

How to classify storm overflow performance

Guidance note

Reference number: GN066

Document Owner: Head of Business, Regulation and Permitting

What is this document about?

This guidance outlines the criteria, process and methodology Water and Sewerage Companies should use to classify the status of both permitted and unpermitted storm overflows. The classification will be used to plan and prioritise improvements to bring all storm overflows up to satisfactory status.

There is additional guidance for unpermitted storm overflows in GN021 Unpermitted Storm Overflows. This can be obtained using the email address for queries and feedback below.

Who is this document for?

Water and Sewerage Companies that operate wholly or mainly in Wales.

Contact for queries and feedback

Water Quality Policy team: waterqualitypolicyteam@cyfoethnaturiolcymru.gov.uk

Version History

Document version	Date published	Summary of changes
1.0	26 October 2023	Document published
2.0	29 July 2026	Chapter 1 <ul style="list-style-type: none">Clarification of the following terms 'should', 'must', 'could', 'you', 'your', 'we', 'us', 'our' terminology which is used throughout this document. Chapter 2 <ul style="list-style-type: none">Definitions of Infiltration, inflow and unusually heavy rainfall added to the guidance.The definitions have been re-ordered so they are listed alphabetically.

		<ul style="list-style-type: none"> • Heavy rainfall definition changed to Unusually heavy rainfall. <p>Chapter 4</p> <ul style="list-style-type: none"> • Addition of guidance for SO's that discharge to transitional and coastal waters (TraC). • Stages required (section 4.2) brought forward in section. • Process map added (Figure 2) to show the different stages required for SO's that discharge to inland and TraC waters. • Process map added (Figure 4) showing an overview of the SO classification process. <p>Annex 1</p> <ul style="list-style-type: none"> • TraC WQ impact assessment guidance added. • Test 1 - Heavy rainfall methodology added.
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Review Date: July 2028

To report issues or problems with this guidance contact:
guidance.development@cyfoethnaturiolcymru.gov.uk

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1. Introduction

This guidance sets out the [definitions \(Section 2\)](#), [classification criteria \(Section 3\)](#), assessment methodology [summary \(Section 4\)](#) and [detail \(Annex 1\)](#) and [data collection and submission requirements \(Annex 2\)](#). Water and Sewerage Companies (WaSCs) must use it to classify storm overflows (SOs) as either:

- Satisfactory
- Substandard
- Unsatisfactory

This guidance is applicable to all SOs, unpermitted and permitted. It should be used for SOs that discharge to rivers and Transitional and Coastal (TraC) waters. For unpermitted SOs, WaSCs should also use the guidance contained in GN021 Unpermitted Storm Overflows

The classification methodology contained later in this guidance has been developed from the User Guide for Assessing the Impact of Combined Sewer Overflows FR 0466 (Foundation for Water Research, 1994) and Storm Overflow Assessment Framework (SOAF) (Environment Agency, 2018) methodologies. This Guidance Note methodology replaces these documents. They should no longer be used or referenced.

This document uses the following terminology throughout:

‘Must’ indicates a statutory requirement. If you do not follow a ‘must’ you may not be legally compliant.

‘Should’ indicates an action recommended to meet a ‘must’. If you decide to take a different approach you should consider showing how this meets your obligations.

‘Could’ indicates approaches or actions that could be considered depending on your priorities.

‘You/your’ refers collectively to all water companies

‘We/us/our’ refers to Natural Resources Wales (NRW)

Important This guidance replaces the relevant sections in

- 7.01 How To Comply With Your Environmental Permit.
- Methodologies and scoring set out in User Guide for Assessing The Impact Of Combined Sewer Overflows FR 0466 (Foundation for Water Research, 1994) and
- the Storm Overflow Assessment Framework (SOAF) (Environment Agency, 2018) which should no longer be used.

1.1. Requirements

You should assess and understand how your sewerage system is operating. You must notify us where there is potential or actual pollution from a SO. The guidance contained in this document does not alter the existing requirement for you to self-report pollution incidents to us. You should also self-report when an unpermitted overflow is identified.

