Surface Water Management Plan

Prepared for London Borough of Wandsworth

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EXECUTIVE SUMMARY

A Surface Water Management Plan (SWMP) is a document produced by Lead Local Flood Authorities (LLFAs), in this case the London Borough of Wandsworth (LB Wandsworth). It outlines the preferred methodology for managing the risk of flooding from local flood sources for a given area. A SWMP should influence future capital investment, drainage maintenance, public engagement and understanding, land use planning, emergency planning and future developments. A SWMP study is undertaken in consultation with key stakeholders and partners who are responsible for surface water management and drainage in their area. Engagement with stakeholders and partners encourages the development of innovative solutions and practices. More information can be found in *Section 1* of this document.

Predicted flood risks from all sources are summarised within *Section 2*. Within the SWMP Technical Guidance (DEFRA 2010) the main sources of surface water flooding studied within a SWMP are identified. These are from sewers, drains, groundwater, and runoff from land, ordinary watercourses and ditches as a result of heavy rainfall:

- Sewer flooding occurs when the piped network (predominantly public sewers maintained by Thames Water) is no longer able to contain flows and starts spilling over into its immediate environment.
- Groundwater flooding occurs when the natural groundwater levels within aquifers rise to the surface. While groundwater levels are impacted by rainfall, they may not have instantaneous impacts upon watercourses.
- Surface water flooding describes flooding caused by overland runoff from short duration, high intensity storms causing the permeable land to quickly become saturated, preventing the water from infiltrating below ground or being drained through the existing drainage systems.

This new SWMP has a different structure to the 2011 SWMP to make the document more user friendly and the information easy to find, and adopts a different approach from the current Critical Drainage Areas (CDAs) and Local Flood Risk Zones. *Table A.1* provides information on four basins within which eight catchments have been defined, with more information available in *Section 3*. Please note, catchment R05 East Sheen does not cross into the Wandsworth boundary but is contained within the Basin A so is listed here for completeness.

Table A.1 Basins and catchments

Code	Basin	No.	Code	Catchment	Cross-boundary Authority
A	Beverley Brook	-	R05	East Sheen	RB Kingston, LB Richmond
		1	R07/W02	Putney Heath	LBs Richmond & Merton
B	Thames River South & Beverley Brook	2	R06/W01	Putney	LB Richmond
C	River Wandle	3	W03	Southfields	
		4	W04	Wimbledon Park	LB Merton
		5	W05	Earlsfield	LB Merton

D	Thames River South – Wandsworth	6	W06	Wandsworth Common	LB Lambeth
		7	W07	Clapham Common	LB Lambeth

Sections 4 to 10 of the new SWMP consist of information on each of the catchments. Each include the following:

- **Updates since the 2011 SWMP** – summary of any local flood risk modelling and / or investigative work carried out on any of the areas within the catchment.
- **Catchment extents** – a summary of local flood risks, general topography and a map of the catchment boundary.
- **Properties at risk** – the number of properties predicted to be at risk of surface water flooding within the catchment. See *Section 3.3* for more detail on the method used.
- **Historic flood records** – summary of any records of flooding incidents the LB Richmond holds and high-level comments about their alignment with the mapped predicted areas at risk of surface water flooding.
- **Hotspots** – defined using the Environment Agency's Risk of Flooding from Surface Water 1 in 100-year event dataset extents and a minimum of 15 residential properties predicted to be at risk of flooding.
- **Flood Incident Areas –** defined through evaluation of flood incident reports and are areas which have two or more flood incidents recorded within them.

Section 11 contains the description of the options proposed across the borough at hotspot level. Compared to 2011, this new SWMP proposes options at a hotspot level which replaces the previous CDA approach. Three types of options have been identified following the source-pathway-receptor method. **Source** options include swales, detention basins, or wetlands which could be used to attenuate small or large volumes of surface water upstream of catchments. **Pathway** options include improving maintenance regimes, managing overland flow through preferential flow paths, or de-culverting watercourses to provide flood mitigation along flood corridors. **Receptor** options include planning policies to influence development and social change, education and awareness, to propose mitigation through the end user's experience. Wherever possible, green, sustainable options have been identified.

An opportunity assessment has been carried out using a 'red, amber, green' (RAG) method. *Table 11-1* lists the different types of mitigation options assessed. The options proposed are initial attempts to identify potential opportunities to reduce surface water flood risk across the borough. The number of properties at risk in the 1 in 100-year return period was assessed for each Hotspot, which was subsequently given a risk level (Low, Medium, High):

- If the number of properties at risk in the 1 in 100-year return period are up to 30, a 'Low' risk has been assigned.
- If the number of properties at risk in the same return period are between 31 to 199 inclusive, a 'Medium' risk has been assigned.
- If the number is 200 or greater, a 'High' risk has been assigned.

This document has identified five Hotspots from a total of 58 across the borough with a 'High' risk rating. Each of these has over 200 properties at risk (shown in *Table 11-2*) and have been shortlisted as being the greatest priority hotspots for the LB Wandsworth LLFA to investigate further.

Table A-2 Shortlisted high risk Hotspots

Hotspot ID	Type	Number of properties at risk	Option Description
W05_01 (Refer to *Section 8* and *Figure 8-2*)	Source	667	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W07_03 (Refer to *Section 10* and *Figure 10-2*)	Source	485	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W05_03 (Refer to *Section 8* and *Figure 8-2*)	Source	346	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W06_17 (Refer to *Section 9* and *Figure 9-2*)	Source	298	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Retrofit flat roofs with green/blue roofs. Raingardens in areas of open space. Permeable paving in car parking bays.
W06_13 (Refer to *Section 9* and *Figure 9-2*)	Source	249	Raingardens and planters in footways. Encourage residents and business owners to use rainwater harvesting. Retrofit flat roofs with green/blue roofs. Permeable paving in car parking bays.

An action plan has been written as part of this SWMP to define activities recommended to take forward the findings of this SWMP, aligning to any associated LLFA requirements under the Flood and Water Management Act 2010. It sets out the tasks and priority ranking for managing surface water across the borough through the following timeframes: short term (1 – 2 years), medium term (2 – 5 years and long term (5 – 10 years). The authorities responsible for implementing actions, as well as primary stakeholder support are clearly stated. A RAG progress tracker is displayed within the Action Plan. Green actions are those which LB Richmond have already implemented and they will continue to implement these. Amber actions are those which LB Richmond are planning to carry out, and red actions are those which are not currently in progress. The full action plan is included within *Appendix C – Action Plan*. The SWMP action plan should be reviewed and updated every two or three years to capture updates, for example investigatory works being carried out or changes occurring which may influence the surface water flood risk within Wandsworth. It should also be used during future updates of the LB Richmond LLFA's Local Flood Risk Management Strategy to underpin future work programmes and overarching aims and objectives.

Sections 12 and 13 detail the recommendations and conclusions from this SWMP. The recommendations propose that standalone feasibility studies are carried out for the Catchments containing the shortlisted Hotspots, in order of risk ranking. The next steps for these studies are as follows:

1. Use the outputs of this new SWMP (prioritised Catchment and Hotspot information) to create sub-Catchments (where necessary for individual Hotspots to enable inclusion of the contributing and benefitting areas).
2. Gather further information about significant recorded flood incidents and validate predicted surface water flood risk extents.
3. Identify potential benefactors and constraints.
4. Conduct locally-specific long-list and short-listing exercises to identify potential mitigation options
5. Determine the feasibility of each potential mitigation option using a multi-criteria decision matrix
6. Conduct an economic appraisal for the options identified for each Catchment through cost benefit analysis. This should include identification of flood and non-flood risk related benefits, flood damage calculations, and consideration of whole life costs. This exercise should also define the benefitting area and identify the volume of surface water that could be stored in a 1 in 30-year surface water flood event for each option.
7. Use the results of the economic appraisal to revise the current risk rating for each Catchment. The options with the highest refined rating which are shown to be feasible could then be prioritised for further detailed investigation.
8. Options which are prioritised for further detailed investigation should undergo detailed modelling and a business case should be prepared and submitted to determine potential for continuation through detailed design to construction.

Additional recommendations identified through this new SWMP include:

- The LB Wandsworth LLFA should continue to work with neighbouring boroughs, building on engagement made during this new SWMP, where Catchments overlap political boundaries to manage the flood risks holistically.
- Ensure that flood incidents are recorded consistently and accurately and conduct investigations of repeat or significant flooding incidents which have occurred in Hotspots and Flood Incident Areas.
- Conduct regular maintenance of gullies and drains, prioritising those within Hotspots or Flood Incident Areas.
- Liaise with LB Wandsworth's Planning team to ensure that new developments incorporate rainwater harvesting, green blue infrastructure, particularly within Hotspots or Flood Incident Areas.
- Liaise with Wandsworth's Climate Change Group (within the Communications team) and contribute to projects which help to reduce the impacts of climate change, reduce carbon emissions and work towards becoming carbon neutral, in line with Wandsworth's Environment and Sustainability Strategy.
- Investigate resilience of key transport infrastructure across the borough including the strategic highway network, railway lines and public transport assets.

Along with the main and additional recommendations, it is advised that this document is updated as significant work in reducing flood risk is completed and / or when significant improvements in the knowledge and understanding of local flood risks are identified.

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
CDA	Critical Drainage Areas
CFMP	Thames Catchment Flood Management Plan
DEFRA	Department of Environment, Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
FRMP	Flood Risk Management Plan
FRR	Flood Risk Regulations
FWMA	Flood and Water Management Act
GLA	Greater London Authority
LB Lambeth	London Borough of Lambeth
LB Merton	London Borough of Merton

Abbreviation	Definition
LB Richmond	London Borough of Richmond upon Thames
LB Wandsworth	London Borough of Wandsworth
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
PFRA	Preliminary Flood Risk Assessment
RB Kingston	Royal Borough of Kingston upon Thames
RFRA	Regional Flood Risk Appraisal
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan
TfL	Transport for London
TWUL	Thames Water Utilities Limited

1. INTRODUCTION

1.1. Introduction to the SWMP

1.1.1. What is a Surface Water Management Plan?

A Surface Water Management Plan (SWMP) is produced by the Lead Local Flood Authority (LLFA), in this case the London Borough of Wandsworth (LB Wandsworth). A SWMP sets out how flood risk from various sources will be managed within a given area. It should influence future capital investment, drainage maintenance, public engagement and understanding, land use planning, emergency planning and future development.

The benefits of undertaking a SWMP study are as follows:

- Increased understanding of the causes, probability, and consequences of surface water flooding.
- Spatial and emergency planning functions can be informed by increased understanding of where surface water flooding will occur.
- Partners and stakeholders are identified to enable the establishment of co-ordinated plans to tackle surface water flooding.
- Opportunities to implement Sustainable Drainage Systems (SuDS) to manage surface water flood risk are identified.
- An action plan can be generated based on information on surface water flood risk and potential flood mitigation options gathered as part of the SWMP study.

The SWMP acts in alignment with the LB Wandsworth's Local Flood Risk Management Strategy (LFRMS), which considers key legislation and industry drivers. This new SWMP will replace the previous SWMP delivered as part of the Tier 2 package of works of the Drain London Project in 2011. The SWMP has been updated to ensure that it captures the most up to date flood risk mapping, as well as information on properties and infrastructure at risk and potential flood alleviation schemes. GIS analysis was used to create drainage Basins and surface water Catchments, within which localised areas of flood risk have been identified, referred to as Hotspots and Flood Incident Areas (*Section 3.3*). Borough-wide mitigation options have also been identified and updated stakeholder engagement and action plans have been produced.

1.1.2. SWMP process

The framework for undertaking a SWMP is illustrated through the Department of Environment, Food and Rural Affairs' (DEFRA) SWMP process wheel diagram (*Figure 1-1*). It has four main phases: **Preparation; Risk Assessment; Options; and Implementation and Review**. The first three phases involve planning and creating the SWMP report, and the fourth phase involves producing and implementing an action plan based on information gathered in the SWMP report. It is based on a widely adopted generic approach to evidence and risk-based decision making which is outlined in the SWMP technical guidance (DEFRA, 2010).

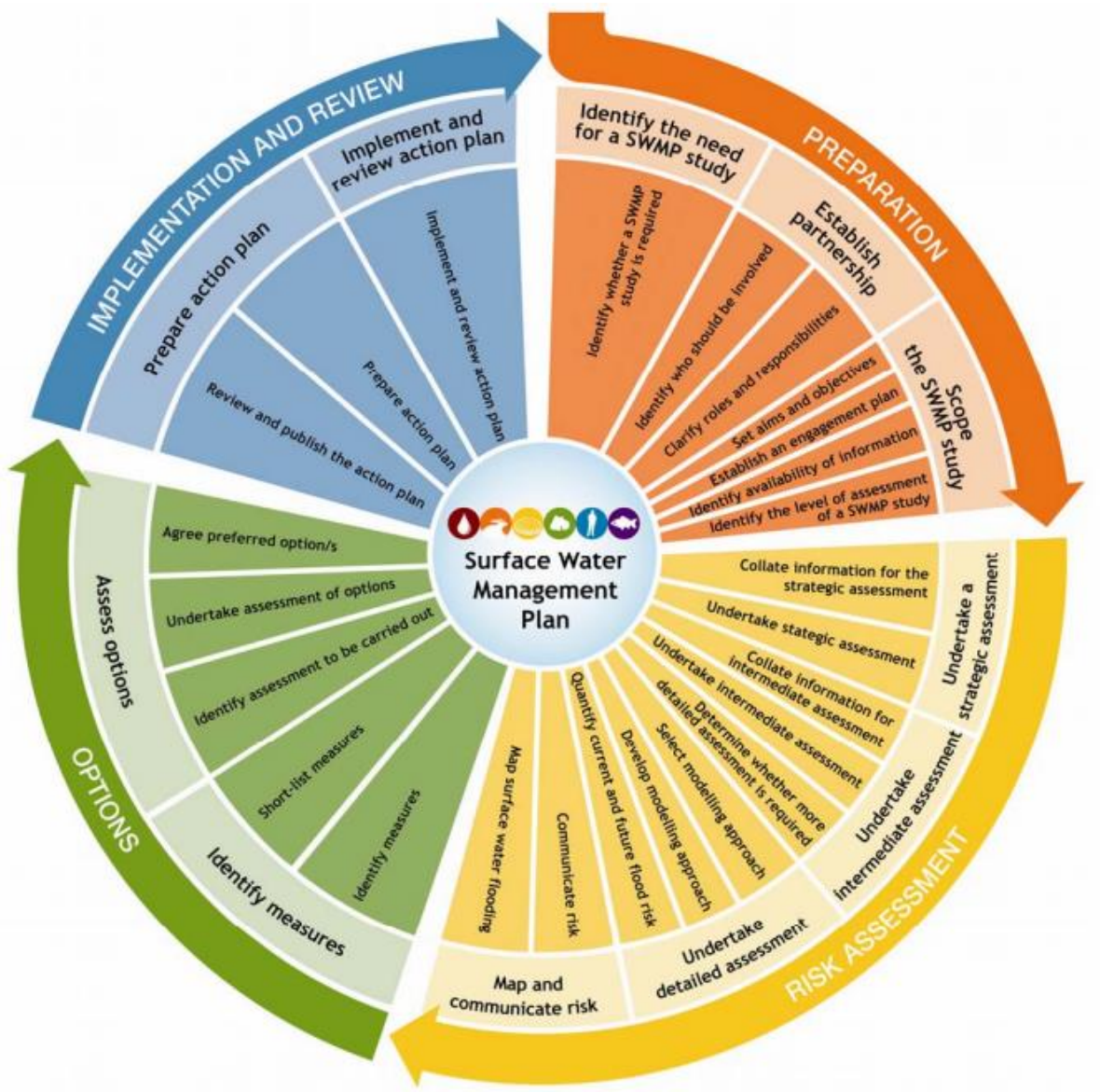

Figure 1-1 Recommended SWMP process (DEFRA, 2010)

1.1.3. Objectives

This SWMP has the following objectives:

- Apply the most appropriate guidance and include the most relevant information from the existing 2011 SWMP, signposting other strategic and guidance-based documents at local, regional and national levels.
- Apply a similar approach to neighbouring Local Authorities to help develop cross-boundary authority collaboration on future projects.
- Provide a new structure to make the document more user friendly for the end user.
- Include up-to-date information about at-risk properties and infrastructure.
- Identify Hotspots at a surface water Catchment level.
- Identify Flood Incident Areas using historic reports of flooding and local knowledge.
- Set out a plan for managing surface water at a borough-wide level.

- Provide guidance on how different partners and stakeholders will need to be involved to successfully deliver the SWMP's Action Plan.
- Enable engagement with key partners and stakeholders on developing an effective and achievable Action Plan for managing surface water flood risks.

1.1.4. LLFA responsibilities

The Flood and Water Management Act (FWMA) 2010 and the Flood Risk Regulations (FRR) 2009 set out responsibilities and statutory duties belonging to LLFAs. The role of LLFAs is to prepare and maintain a strategy for managing local flood risk. They must coordinate with other Risk Management Authorities (RMAs) and the public to deliver area-wide benefits and reduce the risk of flooding. The SWMP enables the LLFA to carry out their responsibilities by proposing potential mitigation measures and an Action Plan to reduce flood risk in the area, as well as suggesting methods for working collaboratively with partners and stakeholders.

Working collaboratively will also help LB Wandsworth apply guidance from the recent 2021 update to the National Flood and Coastal Erosion Management Strategy Action Plan. This outlines that LLFAs must do more to engage with communities to help reduce the risk of flooding through improving resilience. Engaging with LB Wandsworth's local community is key in further reducing the risk of flooding, and will help deliver additional social, economic, and environmental benefits to the borough. This SWMP proposes appropriate measures in the mitigation options and Action Plan to achieve this objective.

1.1.5. Links to other plans

Local Flood Risk Management Strategy (LFRMS) 2016:

The FWMA 2010 requires each LLFA to produce a LFRMS to assess the local flood risk, set out objectives for managing it, define the costs and benefits of the proposed measures, and how the measures are proposed to be paid for. LB Wandsworth is currently updating its LFRMS. The new SWMP will act in alignment with the LFRMS and be used as an evidence base to deliver more flood investigation and option assessments into areas identified to be at risk, subject to available resources.

Preliminary Flood Risk Assessment (PFRA) 2011 and addendum in 2017:

PFRAs are required as part of the Flood Risk Regulations (2009) which implement the requirements of the European Floods Directive (2007). Produced for each London Borough LLFA by Drain London, it gives an overview of all local sources of flood risk. The information gathered for this SWMP will benefit future revisions of the PFRA document.

Regional Flood Risk Appraisal (RFRA) 2018:

The RFRA is produced by the Greater London Authority and gives a regional overview of flooding from all sources.

Strategic Flood Risk Assessment (SFRA) 2016:

The SFRA assesses flood risk from all sources in the present and future, considering the impact of climate change. The SFRA is designed to help address local requirements, manage development requirements, and manage the risk of flooding posed to residents and property from all sources.

Thames Catchment Flood Management Plan (CFMP) 2009:

Published by the Environment Agency (EA), the CFMP sets out policies for the sustainable management of flood risk across the whole Thames Catchment over the long-term (50 to 100-years) taking climate change into account. The CFMP emphasises the role of the floodplain as an important asset for the management of flood risk and the need to re-create river corridors so that rivers can flow and flood more naturally.

Thames River Basin District Flood Risk Management Plan (FRMP) 2015 – 2021 and 2021 - 2027:

The Thames River Basin FRMP sets out the risk of flooding from all sources within the London Flood Risk Area and how RMAs will manage flood and coastal risk over a six-year period. The FRMP sets out specific objectives and measures for RMAs which aim to prevent risk within the Thames River Basin District. LB Wandsworth LLFA holds a list of these objectives and measures.

The second cycle of the Thames River Basin District FRMP was in consultation phase during the formation of this report. A draft copy of the document was evaluated by LB Wandsworth LLFA and its content has informed the proposed measures and Action Plan within this report.

Thames Estuary 2100 Plan (TE2100) 2011 and review in 2021:

The TE2100 plan sets out how the tidal flood risk will be managed in the Thames Estuary until 2100. This document is produced by the Environment Agency and looks at how they will protect 1.4 million people and around £320 billion worth of property from tidal flood risk. The River Thames is tidal until Teddington Lock in LB Richmond, which is upstream of LB Wandsworth. Therefore, these plans directly influence the tidal flood risk in LB Wandsworth.

1.1.6. Links to climate change

Surface water management practices identified throughout the SWMP and Action Plan contribute to increasing the borough's resilience to climate change. The frequency and intensity of rainfall events is predicted to change as the climate changes. It is predicted by the International Panel on Climate Change that there will be an increase in the intensity and frequency of precipitation events as the climate warms. This results in greater potential for surface water flooding as explained further in *Section 2.3*. Therefore, any measures to reduce the risk of surface water flooding will increase the boroughs resilience to this potential effect from climate change.

1.2. Document overview

1.2.1. Structure

The 2011 SWMP was delivered as part of Tier 2 of the Drain London Project. The structure of the 2011 SWMP followed the four-phase approach as set out in DEFRAs SWMP Technical Guidance and discussed in Section 1.1.2 (*Figure 1-1*).

Each Catchment section and its figures have been retained within the main body of the report to limit the number of appendices and ensure that the document is user-friendly.

This SWMP adopts a different approach to the previous SWMP because it uses a Basin and Catchment-based approach rather than establishing Critical Drainage Areas (CDAs). Hydrological analysis of the borough and surrounding areas was undertaken using a digital terrain model (DTM) and watercourse information to define surface water Basins. These Basins were split into smaller Catchments using the existing sewer infrastructure, watercourses and overland features such as railway tracks. Flood Hotspots and Flood Incident Areas have been defined within these Catchments. More information about the new Basin and Catchment based approach is available in *Section 3*. A comparison of the sections in the 2011 SWMP to the 2021 SWMP can be found in *Table 1-1.*

Table 1-1 Comparison between 2011 and new SWMP structures

DEFRA SWMP Process	Relevant section in:	
	2011 SWMP	New SWMP
Preparation	Section 2: Phase 1 Preparation	Section 1.2: Document Overview Section 1.4: Stakeholder Engagement Section 3: Basin-based Approach
Risk Assessment	Section 3: Phase 2 Risk Assessment	Section 2: Flood risk overview Sections 4 - 10: Catchment-specific Risk
Options	Section 4: Phase 3 Options	Section 11: Borough-wide Options and Action Plan
Implementation and Review	Section 5 Phase 4: Implementation and Review	Section 12: Recommendations

Sections 4 to *10* of this document contain a Catchment portfolio which provides information on each of the Catchments identified. The following is included in each of these:

- **Updates since the 2011 SWMP** – a summary of previous CDAs and any changes in the Catchment, including any local flood risk modelling that has been carried out within the Catchment.
- **Catchment Extents** – a summary of the physical Catchment including topography, key infrastructure, surface water overland flow paths and other notable features.
- **Properties at risk and Hotspots** – the number of properties predicted to be at risk for 30-year, 100-year and 1000-year events according to EA "Properties at Risk of Flooding from Surface Water" mapping. Information about flooding 'Hotspot' areas defined using the EA Risk of Flooding from Surface Water (RoFSW) mapping, particularly the 1 in 100-year event extents and a minimum of 15 residential properties predicted to be at risk of flooding.
- **Historic flood records and Flood Incident Areas** – a summary of any surface water flood incidents held by the LB Wandsworth and Thames Water Utilities Limited (TWUL). Information about 'Flood Incident Areas' defined through the evaluation of flood incident reports and local knowledge. These areas were created with input from LB Wandsworth's

LLFA team, LB Wandsworth councillors, and Highway maintenance officers. They are defined as areas which have two or more flood incidents recorded within them.

Section 11 summarises potential borough wide flood mitigation options that have been identified and are aligned to the source-pathway-receptor model. It also contains an action plan covering the next ten years for local flood risk management. A stakeholder engagement plan is also provided which identifies priority stakeholders that could aid the delivery of the SWMP action plan and high level mitigation options.

1.2.2. Relevant Projects

Since the 2011 SWMP, several projects have been undertaken in LB Wandsworth to tackle surface water flooding. A number of SuDS schemes have been installed across the borough which include:

- **Southfields –** Tree pits on Wimbledon Park Road and Replingham Road
- **Junction of Trewint Street with Summerly Street –** Raingardens
- **Mellison Road, Graveney –** Pocket Park

Alongside these projects, a flood alleviation study was commissioned from AECOM in to investigate surface water flood risk in CDA 22 Clapham. It involved hydraulic modelling of the immediate surface water Catchment in order to identify suitable areas and options for flood alleviation. Three options were identified but none have been brought forward at this stage.

In addition to these SuDS scheme, LB Wandsworth have secured funding from the EA to progress with flood alleviation schemes in the following locations:

- CDA18 Summerstown, and
- CDA19 Earlsfield.

LB Wandsworth have also jointly commissioned a report with the LB Merton to appraise options and feasibility for SuDS within Southfields grid, which crosses the LB Wandsworth/ Merton boundary.

1.3. Data overview

The data used to produce the new SWMP was obtained from relevant authorities and stakeholders. Key stakeholders within LB Wandsworth and external stakeholders such as TWUL were approached to contribute data. Freely available data was obtained and knowledge from past LLFA projects and programmes was also important for data collection. The data sources used for this SWMP are listed in *Table 1-2.*

Table 1-2 Data Sources

Source	Data	Use in SWMP
British Geological Survey (BGS)	Geological Map (2021)	To understand and map the geological context
	Groundwater Flooding Susceptibility (2017)	To understand and map the flood risk from groundwater
DEFRA	LIDAR Composite DTM 2019 – 2m	To understand and map the topographical context
EA	Detailed River Network (2019)	To understand and map the fluvial context
	Properties at Risk of Flooding for the 1 in 30, 1 in 100 and 1 in 1000-year return periods (2014)	To understand and map the flood risk from multiple sources
	RoFSW Flood Extent 1 in 30, 1 in 100 and 1 in 1000 years (2020)	
	Flood Map for Planning Rivers and Seas Zones 2 and 3 (2020)	
	Recorded Flood Outlines (2020)	
	Reservoir Flooding Max Depth-WMS (2021)	
LB Wandsworth	Wandsworth Flood Incident Data (2021)	To understand and visually represent the flood risk as well as validate the EA RoFSW data
	Local Authority Administrative Boundaries	For representation in mapping
	2011 SWMP CDA dataset	As comparative basis for new Catchments and Hotspots
	Asset Register	As comparative basis for SWMP mapping
	Open-Source Sites by Land Use (2021)	To understand and map the land use context
TWUL	Drainage Asset Data (2021)	To understand the sewer network and define the Basins and Catchments
	Sewer Flooding Incident Data (at district level post code only) (2021)	To understand and map the flood risk from sewers

1.4. Stakeholder engagement

The delivery of a successful SWMP has been made possible through the active involvement and collaboration of stakeholders. Relevant stakeholders and their involvement in the SWMP are summarised in *Table 1-3.*

Table 1-3 Stakeholders List

Stakeholder	Involvement
LB Wandsworth	
LLFA	• Acted as main liaison throughout the formation of the SWMP document. • Attended a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme. • Attended a stakeholder engagement meeting to review the new Catchments and Basins created and to ensure that known areas of flood risk are being captured and represented correctly. • Provided information on proposed and ongoing schemes since 2011 for incorporation into relevant Basin and Catchment sections.
Highways	• Attended a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme.
Parks and Open Spaces	• Attended a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme.
Environmental Services	• Invited to a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme.
Development Management	• Invited to a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme.
Transport	• Invited to a stakeholder engagement meeting which outlined the reasons for updating the SWMP, delivery approach, proposed draft structure and programme.
Key Organisations	
EA	• Provided relevant datasets listed above • Provided information on proposed and ongoing schemes since 2011 for inclusion in relevant Basin and Catchment sections
TWUL	• Provided relevant datasets listed above • Provided information on proposed and ongoing schemes since 2011 for inclusion in relevant Basin and Catchment sections
Cross boundary boroughs	
LB Lambeth LLFA	• Engaged to review the new Catchments and Basins created and to ensure that known areas of flood risk are being captured and represented correctly .
LB Merton LLFA	• Engaged to review the new Catchments and Basins created and to ensure that known areas of flood risk are being captured and represented correctly.

2. FLOOD RISK OVERVIEW

2.1. Borough Overview

2.1.1. Characteristics

The LB Wandsworth is located in the south of Greater London. The River Thames forms the northern boundary of the borough, with LB of Lambeth bordering to the east, LB of Merton to the south and LB Richmond upon Thames to the west. Most of the borough is low lying. The elevations are highest in Putney Heath, falling to the north and east towards the River Thames and River Wandle respectively. To the east of the River Wandle the borough is generally flat with a gentle drop towards the River Thames. These topographical features are shown in *Figure 2-1*.

