

# Drainage and Wastewater Management Plan

Summary of the methodology for the Baseline Risk and Vulnerability Assessment (BRAVA) on:

**Wastewater Treatment Works Water Quality Compliance**

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from  
**Southern  
Water** 

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# 1. Background

## 1.1. Purpose

The purpose of this document is to provide a summary of the method for undertaking the Baseline Risk and Vulnerability Assessment (BRAVA) for the planning objective on **Wastewater Treatment Works (WTW) Water Quality Compliance**.

The BRAVA is an important step in the development of Drainage and Wastewater Management Plans (DWMPs). It is an assessment of current and future risks for each of the planning objectives below and is undertaken for the sewer catchments that were flagged during the Risk Based Catchment Screening (RBCS).

All Water and Sewerage Companies (WaSCs) are required to complete a BRAVA and report to Water UK on the following six common planning objectives:

1. Risk of sewer flooding in a 1 in 50 year storm
2. Storm overflow performance
3. Risk of WTW compliance failure
4. Internal sewer flooding risk
5. Pollution risk
6. Sewer collapse risk

We have developed this methodology in accordance with Water UK guidance on '[BRAVA planning objectives for national reporting](#)' published on 29 July 2020. An extract from the Water UK guidance on the planning objective for WTW quality compliance failure is provided in the Annex to this document.

## 1.2. Definitions

The Environment Agency (EA) regulates wastewater treatment works (WTW) by assessing the quality of the wastewater they discharge against set compliance limits. The level of treatment and monitoring that is required is based on the size of the population the WTW serves and where the final effluent is discharged. The quality of the final effluent discharged to the environment is set in the consent or permit that is issued to us by the EA. The EA sets conditions in the permits based on the nature and sensitivity of the local environment and the receiving water body. These conditions can include the composition of the discharge such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), pH, ammonia (NH<sub>3</sub>) and Phosphorus (P). In a few of our sites we are also required to monitor metals.

In a few of our sites we installed UV plant to disinfect effluent before it is discharged to the environment. Performance of the UV plants has not been assessed as part of this planning objective in this cycle of DWMP.

We focus on managing our assets and their performance to be 100% compliant with the permits.

## 1.3. Reporting Requirements

Water UK guidance on DWMPs requires all WaSCs to report on the WTW water quality compliance for the baseline 2020 horizon and a 2050 planning horizon. The 2050 planning horizon considers the impact of growth within a catchment.

In addition to the planning horizons required by Water UK, we will complete an assessment for 2025, 2030 and 2035 to support the development of our DWMPs.

## 2. Data Sources

The following is a short description of the data that has been used and where it has been obtained from.

### 2.1. WTW Compliance

We have 367 WTW sites. 295 of our sites have a full licence and 72 have a descriptive licence. Most of the WTWs with a descriptive licence are very small and no specific numerical condition has been set on the composition of the discharge.

We take 24 hour composite samples of crude and final effluent in accordance with the Urban Wastewater Treatment Regulations (UWWTR) 1994, for all our sites serving a population equivalent (PE) of 2000 or more. We also take spot samples in accordance with the Environmental Permitting Regulations (EPR) 2010.

Our compliance samples are recorded in our database system, SAP BI.

For the BRAVA, we have used data from SAP BI for the last three year period from 2018, 2019 and 2020 (up to October 2020). We have not used data from 2017 as this data falls within a period of mis-reporting that is currently under investigation.

### 2.2. WTW Capacity Assessment

We use an asset performance assessment tool developed in-house called 'AM410'. The tool allows us to assess the capacity of each unit in a WTW as a function of the PE. Table 1 shows the type of capacity assessment for process units in a WTW.