GN018 Water Company Pollution Incidents provides guidance on what we expect you to do in response to a pollution incident, and the information you should provide us with.

You should ensure that SO classifications are kept up to date to reflect current performance if new evidence shows a change in performance. You should submit an updated assessment as soon as reasonably practicable.

The classification assessment should be focused on identifying and assessing hydraulic and engineering design issues that will need investment and scheme planning/design to resolve. If the SO has maintenance issues (for example pump failure, infiltration, problem inflow and tidal or river inundation) you should upload this information to the master tracker as soon as is reasonably practicable and ensure the issues are rectified as soon as possible. We would expect these types of issues to be typically resolved within 12 months from the date they are identified.

Data affected by the issue should be excluded from the assessment. For example, the relevant Event Duration Monitoring (EDM) annual dataset where high spills were caused by a partial blockage can be excluded from Stage 1 of the assessment, but this should be made clear in your assessment submission and evidence should be available on request (AOR).

This guidance is underpinned by the [Urban Wastewater Treatment Regulations \(UWWTR\) 1994](#). You must design, construct and maintain sewerage systems to limit pollution of the environment and provide long term sustainability.

SOs must not discharge on a [dry day](#). When a discharge from a SO on a dry day has been identified, it must be self-reported as a pollution incident as soon as is reasonably practicable, not at the end of the SO classification process. GN018 Water Company Pollution Incidents sets out the guidance on how to self-report SO dry day discharges.

Important We will consider the appropriate regulatory response for SOs that are classified as substandard or unsatisfactory. We may take enforcement action and or vary permits to add improvement conditions or amend existing conditions as appropriate.

1.2. Good practice

You should use Urban Pollution Manual (UPM) version 3.1 (Foundation for Water Research, 2018): [UPM-manual.pdf](#) when classifying a SO

You should also follow all relevant good practice guides and codes, including those produced by CIWEM: <https://www.ciwem.org/special-interest-groups/urban-drainage-group> when classifying SOs.

2. Definitions

2.1 Continuation flow

As defined in UPM manual version 3.1, the continuation flow is the rate at which flow is passed forward for treatment from the structure or device. It is expressed as a proportion of the design peak inflow rate for the structure or device.

2.2 Drain down time

SOs may operate, or continue to operate, after rainfall or snowmelt has ceased. This is due to the time it takes for water to enter the sewer system and the time it takes to travel along the sewers to the relevant SO. We expect the allowable drain down time, in even the largest sewerage catchments, from directly and or positively drained areas (roofs, roads, pavements, drives, patios, yards), is highly unlikely to exceed 24 hours.

24 hours drain-down time is the minimum allowance for any given event when applying the one calendar day criterion, so the actual allowance may be higher depending on when the rainfall ceased.

Drain down times more than 24 hours are likely to be due to one or more of the following:

- run-off from indirectly drained (remote) areas
- land drains
- excessive infiltration

These are all unacceptable causes for a storm overflow to operate. They should be reduced, or the excess flow accommodated with the sewer system and WwTW treatment capacity.

2.3 Dry day and dry day discharges

A “dry day” is a day (midnight-midnight) with total rainfall accumulation not exceeding 0.25 millimetres.

“One dry day” is one whole calendar day (midnight-midnight) after cessation of rainfall.

A “dry day discharge” is any discharge that occurs or continues on a “dry day”, allowing “one dry day” after rainfall ends. This provides allowance for network drain-down for the first dry day after rainfall or snowmelt.

For example, if rainfall ceases at 5pm on 10 December, a dry day discharge is where an overflow discharges any time after midnight on 11 December.