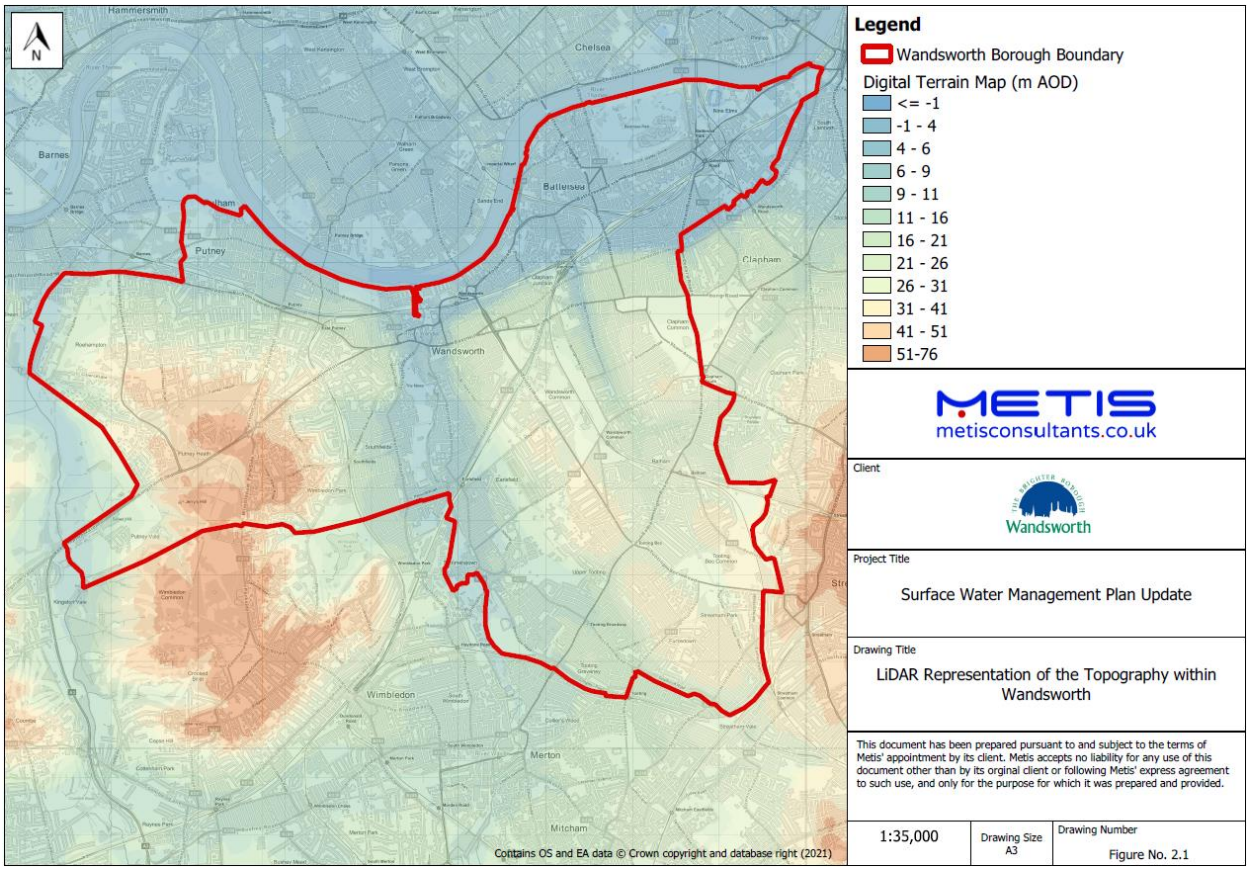

Figure 2-1 LiDAR representation of the topography in Wandsworth

The borough contains the following significant infrastructure and amenity areas:

- The borough's main town centres are Balham, Clapham Junction, Putney, Tooting, and Wandsworth. Smaller district centres include Earlsfield, Roehampton, and Southfields.
- Network Rail (South Western railway line), London Underground (District Line) and London Overground rail lines cross the borough, with a multitude of associated railway Stations and maintenance assets.

- The borough's major Railway Station is Clapham Junction, which provides rail and underground routes towards London Waterloo and London Victoria. There are also a number of smaller Railway and Underground Stations providing links to the wider area.
- The A3, A24, A205, A214, A306, A217, A3205 and A3220 are the major roads which pass through the borough, connecting Wandsworth with central London and wider southeast of England.
- St. Georges Hospital is located in Tooting and is one of the largest hospitals in southwest London.
- LB Wandsworth is mainly urban in land use. The main areas of open and green spaces are Putney Heath, Battersea Park, Tooting Bec Common, Wandsworth Common and Clapham Common (*Figure 2-2*).

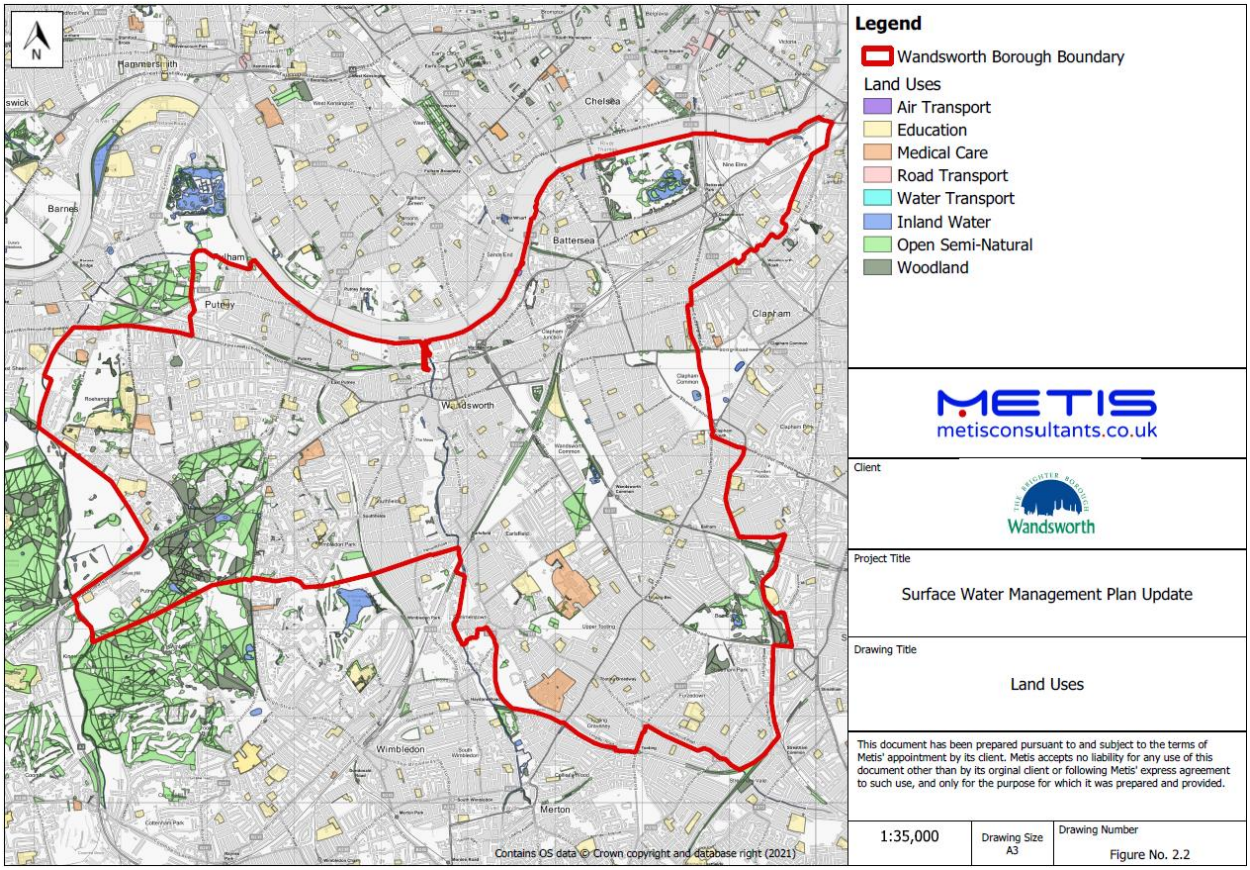

Figure 2-2 Land Use in Wandsworth

2.1.2. Interactions with Neighbouring Local Authorities

The South West London Strategic Flood Group was set up during the creation of the 2011 SWMPs by Drain London. It includes the LBs of Croydon, Merton, Sutton, Richmond Upon Thames, Wandsworth, and RB Kingston. The Southwest London Strategic Flood Group reports to the Regional Flood Defence Committee, currently through a representative councillor for the sub-region (currently from LB Richmond). It has met every 3 months since March 2011 and continues with the aim of ensuring collaborative working across the boroughs and relevant stakeholders.

2.1.3. Flooding interactions

DEFRA's 2010 guidance on SWMPs identifies the main sources of flooding to be studied within a SWMP, which include surface water runoff, groundwater, sewers, open-channel and culverted watercourses, and overland flows from groundwater.

Surface water flooding, also known as pluvial flooding, generally describes runoff and flooding caused by high intensity rainfall. The high intensity rainfall often leads to permeable land quickly becoming saturated. As a result, the water is unable to infiltrate below ground or be drained through the existing drainage systems which may be at capacity. In urban areas such as LB Wandsworth, much of the land is impermeable meaning the water cannot infiltrate to the ground and can quickly overwhelm the existing drainage system. Surface water flooding incidents typically affect localised low-lying areas, and it is not uncommon for groundwater or sewer flooding incidents to be mistaken for surface water, due to the numerous and complex interactions between natural and manmade drainage networks.

Sewer flooding occurs when the capacity of the network is exceeded due to heavy rainfall, resulting in flows spilling over into the immediate environment. Surface water sewers can be affected by high water levels in the receiving watercourse because hydraulic pressure from the river prevents outlet flaps from releasing the surface water runoff. This can cause surface water to back up and cause flooding by overwhelming the drainage network.

Groundwater flooding occurs when the natural groundwater levels within aquifers rise to the surface. This may lead to the flooding of areas that are normally dry, particularly during periods of persistent rainfall. Groundwater levels are impacted by rainfall but may not have instantaneous impact upon watercourses.

2.2. Fluvial flood risk

A watercourse will be categorized as either a main river or an ordinary watercourse based on its local and hydrological importance. The flood risk from main rivers is termed 'fluvial' and may have the potential to cause high levels of damage or a wide impact. The FWMA defines any watercourse that is not a main river as an ordinary watercourse, including ditches, dykes, and drains but excluding public sewers. Flood risk from ordinary watercourses falls under surface water flooding. The EA has duties, powers and responsibility in relation to main rivers while Local Authorities have rights and responsibilities relating to ordinary watercourses and maintains spatial information on them. The flood risk from ordinary watercourses is covered in *Section 2.3.1*.

The main rivers in LB Wandsworth include:

- The River Thames which runs eastwards along the northern boundary of the borough.
- The Beverley Brook which runs south to north along the western boundary of the borough and discharges to the River Thames at Barn Elms.
- The River Graveney which runs along the southeast boundary of the borough where it joins the River Wandle northeast of Wimbledon.
- The River Wandle which runs south to north through the middle of the borough and discharges to the River Thames at Bell Lane Creek.

The fluvial Flood Zones are areas predicted to be at risk from river flooding. In the borough, areas within Flood Zone 2 are predicted to have between a 1 in 100 and 1 in 1,000 annual probability of river flooding, or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. Areas within Flood Zone 3 are predicted to be at a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. *Figure 2-3* maps the main rivers and ordinary watercourses along with the associated Flood Zones as defined by the EA. Key areas at risk from fluvial flooding are the northeast and central regions of the borough including Battersea, Putney, Wandsworth, Southfields and Summerstown.

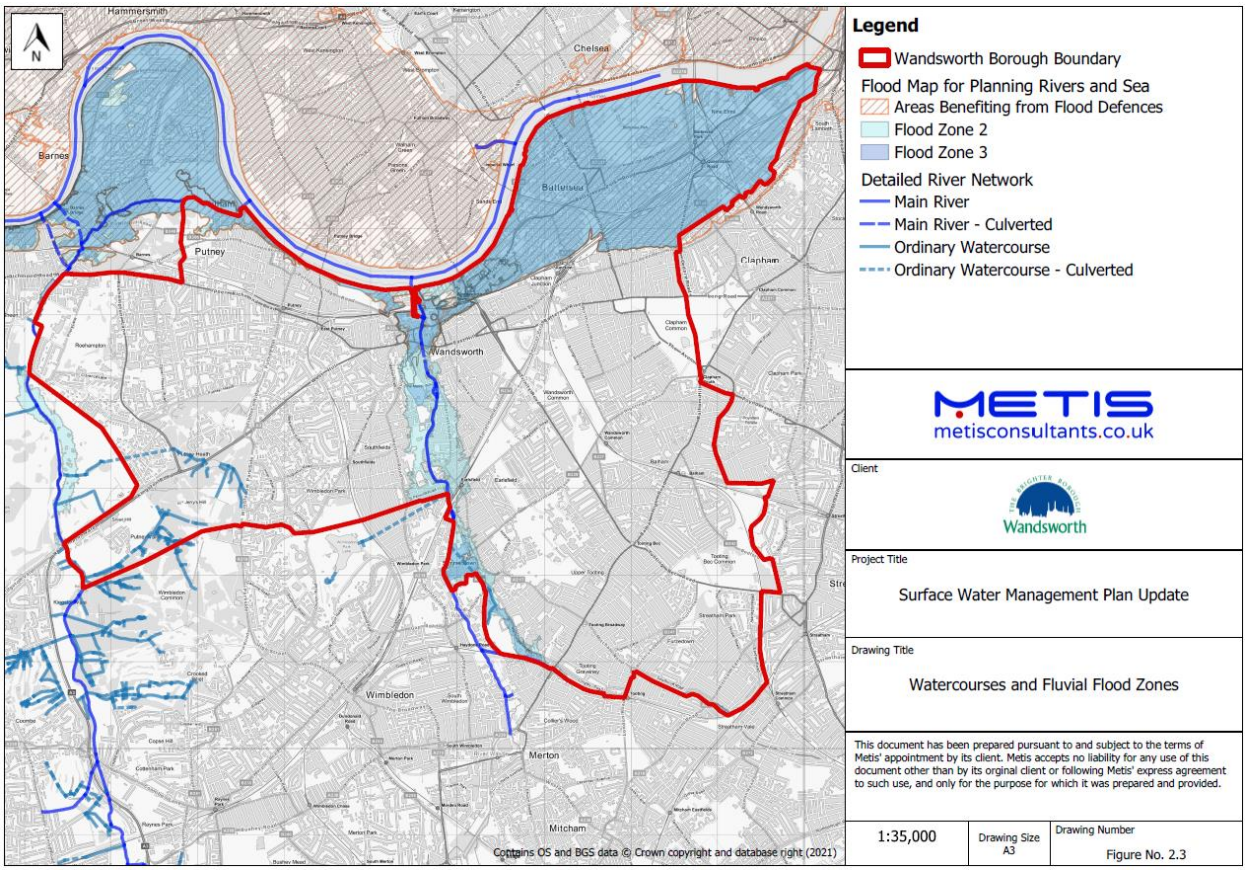

Figure 2-3 Watercourses and fluvial flood risk

2.3. Surface water flood risk

2.3.1. Ordinary Watercourse Flooding

An ordinary watercourse is defined in the Land Drainage Act 1991 as a watercourse that does not form part of a main river. Similar to main rivers, ordinary watercourses flood when the capacity of the channel is exceeded, causing the water level to over-top its banks and into adjacent land. They are typically faster responding watercourses with rainfall playing a big part in controlling water depths. There are several ordinary watercourses in Wandsworth which are tributaries to the main rivers identified in *Section 2.2*. The most prominent ordinary watercourses in Wandsworth are all in the west of the borough, located in Putney Heath and Putney Vale which join the Beverley Brook. There is another unnamed drain in Summerstown which is a tributary of the River Wandle. Flood risk from ordinary watercourses is included in the EAs RoFSW maps (*Figure 2-4*).

2.3.2. Surface Water Flooding

Surface water flooding occurs in areas when short duration, intense rainfall cannot infiltrate below ground or enter drainage systems, and consequently runs overland. It is further intensified when soils are saturated, or in urban areas with impermeable ground. The excess water can pond at local low points and often form flow pathways along roads, built up areas or open spaces. The volume and rate of surface water runoff in an area can increase based on the extent of impermeable surfaces such as roads and car parks.

Surface water flooding is much flashier than fluvial flooding (i.e. occurs sooner and quicker) due to the impermeable urban environment, which prevents water from draining into the ground. High magnitude, short duration rainfalls are typical in the summer, and these can cause rapid flooding. Flooding often occurs around gullies and sewers which can become blocked or reach capacity. Surface water flooding tends to have less serious consequences compared to other forms of flooding, such as fluvial flooding, due to its short duration. However, it can still cause significant local damage and disruption particularly in sudden, intense rainfall events.

LB Wandsworth LLFA hold records of past surface water flooding within the borough. These incidents are widespread across the borough though there is a greater concentration in the east. The EA RoFSW dataset is based upon national scale modelling to identify surface water flood risk areas largely based upon topography and a catchment-based rainfall loss estimation. The RoFSW extents have been used in this SWMP to validate the flood incident records, and these incidents are displayed alongside the EA RoFSW within *Figure 2-4*.

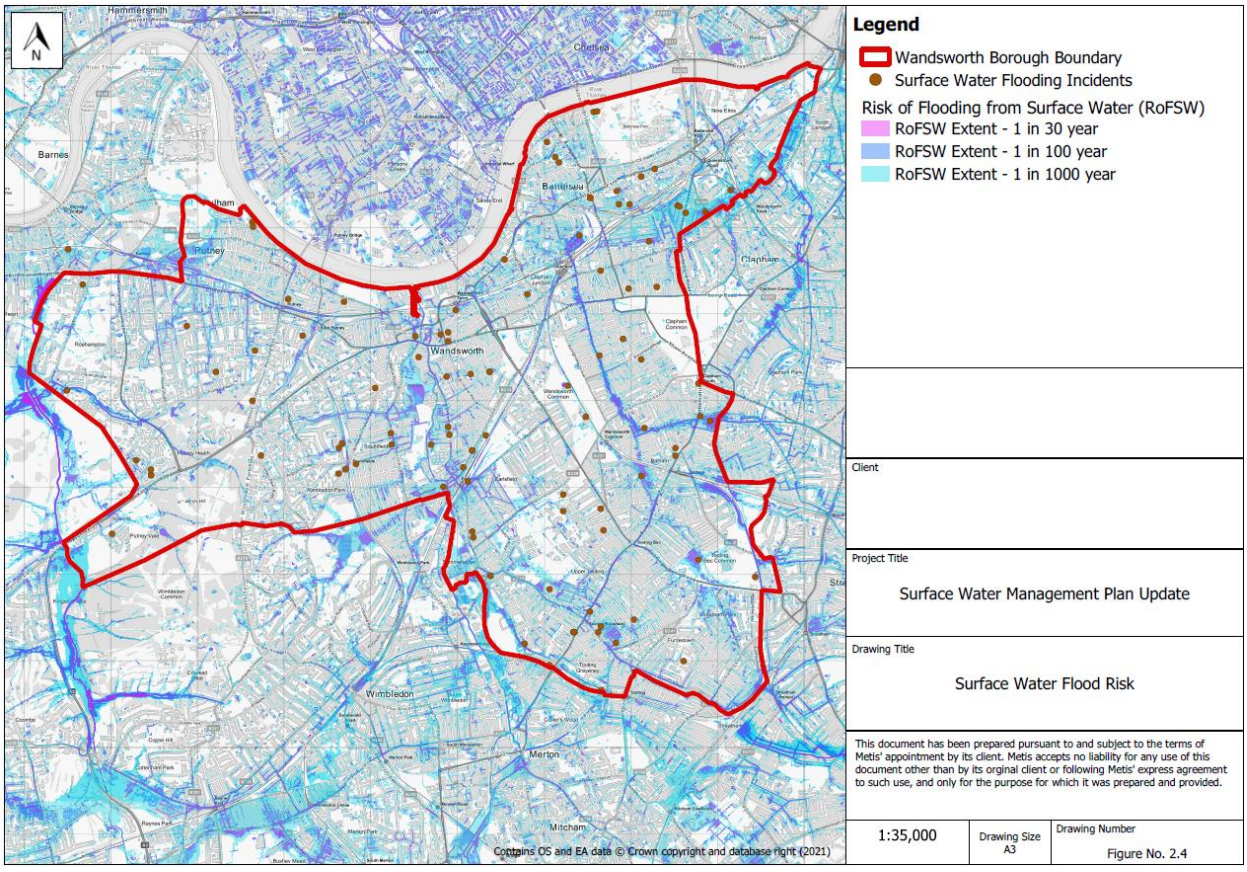

Figure 2-4 Surface Water Flood Risk

2.4. Groundwater flood risk

Groundwater flooding is caused when water from the sub-surface permeable strata emerges above ground. It is dependent on local variations in topography and geology, and generally stems from a rise in groundwater level, inundating low-lying land. Groundwater flooding usually develops over long periods, with its effects potentially lasting weeks or months. It can be difficult to immediately differentiate groundwater flooding from other sources, such as surface water or sewer flooding, and local groundwater levels can also impact on the levels within watercourses.

The bedrock geology for LB Wandsworth consists almost entirely of the London Clay formation which is made up of clay and silt. There is a small area of Claygate Member in Putney Heath which is made up of sand, silt and clay, and an area of Lambeth group of clay, silt and sand in Tooting. The superficial deposits are made up of Alluvium, Black Park Gravel, Kempton Park Gravel, Hackney Gravel Member, Head, and Langley Silt. The geology of LB Wandsworth can be seen in *Figure 2-5*.

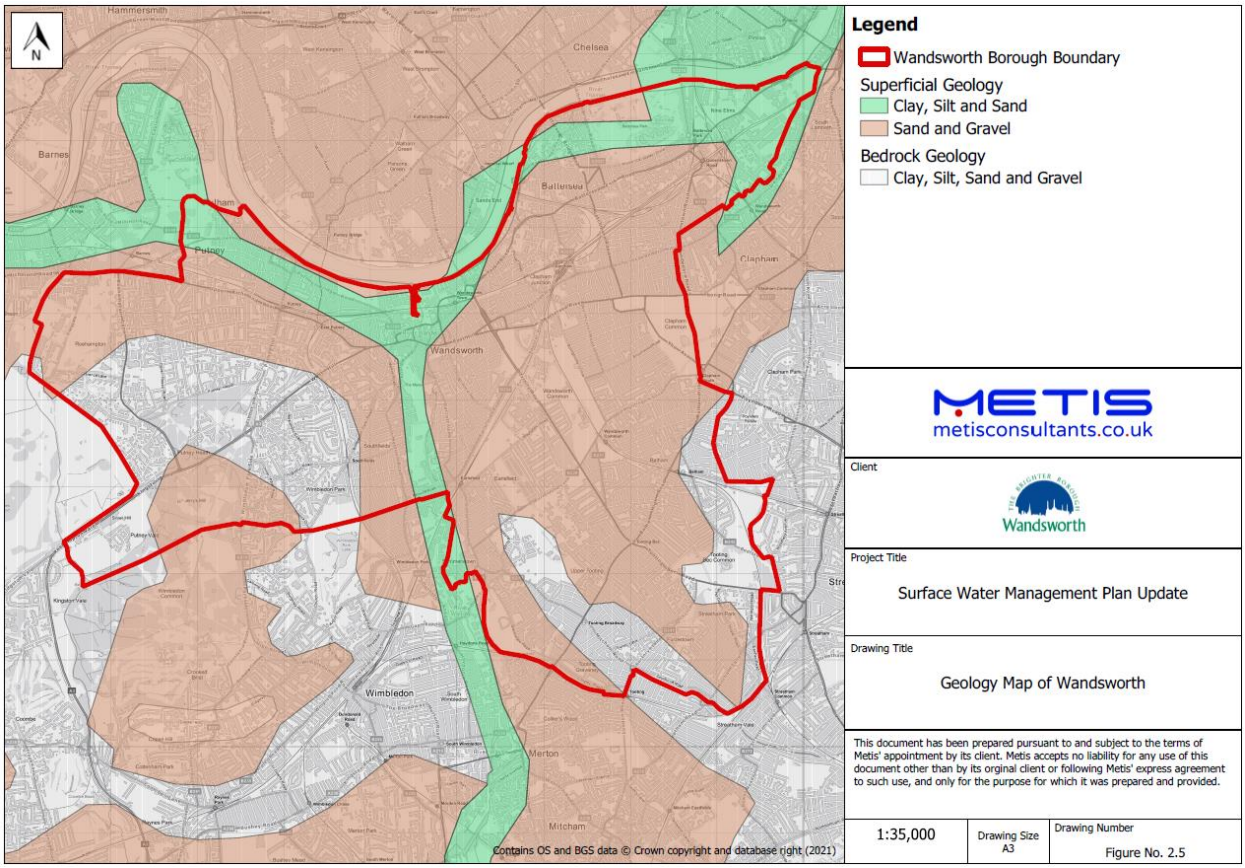

Figure 2-5 Geology

Areas with the highest susceptibility to groundwater flooding include the south-central regions of the borough, around Summerstown and Tooting and Graveney (*Figure 2-6*). Further information on groundwater flood risk and geology can be found in Wandsworth's Level 1 SFRA.

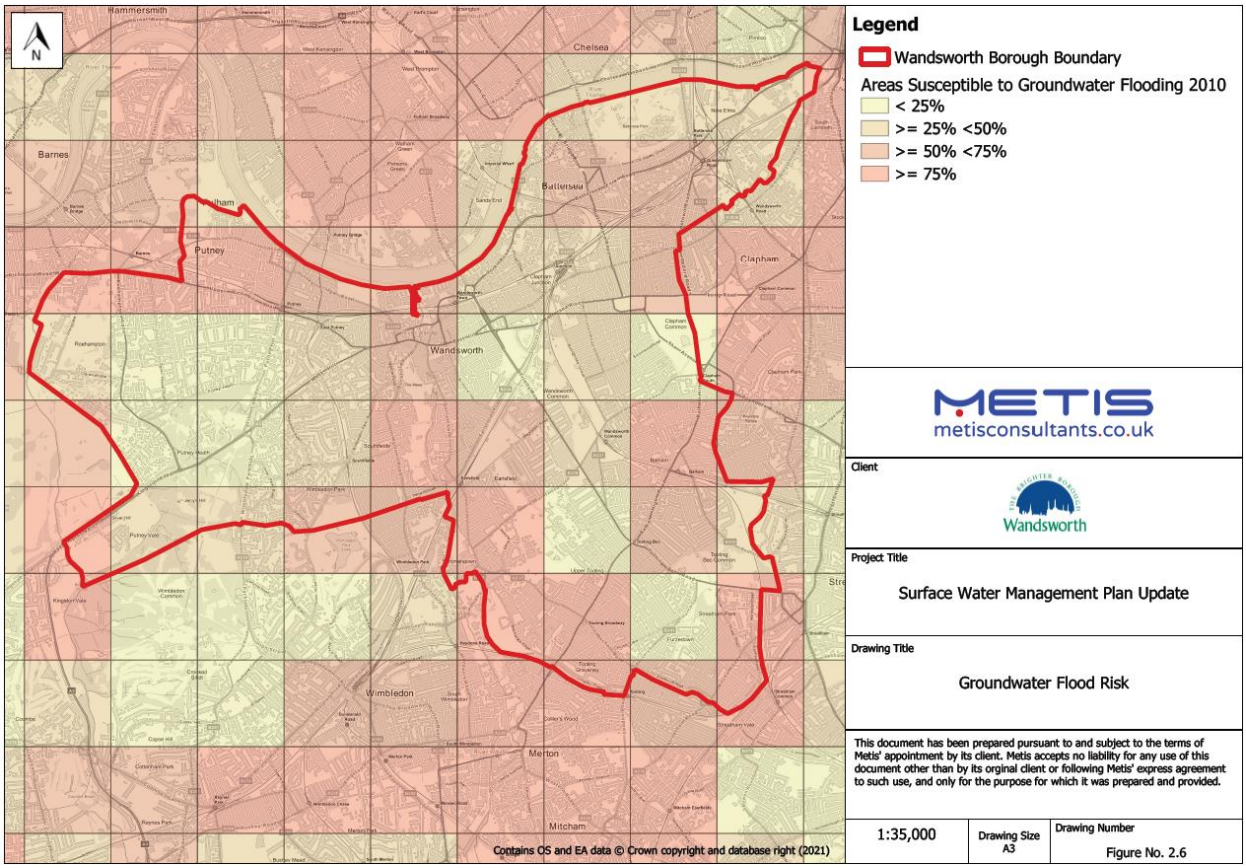

Figure 2-6 Groundwater Flood Risk

2.5. Sewer flood risk

Sewer flooding occurs when the volume of rainfall entering the sewer network is too large to be contained. A lack of capacity in the sewer networks may be due to:

- An increase in flow (such as climate change impacts on rainfall and/ or new developments);
- Having to sustain events larger than the system-designed event;
- The failure of key infrastructure such as pumps or valves;
- A watercourse having been culverted or incorporated into the drainage network;
- A lack of maintenance which can sometimes lead to total blockage;
- Groundwater infiltration into pipe networks in poor condition; and
- Limited outflow from the sewer network due to high water levels in receiving watercourses.

The impact of sewer flooding is usually restricted locally but can be rapid and unpredictable. Flood waters from sewers are also often contaminated with sewage which can be harmful to health.

While separate foul and surface water pipes are present in LB Wandsworth, most of the borough is served by a combined sewer system, in which foul sewage and rainwater are drained through the same pipes. The sewer system and associated infrastructure is dated and not built to withstand high intensity rainfall such as a 1 in 100-year event. This results in associated sewer flooding where the assets cannot cope with the volume of water. *Figure 2-7* shows the sewer flood risk based on recorded

flooding incidents reported to TWUL in the borough. More information on sewer flood risk can be found in Wandsworth's Level 1 SFRA.

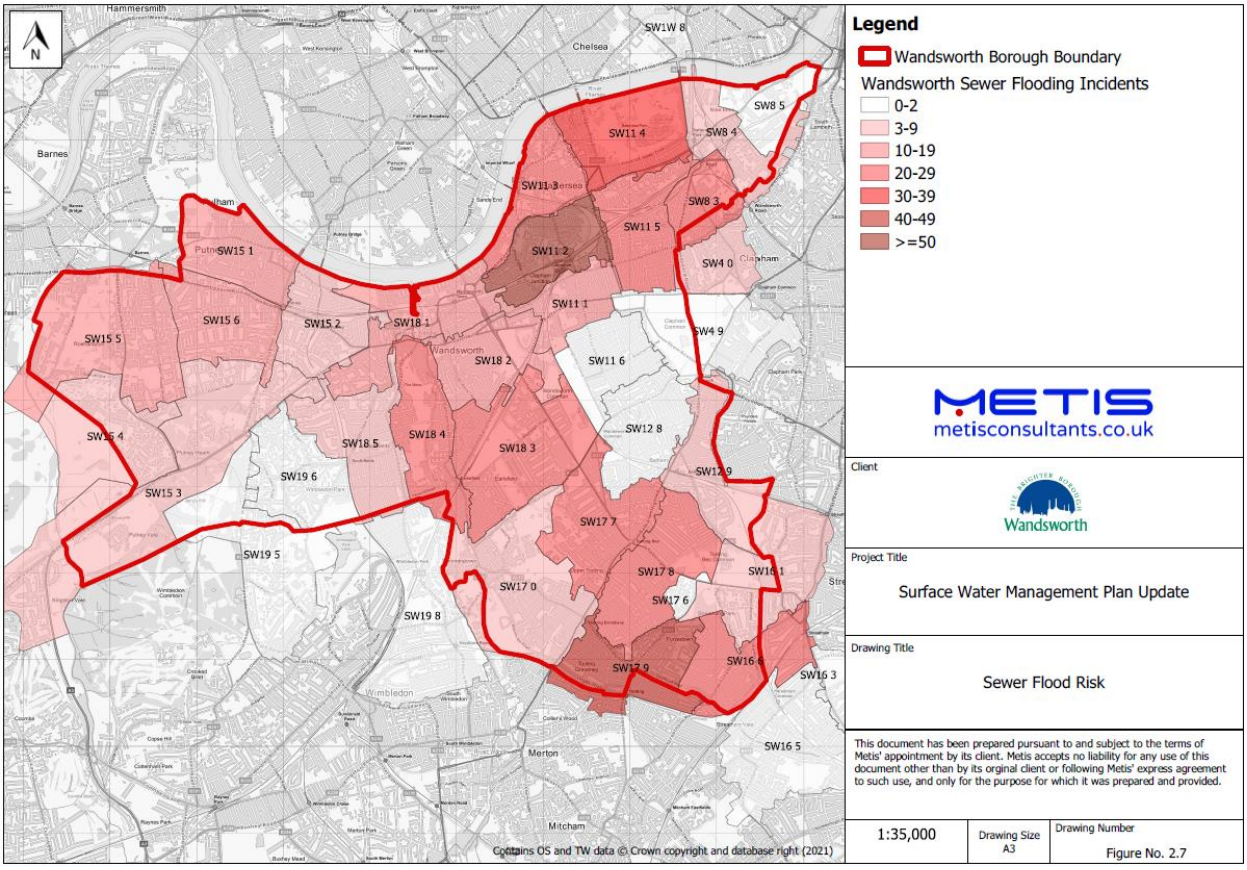

Figure 2-7 Sewer flood risk in LB Wandsworth

2.6. Flood risk from other sources (tidal and artificial)

Tidal Flooding can occur during extreme high tide or storm surges. The River Thames is tidally influenced throughout the whole of LB Wandsworth, with many flood walls acting as part of the EA's Thames Tidal Defence system. The EA Flood Map for Planning for Rivers and Sea's Areas Benefitting from Flood Defences dataset depicts areas that are protected from tidal flood risks. Parts of the borough adjacent to the River Thames benefit from these defences (*Figure 2-3*).

