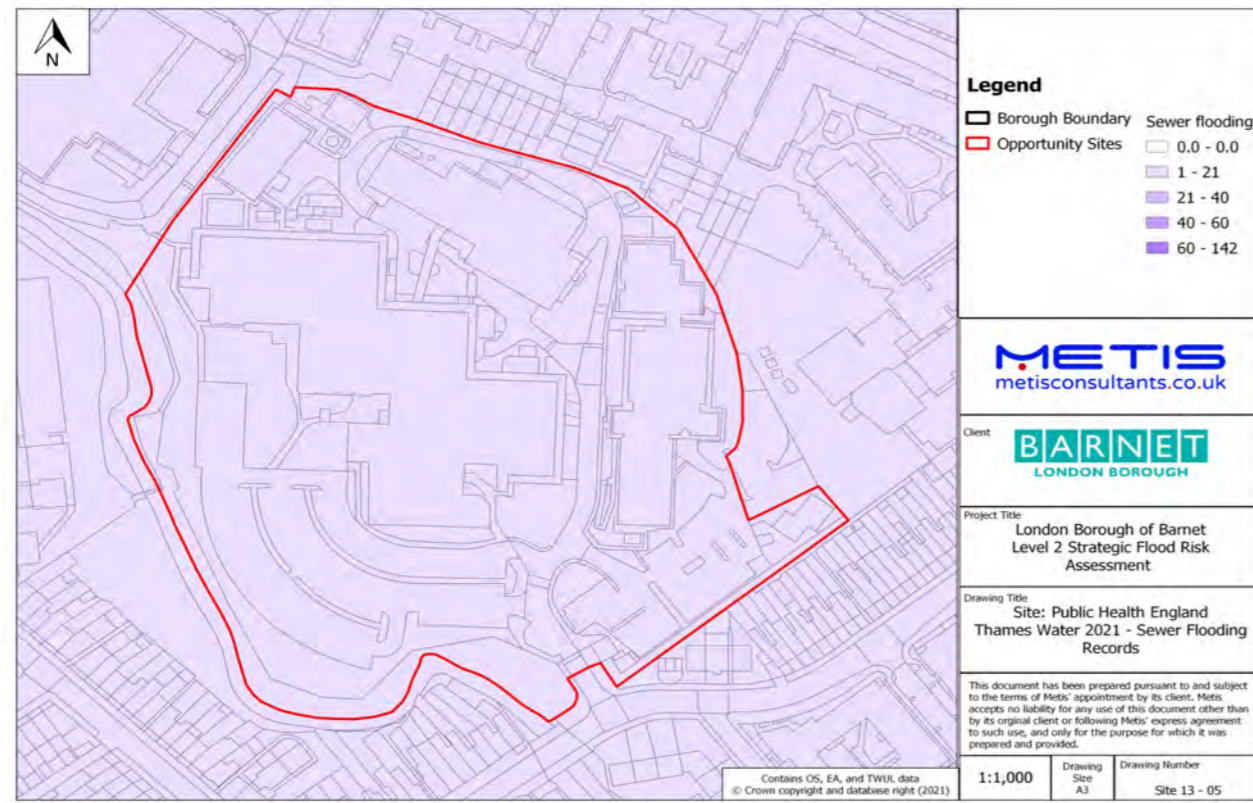


Figure 6 - Areas Susceptible to Groundwater Flooding Map

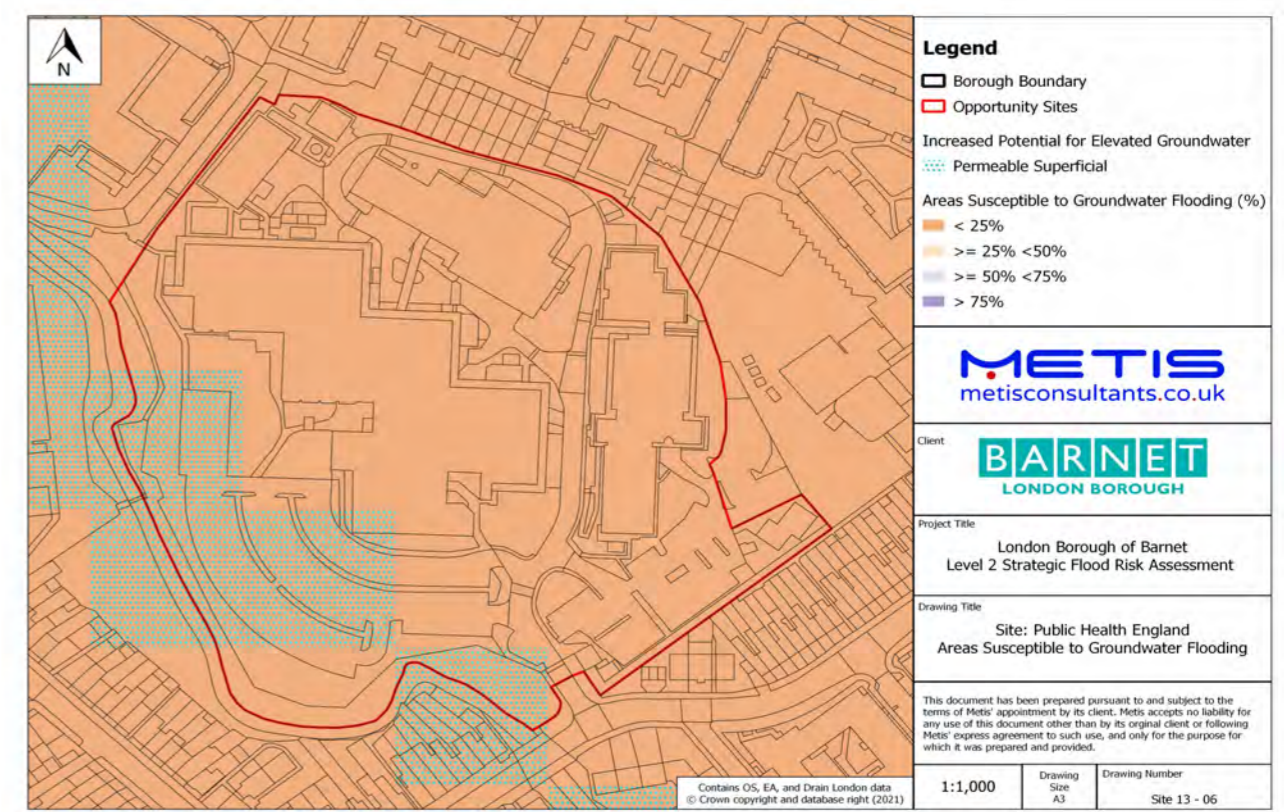
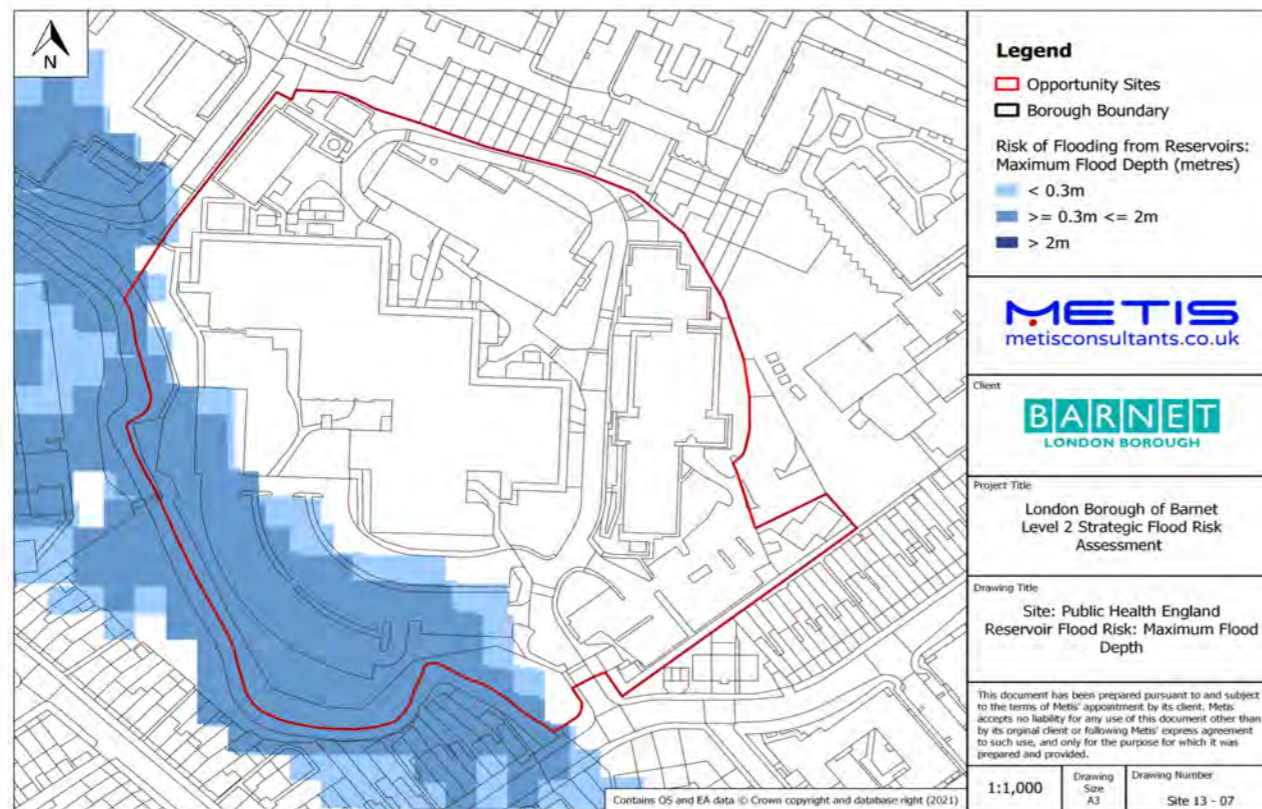


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Sainsbury's The Hyde

Address: Edgware Rd, The Hyde, NW9 6JX	Area: 3.26 Ha
	Site Reference: 14

Current Use	Proposed Use
Supermarket with associated car parking and petrol station	Residential with 25% mixed uses (retail, car parking, community)

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal **			Groundwater		
FZ2	78.2	% of Site	<25	100	% of Site
FZ3a	12.7	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	2.9	% of Site	Artificial		
1% AEP	6.6	% of Site	Reservoir	Y	At risk?
0.1% AEP	19.1	% of Site	Canal	N	At risk?
Sewer Flooding			Other	Y	At risk?
No. Incidents		5			

Flood Defences
<ul style="list-style-type: none"> There are no flood defences located either on or within the immediate vicinity of the site. The site is in an area that benefits from flood defences, located upstream in Edgwarebury Park for the Silk Stream.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	4.5	3.25	Hrs
Min. Depth	N/A	0	0	m
Max. Depth	N/A	0.1	1.6	m
Max. Velocity	N/A	0.1	1.2	m/s
Max Flood Level	N/A	40.00	40.73	m AOD
Max Ground Level	42.89	42.89	42.89	m AOD
Min Ground Level	38.99	38.99	38.99	m AOD
Flood Hazard	N/A	Caution	Danger for most	N/A
Duration of Flood	N/A	2.25	15.5+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Silk Stream. The river runs close to the site's eastern and southern border. Ground levels are lower on the northern / western bank of the river (site-side). The Silk Stream inundates the site from the south in the 1% AEP event. The predicted flood risk extent for the climate change scenario is significantly greater, with the south and east of the site at risk of flooding. The maximum flood depth, maximum velocity and flood hazard is greater under this scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 57.9%. <p>** The Flood Zones and the Silk Stream model results for the 1% AEP runs differ significantly. Based on the Silk Stream model outputs, this site is at minimal risk of fluvial flooding during a 1% AEP event (Flood Zone 3a) as the site likely benefits from flood defences. The Silk Stream model considers the impact of flood defences on flood risk, whereas Flood Zones do not. The worst case scenario (EA Flood Zone) was used for this assessment.</p>

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> A region in the southern extent of the site is at risk of flooding in the 1% AEP scenario. The flood risk extent is significantly greater in the 1% AEP + Climate Change scenario, leaving south and eastern regions of the flooded. Safe access and egress routes from the site should be routed towards the north on Hyde Estate Road.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> Development should be restricted to areas located towards the north-western regions of the site. Proposed developments on the site should be located outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream. Developments within 20m of the Main River require consultation with the EA. Limit basement developments to less vulnerable or water compatible uses. See SFRA - Level 2 Report section numbers 4.2, 4.3 and 4.4 for further development requirements. See SFRA - Level 2 Report section number 4.6 for Main River requirements. Develop a Flood Emergency and Evacuation Plan for the site. Site users should be signed up to EA's Flood Warning Service. There may be a residual risk of flooding if the Silk Stream flood defences are breached. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. Developers must consult with the EA regarding the most appropriate measures.

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.15 - 0.30	0.30 - 0.60	0.60 - 0.90	m
Max. Velocity	0 - 0.25	0.25 - 0.50	0.50 - 1.00	m/s
Max. Hazard	0.75 - 1.25	0.75 - 1.25	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Surface water enters from Edgware Road and Hyde Estate Road on the site boundary, converging to the east and south of the current supermarket building. Climate Change will increase the flood extent, velocity, depth, and hazard.

Site Access / Egress
<ul style="list-style-type: none"> The site is predicted to be surrounded on all sides with shallow but high velocity flood water, especially in the 0.1% AEP scenario. Safe refuge areas should be provided on site. Safe access and egress routes from the site should be routed towards the north on Hyde Estate Road, where the predicted flood risk extent is lower for a 1% AEP event. Evacuation needs to occur before the surrounding areas of the site are inundated due to surface water.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against the 1% AEP surface water event, more vulnerable development should be located away from the east of the site. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations would be required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Sainsbury's The Hyde

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 5 reported incidents of sewer flooding in this site's postcode region (NW9 6): 2 internal and 3 external incidents, both in the 1 in 20-year (5% AEP) rainfall event. 	<ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. The site is in close proximity to the Silk Stream, which is underlain by a Alluvium (clay, silt, sand, and gravel) superficial deposits. The whole site is also underlain by London Clay bedrock deposits. 	<ul style="list-style-type: none"> The eastern and southern edges of the site (parallel to the Silk Stream) are at risk of artificial flooding from overflows of flood storage areas at Prince Edward Playing Fields, Stoney Wood, and Bury Farm. Overflow from Seven Acre Lake may also cause flooding on the site. Flood depth is predicted to be between 0.3m and 2m. Flood speed is predicted to be under 0.5 m/s.
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	No mitigation measures required.	<ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building stipulations. Directing development towards the north-western regions of the site, where the site is not predicted to flood based on the EA Flood Zone mapping. The West London SFRA Silk Stream hydraulic model data and EA Flood Zone flood extents do not align with each other. This is because the Silk Stream model considers the impact of flood defences on flood risk, whereas Flood Zones assume there are no defences in place. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. Developers must consult with the EA regarding the most appropriate measures. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through measures such as rain gardens, other above ground SuDS measures such as basins or swales, and / or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage stipulations. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The development land use is changing from a 'Less Vulnerable' to 'More Vulnerable' classification. The site is proposed to be used for residential purposes. The site is currently a brownfield site with hardstanding areas. Development must mitigate any increase in impermeable area to the site with flood plain compensation and runoff storage to prevent any increase in flood risk. An increase in impermeable area coverage and change in topography on site may increase surface water runoff and runoff to the Silk Stream, increasing surface water and fluvial flood risk if not managed properly. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Proposed developments on the site should be located outside of the 8m Main River buffer zone. Tall buildings should not be located within 20m of the Silk Stream. The inclusion of suitable SuDS measures on site would provide management for surface water runoff from the site. Increased attenuation / storage on site would improve the management of surface water, and reduce the risk of surface water flooding as a result. Basements developments, that are less vulnerable or water compatible uses, may be appropriate onsite, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP event. Non-dwelling basement developments within the 1% AEP fluvial and surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted Flood Zone 3a + CC fluvial and 0.1% AEP surface water flood depths. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes - the Silk Stream borders the site. See SFRA - Level 2 Report Section 4.6 for further requirements. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against fluvial flooding, including deep maximum fluvial flood depths, can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
<ul style="list-style-type: none"> Development should be restricted to areas towards the north-western regions of the site to future proof the development against climate change. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. 	<ul style="list-style-type: none"> Proposed developments on the site should be located outside of the 8m Main River buffer zone. Tall buildings should not be located within the 20m of the Silk Stream. Safe egress routes from the site should be directed north.
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	<ul style="list-style-type: none"> Flood resistant / resilient buildings required. Introduce SuDS to reduce surface water runoff to greenfield rates. Safe refuge areas should be provided on site.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.	