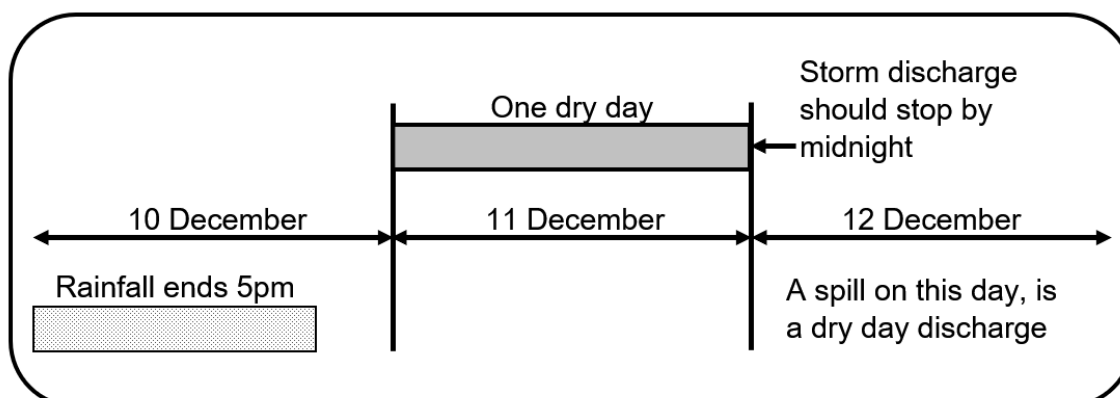


Figure 1. Diagram showing a dry day and a dry day discharge

2.4 Dry weather flow (DWF)

Dry weather flow (DWF) is the average daily flow to a WwTW during a period without rain.

The flow in a combined sewerage system will increase when it rains. This flow may vary seasonally due to changing levels of sewer infiltration and population numbers. You need to design your WwTW with enough capacity to treat the flows from the sewerage collection systems it serves.

It is calculated as the total daily flow value that is exceeded by 80% of the total daily flow values in any period of twelve months.

2.5 Flow passed forward (FPF)

FPF is defined as the rate of flow (litres per second) of the wastewater arriving at the overflow from its upstream collection system and passed forward to the [continuation flow](#). FPF must be maintained for the duration of the spill event, or the hydraulic capacity of the downstream sewer shall be deemed to have been exceeded (as per the individual permit condition of the SO).

For Wastewater Treatment Works (WwTW) and Last In Line (LIL) Sewage Pumping Stations (SPS), FPF does not include any flows drawn from a continuation flow that has already been passed forward by the overflow and reintroduced to the incoming flow upstream of that SO.

Achievement of FPF rate can be demonstrated using monitoring certificate scheme (MCERTS) accredited flow monitors or pumping station rates, using the permitting conditions as standard. In the absence of these data sources within the sewer network, DWMP (Drainage and Wastewater Management Plan) network models should be used. FPF rates for the duration of spills can be assessed to ensure that the permitted rate is being achieved.

2.6 Flow to full treatment (FFT)

The WwTW must be designed to treat peak dry weather flow ([DWF](#)) and additional flows from light rainfall. The normal minimum FPF is set as:

- Flow to full treatment (FFT) = $3PG + I_{max} + 3E$

Where:

- P = catchment population (number)
- G = per capita domestic flow (litre/head/day)
- E = trade effluent flow (litre/day)

This FFT setting is also known as 3DWF.

I_{max} is the maximum infiltration rate over the whole year. In certain circumstances you will need to consider the infiltration for summer and winter separately.

To find the maximum infiltration (I_{max}), calculate infiltration for every dry day as:

- I (dry day) = measured TDV – PG – E

The value of I within this calculation includes all flow above PG and E, thereby encompasses, groundwater infiltration, water entering a sewer, drain, or manhole chamber due to leaking joints, cracks, or faults or via purpose formed routes such as land drains and illegal connections. Where I_{max} exceeds 40% (typical rate as set out in [Future Impacts on Sewer Systems in England and Wales, report prepared for Ofwat by Mott MacDonald, June 2011](#)) of domestic flow an infiltration study needs to be undertaken to understand how to reduce this flow. A reduction plan which includes justification for not reducing infiltration, should be provided. This will include a definition of the extent of infiltration, identifying any point source discharges, along with a plan detailing the solutions and timescales for implementation.

2.7 Formula A

Formula A is the flow passed forward to a network or terminal SO.