Artificial flooding occurs as a result of infrastructure failure or human interaction. Typical flood sources can include reservoirs or canals. The EA's risk of flooding from reservoir mapping shows the extents of flooding from artificial sources (*Figure 2-8*).

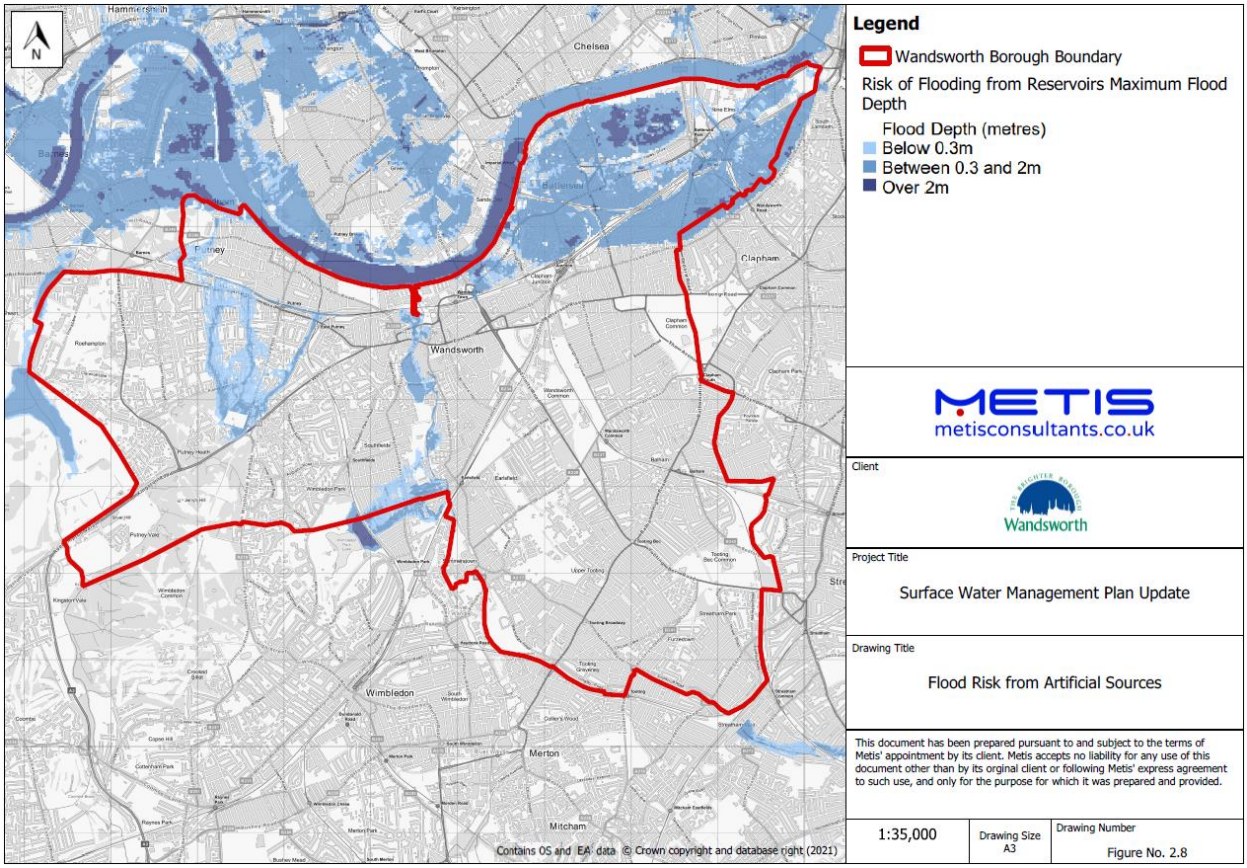

Figure 2-8 Risk of flooding from artificial sources

2.7. Properties at risk within the borough

There are 8,489 properties predicted to be at risk across LB Wandsworth during the 1 in 100-year surface water flood event (*Table 2-1*). The EA's Properties at Risk of Flooding for the 1 in 30, 1 in 100 and 1 in 1000-year events (2014) dataset has been used across the whole borough. Modelling of properties at risk in the 1 in 100-year flood event have been presented in *Figure 2-9*. It is recommended that as more detailed and local modelling is undertaken the resultant mapping and property count should be incorporated into future updates of the SWMP to ensure it is consistent with the current level of understanding of flood risk across the borough.

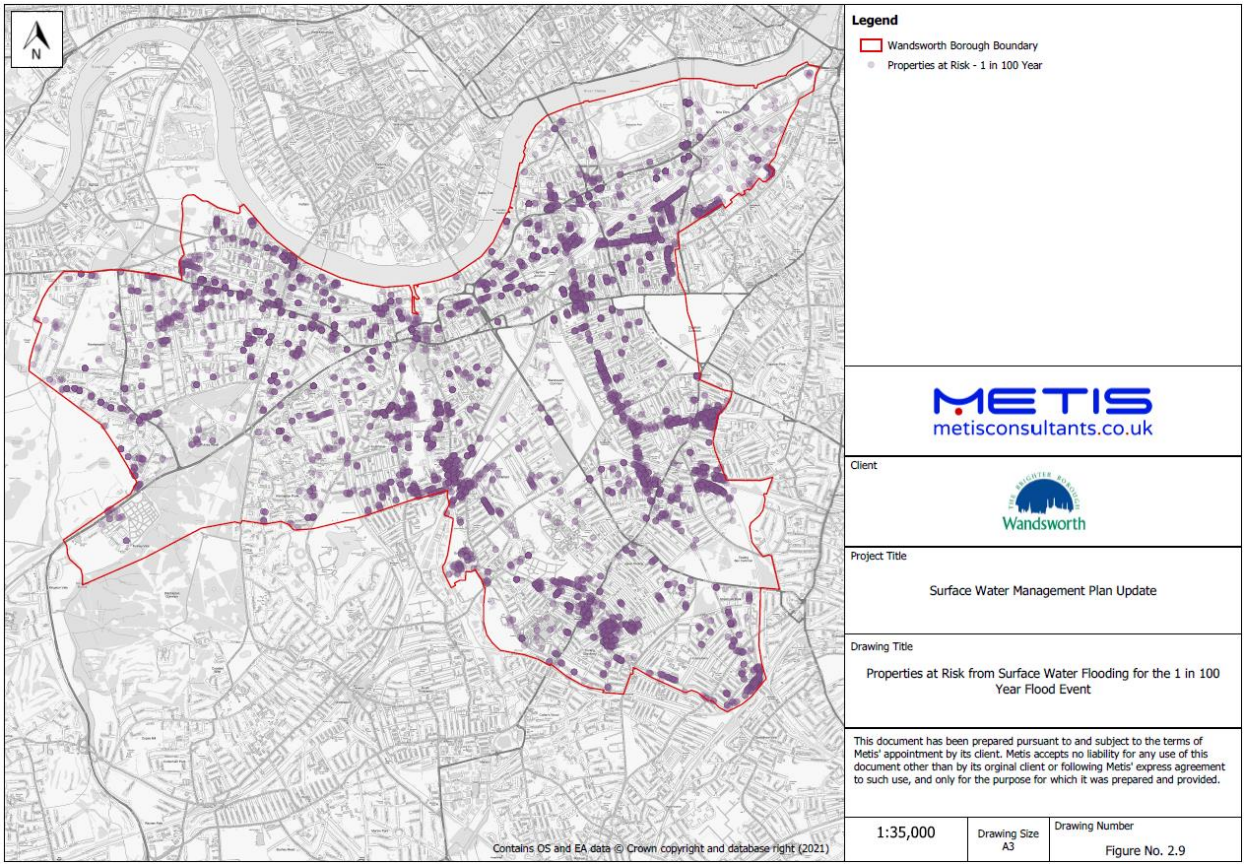

Figure 2-9 Properties at Risk from Surface Water Flooding for the 1 in 100-Year Flood Event

Property counts for individual Catchments can be found in *Sections 4 to 10*. For comparison, the 2011 SWMP analysis of the number of properties at risk of flooding for the 1 in 100-year event demonstrated that 41,770 residential properties and 3,280 non-residential properties in LB Wandsworth could be at risk of greater than 0.03m depth of flooding. Since the 2011 SWMP, the RoFSW has been remodelled by the EA for the area. The number of properties at risk has reduced drastically in this SWMP as the depth threshold for internal property flooding was increased by the EA modelling. The modelled ground level was raised within building footprints by an average of 0.3 metres to represent the way that the average building would not flood internally until water outside is 0.3m deep. Once the modelled water level reaches that threshold, the buildings are flooded.

In *Table 2-1*, 'Residential' properties are accounted for while the 'Other' section includes information about commercial, transport, or other such infrastructural properties. The 'Unclassified' section refers to properties which have been mapped and are at risk of flooding but have not been identified under a specific use due to a lack of information. The EA periodically reviews the 'Unclassified' properties when new information is provided to them.

Table 2-1 Properties at risk of surface water flooding in Wandsworth

	Residential	Other	Unclassified
Within 30-year surface water extent	1,890	708	198
Within 100-year surface water extent	5,836	2,103	550
Within 1000-year surface water extent	21,854	7,067	1,747

2.8. Recorded flooding history within the borough

LB Wandsworth collects information on flood incidents and keeps a record of historic flood incidents. This information includes all sources of flooding and is not limited to significant incidents. This helps to build up a clear picture of flooding across the borough and can also aid in understanding of how flood risk changes, particularly with issues such as climate change. Currently, LB Wandsworth have 805 recorded flood incidents across the borough from 1990 to 30th July 2021. Flood incidents recorded after 30th July 2021 could not be included in the report as the data analysis began before this date, and more reports could not be added without interfering with the methodology. It should be noted that data is limited as many residents do not report flood incidents. Where available, reports of surface water flood incidents were used to help validate the EAs RoFSW mapping, and the Hotspots creation. Residents are encouraged to report flood incidents to Wandsworth's online flood reporting tool.

Recorded flood event and extent data has been provided by the EA (*Figure 2-10 and Figure 2-11*). This shows that flooding has occurred where the River Wandle meets the River Thames in central northern Wandsworth, and to the northeast in Battersea, particularly Battersea Park and between York Road and Battersea Bridge Road.

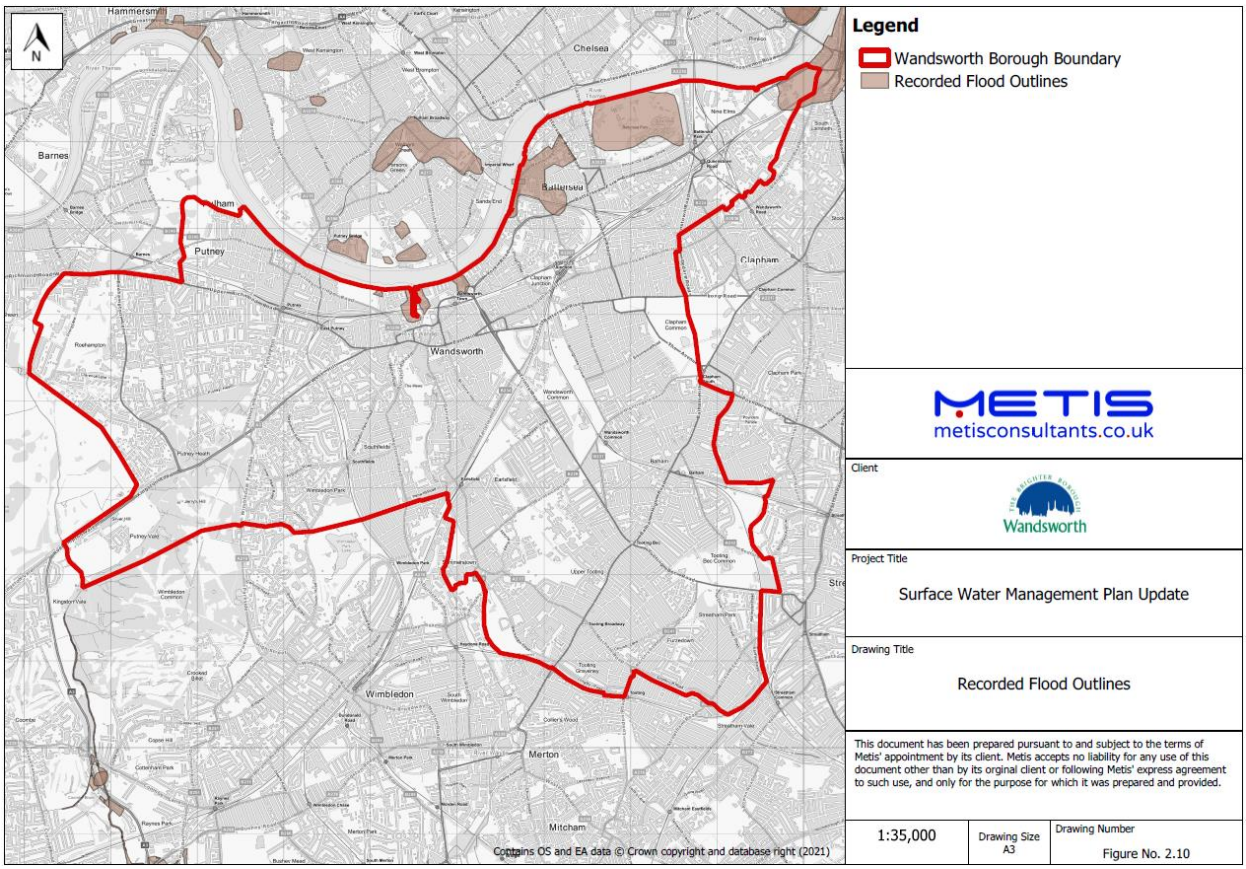

Figure 2-10 Recorded Flood Outlines (EA)

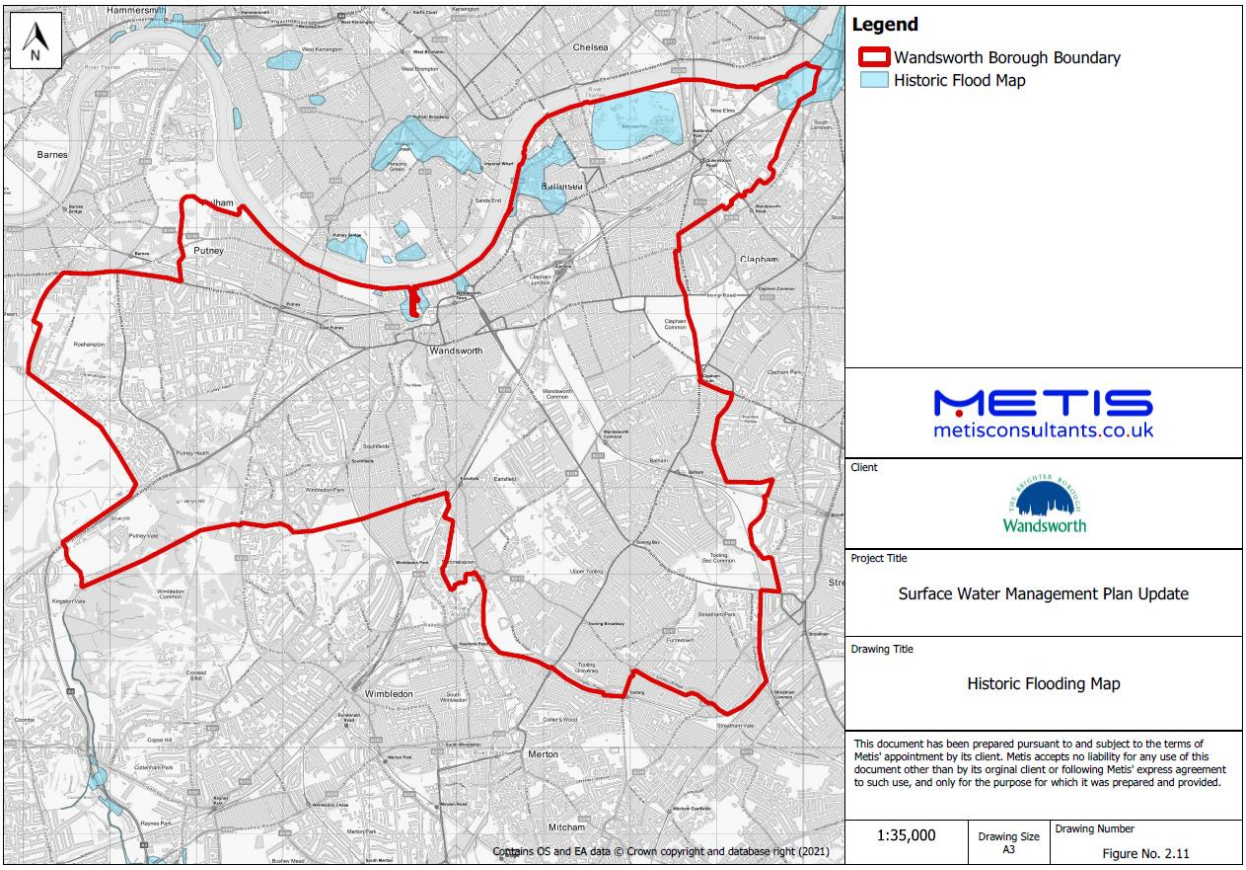

Figure 2-11 Historic Flood Events (EA)

TWUL have provided sewer flooding incident data (*Table 2-2*). Due to the sensitivity of the information, it was provided as postcode sectors. Consequently, it is not property specific, and contains flood incidents up to May 2021. In the past, TWUL has gathered flood reports from phone calls and hard copy report forms, but they have recently switched to an online report form. This may result in changes to the rate of reporting. Where a postcode sector crosses the borough boundary the incidents reported are for LB Wandsworth only. In total, there were 469 recorded sewer flood incidents across Wandsworth, the highest of those were SW11 2, SW17 9, and SW11 4.

Table 2-2 Number of Thames Water Sewer Flood Records across Wandsworth

Postcode Sector	Internal Flooding			External Flooding			Total
	2 in 10 year	1 in 10 year	1 in 20 year	2 in 10 year	1 in 10 year	1 in 20 year	
SW11 1	1	0	10	0	1	0	12
SW11 2	2	3	51	0	0	2	58
SW11 3	0	2	25	0	0	0	27
SW11 4	1	3	23	0	0	3	30
SW11 5	2	4	18	0	1	2	27
SW11 6	0	0	0	0	0	0	0
SW12 8	0	0	2	0	0	0	2
SW15 1	0	0	13	0	0	0	13
SW15 2	0	0	2	0	0	1	3
SW15 3	0	0	0	0	1	6	7
SW15 4	0	0	4	0	0	0	4
SW15 5	0	0	2	0	0	8	10
SW15 6	0	0	7	0	0	4	11
SW16 1	0	0	3	0	0	0	3
SW16 3	0	0	0	0	1	0	1
SW16 5	0	0	0	0	1	0	1
SW16 6	0	0	18	0	1	1	20
SW17 0	0	0	5	0	0	0	5
SW17 6	0	0	0	0	0	0	0
SW17 7	0	0	23	0	0	2	25
SW17 8	0	1	21	0	0	1	23
SW17 9	0	1	42	0	0	0	43
SW18 1	1	2	8	0	0	0	11
SW18 2	0	0	14	0	0	0	14
SW18 3	0	0	18	0	0	2	20
SW18 4	0	4	14	0	2	4	24
SW18 5	0	1	3	0	2	1	7
SW19 5	0	0	0	0	0	0	0
SW19 6	0	0	1	0	0	0	1
SW19 8	0	0	2	0	0	0	2
SW4 0	0	0	1	0	0	2	3
SW4 9	0	0	0	0	0	0	0
SW8 3	0	0	24	0	0	4	28
SW8 4	0	0	6	0	0	0	6
SW8 5	0	0	1	0	0	0	1
TOTAL	**7**	**21**	**361**	**0**	**10**	**43**	**442**

3. BASIN BASED APPROACH

3.1. Why this approach

Since the 2011 SWMP, which identified eleven CDAs in the borough, LB Wandsworth has worked to improve the understanding of surface water flood risk in some of these areas. As the drainage network and local topography were not integrally considered within the 2011 modelling, the amount of surface water entering a particular area was not fully accounted for. Since 2011, it has been identified that CDA extents sometimes do not correspond to their contributing areas, typically only covering the locations most at risk from surface water flooding.

The new SWMP introduces a new approach to managing flood risk in which the local topography, watercourse and sewer information have been used to better represent hydrological Catchments within larger Basins. The natural Catchments therefore better reflect and cover a larger geographic area than the 2011 CDAs. This approach is in line with national flood risk management and planning policy which have been progressively moving towards a Catchment / Basin-based focus in recent years. As many neighbouring boroughs update their SWMPs and / or undertake refined surface water flood risk modelling, they have also used a Catchment / Basin-based approach to define study areas, so consistency is maintained.

The Catchment / Basin-based approach better aligns to the EA's river basin methodology used for the management of fluvial flood risk. Within *Figure 3-1* the new Catchments are depicted alongside the 2011 CDAs, the CDAs being largely focused on non-residential areas such as railway lines. While there were several inconsistencies with the extents of the 2011 CDAs aligning to hydrological Catchments, the new approach reflects the predicted flow paths of rainfall runoff regardless of whether it is over the surface, in watercourses or in the sewer network and mirrors the source-pathway-receptor model for managing flood risk.

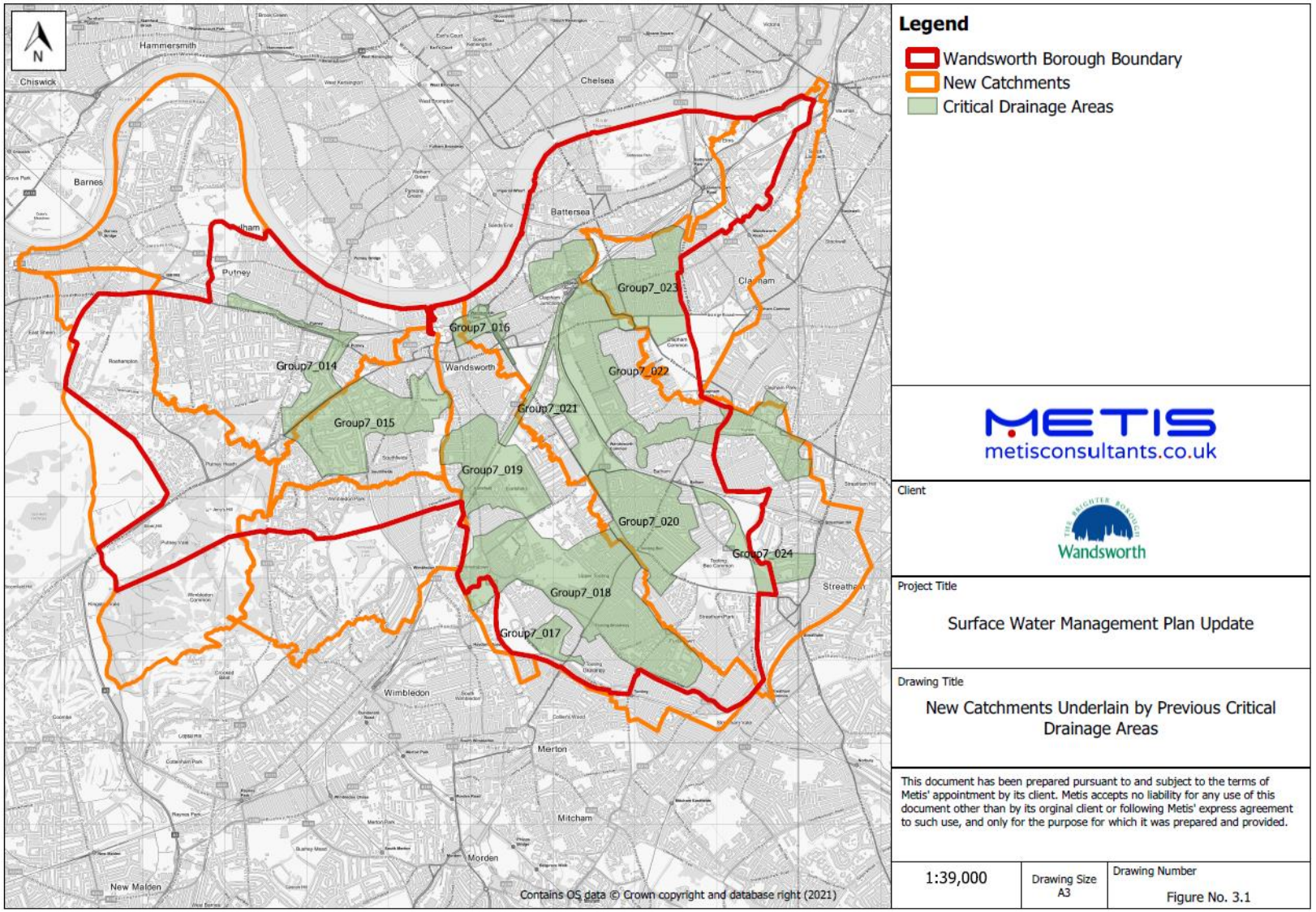

Figure 3-1 New Catchments and previous CDAs

3.2. How the approach was applied

A watershed analysis was carried out to identify the Basins covering LB Wandsworth by using the local topography and detailed river network. Next, refined hydrological areas within each Basin called 'Catchments' were defined using additional features such as the existing drainage network and key infrastructure. Basins cover a wider geographical area than Catchments and reflect the spatial extent of rainfall runoff which contributes towards the final runoff destination. Catchments, however, identify more localised flow paths (above and below ground) across Basins. Key elements used to define the Catchment extents included the following, listed in priority order:

- Detailed river network features such as watercourses
- Surface water and combined sewer network orientation and flow direction
- Flow paths identified from the watershed analysis
- Major railway or London Underground lines
- Road network splits

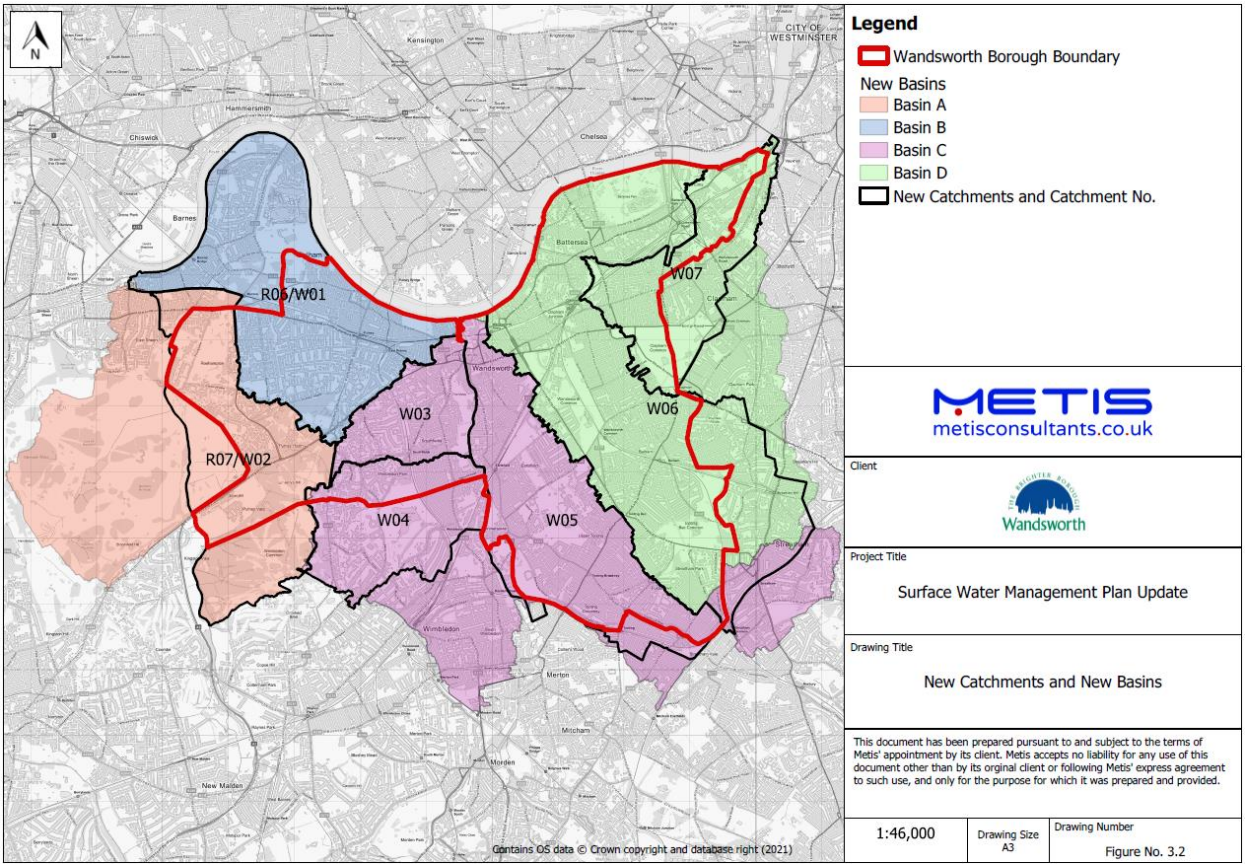

Figure 3-2 New Catchments and New Basins

Under this new approach, 4 Basins including a total of 7 Catchments were defined as per *Figure 3-2*. Several Basins and Catchments cross the LB Wandsworth boundary and are therefore shared with neighbouring boroughs.