Figure 1 - Fluvial Flood Depth Map

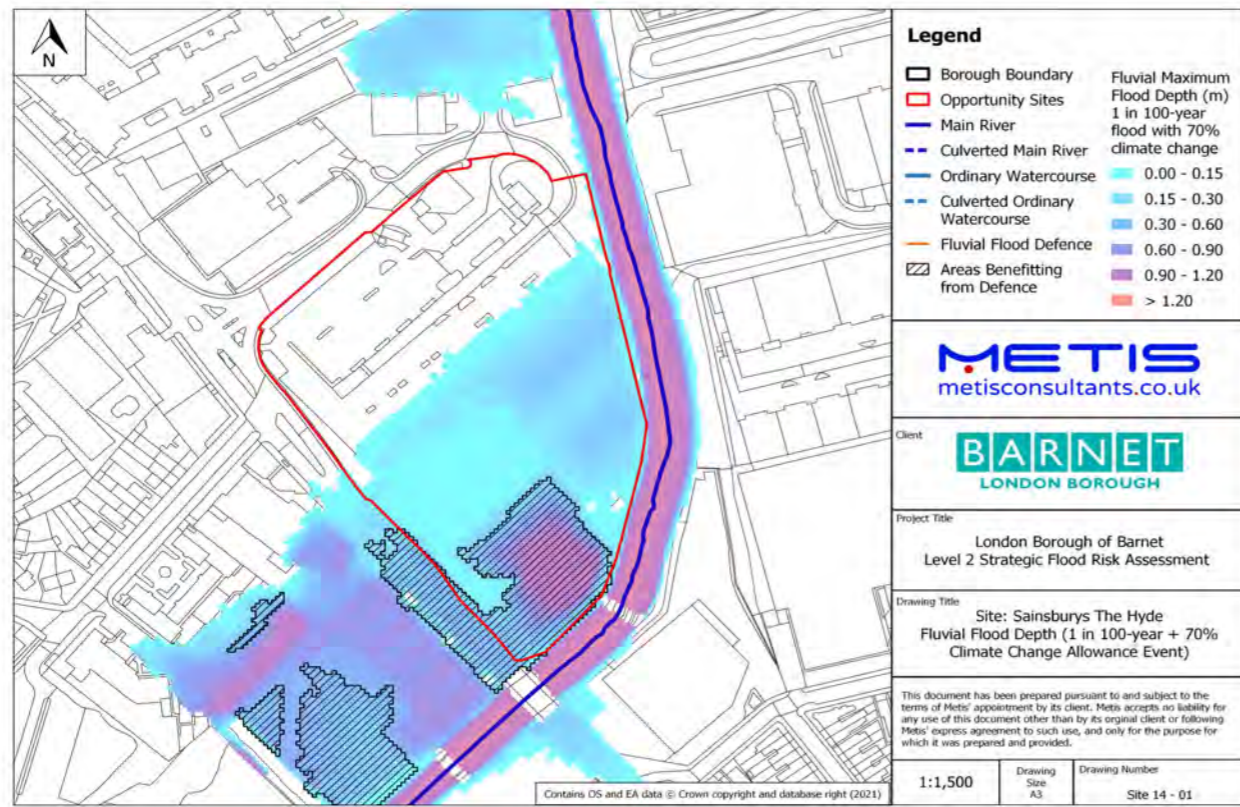


Figure 2 - Fluvial Flood Hazard Map

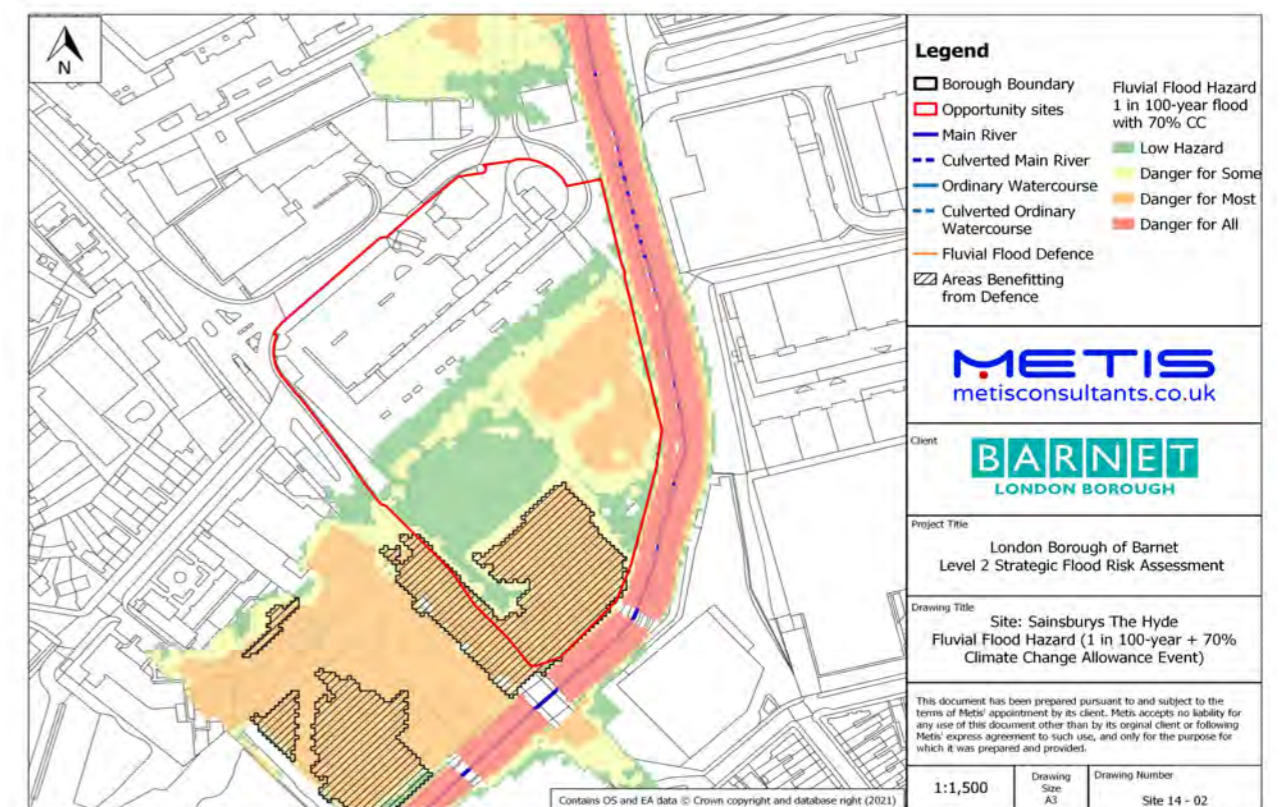


Figure 3 - RoFSW Flood Depth Map

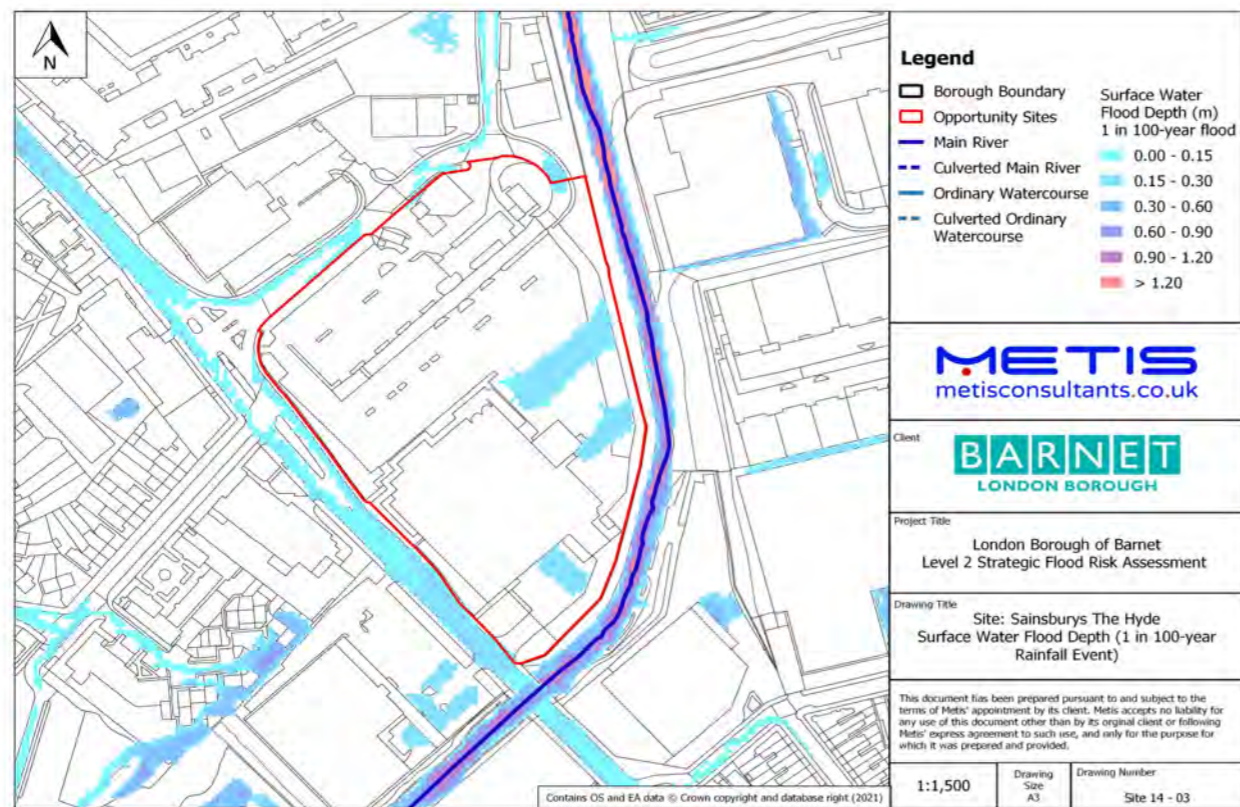


Figure 4 - RoFSW Flood Hazard Map

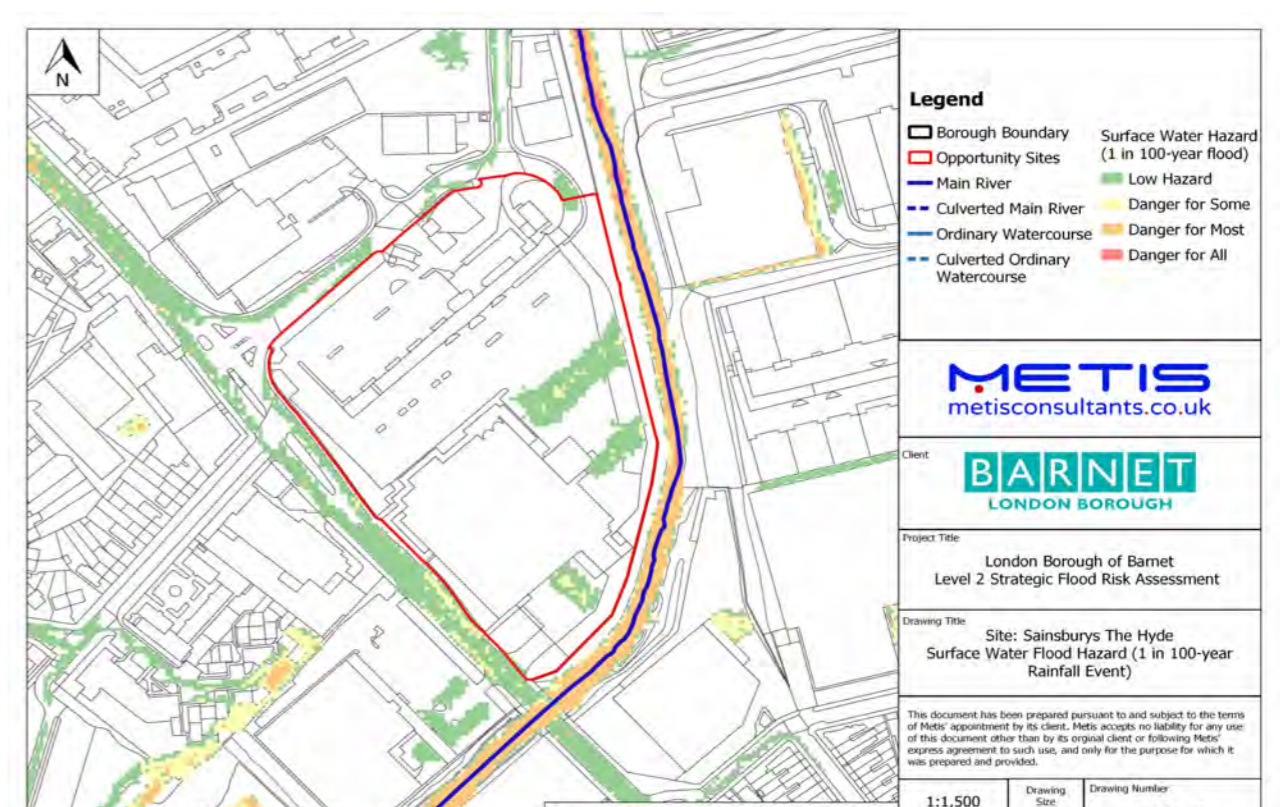


Figure 5 - Thames Water Sewer Flood Map

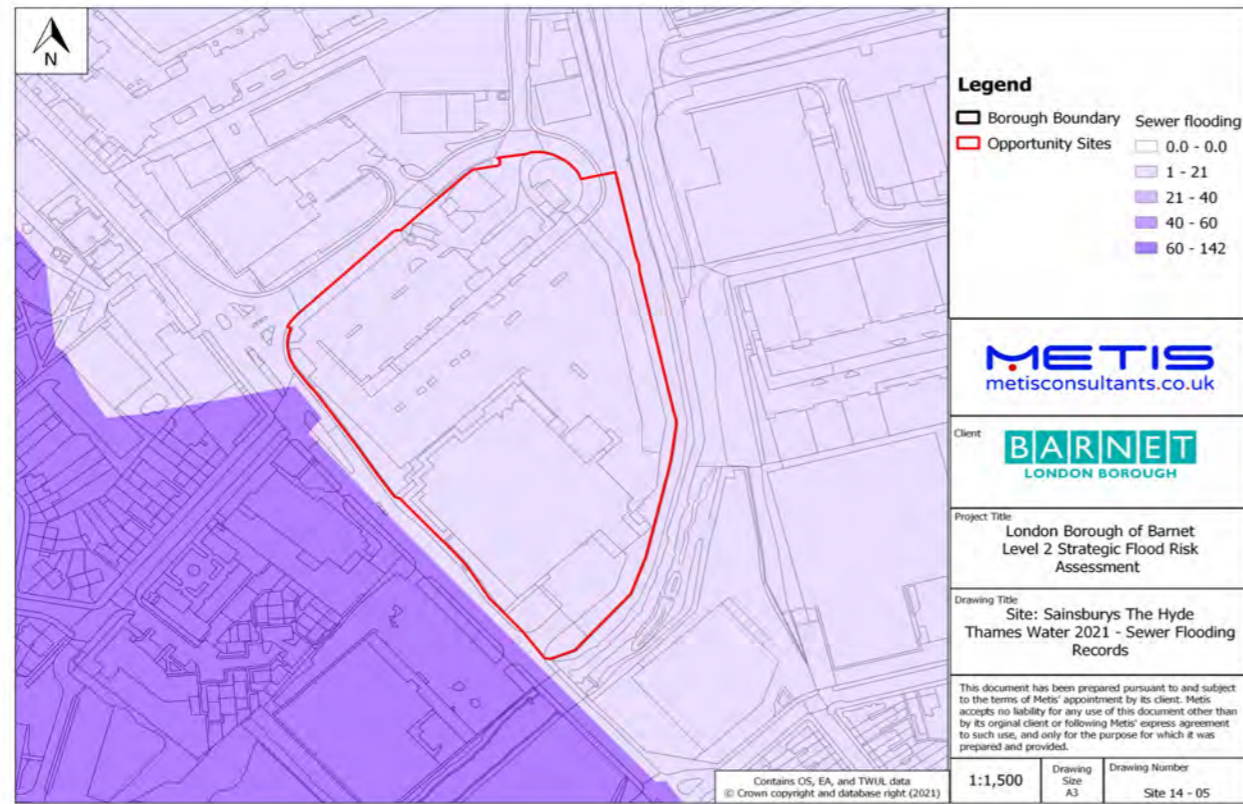


Figure 6 - Areas Susceptible to Groundwater Flooding Map

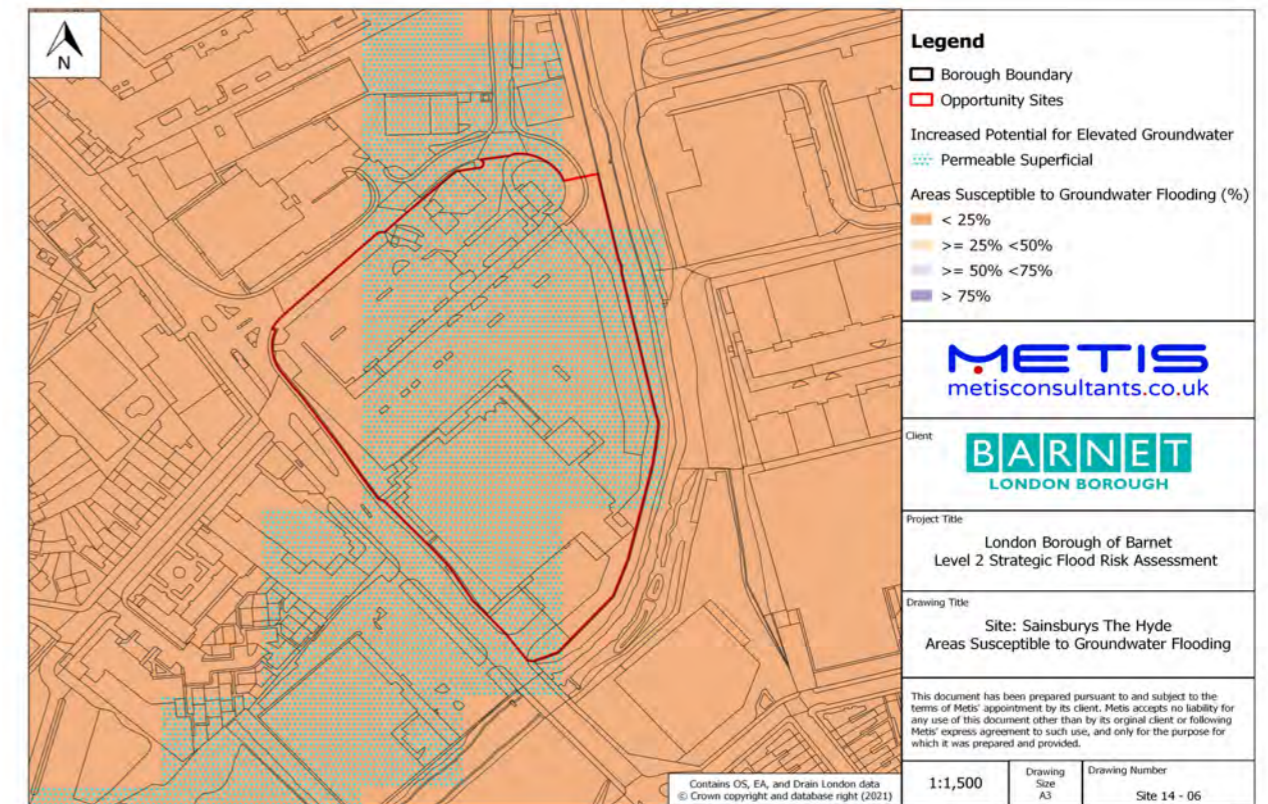
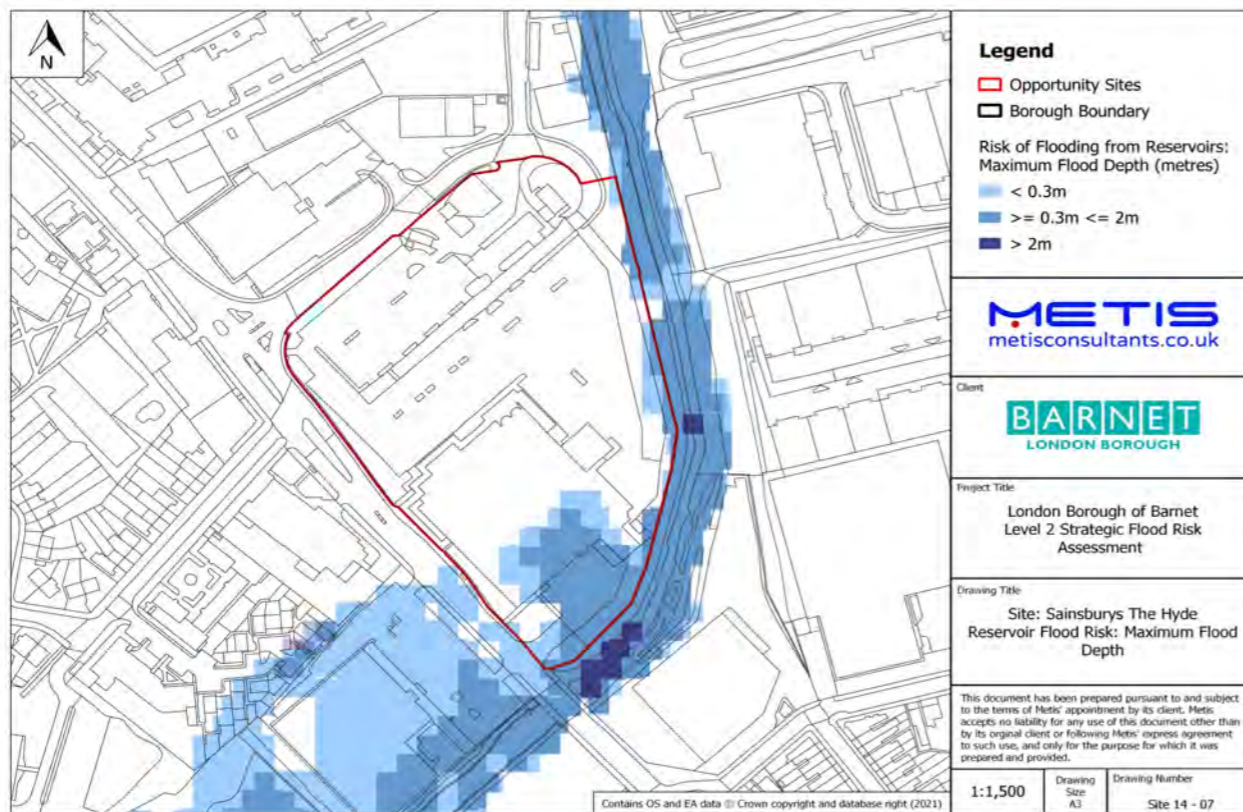


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Tesco Coppetts Centre

Address: Colney Hatch Lane, Friern Barnet, N12 0SH	Area: 3.11 Ha
	Site Reference: 15

Current Use	Proposed Use
Retail	Residential with 25% mixed uses (retail, car parking and community).

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary					
Fluvial / Tidal **			Groundwater		
FZ2	4.0	% of Site	<25	100	% of Site
FZ3a	4.0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	1.0	% of Site	Artificial		
1% AEP	1.8	% of Site	Reservoir	No	At risk?
0.1% AEP	4.1	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		11			

Flood Defences
The site is not in an area benefitting from flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	55.62	55.62	55.62	m AOD
Min Ground Level	45.28	45.28	45.28	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Un defended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism

- The site is adjacent to the Bounds Green Brook (Main River) that flows east towards the Pymmes Brook. The Brook is culverted, flowing underneath the site at the southern border.
- Water from the Brook is predicted to flow along the highway that borders the site to the south, flooding the southernmost extent.
- The predicted fluvial flood extent for the 1% AEP + Climate Change event is 0.0%.

** The Flood Zones and the River Lee model results for the climate change runs differ significantly. Based on the River Lee model outputs, this site is not at risk of fluvial flooding under climate change scenarios as the site likely benefits from flood defences. The River Lee model considers the impact of flood defences on flood risk, whereas Flood Zones do not. The worst case scenario (EA Flood Zone) was used for this assessment.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress

- The southernmost region by the site border is flooded in the 1% AEP scenario.
- Safe egress routes should be routed towards the west or east of the site where the risk is lower. Existing roads on site should be utilised to create safe exit paths towards A406/Pinkham Way and Colney Hatch Lane (B550).
- Alternatively, safe egress routes can be routed towards the north-west towards Coppetts Wood.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements

- Developments should be restricted to areas away from the southernmost region of the site.
- Developments should not be built on top of the Bounds Green Brook culvert running through the site by the southern border. If there are plans to build over the culvert, consultation and agreement of the development approach with the EA is mandatory.
- Due to the potential risk of fluvial flooding, basement developments should be limited to less vulnerable and water compatible uses.
- See SFRA - Level 2 Report mitigation requirement number 4.2, 4.3 and 4.4 for further development stipulations.
- Develop a Flood Emergency and Evacuation Plan for the site.
- There may be a residual risk of flooding if the River Lee flood defences are breached. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. Developers must consult with the EA regarding the most appropriate measures.

SURFACE WATER

Risk Assessment*				
Parameter	3.33% AEP	1% AEP	**0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.60 - 0.90	> 1.20	m
Max. Velocity	0.25 - 0.50	0.50 - 1.00	0.50 - 1.00	m/s
Max. Hazard	1.25 - 2.00	1.25 - 2.00	1.25 - 2.00	N/A

* Site extent encroaches into the Bounds Green Brook. The values provided are for the extent outside of the brook extent.

** The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism

- Surface water enters the site from the northern and western boundaries, and flows diagonally across to the south-east.
- CC is predicted to increase flood extent and depth, but not maximum velocity or hazard. This site lies within Barnet's CDA 010.

Site Access / Egress

Safe access and egress routes should be towards the north-western corner of the site, which has no predicted flood risk.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements

- More vulnerable development should be located towards the centre and east of the site, which are not predicted to flood in the 0.1% AEP event.
- See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage

- A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS.
- The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Tesco Coppetts Centre

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. The site falls within the N12 0 postcode district, where there have been 11 reported flood incidents from sewer flooding. Part of the site also falls within the N11 3 postcode district, where there have been 16 reported flood incidents from sewer flooding. <p>Figure 5 - Thames Water Sewer Flood Map</p>	<ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. The site is in close proximity to the Bound's Green Brook, which is underlain by a Dollis Hill Gravel Member (sand and gravel) superficial deposit geology. <p>Figure 6 - Areas Susceptible to Groundwater Flooding Map</p>	<p>There is no risk from artificial flooding.</p> <p>Figure 7 - Outline Reservoir Flood Map</p>
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Thames Water must be consulted to confirm if the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. The development must implement SuDS to reduce the runoff to sewer to greenfield rates or as close as possible to greenfield rates. 	<p>No mitigation measures required.</p>	<p>No mitigation measures required.</p>

PLANNING CONSIDERATIONS

Safety of Development	Exception Test																				
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. Directing developments from the southernmost region of the site, where the site is not predicted to flood based on the EA Flood Zone mapping. The West London SFRA River Lee hydraulic model data and EA Flood Zone flood extents do not align with each other. This is because the River Lee model considers the impact of flood defences on flood risk, whereas Flood Zones assume there are no defences in place. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. Developers must consult with the EA regarding the most appropriate measures. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing to the 'More Vulnerable' category due to introduction of residences. The site is currently a brownfield site, with approximately half the surface area being comprised of hardstanding surfaces (located on the south and east). Development may result in the loss of flood storage; thus, flood plain compensation must be implemented. There are some green verges to the south and east of the site. Paving over these would result in increased impermeable surface. This must be mitigated through the introduction of SuDS. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Provide safe access/egress routes to the north-west (towards Coppetts Wood) or south-east (towards the Pinkham Way and Colney Hatch Lane junction) to cater for both fluvial and surface water flooding events. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater runoff management by introducing SuDS (see Mitigation - Surface Water Drainage). Basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes, a culverted section of the Bounds Green Brook passes through the site. See SFRA Level 2 Report, mitigation requirement 4.6. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p> <p style="text-align: center;">Summary - Site Specific FRA - Key Requirements</p> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2" style="background-color: #d3d3d3;">Fluvial / Tidal</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> Developments should not be built on top of the Bounds Green Brook culvert running through the site by the southern border. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. </td> <td> <ul style="list-style-type: none"> Safe egress routes from the site should be directed towards the south-east (Pinkham Way/Colney Hatch Lane junction) or north-west (Coppetts Wood). Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. </td> </tr> <tr> <th colspan="2" style="background-color: #d3d3d3;">Surface Water</th> </tr> <tr> <td> <ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. </td> <td> <p>New development should introduce SuDS to reduce surface water runoff to greenfield rates.</p> </td> </tr> <tr> <th colspan="2" style="background-color: #d3d3d3;">Sewer</th> </tr> <tr> <td> <p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p> </td> <td> <p>Development must reduce the runoff to sewer to greenfield rates.</p> </td> </tr> <tr> <th colspan="2" style="background-color: #d3d3d3;">Groundwater</th> </tr> <tr> <td colspan="2"> <p>No mitigation required.</p> </td> </tr> <tr> <th colspan="2" style="background-color: #d3d3d3;">Artificial</th> </tr> <tr> <td colspan="2"> <p>No mitigation required.</p> </td> </tr> </tbody> </table>	Fluvial / Tidal		<ul style="list-style-type: none"> Developments should not be built on top of the Bounds Green Brook culvert running through the site by the southern border. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. 	<ul style="list-style-type: none"> Safe egress routes from the site should be directed towards the south-east (Pinkham Way/Colney Hatch Lane junction) or north-west (Coppetts Wood). Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. 	Surface Water		<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	<p>New development should introduce SuDS to reduce surface water runoff to greenfield rates.</p>	Sewer		<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p>	<p>Development must reduce the runoff to sewer to greenfield rates.</p>	Groundwater		<p>No mitigation required.</p>		Artificial		<p>No mitigation required.</p>	
Fluvial / Tidal																					
<ul style="list-style-type: none"> Developments should not be built on top of the Bounds Green Brook culvert running through the site by the southern border. Consideration for possible breach flooding should be incorporated within development proposals through flood resilience measures. 	<ul style="list-style-type: none"> Safe egress routes from the site should be directed towards the south-east (Pinkham Way/Colney Hatch Lane junction) or north-west (Coppetts Wood). Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. 																				
Surface Water																					
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	<p>New development should introduce SuDS to reduce surface water runoff to greenfield rates.</p>																				
Sewer																					
<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p>	<p>Development must reduce the runoff to sewer to greenfield rates.</p>																				
Groundwater																					
<p>No mitigation required.</p>																					
Artificial																					
<p>No mitigation required.</p>																					