**Table 1: Type of capacity assessment at each process stage/unit at WTW**

Process stage	Process units	Theoretical capacity assessment
Preliminary	Screens	Hydraulic
Primary	Primary Settlement Tank ( PST), septic tanks, lamellas	Hydraulic
Secondary biological	Trickling filter, Activated Sludge Process (ASP), Submerged Aerated Fixed Films (SAFF) , Biological Aerated Flooded Filter ( BAFF)	Biological
Secondary settlement	Humus tank, Final Settlement Tank (FST)	Hydraulic
Tertiary biological	Nitrifying Submerged Aerated Filter (NSAF),	Biological
Tertiary settlement	Sand filter, cloth filter, disk filter, reed bed	Hydraulic

## 2.3. Population Growth

Population data for each of the sewer catchments is obtained from the Experian 7.1 (SAGE) database, which compiles domestic data and includes trade and cesspit wastewater collected from networks which are not directly connected with wastewater treatment works and which provides current and projected (future) population levels across our operating region. This population data is collated for each sewer catchment for the 2020 baseline and for the projected 2045 planning horizon. For the purpose of this study, the 2045 is projected linearly to 2050.

## 2.4. Asset Risk Management (ARM)

Asset risks identified during operation or supervision are recorded in our Asset Risk Management (ARM) database. The database provides details of the risk identified, its consequence, likelihood and a risk score. The risk scores are assigned in account of likelihood and consequence of the risk. The higher the risk score is the higher the consequence and likelihood.

We used the information on consequence and risk score in ARM to identify asset condition that may pose risk in achieving the water quality compliance.

## 3. Method of Assessment

The following methodology has been developed to assess the level of risk of compliance.

### 3.1. Process - Baseline (2020)

#### 3.1.1 Capacity Assessment

The UWWTR and EPR are used for the baseline assessment on WTW compliance.

From the EPR and UWWTR Site Compliance Report, the compliance status of all sites are listed. For each status, a score is give according to the table below:

**Table 2: Score for each compliance status**

Compliance status	Compliance score
Fail	10
Critical	5
Sub Critical	3
Pass	0
N/A	N/A

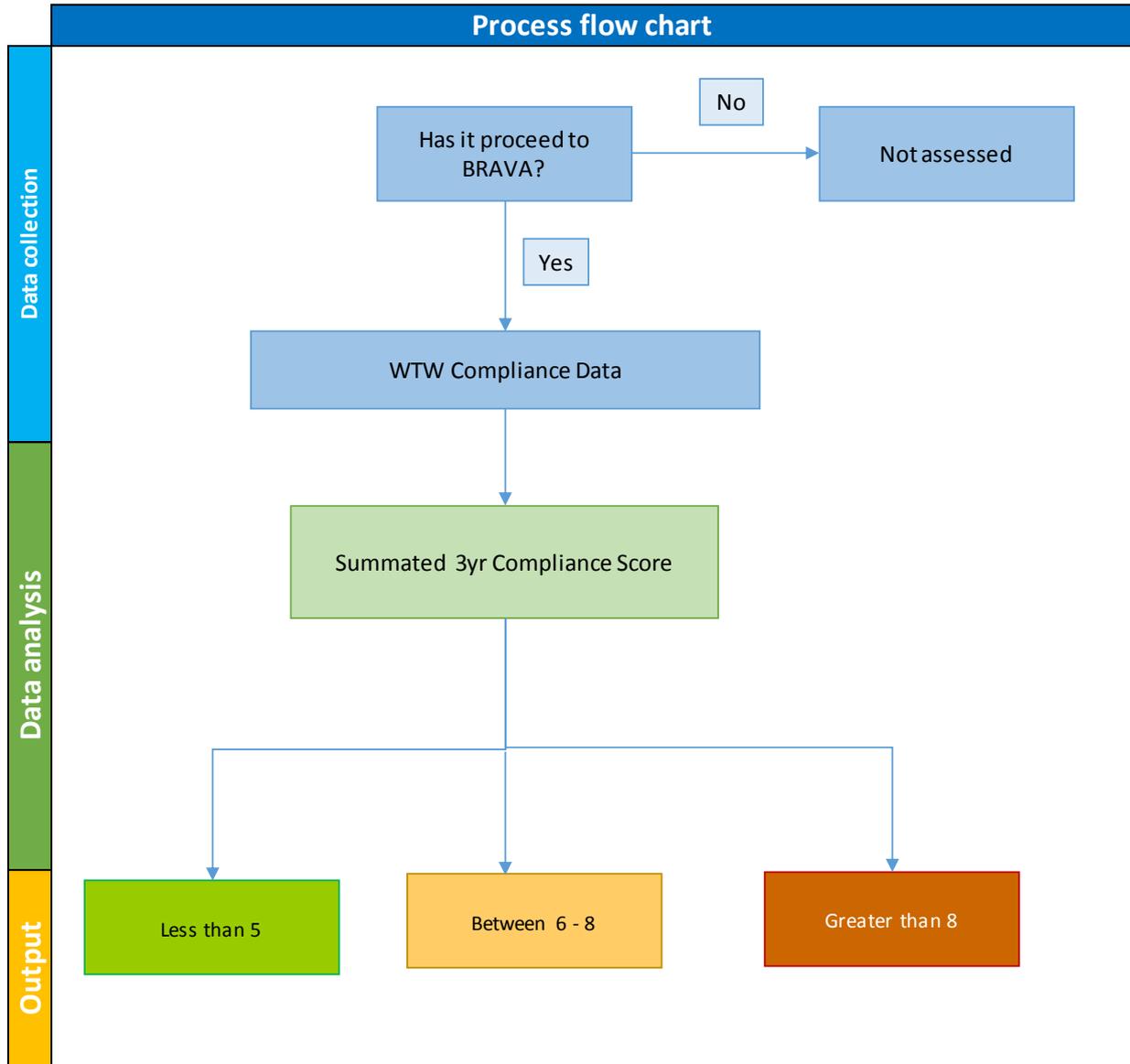
The compliance status for the past 3 years (2018, 2019 and 2020 (up to October)) are added together to give an overall compliance risk score for each WTW as per table 3.

