Method Statement for PR24 Storm Overflows

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Document control and revisions table:

Revision	Issue date	Description	Author(s)	Reviewed	Approved	Approval date
V1	23/11/2022	Flowchart first draft	RMcT	CB, JWR, ML (TW)		
V2	30/11/2022	Flowchart update based upon TW comments	RMcT			
V3	6/12/2022	Document first draft	RMcT	CB (TW)		
V4	9/12/2022	Document update based upon TW comments	RMcT	RP	CM	9/12/2022
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V6	19/12/2022	Document update based upon TW comments	RMcT	RP	RMcT	20/12/2022
V7	20/12/2022	Final draft for comments	RMcT	JWR, ML, CB, AH (TW)		
V8	12/01/2023	Document update based on TW comments	RMcT / RP / CM	JWR, ML, CB (TW)	AH, JW, PD (TW)	19/01/2023

Abbreviations:

AMP	Asset Management Period
BOTEX	Base Operational Total Expenditure
CSO	Combined Sewer Overflow
DWMP	Drainage and Wastewater Management Plan
EDM	Event Duration Monitoring
GISMP	Groundwater Impacted System Management Plans
ICW	Integrated Constructed Wetland
OAR	Options Assessment Report
ODR	Options Development Report
Ofwat	Water Services Regulation Authority
OTA	Operating Techniques Agreement
PE	Population equivalent or unit per capita loading
PR24	Price Review 2024
PS	Pumping Station
SOAF	Storm Overflow Assessment Framework
SOEP	Storm Overflow Evidence Project
STW	Sewage Treatment Works
TTT	Thames Tideway Tunnel
UPM	Urban Pollution Management
WaSC	Water and Sewage Company
WINEP	Water Industry National Environment Programme

Glossary of Storm Overflow Permit Status

Live	Storm Overflows which operate under a live permit.
Live to be investigated	Storm Overflows which have a live permit and are under investigation to surrender the permit.
Active	Storm Overflows which operate but do not have a live permit.
Non active	Storm Overflows which do not spill annually or are an emergency overflow.
TTT	Storm Overflow that are in the process of being connected into the new Thames Tideway Tunnel.

1 Thames Water PR24 Storm Overflow Reduction Methodology

1.1 Summary

Thames Water's PR24 storm overflow reduction Method Statement has been developed in accordance with WINEP guidance provided by the Environment Agency and includes WINEP and non WINEP investment[1].

The method is centred on three obligation areas:

1. The requirements of the Environment Act (as set out in WINEP guidance) and alignment with Defra's storm overflow strategy.
2. Potential performance commitments in PR24
3. Thames Water public commitments relating to storm overflows[2]; and
4. Previous commitments made by Thames Water to regulators.

In order to meet these multiple requirements, maintain alignment with the WINEP methodology and deliver improvements quickly and efficiently, a methodology has been defined which makes best use of previous investigations and available data both in terms of solution selection and site selection. By using available information and combining the selection of sites with the costs and benefits of potential options for each location, we aim to achieve the identification of the overall best value plan.

Solution options are then costed and selected in accordance with the WINEP methodology (e.g., including benefits assessment).

As the storm overflow spill reduction programme will be implemented over multiple Asset Management Plan (AMP) periods, selection criteria have been built into the method that allows solution options to be assigned to one of five Ranked Categories, which in turn determines the priority within the programme.

For each storm overflow action (e.g., investigation or improvement) an Action ID is assigned, and an Options Assessment Report is produced for that Action ID. Data related to the action are also included on the WINEP and Wider Environmental Outcomes (WEO) spreadsheets in accordance with WINEP guidance.

The method is broken down into seven stages (**Error! Reference source not found.**Figure 1). Each stage is described in detail from Section 4 to Section 10.

[1] Environment Agency. PR24 WINEP driver guidance – Storm overflow reductions.
[2] Applies to both network and treatment storm overflows but excludes emergency only overflows.