Figure 1 - Fluvial Flood Depth Map

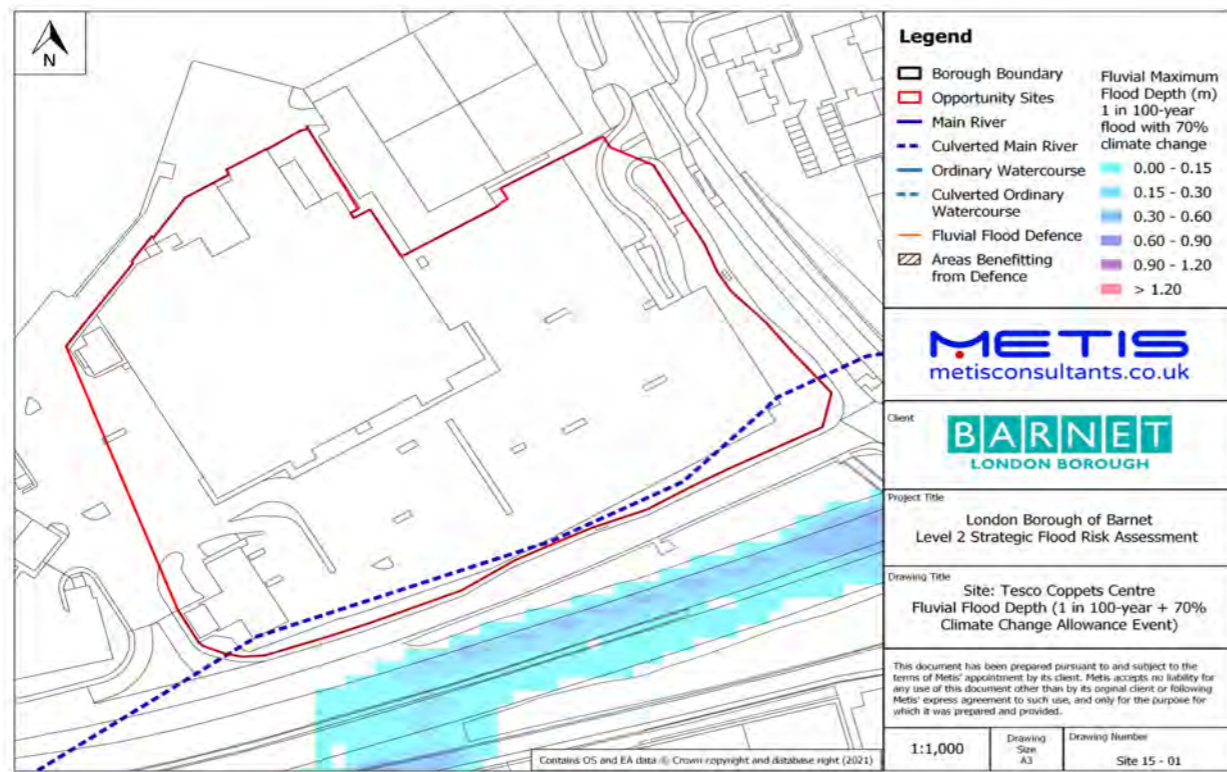


Figure 2 - Fluvial Flood Hazard Map

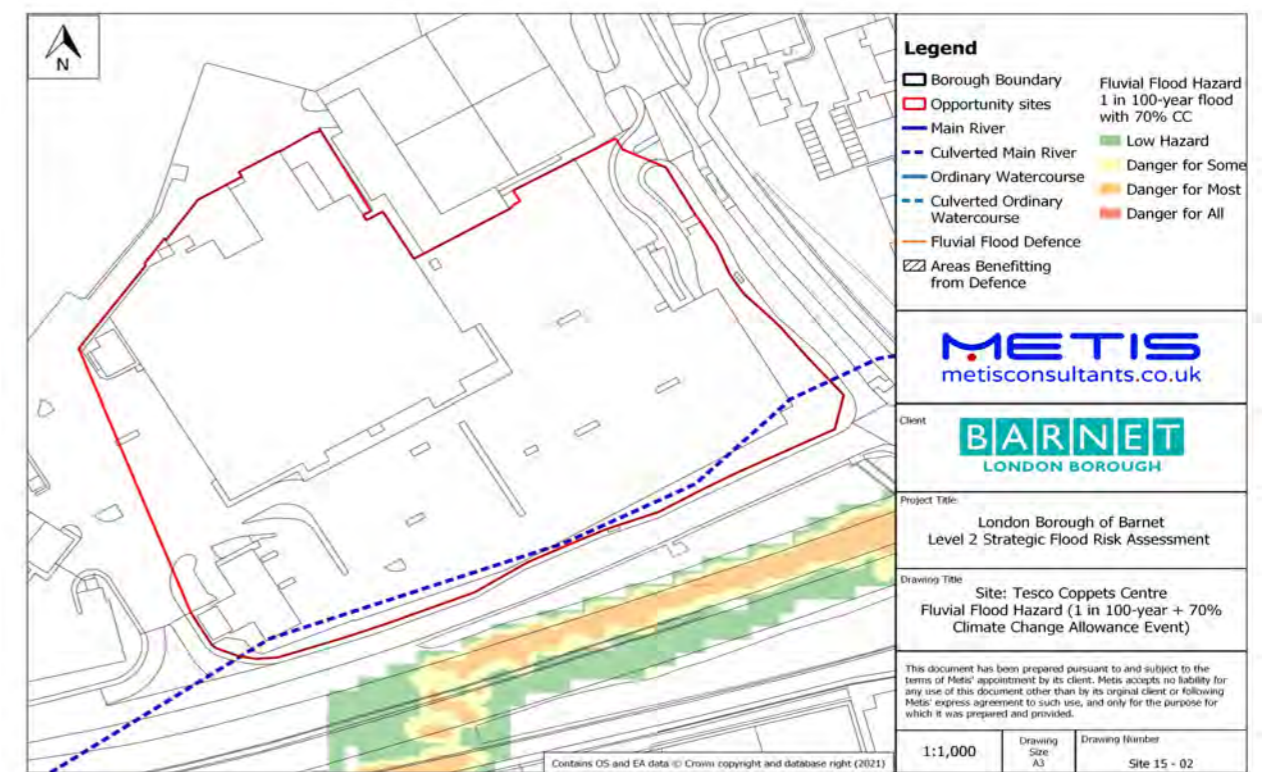


Figure 3 - RoFSW Flood Depth Map

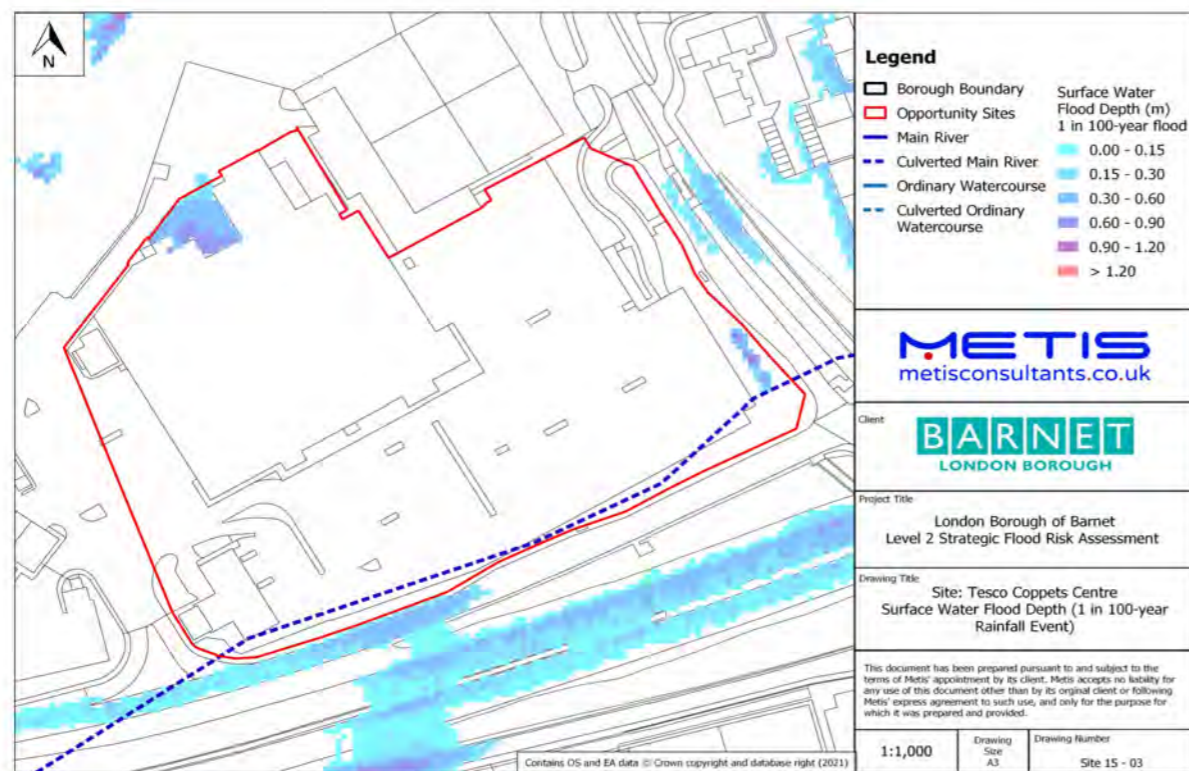


Figure 4 - RoFSW Flood Hazard Map

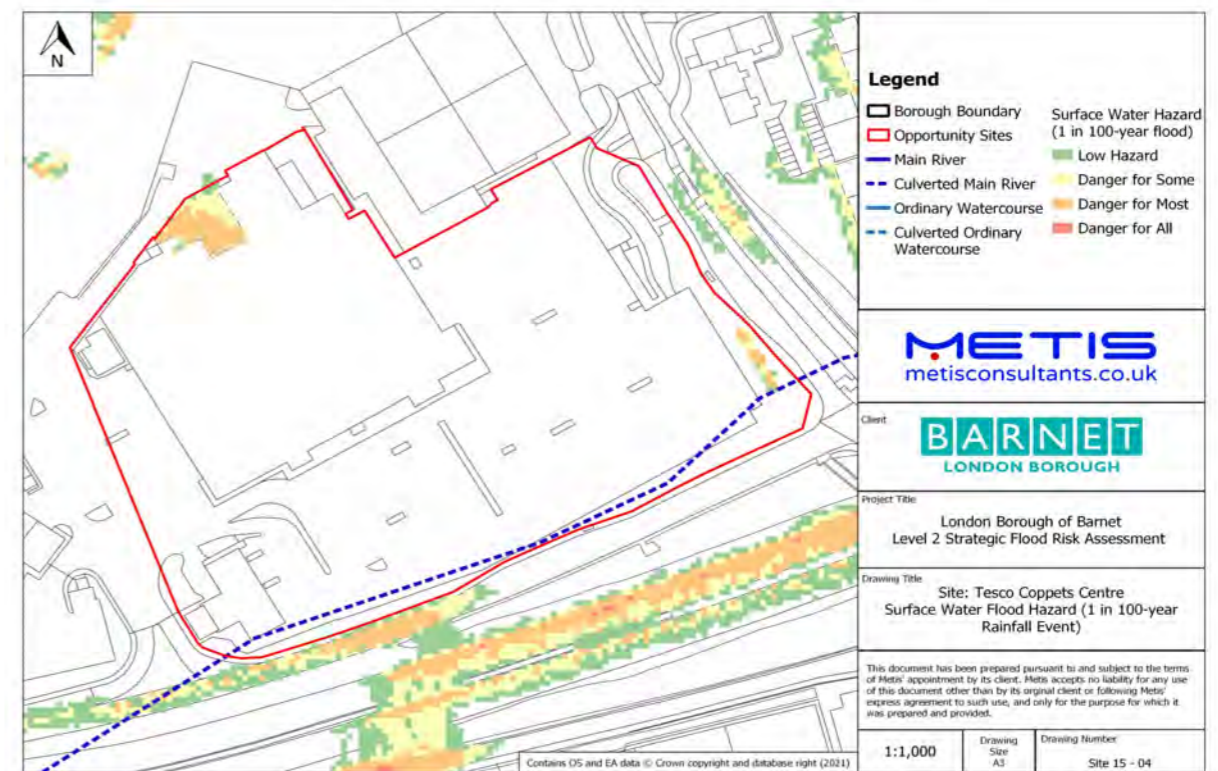


Figure 5 - Thames Water Sewer Flood Map

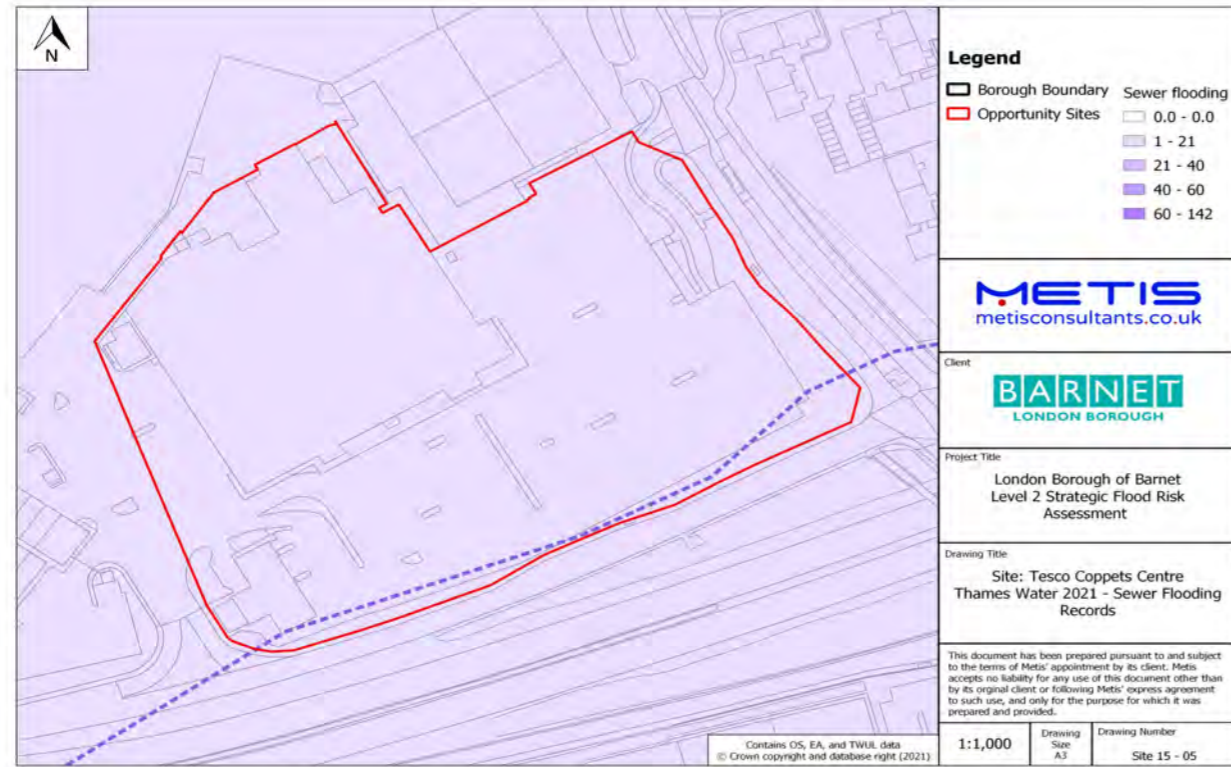


Figure 6 - Areas Susceptible to Groundwater Flooding Map

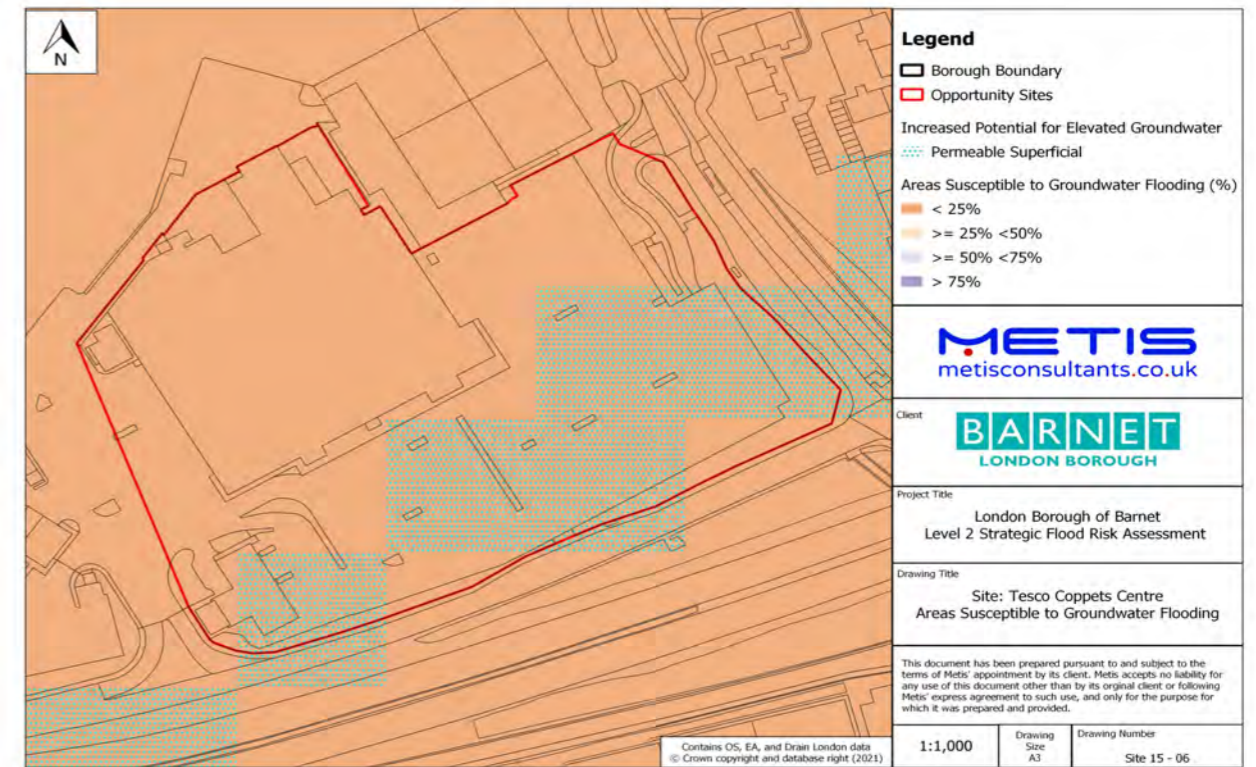
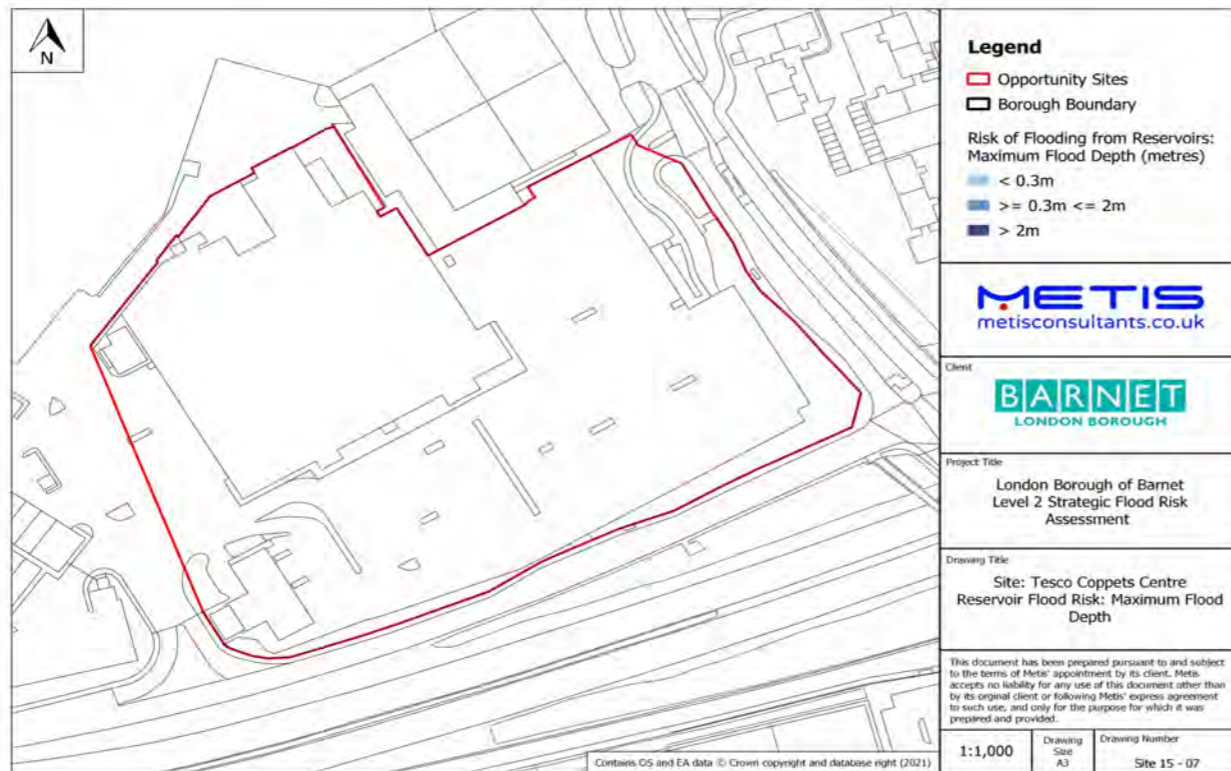


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - East Barnet Shooting Club

Address: Victoria Rd, New Barnet EN4 9SH	Area: 0.25 Ha
	Site Reference: 19

Current Use	Proposed Use
Shooting range	Residential only

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	No data	% of Site
FZ3a	0	% of Site	25-50	No data	% of Site
FZ3b	0	% of Site	50-75	No data	% of Site
Surface Water			>75	No data	% of Site
3.33%*	0.5	% of Site	Artificial		
1% AEP	5.9	% of Site	Reservoir	No	At risk?
0.1% AEP	33.4	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents	11				

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site. The Shirebourne River, located 7.5m to the north-east of the site, runs from west to east, so its flood waters are unlikely to enter the site.

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Figure 1 - Fluvial Flood Depth Map

Figure 2 - Fluvial Flood Hazard Map

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.15 - 0.30	0.30 - 0.60	0.30 - 0.60	m
Max. Velocity	0 - 0.25	0.25 - 0.50	1.00 - 2.00	m/s
Max. Hazard	0.50 - 0.75	0.75 - 1.25	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Flood waters enter the site from Albert Road on the south-west and pool along the shooting range building and to the north. Climate change is predicted to increase the extent, velocity, and hazard rating of floods, but not maximum depth. This site lies within Barnet's CDA 007.

Site Access / Egress
Safe access and egress routes should be directed to the footpath on the east of the site, where the risk of flooding is lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> Minimise permeable surface lost by restricting development on the north of the site near Victoria Park. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations would be required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - East Barnet Shooting Club

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 11 reported incidents of sewer flooding in this site's postcode region (EN4 9): 6 internal and 5 external incidents, both for the 1 in 20-year (5% AEP) rainfall events 	<ul style="list-style-type: none"> The site is not susceptible to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	<p>There is no risk from artificial flooding.</p>
Figure 5 - Thames Water Sewer Flood Map	Figure 6 - Areas Susceptible to Groundwater Flooding Map	Figure 7 - Outline Reservoir Flood Map
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	<p>No mitigation measures are required.</p>	<p>No mitigation measures are required.</p>

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. The existing shooting range building is predicted to be surrounded on three sides by high-velocity flood water in the climate change scenario (i.e. RoFSW 0.1% AEP; see Level 1 SFRA Web Mapping). Thus, much of the site should be restricted to less vulnerable/water compatible uses. More vulnerable development should be restricted to the south-east of the site, where there is lower risk of flooding. In other areas, an evacuation plan for the development must be created. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. On-ground SuDS should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> The land is being developed to a more vulnerable risk category through the inclusion of residences. About half the site is currently made up of greenfield. Development is likely to increase the impermeable surface area. This increase must be mitigated with flood plain compensation and runoff storage to prevent increase in flood risk. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Restricting vulnerable development to the south-eastern portion of the site. Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes, the site is located less than 8m from the Shirebourne Brook and less than 5m from a culverted Ordinary Watercourse. See SFRA 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Restrict vulnerable development to the south-east of the site. Introduce SuDS to reduce surface water runoff to greenfield rates. 	<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Provide flood plain compensation for up to and including a 1% AEP surface water event.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

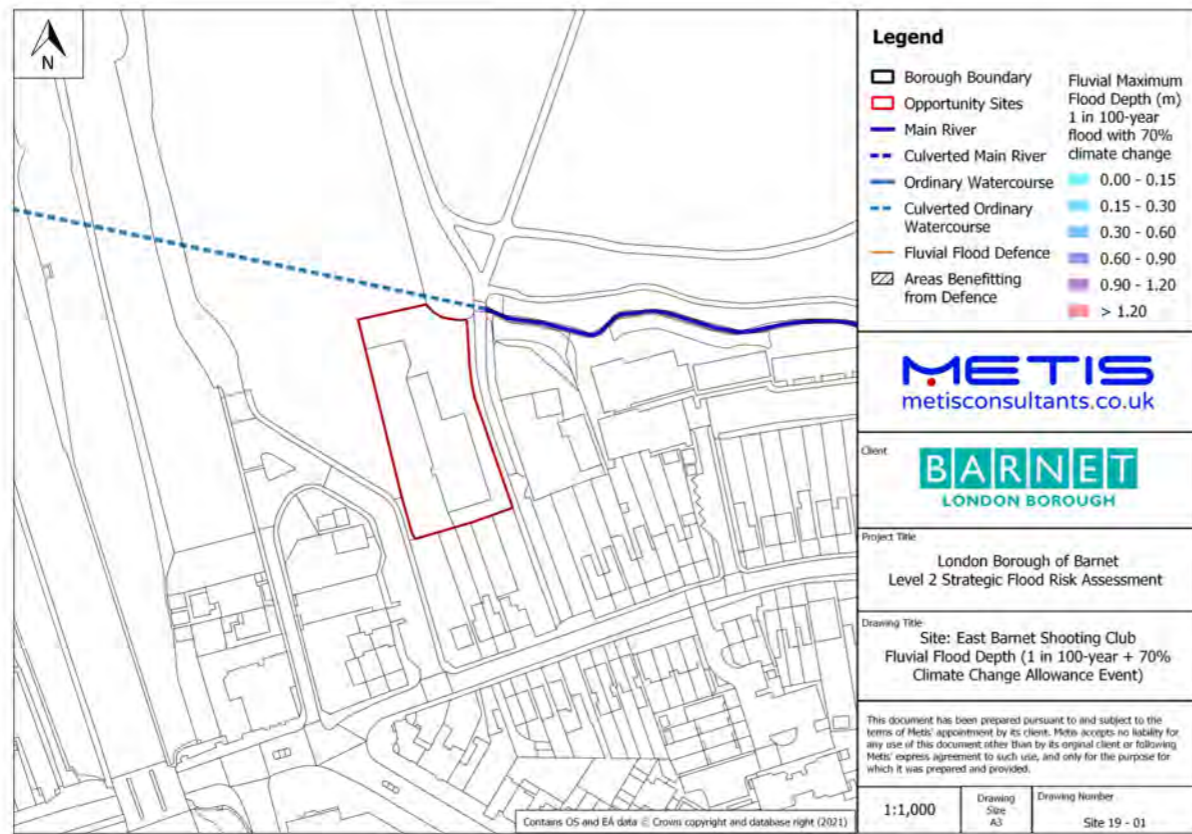


Figure 2 - Fluvial Flood Hazard Map

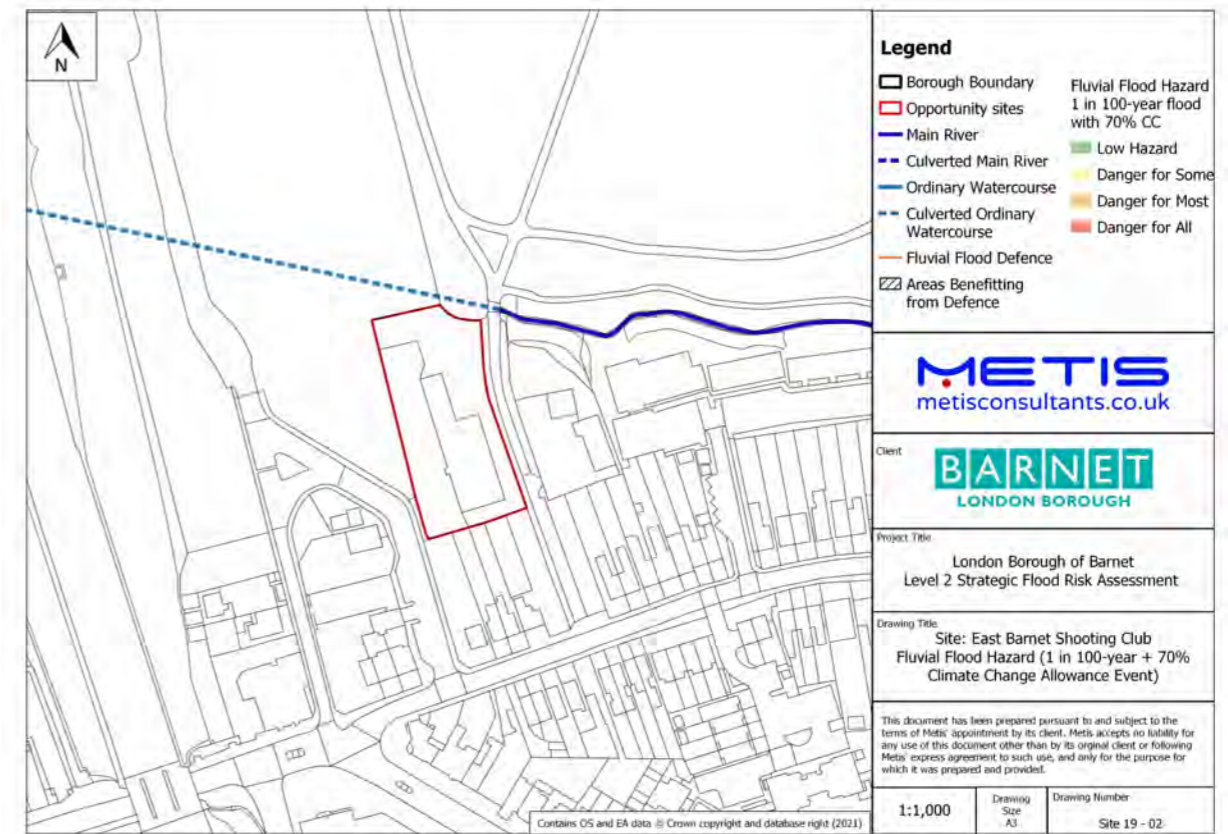


Figure 3 - RoFSW Flood Depth Map

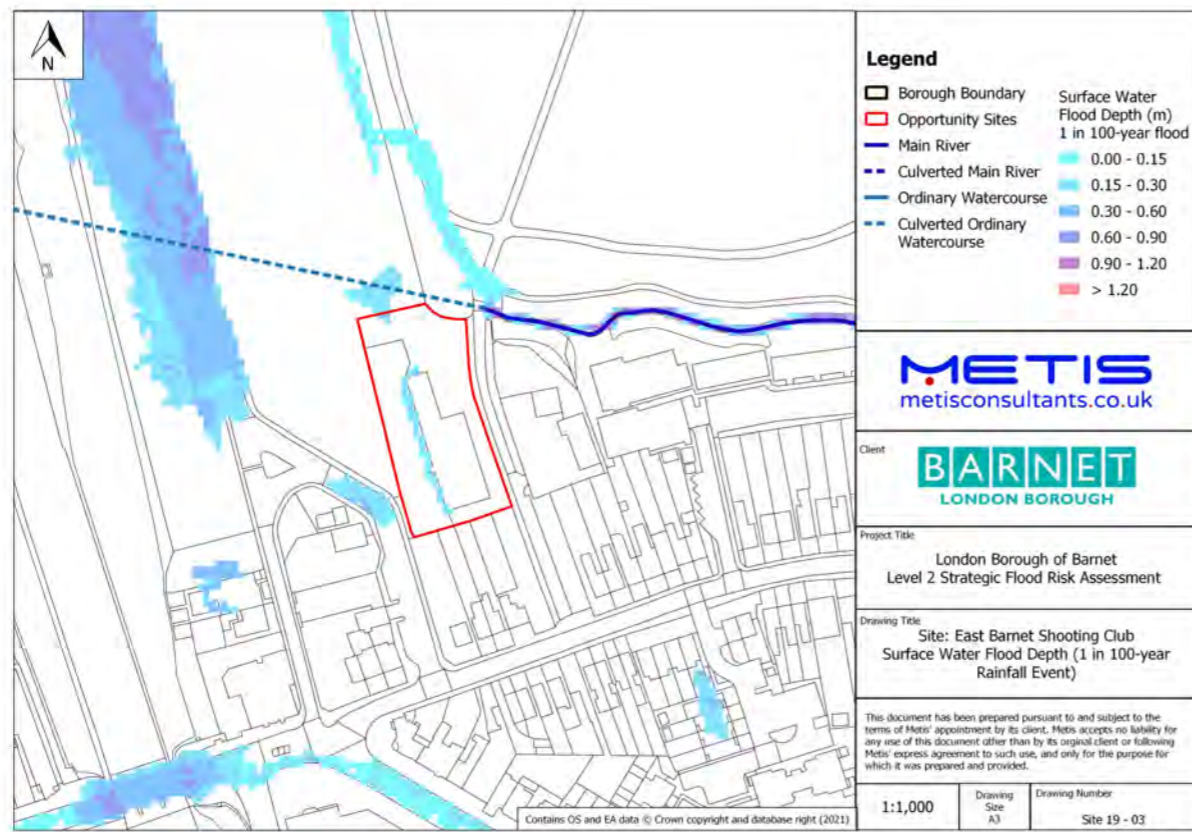


Figure 4 - RoFSW Flood Hazard Map

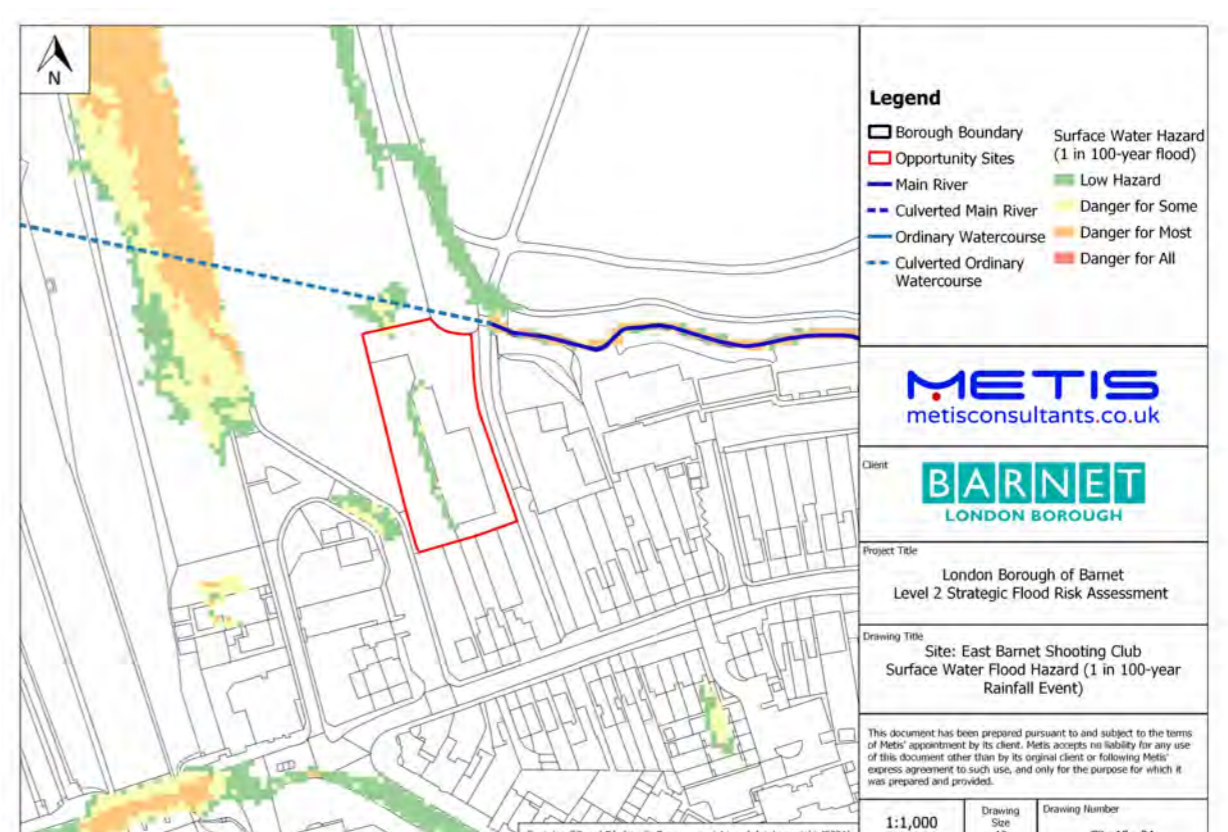


Figure 5 - Thames Water Sewer Flood Map

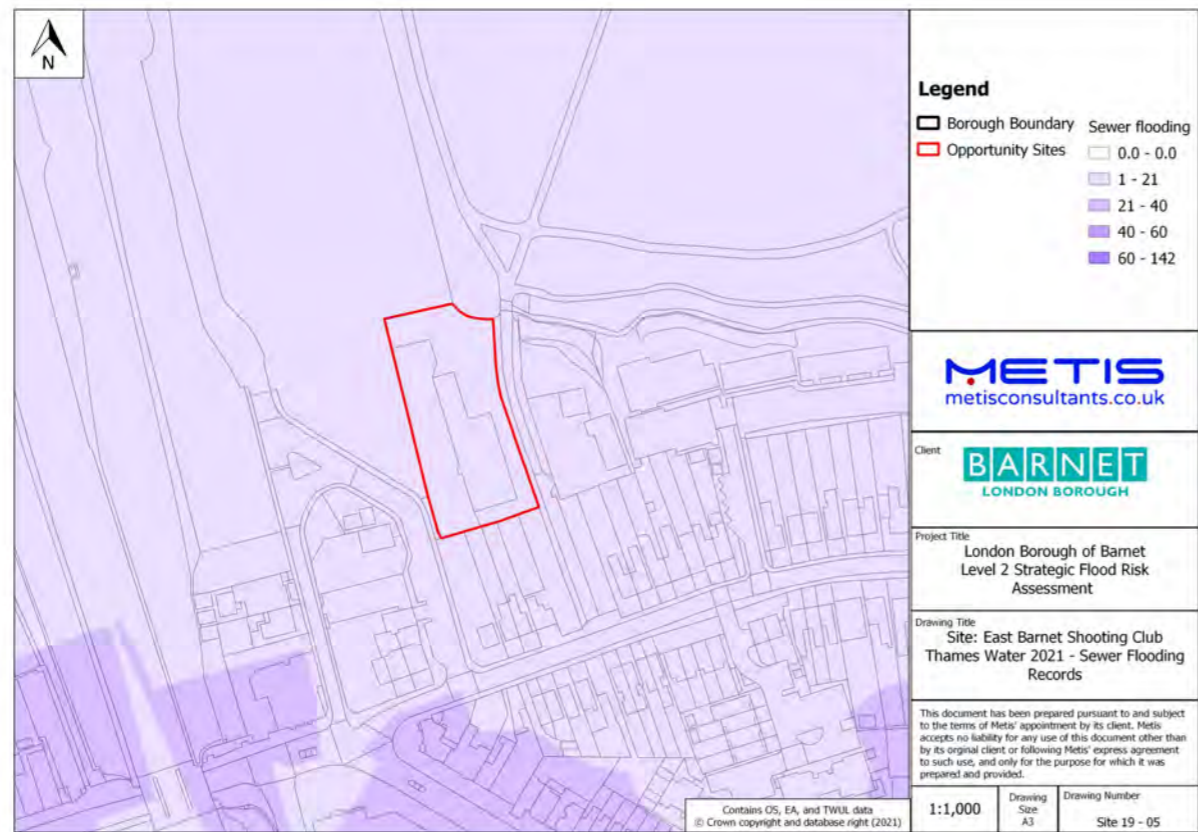


Figure 6 - Areas Susceptible to Groundwater Flooding Map

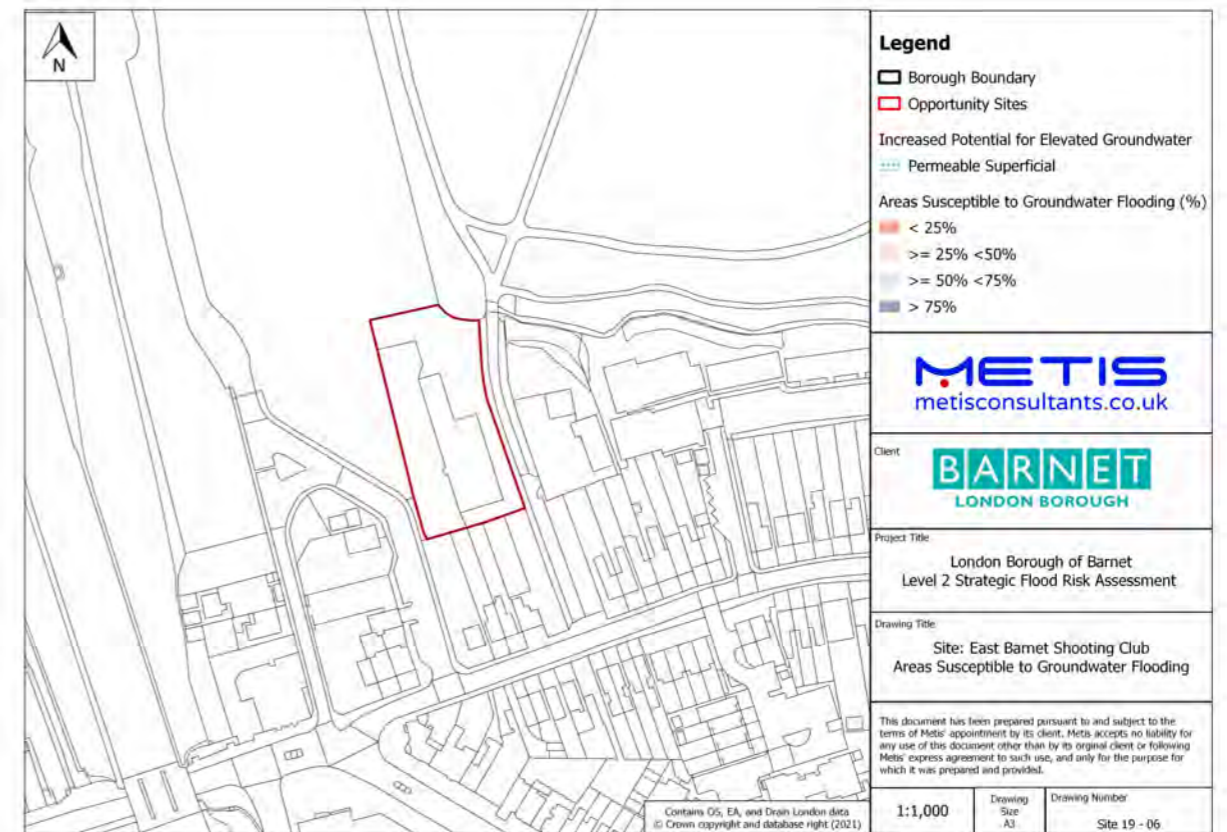
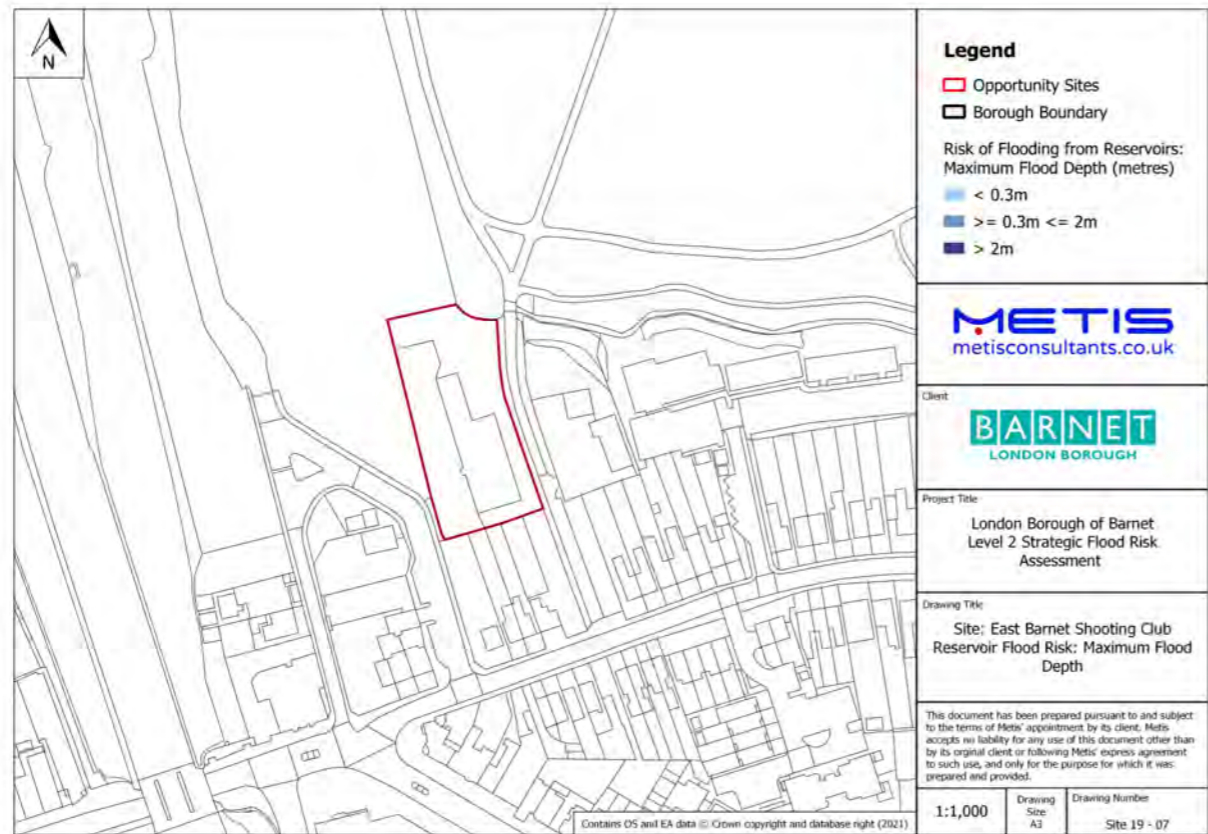


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Sainsbury's New Barnet TC

Address: 66 East Barnet Rd, New Barnet, EN4 8RQ	Area: 1.02 Ha
	Site Reference: 22

Current Use	Proposed Use
Retail and car parking	Residential with 25% retail and car parking

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	No data	% of Site
FZ3a	0	% of Site	25-50	No data	% of Site
FZ3b	0	% of Site	50-75	No data	% of Site
Surface Water			>75	No data	% of Site
3.33%*	1.4	% of Site	Artificial		
1% AEP	1.4	% of Site	Reservoir	No	At risk?
0.1% AEP	11.3	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		30			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.60 - 0.90	0.60 - 0.90	m
Max. Velocity	0 - 0.25	0 - 0.25	1.00 - 2.00	m/s
Max. Hazard	1.25 - 2.00	1.25 - 2.00	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water flows from south-west to north-east and pools at the current supermarket building, which is at a lower elevation. Climate change is predicted to increase the flood extent and velocity, but not maximum depth or hazard rating. This site lies within Barnet's CDA 007.