Due to the key elements of Catchment extent definition listed above, there are areas where Catchment boundaries do not necessarily align with the Basin boundaries. Where the surface water sewer network flows against the general topography, there are slight differences between the Basin and its Catchment boundaries. For example, for Catchment Wimbledon Park (W04) and Earlsfield (W05) in Basin C, and Catchment Wandsworth Common (W06) and Clapham Common (W07) in Basin D. While the Basin boundaries mainly follow the output of the watershed analysis reflecting the topography, the Catchment boundaries were adjusted due to the locations of surface water sewers, railway lines and major roads to reflect the drainage nature of the area. More information is included in *Section 3.4*. *Table 3-1* provides information on the Basins and Catchments, as defined under the new approach.

It is worth noting that although Catchment East Sheen (R05) is a Richmond Catchment and does not cross LB Wandsworth boundary, it forms part of the Basin A. Therefore, it is included in *Table 3-1* below without being given a catchment number.

Table 3-1 Basins and Catchments

Code	Basin	No.	Code	Catchment	Cross-boundary Authority
A	Beverley Brook	-	R05	East Sheen	RB Kingston
		1	R07/W02	Putney Heath	LBs Richmond & Merton
B	Thames River South & Beverley Brook	2	R06/W01	Putney	LB Richmond
C	River Wandle	3	W03	Southfields	
		4	W04	Wimbledon Park	LB Merton
		5	W05	Earlsfield	LB Merton
D	Thames River South – Wandsworth	6	W06	Wandsworth Common	LB Lambeth
		7	W07	Clapham Common	LB Lambeth

A high-level validation exercise of the EA's RoFSW datasets was carried out using LB Wandsworth LLFA's recorded flooding incidents (to a road-specific level, not a property-specific level). The number of properties predicted to be at risk from surface water flooding within each Basin or Catchment was quantified using the RoFSW datasets. At a Basin level, visual checks were carried out by overlaying the RoFSW extents for the 1 in 30-, 100- and 1000-year return periods with LB Wandsworth's recorded flood information. *Figure 3-3 to Figure 3-6* depict the validation maps for Basins A to D.

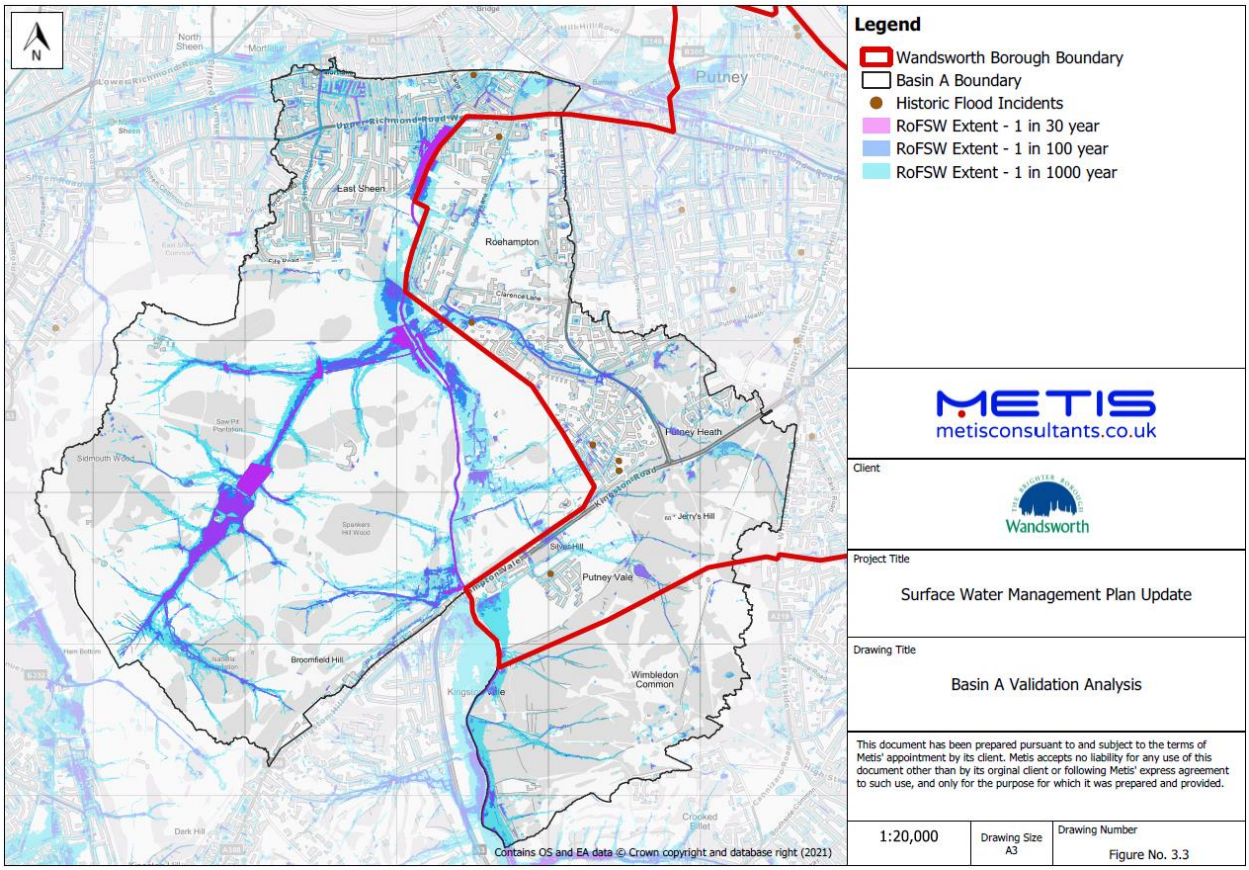

Figure 3-3 Basin A Validation Analysis

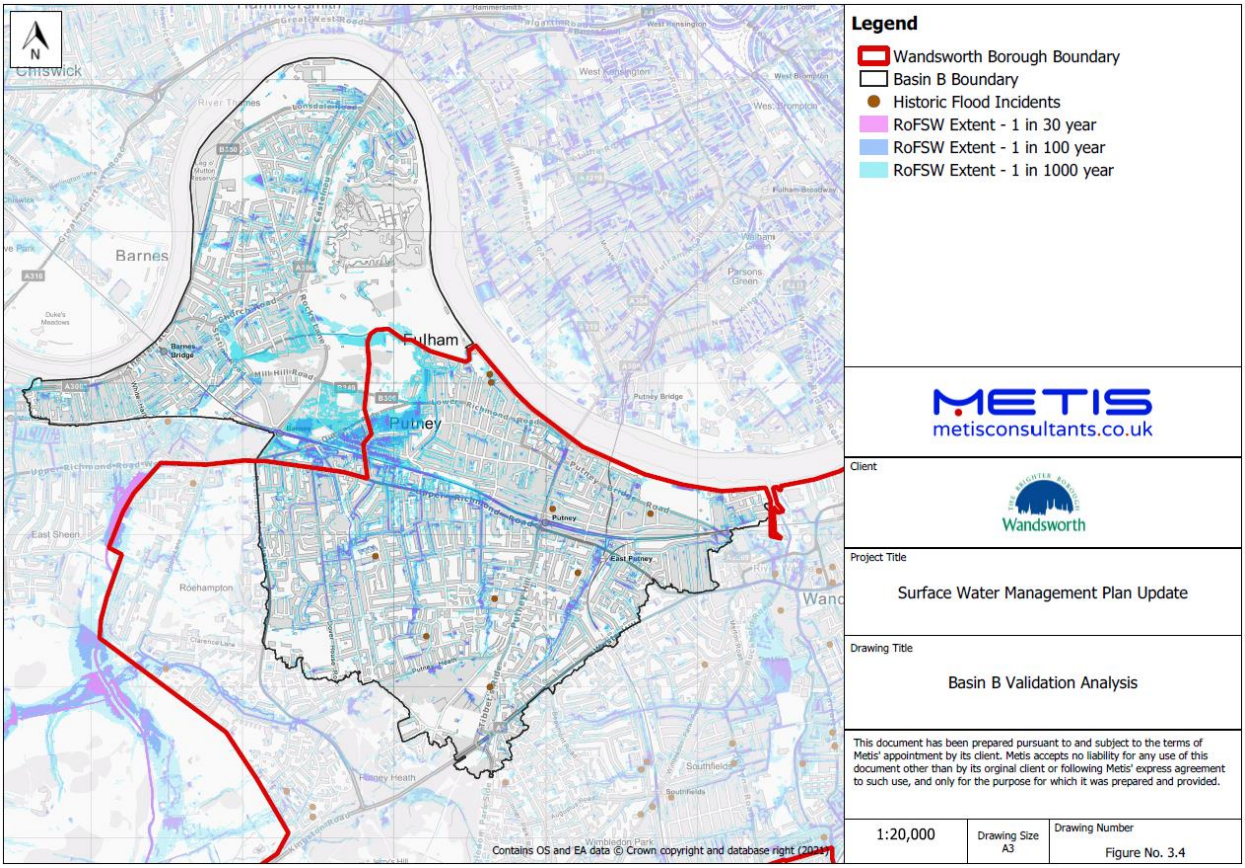

Figure 3-4 Basin B Validation Analysis

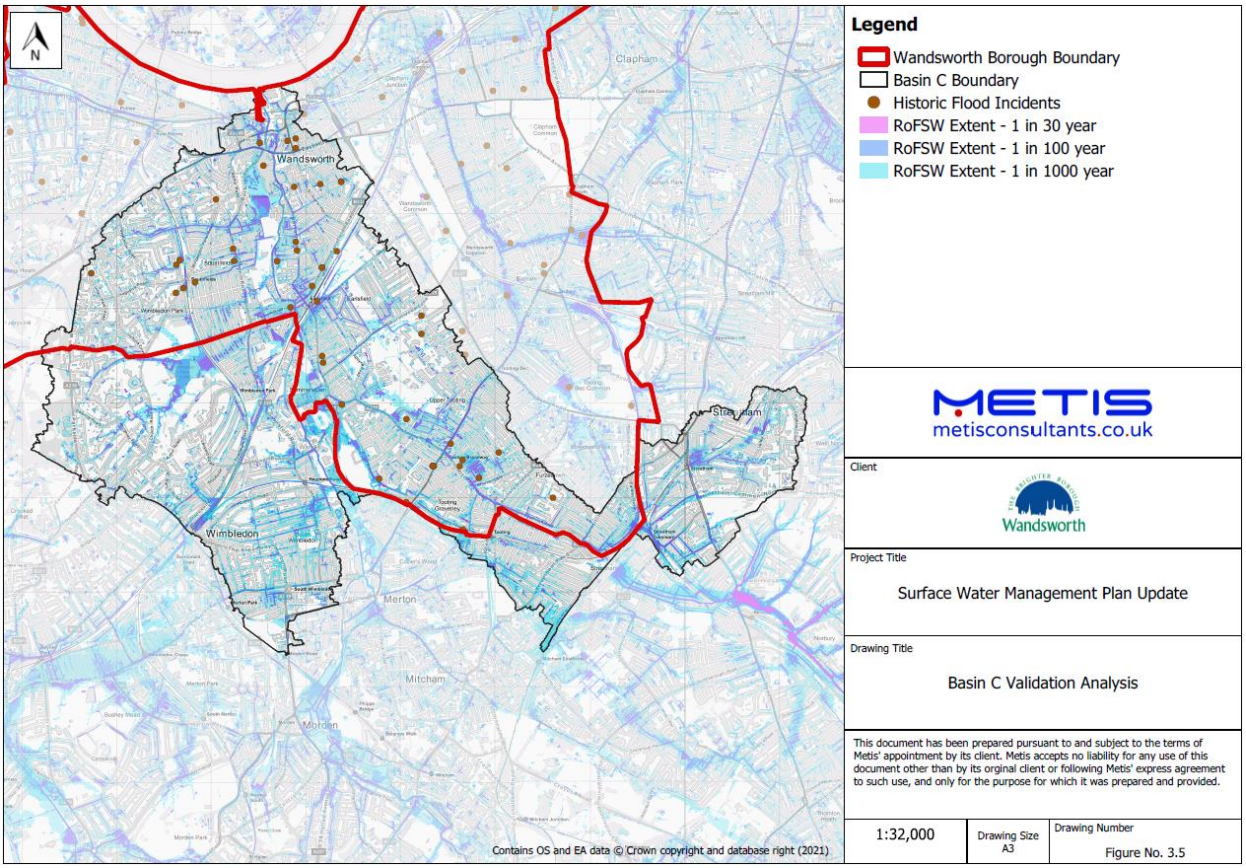

Figure 3-5 Basin C Validation Analysis

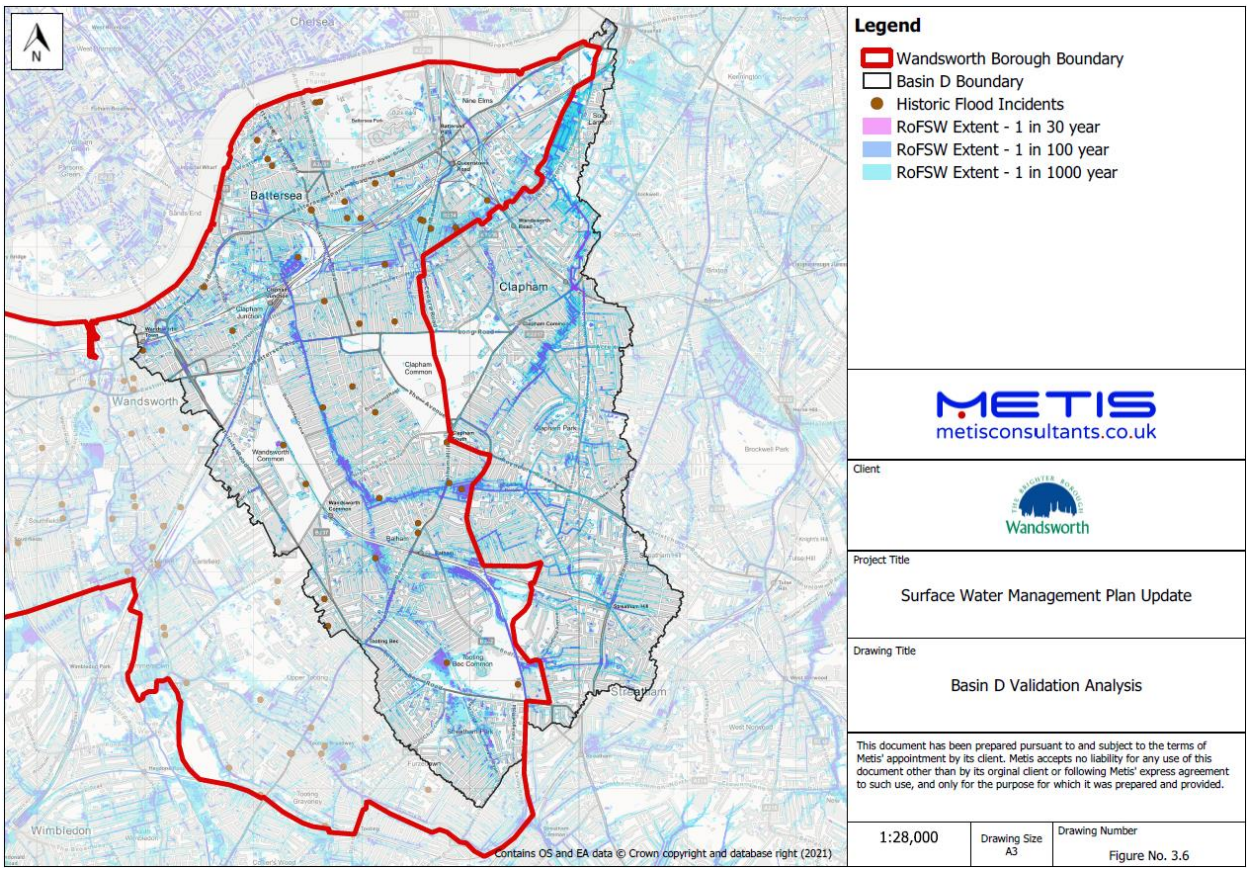

Figure 3-6 Basin D Validation Analysis

Basin A contains mostly green spaces. EA main river Beverley Brook and its tributaries pass through Basin A. In the built-up areas, the recorded flood incidents match with the flood extents in the RoFSW mapping. The majority of the flood incidents are on roads where the RoFSW mapping predicted flooding for 1 in 30-year return period. However, there was no former CDA in this area.

Basin B contains 1 former CDA. The recorded flood incidents are scattered across the basin. The RoFSW mapping partially aligns with the recorded incidents. All incidents lie outside of the CDA extents.

Basin C contains 4 former CDAs. The RoFSW mapping appears to be predominantly consistent with the recorded flood incidents. However, only some of the incidents are covered by the 4 CDAs. There is a cluster of flood incidents in the northern part of the Basin that is not covered by CDAs.

Basin D contains 5 former CDAs. The recorded flood incidents mostly align with the RoFSW mapping other than a few areas, such as the flood incidents around Battersea Park. There is a large cluster of flood incidents in the northern part of the Basin that is not covered by any of the CDAs. Historically, the old Falcon Brook River ran through Basin D and flooding took place down the path of the river. The old river is now the falcon sewer which increases flood risk.

Overall, the recorded flooding incidents largely correspond well to the RoFSW datasets. Comparing the recorded incidents, and RoFSW prediction and the former CDAs also proves that the Catchment / Basin-based approach better defines the likely flow paths. It shows both the areas that are predicted to flood and the areas that contribute runoff towards them, making it more practical for the management of surface water flood risk.

3.3. Hotspot and Flood Incident Area creation

The definitions of Hotpots and Flood Incident Areas are:

- Hotspots: areas with a minimum of 15 residential properties predicted to be at risk of flooding in the 1 in 100-year surface water flood event (using the EA's Properties at Risk of Flooding data and the RoFSW map extents).
- Flood Incident Areas: areas identified by LB Wandsworth where there were two or more flood incidents affecting properties. The threshold was chosen as two flood incidents to ensure that a Flood Incident Area was not defined based on any single event.

Following the validation exercise, Hotspots were created to highlight the areas with higher predicted potential of property flood risk. They were reviewed and validated by relevant staff of LB Wandsworth.

Hotspots can be used to inform the focus of potential flood risk mitigation works in the future or can be used to flag up problematic areas ahead of extreme rainfall events. Increased flood risk-related planning policy strength can also be used to better protect and ensure sustainable development in these Hotspots, although stronger policy borough-wide is preferred by LB Wandsworth's LLFA.

In addition to the Hotspots, LB Wandsworth also highlighted several 'Flood Incident Areas' and are shown in *Sections 4 to 0.*

3.4. Cross-boundary involvement

As mentioned in *Section 3.2*, many hydrological Catchments overlap across administrative boundaries and the relevant stakeholders (LLFAs) of these cross-boundary Basins were contacted for their input. Amendments were made following comments from neighbouring LLFAs, and *Sections 3.4.1 to 3.4.3* summarise these.

3.4.1. Putney Heath (R07/W02) and Putney (R06/W01)

These two Catchments are shared between LB Richmond and LB Wandsworth. The Catchment extents were assessed and adjusted based on the river network, local sewer network and railway lines. This was discussed with LB Richmond and LB Wandsworth's LLFA to confirm that the Catchment extents do not require further change.

3.4.2. Putney Heath (R07/W02), Wimbledon Park (W04) and Earlsfield (W05)

These three Catchments cross the borough boundary into LB Merton. The initial Catchment extents were issued to LB Merton's LLFA for review and the extends were updated based on the local sewer network and Merton's Drainage Catchments as outlined in their SFRA.

The southern boundary of Catchment Putney Heath (R07/W02) now closely follows LB Merton's Drainage Catchment boundary. The western, northern and eastern boundary of Catchment Wimbledon Park (W04) now matches with the West Merton Surface Water Model boundary. Catchment Earlsfield (W05) covers a small area of LB Merton. There is a small difference in the boundary alignment against LB Merton's Drainage Catchment boundary. However, this has been discussed with LB Merton's LLFA and agreed upon based on likely flow paths.

3.4.3. Wandsworth Common (W06) and Clapham Common (W07)

These two Catchments cross LB Wandsworth's borough boundary into LB Lambeth. The initial Catchment extents were issued to LB Lambeth's LLFA for review and the extends were updated based on the local sewer network and LB Lambeth's CDAs.

Where the Catchment Wandsworth Common (W06) crosses into LB Lambeth, the boundary mostly align with LB Lambeth's CDA boundary. The boundary of Catchment Clapham Common (W07) was extended slightly northwest to include the residential area north of Robertson Street and therefore align to LB Lambeth's CDA boundary. The southwestern boundary of Catchment Clapham Common (W07) was extended to include the whole of Clapham Common following the advice of LB Lambeth's LLFA.

4. CATCHMENT R06/W01 – PUTNEY

4.1. Updates since 2011 SWMP

Putney Catchment contains some of CDA 4 Richmond and Mortlake. A flood risk management study completed in 2016 looked at each of the CDAs in greater detail. However, no schemes were taken forward in this Catchment for further consideration. To date no updated flood risk modelling has been undertaken in the Putney Catchment but this catchment includes the Richmond Beverley Brook flood resilience project.

4.2. Catchment extents

This Catchment is located across the border of LB Richmond and LB Wandsworth. It is mostly urbanised in the Mortlake, Barnes, and Putney areas with the WWT London Wetland Centre on the east side next to the River Thames. The River Thames is on the north border of this Catchment. Notable features include the Barn Elms Sports Trust and Putney Bridge. The A3 (West Hill) is on the south border of this Catchment and the A205 (Upper Richmond Road) cuts across the centre of Putney. The A306 (Castlenau) also cuts north through Barnes. Barnes Bridge, Barnes, Putney, and East Putney Stations are in this Catchment along the railway line from the west side of the Catchment across to the east. The topography in this Catchment is highest on the furthest extents from the River Thames with the main flow paths running from south to north towards the A205. This acts as a break and surface water conveys east from here then the flow paths convey towards the River Thames. *Figure 4-1* shows Catchment extents and the risk of surface water flooding.

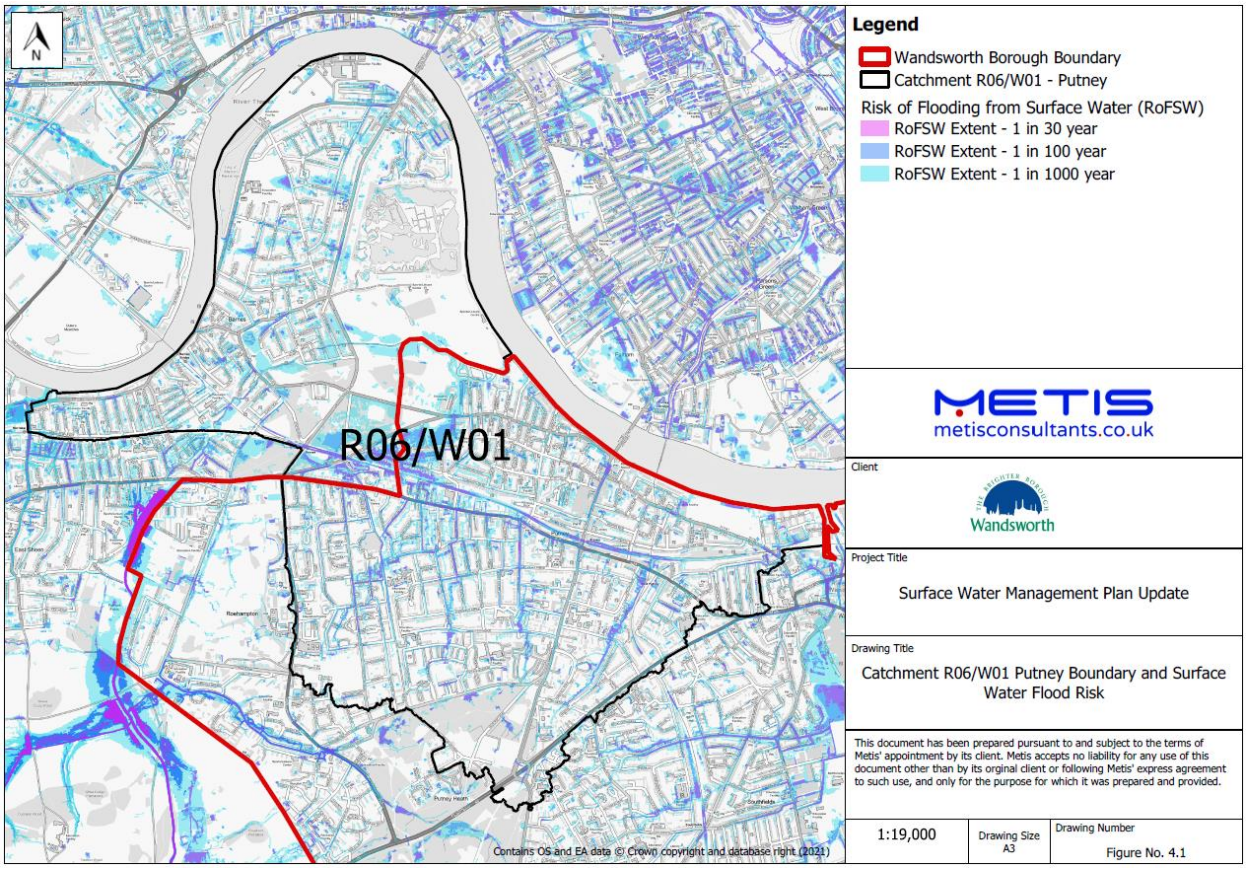

Figure 4-1 R06/W01 Putney Catchment Boundary and Surface Water Flood Risk

4.3. Properties at risk and Hotspots

Table 4-1 summarises the number of properties predicted to be at risk within this Catchment (LB Wandsworth only). Wandsworth has had nine historic reports of flooding in the Putney Catchment R06/W01. Some incidents do not align with the predicted risk areas, which are along the surface water flow paths to the railway line and the River Thames along A219 (Putney Hill) to Putney High Street, or where Hotspots are mostly located. These incidents happened in the following areas in Summer 2007: Tibbetts Corner, Witnell Way and Carslake Road.

Table 4-1 Properties at risk in Putney Catchment R06/W01

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	250	946	2748
Other	82	282	799
Unclassified	25	81	216

In this Catchment, there are six Hotspots shown in *Figure 4-2*. These have been summarised in *Table 4-2.*

Table 4-2 Hotspots in Putney Catchment R06/W01

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
R06_W01_01	Putney	Flow paths towards the railway line from Evenwood Close	97
R06_W01_02	Putney	At the junction of Putney Hill and A205 Upper Richmond Road	68
R06_W01_03	Barnes	Along the flow path from Barnes Common along Dryburgh Road	71
R06_W01_04	Roehampton	Along the flow path from The Pleasance towards A205 Upper Richmond Road	80
R06_W01_05	Putney	Along the flow path from Waterman Street and Weimar Street towards Putney Bridge Approach	108
R06_W01_06	Putney	Along the flow path from Northfields Avenue, Eastfields Avenue and Point Pleasant towards A3209 Putney Bridge Road	57

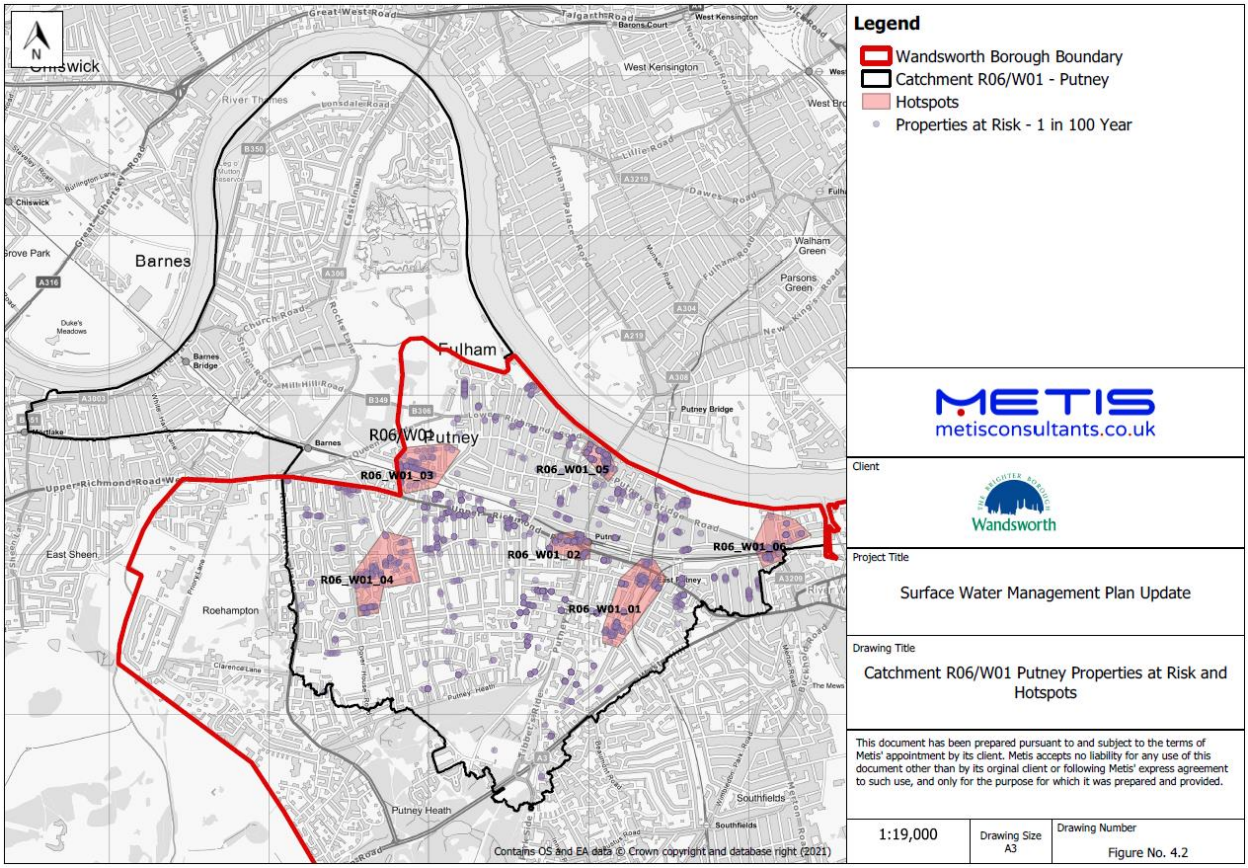

Figure 4-2 R06/W01 Putney Catchment Properties at Risk and Hotspots

4.4. Historic Flood Incidents and Flood Incident Areas

Historic reports of flooding incidents in this Catchment date back to the Summer 2007 flood event in Putney where Greenmead School, Putney High Street, Putney Library, Putney Bridge Road and properties in Carslake Road, Witnell Way, Carlton Drive and Tibbetts Corner reported flooding. All flood reports have been in the urbanised part of this Catchment. Recorded flood incidents are shown in *Figure 4-3.* There are no Flood Incident Areas in this Catchment. In more recent reports in July 2021, there are reports of property flooding that occurred in the SW15 area (see *Figure 2-7* for postal code areas) on Festing Road and Rotherwood Road. Also in March 2021, significant highway flooding occurred on Kingston road in the SW19 area. None of these recent events align with the properties affected in Summer 2007.