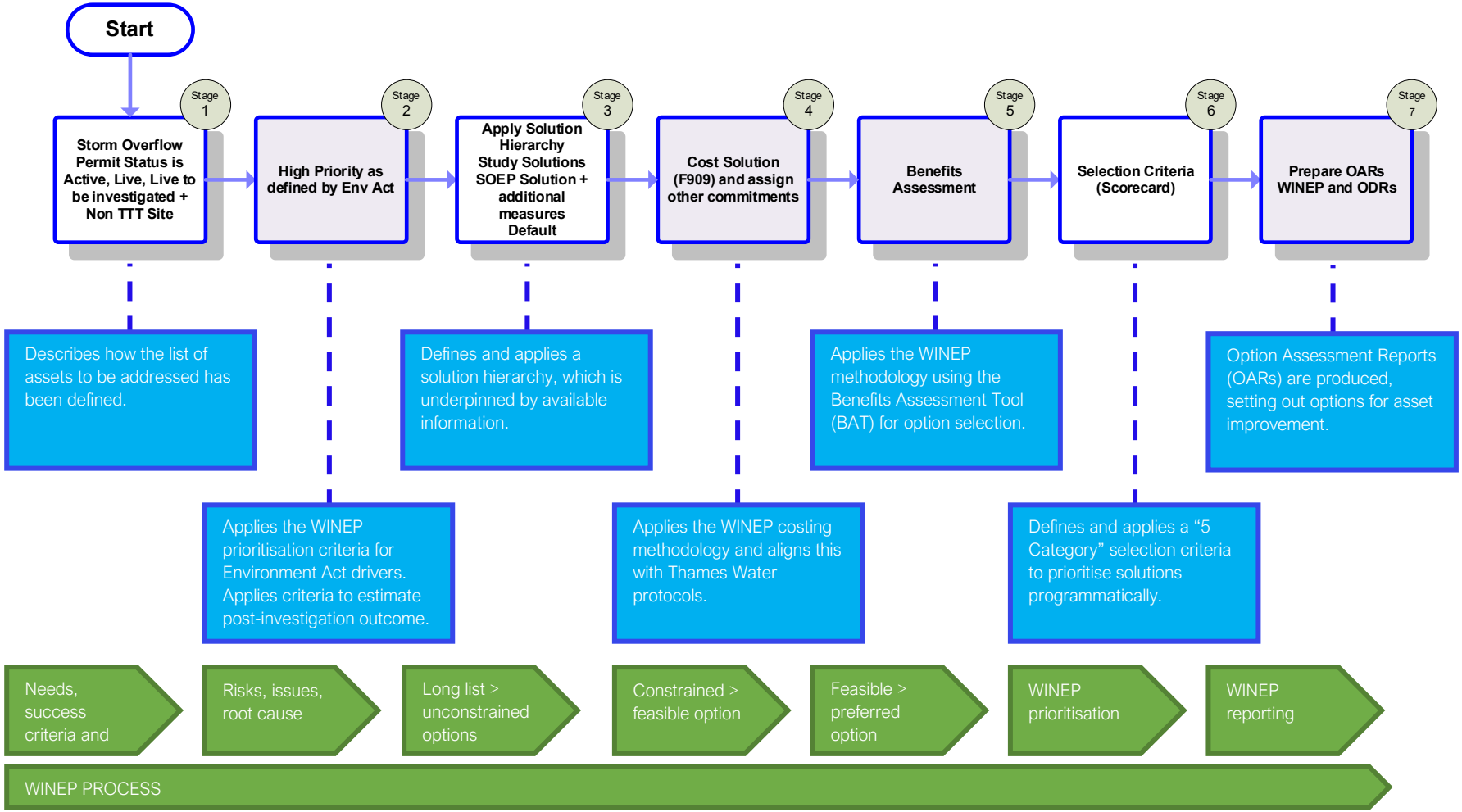

Figure *1* Method Stages[3]

[3] Please refer to the Glossary of Storm Overflow Permit Status at the start of the document

2 Scope

2.1 Inclusion and exclusions from WINEP

Whilst this storm overflow reduction method has been developed for WINEP, it applies to all PR24 storm overflows. When considering costs decisions must be made regarding which costs fall within WINEP and which investments which would not be eligible to be included in WINEP. The Thames Water approach considers Ofwat's final methodology, Environment Agency guidance, Natural England requirements and our public commitment relating to spill duration reduction.

The Environment Agency has explicitly excluded storm overflow issues caused by "excessive infiltration" from being included in the WINEP programme. However, there is no explicit guidance about what could be deemed "excessive infiltration". We recognise that the root cause for a small number of storm overflow actions included in this submission will be due to excessive infiltration. We wish to work with the Environment Agency to define a nationally consistent approach to determine the circumstances where infiltration is considered excessive and therefore ineligible for inclusion under WINEP. We have a proposal for this definition available for consideration. As part of GISMPs, Thames Water are looking to identify of the catchments experiencing an infiltration response, which are deemed to required attention due to what could be defined as 'excessive infiltration'. This is independent of the consideration of whether we should undertake infiltration reduction solutions in the network (i.e., sewer lining) to prevent flow at source verses additional storage and treatment capacity at Sewage Treatment Works.

2.2 The WINEP Optioneering Process

This Method Statement should be read in conjunction with the Options Development Report (ODR). The Method Statement is one component of the ODR, with the latter setting out the WINEP optioneering process.

Please note that the Method Statement contributes to the process to be followed in subsequent optioneering (i.e., how we will approach things). It is not a solution report and therefore will not contain data reports such options lists.

Embedded within the ODR is a package of supporting information, which includes:

- The Generic WINEP Approach (see below)
- The Method Statement for catchment screening
- The Method Statement for benefits assessment
- Generic cost curve approach
- The Method Statement for Storm Overflows
- Storm Overflow Technical Report
- Benefits Assessment tables, charts, and outputs
- PR24 Whole Life Cost read-me and summary sheets
- Unconstrained Screening (including the long list of options)
- Constrained Screening
- Stakeholder Engagement

Within the ODR, the Generic WINEP Approach includes:

- Describes the overall methodology
- Details the Catchment Characterisation method
- Details the Catchment Screening method
- Details the Unconstrained Screening method

- Explains the method to determine AMP8 and AMP9 obligations
- Details the Constrained Screening method
- Explains the Benefits Assessment method
- Explains the Carbon method
- Explains the Cost method
- Outlines the Options Assessment method
- Provides the workflow for the Options Development Report method
- Outlines the Investigation pathway
- Outlines the pathway for solutions developed from PR19 investigations

This Method Statement does provide details of the unconstrained options list or the constrained list. Rather it references these options – with details of their derivation provided in the ODR:

- The option selection starts with an unconstrained long list of 138 options.
- Through consideration of the WINEP requirements this is reduced to an unconstrained short list of 13.
- Six options are then taken forward for fine screening. At this stage some options were combined to create two additional combined solutions. For example, option Z6 appears twice in the constrained short list. Firstly, as standalone, and secondly combined with storage. Similarly, J1 (Source control SuDS measures) is presented as stand-alone and combined with wetlands and storage.
- It is these combined solutions that are taken forward from the fine screening. Note, that the process of combining creates sub-options within each combined option (i.e., option selection is not limited to two options).

3 Storm Overflow Reduction Areas of Obligation

This section and subsequent sections set out how the storm overflow options were assessed within the overall WINEP process. The adopted methods reflect the time available (i.e., two months since receiving Environment Agency guidance to screen approximately 1000 sites) and within existing data constraints (i.e., the available information regarding each individual storm overflow was very variable – meaning that the method needed to account for estimating techniques in the absence information).

Our Storm Overflow methodology aligns with the requirements set by both Environment Act legislation and Thames Water's commitments, including medium-term public commitments and long-term commitments outlined in the Drainage and Wastewater Management Plan (DWMP).

3.1 Environment Act Requirements

All Environment Act driver codes contained in the WINEP guidance are statutory drivers. Statutory (S) obligations are set out in primary or secondary legislation. Thames Water must complete WINEP actions to fulfil statutory obligations. These actions are not subject to a cost benefit test[4].