Site Access / Egress
Safe access and egress routes should be directed to the west of the site, towards New Barnet station, which has lower risk of flooding.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> Maximum runoff must be restricted to greenfield rates. Also see SFRA Level 2 Report mitigation requirements number 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Sainsbury's New Barnet TC

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 30 reported incidents of sewer flooding in this site's postcode region (EN4 8): 15 internal in the 5% AEP event, and 15 external distributed across the 20%, 10%, and 5% AEP rainfall events. <p>Figure 5 - Thames Water Sewer Flood Map</p>	<ul style="list-style-type: none"> The site is not susceptible to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). <p>Figure 6 - Areas Susceptible to Groundwater Flooding Map</p>	<p>There is no risk from artificial flooding.</p> <p>Figure 7 - Outline Reservoir Flood Map</p>
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	<p>No mitigation measures are required.</p>	<p>No mitigation measures are required.</p>

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. On-ground SuDS should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing from the 'less vulnerable' to the 'more vulnerable' classification. This can increase flood risk, especially to the north and east of the site. The site is currently a brownfield with hardstanding to the west. Development may result in the loss of flood storage. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> More vulnerable development should be restricted to the south and west side of the site, as these are predicted to be at lower flood risk. Basements dwellings may be appropriate in the south-western portion of the site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, the site is not near a Main River or Ordinary Watercourse. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	SuDS should be introduced to reduce surface water runoff to greenfield rates.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

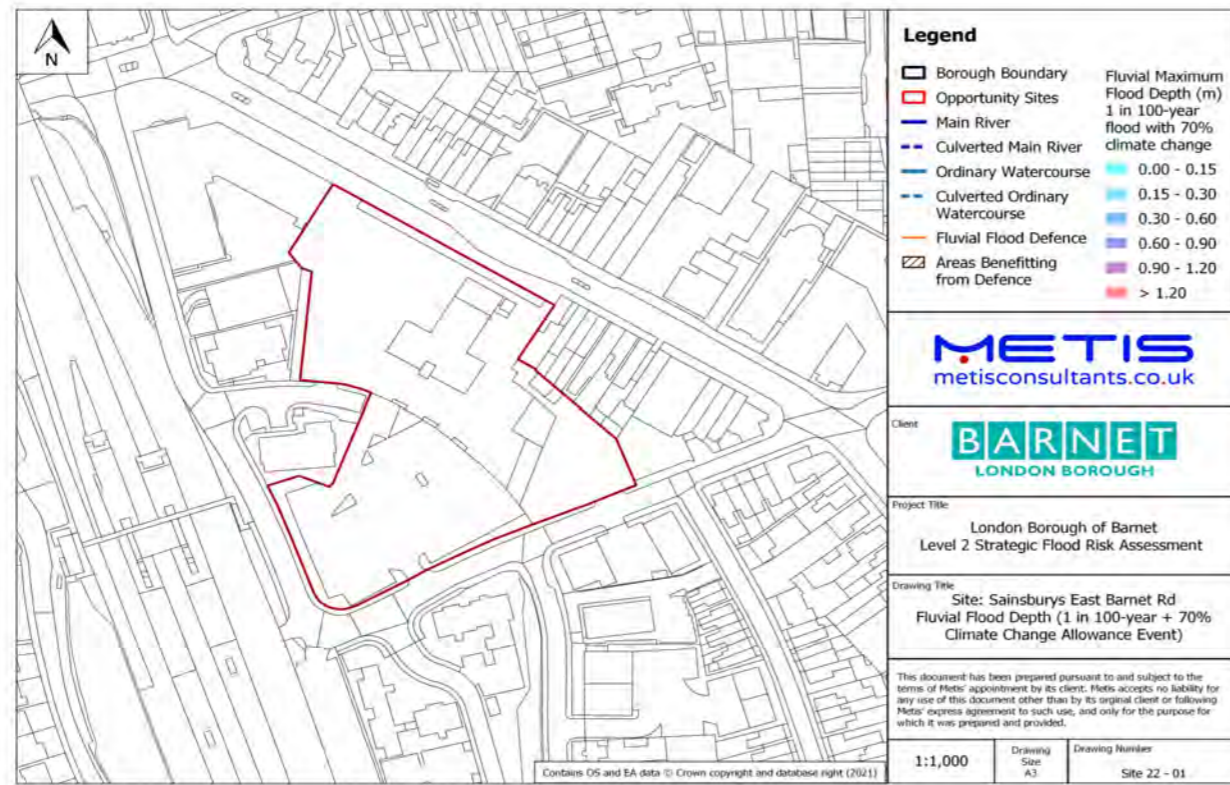


Figure 2 - Fluvial Flood Hazard Map

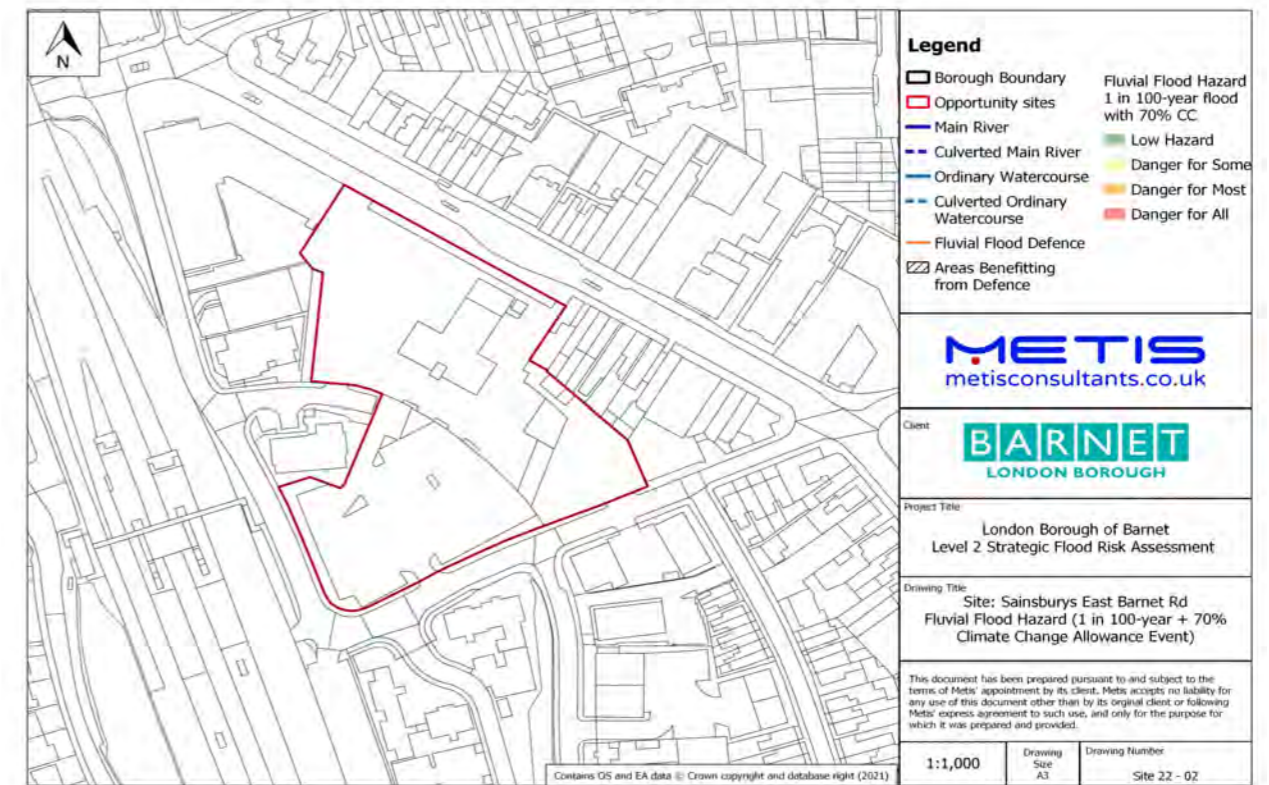


Figure 3 - RoFSW Flood Depth Map

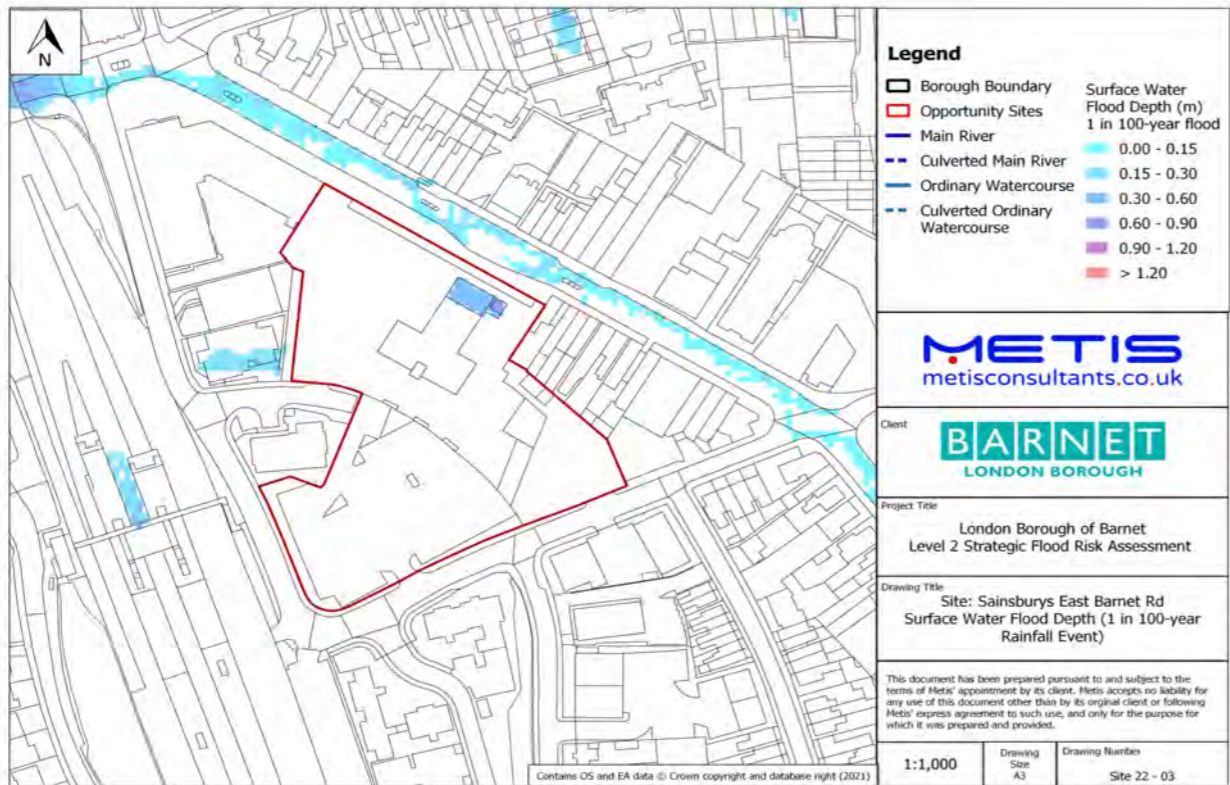


Figure 4 - RoFSW Flood Hazard Map

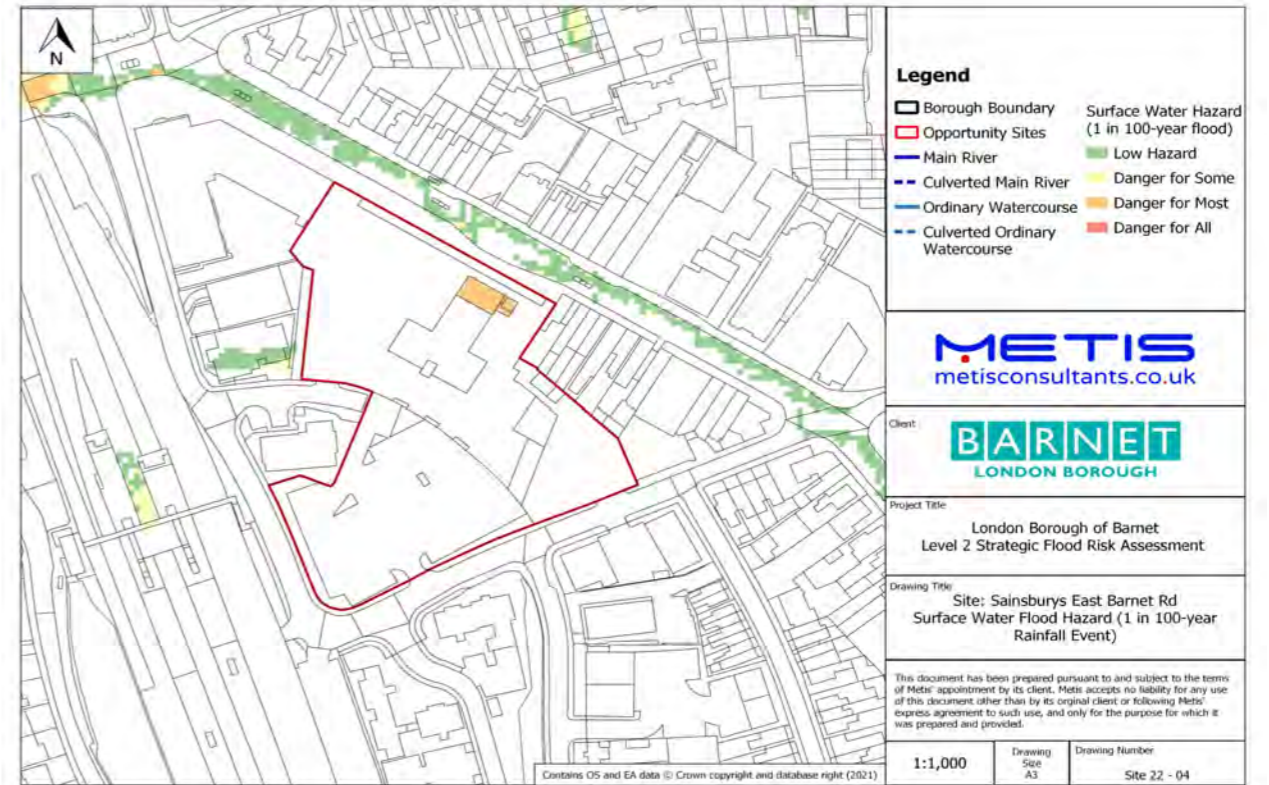


Figure 5 - Thames Water Sewer Flood Map

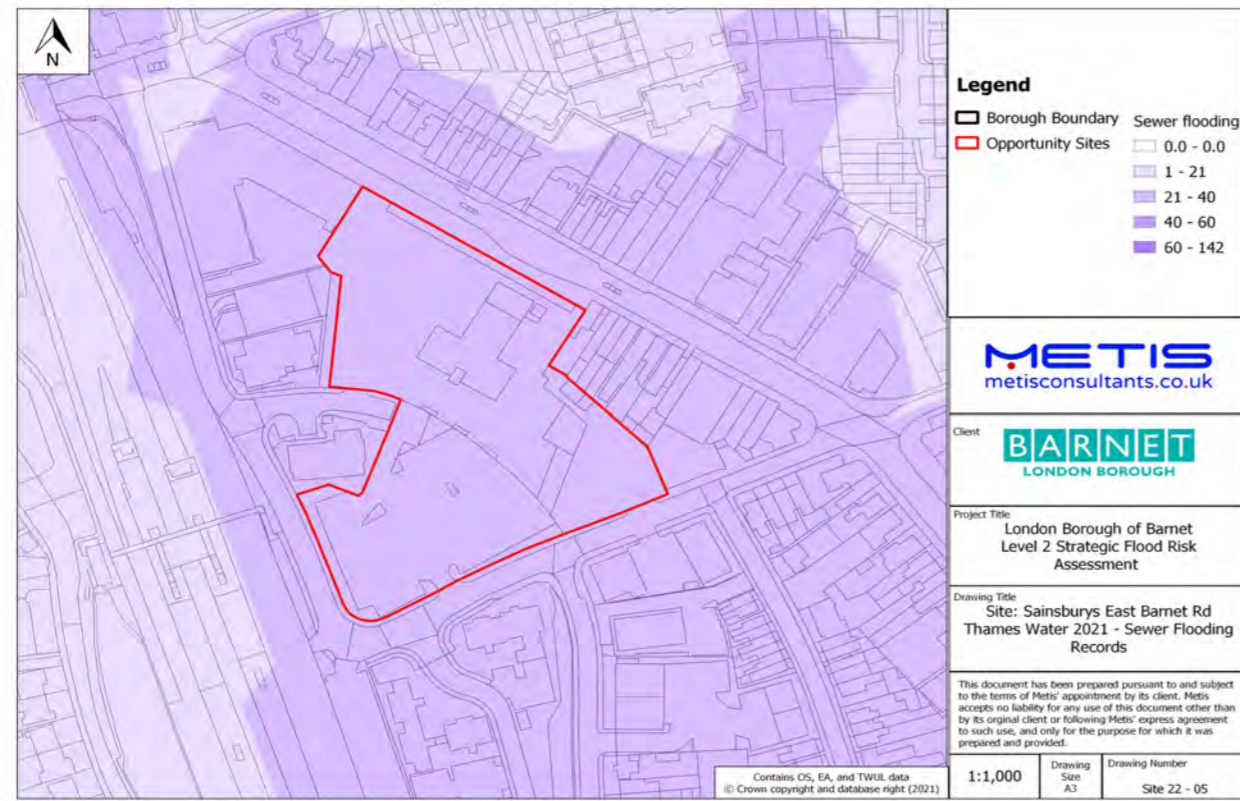


Figure 6 - Areas Susceptible to Groundwater Flooding Map

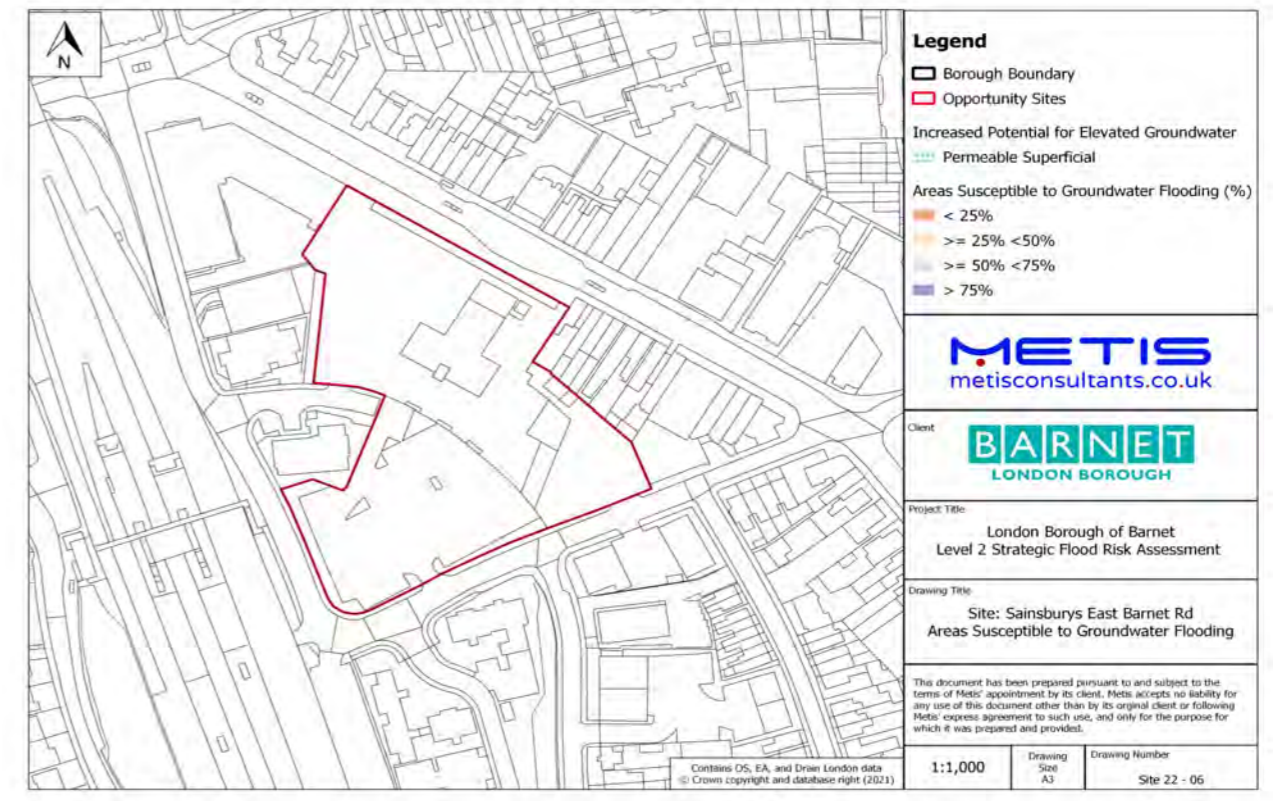
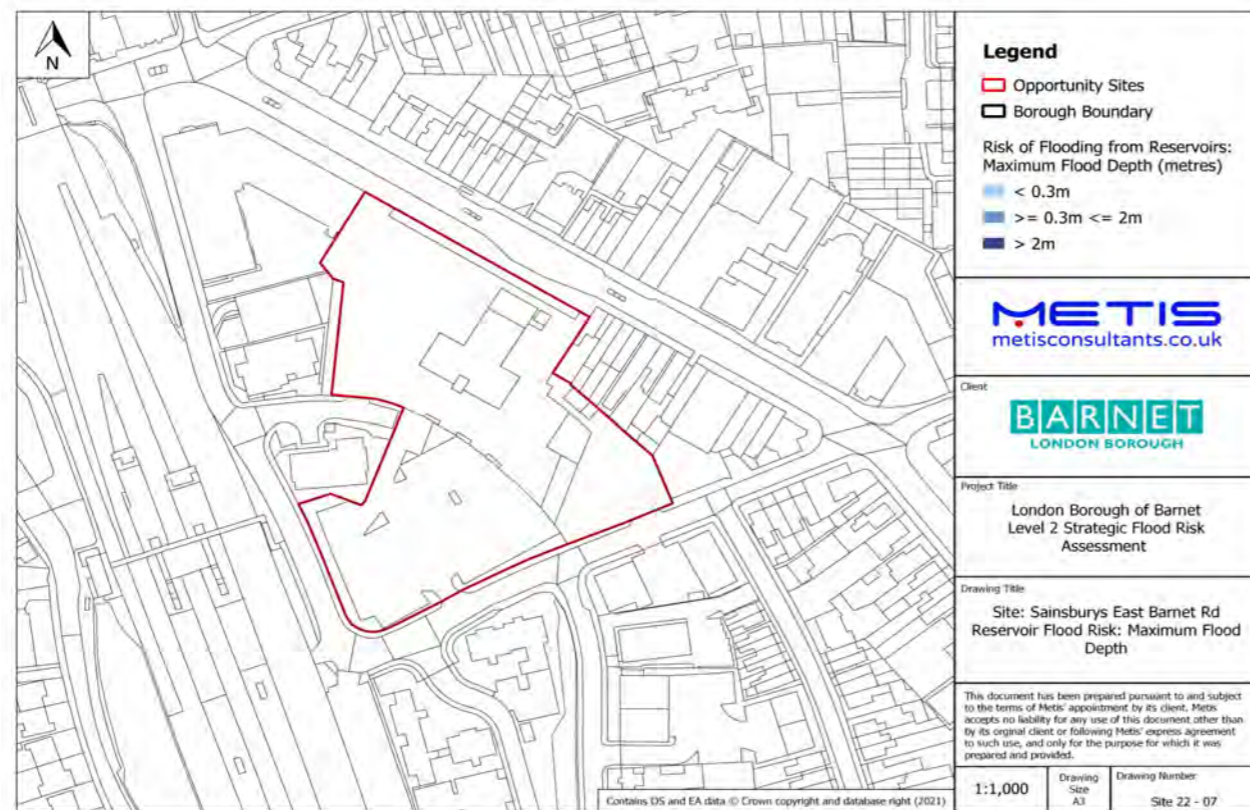


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - East Finchley Substation

Address: High Rd, East Finchley, N2 0NL	Area: 0.19 Ha
	Site Reference: 25

Current Use	Proposed Use
Vacant	Residential only

Current Vulnerability Classification	Proposed Vulnerability Classification
Unclassified	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	100	% of Site
FZ3a	0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	27.1	% of Site	Artificial		
1% AEP	40.1	% of Site	Reservoir	Yes	At risk?
0.1% AEP	100	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		13			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0 - 0.15	m
Max. Depth	0.30 - 0.60	0.30 - 0.60	0.90 - 1.20	m
Max. Velocity	0.50 - 1.00	1.00 - 2.00	> 2.00	m/s
Max. Hazard	1.25 - 2.00	1.25 - 2.00	> 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water flows from north to south in the site, entering by the railway line. Climate change is predicted to increase the flood extent, depth, velocity, and hazard.

Site Access / Egress
Safe access and egress routes should be towards the south-east of the site, near the railway line, where the predicted risk of surface water flooding is lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP surface water event, more vulnerable development should be restricted to the area along the east of the site parallel to the railway line. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations would be required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - East Finchley Substation

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment <ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 13 reported incidents of sewer flooding in this site's postcode region (N2 0): 11 internal incidents in the 5% AEP rainfall event, and 2 external, distributed across the 10% AEP and 5% AEP rainfall events. 	Risk Assessment <ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	Risk Assessment <ul style="list-style-type: none"> The south-eastern edge of the site is at risk of flooding from the failure of the Fortis Green reservoir. The site is predicted to flood to less than 0.3m depth in the event of reservoir failure. Reservoir failure flood speeds would be below 0.5 m/s.
Mitigation Requirements <ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	Mitigation Requirements No mitigation measures required.	Mitigation Requirements No mitigation measures required due to low flood depth and small size of area affected.

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test		
Can the development future be proofed for climate change considerations? <ul style="list-style-type: none"> Yes. See SFRA - Level 2 Report mitigation requirement number 4.2 and 4.3 for the required finished floor levels and flood resistant / resilient building requirements. 	Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).		
Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere? <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA - Level 2 Report mitigation requirement number 4.4 for compensatory flood storage requirements. 			
What is the cumulative impact of the development land use change and will flood risk increase? <ul style="list-style-type: none"> Land use is changing to the 'more vulnerable' category, to be used for residential purposes. Currently, this site is mostly greenfield. Development will lead to an increase in impermeable surface area, which if not carefully managed can lead to increased flood risk. Flood plain compensation must be introduced to mitigate this. The entire site is predicted to flood with high-velocity surface water in the climate change scenario (i.e., 0.1% AEP/1 in 1000-year RoFSW - see Level 1 SFRA Web Maps). Development may further increase flood depths onsite. 	Summary - Site Specific FRA - Key Requirements		
How can the development reduce risk overall? <ul style="list-style-type: none"> Limiting development to water-compatible uses where possible, especially along the middle of the site. Less vulnerable or water compatible categories of basements may be appropriate along the eastern edge of the site, but no basements should be built within in the 3.33% AEP RoFSW extent. Prior to construction, a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. 	Fluvial / Tidal No mitigation measures required.		
Will development require a flood risk permit/watercourse consent? <ul style="list-style-type: none"> No, there are no Main Rivers or Ordinary Watercourses near the site. 	Surface Water <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"> <ul style="list-style-type: none"> Flood resistant / resilient buildings required. Limit development to water-compatible uses along centre of the site </td> <td style="width: 50%;"> <ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. </td> </tr> </table>	<ul style="list-style-type: none"> Flood resistant / resilient buildings required. Limit development to water-compatible uses along centre of the site 	<ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite.
<ul style="list-style-type: none"> Flood resistant / resilient buildings required. Limit development to water-compatible uses along centre of the site 	<ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. 		
	Sewer <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"> Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources. </td> <td style="width: 50%;"> Development must reduce the runoff to sewer to greenfield rates. </td> </tr> </table>	Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.		
	Groundwater No mitigation measures required.		
	Artificial No mitigation measures required.		