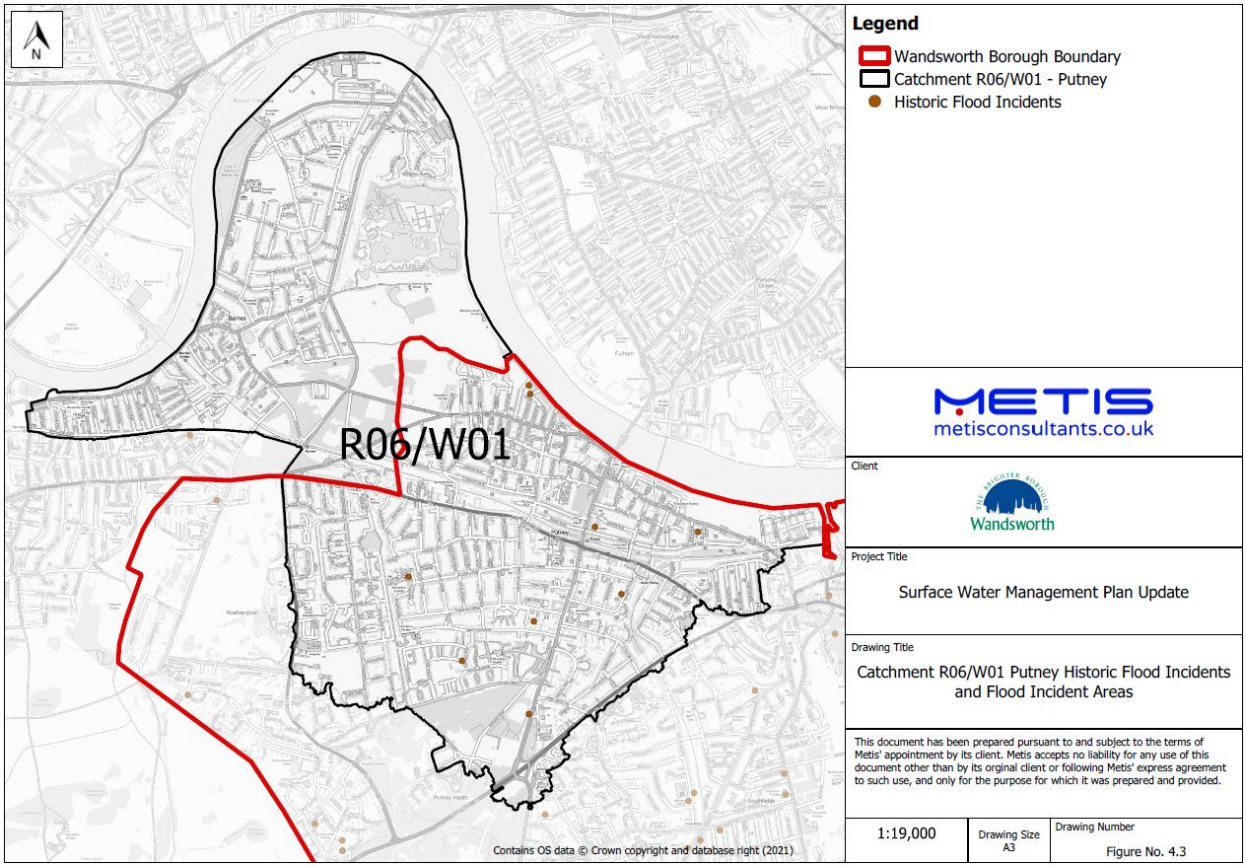

Figure 4-3 R06/W01 Putney Catchment Historic Flood Incidents and Flood Incident Areas

5. CATCHMENT R07/W02 - PUTNEY HEATH

5.1. Updates since 2011 SWMP

Putney Heath Catchment contains some of CDA 4 Richmond and Mortlake. A flood risk management study completed in 2016 looked at each of the CDAs in greater detail. However, no schemes were taken forward in this Catchment for further consideration. To date no updated flood risk modelling has been undertaken in the Putney Heath Catchment but this catchment includes the Beverley Brook flood resilience project.

5.2. Catchment extents

This Catchment contains the eastern edge of Richmond Park and the northern part of Wimbledon Common. Urbanised areas include East Sheen, Putney Vale, Putney Heath, and Roehampton. Notable features include the University of Roehampton and Richmond Park golf course. The A3 (Kingston Road) cuts northwest through the centre of this Catchment and the A306 (Roehampton Lane) cuts north from this along the east of this Catchment up to A205 (Upper Richmond Road). The Beverley Brook also runs north along the western edge of this Catchment. The general topography is highest on the eastern edge and lower on the western edge with most surface water conveying along flow paths towards Beverley Brook, mostly along the A306. From the A205, the flow path conveys north towards the River Thames. *Figure 5-1* shows Catchment extents and risk of surface water flooding.

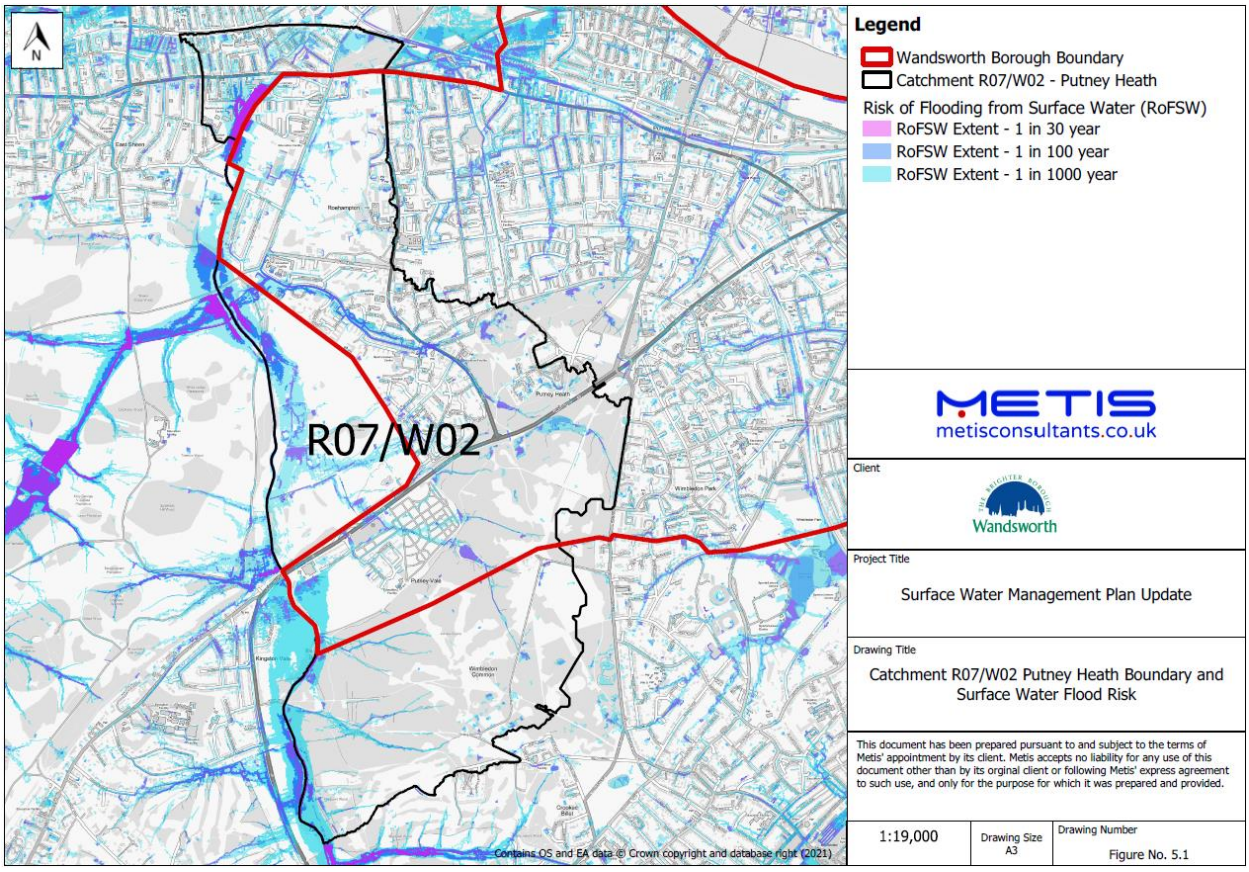

Figure 5-1 R07/W02 Putney Heath Catchment Boundary and Surface Water Flood Risk

5.3. Properties at risk and Hotspots

Table 5-1 summarises the number of properties predicted to be at risk within this Catchment (LB Wandsworth only). Wandsworth has had seven historic reports of flooding in this Catchment. All incidents align with the predicted risk areas and Hotspots, along the surface water flow paths from Priory Lane and A3 (Kingston Road) along Danebury Avenue to Beverley Brook.

Table 5-1 Properties at risk in Putney Heath Catchment R07/W02

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	100	207	695
Other	30	47	104
Unclassified	39	64	145

In this Catchment, there are three Hotspots shown in *Figure 5-2*. This has been summarised in *Table* 5-2 Hotspots in Putney Heath Catchment R07/W0*.*

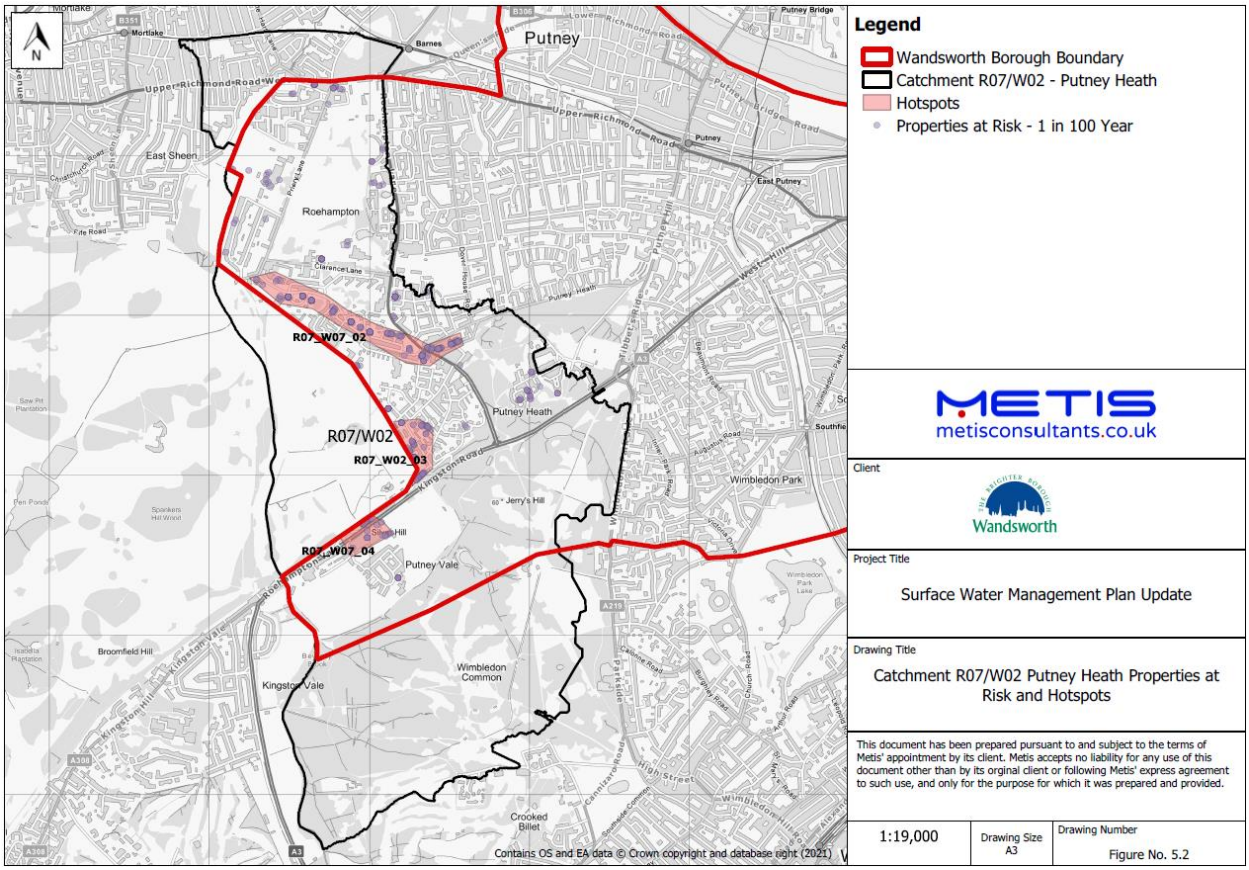

Figure 5-2 R07/W02 Putney Heath Catchment Properties at Risk and Hotspots

Table 5-2 Hotspots in Putney Heath Catchment R07/W0

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
R07_W02_02	Roehampton	Along the flow path of Danebury Avenue toward A306 Roehampton Lane	132
R07_W02_03	Roehampton	Along the flow paths from Alton Road to Richmond Park	57
R07_W02_04	Putney Vale	Along the flow path from A3 Roehampton Vale	20

5.4. Historic Flood Incidents and Flood Incident Areas

Historic reports of flood incidents in this Catchment date back to the Summer 2007 flood in Roehampton where Paddock School and Heathmere Primary School reported flooding as well as properties on Alton Road and Frensham Drive. All flood reports have been in the urbanised part of this Catchment. Recorded flood incidents are shown in *Figure 5-3*. There are no Flood Incident Areas in this Catchment. In more recent reports in June 2021, there were reports of property flooding in the SW15 area (see *Figure 2-7)* in Norley Vale and at Bessborough Road. These incidents do not align with properties affected by the flooding in Summer 2007.

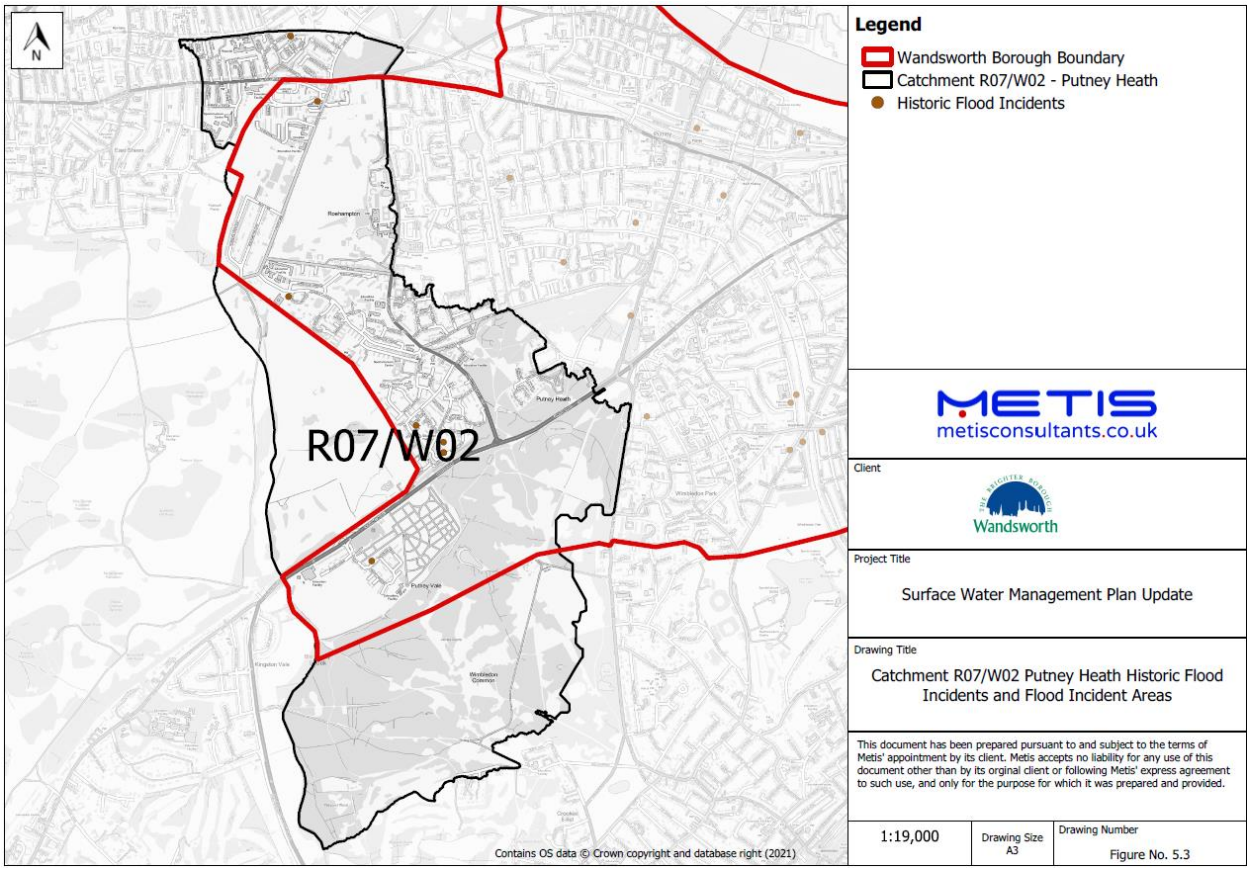

Figure 5-3 R07/W02 Putney Heath Catchment Historic Flood Incidents and Flood Incident Areas

6. CATCHMENT W03 - SOUTHFIELDS

6.1. Updates since 2011 SWMP

Catchment W03 encompasses former CDA King Georges Park. To date no updated flood risk modelling has been undertaken in the Southfields Catchment. Tree pits have recently been constructed on Wimbledon Road and Replingham Road.

6.2. Catchment extents

The Catchment extends from the eastern side of Putney Heath to the River Wandle, which runs along the eastern boundary of this Catchment. The London Underground District Line bisects the Catchment from north to south and includes Southfields Station. Other notable features in the Catchment include King George's Park. The general topography is highest in the west and lower towards the River Wandle in the east with the flow paths conveying towards King Georges Park and the River Wandle. *Figure 6-1* presents catchment extents and the surface water flood risk.

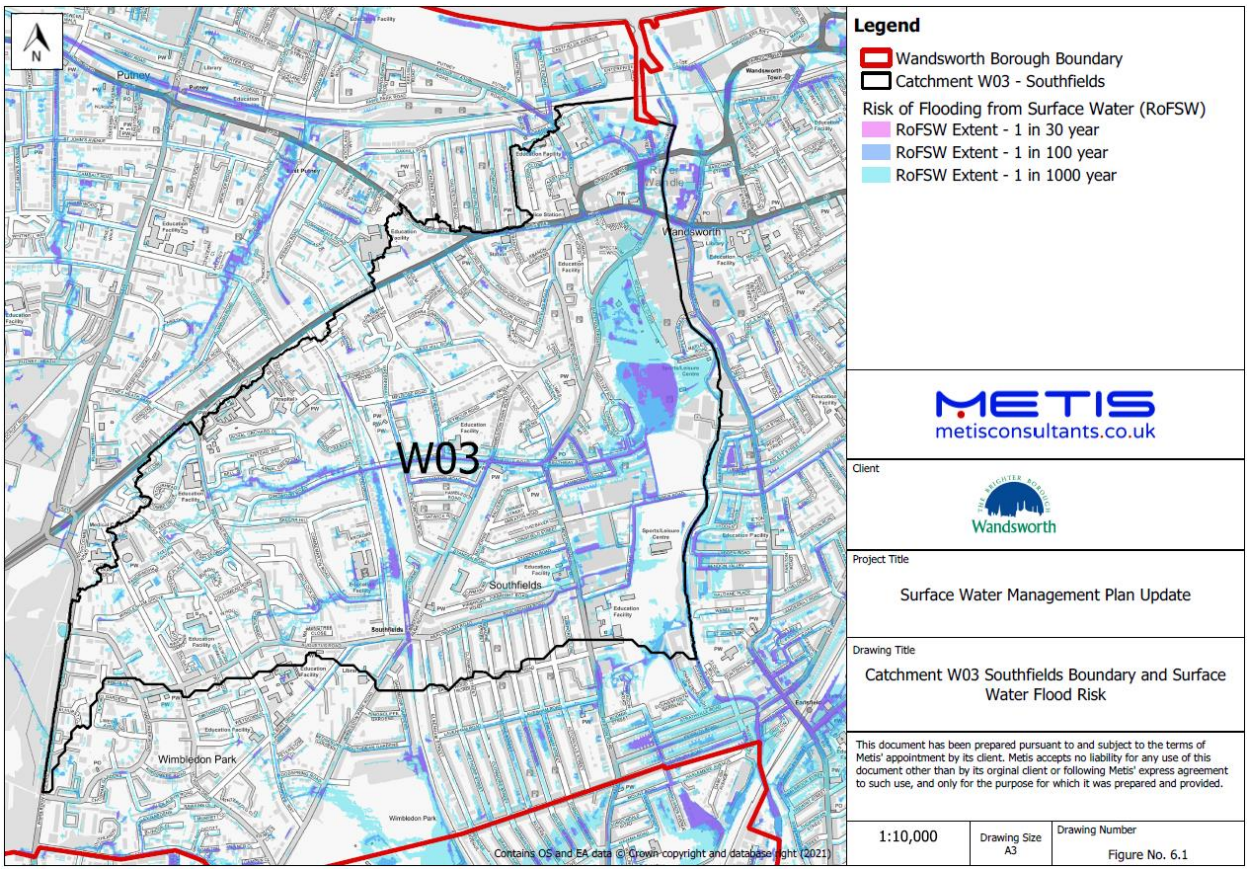

Figure 6-1 W03 Southfields Catchment Boundary and Surface Water Flood Risk

6.3. Properties at risk and Hotspots

Figure 6-1 summarises the number of properties predicted to be at risk within this Catchment. Wandsworth has had seven historic reports of flooding in the Southfield Catchment W03. All incidents align with the predicted risk areas and Hotspots, along the surface water flow paths from Wimbledon Park Road, Merton Road and from the railway line to the River Wandle.

Table 6-1 Properties at risk in Southfields Catchment W05

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	102	366	1487
Other	56	139	404
Unclassified	5	23	146

In this Catchment, there are five Hotspots shown in *Figure 6-2*. This has been summarised in *Table* 6-2.

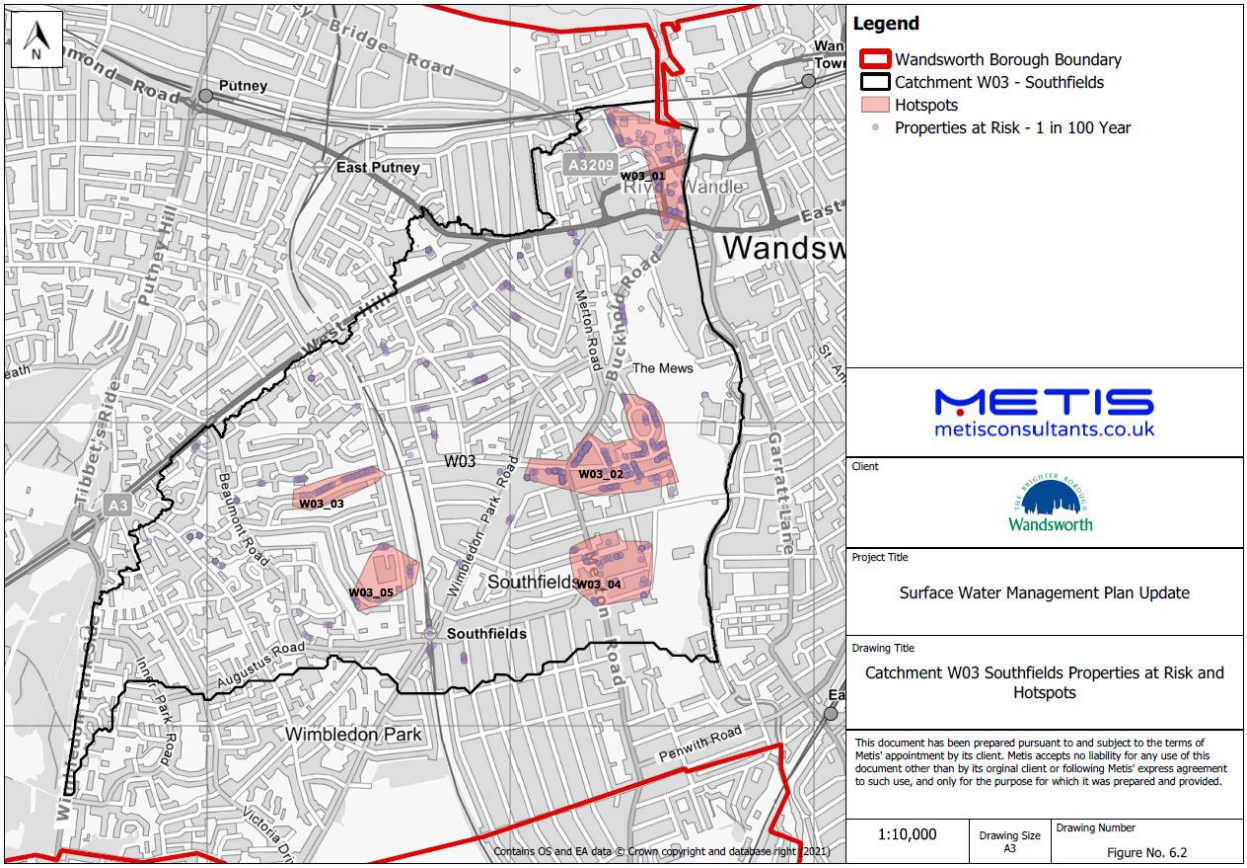

Figure 6-2 W03 Southfields Catchment Properties at Risk and Hotspots

Table 6-2 Hotspots in Southfields Catchment W03

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W03_01	Wandsworth	Along flow path to River Wandle from Amoury Way and A3 West Hill	75
W03_02	Southfields	Within former CDA King Georges Park along Granville Road and Brathway Road	21
W03_03	Southfields	Within former CDA King Georges Park along Girdwood Road	178

W03_04	Southfields	Along Merton Road and Burr Road	18
W03_05	Southfields	Within former CDA King Georges Park along Combemartin Road	44

6.4. Historic Flood Incidents and Flood Incident Areas

All flood reports have been in the urbanised part of this Catchment (*Figure 6-3*). There are no Flood Incident Areas in this Catchment. Two surface water flood incidents in Summer 2016 were reported in postcode sector SW18 4 (see *Figure 2-7*), near the banks of the River Wandle on Wandsworth Plain, A217 (Garratt Lane) and on West Hill Road and Merton Road. The remainder are incidents of sewer flooding and blockages causing flooding to properties in the Southfields area along Sutherland Grove in 2003, Merton Road in Summer 2007 at a different location, Windlesham Grove in February 2021, and Replingham Road in Summer 2016. Wimbledon Park Road also was also affected by sewer flooding in June 2021 and again nearby on Church Road in July 2021. These incidents align with surface water flow paths leading to the River Wandle and hotspot areas.

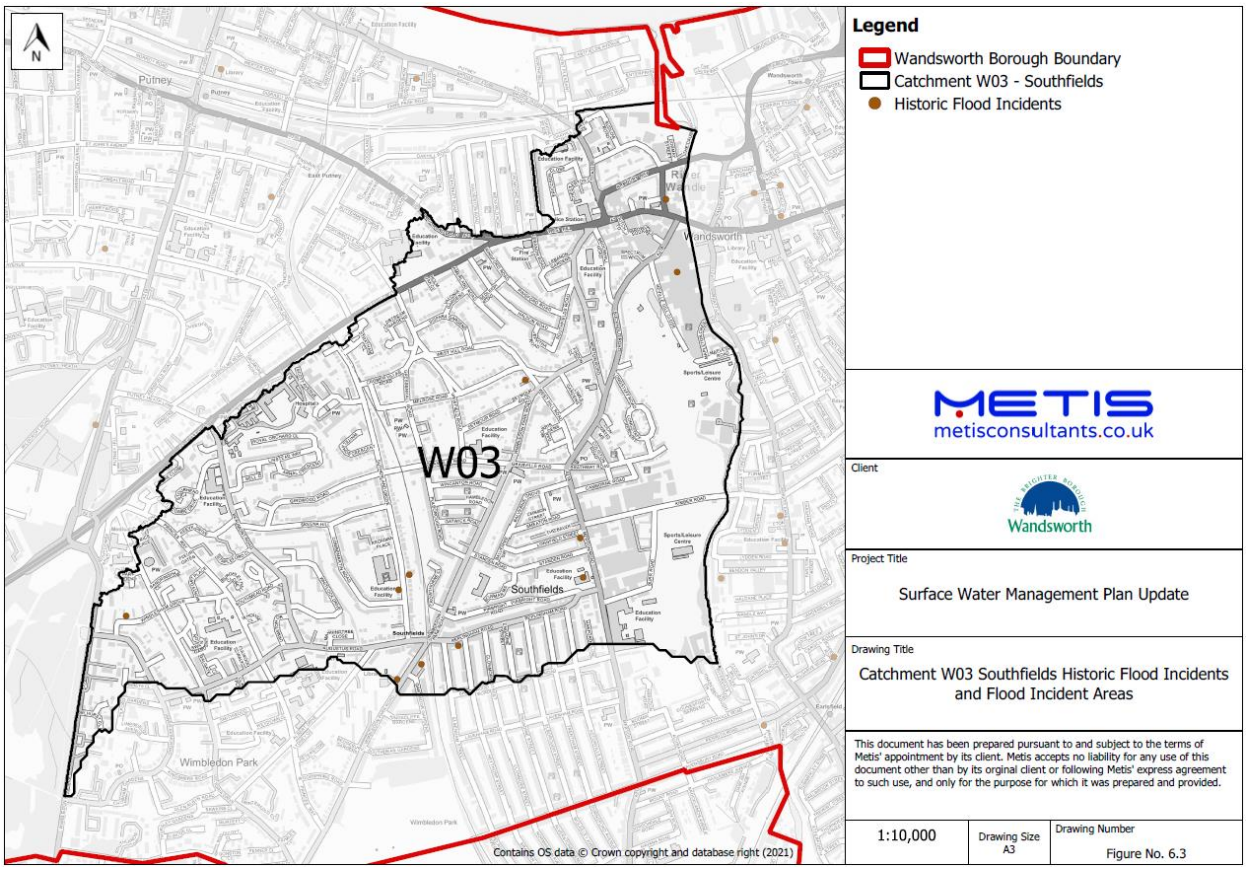

Figure 6-3 W03 Southfield Catchment Historic Flood Incidents and Flood Incident Areas

7. CATCHMENT W04 - WIMBLEDON PARK

7.1. Updates since 2011 SWMP

There are no former CDAs in Catchment W04. To date no updated flood risk modelling has been undertaken in the Wimbledon Park Catchment. A feasibility study has been completed for the Southfields grid area that identified possible areas to implement highway SuDS schemes at Haslemere Avenue and Dawlish Avenue junction, Haslemere Avenue and Ravensbury Terrace junction, Mount Road, Acuba Road and Brooklands Road intersection, Acuba Road and Ravensbury Road intersection and Penrith Road and Acuba Road intersection. Open storage was also suggested for Durnsford Recreation Ground and King George's Park.