The improvement **(EnvAct_IMP2, EnvAct_IMP3 and EnvAct_IMP4) drivers** set out in Stage 2, section 5 below are considered **full scope** within the WINEP options development guidance as all options should consider the opportunity for green infrastructure solutions as well as grey

[4] Environment Agency. December 2021. Version: Final Draft. Water industry national environment programme (WINEP) methodology.

infrastructure. The exception is EnvAct_IMP5 which is minimum scope as it is requiring a screen. Relevant sections of Part 1 of the Options Assessment Report must be completed – this must include costs for the preferred option[1].

The methodology aims to identify a programme of capital works which will deliver improvements to Thames Water storm overflows in Asset Management Plan period 8 (AMP8) and beyond in line with the requirements of the Environment Act. The Environment Act driver guidance distinguishes between overflows that discharge to 'high priority nature sites[5]' and those that don't, and maps multi-AMP delivery profiles as shown in Figure 2 for both categories.

Year	2030	2035	2040	2045	2050
% of high priority site storm overflows improved	38%	75%	87%	100%	100%
% of total storm overflows improved	14%	28%	52%	76%	100%

Figure 2 Environment Act Delivery Profile[6]

The Environment Act requirements are statutory. These drivers seek to limit spill frequency so that:

- the discharges have no adverse ecological impact.
- protect public health at bathing waters.
- set limits on how many discharges there are per annum and
- to reduce storm overflow aesthetic impacts through the installation of screens.

[5] Please refer to section 4 of this report for the definitions and criteria for 'High Priority Nature Sites'
[6] Storm_Overflows_Discharge_Reduction_Plan.pdf (publishing.service.gov.uk)

3.2 Thames Water Public Commitment

The programme of work developed by the methodology detailed in this document aims to deliver Thames Water's public commitment for storm overflows. Whilst not legally binding, we seek to meet our customer's expectations in keeping rivers clean (our customers' Public Value top priority) by preventing heavy rainfall from causing sewage overflow and sewage spills into rivers and reducing the frequency, severity and duration of pollution incidents as well as improving the quality of rivers and waterways[7].

Our stated commitment is to achieve at least a 50% reduction in the total annual duration of untreated discharges by 2030 and, within that, an 80% reduction in sensitive catchments[8] (using a 2020 baseline)[9].

The 2020 baseline consists of the 465 storm overflow sites that had Event Duration Monitoring (EDM) in 2020 and a further 284 sites (see section 3 for guidance on how this list has been derived) where data is not available for prior 2020 or where sites will be subject to EDMs installed within AMP7, after 2020.

Based on EDM records for 2020 the total duration of spill from the 465 storm overflows with EDMs is 215,887 hours.

To align the public commitment with latest information, we have assumed 102 hours of spill per storm overflow for the additional 284 storm overflows. This figure was calculated based on the average spill duration for in catchment storm overflows[10]. Using this assumption, the forecast duration of spills from these 284 overflows is 28,968 hours.

Adding these together means an overall 2020 baseline spill duration of 244,855 hours from 749 storm overflows. This sets a target spill duration (50% reduction of baseline by 2030) of 122,427 hours or a target reduction in duration of spills of 122,427 hours.

An allowance has been made for existing committed investments[11] to achieve -16,940 hours to the end of AMP7. Assuming this is delivered, **our public commitment requires further investment in PR24 to reduce storm overflow durations by 105,487 hours before 2030[12]**.

The WINEP options were developed in accordance with the guidance documents. Alongside this, Thames Water identified a set of scoring criteria to identify sensitive catchments. The WINEP solutions were then checked in the sensitive catchments to see if they achieved to 80% reduction. The sensitive catchment scoring was applied as part of Stage 6 – see section 9 below. In conclusion, it was found that this public commitment was met within the WINEP solutions.

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[7] Source: "What Customers, Communities and Stakeholders Want - A summary of our customer, community and stakeholder insights" Version 16, August 2022.

[8] This is an internal TW definition precedent and unrelated to 'High Priority' sites as defined by the Environment Act

[9] river-health-summary.pdf (thameswater.co.uk)

[10] Storm Overflows which are not located at Wastewater Treatment Works. This figure has been used instead of an average of the entire Storm Overflow dataset as most overflows without EDM data are catchment overflows.

[11] Works include AMP7 U_IMP5, U_IMP6, DWF increase projects and Thames Tideway Tunnel

[12] Thames Water commits to river health improvement package

In addition, site specific commitments have been made with local stakeholders (e.g., through the DWMP). These commitments have also been cross checked whilst developing the WINEP options.

3.3 Drainage and Wastewater Management Plan

DWMPs are being developed to ensure the sustainability of drainage and wastewater management infrastructure and the services it provides to customers and the environment. They will set out how water and sewerage companies intend to extend, improve, and maintain a robust and resilient drainage and wastewater system over the long term.

Draft DWMPs were published for consultation in June 2022; the final DWMPs will be published by the end of May 2023[2].

The WINEP Storm Overflow reduction Plans must align with DWMP, which will include Thames Water's long-term adaptive plan, which will address strategic risks and uncertainties, and inform the PR24 business plan. The WINEP for AMP8 (2025 – 2030), alongside the supply-demand and capital maintenance elements of the water companies' business plans, will implement the first delivery phase of the DWMP. The DWMP will provide an evidence base that supports investment need.

From 2025 onwards the second cycle of DWMP production will commence. The Environment Act 2021 makes DWMPs statutory for the second cycle of these plans[13].

3.4 Customer and Stakeholder Consultation

Customer and stakeholder consultation is reviewed in the ODR. By implication this includes the above public commitments.

Current customer consultation will not include the specific PR24 WINEP aspirations as these were not available for the most recent consultation. Further customer consultation is being undertaken from December 2022.

All storm overflow drivers are statutory. Statutory obligations (S) arise from legislative requirements and the need to comply with obligations imposed directly by statute or by permits, licences and authorisations granted by the Secretary of State, the Environment Agency or other body of competent jurisdiction. Other statutory obligations include ministerial directions and meeting specific planning requirements. While it is important to understand the costs and benefits of actions needed water companies must complete WINEP actions to fulfil statutory obligations[14].