Figure 1 - Fluvial Flood Depth Map

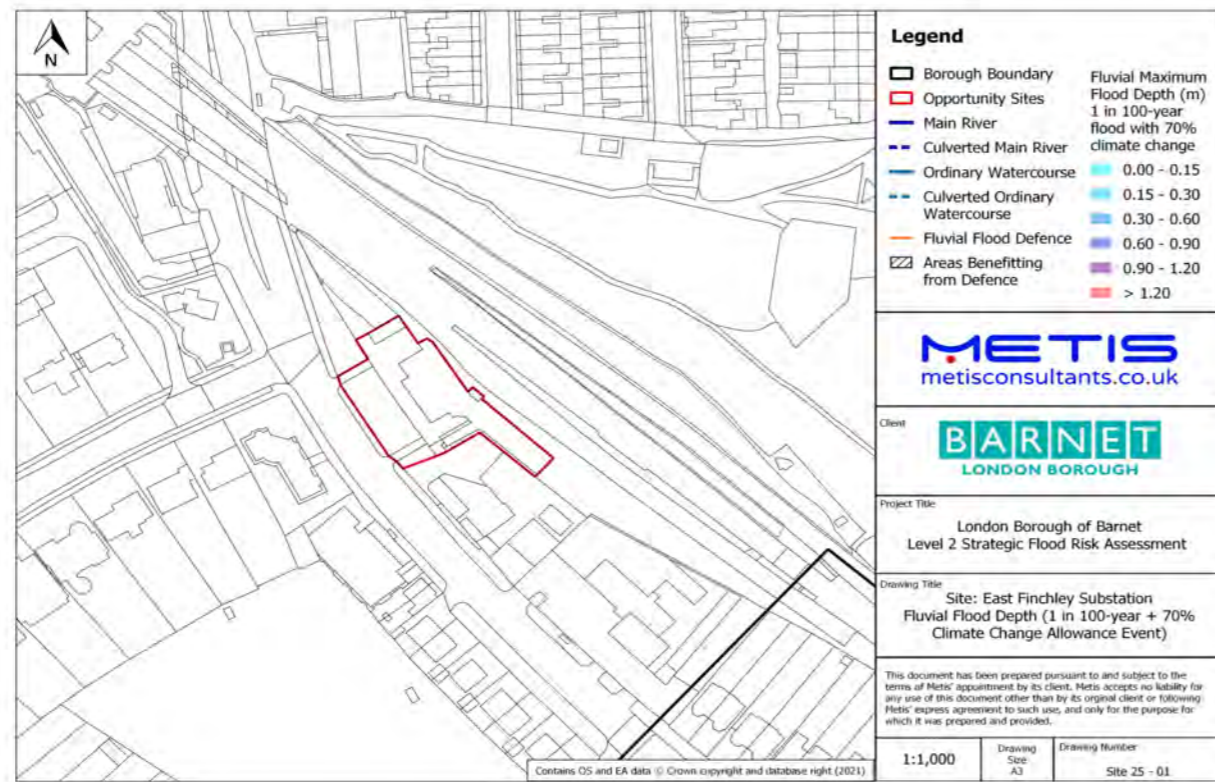


Figure 2 - Fluvial Flood Hazard Map

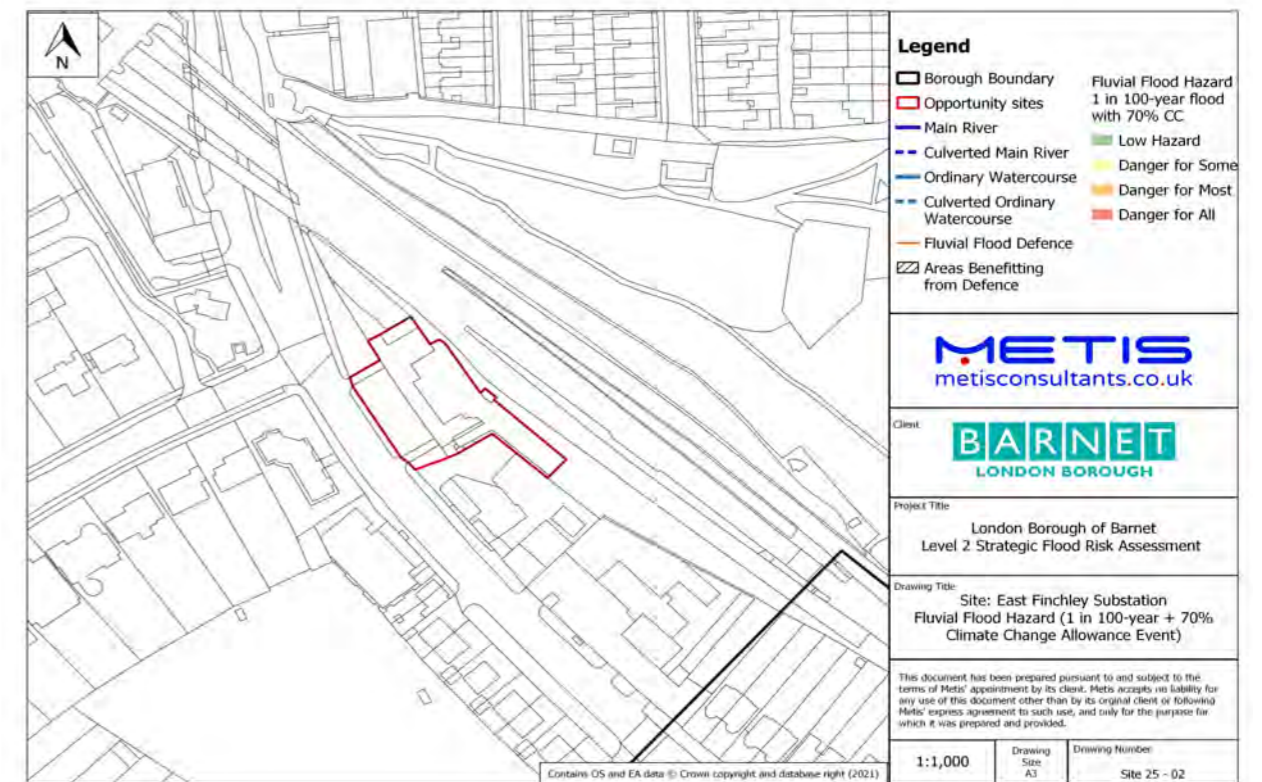


Figure 3 - RoFSW Flood Depth Map

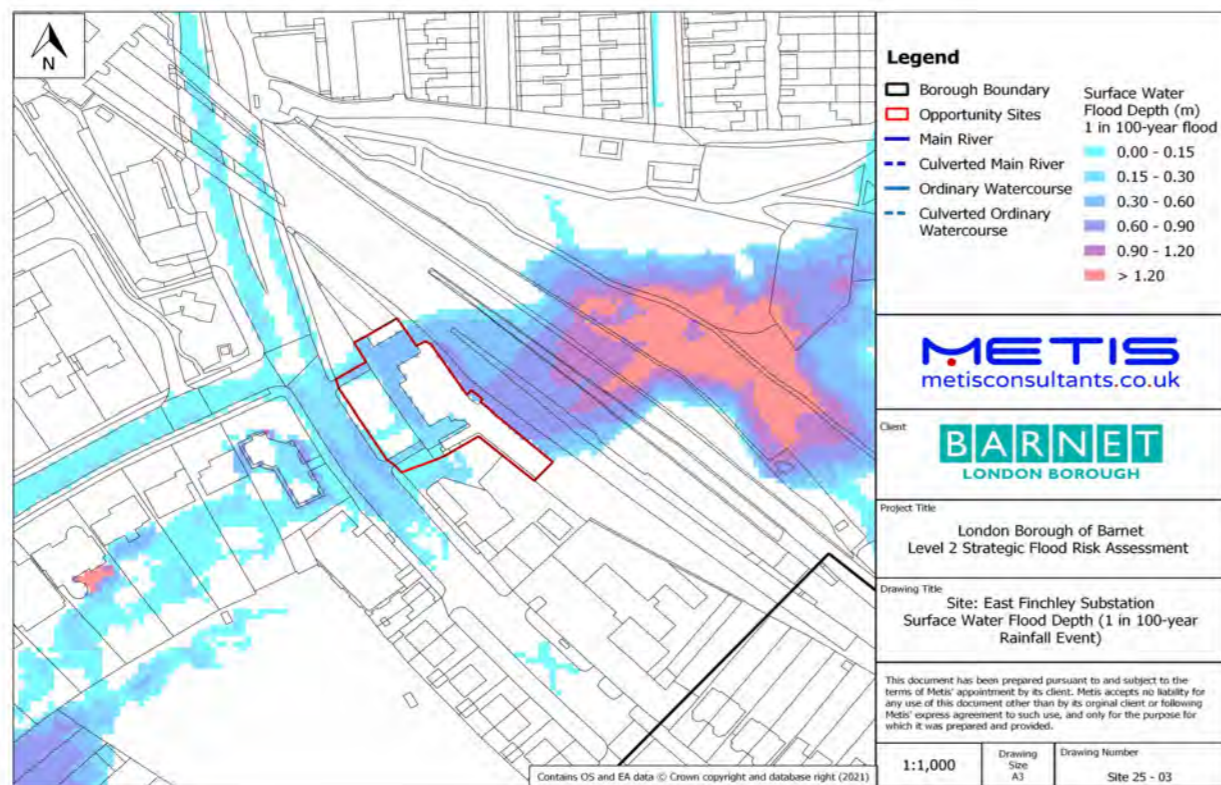


Figure 4 - RoFSW Flood Hazard Map

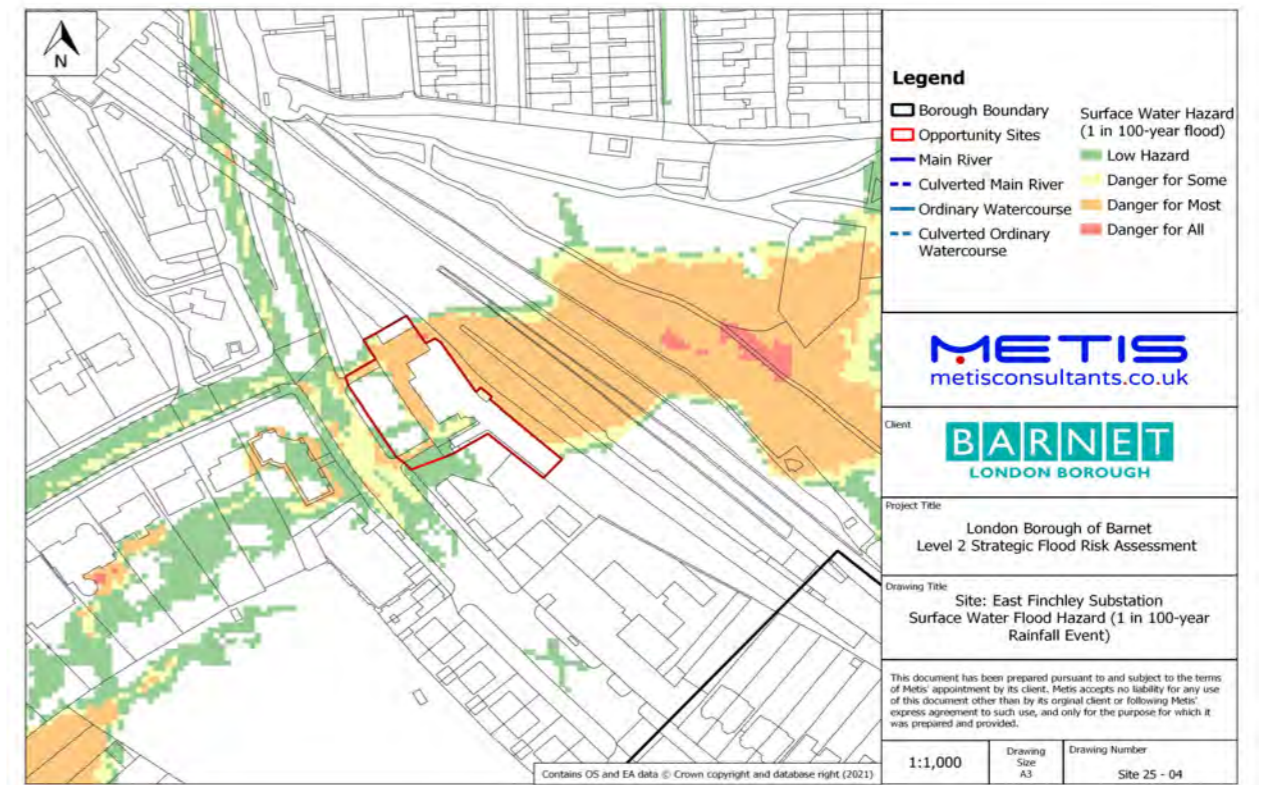


Figure 5 - Thames Water Sewer Flood Map

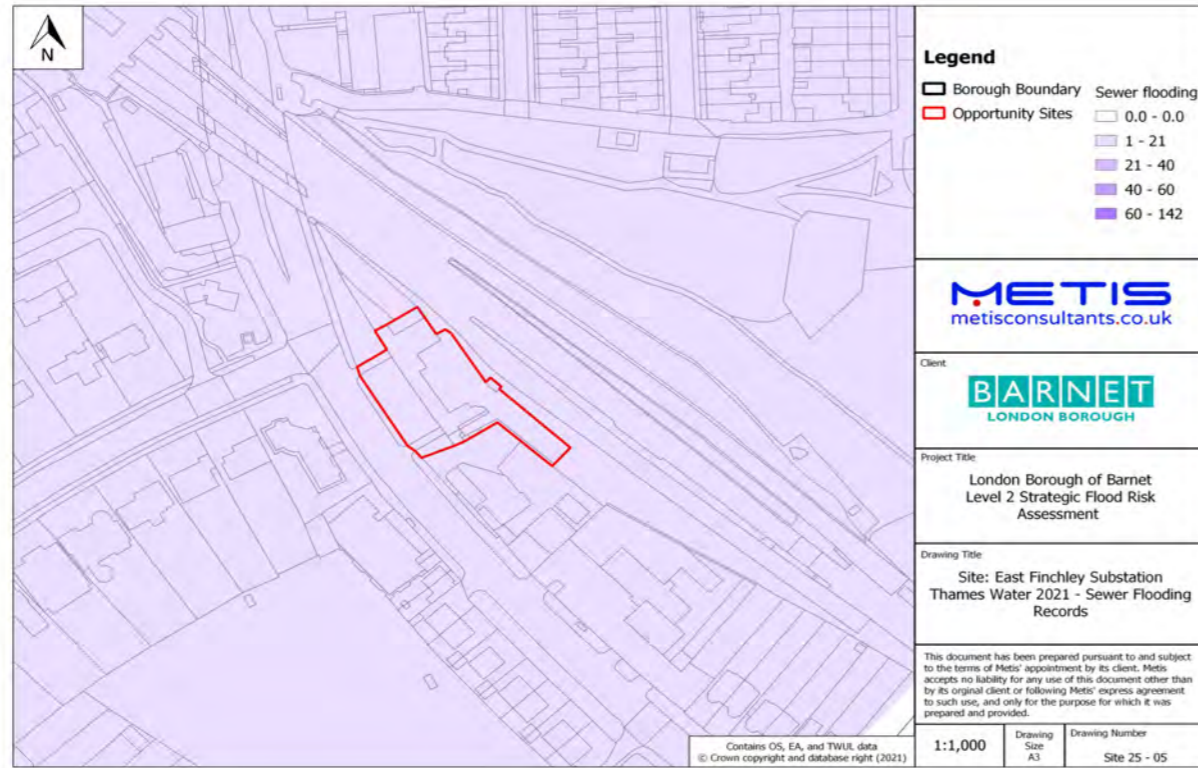


Figure 6 - Areas Susceptible to Groundwater Flooding Map

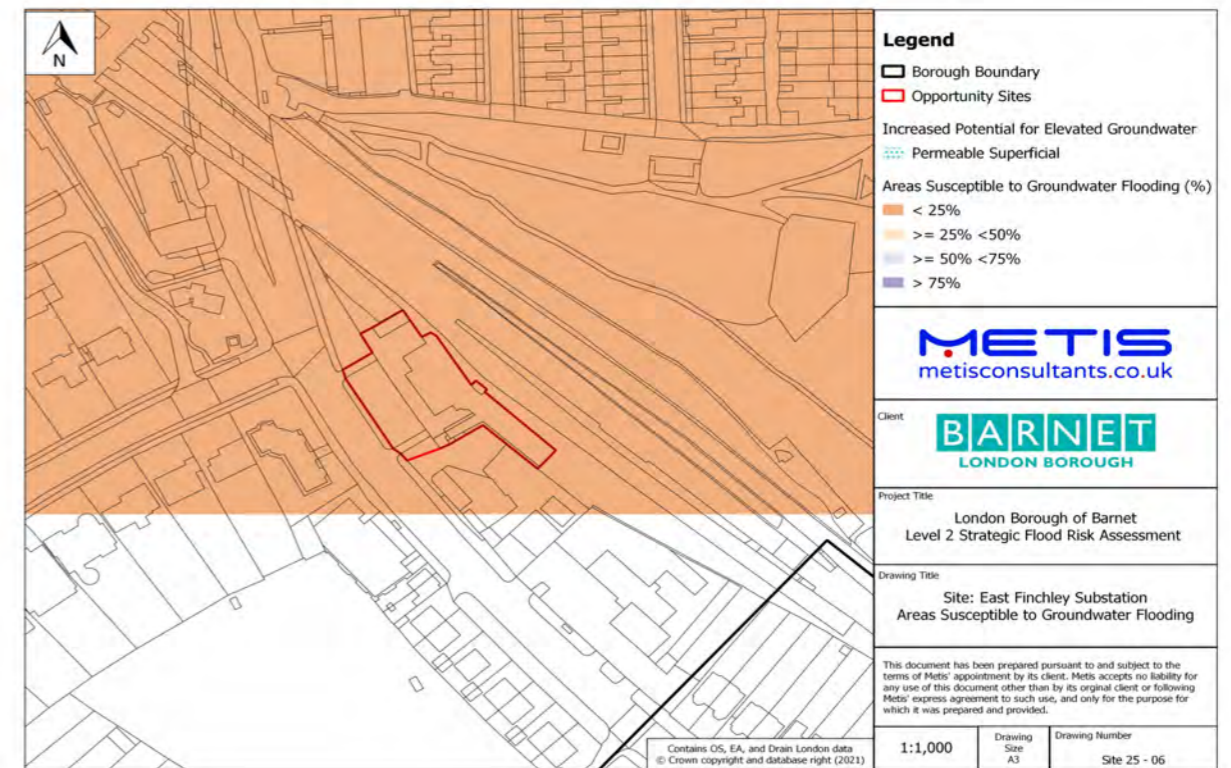
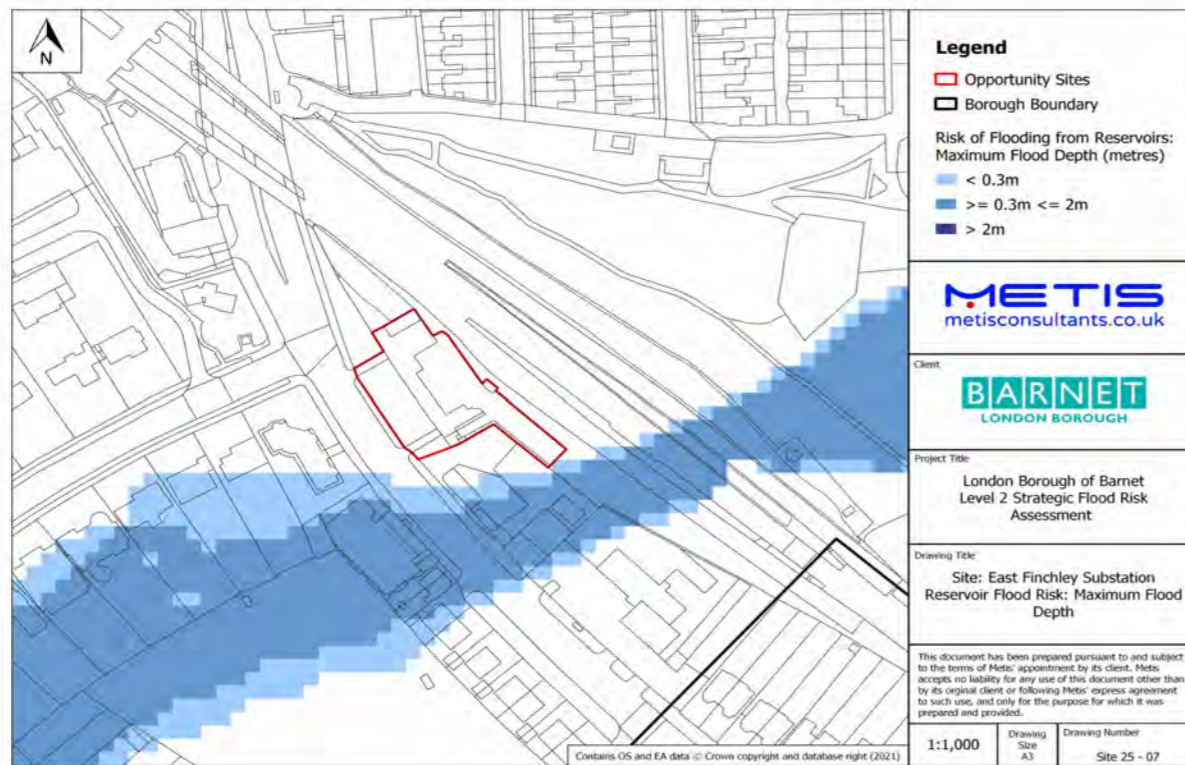


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Edgware Underground and Bus Stations

Address: Station Rd, Edgware, HA8 7AW	Area: 8.17 Ha
	Site Reference: 28

Current Use	Proposed Use
Transport operations	Residential with 30% mixed uses (transport, retail, office, and community)

Current Vulnerability Classification	Proposed Vulnerability Classification
Essential Infrastructure	More Vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	3.0	% of Site	<25	100	% of Site
FZ3a	1.6	% of Site	25-50	0	% of Site
FZ3b	0.8	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	1.8	% of Site	Artificial		
1% AEP	4.5	% of Site	Reservoir	No	At risk?
0.1% AEP	17.6	% of Site	Canal	No	At risk?
Sewer Flooding			Other	Yes	At risk?
No. Incidents		88			

Flood Defences
<ul style="list-style-type: none"> There are no flood defences located either on or within the immediate vicinity of the site. The area immediately upstream of the site, to the north and north-east, benefit from flood defences. The defences are located upstream in Edgwarebury Park for the Silk Stream.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	1.75	1.5	1.25	Hrs
Min. Depth	0	0	0	m
Max. Depth	2.9	3.9	5.1	m
Max. Velocity	1.3	1.6	1.8	m/s
Max Flood Level	53.83	53.95	54.10	m AOD
Max Ground Level	60.33	60.33	60.33	m AOD
Min Ground Level	48.18	48.18	48.18	m AOD
Flood Hazard	Danger for all	Danger for all	Danger for all	N/A
Duration of Flood	17.0+	17.25+	17.5+	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
<ul style="list-style-type: none"> The site is at risk of flooding from the Edgwarebury Brook and the Dean's Brook. They flow towards the site from the north, with the Edgwarebury Brook and Dean's Brook flowing from the north-west and north-east respectively. The Edgwarebury Brook is culverted north of the site, and the Dean's Brook is culverted at the site boundary. Flooding is predicted to originate from the Edgwarebury Brook and Dean's Brook exceeding capacity, with flood water flowing southward towards the site above ground. The predicted flood risk extent for the climate change scenario is slightly greater. The predicted maximum flood depth and flood velocity is also greater under the climate change scenario. The predicted fluvial flood extent for the 1% AEP + Climate Change event is 2.4%.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
<ul style="list-style-type: none"> Areas at the north-western and north-eastern boundary of the site are predicted to flood in the 1% AEP scenario. These areas are north of the railway line. Safe egress routes from the site should be routed towards the north-east region of the site, below the railway line, towards Station Road.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the 1% AEP + climate change fluvial event, 'More Vulnerable' development should be restricted to areas south of the railway line. Developments should not be built on top of the Dean's Brook culvert running through the site. Proposed developments on the site should be located outside of the 8m Main River buffer zone for the Dean's Brook. Due to the fluvial flood risk on site, basement developments should be limited to less vulnerable and water compatible uses. Basements are not permitted in Flood Zone 3b. See SFRA - Level 2 Report section numbers 4.2, 4.3, 4.4, and 4.5 for further development stipulations. See SFRA - Level 2 Report section number 4.6 for Main River stipulations. Develop a Flood Emergency and Evacuation Plan for the site.

SURFACE WATER

Risk Assessment*				
Parameter	3.33% AEP	1% AEP	**0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.15 - 0.30	0.60 - 0.90	0.60 - 0.90	m
Max. Velocity	0 - 0.25	0.25 - 0.50	0.50 - 1.00	m/s
Max. Hazard	0.75 - 1.25	1.25 - 2.00	1.25 - 2.00	N/A

* Site extent encroaches into a culverted Main River (Dean's Brook). The values provided are for the extent outside of the Dean's Brook channel extent.

** The 0.1% annual probability extent represents potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site from the north-west and collects around the bus depot and in the south-west by Dean's Brook. CC is predicted to increase flood extent and velocity, but not max depth or hazard. The majority of this site is within Barnet's CDA 024.

Site Access / Egress
Safe access and egress routes can be directed to the south-west of the site, towards the current Broadwalk Centre retail building. Flood risk in this direction is predicted to be lower.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> Vulnerable development must be directed away from the north-western corner of the site and the area to the immediate north of the bus depot. To mitigate against the 0.1% AEP event, the area between Dean's Brook and the railway line must also be reserved for less vulnerable development. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site + comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock geology. Ground investigations are required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Edgware Underground and Bus Stations

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment <ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. The site falls within the HA8 7 postcode district, where there have been 20 reported flood incidents from sewer flooding. Part of the site also falls within the HA8 9 postcode district, where there have been 68 reported flood incidents from sewer flooding. 	Risk Assessment <ul style="list-style-type: none"> The site falls in an area that is classified as having <25% susceptibility to groundwater flooding. The site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. This is associated with the Dean's Brook and Edgwarebury Brook. These main rivers are underlain by Alluvium (clay, silt, sand, and gravel) superficial deposits. 	Risk Assessment <p>The site is at risk of artificial flooding from flood storage areas at Bury Farm, Stoney Wood, and Prince Edward Playing Fields. Seven Acre Lake to the north of Canons Park also contributes to artificial flood risk.</p> <ul style="list-style-type: none"> The artificial flooding extent is predicted to leave an area in the east of the site at risk of flooding. The site is predicted to flood to depths of over 2m. Reservoir failure flood speeds are predicted to reach a maximum of over 2m/s.
Mitigation Requirements <ul style="list-style-type: none"> Thames Water must be consulted to confirm if the site has historically flooded and to establish if there is sufficient capacity in the surface water sewer network. The development must implement SuDS to reduce the runoff to sewer to greenfield rates or as close as possible to greenfield rates. 	Mitigation Requirements <p>No mitigation measures required.</p>	Mitigation Requirements <ul style="list-style-type: none"> A suitable emergency response plan should be put in place for any proposed development, including an emergency warning system in the event of a reservoir flooding incident. Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes. See SFRA Level 2 Report mitigation requirement numbers 4.2 and 4.3 for finished floor level and flood resistant / resilient building regulations. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes - The development must use proper surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. See SFRA Level 2 Report mitigation requirement number 4.4 for compensatory flood storage requirements. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use vulnerability classification is not changing. However, the development plan will see more of the site covered with 'Less Vulnerable' and 'More Vulnerable' categories rather than essential infrastructure. The site currently consists of brownfield with some green space to the south. Development may cause increased flood risk in low-elevation areas such as the southern side of the site. SuDS must be implemented to manage this. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Developments should not be built on top of the Dean's Brook culvert running through the site. Developments should be restricted to areas outside of the 8m Main River buffer zone for the Dean's Brook. An emergency evacuation plan must be put in place to ensure the railway and bus routes can remain operational in case of flood. Vulnerable development must be restricted to the area between the railway line and the Broadwalk Centre. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater runoff management by introducing SuDS (see Mitigation - Surface Water Drainage). Basements are not permitted in Flood Zone 3b. Basements may be appropriate outside of Flood Zone 3b, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> Yes, a culverted section of the Dean's Brook (Main River) passes through the site. See SFRA Level 2 Report, mitigation requirement 4.6. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (See Safety of Development box). Mitigation measures to protect proposed developments against deep maximum fluvial flood depths can be implemented (See Mitigation / FRA Requirements). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (See Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
<ul style="list-style-type: none"> Finished floor levels must be at least 0.3m above predicted 1% AEP+70%CC flood levels, and flood compensation provided. Proposed developments should be restricted to areas outside of the 8m Main River buffer zone. 	<ul style="list-style-type: none"> Developments should not be built on top of the culvert. A Flood Emergency and Evacuation Plan must be developed for the railway and bus stations. Vulnerable development should be restricted to the centre of the site, south of the railway line.
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. Flood resistant/resilient construction is required. 	<p>Flood plain compensation must be provided for up to and including a 1% AEP surface water event.</p>
Sewer	
<p>Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.</p>	<p>Development must reduce the runoff to sewer to greenfield rates.</p>
Groundwater	
<p>No mitigation measures required.</p>	
Artificial	
<p>Emergency planning officers must be consulted to create a reservoir failure emergency and evacuation plan.</p>	