7.2. Catchment extents

Catchment W04 extends across the southern region of Wandsworth from the eastern edge of Putney Heath to the River Wandle. The southern area of the Catchment extends into LB Merton. Key infrastructure in the Catchment includes the District Line, Wimbledon Park Station and the A218 (Merton Road) which cuts from north to south from Wandsworth town centre to South Wimbledon. The northern tip of Wimbledon Park is in this Catchment and the portion of this Catchment that lies in Merton includes Wimbledon Park Lake. There are no major flow paths within the west of the Catchment however, surface water flow follows the topography, conveying northeast from Merton towards the River Wandle.

Surface water flood risk is greatest in the Catchment east of the District Line around the Southfields area (*Figure 7-1*). A feasibility study was conducted by Metis Consultants in 2021 where the West Merton Surface Water (SW) model, a model developed in 2020 to update the EA's Risk of Flooding from Surface Water (RoFSW) mapping, was used to assess the options for the Southfields Grid area. A combination of highway SuDS in Southfields Grid was the only option deemed feasible. It was suggested that alternative funding to Grant in Aid is applied for, and more locations researched.

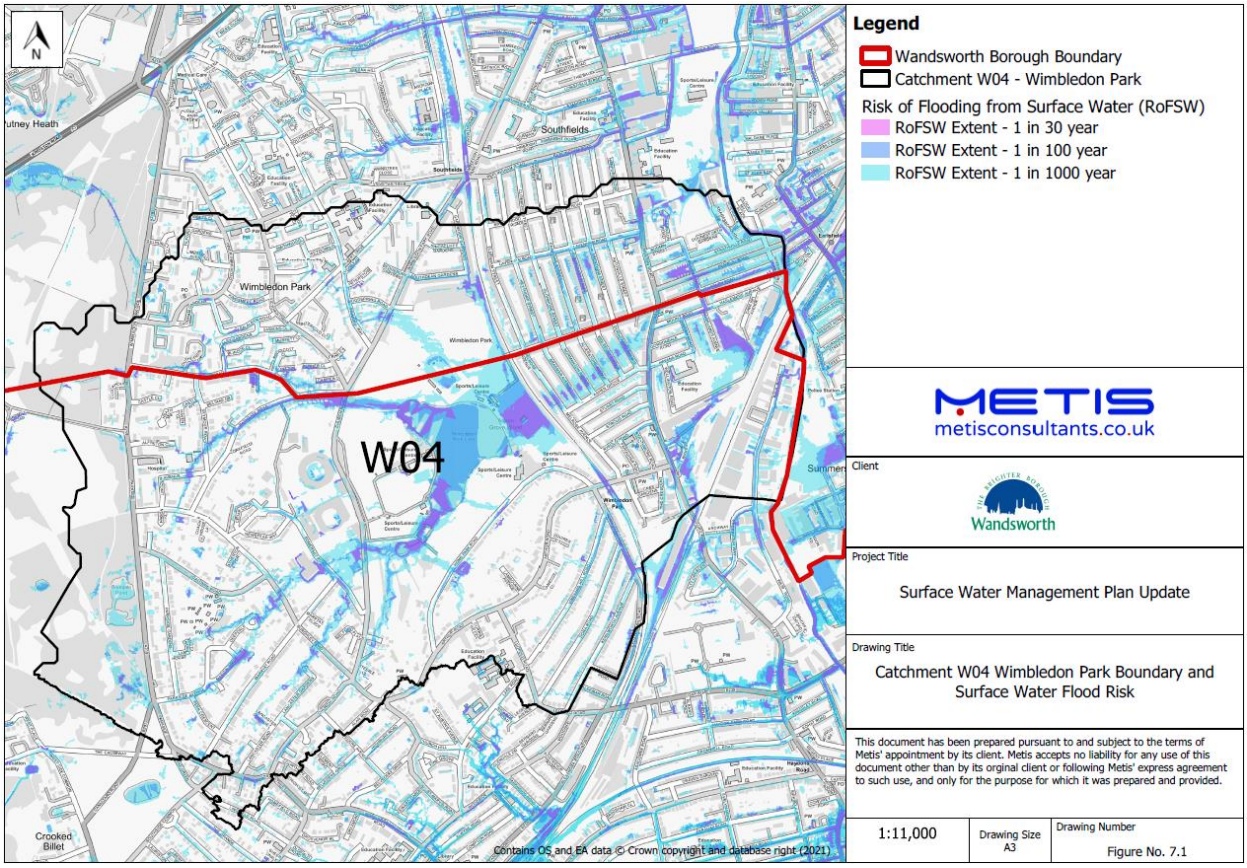

Figure 7-1 Wimbledon Park Catchment Boundary and Surface Water Flood Risk

7.3. Properties at risk and Hotspots

Table 7-1 summarises the number of properties predicted to be at risk within this Catchment (LB Wandsworth only). Wandsworth has had one historic report of flooding in the Wimbledon Park Catchment W04. This incident in July 2021 aligns with the predicted risk areas and Hotspots, along the surface water flow paths from Ravensbury Terrace to the River Wandle.

Table 7-1 Properties at risk in Wimbledon Park Catchment W04

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	68	233	901
Other	15	47	119
Unclassified	7	11	28

In this Catchment, there are two Hotspots shown in *Figure 7-2*. This has been summarised in *Table 7-2*.

Table 7-2 Hotspots in Catchment Wimbledon Park W04

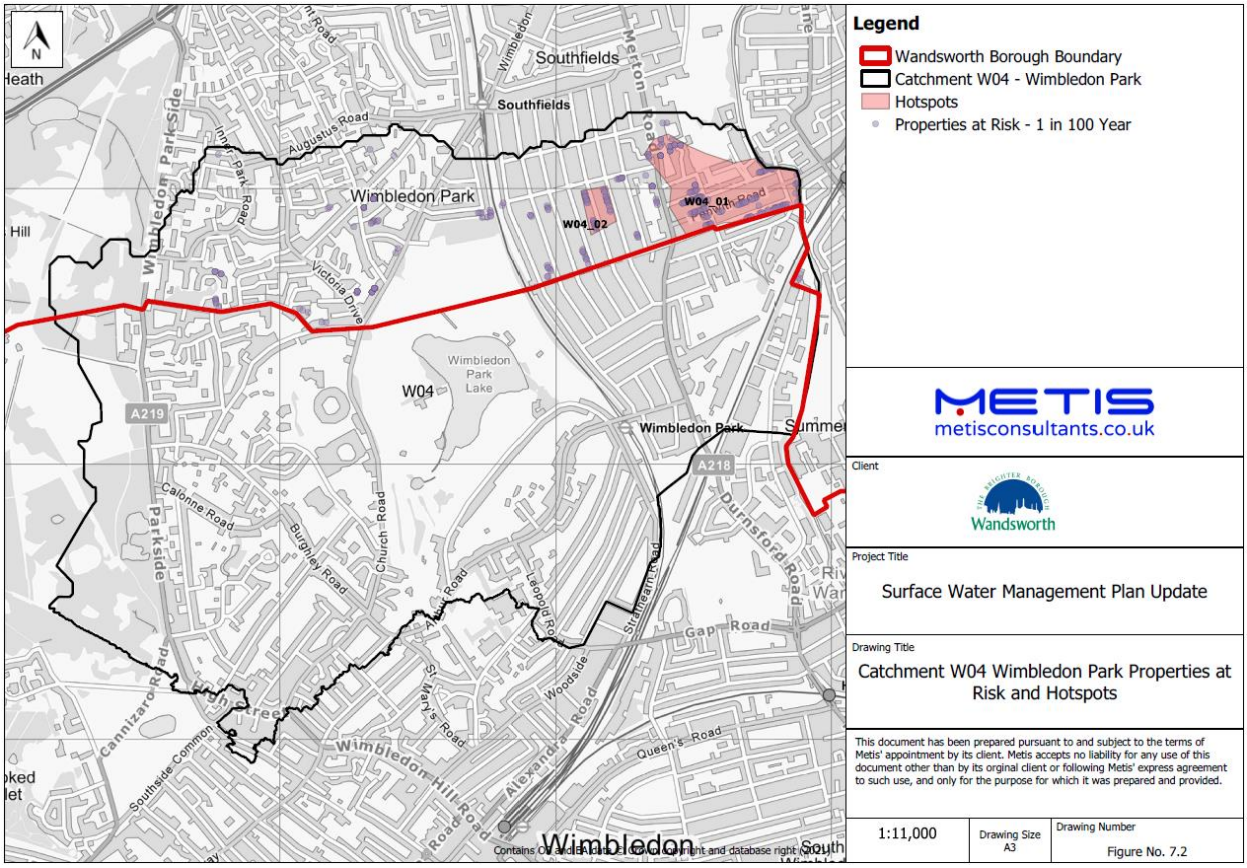

Figure 7-2 Catchment W04 Wimbledon Park Properties at Risk and Hotspots

Table 7-2 Hotspots in Catchment Wimbledon Park W04

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W04_01	Southfields	South side of King George's Park flow path into the River Wandle	145
W04_02	Southfields	Elborough Street flow path leading to Revelstoke Road	29

7.4. Historic Flood Incidents and Flood Incident Areas

LB Wandsworth has one record of historic surface water flooding in Catchment W04 in the southern end of King Georges Park in Summer 2016 in the east of the Catchment. The flood report was in the urbanised part of this Catchment. Recorded flood incidents are shown in *Figure 7-3.* There are no identified Flood Incident Areas in this Catchment, however, LB Merton conducted a Section 19 report which includes this area.

TWUL have received reports of flooding in the eastern area of the Catchment, with 24 reports in SW18 4 (See *Figure 2-7* for postal code areas) and seven reports in SW18 5.

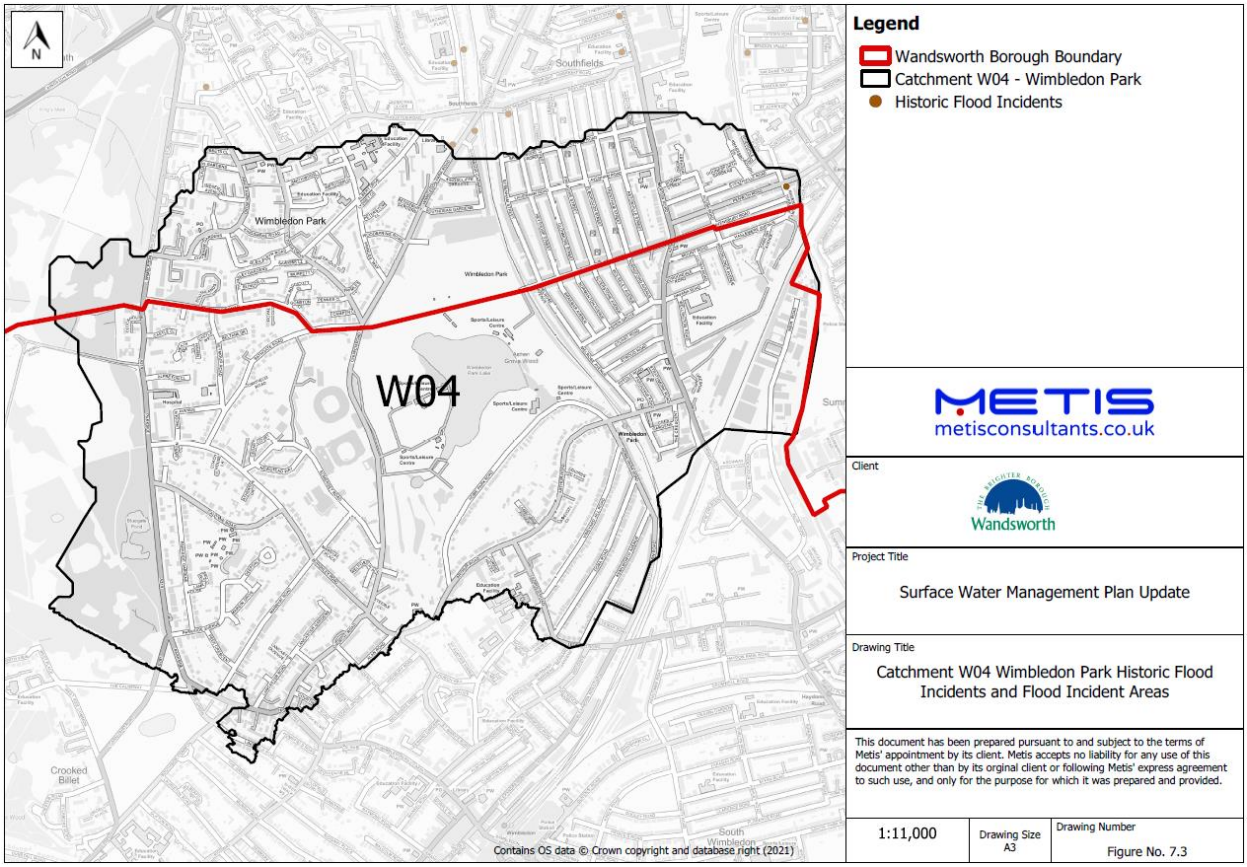

Figure 7-3 W04 Wimbledon Park Catchment Historic Flood Incidents and Flood Incident Areas

8. CATCHMENT W05 - EARLSFIELD

8.1. Updates since 2011 SWMP

Catchment W05 includes the following former CDAs:

- 18 - Summerstown (Wandsworth),
- 19 - Earlsfield (Wandsworth), and
- 17 - St Georges Hospital,

along with areas of:

- 21 - Clapham Junction South,
- 16 - Trinity Road (Wandsworth), and
- 20 - South Balham (Wandsworth).

To date no updated flood risk modelling has been undertaken in the Earlsfield Catchment. However, raingardens have been installed at the Junction of Trewint Street with Summerly Street. Funding is obtained for feasibility studies in Summerstown and Earlsfield.

8.2. Catchment extents

The River Wandle forms the western boundary of Catchment W05 which extends from the north to the south of Wandsworth from the River Thames to Tooting Graveney. The South Western railway line to Clapham Junction and central London cuts east to west through the centre of the Catchment. Earlsfield Station is in the east of the Catchment. Other key infrastructure includes the A3 (West Hill), A218 (Merton Road) and one notable feature in this Catchment is St Georges Hospital. The Catchment also includes the urbanised areas of Tooting Graveney, Earlsfield and Wandsworth.

There are three main flow paths in the Catchment. Two of them convey towards the River Wandle in the east of the Catchment around the Summerstown and Earlsfield areas, and one conveys towards the River Wandle near to its confluence with the River Thames. *Figure 8-1* presents the Catchment extents and risk of surface water flooding.

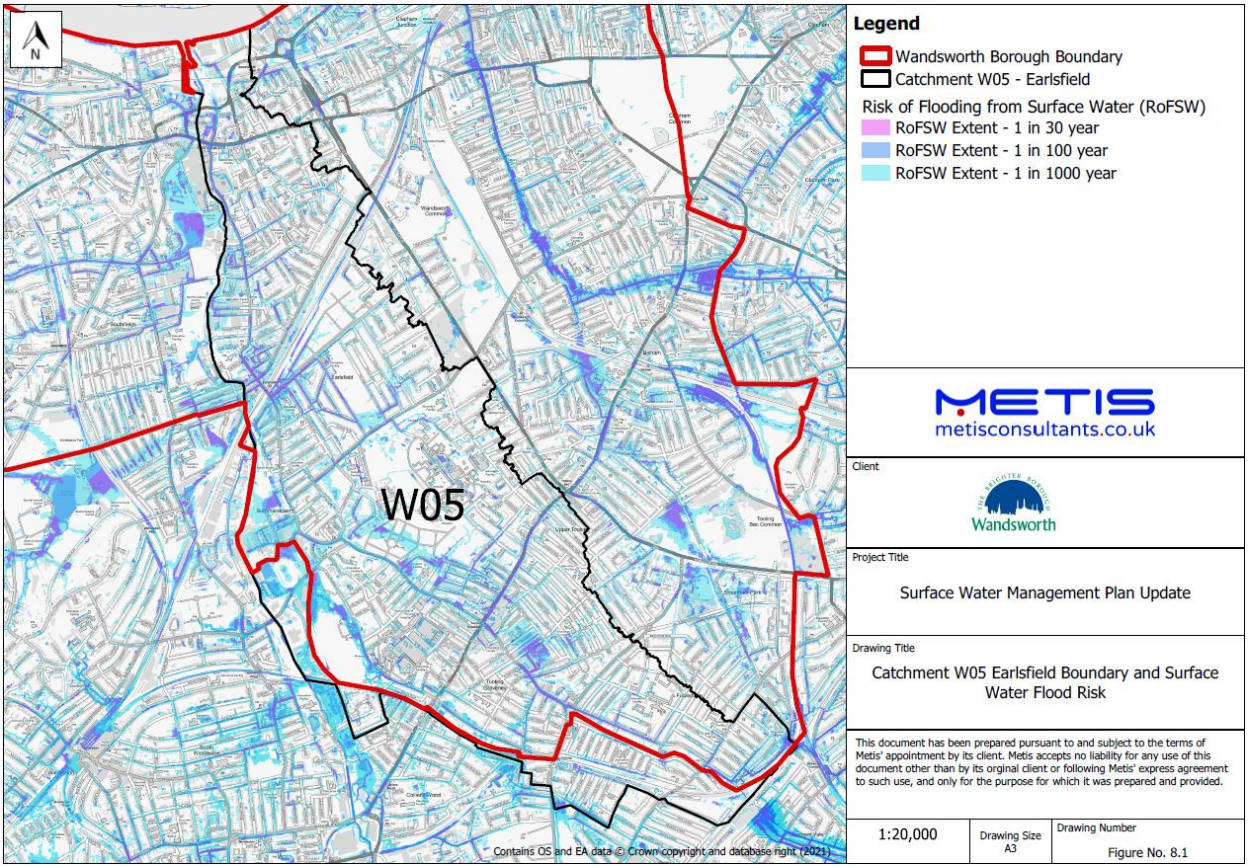

Figure 8-1 W05 Earlsfield Catchment Boundary and Surface Water Flood Risk

8.3. Properties at risk and Hotspots

Table 8-1 summarises the number of properties predicted to be at risk within this Catchment (Wandsworth only). Wandsworth has had 34 historic reports of flooding in the Earlsfield Catchment W05. These incidents mostly align with the predicted risk areas and Hotspots, along the surface water flow paths from Balham High Road and parallel in a northernly direction along the railway line to Battersea conveying to the River Thames. Also, along the flow paths to the River Wandle in the north of this Catchment.

Table 8-1 Properties at risk in Earlsfield Catchment W05

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	383	1157	5114
Other	209	595	1976
Unclassified	62	167	460

Given the high number of properties predicted to be at risk in this Catchment, there are nine Hotspots shown in *Figure 8-2*. This has been summarised in *Table 8-2*.

Table 8-2 Hotspots in Earlsfield Catchment W05

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W05_01	Tooting Graveney	Along the main flow path from Tooting Graveney towards Summerstown	667
W04_02	Summerstown	Where the flow path from Tooting Graveney meets the River Wandle	66
W05_03	Earlsfield	Encompasses critical infrastructure including Earlsfield Stations, part of the district line and the A27	348
W05_04	Earlsfield	Along the eastern boundary of the Catchment, adjacent to the River Wandle	179
W05_05	Wandsworth town centre	Covers Wandsworth Town centre where there are several historic flood records	23
W05_06	Merton boundary	Located at the southern tip of the Catchment along the border with Merton. There are no historic records of flooding from Wandsworth in this hotspot however TWUL records indicate there are 20 flood incidents in the corresponding postal sector	132
W05_07	Earlsfield	Covers Tranmere Road and Swaby Road and is located on part of the main flow path leading to Earlsfield	59
W05_08	Earlsfield	On the flow path towards the River Wandle at Earlsfield and covers Ellerton Road, Tilehurst Road, and Burntwood Grange Road	21
W05_09	St George's Hospital	covers St George's Hospital and the former CDA 17	63

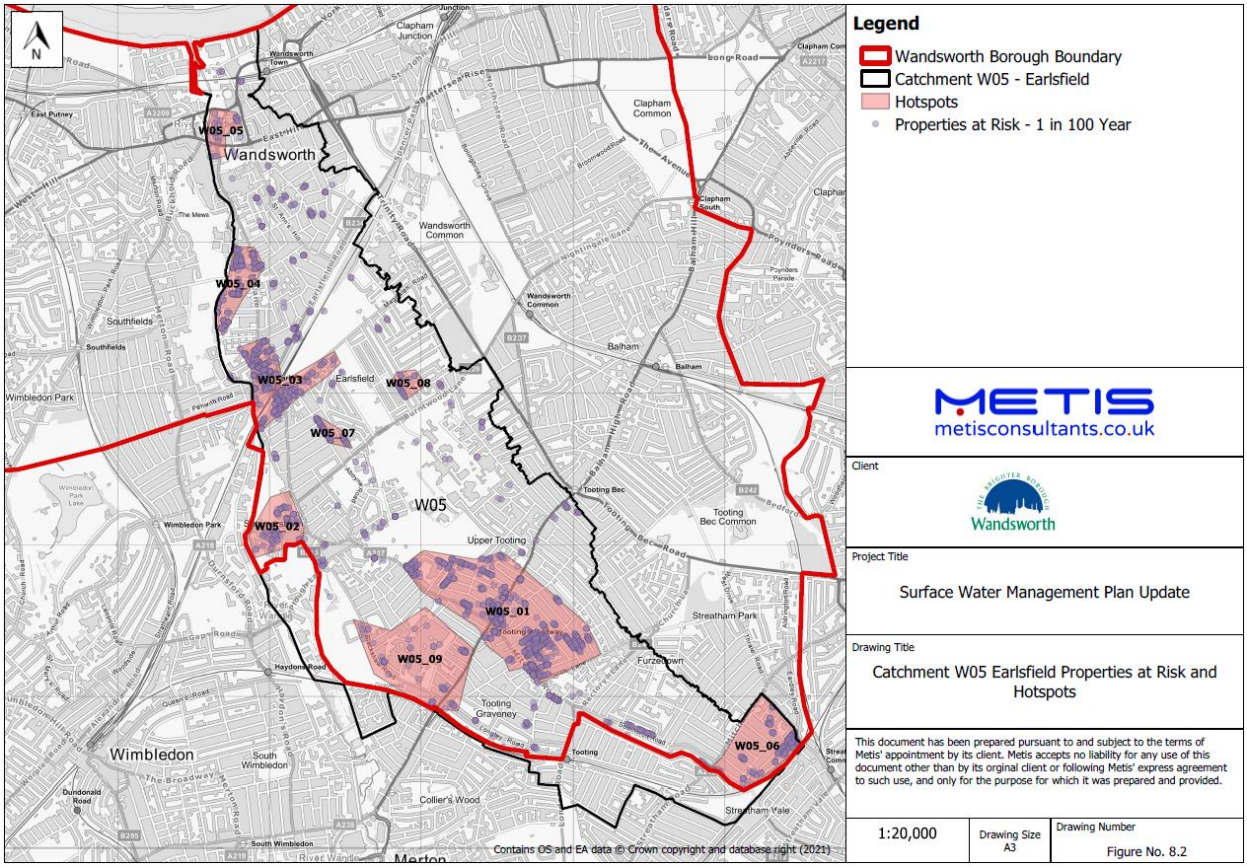

Figure 8-2 W05 Earlsfield Catchment Properties at Risk and Hotspots

8.4. Historic Flood Incidents and Flood Incident Areas

LB Wandsworth have recorded 34 flood incidents in this Catchment, and these correspond well to the RoFSW maps, and the properties predicted to be at risk. Wandsworth town centre and the area around Tooting Graveney and St Georges Hospital have the greatest number of recorded flood incidents. All flood reports have been in the urbanised part of this Catchment. Recorded flood incidents are shown in *Figure 8-3.* There are no identified Flood Incident Areas in this Catchment. Flooding locations in Summer 2007 and Summer 2016 have not repeated in Summer 2021.

TWUL have records of flooding in every postcode sector in the Catchment. Postcode sector SW17 9 (See *Figure 2-7*) has the greatest number of recorded flood incidents (43) followed by SW17 7 (25) and SW18 3 (20).

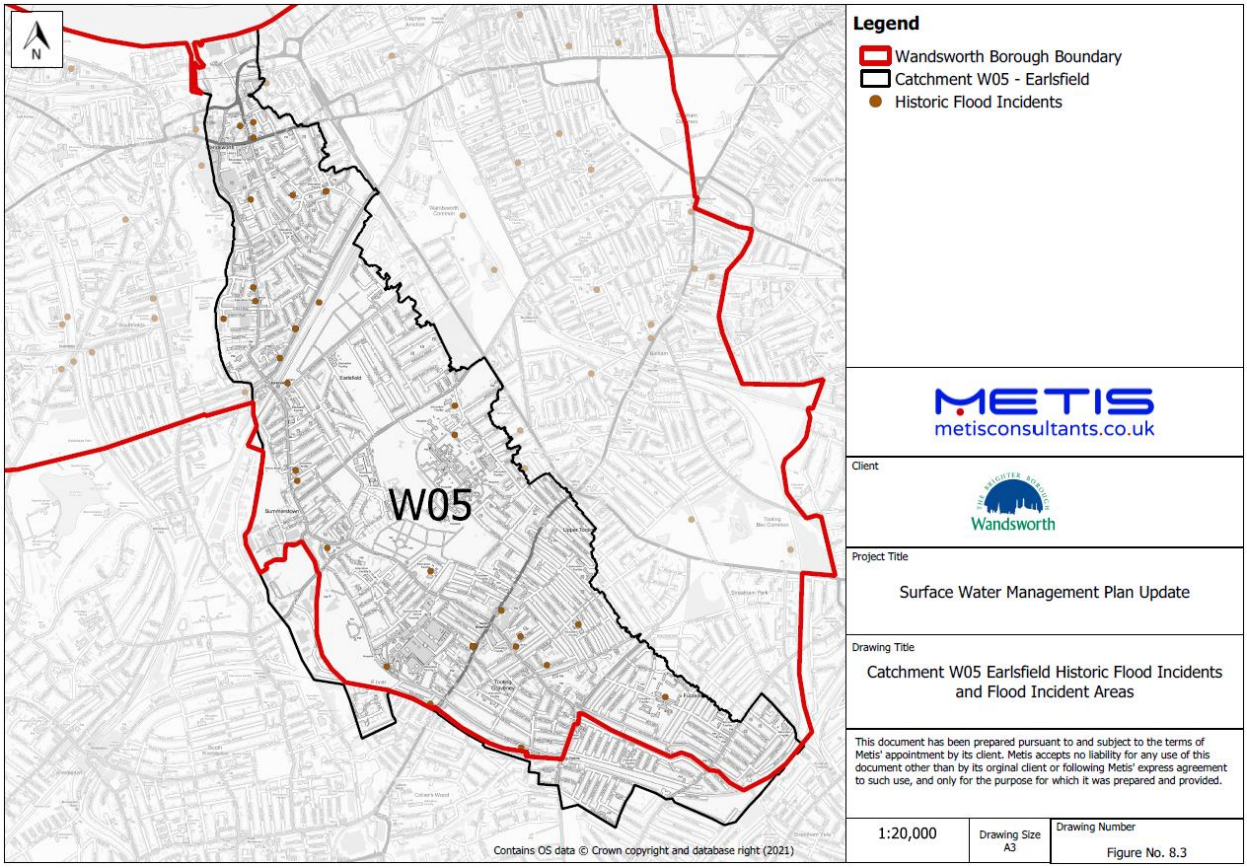

Figure 8-3 W05 Earlsfield Catchment Historic Flood Incidents and Flood Incident Areas

9. CATCHMENT W06 - WANDSWORTH COMMON

9.1. Updates since 2011 SWMP

Catchment W06 includes the following former CDAs:

- 21 – Clapham Junction,
- 22 – Clapham Junction South, and
- 20 – South Balham,

along with areas of:

- 19 - Earlsfield,
- 18 - Summerstown, and
- 16 – Trinity Road.

Flood risk modelling has been undertaken in the Clapham Junction modelling project in 2016.