A minimum retained flow in the sewer of Formula A is the normal minimum requirement for SOs on the sewer network and for Last in Line (LIL) unsettled SOs at the inlet to a WwTW.

It is calculated as:

- Formula A (litre/day) = DWF + 1360P + 2E

Where:

- DWF = total [dry weather flow](#) (litre/day) calculated from PG + I + E
- P = catchment population (number)
- G = per capita domestic flow (litre/head/day)
- I = infiltration (litre/day)
- E = trade effluent flow (litre/day)

Where Formula A equivalent storage is provided at an SO and in very large sewerage systems where significant smoothing of flows occur, this can be considered in defining the performance equivalent to Formula A, subject to agreement with us.

Where there are significant areas within the catchment that were designed, and remain, separately drained, an allowance for separately drained areas may be made. You will need to provide evidence that the storm response in these sewers is minimal (less than or equal to 3DWF). Consequently, the minimum FPF required from those populations served by separately drained areas is:

- $3PsG + I_s + 3E_s$

Where:

- P_s = population in areas served by a separate system
- G = per capita domestic flow (litre/head/day)
- I_s = infiltration flow from separately drained areas (litre/day)
- E_s = trade flow from separately drained areas (litre/day)

Formula A becomes:

- Formula A (litre/day) = DWF + 2PsG + 1360 Pc + 2Et

and:

- DWF (litre/day) = PtG + It + Et

Where:

- Pc = population in areas served by combined and partially separate sewers
- Pt = total population
- It = total infiltration (litre/day)
- Et = total trade flow (litre/day)

2.8 Unusually Heavy rainfall

Storm overflows should only release untreated sewage into rivers and coastal waters in exceptional circumstances, such as during “unusually heavy rainfall”.

Unusually heavy rainfall is the highest 5% of rainfall totals.

The methodology for calculating unusually heavy rainfall can be found in Test 1: Dry day discharges.

2.9 Inflow and problem Inflow

Inflow is defined as water draining directly into sewers from hard surfaces (roads/roofs/yards) via drains and pipework. This flow should have been planned for and included in the design specification of the sewer system and accounted for in Formula A.

Problem inflow is defined as unwanted water draining directly into the sewer system that has not been planned or accounted for in the sewer design. This may include overland flow from rural areas, land drains, watercourses diverted into the sewer and illegal misconnections.

2.10 Infiltration

Infiltration is defined as water entering a sewer system, drain or manhole chamber indirectly through leaking joints, cracks or faults.

Groundwater infiltration is specifically characterised by reference to the Environmental Permitting Regulations (EPR) 2016: “Groundwater” is defined as all water below the ground surface in the saturation zone and in direct contact with the ground or subsoil.

2.11 Mixing zone

The mixing zone is defined as the location downstream from a discharge point where the discharge is adequately mixed with the waterbody. Typically, a distance equivalent to seven river widths (bank to bank) can be used, but local conditions may mean it is less or more than this.

3. Criteria used to classify all storm overflows (both TraC and Inland)

3.1 Satisfactory

There are specific criteria which must be met for a SO to be classified as satisfactory. The SO must:

- meet all minimum design standards
- be compliant with permit conditions
- have no or very low environmental impact (includes aesthetic, biological, water quality, protected sites and groundwater).

3.2 Substandard

An SO will be classified as substandard if it is compliant with its permit and does not cause an environmental impact, but fails to meet **one or more** of the following minimum design standards:

- Does **not discharge only during wet weather** (i.e. discharges on a dry day)
- Does **not contain flows up to unusually heavy rainfall**
- Is **not screened to 6 mm**
- Does **not have adequate settled storm storage** (storm tanks only)
- Does **not have a Flow to Full Treatment (FPF) equal to the Flow to Full Treatment capacity (FFT)** (storm tanks only)
- Does **not pass forward Formula A flows** (applies to SOs and Sewage Pumping Stations (SPS) only)

3.3 Unsatisfactory

If any of the tests confirm unsatisfactory performance, the asset will be classified as unsatisfactory overall. The tests include:

- discharging on a dry day
- causing at least a low environmental impact (includes aesthetic, biological, water quality, protected sites and groundwater) as defined in [Annex 1](#)
- non-compliance with permit conditions.