Figure 1 - Fluvial Flood Depth Map

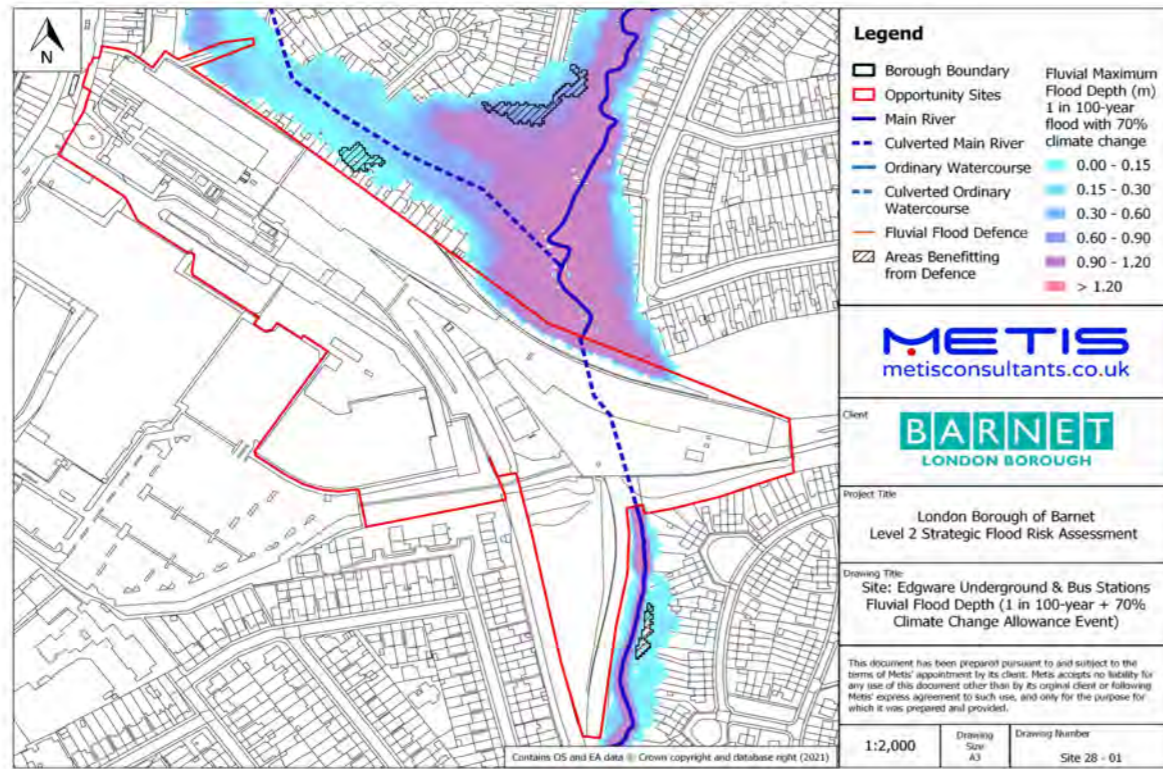


Figure 2 - Fluvial Flood Hazard Map

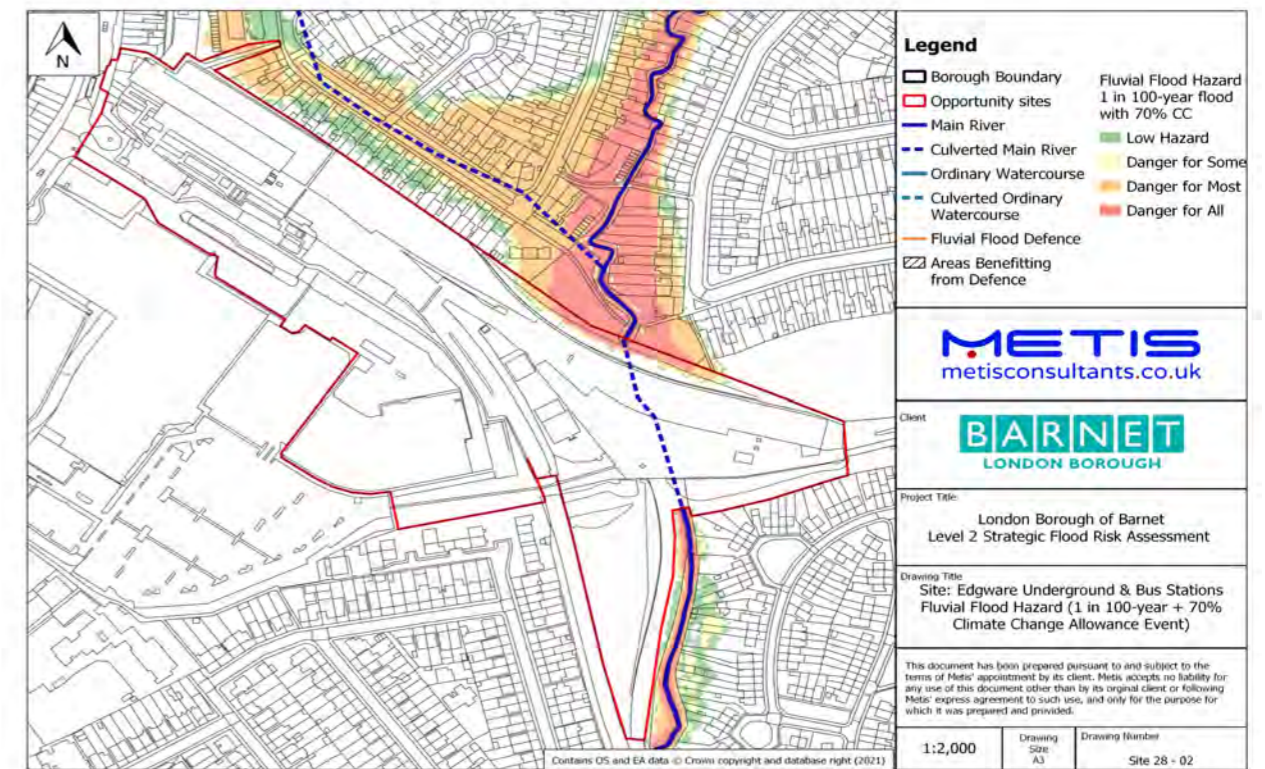


Figure 3 - RoFSW Flood Depth Map

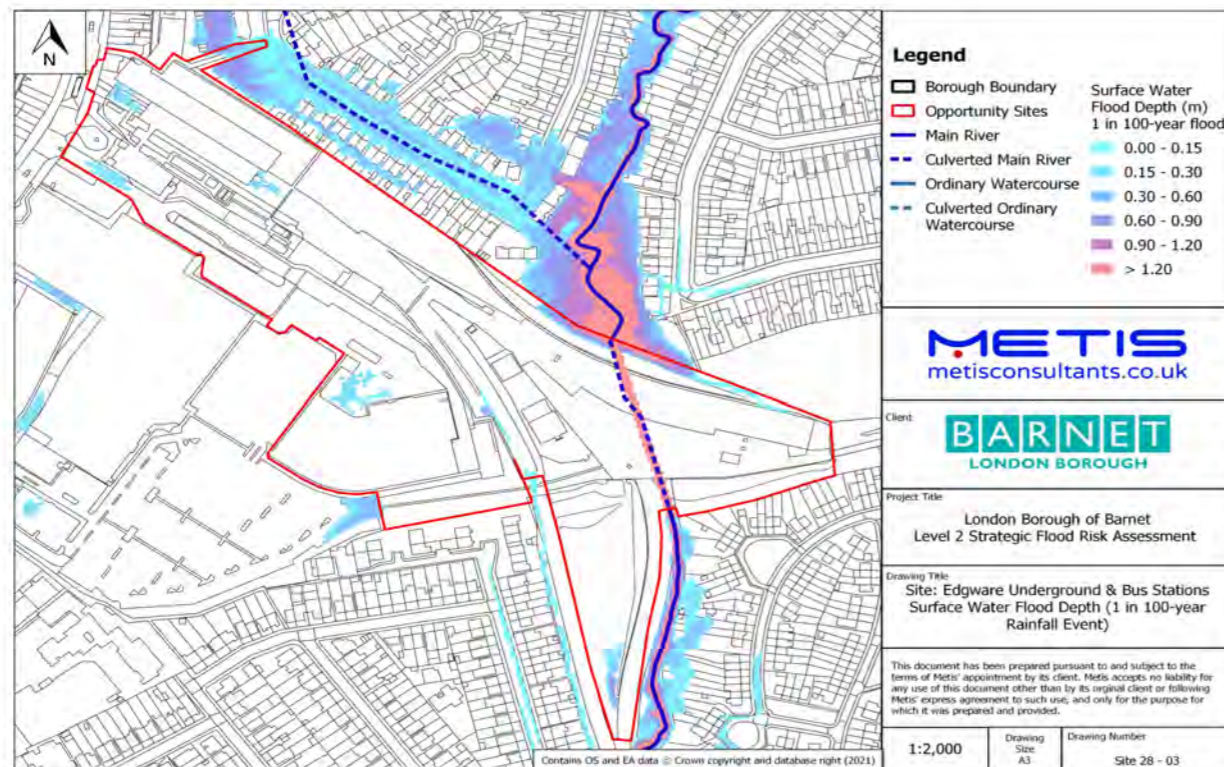


Figure 4 - RoFSW Flood Hazard Map

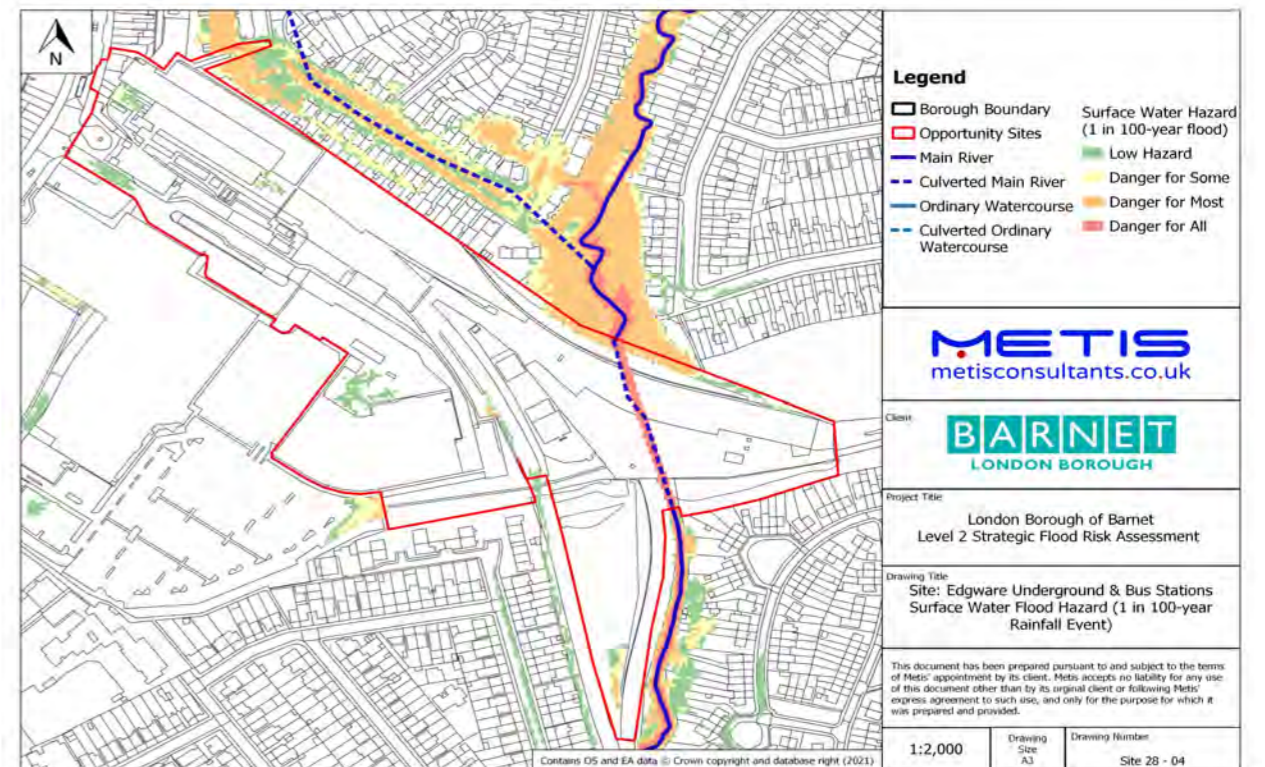


Figure 5 - Thames Water Sewer Flood Map

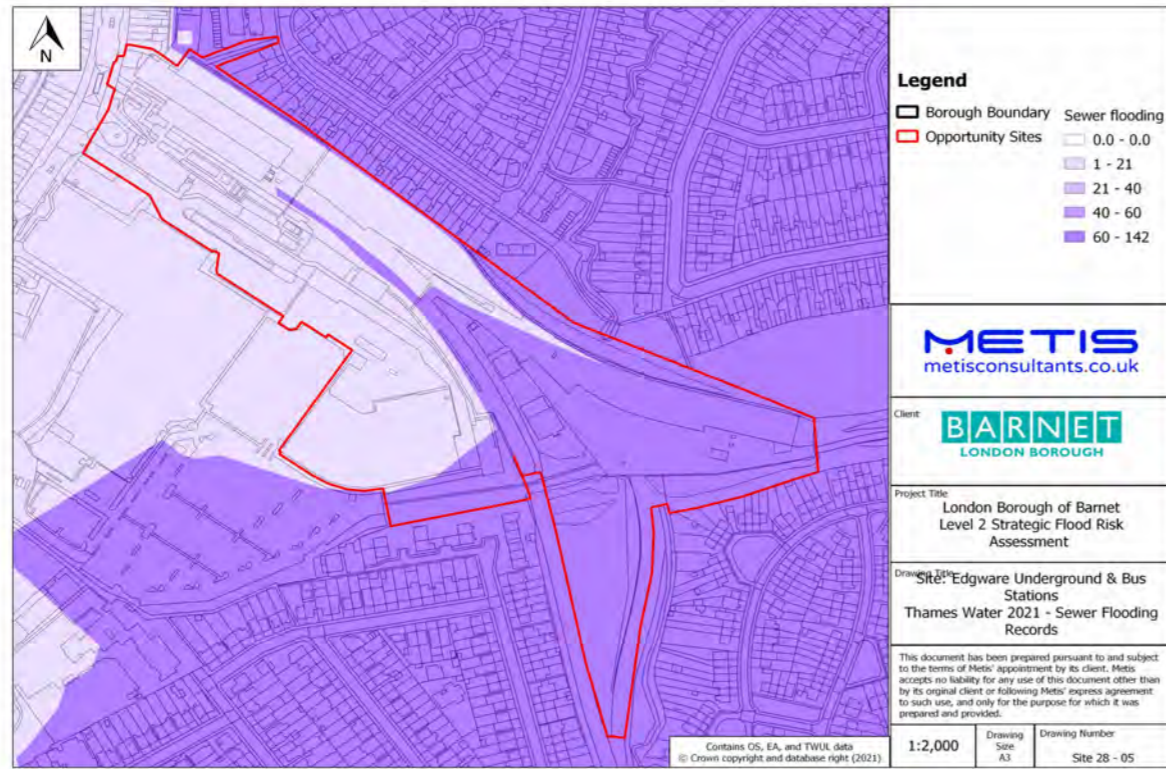


Figure 6 - Areas Susceptible to Groundwater Flooding Map

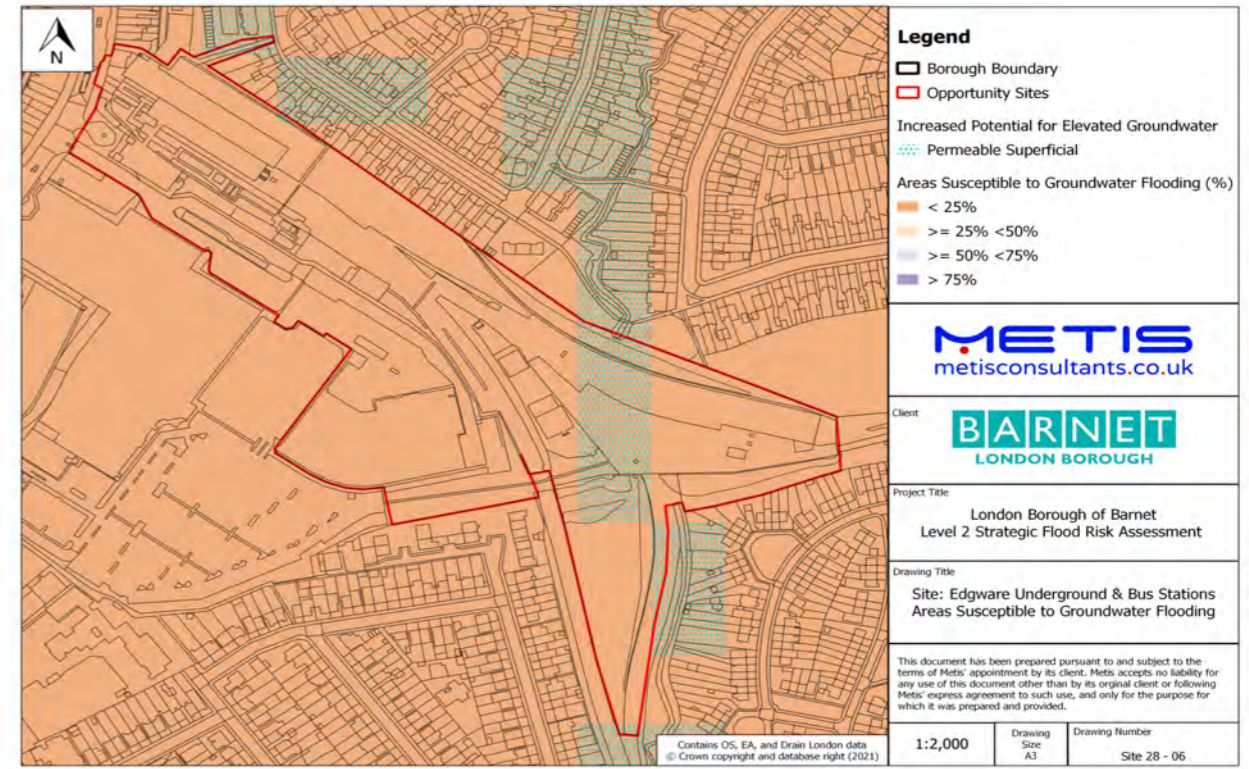
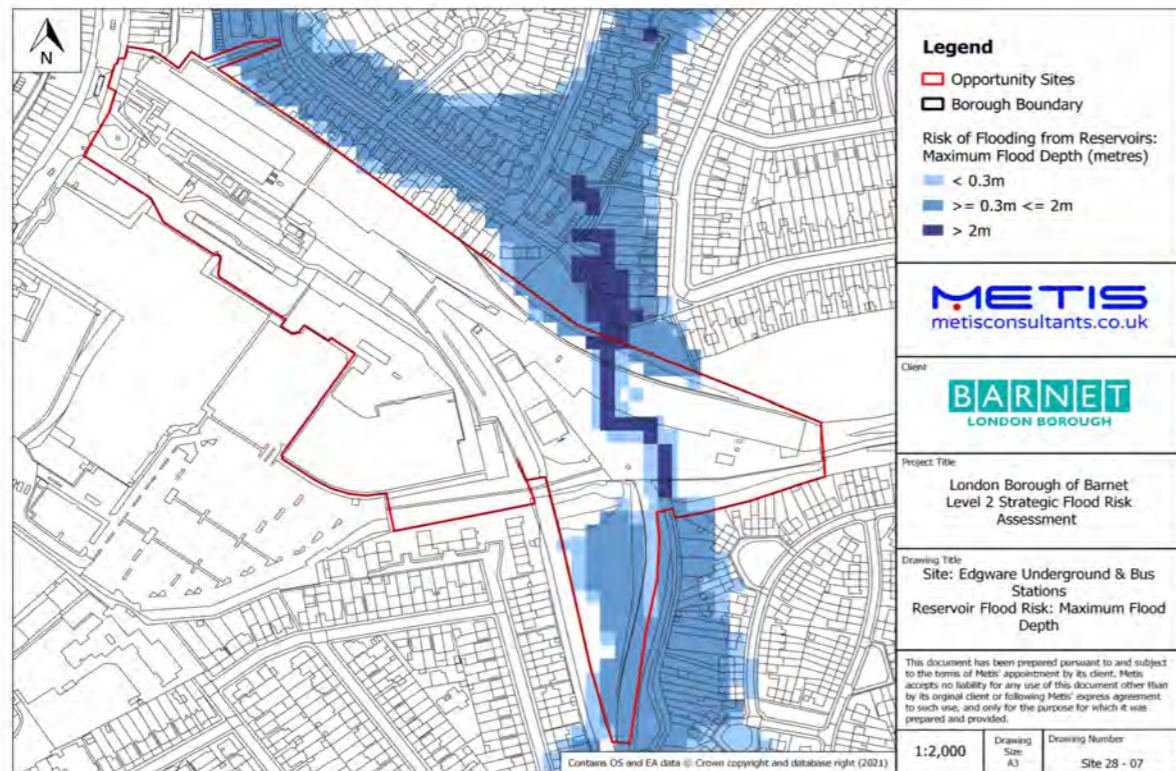


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Finchley Central Station

Address: Squires Lane/ Nether St/ Crescent St, Finchley N12	Area: 6.74 Ha
	Site Reference: 30

Current Use	Proposed Use
Railway station, retail	Residential-led with 50% mixed uses (transport, retail, offices, car parking)

Current Vulnerability Classification	Proposed Vulnerability Classification
Essential	Essential

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	100	% of Site
FZ3a	0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	3.3	% of Site	Artificial		
1% AEP	11.6	% of Site	Reservoir	No	At risk?
0.1% AEP	36.4	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		32			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Figure 1 - Fluvial Flood Depth Map

Figure 2 - Fluvial Flood Hazard Map

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.60 - 0.90	> 1.20	> 1.20	m
Max. Velocity	0.50 - 1.00	0.50 - 1.00	1.00 - 2.00	m/s
Max. Hazard	1.25 - 2.00	1.25 - 2.00	> 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site to the south-east by Squires Lane, and flows along the railway line to exit by Crescent Road in the north-west. There is significant water ponding by the Underground station. CC is predicted to increase flood extent, depth, speed, and hazard.

Site Access / Egress
<ul style="list-style-type: none"> For central portions of the site, egress routes should be directed to Regent's Park Road, which is a bridge over the railway line and is less likely to flood. For other parts, egress routes may be toward the home gardens parallel to the railway line. Emergency plans must indicate how the railway line can be kept operational to comply with PPG guidance (Flood Risk and Coastal Change, paragraph 039).

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against predicted flooding in the climate change scenario (0.1% AEP surface water event), more vulnerable development should be located in the upper half of the site and away from the railway line. See West London SFRA web maps. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay bedrock and Lowestoft Formation superficial deposits. Ground investigations would be required to confirm whether infiltration based SuDS are suitable.

Figure 3 - RoFSW Flood Depth Map

Figure 4 - RoFSW Flood Hazard Map

SITE ASSESSMENT - Finchley Central Station

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 13 reported incidents of sewer flooding in the postcode region of the lower half of this site (N3 2): 9 internal and 4 external incidents. On the upper half (region N3 1), there have been 19 incidents: 6 internal and 13 external. <p>Figure 5 - Thames Water Sewer Flood Map</p>	<ul style="list-style-type: none"> The site is classified as having <25% susceptibility to groundwater flooding. The north-western end of the site falls within a 'Permeable Superficial' area with regards to Increased Potential for Elevated Groundwater. Most of the site is underlain by Lowestoft formation (diamicton) superficial deposits. The north-western edge is underlain by Dollis Hill gravel member (sand and gravel) superficial deposits. <p>Figure 6 - Areas Susceptible to Groundwater Flooding Map</p>	<p>There is no risk from artificial flooding.</p> <p>Figure 7 - Outline Reservoir Flood Map</p>
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	<p>No mitigation measures are required.</p>	<p>No mitigation measures are required.</p>

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use and the current vulnerability classification is not changing. The site currently consists of a railway line surrounded by greenfield. Developing these greenfields will lead to an increase in impermeable surface area, which if not carefully managed can lead to increased flood risk. Flood plain compensation must be introduced to mitigate this. Much of the railway line is currently at high flood risk. The area by the underground station, especially, is predicted to flood at depths > 1.2m with high-velocity flood water under the 1% AEP surface water event. New developments must mitigate this residual risk - see SFRA Level 2 Report, requirement number 4.5. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> More vulnerable development should be restricted to the upper portion of the site parallel to Dollis Park. Low elevation points on site (such as the railway line) are currently predicted to be at high flood risk. This implies that site runoff is likely to be at an uncontrolled rate. New developments must introduce SuDS to manage this. (See Mitigation - Surface Water Drainage). Less vulnerable or water compatible categories of basements may be appropriate north of Regent's Park Road, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exceptions test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, there are no Main Rivers or Ordinary Watercourses near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> An emergency evacuation plan should be created for the Underground station 1% AEP event. More vulnerable development should be restricted to the upper portion of the site parallel to Dollis Park. 	<ul style="list-style-type: none"> New development should introduce SuDS to manage surface water runoff. Flood plain compensation must be provided for up to and including a 1% AEP surface water event.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