9.2. Catchment extents

This Catchment covers a large north to south area along the LB Lambeth and LB Wandsworth borders from the northern edge along the River Thames near Clapham Junction to the south of this Catchment on the outskirts of Streatham. Parkland areas include Tooting Bec Common, Battersea Park and Wandsworth Common with the railway line cutting through Streatham Hill, Balham, Wandsworth

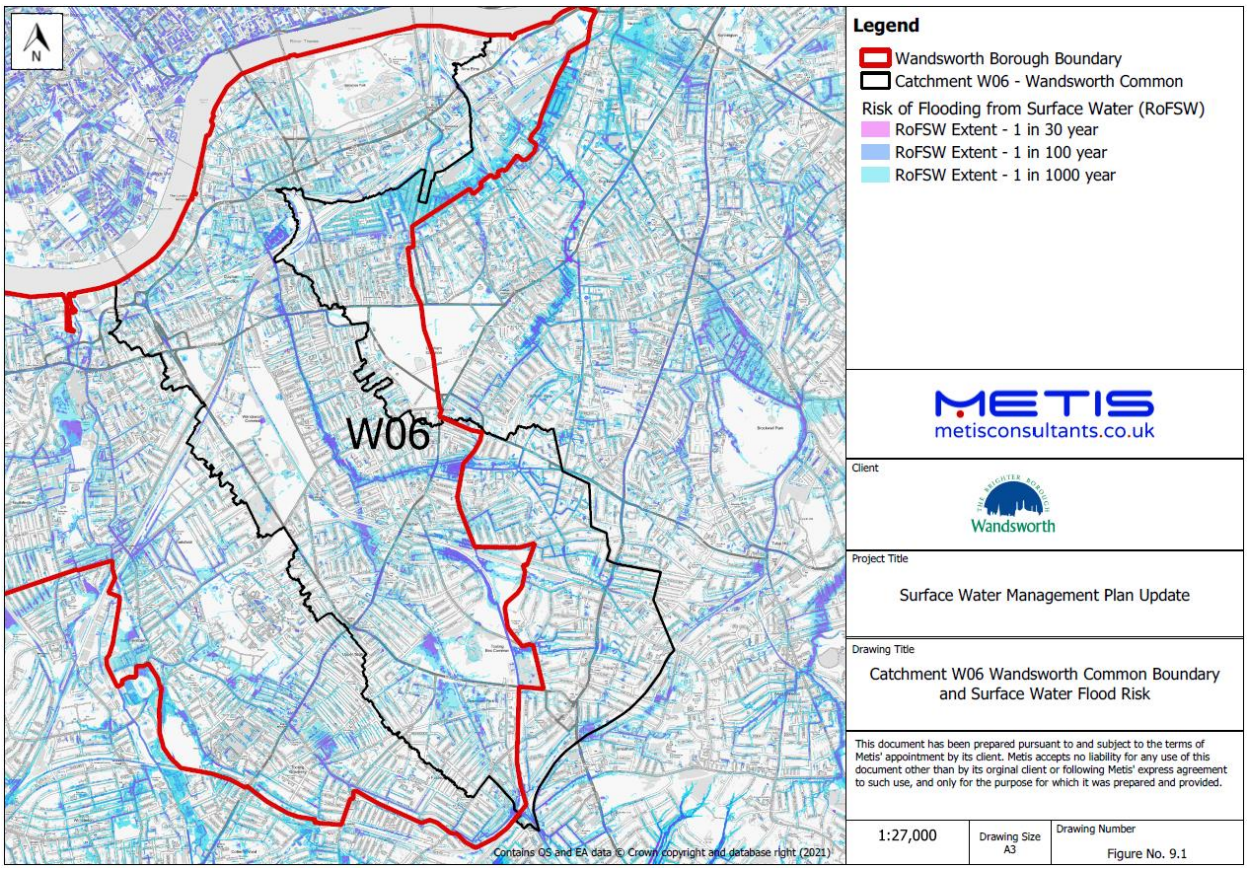

Figure 9-1 W06 Wandsworth Common Catchment Boundary and Surface Water Flood Risk

Common, Clapham Junction, Battersea, Battersea Park and Queenstown Road. Key infrastructure also includes the A3205 (Battersea Park Road), A3220 (Battersea Bridge Road), A214 (Trinity Road), A3 (Battersea Rise), A24 (Balham High Road), A214 (Tooting Bec Road), and the A23 (Streatham High Road). The topography of this Catchment is higher in the southeast with main flow paths conveying west to the River Wandle or north to the River Thames. *Figure 9-1* presents the Catchment extent and risk of surface water flooding.

9.3. Properties at risk and Hotspots

Table 9-1 summarises the number of properties predicted to be at risk within this Catchment (LB Wandsworth only). Wandsworth has had 32 historic reports of flooding in the Wandsworth Common Catchment W06. These incidents mostly align with the predicted risk areas and Hotspots, along the surface water flow paths from A214 (Tooting Bec Road) and in a northernly direction along the railway line to Clapham Junction conveying to the River Thames. Also, along the flow paths to the River Wandle in the north of this Catchment from the railway line.

Table 9-1 Properties at risk in Wandsworth Common Catchment W06

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	785	2240	8007
Other	279	839	2958
Unclassified	44	151	547

Given the high number of properties in this Catchment predicted to be at risk, there are 29 Hotspots shown in *Figure 9-2*. This has been summarised in *Table 9-2*.

Table 9-2 Hotspots in Wandsworth Common Catchment W06

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W06_01	Nine Elms	Next to Battersea Park Stations	43
W06_02	Battersea	On A3205 Battersea Park Road	29
W06_03	Battersea	Along Hersley Street	18
W06_04	Battersea	On Abercrombie Street and Burns Road	28
W06_05	Battersea	On Shuttleworth Road, Winders Road and Simpson Street	95

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W06_06	Battersea	On Wye Street and Fawcett Close	31
W06_07	Battersea	On Candahar Road	16
W06_08	Falcon Road	On the streets and flow paths leading onto A3207 Falcon Road	103
W06_09	Clapham Junction	On Maysoule Road	24
W06_10	Clapham Junction	On Nantes Close	43
W06_11	Wandsworth	On A3205 York Road junction with Petergate	48
W06_12	Wandsworth	On the street joining Old York Road by Wandworth Town Stations	63
W06_13	Clapham Junction	In Clapham Junction on the street surrounding the junction of A3 Battersea Rise and St John's Road	249
W06_14	Clapham Junction	Junction on Northcote Road	151
W06_15	Wandsworth Common	Junction on Hendrick Avenue	72
W06_16	Balham	On Ravenslea Road and Gosberton Road	33
W06_17	Balham	On roads surrounding Vukon Road and Dinsmore Road	298
W06_18	Balham	On Rowfant Road and Balham Park Road	189
W06_19	Balham	On Oldridge Road and Lochinvar Street	36
W06_20	Balham	On Oldridge Road	62

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W06_21	Balham	On Fernlea Road	139
W06_22	Balham	On Byrne Road	106
W06_23	Balham	On Elmfield Road	23
W06_24	Balham	On Cheriton Square	21
W06_25	Balham	On Foxbourne Road	26
W06_26	Streatham Park	On Thrale Road	34
W06_27	Streatham Park	On Blegborough Road	61
W06_28	Streatham Park	On Thrale Road and Mitcham Lane	34
W06_29	Battersea	Along the flow path of Broughton Street toward Queenstown Road	52

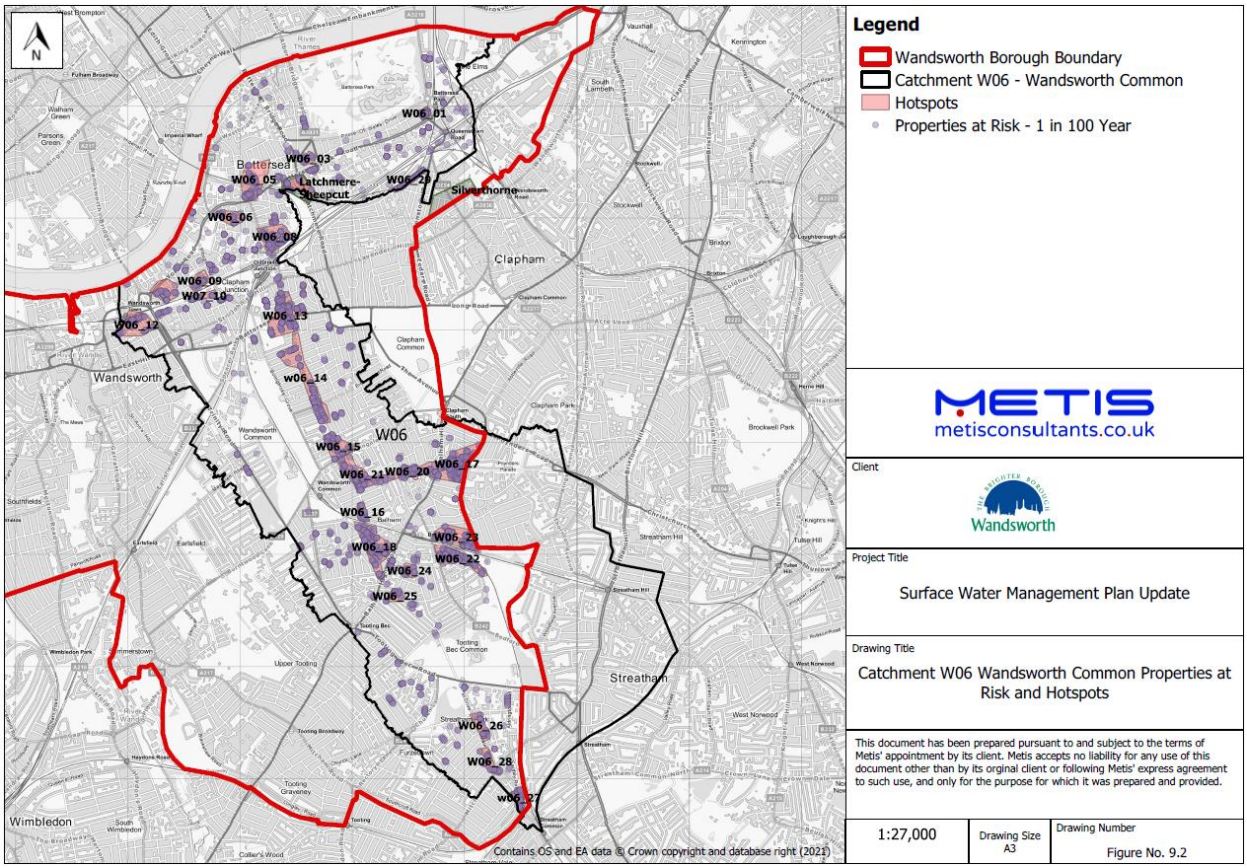

Figure 9-2 W06 Wandsworth Common Catchment Properties at Risk and Hotspots

9.4. Historic Flood Incidents and Flood Incident Areas

Historically, flooding has taken place around the old Falcon Brook River which is now the falcon sewer. Historic flood incidents have occurred down the path of the old river, on Northcote Road and Falcon Road. In Summer 2007, flooding to several properties occurred in Wandsworth town centre including the town hall. Also, in Battersea town centre, 21 properties flooded in 2007. In Upper Tooting, 26 reports of flooding took place in 2007 and regular flooding was reported at Flowersmead Estate. Other reports have included internal surface water flooding recently in Freedom Street and Reform Street in Battersea in June 2021 and Parkham Street in July 2021. In Clapham in June 2021 internal surface water flooding occurred on A3205 (York Road) and Old York Road. These recent reports do not align with location reported in the Summer 2007 flood incidents.

All flood reports have been in the urbanised part of this Catchment. Recorded flood incidents and Flood Incident Areas are shown in *Figure 9-3* and summarised in *Table 9-3*.

Table 9-3 Flood Incident Areas in Catchment Wandsworth Common W06

Flood Incident Area	Location	Related Hotspots or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period	Recorded flood incidents in this location
Latchmere-Sheepcut	Battersea	Along Abercrombie Street	37	6

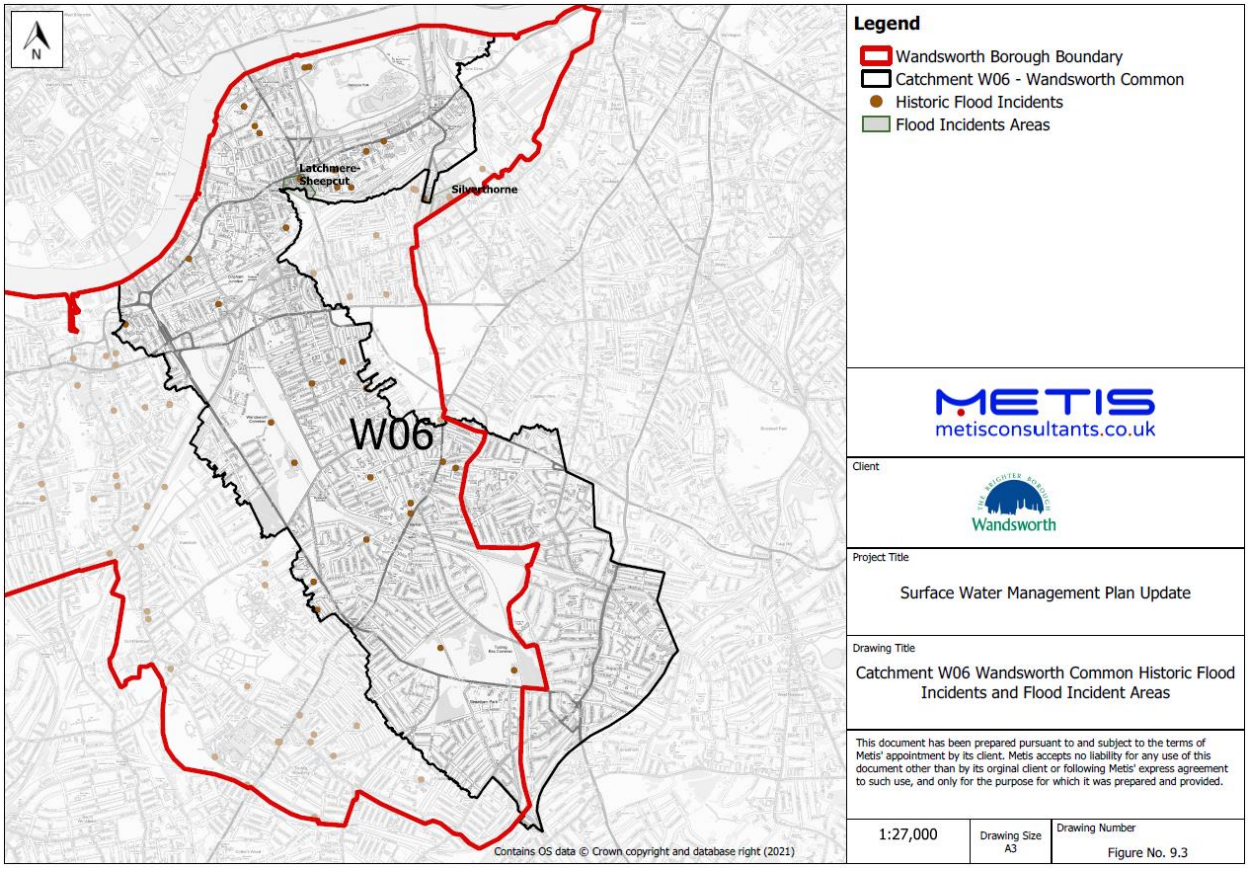

Figure 9-3 W06 Wandsworth Common Catchment Historic Flood Incidents and Flood Incident Areas

10. CATCHMENT W07 - CLAPHAM COMMON

10.1. Updates since 2011 SWMP

Catchment W07 encompasses former CDA 23 Lavender Hill. Flood risk modelling has been undertaken in the Clapham Common modelling project in 2016.

10.2. Catchment extents

Catchment W07 is in the east of LB Wandsworth and is split across LB Wandsworth and LB Lambeth. It includes the majority of Clapham Common, part of the A3 (Long Road), A3036 (Wandsworth Road), A3205 (Nine Elms Lane), A3036 (Lavender Hill), and the A205 (The Avenue). The railway line from Wandsworth Road bisects the Catchment north to south. The topography of the Catchment is lowest in the north with surface water conveying to the River Thames meaning that the railway line acts as a barrier to the surface water flow. Other notable features include Clapham Common in the south of this Catchment, and it is mostly urbanised with industrial areas to the north by the River Thames on the northern perimeter. *Figure 10-1* shows the Catchment extent and risk of surface water flooding.

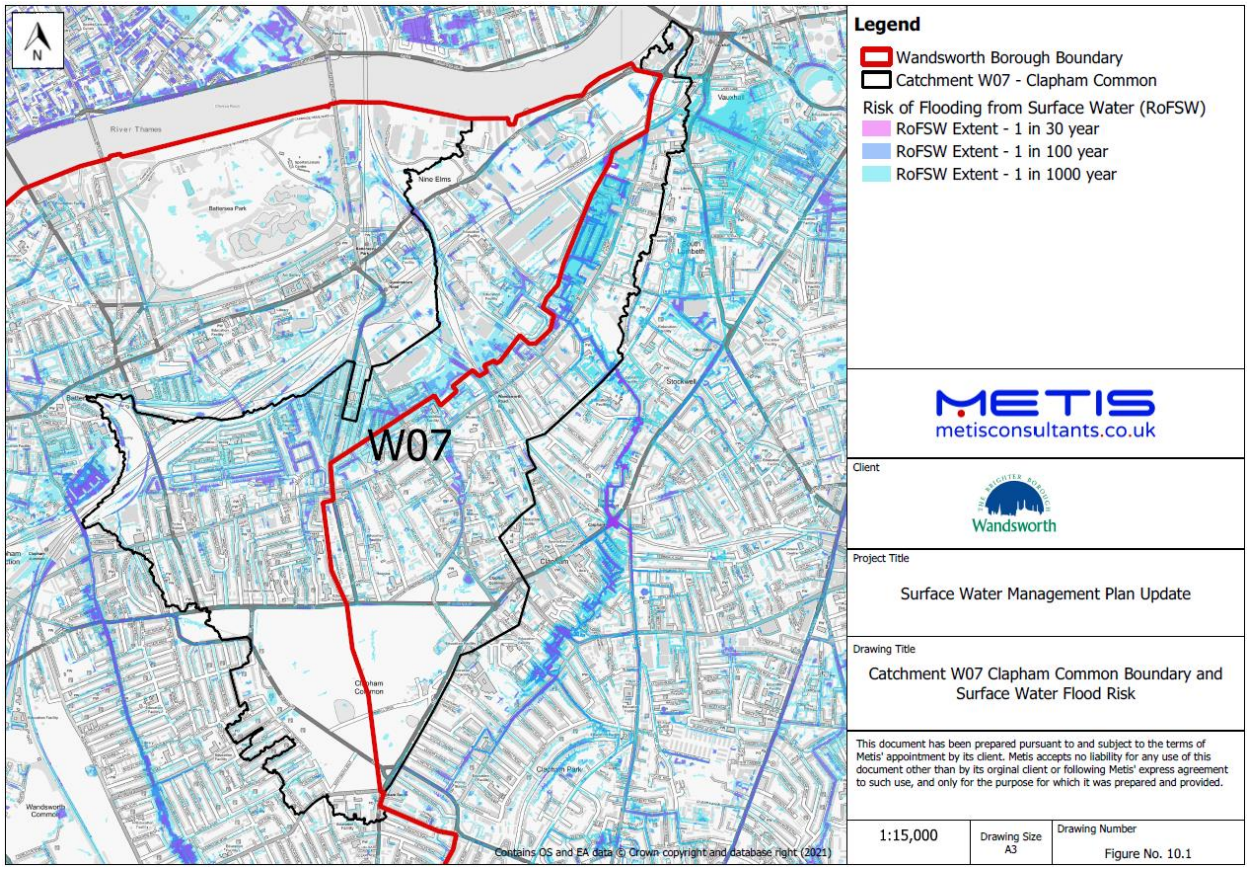

Figure 10-1 W07 Clapham Common Catchment Boundary and Surface Water Flood Risk

10.3. Properties at risk and Hotspots

Table 10-1 summarises the number of properties predicted to be at risk within this Catchment (LB Wandsworth only). Wandsworth has had 11 historic reports of flooding in the Clapham Common

Catchment W06. Some incidents align with the predicted risk areas and Hotspots, along the surface water flow paths from A3 (Long Road) and in a northernly direction to the railway lines at Clapham Junction conveying to the River Thames. Areas of flood incidents that do not align with these Hotspots and flow paths include Nightingale Lane, Jedburgh Street and Lavender Hill in summer 2007 and Mysore Road in July 2021.

Table 10-1 Properties at risk in Clapham Common Catchment W07

Property type	Within 30-year surface water extent	Within 100-year surface water extent	Within 1000-year surface water extent
Residential	202	695	2841
Other	37	156	708
Unclassified	16	52	205

In this Catchment, there are three Hotspots shown in *Figure 10-2*. This has been summarised in *Table 10-2.*

Table 10-2 Hotspots in Clapham Common Catchment W07

Hotspot	Location	Flow path or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period
W07_01	Clapham Common	From Silverthorne Road and the surrounding streets	245
W07_02	Clapham Common	Covers Carey Gardens and Blore Close	58
W07_03	Clapham Common	Town centre	485

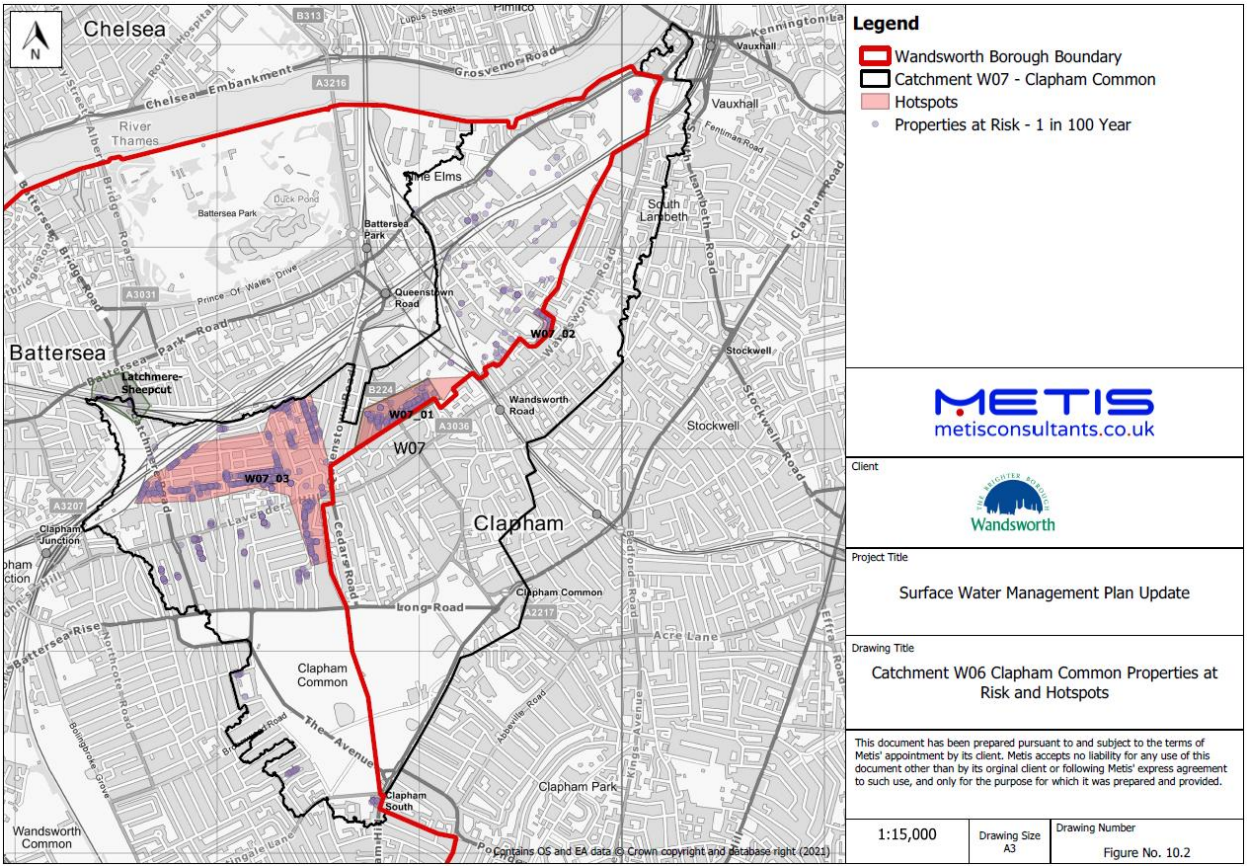

Figure 10-2 W07 Clapham Common Catchment Properties at Risk and Hotspots

10.4. Historic Flood Incidents and Flood Incident Areas

LB Wandsworth has 11 historic reports of flooding in the Catchment, the majority of which have occurred in the west of the Catchment, north of Clapham Common. This area also corresponds with a high number of flood reports from TWUL, with 27 incidents recorded in postcode sector SW11 5 and 28 recorded in SW8 3. All flood reports have been in the urbanised part of this Catchment. In Summer 2007, Gideon Road, A3036 (Lavender Hill) and Forthbridge Road had reported property surface water flooding. In Summer 2016, Portslade Road and Prairie Street had reported property flooding. Recently in June 2021 at Mysore Road and in July, internal property flooding was reported. Also reported were Robertson Street and Thackeray Road, and again at Prairie Street. Prairie Street suffers from sewer capacity issues as it is a low point in the sewers with shallow gravity. This means that in times of heavy rainfall there is a greater possibility of basement flooding and highway flooding occurring. Recorded flood incidents and Flood Incident Areas are shown in Figure 10-3 and summarised in Table 10-3.

Table 10-3 Flood Incident Areas in Catchment Clapham Common W07

Flood Incident Area	Location	Related Hotspots or streets affected	Properties predicted to be at risk from surface water flooding from the 1 in 100-year return period	Recorded flood incidents in this location
Silverthorne	Clapham	Along Silverthorne Road and surrounding streets	116	11

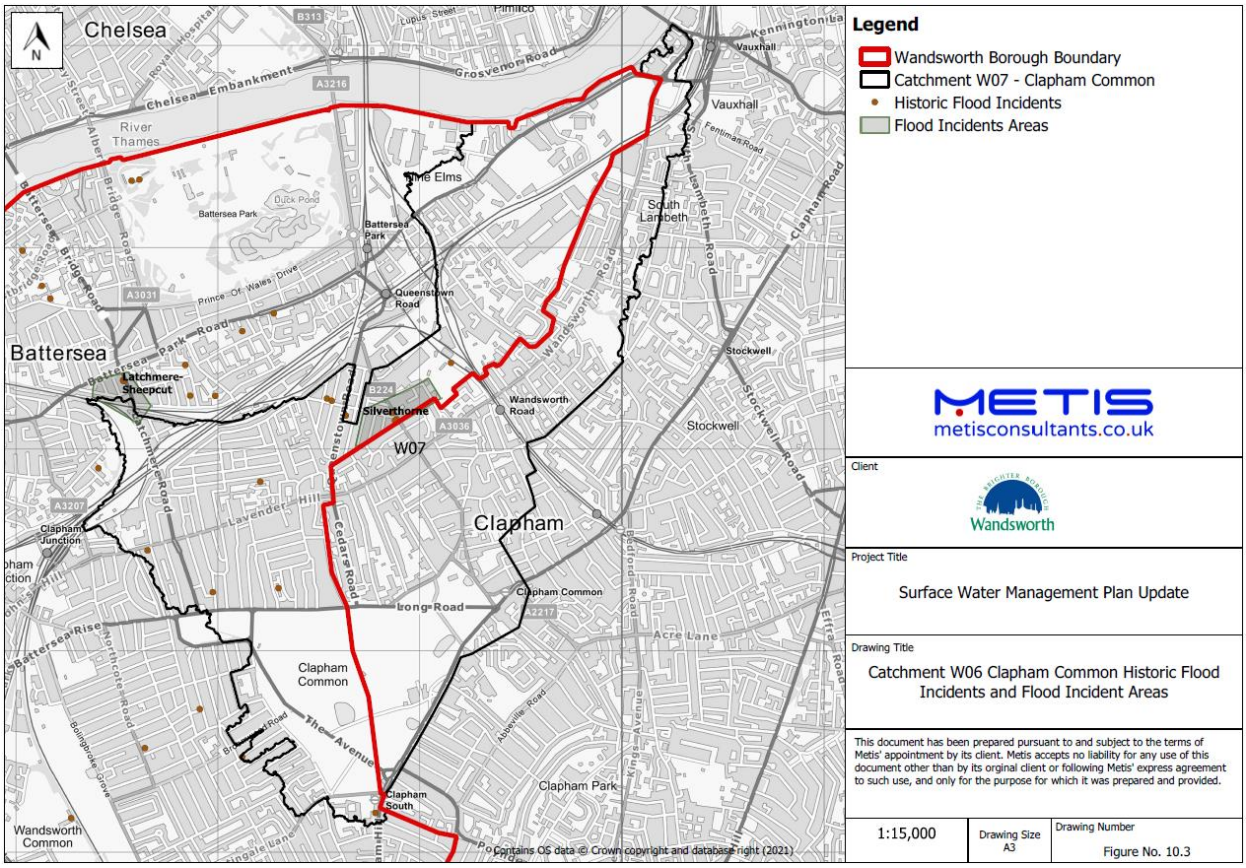

Figure 10-3 W07 Clapham Common Catchment Historic Flood Incidents and Flood Incident Areas

11. BOROUGH-WIDE OPTIONS

11.1. Mitigation options

Potential options to mitigate the risk of flooding from surface water have been identified at a high-level throughout Wandsworth. These options have been categorised into three types following the source-pathway-receptor method. **Source** options include swales, detention basins, or wetlands which could be used to attenuate small or large volumes of surface water upstream of Catchments. **Pathway** options include improving maintenance regimes, managing overland flow through preferential flow paths, or de-culverting watercourses to provide flood mitigation along flood corridors. **Receptor** options include planning policies to influence development and social change, education and awareness, to propose mitigation through the end user's experience.

An opportunity assessment (OA) has been carried out using the 'red, amber, green' (RAG) method in which red (R) represents that the measure is not deemed applicable due to its perceived ineffectiveness in providing sufficient flood mitigation, amber (A) shows that intermediate flood mitigation can be expected from the measure, and green (G) indicates good estimated benefits in terms of flood damages avoided. *Table 11-1* lists the different types of mitigation options assessed.