4 Stage 1 – Definition of the list of assets needing to be addressed

The first stage mapped out in Figure *1* is to confirm the list of storm overflows needing to be addressed. Environment Act driver guidance states that the Act only applies to permitted storm overflows, however we are currently in the process of reviewing and investigating several other potential (unpermitted) storm overflows. As such there are a number of additional assets which will be permitted (or which are in the process of getting permitted) before the end of AMP7.

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[13] Drainage and wastewater plan | Regulation | About us | Thames Water

[14] Guidance: Water industry national environment programme (WINEP) methodology. Published 11 May 2022. https://www.gov.uk/government/publications/developing-the-environmental-resilience-and-flood-risk-actions-for-the-price-review-2024/water-industry-national-environment-programme-winep-methodology

The PR24 baseline assumes all assets are operating as designed up to, and including, all planned AMP7 interventions. That is, PR24 excludes planned Capital Maintenance and existing and planned AMP7 interventions.

Section 4.1 details the creation of a storm overflows list that will be permitted by the end of AMP7.

4.1 Input data

The following data were used to define and filter the list of assets to be included in the PR24 storm overflow programme:

- ATAC units set up as temporary overflows (e.g., East Shefford and Ramsbury) were included in the initial screening. However, these were subsequently excluded because of their temporary nature.
- The existing overflow EDM list detailing sites already fitted with permanent spill monitoring
- The proposed overflow EDM list detailing sites where there are ongoing proposals to install permanent spill monitoring
- The draft DWMP list of known and modelled storm overflows
- The storm discharge permit database detailing sites where a storm overflow permit is in force
- The Emergency Overflow (EO) discharge permit database detailing sites where an EO permit is in force and which show signs of storm overflow operation, and
- Unpermitted site database detailing sites where an unknown overflow may exist[15]

These lists include Sewage Treatment Works (STWs), Pumping Stations (PSs) and Combined/Consented Sewer Overflows (CSOs) and have been amalgamated into a single list.

The whole asset list amounts to 1066 lines. However, it contains duplicates, sites to be surrendered, non-active sites, emergency overflows, Thames Tideway Tunnel sites as well as storm overflows. Filtering this list to remove duplicates and non-active storm overflows results in a total of 749 storm overflows. This figure forms the 2020 baseline for our public commitment.

4.2 Input data checks

Further filtering based on the "potential" for the site to be an active storm overflow - which is not part of the wider Thames Tideway Tunnel programme, resulted in a revised list for consideration as part of the Storm Overflow Reduction Programme of 695 sites. In this context, "potential" refers to unpermitted storm overflows with little or no information. As part of the screening, these sites were discussed with Thames Water staff who have expertise in the locality, to determine which sites had the potential to be active.

The location of each of the 695 sites was checked against the sewer records and, where possible, the exact outfall location confirmed. Where outfall data were not available, the receiving watercourse was identified from site location and watershed data.

For the 465 storm overflows with EDM data, only two years of corrected EDM data for 2020 and 2021 have been considered for the assessment.

[15] Sites which are under investigation to be permitted as storm overflows 02/12.22

The list of 695 sites was then amalgamated with the DWMP results, based on a "fuzzy match"[16] between datasets. The DWMPs use the SOEP approach to give two options (or solutions) per site to limit the modelled spills to 10 spills per annum on average. These were a storage only option and storage plus contributing area reduction. A smaller number of catchments was looked at in more detail and which have modelled solution options available.

5 Stage 2 – Environment Act Prioritisation Criteria

The storm overflow reduction drivers span multiple AMP periods.

Storm overflows can have multiple drivers within one AMP period. Investigations can be conducted within the same period that improvement schemes will be delivered. By prioritising storm overflows against the WINEP guidance criteria set out below, we can document which storm overflows qualify for specific drivers and determine inclusion for the PR24 or a later AMP period.

The Environment Act requires that each overflow is tested against several categories that define its status as a 'High Priority' site, the performance of the storm overflow and the classification / condition of the receiving watercourse.

The categories relate to different WINEP drivers which are shown in Figure 3.

[16] The original DWMP used dataset which pre-date this exercise with slightly different naming conventions and location information, so attempts were made to reconcile the two. A "fuzzy match" defines a reconciliation methodology which attempted to join the two datasets based on similar names and geographical proximity rather than exact matches.

Driver code	Description	Legal obligation	Tier 1 outcome
EnvAct_INV4	Investigations to reduce storm overflow spills to protect the environment so that they have no local adverse ecological impact.	S	Water company actions to protect the environment from the effects of intermittent discharges.
EnvAct_IMP2	Improvements to reduce storm overflow spills to protect the environment so that they have no local adverse ecological impact.	S	
EnvAct_IMP3	Improvements to reduce storm overflows that spill to designated bathing waters to protect public health.	S	
EnvAct_IMP4	Improvements to reduce storm overflows spills so that they do not discharge above an average of 10 rainfall events per year by 2050.	S	
EnvAct_IMP5	Improvements to reduce storm overflow aesthetic impacts by installation of screens.	S	

Figure 3 Environment Act Core Driver Codes[1]

5.1 EnvAct_INV4

The EnvAct_INV4 driver is instrumental to the EnvAct_IMP2 driver. They focus on adverse ecological impact and look at the overflows potential impact as defined by Reasons for Not Achieving Good (RNAG) and proximity to designated Shellfish Waters and Sensitive Inland Waters. Storm overflows which meet any of the IMP2 driver category's criteria are deemed potential 'High Priority Sites' (see following section for detailed definition).

No local adverse ecological impact means achieving the Urban Pollution Management (UPM) FIS and 99 percentile standards, as referenced in the WINEP guidance. For most sites these investigations (i.e., UPM assessments) have not been undertaken. Therefore, the evidence requirements as set out in WINEP guidance are not available at this time. It follows that for these sites there is insufficient evidence to assess storm overflow performance against the

EnvAct_IMP2 driver at this stage. In order to develop this evidence, each site identified with a EnvAct_IMP2 driver will require a EnvAct_INV4 investigation in early AMP8 to provide certain evidence of local adverse ecological impact. If the investigation will evidence local adverse ecological impact caused by Thames Water assets to meet the EnvAct_IMP2 requirements, an improvement will be made under such driver.