4. Classification methodology summary

4.1 Overview

There are four stages in the Storm Overflow Classification Methodology. These four stages contain tests.

Stage 1 Minimum design standards

Stage 2 Permit Compliance

Stage 3 Environmental Impact Assessment

Stage 4 Other Evidence

Guidance on how to carry out the tests, score the assessment results and determine if any results confirm substandard or unsatisfactory status, are provided in [Annex 1 – Classification methodology](#).

If a SO has already been through the SOAF assessment, you can reuse the assessment results if they are still representative of the SOs current performance. However, the scoring and classification set out in this guidance must be used.

4.2 Stages required

Important! Depending on whether a SO discharges to Inland or TraC waters, there are different stages to complete, these are described below and shown in Figure 2:

- Permitted SOs
 - If TraC you must complete stages 1, 2, 3c and 4.
 - If Inland you must complete stages 1, 2, 3a, 3b or 3c and 4.
- Unpermitted SOs
 - If TraC you must complete stages 1, 3c and 4.
 - If Inland you must complete stages 1, 3a, 3b or 3c and 4.

Unpermitted SOs are required to have an Environmental Permitting Regulations 2016 (EPR) permit to authorise water discharge activities. Details of the steps and timelines required are included in GN021 Unpermitted Storm Overflows.

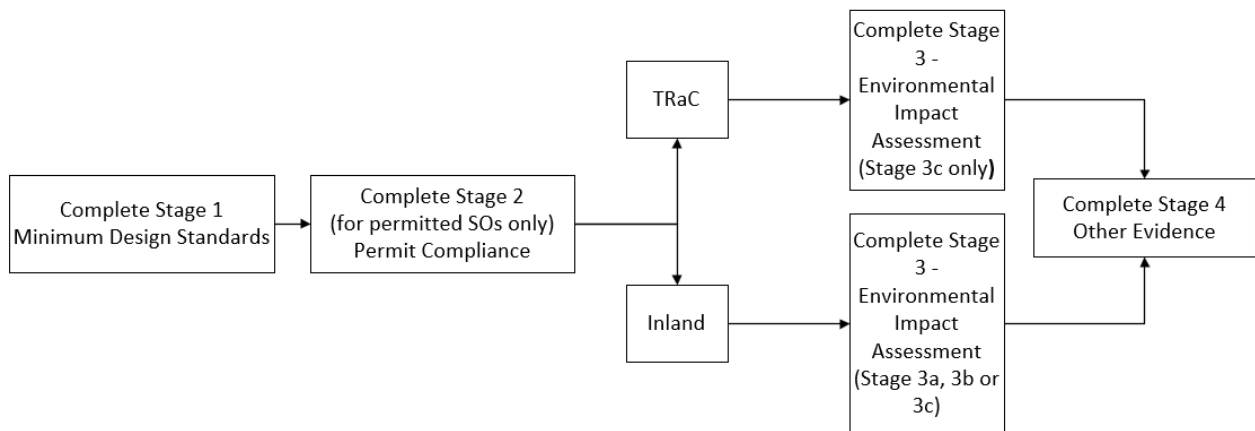


Figure 2 - Process map showing the stages to be completed for SOs discharging to TraC and Inland waters

Stage 1: Minimum design standards

This stage contains six tests. These tests apply to both SOs that discharge to inland waters and TraC waters.

1. [Dry day discharges](#)
2. [Unusually heavy rainfall spills](#)
3. [6 mm screening](#)
4. [Settled storm storage](#) (storm tank only)
5. [FPF equal to FFT](#) (storm tank only)
6. [Passing forward Formula A](#) (SO or SPS only)

Stage 2: Permit compliance

This stage contains four tests to check if the SO is compliant with permit conditions related to design standards. The tests should be used for SOs that discharge to rivers and TraC waters.