**Table 3: Banding based on the total of the last 3 years compliance score**

EPR compliance - Risk band	Description	Summated compliance score
2	Very significant risk	$\geq 9$
1	Moderate risk	$6 \leq X \leq 8$
0	No significant risk	$\leq 5$

The process for the baseline 2020 assessment is illustrated in figure 1.

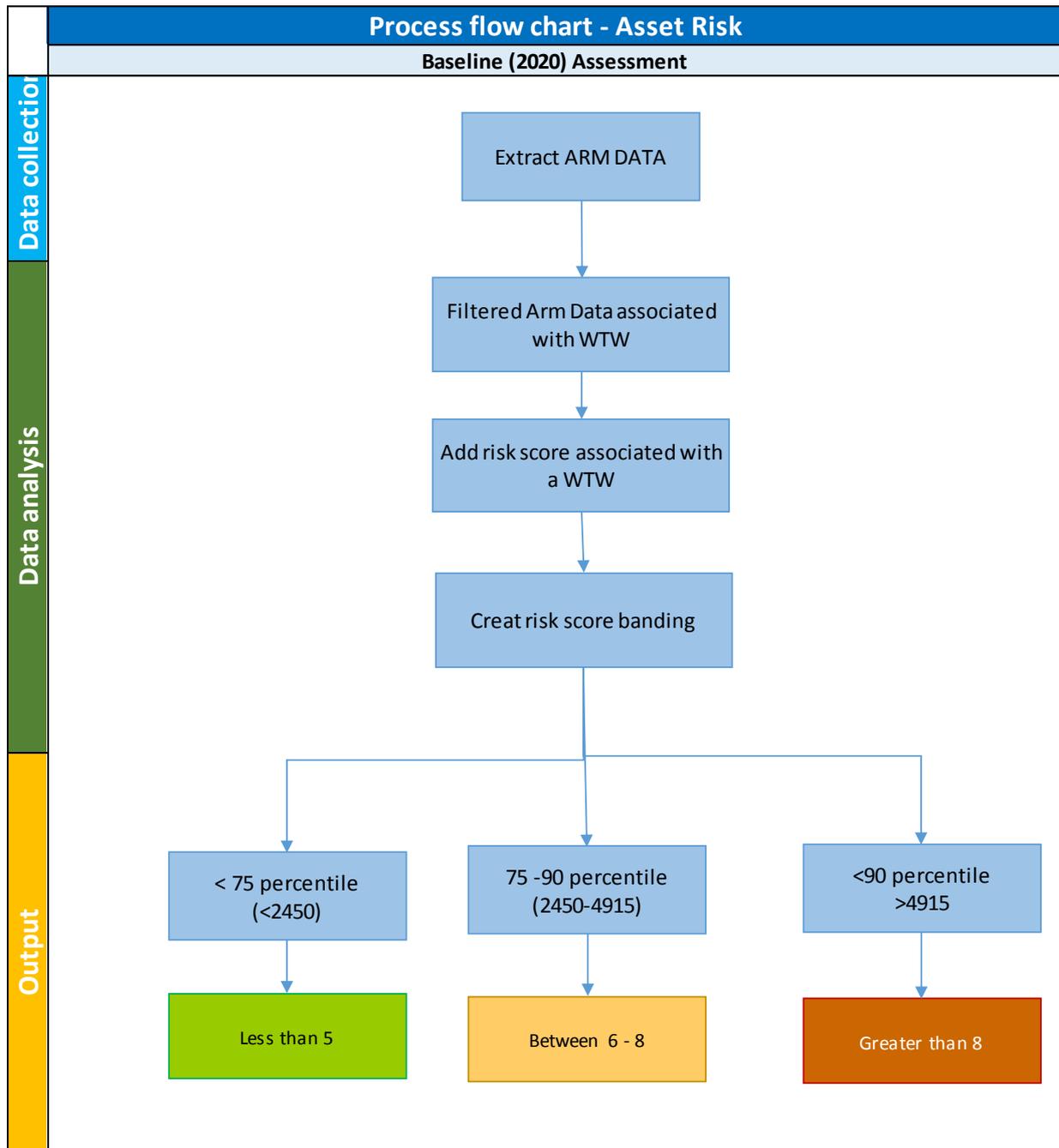
Figure 1 Process flow chart for the 2020 (baseline) Water Quality Compliance BRAVA