5.2 EnvAct_IMP2

The categories and criteria for 'High Priority Sites' are listed in Figure 4, Figure 5 and Figure 6.

The RNAG category is made up of RNAG and SOAF environmental impact assessments. If either are assessed as "Yes" (either Yes Confirmed, Yes Probable) (e.g., see Figure 4 below) then these overflows are priority storm overflows for the purposes of EnvAct_INV4 and EnvAct_IMP2 drivers. Storm overflows assessed as "No" are not excluded from EnvAct_INV4 and EnvAct_IMP2 drivers, but are to be investigated in later AMP periods, unless they are prioritised for other criteria in PR24.

RNAG *(EnvAct_INV4 & EnvAct_IMP2)*	
RNAG - Sewage Intermittent (Confirmed / Probable) (Discharges into)	**SOAF - Stage 2 Environmental Impact**
No	No
Yes - Confirmed	Yes
Yes - Probable	

Figure 4 Reasons for Not Achieving Good Status[1]

The discharge is considered a priority storm overflows for the purposes of EnvAct_INV4 and EnvAct_IMP2 drivers if the RNAG assessment records "Yes" to either of the following:

- The storm overflow discharges into has a RNAG classed as "Confirmed" or "Probable" for "Intermittent Sewage".
- The outcome of SOAF assessments. If the assessment identified a storm overflow causing an "environmental impact" then flag as "Yes".

Sensitive Inland *(EnvAct_INV4 & EnvAct_IMP2)*			
Discharges into or within 50m of SSSI water feature	**Discharges into or within 50m of SAC, SPA, RAMSAR water feature**	**Discharges into or within 50m of Chalk River**	**Discharges into or within 50m of Eutrophic Special Area (UWWTR sensitive area)**
No	No	No	No
Yes - unfavourable status	Yes - unfavourable status	Yes	Yes
Yes - favourable status	Yes - favourable status		

Figure 5 Sensitive Inland Waters[1]

Designated Shellfish Waters *(EnvAct_IMP2)*
Discharges into or less than 1km upstream of a designated Shellfish Water - assess against >10 spills per annum
No
Yes

Figure 6 Shellfish Waters[1]

Until the INV4 investigations (detailed above) are concluded in 2027 we are unable to conclusively determine how many of the 326 storm overflows which fall into this category have an adverse local ecological impact (as defined by UPM FIS and 99 percentile standards). A reasoned approach is then needed to determine the potential outcome of the detailed AMP8 INV4 investigation driver to achieve the 38% target of High Priority sites needed.

An assessment based on 'likelihood of adverse impact' has therefore been made so weightings can be introduced into calculations to determine a probable number of sites to carry forwards with IMP2 drivers at this stage.

This 'likelihood of adverse impact' assessment weighting is detailed below[17]:

- High - a weighting factor of 1 is applied to each overflow where an AMP7 investigation such as a SOAF, UPM or Groundwater Impacted System Management Plans (GISMP) has been carried out and recommended further works and / or both 2020 and 2021 EDM data had spill durations greater than 87.6 hours[18].

[17] Please note that this is a different assessment to 'Harm Potential' as defined in section 8.2.
[18] 87.6 hours is a figure taken with basis from the 99-percentile standard assessment

- Moderate - a weighting factor of 0.5 is applied to each overflow where no data is available or just one of 2020 or 2021 EDM records had spill durations >87.6
- Low - a weighting factor of 0.25 is applied to each overflow where EDM spill duration records from 2020 or 2021 are <87.6 hrs.

5.3 EnvAct_IMP3

The EnvAct_IMP3 driver is designed to protect public health. It requires improvements to reduce storm overflow discharges that are highly likely to impact upon designated bathing waters. See Figure 7 for details.

Designated Bathing Waters *(EnvAct_IMP3)*		
Discharges into or less than 1km upstream of a designated Coastal Bathing Water with good/sufficient/poor status assess against >3 spills per bathing season	**Discharges into or less than 1km upstream of a designated Coastal Bathing Water with excellent status assess against >2 spills per bathing season**	**Discharges into or less than 5 km upstream of a designated Inland Bathing Water with good/sufficient status assess against >1 spill per bathing season**
No	No	No
Yes	Yes	Yes

Figure 7 Bathing Waters[1]

5.4 EnvAct_IMP4

The objective for the EnvAct_IMP4 driver is to reduce storm overflows spills so that they do not discharge above an average of 10 rainfall events per year by 2050. This is based on a rolling annual average of 10 years of spill data.[19] All spill events will be counted, including those that spill less than 50m^3. A spill event is defined using the 12/24 counting method. Sites which currently spill less than this based on either 2020 or 2021 (highest value taken) EDM data are exempt[20]. See Figure 8 for details.

[19] To measure success where a solution is implemented it can be assumed that a step change in performance will occur following the intervention and the annual average is then calculated from the date of enhancement rather than the full 10 years. This is in line with recognised measures of success for other water quality improvements like bathing waters.

[20] Thames Tideway Tunnel sites are also excluded from this list

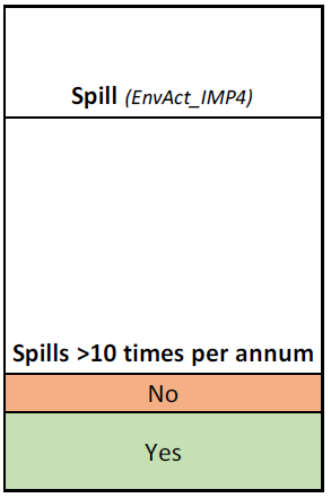

Figure 8 Improvements to reduce storm overflows spills so that they do not discharge above an average of 10 rainfall events per year by 2050[1].