Users of this SWMP should note that the mitigation options are all initial, high level and generic proposed ideas which have been identified from desktop assessments only. No site-specific feasibility or economic viability work has been undertaken. The reason for this is to enable a prioritised list of potential mitigation options which can be assessed for the most relevant Catchments in line with the LLFA's available resources. Further feasibility and viability work may show that mitigation options initially thought to be viable may not be possible. This could be due to site constraints (such as available space or the presence of existing below ground utilities), or the availability of funding. Possible constraints and risks for each mitigation option are shown in *Table 11-1.*

Table 11-1 Measures used when proposing mitigation options

	Measure	OA	Description	Constraints / risks
Source	Blue / green roof		Generic measure which could be integrated into new developments or retrofitted into older buildings	Can only be implemented on developments with flat roofs. May cause structural / loading issues on some buildings
	Soakaway		Specific measure which could be implemented in geologically suitable areas	Not suitable for areas with impermeable geology or constrained sites where they cannot be sited more than 5m away from buildings
	Swales		Specific measure which could be introduced in open areas within key areas of interest to channel water to storage features or temporarily hold surface water	Not suitable for constrained sites or where there is existing underground infrastructure / utilities
	Permeable paving		Generic measure, could be introduced across most car parks and in new developments	Not suitable where there is existing underground infrastructure / utilities
	Rainwater harvesting			Some developments may not have a requirement for recycled water. Rainwater harvesting tanks may cause structural /

	Measure	OA	Description	Constraints / risks
				loading issues on some buildings
	Detention basin / dry pond		Specific measure which could be introduced across most open areas within key areas of interest	Not suitable for constrained sites or where there is existing underground infrastructure / utilities
	Pond			
	Wetland			
	Rain garden		Specific measure, most suitable to open spaces or on wide footways	Not suitable for constrained sites or where there is existing underground infrastructure / utilities
Pathway	Increase capacity in drainage system / watercourse		Existing drainage or watercourse channel storage capacity increased to accommodate additional surface water and prevent peak flooding	Increasing capacity in one part of the drainage system / watercourse may not be feasible if downstream parts do not have sufficient capacity to accommodate the additional surface water
	Separation of foul and surface water sewers		Sewer system almost completely separated	Is only beneficial for areas where the drainage system is combined
	Diversion of drainage system / watercourse		Watercourse channels diverted through areas that could intermittently flood as an exceedance measure	Not suitable for constrained or heavily urbanised areas
	Improved maintenance regimes		Drainage network being properly maintained removes the incidence of blockages and consequent flooding	N/A
	Managing overland flow - online storage		Storage areas created for temporary storage in open spaces with slow release back into the surface water sewer network at a restricted rate	Not suitable for constrained or heavily urbanised areas
	Managing overland flow - preferential flow paths		Flows diverted to open areas such as parks or roadside swales with possible kerb raising	Not suitable for constrained or heavily urbanised areas
	Land management practices		Management of runoff rates and volumes from upstream Catchments	Only applicable to rural areas
	De-culverting watercourse(s)		Watercourses returned to a more natural state to prevent flooding upstream of culverts	Not suitable for constrained or heavily urbanised areas
Receptor	Improved weather warning		Warning time provided to residents ahead of flooding	In instances of flash flooding, it is unlikely that sufficient warning time would be able to be provided to residents
	Planning policies to influence development		Generic measure which could be applied to all Catchments to reduce flooding from new developments	N/A

	Measure	OA	Description	Constraints / risks
	Temporary / demountable flood defences		Specific measure which could be installed in areas of significant risk of flooding with adequate warning	In instances of flash flooding, it is unlikely that there would be sufficient time to install flood defences
	Social change, education and awareness		Generic measures, focusing on community engagement and the need for property level protection	N/A
	Improved resilience and resistance measures		Educating the local community of the need and how to protect themselves using commercial and residential property level measures	N/A

Land management practices have not been deemed a good measure due to Hotspots being heavily urbanised. A more detailed review of the existing drainage system and a feasibility study should be undertaken if the 'Increase Capacity in Drainage System / Watercourse' option is proposed. It is suggested that asset owners are engaged to consider existing maintenance regimes and potential constraints of upgrading drainage infrastructure. *Section 11.4* includes a proposed stakeholder engagement plan. It should also be noted that green roofs do not typically store high volumes of water. Blue roofs with higher attenuation capacity should be considered instead of green roofs where large volumes of water can be stored.

11.2. Options in high-risk areas

The options proposed are initial attempts to identify potential opportunities to reduce surface water flood risk across the borough. Using the number of benefitting properties, each proposed option was assessed and given a risk level (low, medium or high). If the number of properties at risk in the 1 in 100-year return period were up to and including 30 a 'Low' risk was assigned. If the number of properties at risk in the same return period were between 31 to 199 inclusive a 'Medium' risk was assigned, and if it was beyond 200 a 'High' risk was assigned. This document has identified five Hotspots from a total of 58 with a 'High' risk rating. *Appendix B* – High Level Option Assessment contains the options assessment for each hotspot alongside its risk rating. Proposed mitigation options for the five Hotspots which have 200 or more properties at risk (the shortlisted high risk Hotspots) are shown in *Table 11-2.* It is recommended that for future feasibility studies for these Hotspots, an economic appraisal approach is used to assess, then score, the high risk proposed options (please refer to the recommendations in *Section 12)*.

Table 11-2 Shortlisted high risk Hotspots

Hotspot ID	Type	Number of properties at risk	Option Description
W05_01 (Refer to *Section 8* and *Figure 8-2*)	Source	667	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W07_03 (Refer to *Section 10* and *Figure 10-2*)	Source	485	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W05_03 (Refer to *Section 8* and *Figure 8-2*)	Source	346	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Permeable paving in car parks. Retrofit flat roofs with green/blue roofs. Rain gardens/swales in areas of open space. Retrofit schools with raingardens, planters and permeable paving.
W06_17 (Refer to *Section 9* and *Figure 9-2*)	Source	298	Raingardens and planters in footways. Encourage residents to use rainwater harvesting. Retrofit flat roofs with green/blue roofs. Raingardens in areas of open space. Permeable paving in car parking bays.
W06_13 (Refer to *Section 9* and *Figure 9-2*)	Source	249	Raingardens and planters in footways. Encourage residents and business owners to use rainwater harvesting. Retrofit flat roofs with green/blue roofs. Permeable paving in car parking bays.

It should be noted that all the shortlisted Hotspots lie within CDAs. Hotspot W05_01 lies within the Summerstown CDA and Hotspot W05_03 lies within the Earlsfield CDA, both of which have received Grant in Aid funding from the EA. For these Hotspots, alternative sources of funding should be sought if the mitigation options are prioritised for further detailed investigation, design and construction. If no new mitigation options are feasible for a Hotspot currently being investigated through CDA studies, then LB Wandsworth will explore mitigation options for the Hotspot with the next highest number of properties at risk, as shown in *Appendix B* – High Level Option Assessment(this may be a Hotspot with a 'Medium' risk rating).

It is recommended that a consistent prioritisation mechanism is used at the initial assessment stage to ensure that focus is given to the options with the most potential benefits. The methods used within this document to identify possible options reflect the range of benefits offered by SuDS features and the potential to include them into future collaborative projects.

11.3. Action Plan

The purpose of the Action Plan is to define activities required by the LLFA to meet its requirements set out by the FWMA 2010. The Action Plan sets out the tasks and priority for managing surface water across the borough through the following timeframes: short term (1-2 years), medium term (2-5 years) and long term (5-10 years). These tasks provide a structure for implementing the potential preferred options identified. The parties responsible for implementing actions and key partners are included within the Action Plan. Most of the actions within the plan align with the measures for LB Wandsworth in the Thames River Basin District FRMP (2020). These measures are currently out for public consultation and are subject to change.

The types of actions proposed are categorised as follows:

- **Communication / Partnerships** – actions used internally or externally to communicate risk or create / improve flood risk related partnerships.
- **Financial / Resourcing** – actions used to internally or externally secure funding to support works or additional resources to deliver actions.
- **Flood and Water Management Act / Flood Risk Regulations** – actions which are aligned to legislative duties or powers under the FWMA 2010 or FRR 2009.
- **Flooding Mitigation** – actions relating to maintenance or capital works done to mitigate flood risk.
- **Investigation / Feasibility / Design** – actions which include or enable further investigation / feasibility studies / design of mitigation options to occur.
- **Policy** – actions which improve planning or development control activities.

A summary of the Action Plan is provided in *Table 11.3*. Actions with a 'High' priority ranking are displayed within this summary. The full Action Plan is included within *Appendix C* – Action Plan. A RAG progress tracker is displayed within the Action Plan. Green actions are those which LB Wandsworth have already implemented and they will continue to implement these or strengthen their approach. Amber actions are those which LB Wandsworth are planning to carry out, and should be actioned if possible. Red actions are those which are not currently in progress. The SWMP Action Plan should be reviewed and updated regularly (approximately every two or three years) to capture updates such as investigatory works being carried out or changes occurring which may influence the surface water flood risk within Wandsworth.

Table 11.3 Action plan summary

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
1	Co-operation between Authorities in exercising functions under the Flood and Water Management Act and all relevant legislation	- Attendance at key strategic meetings to share best practices and manage common challenges. - Engage with RMA's through cross borough boundary projects to work collaboratively to achieve local flood risk objectives.	- Hold 3 monthly meetings, inviting the members of the flood risk management (FRM) team and other council services as appropriate in Wandsworth. - Review opportunities for collaborative working through the internal flood group meetings and raise opportunities to the South West London Flood Group in Wandsworth.	High	Short	Flood and Water Management Act	LB Wandsworth LLFA	EA, TWUL, neighbouring Local Authorities, and TfL
2	Investigate repeat or significant flooding incidents which have occurred in Hotspots and Flood Incident Areas to determine the potential cause(s) and recommendations for future actions	- Determine process and timescale for conducting Section 19 investigations. -Undertake projects to identify potential solutions to flooding	- Identify key 'at risk' communities, develop resources in Wandsworth	High	Short	Investigation / Feasibility / Design	LB Wandsworth LLFA	EA, TWUL, and neighbouring Local Authorities

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
		problem (where resources permit) and, where viable, deliver schemes.						
3*	Carry out an economic appraisal for each proposed mitigation option for the shortlisted high risk Hotspots, and revise the ranking given to reflect its economic viability	- Undertake an economic appraisal that should include a cost and benefit analysis of the scheme over its lifetime. - A programme should be produced outlining how and when viable schemes could be taken forward.	- Publish and begin implementing a programme of flood alleviation schemes which mitigate local flood risks, utilising a catchment-based approach in Wandsworth.	High	Short	Investigation / Feasibility / Design	LB Wandsworth LLFA	
8	Record incidents in a timely and consistent manner at the exact location of flooding	- Further advertise use of the LLFA's online reporting system and regularly review submitted information. - Liaise with TWUL where	NB: This action does not directly link to the FRMP measures, however, it is relevant to other LB Wandsworth priorities.	High	Short	Flood and Water Management Act	LB Wandsworth LLFA	

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
		flooding reports are / may be associated with sewer infrastructure and ensure residents are reporting such via TWUL's online reporting function tool.						
9	Conduct maintenance of the drainage system such as ensuring gullies and drains are regularly maintained to allow the drainage network to operate at capacity in Hotspots	- Review existing maintenance schedules and incorporate SWMP findings wherever possible e.g. maintenance works could be carried out in order of risk ranking for Hotspots and Flood Incident Areas.	- NB: This action does not directly link to the FRMP measures, however, it is relevant to other LB Wandsworth priorities.	High	Short	Flood and Water Management Act	LB Wandsworth LLFA	LB Wandsworth Highways, TWUL, TfL, and Highways England
10†	Investigate the capacity of the surface water sewer system within Hotspot and Flood Incident Areas and investigate options for increasing sewer capacity	- Develop a programme and undertake investigations to be carried out in order of risk ranking for	NB: This action does not directly link to the FRMP measures, however, it is relevant to other LB Wandsworth priorities (such as co-operation with other	High	Short	Investigation / Feasibility / Design	TWUL	LB Wandsworth LLFA

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
		Hotspots and Flood Incident Areas	Authorities to reduce flood risk).					
11	Ensure all new developments, particularly in Hotspots and Flood Incident Areas, contribute to measures to reduce surface water flood risk in the Catchment through the incorporation of rainwater harvesting and green blue infrastructure	- Engage with LB Wandsworth's Planning Team to incorporate extra requirements and processes for planning applications within Hotspots and Flood Incident Areas. -Support LB Wandsworth's Planning Case Officers with the information and tools they require to ensure these measures are being delivered in new development eg. by regularly updating internal protocol documents for planners to	- Work with Local Planning Authority colleagues to implement strengthened policy and guidance in Wandsworth.	High	Short	Policy	LB Wandsworth Planning	LB Wandsworth LLFA

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
		implement the latest flood risk management guidance.						
12	Seek opportunities within all relevant local or regional strategic plans to integrate surface water flood risk reduction measures	- Ensure that local plans and strategic documents are up to date and that actions set out are prioritised and delivered at both local and regional levels.	- Work with Local Planning Authority colleagues to implement strengthened policy and guidance in Wandsworth.	High	Medium	Policy	LB Wandsworth Planning	EA, TWUL, neighbouring Local Authorities, Greater London Authority, and TfL
13	Introduce SuDS retrofitting policies and incentives which seek to enhance or replace conventional drainage systems in favour of green roofs, rainwater harvesting and reuse, or other above ground green blue attenuation features on new developments	- Engage with LB Wandsworth's Planning Team to incorporate extra requirements for planning applications.	- Work with Local Planning Authority colleagues to implement strengthened policy and guidance in Wandsworth.	High	Short	Policy	LB Wandsworth Planning	LB Wandsworth LLFA
15‡	Investigate resilience of key transport infrastructure across the borough including the strategic highway network, railway lines	- Develop and keep up to date a list of all critical infrastructure and work with	NB: This action does not directly link to the FRMP measures, however, it is relevant to other LB Wandsworth priorities.	High	Short	Investigation / Feasibility / Design	LB Wandsworth LLFA	LB Wandsworth Transport, Transport for London, Network Rail, and Highways England

ID	Action	Key Focuses	Alignment to existing FRMP measure(s) (2020)	Priority Ranking	Time-frame	Action Type	Responsibility	
							Lead RMA	Primary Support
	and public transport assets	relevant departments and RMA's to ensure the resilience of this infrastructure against flood risk now and in the future.						

*Completion of action is dependent on successful application for funding

†TWUL should be collaborated with and informed of any capacity issues identified by LB Wandsworth LLFA

‡LB Wandsworth investigates resilience of its own assets

11.4. Stakeholder engagement plan

A borough-wide stakeholder engagement plan has been created to help the LB Wandsworth increase awareness of the SWMP and the opportunities for future collaborative working to help mitigate flood risk in the borough. The plan explains how different partners can use the new SWMP to enable effective and ongoing collaborative working with LB Wandsworth in the future.

11.4.1. Stakeholder mapping

Stakeholders' interest was mapped against their power to influence the direction of future initiatives and decision-making to identify the stakeholders who should be engaged. Stakeholders which have high levels of interest and influence should be targeted for collaboration as they would be valuable to further investigations. Stakeholders who would be more affected by policy changes but are perceived to have less influence in decision-making should be consulted. Care should be taken to ensure this category of stakeholder has a voice to reduce the risk that their issues might be overlooked even if they are likely to be substantially affected by the outcomes.

Lobbying and campaigning type organisations such as local charities should be involved to provide valuable input in terms of knowledge and funding. Academic or research focused organisations linked to water policy might be informed such as the BGS, or NGOs. These stakeholders might be called upon to provide expert input as and when necessary. *Table 11-3* Stakeholder strategy shows the engagement strategy and actions for different combinations of interest and influence.

Table 11-3 Stakeholder strategy

Interest	Influence	Strategy	Actions
High	High	Collaborate	• Stakeholder panels • Steering groups • Facilitated meetings
High	Low	Consult	• Surveys • Meetings • Interviews
Low	High	Involve	• Workshops • Forums • Focus groups
Low	Low	Inform	• Briefings • Electronic documents • Exhibitions

Stakeholder engagement should be dynamic. It is therefore recommended to engage the stakeholders identified at the SWMP level for specific actions within the Action Plan in contributing to the identification and segmentation of future stakeholder groups. The stakeholder analysis may then provide both a management tool and a rationale as to why certain stakeholder groups are invited to participate in certain stages of the process and others not. *Figure 11-1* illustrates the engagement strategy for each stakeholder identified for the purposes of the SWMP. Each stakeholder was given a score between 1 and 5 based on their level of interest and level of influence. The combination of these two scores was used to plot the stakeholders' position on the map in *Figure 11-1*. A score of 4 - 5 indicated high interest or influence, and a score of 1 - 2 indicated low interest or influence. The strategy for stakeholders with high interest and high influence is to

collaborate, for high interest and low influence is to consult, for low interest and high influence is to involve, and for low interest and low influence is to inform.

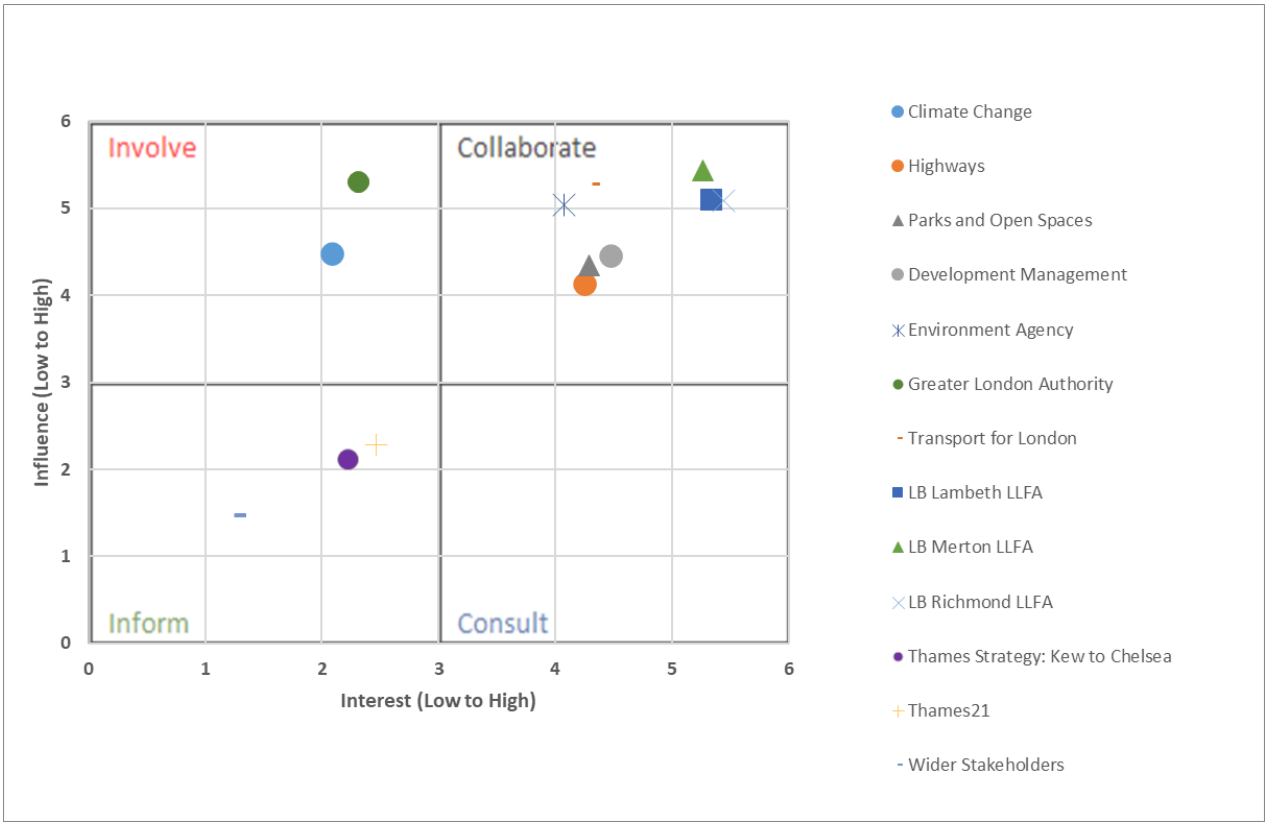

Figure 11-1 Stakeholder map

11.4.2. Stakeholder groups and engagement

LB Wandsworth

Several teams within the LB Wandsworth were identified for potential future collaboration. In seeking opportunities within all relevant local or regional strategic plans to integrate surface water flood risk reduction measures (Action Plan ID 12, *Appendix C* – Action Plan), the Highways, Parks and Open Spaces, and Development Management internal teams should continue to be engaged collaboratively. Engagement with other teams within the LB Wandsworth occurs via Internal Flood Group meetings, where flooding issues are discussed.

The Highways, Parks and Open Spaces, and Transport and Strategy teams will be essential in helping the LB Wandsworth LLFA in designing and building financially viable schemes which provide multiple benefits (Action Plan ID 7, *Appendix C* – Action Plan). In addition to these teams, the Climate Change team should also be contacted when identifying potential funding contributors and securing funding for scheme options to increase potential for delivery (Action Plan ID 6, *Appendix C* – Action Plan), maximising multiple benefits where possible.

The Transport and Strategy team should investigate the resilience of key transport infrastructure across the borough including the strategic highway network, railway lines and public transport assets (Action Plan ID 15, *Appendix C* – Action Plan). The results of such investigations should be clearly communicated to the LLFA. It is also key that the LLFA continues to communicate with the

Highways team regarding the maintenance of drainage systems to ensure gullies and drains are regularly maintained to allow the drainage network to operate at capacity in Hotspots (Action Plan ID 9, *Appendix C* – Action Plan).

Key Organisations

These act as focal points for discussion and consultation throughout the development of schemes. Key Organisations identified include the EA, Greater London Authority (GLA), TfL and TWUL. These organisations are currently engaged through existing partnerships such as the London Drainage Engineer's Group and the South West London Strategic Flood Group, and on flooding and drainage issues as they occur. Inclusion of this group through meetings/workshops offers a more participatory process. The EA, TWUL, and TfL should continue to be engaged for the following, as per the Action Plan:

- Co-operation between authorities in exercising functions under the Flood and Water Management Act and all relevant legislation (Action Plan ID 1, *Appendix C* – Action Plan);
- Undertake detailed flood risk modelling if required to better assess the benefits of the options with the highest priority ranking (Action Plan ID 4, *Appendix C* – Action Plan); and
- Identifying potential funding contributors and securing funding for scheme options to enable delivery (Action Plan ID 6, *Appendix C* – Action Plan).

It is highly recommended that the EA, TWUL, and GLA are engaged to integrate surface water flood risk reduction measures in relevant local or regional plans (Action Plan ID 12, *Appendix C* – Action Plan). They should also be involved in order to successfully design and build financially viable flood alleviation schemes providing multiple benefits (Action Plan ID 7, *Appendix C* – Action Plan).

Continued engagement with TfL is critical in ensuring gullies and drains are regularly maintained to allow the drainage network to operate at capacity in Hotspots (Action Plan ID 9, *Appendix C* – Action Plan). Investigating the resilience of key transport infrastructure across the borough including the strategic highway network, railway lines and public transport assets (Action Plan ID 15, *Appendix C* – Action Plan), from a surface water flood risk viewpoint, should be carried out with support from the LB Wandsworth LLFA. TfL should be engaged regarding opportunities to integrate surface water flood risk reduction measures (Action Plan ID 12, *Appendix C* – Action Plan) within existing or future strategic development or mitigation plans.

Cross-boundary Local Authorities

Through the creation of the SWMP, other LLFAs were contacted for their input on key deliverables. Keeping them engaged is essential in helping drive future flood risk management both within LB Wandsworth and at wider surface water basin / catchment level. The Local Authorities identified as part of this group are LB Lambeth, LB Merton, LB Richmond upon Thames, and RB Kingston upon Thames LLFAs. Co-operation between Authorities in exercising functions under the FWMA 2010 and all relevant legislation (Action Plan ID 1, *Appendix C* – Action Plan) and seek opportunities within all relevant local or regional strategic plans to integrate surface water flood risk reduction measures (Action Plan ID 12, *Appendix C* – Action Plan) are expected to be continued from these LLFAs through existing partnerships such as the London Drainage Engineer's Group, the South West London Strategic Flood Group and the Thames Regional Flood and Coastal Committee.

Other Organisations

Many individuals and organisations are likely to be affected by the decisions made by the LB Wandsworth LLFA. For the South East Rivers Trust, information should be shared and discussions held As it may be impractical to involve these remaining stakeholders within one of the other groups outlined above, a group of 'Wider stakeholders' has also been identified for members of the public, friends / volunteer groups, allotment societies, sports groups, and the like. The Thames Strategy: Kew to Chelsea, Thames21, and other wider stakeholders should be kept informed about relevant projects.

12. RECOMMENDATIONS

This document has shortlisted five Hotspots with a 'High' risk rating. It is recommended that, subject to securing funding, standalone feasibility studies are carried out for the Catchments containing the shortlisted Hotspots, in order of risk ranking. Recommended tasks for these studies are as follows:

1. Use the outputs of this new SWMP (prioritised Catchment and Hotspot information) to create sub-Catchments (where necessary for individual Hotspots to enable inclusion of the contributing and benefitting areas).
2. Gather further information about significant recorded flood incidents and validate predicted surface water flood risk extents.
3. Identify potential benefactors and constraints.
4. Conduct locally-specific long-list and short-listing exercises to identify potential mitigation options
5. Determine the feasibility of each potential mitigation option using a multi-criteria decision matrix
6. Conduct an economic appraisal for the options identified for each Catchment through cost benefit analysis. This should include identification of flood and non-flood risk related benefits, flood damage calculations, and consideration of whole life costs. This exercise should also define the benefitting area and identify the volume of surface water that could be stored in a 1 in 30-year surface water flood event for each option.
7. Use the results of the economic appraisal to revise the current risk rating for each Catchment. The options with the highest refined rating which are shown to be feasible could then be prioritised for further detailed investigation.
8. Options which are prioritised for further detailed investigation should undergo detailed modelling and a business case should be prepared and submitted to determine potential for continuation through detailed design to construction.

Other Hotspots could progress through a similar set of tasks. This should be determined by LB Wandsworth's LLFA according to any increased information about local flood risks or improved collaborative mitigation scheme potential, where resources permit.

Additional recommendations identified through this SWMP include:

- The LB Wandsworth LLFA should continue to work with neighbouring boroughs, building on engagement made during the new SWMP, where Catchments overlap political boundaries to manage the flood risks holistically.
- Ensure that flood incidents are recorded consistently and accurately and conduct investigations of repeat or significant flooding incidents which have occurred in Hotspots and Flood Incident Areas.
- Conduct regular maintenance of gullies and drains, prioritising those within Hotspots or Flood Incident Areas.
- Liaise with LB Wandsworth's Planning team to ensure that new developments incorporate rainwater harvesting, green blue infrastructure, particularly within Hotspots or Flood Incident Areas.
- Liaise with Wandsworth's Climate Change Group (within the Communications team) and contribute to projects which help to reduce the impacts of climate change, reduce carbon

emissions and work towards becoming carbon neutral, in line with Wandsworth's Environment and Sustainability Strategy.

- Investigate resilience of key transport infrastructure across the borough including the strategic highway network, railway lines and public transport assets.

In addition to the above bullet points it is recommended that this document is updated when significant work in reducing flood risk is completed and / or when significant improvements in the knowledge and understanding of local flood risk are identified. As a minimum, this should be reviewed every ten years. This may result in changes to the number of Hotspots with 'High' risk ratings. The action plan should be reviewed every two or three years to remove actions that have been completed, check that other actions are still relevant and add new ones if required.

13. CONCLUSION

Since the 2011 SWMP, the LB Wandsworth has an increased understanding of surface water flood risk in the borough which has resulted in this update. The 2011 SWMP identified a number of CDAs across the borough as areas at increased risk of surface water flooding. Some of these CDAs have undergone investigation of potential flood mitigation options in order to further the understanding of flood risk in those areas. Modelling of these CDAs typically involved the extension of the boundaries to account for surrounding contributing areas, sometimes merging across several CDAs.

The new SWMP reflects this Catchment-based approach, replacing the CDAs with Basins and Catchments which cover larger areas and represent the local watershed. The Basins and Catchments have been defined using topography and local drainage networks (watercourses and sewer systems). This accounts for contributing areas consistently and more accurately than the 2011 SWMP did, aligned with national planning policy and the EA's fluvial flood risk management Catchment-based approaches. The new approach allows for increased potential in collaborative working with neighbouring boroughs, with local / national organisations and / or other authorities all being potential stakeholders. EA national flood mapping data has been used to identify the number of properties predicted to be at risk in a 1 in 100-year return period surface water event. The total number of properties at this level of surface water risk is 8,489 across the whole borough (*Section 2.7*).

To better represent the area's most at risk of surface water flooding, Hotspots and Flood Incident Areas have been defined within each Catchment. There are 7 Catchments in total, 58 Hotspots and 2 Flood Incident Areas. Potential options to mitigate the risk of flooding from surface water have been identified at a high-level for the five Hotspots throughout the borough which are most at risk (W05_01, W07_03, W05_03, W06_17, and W06_13). These options have been identified using the source-pathway-receptor method. The options proposed are initial attempts to identify potential opportunities to reduce local flood risks as sustainably as possible, and mostly involve installing a mixture of SuDS such as rainwater harvesting, rain gardens, swales, blue/green roofs, and permeable paving. Using the number of properties at risk, each hotspot was assessed and given a risk rating. The methods used within this document to assess possible options reflect the complexity of benefits offered by SuDS features and the simplicity of how SuDS can be incorporated into future collaborative projects.

It is recommended that each option undergoes an economic appraisal to revise the risk rating given at this stage through a cost benefit analysis, starting with the options for the Hotspots most at risk. The economic appraisal exercise should define the benefitting area and identify the volume of surface water that could be stored in a 1 in 30-year surface water flood event for each option. The options with the highest rating could then be prioritised for further detailed investigation. Options with the most potential benefits are more likely to qualify for and attract grant funding to enable further investigation work at detailed design stage. Options within Hotspots with a lower risk rating should not be discounted as these may become more viable through collaborative working with stakeholders leading on other, non-flood risk schemes which can deliver multiple benefits. This, along with the action plan, gives the LB Wandsworth a high-level initial programme of potential local flood risk mitigation schemes.

14. APPENDICES

14.1. Appendix A - Methodology for properties at risk of surface water flooding

The EA Properties at Risk of Flooding dataset (2014) contains information about every property identified as being at risk from surface water flooding. Each property has a wetted perimeter percentage for three rainfall events, namely the 1 in 30-, 1 in 100- and 1 in 1000-year events for a range of minimum flood depths (see *Figure A-1* below). To be deemed at risk in this SWMP, properties at ground or basement level identified in the EA dataset must have had a minimum flood depth of 150 mm and a minimum wetted perimeter of 20%. 150 mm is the typical height of a doorstep which is why it was chosen as flood depth threshold. The chances that a given property would have been flooded internally if the flood depth in the area was above 150 mm are typically high as doorsteps are entry paths for flood water. A wetted perimeter of 20% was selected to filter out the properties which are only marginally within the flood extent, making their likelihood of encountering flooding low. Only basement and ground floor properties were included in the count.

os_class	floorarea	floorlevel	P100_NoDT	P100_D150	P100_D200	P100_D300	P100_D600	P100_D900
Dwelling	261.28	pG	0.478	0.464	0.445	0.391	0	0

Figure A-1. Example of the EA's RoFSW output for a 1 in 100-year event

14.2. Appendix B – High Level Option Assessment

Please refer to the relevant PDF.

14.3. Appendix C – Action Plan

Please refer to the relevant PDF.