### 3.1.2 Asset Condition Assessment

The condition of our assets is a factor in the overall performance of our sites and our ability to achieve the permit conditions. In addition to the capacity risk assessment we also assessed the risk of water quality compliance failure based on the condition of our wastewater treatment works. The condition assessment is based on last three years compliance record for baseline and impact of growth in a catchment for future planning horizons. The ARM data is used to identify asset conditions that potential may lead to failure of achieving water quality compliance. The process is shown in figure 2.

Figure 2 Process flow chart for the Asset Condition Risk to WTW BRAVA Assessment



### 3.2. Process - 2050 Assessment

The projected population forecast from Experian 7.1 (SAGE) to determine future wastewater treatment works capacity. The future wastewater treatment works capacity is compared with the available capacity at the works and is used to define the additional capacity required. When assessing future capacity we have made the following assumptions:

- WTW assets and their condition will remain the same between 2020 and 2050
- Receiving water quality and permits remains the same unless already confirmed in AMP7
- Existing capacity assessment is validated based on current WTW compliance. That is, if a WTW is currently meeting the compliance requirement and has not failed in the last three years but the current theoretical capacity assessment indicates that there is a shortfall in capacity the WTW is considered to have adequate capacity. Therefore the additional capacity required is determined as the difference between future and current theoretical capacity. WTW are banded according to the additional capacity required, as shown in the table below.

**Table 4: Future banding of WTWs according to additional capacity required**

Capacity risk score	Description	Additional capacity required
2	Very significant	> 10%
1	Moderately significant	5 < X <=10%
0	Not significant	<= 5%

### 3.3. Outputs from the BRAVA

#### 3.3.1 Capacity Assessment

The capacity assessment for each of our 295 WTWs with a numerical permit was completed for 2020 and 2050 using the methodology outlined above.

The results of these assessments have been used to categorise each of our WTWs into three bands as required by Water UK. These bands and the thresholds are shown in table 5.

**Table 5: Banding of WTWs according to capacity of the treatment works**

Assessment Criteria / Thresholds	Band	
Currently compliant – lower chance of failure Future – (additional capacity required <5%)	0	<i>Not Significant</i>
Currently compliant – higher chance of failure Future (additional capacity required 5% -10%)	1	<i>Moderately Significant</i>
Not currently compliant Future (additional capacity required >10%)	2	<i>Very Significant</i>

### 3.3.2 Asset Condition Risk Assessment

The overall risk at WTW is calculated by summing up total risk score of each items or assets at the works as recorded in the ARM database. The overall risk score is then used to define the risk banding as shown in the Table 6.