1. [FPF rate](#)
2. [Screen requirements](#)
3. [Storage requirements](#)
4. [Discharging only due to rainfall/snowmelt](#)

Stage 3: Environmental impact assessment

Important! There is a different stage 3c water quality modelling assessment process depending on whether the SO discharges to TraC or inland waters.

TraC

For discharges to TraC waters use the [Stage 3c – TraC water quality \(WQ\) modelling impact assessment](#). Do not complete stages 3a and 3b.

Inland waters

For discharges to inland water, please complete the following stages:

1. Stage 3a: Aesthetics, comprising of 6 elements:

- [Element 1: Pollution incidents](#)
- [Element 2: Substantiated public complaints](#)
- [Element 3: Sewage litter](#)
- [Element 4: Sewage fungus on outfall](#)
- [Element 5: Sewage fungus on substrate](#)
- [Element 6: Amenity value](#)

2. [Stage 3b: Invertebrate \(biological\)](#)

or

3. [Stage 3c: Water quality \(WQ\) modelling](#) .

Stage 4: Other Evidence

This guidance in this section applies to both SOs that discharge to inland waters and TraC waters.

You should consider any other available sources of known information. If a SO causes an environmental impact which has not been evidenced in any other stage of the classification assessment, the information should be summarised in the submission to us. Further details, including examples of information that this could include, are available here - [Stage 4: Other Evidence](#).

4.3 How to determine the overall classification

An unsatisfactory classification can be determined during any of the four stages.

A substandard classification can only be determined in Stage 1 (minimum design standards). But if any of the other tests are unsatisfactory, the final classification will be unsatisfactory.

A satisfactory classification can only be given if all four stages are passed.

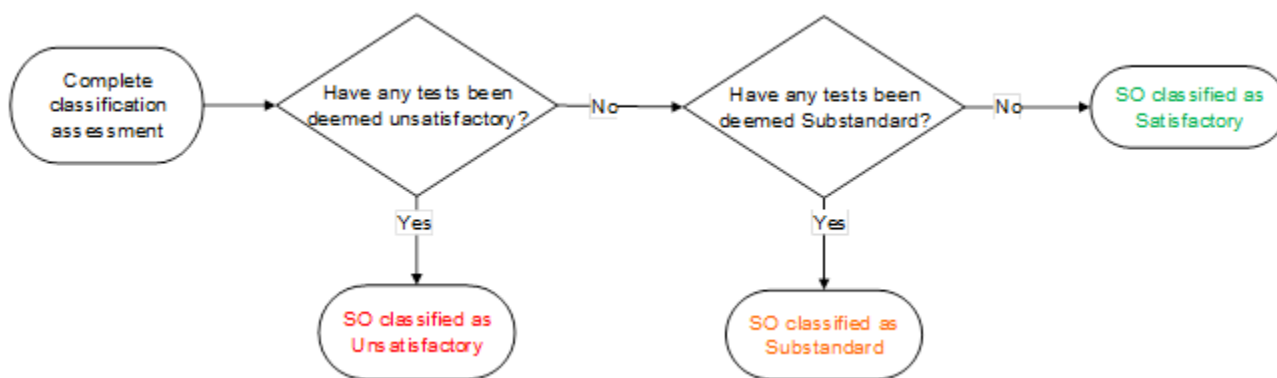


Figure 3: Flow chart for determining overall asset classification

4.4 Recording the storm overflow assessments

Assessment Format and Data Required

We expect you to record all SO assessments in the following formats:

1. A word or PDF document of each SO assessment, including the data fields specified in in [Annex 2](#).
2. A master dataset tracker of an agreed format listing planned and completed SO assessments (permitted and unpermitted), including the data fields specified in [Annex 2](#). The master dataset shall also be used for the purposes of tracking improvement SO scheme development and GN021 Unpermitted SOs assessments.