5.5 EnvAct_IMP5

The objective for the EnvAct_IMP5 driver is that all storm overflows discharging to inland, estuarine, and coastal waters, have screening controls to limit discharge of persistent inorganic material (as well as faecal and organic solids), and they must be well maintained.

Screening controls are defined as 6mm solids separation: separation from the spill to environment effluent, of a significant quantity of persistent material, and faecal and organic solids, greater than 6mm in any 2 dimensions. Screens should be designed to operate effectively up to the 1 in 5-year flow rate. See Figure 9 for details.

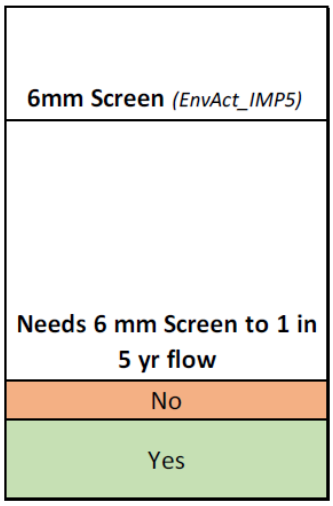

Figure 9 Aesthetic impact control[1].

5.6 Outputs from the Stage 1 and 2 assessments

A summary of the Stage 1 and Stage 2 assessments is detailed below:

- There are 695 active storm overflow assets of which 495 have storm overflow permits and EDM records
- Of these, there are 330 potential IMP2 High Priority Sites with weightings applied based on likelihood of adverse impact. 38% of these High Priority sites which are predicted to have an adverse local ecological impact will need to be addressed prior to 2030.

- There are 2 IMP3 sites to be addressed prior to 2030 based on current bathing water designations.[21] This number may increase as additional bathing waters get designated.
- Of the 695 storm overflows, 639 are predicted to discharge more than 10 times in either 2020 or 2021 EDM data returns or are potential high priority sites. 14% of all overflows need to be addressed prior to 2030.
- 15 of these overflows discharge into 'sensitive catchments' as defined by our public commitment of which 80% need to be addressed prior to 2030.

6 Stage 3 – Define Solution through application of Solution Hierarchy

For each of the 695 sites, solutions were subject to a hierarchy based on the quality of supporting information

- Where an AMP7 investigation has been completed, the recommended solution and associated costs have been taken forward into site selection process[22], in accordance with WINEP Options Development guidance[23].
- Where no appropriate investigation has been undertaken SOEP solutions have been used as per the DWMPs SOEP approach to limit the modelled spills to 10 spills per annum. Additional measures are added to the solution if appropriate (please refer to section 7.2 for more details).
- Where no SOEP assessment has been undertaken due to a lack of available information, a notional solution with default unit costs have been used. This default cost model is not within the WINEP long list of options and therefore has not been carried through as one of the constrained options. However, it serves to provide a solution costing in situations where there are insufficient data to select one of the constrained list WINEP options.

Table 1 details the hierarchy and the solutions generated.

Table 1 Storm Overflow Solution Hierarchy

Solution Hierarchy	Solution Type
Investigation completed and solution developed (UPMs)	As per Preferred Solution
SOEP + GISMP, I_{max} or I_{max} default model	Two solution options: one Grey/Green and Green/Grey
Default Model	Unit Cost

Please note that this section refers to the solution hierarchy. The solution hierarchy relates to quality and quantity of available data. It should not be confused with the WINEP option development set out in the ODR, which relates to screening of options from a long list to unconstrained, constrained, and feasible options in accordance with the WINEP guidelines. The

[21] Candidate Churt SPS upstream of Frensham Great Pond, Designated Cassington STW upstream of Wolvercote Mill Stream.

[22] It should be noted UPM studies inform PR24 and the optioneering and costing have been updated following the methodology required by PR24 EA WINEP guidance.

23 Extract from Options Development Guidance "Required at appropriate scale (or PR19 investigation output treated as ODR where option developed in PR19)"

WINEP options development identified two generic options, which have numerous sub-options within them. These are:

1. WINEP Combined option 2 (C1): Infiltration reduction with storage (Option O2) and SuDS (Option J1) to mitigate residual spills
2. WINEP Combined option 1 (C2): source control SuDS measures with wetlands (Option E4) and storage (Option O2) to mitigate residual spills

6.1 SOEP Grey/Green and Green/Grey solutions

From the SOEP assessment, the following baseline solutions have been selected which are consistent with the WINEP constrained options:

- Grey/Green[24] option - Storage required to limit the modelled spills to 10 spills per annum + Grey/Green additional measures
- Green/Grey option - Storage required to limit the modelled spills to 10 spills per annum with 10% reduction in impermeable area + Green only additional measures

At sites where the measured spill performance is above 40 spills per annum or where modelled spill performance does not match measured spill performance (within 15 spills per annum[25]) additional measures have been deemed to be required for increasing the level of confidence for a solution in achieving the outcome. These measures are in addition to the stated SOEP solution. The additional measures are not designed to achieve the target spill reduction themselves but rather provide a volume reduction arriving at the overflow to reduce baseline spill numbers.

6.2 SOEP Grey/Green Additional measures

Additional measures are split between management of above ground 'surface' flows and below ground protection measures.

The level of investment is based on the I_{max} observed at the site.

54 catchments have a GISMP and within each GISMP the sewer network has been classified by the groundwater potential infiltration risk (H/M/L[26]). Where sites are within a GISMP the degree of additional measures to be carried out is based on the Imax/PE[27] as detailed in

[24] Grey infrastructure refers to human-made structures using hard building materials. Green infrastructure consists of more natural solutions.
[25] In the absence of agreed standards to assess confidence between modelled spill frequencies and EDM results internal standards have been used. Where there is a difference of >15 spills between model and EDM results beneath an upper threshold of 40 spills it can be considered there is a low confidence in the required modelled storage estimates which are needed to achieve a 10 spill per annum (or alternative) solution.
[26] Risk zone categories as defined by the GISMP
[27] Population equivalent or unit per capita loading, (PE), in waste-water treatment is the number expressing the ratio of the sum of the pollution load produced during 24 hours by industrial facilities and services to the individual pollution load in household sewage produced by one person in the same time.