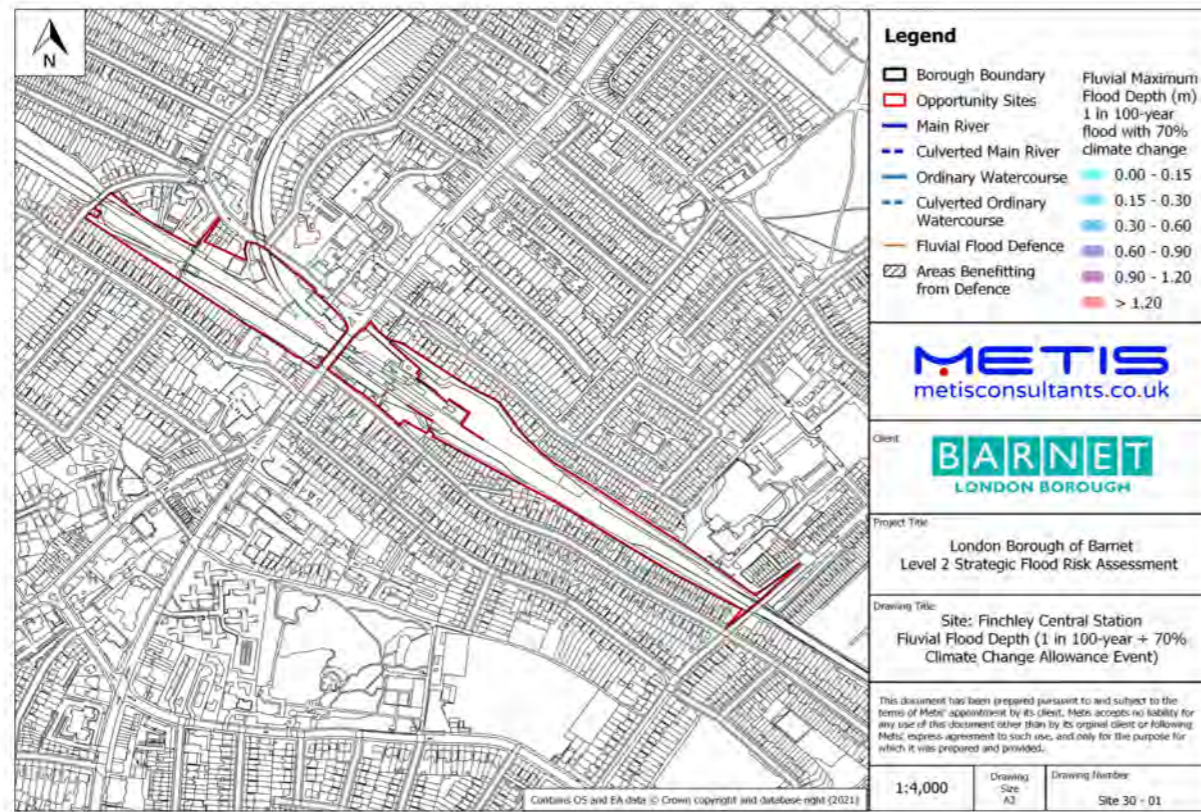


Figure 2 - Fluvial Flood Hazard Map

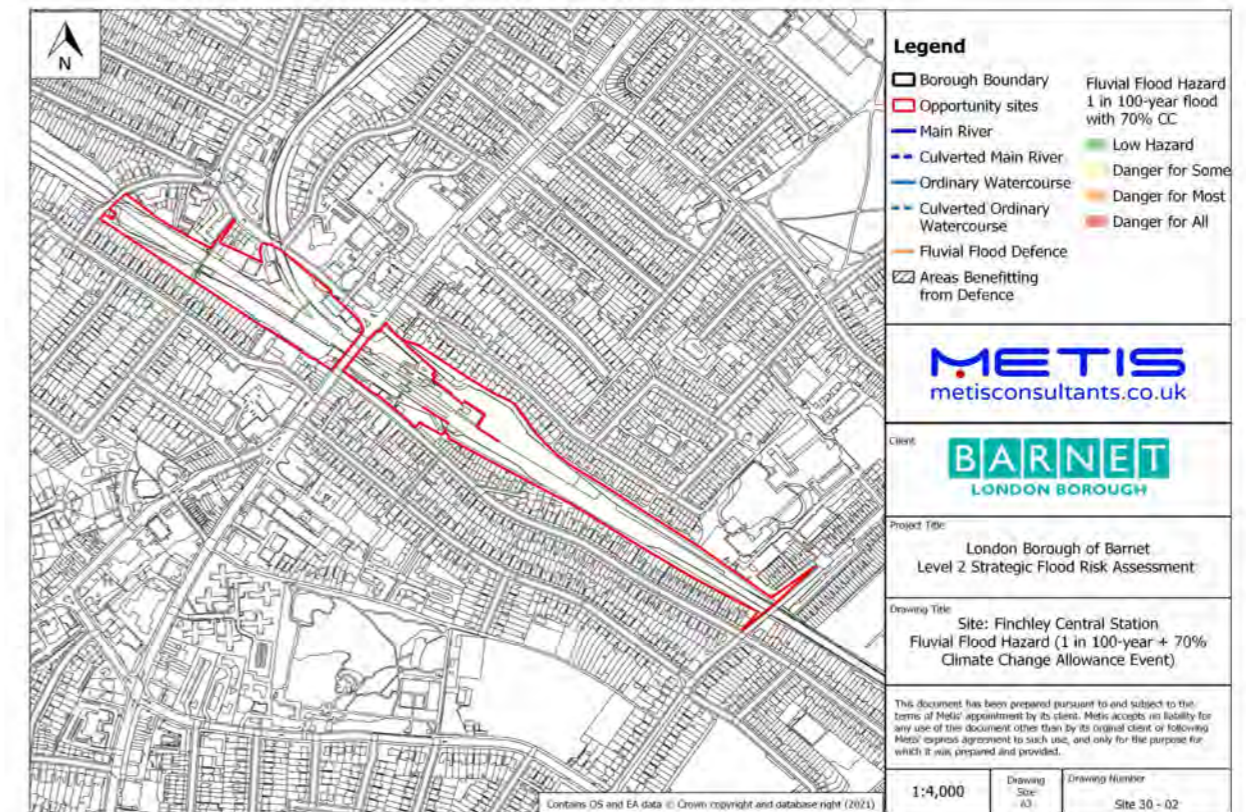


Figure 3 - RoFSW Flood Depth Map

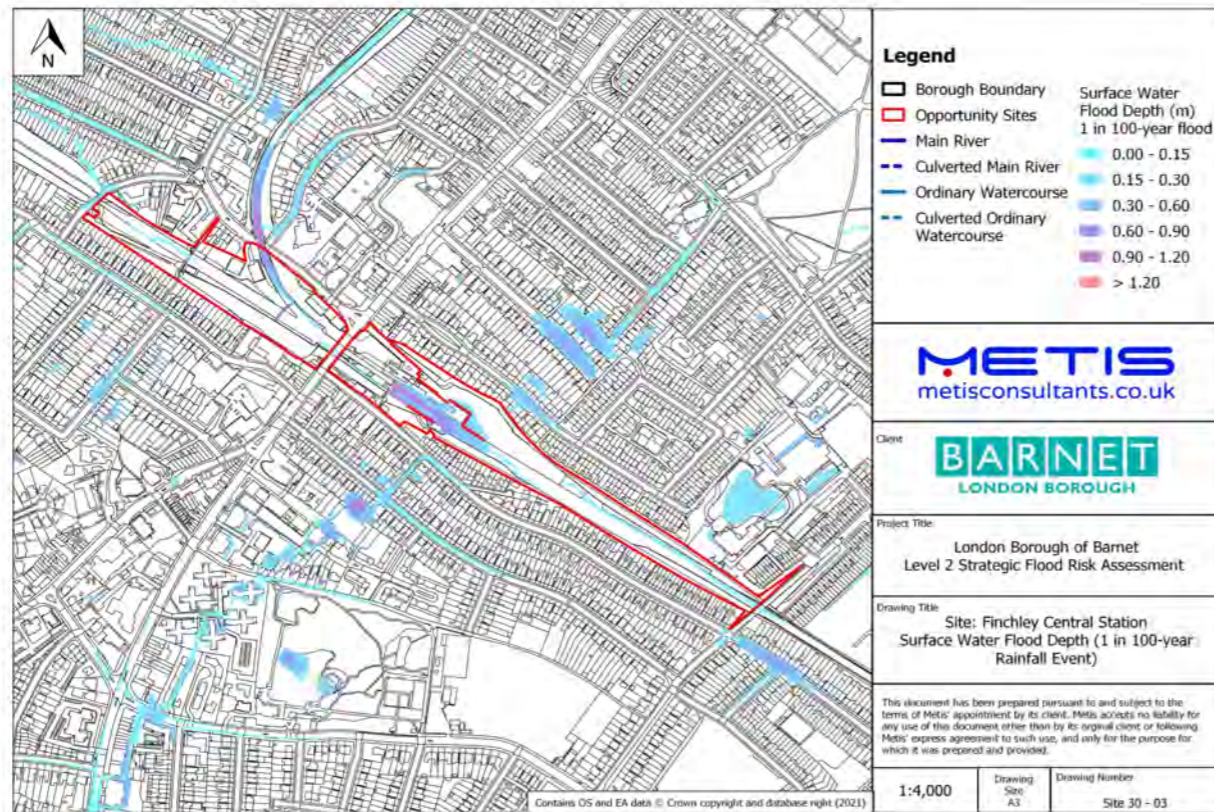


Figure 4 - RoFSW Flood Hazard Map

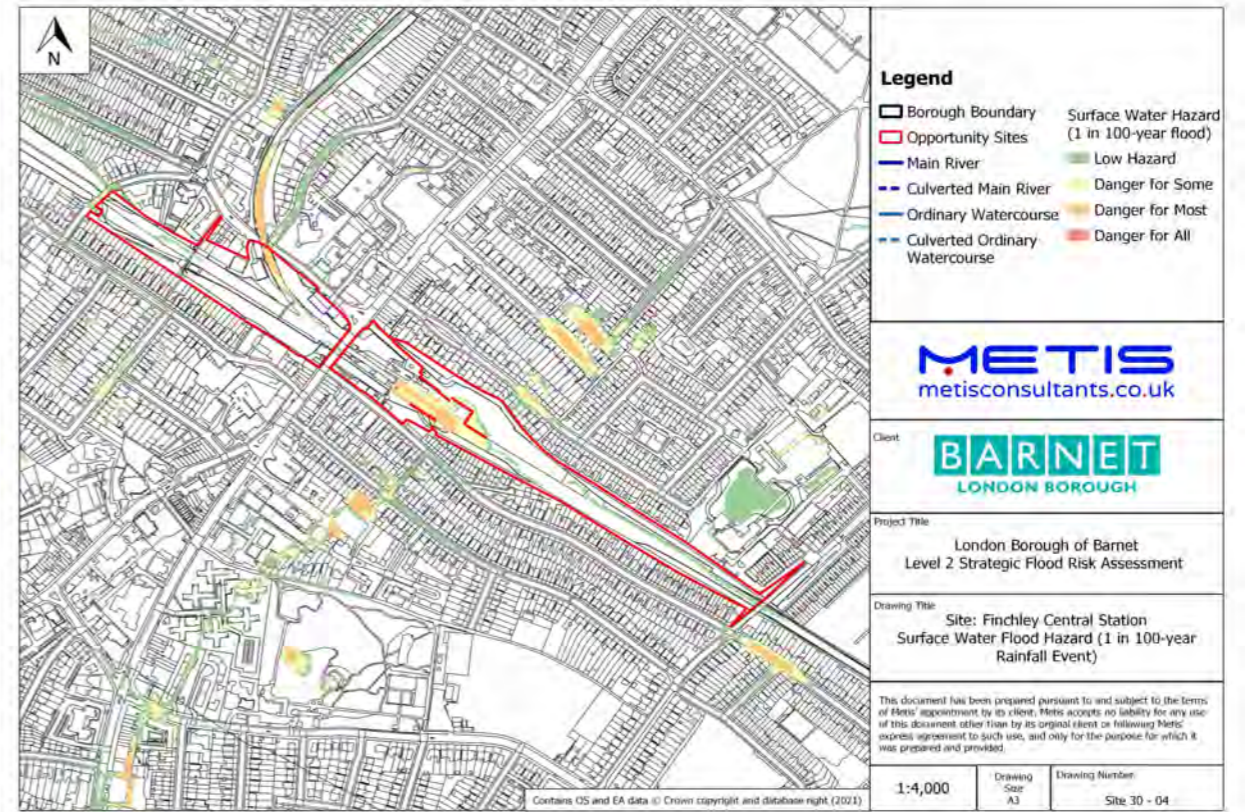


Figure 5 - Thames Water Sewer Flood Map

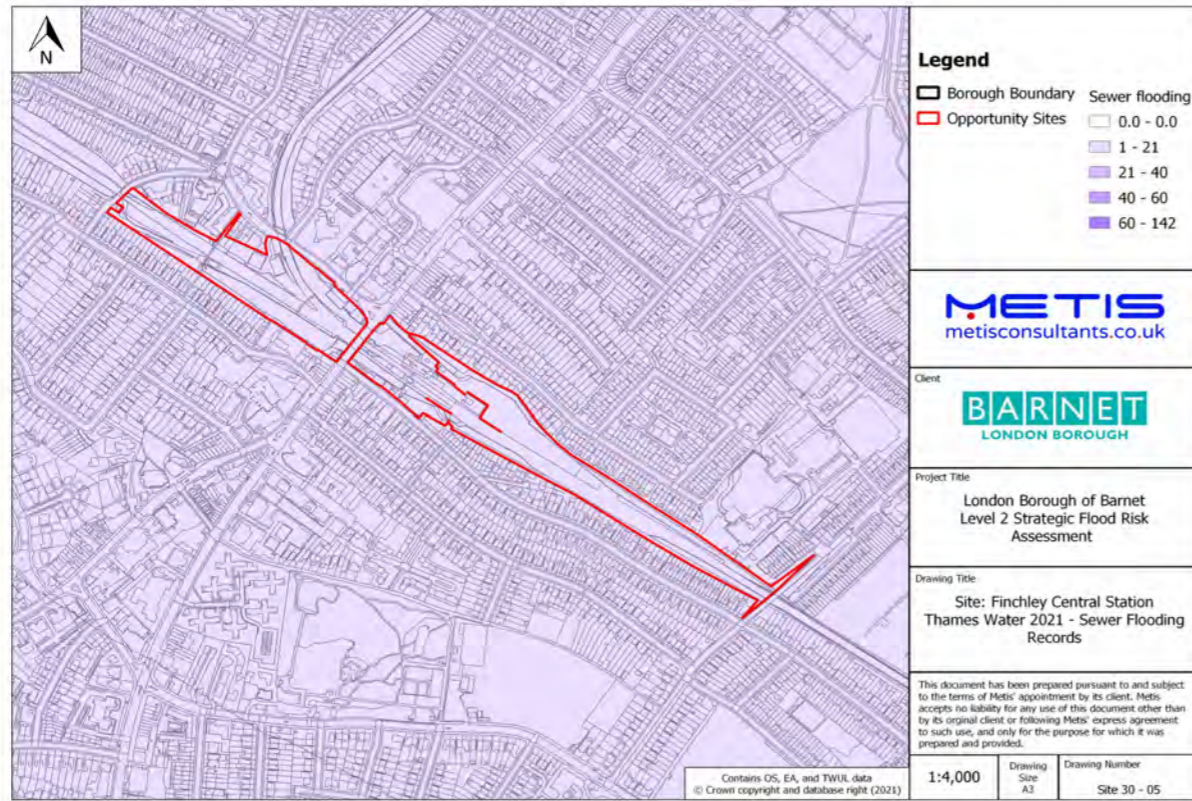


Figure 6 - Areas Susceptible to Groundwater Flooding Map

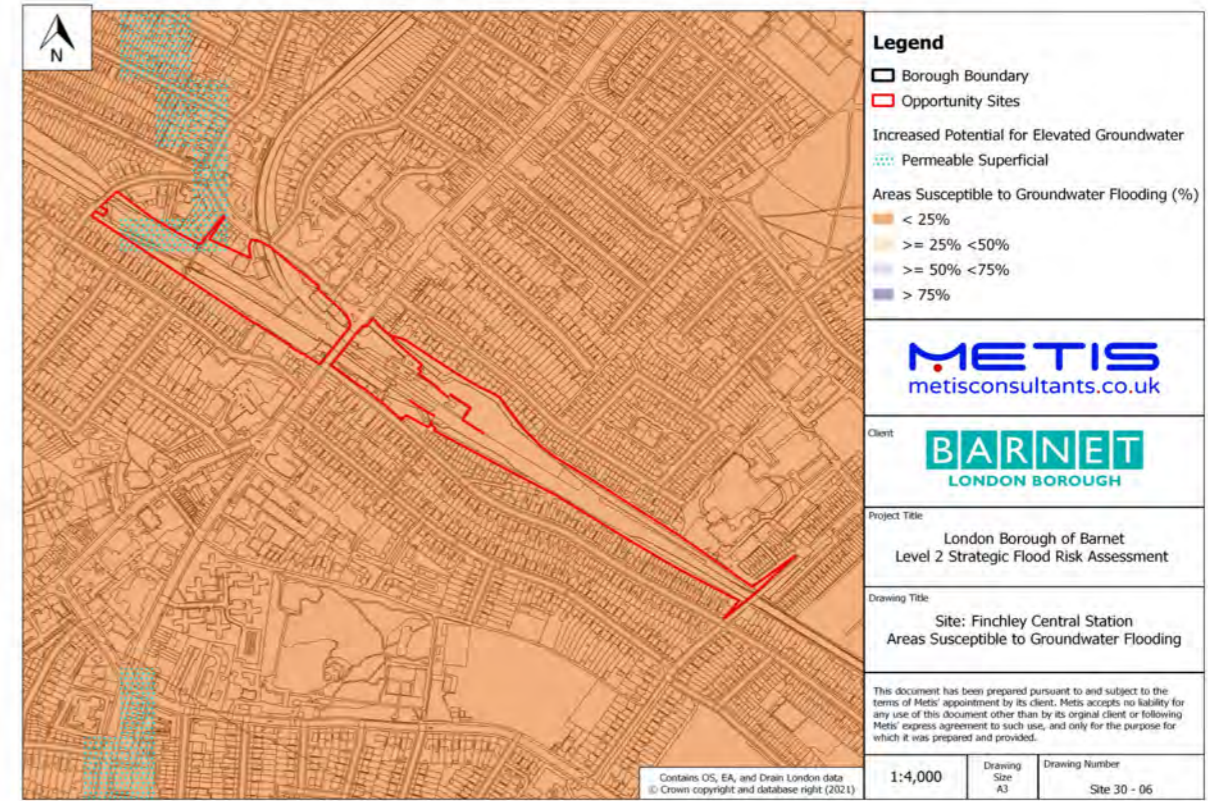
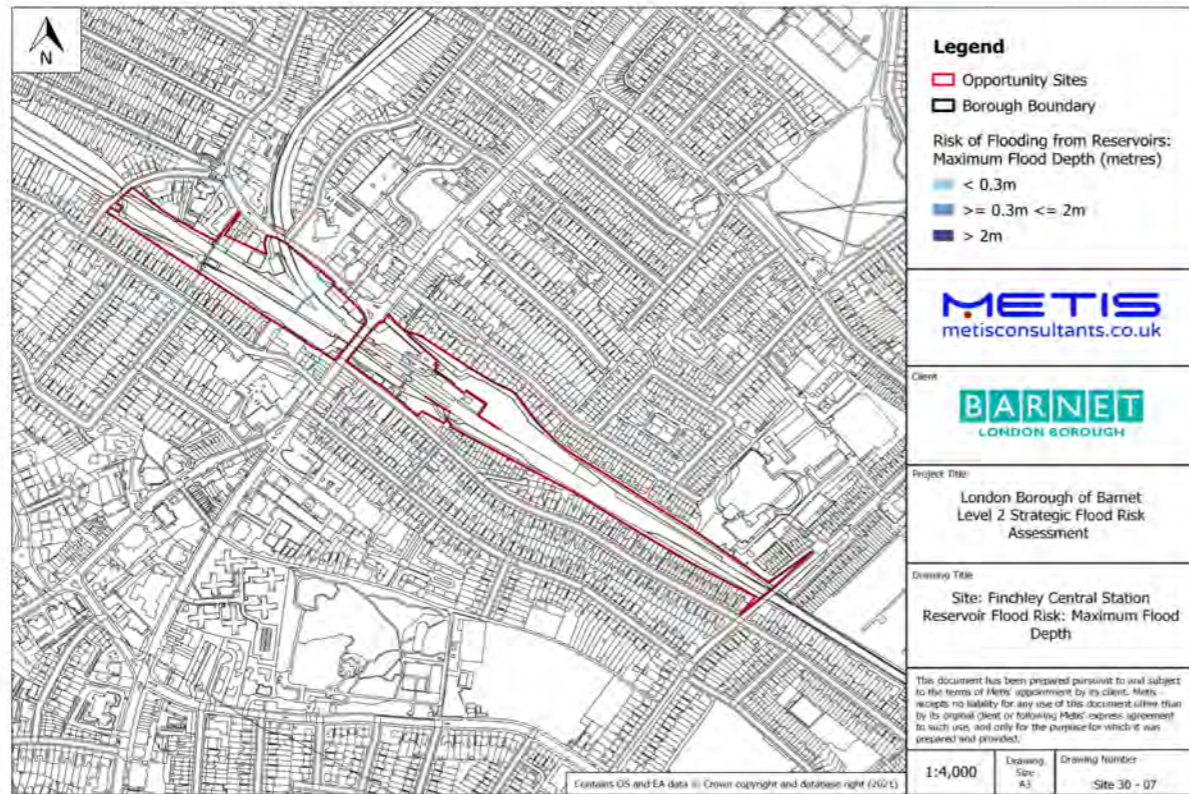


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - High Barnet Station

Address: Great North Rd, Chipping Barnet, EN5 5P	Area: 1.49 Ha
	Site Reference: 44

Current Use	Proposed Use
Car park, storage, retail	Residential with 25% mixed uses (car park, employment)

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	38.1	% of Site
FZ3a	0	% of Site	25-50	No data	% of Site
FZ3b	0	% of Site	50-75	No data	% of Site
Surface Water			>75	No data	% of Site
3.33%*	8.0	% of Site	Artificial		
1% AEP	15.9	% of Site	Reservoir	No	At risk?
0.1% AEP	25.7	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		14			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.30 - 0.60	0.30 - 0.60	m
Max. Velocity	0.25 - 0.50	0.25 - 0.50	0.50 - 1.00	m/s
Max. Hazard	0.75 - 1.25	0.75 - 1.25	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water enters the site from the north-west and accumulates there, as well as in the current car parking area. Climate Change is predicted to increase flood extent, velocity, and hazard, but not maximum flood depth. This site lies within Barnet's CDA 005.

Site Access / Egress
Safe access/egress routes should be directed towards A1000 Barnet Hill and/or the south-east of the site.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against the 1% AEP surface water event, more vulnerable development should be located away from the centre of the site, where the current car park is. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations would be required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - High Barnet Station

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by a foul sewer network only. There have been 14 reported incidents of sewer flooding in this site's postcode region (EN5 5): 8 internal and 6 external. All but one incident was in the 1 in 20-year (5% AEP) rainfall extent. 	<ul style="list-style-type: none"> The lower portion of the site is classified as having <25% susceptibility to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	<p>There is no risk from artificial flooding.</p>
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm whether the site has historically flooded and to ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to zero, as no runoff can be accepted by foul water sewers. 	<p>No mitigation measures required.</p>	<p>No mitigation measures required.</p>

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing to a more vulnerable risk category. This may increase flood risk on the south-eastern corner of the site, which is at a slightly lower elevation. A SuDS installation to manage runoff may be appropriate close to the Underground station entrance to avoid this. Currently, the site is mostly brownfield with hardstanding towards the centre. Development may result in the loss of flood storage; thus, flood plain compensation must be implemented. There is a strip of green space on the north-west of the site, close to the station access road and parallel to Barnet Hill. Building over this will increase the impermeable surface area. This must be mitigated with flood plain compensation and runoff storage. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> More vulnerable development should be restricted to the south-east of the site, where there is no predicted flood risk. Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. It is anticipated that runoff from the site is currently at an uncontrolled rate. New development can provide greater management of runoff through the introduction of SuDS (See Mitigation - Surface Water Drainage). <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No - there are no Ordinary Watercourses or Main Rivers near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP event flood depth at any point onsite. More vulnerable development should be restricted to the south-east of the site. 	<ul style="list-style-type: none"> Flood plain compensation must be provided for up to and including a 1% AEP surface water event. Flood resistant / resilient buildings required.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must eliminate runoff to sewer.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