You should include the following information in addition to the information set out in [Annex 2](#):

- NRW Environment Team name (e.g. Neath Port Talbot). We will provide a list of team names and boundary details to you.
- Permitted/Unpermitted information to be included in one tab on SO master dataset tracker, including a column entitled permitted with yes or no options.
- Three columns in master dataset tracker to show NRW classification outcome, date and final agreed outcome. We will require you to provide us with edit access to these columns within the master dataset tracker.
- Add a column to indicate whether a SO is discharging to TraC waters with 'Yes' or No' options.
- Add a column to indicate whether a SO discharges to a dry creek with 'Yes' or 'No' options.
- Add a maintenance issue column to the SO master dataset tracker with yes or no options located between Stage 4: Other Evidence and Overall Proposed Classification columns.
- Add a separate tab entitled SO Maintenance Issue with maintenance details including the following fields:
 - Permit Reference Number in column A (to link with any given SO master dataset record)
 - Incident Action Plan (IAP) reference if applicable

- Reason for the maintenance being required, including the following options as a drop-down menu:
 - Partial or no capacity due to blockage or restriction
 - sewer collapse (partial or full),
 - groundwater inundation
 - infiltration
 - asset power failure
 - pump failure or issue
 - asset configuration
 - event duration (EDM) non-representative location
 - tidal or river inundation
 - problem inflow
 - other (free text box).
- Estimated time to remedy cause of maintenance issue.
- Date issue resolved.

All data and analysis underpinning the classification assessments should be made available on request by us or our appointed consultants.

Classification Data Location

We expect you to save all the information described in the above section in the agreed location on your SharePoint. You must ensure that the information is always accessible to us. We may review the SO assessments and once any queries or requests for further information have been resolved, we will confirm the classification.

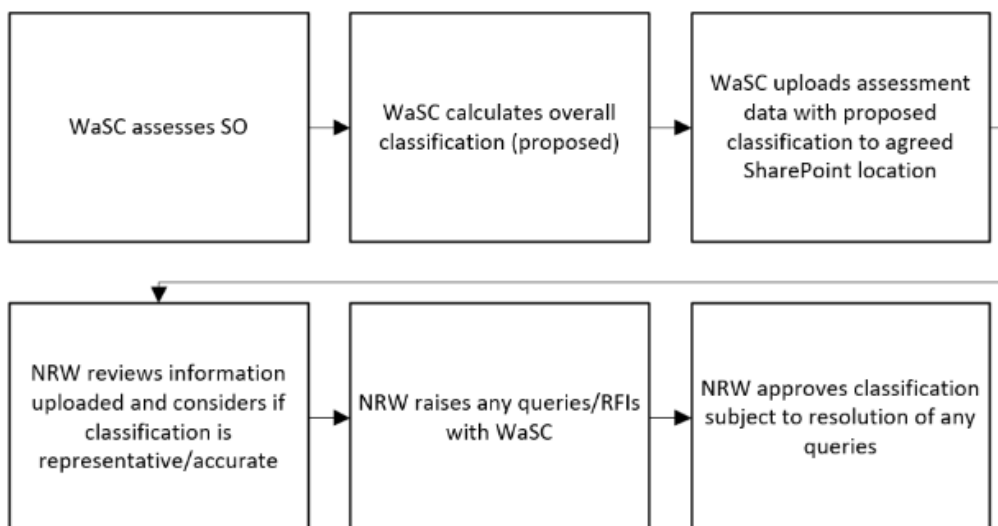


Figure 4: Flow chart showing classification process

Annex 1 – Classification methodology

Stage 1 – Minimum Design Standards

Important: This applies to SOs that discharge to TraC waters and inland waters.

Test 1: Dry day discharges

You should use EDM recorded spills and rainfall data to assess:

“Does the SO have any [dry day discharges](#) in the last 3 years (minimum) that are due to hydraulic reasons?”

Yes = Unsatisfactory; No = Indicates satisfactory; N/A = EDM data not available

EDM recorded spills can be compared to rainfall records. For SOs where you have less than 3 years EDM data, provide what is available. Where maintenance issues, such as blockages, lead to dry day discharges, these can be excluded from the assessment if the you can demonstrate that these have been fully investigated and rectified. You should make this clear in the assessment submission and provide evidence on request.