Table 2.

Table 2 Additional measures

Catchment I_{max}/PE	GISMP	I_{max} method
Less than 300 l/PE/day	Scope to include sewer lining measures under the high-risk category	In the case of no GISMP use Equation 1 below
Less than 301 - 800 l/PE/day	Scope to include sewer lining measure under the H+M risk category	
Greater than 801 l/PE/day	Scope to include sewer lining measure under the H+M+L risk category	

Where no GISMP has been developed Equation 1 has been used to define the sewer lining requirement:

$$sewer\ lining\ measures = \frac{I_{max}/PE}{1500} \times 9m \times PE$$

Equation 1 I_{max} Sewer lining method

Once the overall lining value is defined, 50% is converted to surface measures Sustainable Drainage Systems (SuDS) to control and manage surface flows as a priority or disconnecting of surface water connections into a foul system.

Sewer Lining is an inherently uncertain activity in terms of achieved inflow reduction performance. Therefore, an alternative variant has been considered to replace the sewer lining measures. Furthermore, unlike addressing surface flows the benefits of infiltration reduction will be variable year on year unlike tackling at the end of pipe which will provide year on year benefit. An end of pipe conventional treatment solution has been developed. Selection between end of pipe and sewer lining is based on whole life least cost.

6.3 Green only Additional measures

Peak Flow Equivalent Treatment solutions as additional measures using Integrated Constructed Wetlands (ICW) at the STW have also been developed.

To control the risk to compliance, an assessment has been carried out to determine if an ICW would be subject to an Operating Techniques Agreement (OTA). An OTA is an agreement between the Environment Agency and the Water and Sewage Company (WaSC) to work together with the aim of achieving water quality objectives, while reducing energy use, carbon emissions and obtaining additional benefits associated with nature-based solutions, such as increasing

biodiversity and improving natural capital. Green Peak Flow Equivalent Treatment solutions have only been considered in cases that OTAs are likely to accepted under current guidance.

Where no flow information is available the sizing to the ICW is based on $3m^2$ per PE served by the site[28].

Where the opportunity for a wetland solution was identified, catchment screening was undertaken to ensure the location was suitable for wetlands. This comprised a geospatial analysis of factors that would support wetlands development (e.g., gradient). Further details regarding wetlands screening are provided in the ODR.

7 Stage 4 – Solution Option Costings

For each site, the costing of options has been made in accordance with the WINEP methodology. This has then been harmonised with the overall PR24 scope and cost assurance methodology, to produce F909s[29] for each site.

8 Stage 5 - Benefits Assessment and Options Selection

8.1 Benefits Assessment

As part of the options assessment process, individual benefits assessments have been made for each site. This has been done in accordance with the WINEP guidance using the Benefits Assessment Tool (BAT) developed specifically for PR24 WINEP.

The BAT has been reviewed by Thames Water, its PR24 consultants and the Environment Agency (through various consultations). The WINEP storm overflow assessment used BAT version 5.2.

In accordance with the WINEP guidance, the BAT was applied to all storm overflows where there was not an existing PR19 investigation output[24]. There are 11 storm overflows where PR19 UPM investigations have already identified the preferred solution. For these UPM storm overflows the BAT was not used to support option selection.

The BAT used for the storm overflow assessment is embedded ODR.

In addition to the above, the Environment Agency provided a Wider Environmental Outcomes (WEO) spreadsheet to be completed as part of the WINEP reporting. This has been completed by Thames Water for all WINEP drivers.

8.2 Options Selection

The BAT supported option selection for all schemes where a PR19 investigation had not already identified the preferred option.

The process used for options selection follows:

1. For each storm overflow the WINEP generic options were compiled. These comprised high level grey/green or green/grey options and their associated sub-options.
2. Each option was then assessed the BAT (except for the 11 UPM PR19 preferred solutions). This included sub-option assessment (e.g., grey source control and grey end of pipe).

[28] Based on CIRIA Report 180 Review of design and management of constructed wetlands
[29] Thames Water's internal costing spreadsheet tool, which has been externally assured.

3. Following the BAT assessment, the least cost option was selected as the preferred option.

9 Stage 6 – PR24 / AMP8 Profiling Selection Criteria

A series of selection criteria has been identified to support the profiling of the Storm Overflow programme and thus AMP8 investment. The selection is split between binary requirements (AMP8 or after AMP8) and criteria which will be used for further profiling / prioritising of investment.

In total, five "Ranked Categories" have been used for profiling / prioritising the overall programme. The criteria used are:

- Deliverability: scored between 0 and 3
- Harm potential: scored between 0 and 3
- Additional site information: scored as -2, 0 or +2

The combined score must be four or above (as the threshold value for a project likely to achieve the outcomes required by the guidance) to be considered within one of the investments Ranked Categories.

The following sections and associated scoring include an assessment of risk. However, the WINEP risk assessment is reported more fully in the ODR.

9.1 Deliverability

Solutions will require confirmation that the site requires investment, and to what degree, to meet the objective. The following criteria have been developed to score one site solution against another.

- 3 pts, deliver within 2 years - an AMP7 investigation such as a SOAF, UPM or GISMP has been carried out and recommended further works, the catchment is less than 20,000 PE and the cost of the solution is less than £5m
- 2 pts, deliver within 2-3 years - at least two of the above are achieved
- 1 pts, deliver within 3-4 years - at least one of the above are achieved
- 0 pts, deliver 4+ years - none of the above are achieved

9.2 Harm Potential

Based on existing AMP7 investigation or storm overflow spill duration, the following scoring criteria has been developed.

- 3 pts, High, an AMP7 investigation such as a SOAF, UPM or GISMP has been carried out and recommended further works or the overflow is listed on the Natural England Nature Recovery site list
- 2 pts, Moderate, both 2020 and 2021 EDM data had spill durations greater than 87.6 hours[30]
- 1 pts, only one of 2020 or 2021 EDM records had annual spill durations of >87.6 hrs
- 0 pts, neither 2020 or 2021 EDM records had annual spill durations of >87.6 hrs

A 0.5 points score is given in the case of no data.