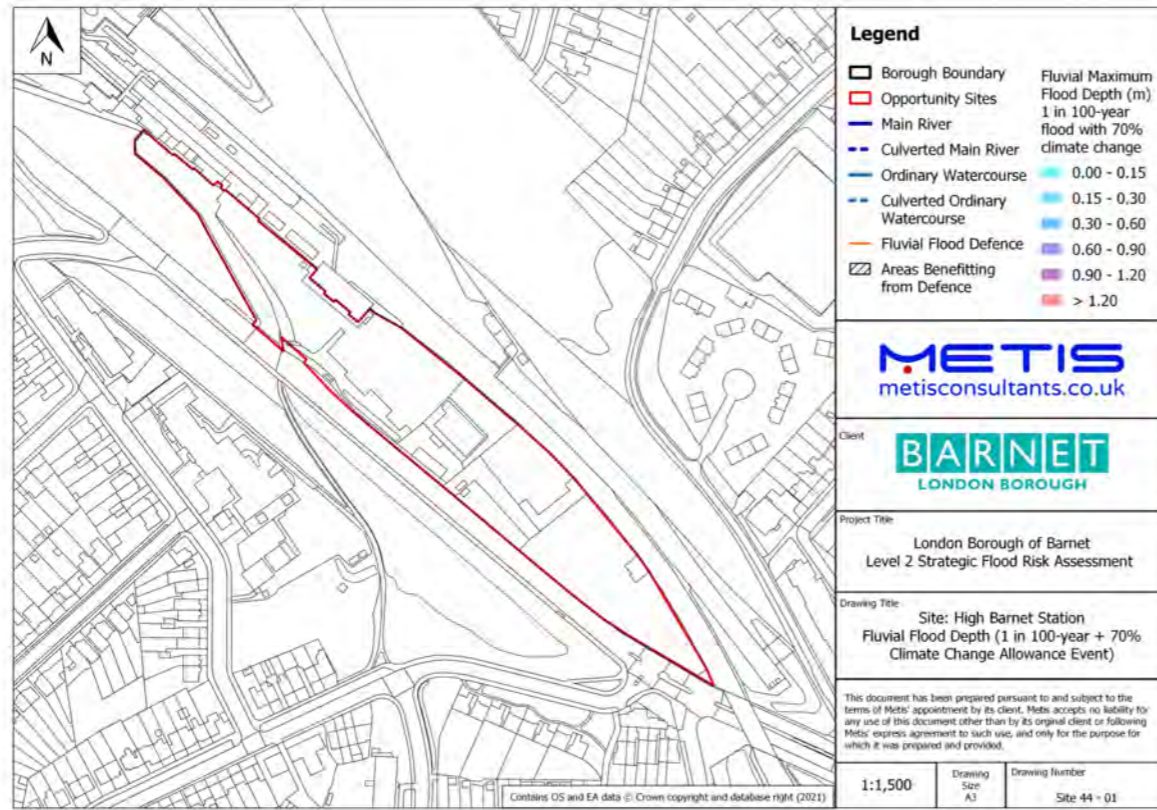


Figure 2 - Fluvial Flood Hazard Map

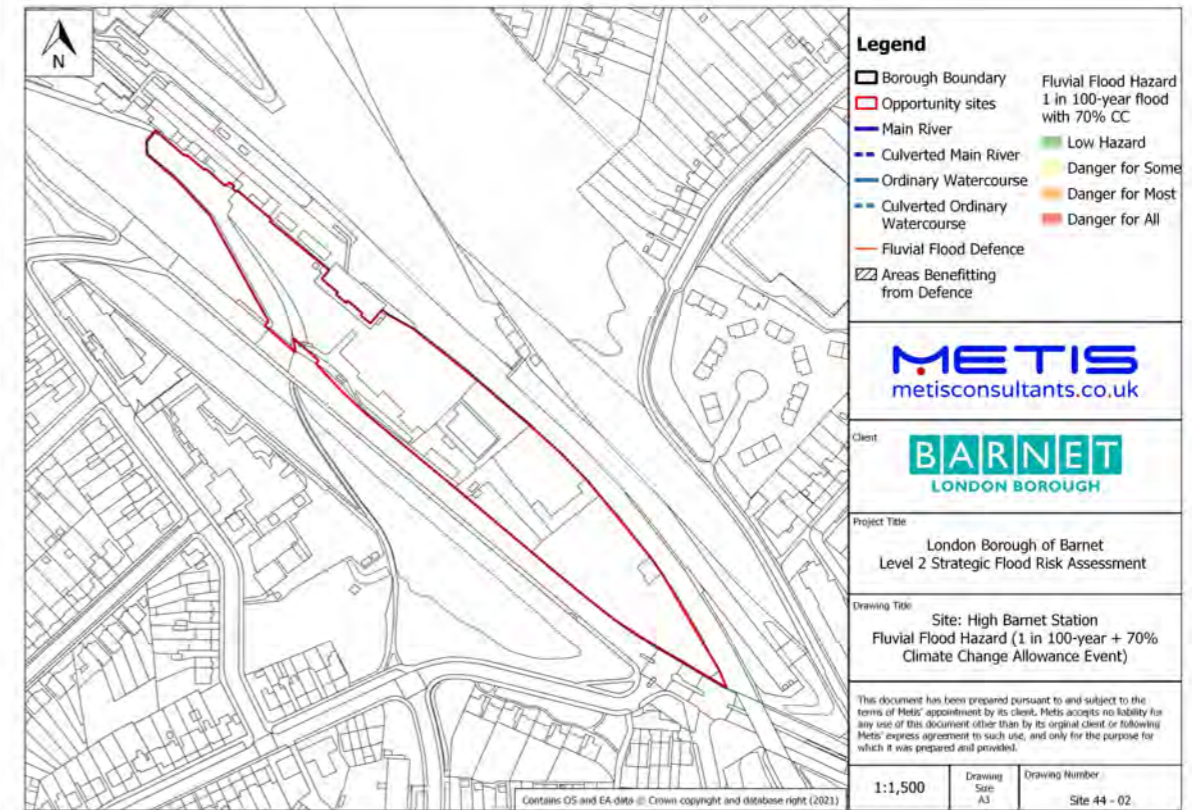


Figure 3 - RoFSW Flood Depth Map

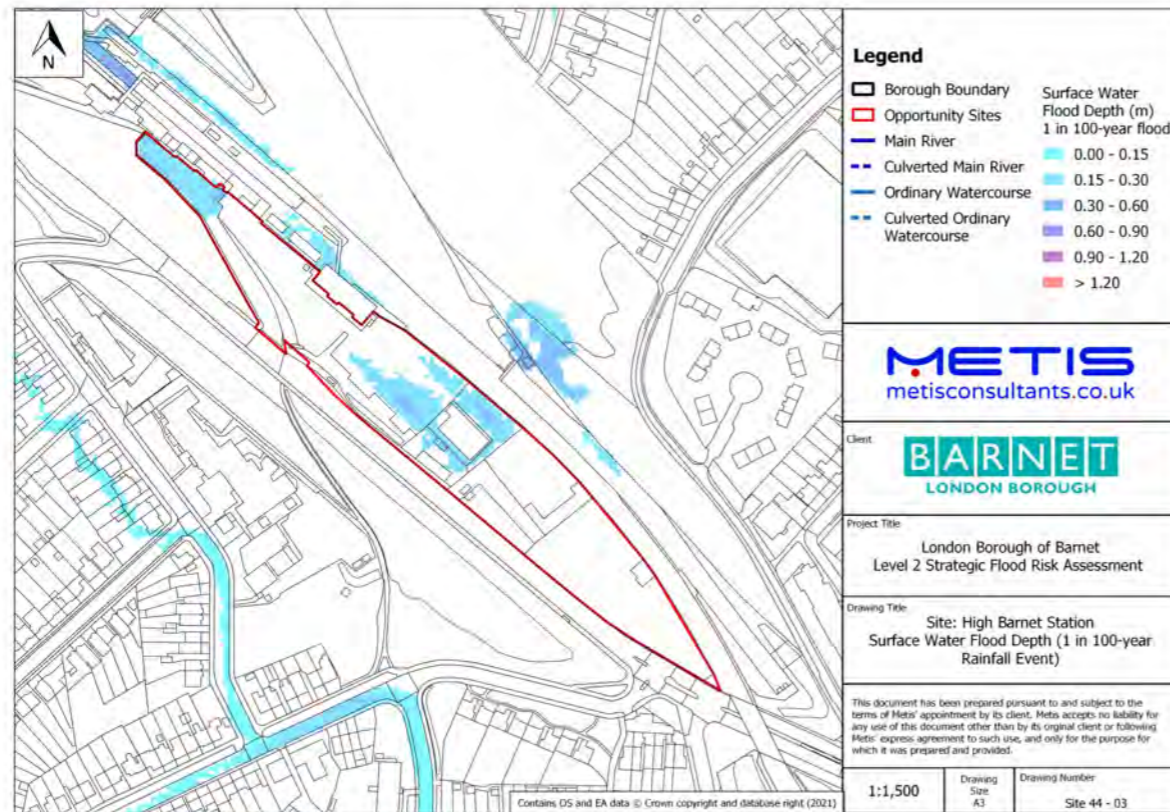


Figure 4 - RoFSW Flood Hazard Map

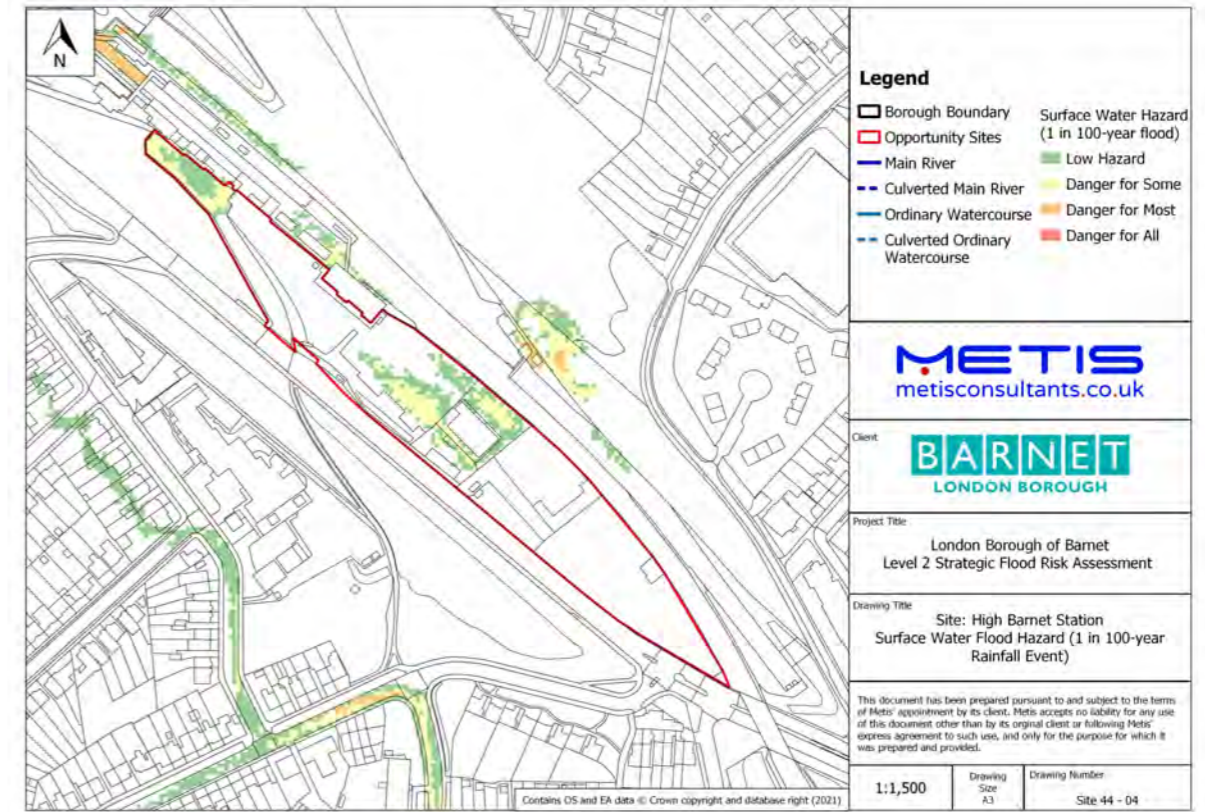


Figure 5 - Thames Water Sewer Flood Map

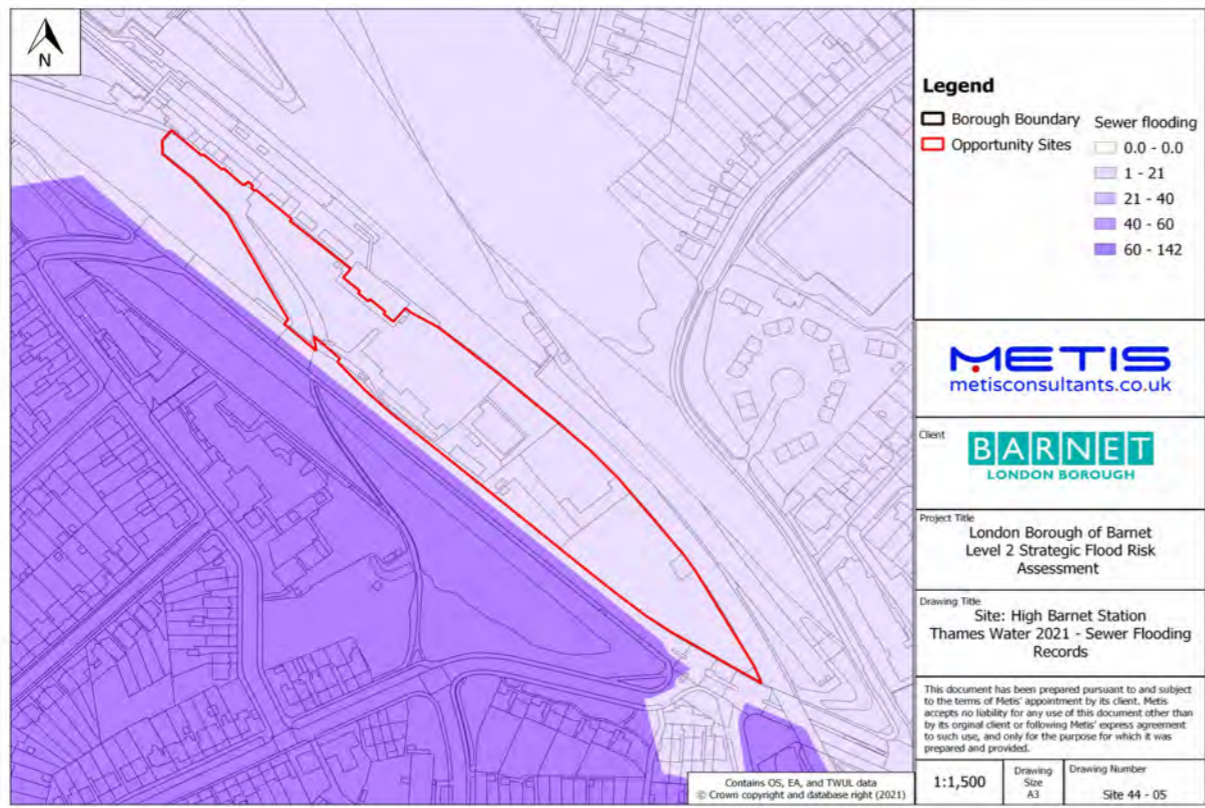


Figure 6 - Areas Susceptible to Groundwater Flooding Map

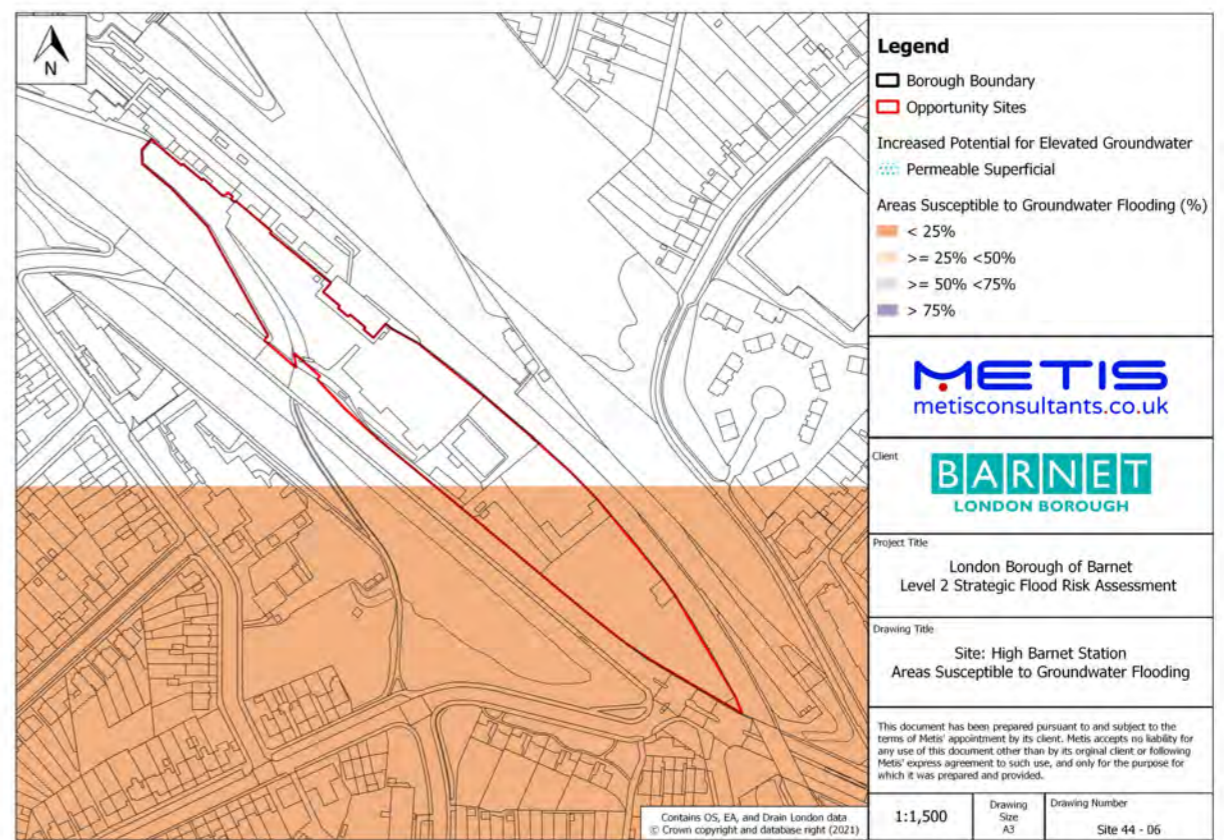
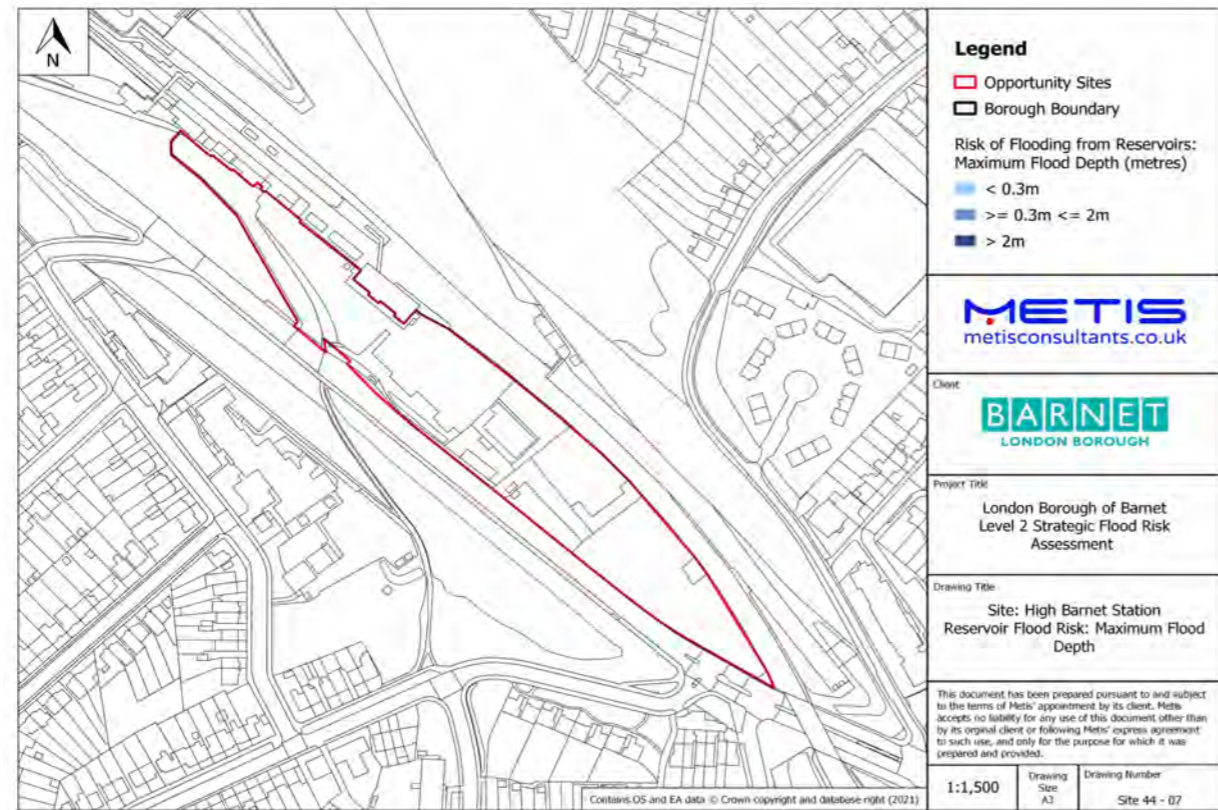


Figure 7 - Outline Reservoir Flood Map



SITE ASSESSMENT - Woodside Park Station East

Address: Woodside Park Rd, Woodside Park, N12 8RT	Area: 0.46 Ha
	Site Reference: 55

Current Use	Proposed Use
Car park	Residential with 20% car parking

Current Vulnerability Classification	Proposed Vulnerability Classification
Less vulnerable	More vulnerable

Current Risk Summary					
Fluvial / Tidal			Groundwater		
FZ2	0	% of Site	<25	100	% of Site
FZ3a	0	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	0	% of Site
Surface Water			>75	0	% of Site
3.33%*	5.8	% of Site	Artificial		
1% AEP	9.1	% of Site	Reservoir	No	At risk?
0.1% AEP	16.4	% of Site	Canal	No	At risk?
Sewer Flooding			Other	No	At risk?
No. Incidents		17			

Flood Defences
N/A - The site is not protected by any fluvial or tidal flood defences.

*Annual Exceedance Probability (AEP)

FLUVIAL / TIDAL

Risk Assessment (Defended)				
Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	N/A	Hrs
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max Flood Level	N/A	N/A	N/A	m AOD
Max Ground Level	N/A	N/A	N/A	m AOD
Min Ground Level	N/A	N/A	N/A	m AOD
Flood Hazard	N/A	N/A	N/A	N/A
Duration of Flood	N/A	N/A	N/A	Hrs

* The +70% Climate Change Allowance event (upper end allowance extreme case) is reviewed

Risk Assessment (Undefended)			
Parameter	FZ3a	*FZ3a+CC	Units
Speed of inundation	N/A	N/A	Hrs
Min. Depth	N/A	N/A	m
Max. Depth	N/A	N/A	m
Max. Velocity	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A
Duration of Flood	N/A	N/A	Hrs

Description of flood mechanism
N/A - No fluvial/tidal risk is predicted at this site

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress
N/A - No fluvial/tidal risk is predicted at this site

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements
N/A - No fluvial/tidal risk is predicted at this site

SURFACE WATER

Risk Assessment				
Parameter	3.33% AEP	1% AEP	*0.1% AEP	Units
Min. Depth	0	0	0	m
Max. Depth	0.30 - 0.60	0.90 - 1.20	> 1.20	m
Max. Velocity	0.50 - 1.00	1.00 - 2.00	> 2.00	m/s
Max. Hazard	1.25 - 2.00	1.25 - 2.00	1.25 - 2.00	N/A

*The 0.1% annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism
<ul style="list-style-type: none"> Water flows in from the west and accumulates to the immediate east of the site, as well as to the south by the Underground station. CC is predicted to increase flood extent, depth and velocity, but not maximum hazard.

Site Access / Egress
Safe access/egress routes should be located towards Holmewood School to the south-east of the site, where there is no predicted risk of flooding.

Figure 3 - RoFSW Flood Depth Map

Mitigation - Flood Risk Requirements
<ul style="list-style-type: none"> To mitigate against the 1% AEP surface water event, more vulnerable development should be restricted to the north and west of the site. See also SFRA Level 2 Report mitigation requirement numbers 4.2, 4.3 and 4.4.

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Surface Water Drainage
<ul style="list-style-type: none"> A detailed drainage plan must account for 100% of surface water generated from the site and comply with Policy SI 13 of the London Plan and Non-statutory technical standards for SuDS. The site is underlain by London Clay - ground investigations would be required to confirm whether infiltration based SuDS are suitable.

SITE ASSESSMENT - Woodside Park Station East

SEWER	GROUNDWATER	ARTIFICIAL
Risk Assessment	Risk Assessment	Risk Assessment
<ul style="list-style-type: none"> The area is served by separate surface water and foul sewer networks. There have been 17 reported incidents of sewer flooding in this site's postcode region (N12 8): 14 internal and 3 external incidents, all but one in the 1 in 20-year (5% AEP) rainfall event. 	<ul style="list-style-type: none"> The site lies in an area classified as having <25% susceptibility to groundwater flooding. There is no increased potential for elevated groundwater based upon the site's underlying geology (Thames Group / London Clay). 	There is no risk from artificial flooding.
Mitigation Requirements	Mitigation Requirements	Mitigation Requirements
<ul style="list-style-type: none"> Consult Thames Water to confirm flooding occurred and ensure sufficient capacity exists in the surface water sewer network. SuDS must be implemented to reduce runoff to greenfield rates. 	No mitigation measures required.	No mitigation measures are required.

Figure 5 - Thames Water Sewer Flood Map

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Figure 7 - Outline Reservoir Flood Map

PLANNING CONSIDERATIONS

Safety of Development	Exception Test
<p>Can the development future be proofed for climate change considerations?</p> <ul style="list-style-type: none"> Yes - see SFRA Level 2 Report mitigation requirements number 4.2 and 4.3 regarding finished floor levels and resistant/resilient construction. <p>Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?</p> <ul style="list-style-type: none"> Yes. Surface water drainage techniques must be used to manage surface water runoff onsite through above ground SuDS and/or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological/biodiversity benefits as per London Plan Policy SI 13. Compensatory flood storage is required - see SFRA Level 2 Report, mitigation requirement 4.4. <p>What is the cumulative impact of the development land use change and will flood risk increase?</p> <ul style="list-style-type: none"> Land use is changing from the 'less vulnerable' to the 'more vulnerable' category, to be used for residential purposes. The site currently consists of hardstanding. Development may result in the loss of flood storage; thus, flood plain compensation must be implemented. <p>How can the development reduce risk overall?</p> <ul style="list-style-type: none"> Restrict development on the southern side of the site to less vulnerable uses. Less vulnerable or water compatible categories of basements may be appropriate on site, but a site-specific Flood Risk Assessment must be completed and the basement must not have any adverse impacts on flooding locally during a 1% AEP surface water event. Basement dwellings within the 1% AEP surface water flood extent may only be permitted if an exception test is passed. Basements must contain an egress route to a higher floor above the predicted 0.1% AEP surface water flood depth. Basements should be made flood resilient. It is anticipated that runoff from the site is currently at an uncontrolled rate. SuDS should be introduced to manage this. (See Mitigation - Surface Water Drainage). <p>Will development require a flood risk permit/watercourse consent?</p> <ul style="list-style-type: none"> No, as there are no Ordinary Watercourses or Main Rivers near the site. 	<p>Development can be made safe throughout its lifetime across the site without increasing flood risk elsewhere (see Safety of Development box). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see Mitigation - Surface Water Drainage and Mitigation - Flood Risk Requirements boxes).</p>
Summary - Site Specific FRA - Key Requirements	
Fluvial / Tidal	
No mitigation measures required.	
Surface Water	
<ul style="list-style-type: none"> Floor levels must be 0.3m above the predicted 0.1% AEP surface water event flood depth at any point onsite. Flood plain compensation must be provided for up to and including a 1% AEP surface water event. 	<ul style="list-style-type: none"> Flood resistant / resilient buildings required. SuDS should be introduced to reduce surface water runoff to greenfield rates.
Sewer	
Thames Water must be consulted to confirm if the site has experienced flooding from sewer flood sources.	Development must reduce the runoff to sewer to greenfield rates.
Groundwater	
No mitigation measures required.	
Artificial	
No mitigation measures required.	

Figure 1 - Fluvial Flood Depth Map

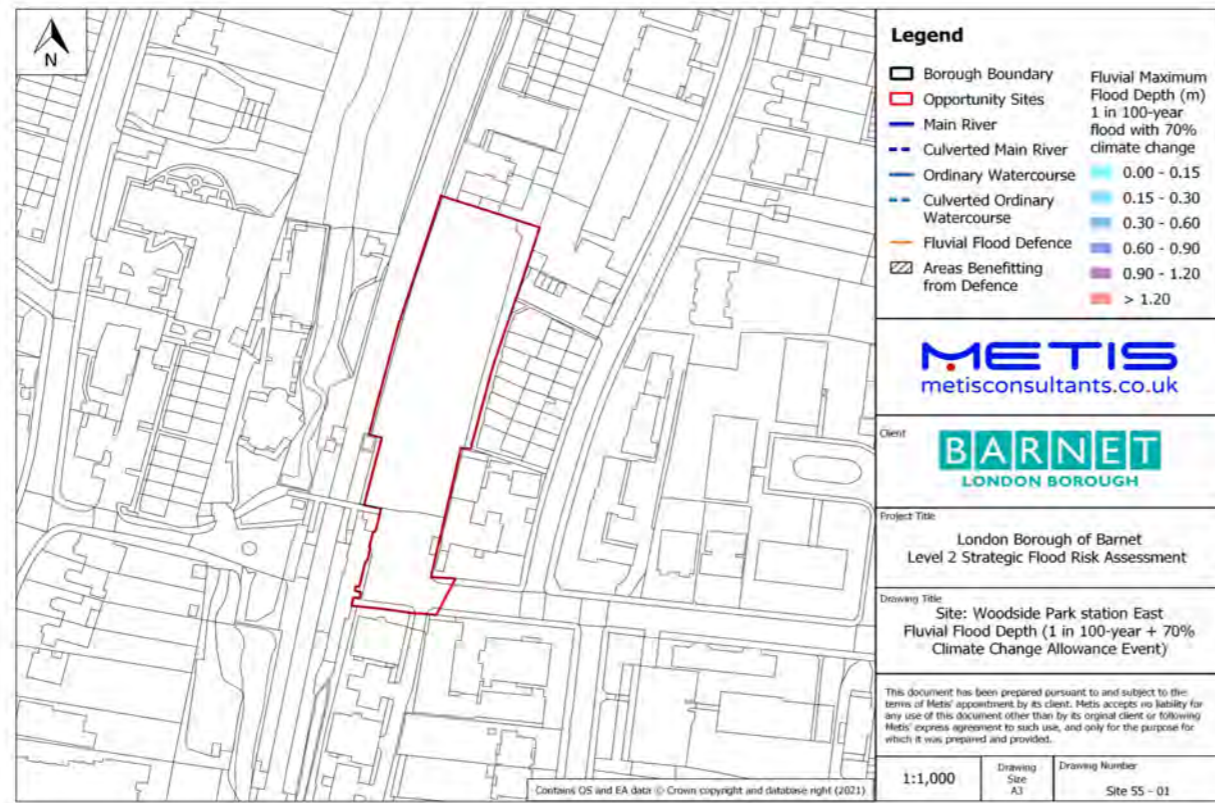


Figure 2 - Fluvial Flood Hazard Map

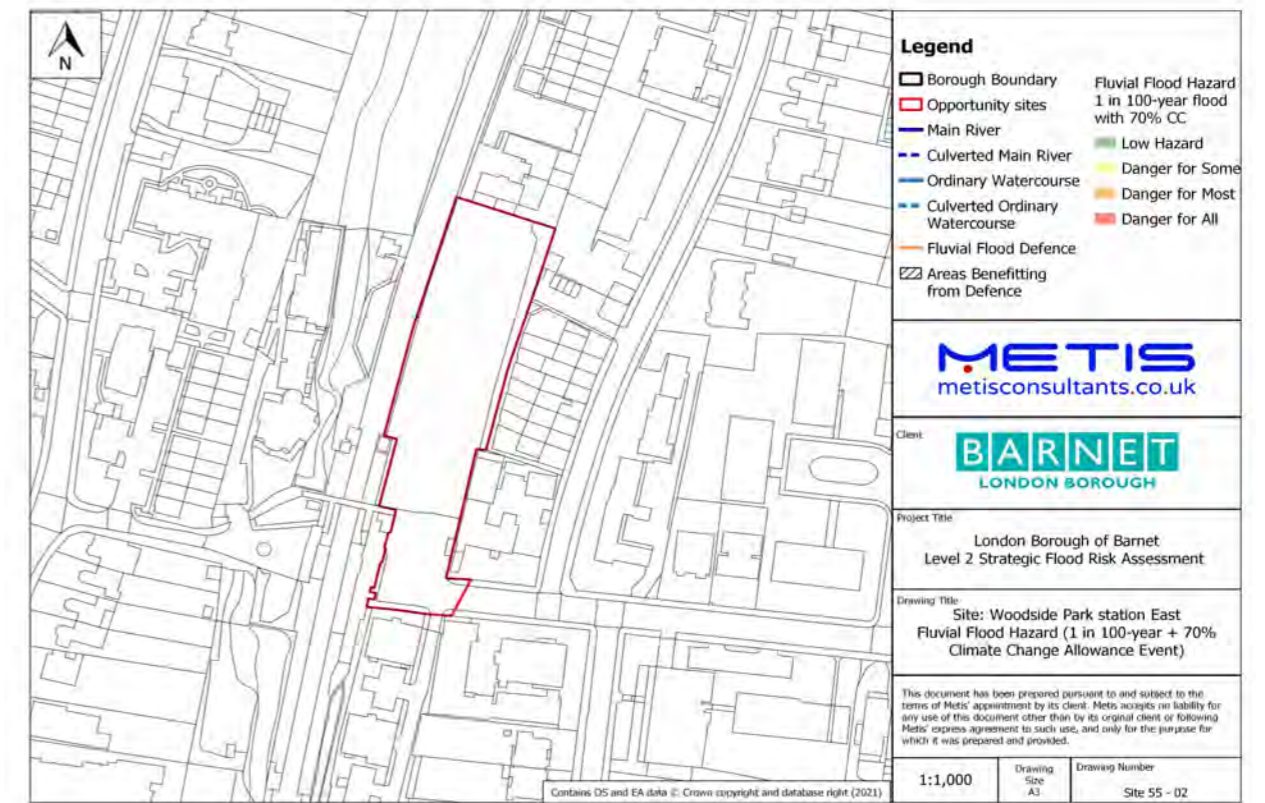


Figure 3 - RoFSW Flood Depth Map

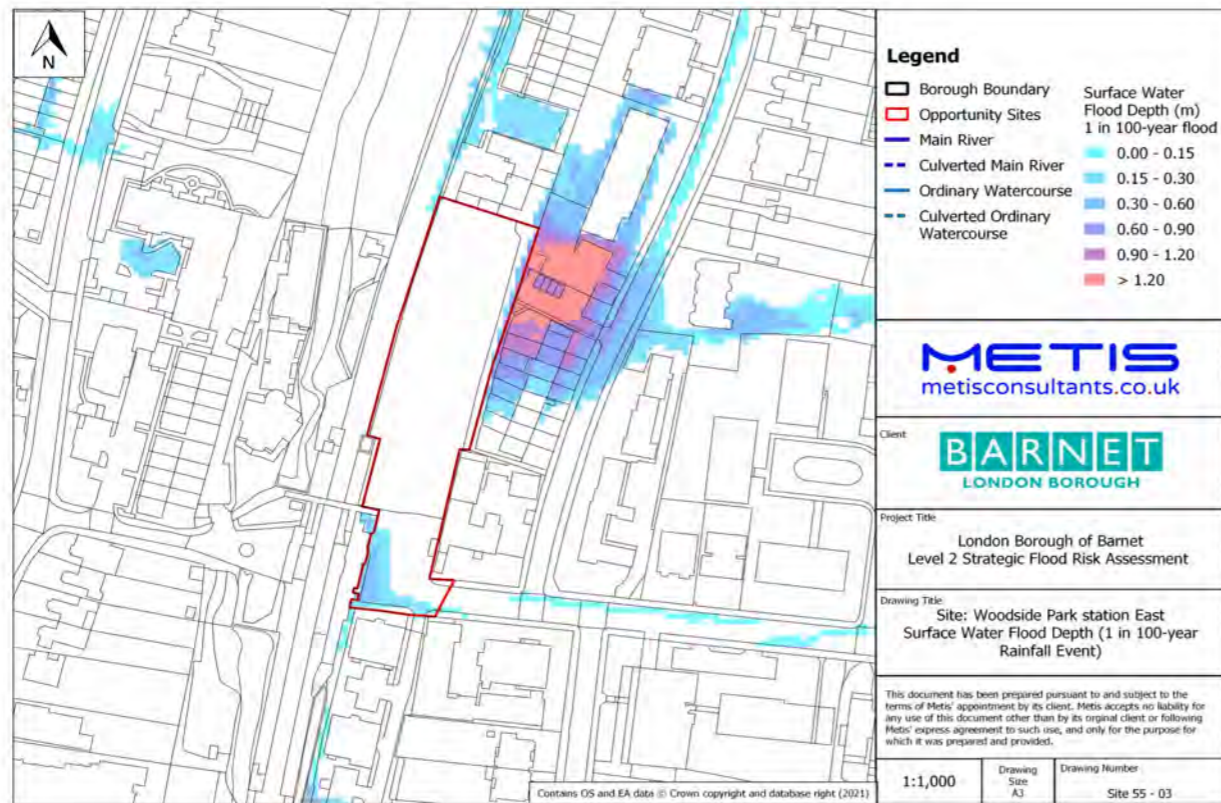


Figure 4 - RoFSW Flood Hazard Map

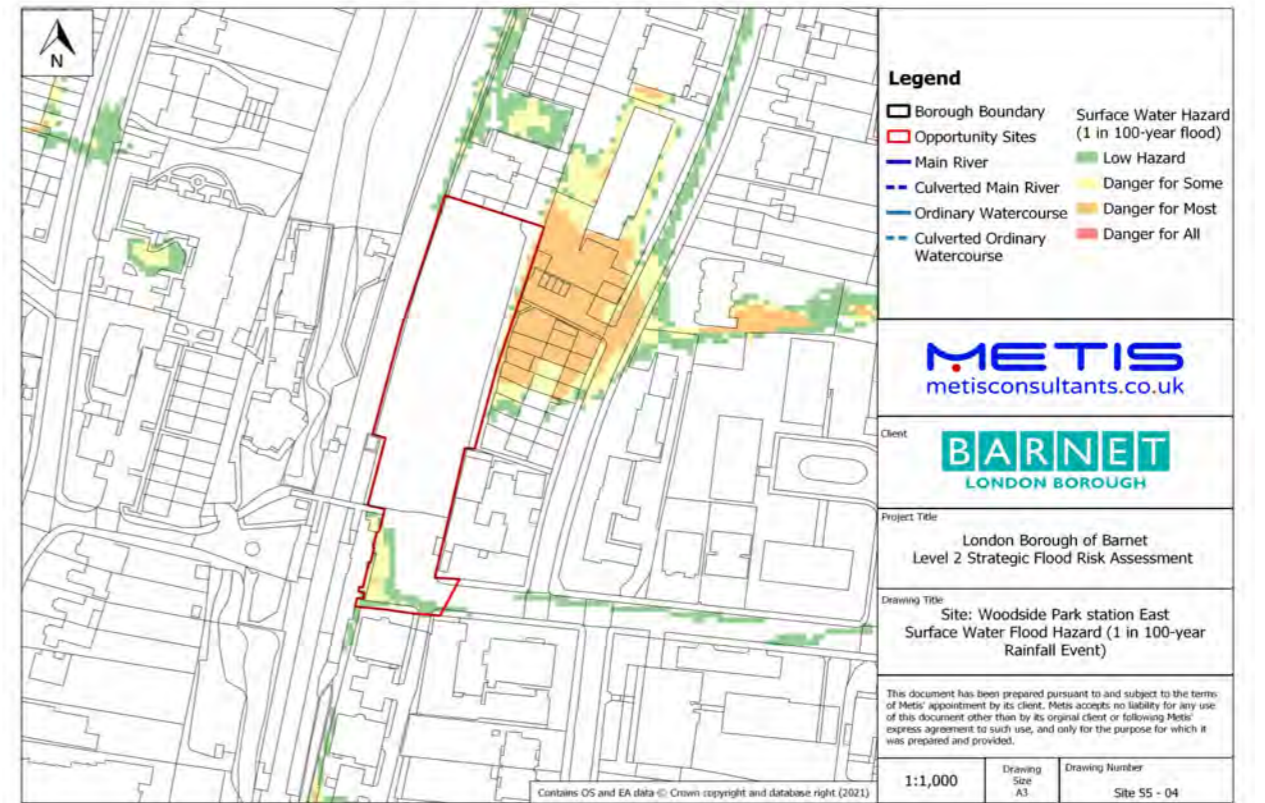


Figure 5 - Thames Water Sewer Flood Map

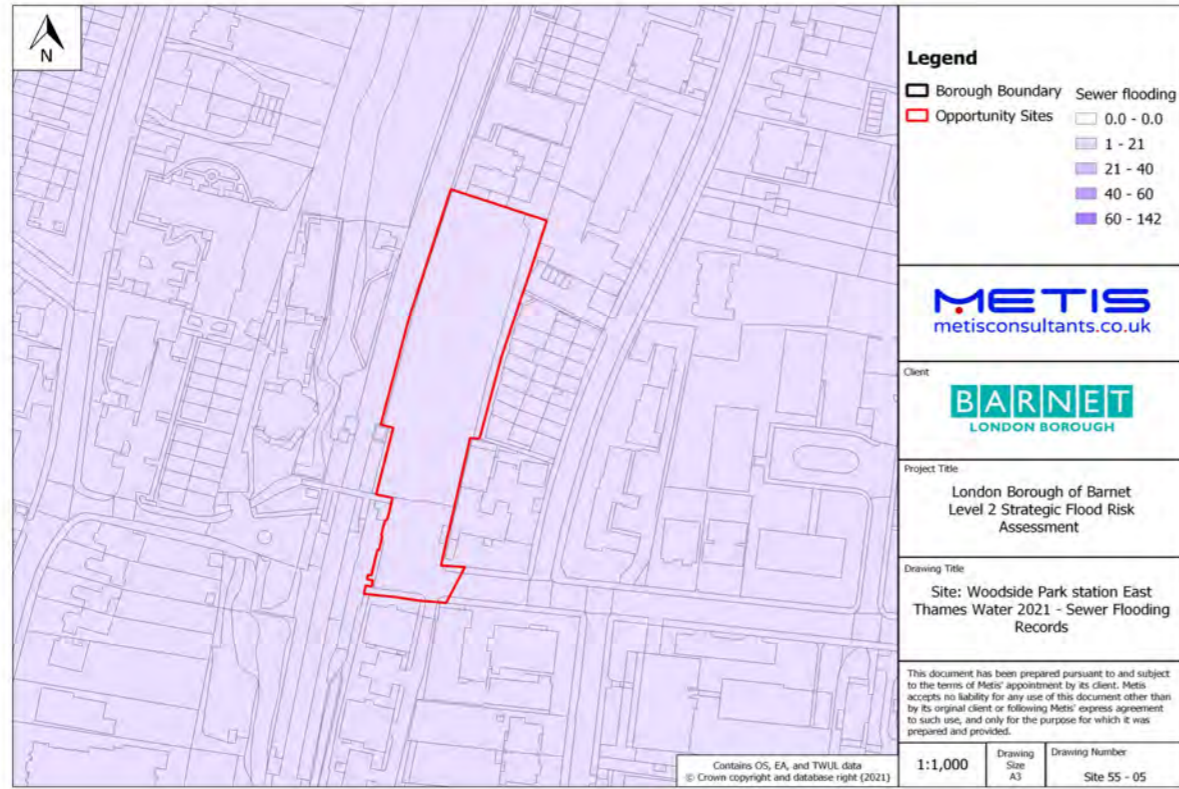


Figure 6 - Areas Susceptible to Groundwater Flooding Map

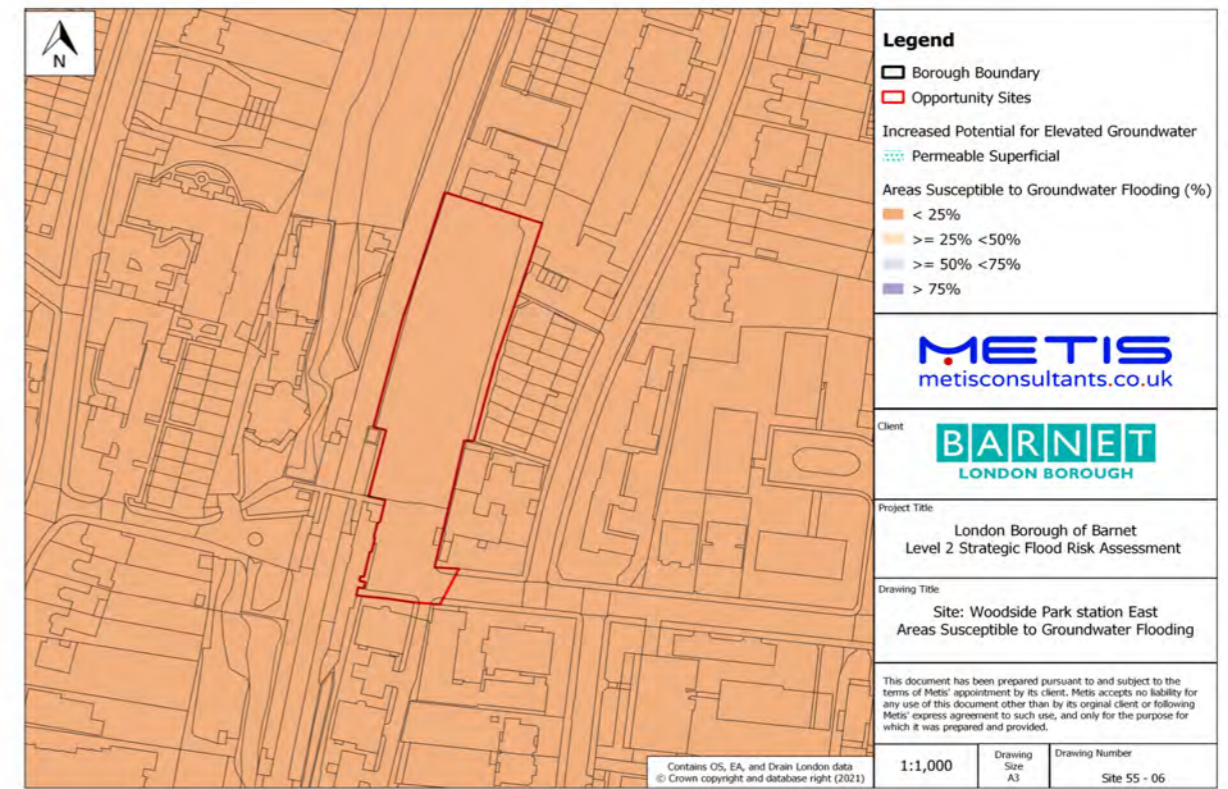


Figure 7 - Outline Reservoir Flood Map