**Table 6: Banding of WTWs according to Asset Condition**

Total Risk Score Required	Band	
< 75 <sup>th</sup> percentile	0	<i>Not Significant</i>
between 75 <sup>th</sup> and 90 <sup>th</sup> percentile	1	<i>Moderately Significant</i>
> 90 <sup>th</sup> percentile	2	<i>Very Significant</i>

### 3.4. Aggregate risk band

Aggregated score is derived by taking the worst band of the two risk assessment undertaken. That is if a catchment in Band 0 on the assessment undertaken based on compliance record but the asset condition risk come up as Band 2 the aggregated risk score of the catchment is taken as Band 2.

## 4. Annex: Water UK guidance

Planning Objective: Risk of WTW Quality Compliance Failure	<p><b><u>Objective/Definition</u></b></p> <p>To be applied to all catchments that have triggered a BRAVA assessment through the RBCS process. This planning objective defines the 'Risk of WTW quality compliance failure'. A compliance failure aligns to the current definition as set out in the <a href="#">EPA guidance</a>. Covers treatment works compliance as set out in Environmental Performance Assessment (EPA) at wastewater assets only. This measure will exclude water treatment works compliance as these assets are not relevant to Drainage and Wastewater Management plans. Results to be presented for the Baseline (2020) and Long term (2050). Companies may choose to cover other elements of WTW compliance in bespoke assessments.</p>	<p><b><u>Definition clarifications</u></b></p> <p>Where WTW have no numeric permit conditions (Descriptive permits), catchments should be flagged as "Not Applicable". Any issues identified with sites holding a descriptive permit should still be considered for options development.</p> <p><b><u>Thresholds</u></b> Bands of 0, 1 &amp; 2 to be applied; with 0 as 'Not Significant', 1 as 'Moderately Significant' and 2 as 'Very Significant'. Where a catchment does not trigger BRAVA, or it is not appropriate to conduct an assessment as per the framework they will be flagged as 'Not applicable'. Thresholds for bands to be developed by each company appropriate to their needs and to ensure outputs are meaningful to inform stakeholder engagement.</p> <p><b><u>Maps</u></b> To be produced at for L2 to visually display bands 0, 1 &amp; 2.</p> <p><b><u>Tables</u></b> To be produced for L1, L2 &amp; L3 and include only 0, 1 &amp; 2 banding.</p>
	<p><b><u>Baseline Assessment</u></b></p> <ul style="list-style-type: none"> <li>The baseline performance is to be based on an assessment of modelled WTW treatment capacity.</li> <li>Where a suitable WTW model is not available companies will use historic performance data to produce a projection of compliance using the last 3 years of performance data.</li> <li>This baseline assessment considers compliance with current permit only.</li> <li>Companies will provide commentary where there is no model to provide transparency.</li> <li>The L3 results are to be aggregated up to a L2 based on PE served.</li> <li>Each company will determine the thresholds it will use to ensure the results appropriately reflect their risk and provide an overview of their calculations.</li> </ul>	<p><b><u>2050 Assessment</u></b></p> <ul style="list-style-type: none"> <li>Same methodology as Baseline Assessment, should be used with the following changes to model inputs and parameters                             <ul style="list-style-type: none"> <li>Updated population equivalent projections</li> <li>Updated flow and load projections</li> <li>Updated permit conditions where there are committed permit change anticipated in AMP7 e.g. WINEP</li> </ul> </li> <li>Where there is no model, a factor should be applied to the trend analysis to account for growth.</li> </ul> <p><b><u>Assumptions</u></b></p> <ul style="list-style-type: none"> <li>WTW assets and condition remain the same between 2020 and 2050</li> <li>Receiving water quality remains the same and does not trigger permit changes unless already confirmed in AMP7. The approach for how climate change will impact this will be developed with stakeholders in advance of cycle 2.</li> <li>The approach for forecasting UV compliance will be reviewed as companies start to produce meaningful data.</li> </ul>