[30] 87.6 hours is a figure taken with basis from the 99-percentile standard assessment

9.3 Additional Site Information

This criterion seeks to quantify our knowledge of the site, based parameters including, but not limited to, site constraints, constructability of solutions and wider benefits captured by other public or regulatory commitments

Scores -2, 0 or +2 are awarded depending on the impact or benefit of this knowledge upon the proposed solution. It should be noted that the default position is zero and that this criterion is only used to support selection based on other criteria. Scoring has been done through expert judgement in consultation between Thames Water and its consultants.

9.4 Categorisation into 'Ranked Categories'

The AMP8 Profiling Selection Criteria are then used to help prioritise, rank and profile the Storm Overflow list into a series of 'Ranked Categories'. These 'Ranked Categories' are aligned with Environment Act driver guidance targets, or our public commitments stated in section 2. For example, Storm Overflows falling into Category 1 and Category 2 will help to achieve the delivery target of addressing 38% of High Priority overflows by 2030 as shown in Figure 2. Additionally, Ranked Categories 3, 4 and 5 capture those overflows which achieve the delivery target of addressing 14% of total storm overflows by 2030 as shown in Figure 2.

The Category site selection process should be viewed as a sequence of selection criteria which each build on the previous categories.

Categories 1, 3 and 4 are largely constrained lists which are all included if the AMP8 Profiling Selection Criteria scorecard threshold is achieved. Category 2 and Category 5 are less constrained and are subject to prioritisation to inform the PR24 profiling. The intent of each selection process is detailed below.

- Category 1 High Priority Overflows with High Harm Potential
  Must score a minimum of 4 on the AMP8 Profiling and Selection Criteria.
  High Priority sites (as defined by the Environment Act) with 'High' Harm Potential (i.e., AMP7 SOAF, GISMP or UPM assessment has been completed or is on the Natural England Nature Recovery Site list).
- Category 2 High Priority Overflows
  Must score a minimum of 4 on the AMP8 Profiling and Selection Criteria.
  High Priority Sites (as defined by Environment Act) but do not require 'High' Harm Potential.
- Category 3 Non-High Priority Overflow with High Harm Potential
  Must score a minimum of 4 on the AMP8 Profiling and Selection Criteria.
  Site is not defined as High Priority by the Environment Act but is included as part of the wider need to address all high spilling storm overflows. The site is also listed as having with 'High' Harm Potential (i.e., AMP7 SOAF, GISMP or UPM assessment has been completed or is on the Natural England Nature Recovery Site list)
- Category 4 Non-High Priority Overflow with NBS Solutions or in 'Sensitive Catchments'
  Site is not defined as High Priority by the Environment Act but is included as part of the wider need to address all high spilling storm overflows. The Storm Overflow is either defined as being in a 'Sensitive Catchment' (as per internal TW definitions associated with our public commitments – see section 2.2) or the preferred solution option involves significant green infrastructure.

- Category 5 Residual Overflows
  All residual storm overflows left subsequently profiled based on Cost per Hour Resolved (cost of solution / spill duration reduction in hours).

9.5 Breakdown of selection process

The following points outline the AMP8 Storm Overflow programme (total 133 sites) and demonstrate how this complies with both the Environment Act Statutory targets and our public commitments set out in section 2.

- EnvAct_IMP2 - To achieve a 38% reduction in storm overflows discharging to High Priority sites by 2030, 71 of the 188 High Priority sites need to be addressed in AMP8. This is all 41 sites in Category 1 plus the highest ranking 30 sites from Category 2.
- EnvAct_IMP3 - 2 storm overflows allocated in Category 1 impact inland or coastal bathing waters, both of which will be delivered in AMP8.
- EnvAct_IMP4 - To achieve a 14% total reduction in storm overflows by 2030 a further 18 storm overflows need to be addressed in AMP8[31]. 19 sites from Categories 3 and 4 are selected
- Public commitments – this programme of works would result in a spill duration reduction of 110,556, exceeding the remaining 105,487 hours (assuming rainfall data is normalised) needed to achieve a 50% target spill duration reduction against the 2020 baseline as defined in section 2.2.
- Public commitments – this programme of works includes 12 of the 15 storm overflows which are defined as being in 'sensitive catchments' under the definitions associated with the public commitment. This corresponds to an 80% reduction in AMP8.

A summary of the AMP8 Storm Overflow Programme by Category is shown in Table 3.

[31] The target for all storm overflows to be improved is 89 based on a confirmed all position of 639 overflows. Calculated as 695 – Sites with spills less than 10 spills and are not confirmed as requiring improvement under IMP2 or IMP3 (88 sites)

Table 3 Summary table of AMP8 Storm Overflow Programme

Category	Description	Number of Sites	No. of IMP2 High Priority Sites	No. of IMP3 BW Sites	No. of Core driver sites to meet Env Act Delivery Profile	Additional Core driver sites to meet Public Commitment	Commitment to 80% Spill Duration Reduction in sensitive catchments [number of sites]	Commitment to 50% Spill Duration Reduction [number of sites]
1	High Priority Overflows with High Harm Potential	41	41	2	41		10,375 [6]	25,356 [41]
2	High Priority Overflows	30	30		30		166 [2]	5,225 [30]
3	Non-High Priority Overflow with High Harm Potential	26	-		10	16		28,736 [26]
4	Non-High Priority Overflow with NBS Solutions or in 'Sensitive Catchments'	9	-		9		2,556 [4]	9,458 [9]
5	Residual Overflows	27	-			27		41,933 [27]
Env Act Profile targets			71		89			
Commitment targets							11,380	105,487
Total number of IMP2 sites			71			27		53,062
Total number of IMP3 sites				2				297
Total number of Core driver Sites					90	43		80,127*
Duration reduction in sensitive catchments							13,097	14,225
Total Spill Duration Reduction (hours)								110,708

*Only IMP4 sites

10 Stage 7 – Prepare WINEP ODR and OARs

For each Action ID identified, individual OARs have been developed. A Single Group Options Development Report (ODR) has been developed at programme level.


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