If using data from NRW tipping bucket rain gauges, one tip (i.e. nominally recording 0.2 mm) can be considered a dry day. Two tips (i.e. nominally 0.4 mm) is not a dry day. This allows for measurement and temporal uncertainties. The most appropriate gauge should be used, which will usually be the closest. Other data sources may be used where this approach is agreed with NRW.

When a [dry day discharge](#) is due to hydraulic reasons the SO will be classified as unsatisfactory.

Test 2: Unusually heavy rainfall spills

“In the last 3 years (minimum) is the SO **only** spilling due to 2.8Unusually Heavy rainfall?”

Yes = Indicates satisfactory; No = Substandard; N/A = EDM data not available

Different rainfall intensities and patterns could be considered ‘unusually heavy’.

This assessment rests on using locally observed rainfall to define an annual spill threshold, rather than identifying specific ‘heavy rainfall’ events. This can then be compared to recorded spills using EDM data to assess SO performance.

The spill threshold should be recalculated periodically using recent data – for example every five years.

Where excessive discharges occur , the SO should be investigated to determine the cause of the discharge(s). The outcome of the investigation should be provided to us with the assessment submission.

Use the following steps to establish the spill threshold at each asset:

1. Identify the most appropriate rain gauge to the SO asset. This is usually the closest to the asset.
2. NRW rain gauges should be chosen with reference to the output from periodic inspections, to ensure the data quality is sufficient for analysis. The output from the most recent inspection can be provided on request, you can request this data by visiting our website [Natural Resources Wales / Request environmental data](#).
3. Ten full years of data should be used, ideally incorporating the most recent data available (e.g. 2016 – 2025).
4. Significant gaps in the data should be infilled from nearby gauges, where this is possible.
5. Suspected spurious data (e.g. unexpected 0 values, unusually high values, events not reflected at nearby gauges) should be checked against nearby rain gauges.
6. Rainfall should be aggregated in 12-hour blocks (midnight to midday, midday to midnight). Blocks with no rainfall should then be excluded from the dataset. The blocks with non-zero rainfall should be analysed to establish 95th percentile 12-hour rainfall (i.e. the amount of rainfall that is exceeded 5% of the time).
7. Once the rainfall threshold has been defined, the mean number of calendar days per year where this threshold is exceeded (either in one or both 12-hour blocks) should be established. This number is the annual spill threshold for the asset in question.
8. Other data sources may be used in the absence of representative rain gauge data where the approach is agreed with NRW.

Test 3: 6 mm screening requirements

“Are the minimum 6mm screening requirements (described below) achieved?”

Yes = indicates satisfactory; No = substandard

All SOs should meet the following screening criteria and provide 6 mm solids separation. This should provide separation from the effluent, of a significant quantity of persistent material and faecal and organic solids, greater than 6 mm in any 2 dimensions. The discharge shall not be comminuted or macerated. All screenings shall be removed from the discharge.

The screen shall be adequately maintained and included within regular maintenance works. Where a mechanically cleaned screen is provided, a telemetry alarm system shall be installed and maintained, to give the operator immediate notification of a failure of the screen cleaning mechanism, unless otherwise agreed in writing by us. The operator must return the screen cleaning mechanism to normal operation as soon as reasonably practicable.

Flows up to and including the 1 in 5-year storm return period must be screened as a minimum. You must provide a bypass weir to prevent flooding due to flows greater than the 5-year screen design flow, or if the screen becomes fully blinded. Screens and chambers must not increase flood risk. The 5-year return period design should consider forecast development and make a suitable allowance for partial screen blinding during spills.

Where 6 mm solids separation is not already in place but the SOs are otherwise performing satisfactorily the SO can be upgraded at end of screen life or whenever other upgrade works are carried out. Where there is currently no screening in place the SO will need to upgrade within a timescale agreed with us.

Test 4: Settled storm storage (storm tank only)

“The storm tank must settle out solids. Does the storm tank have:

- a minimum capacity of 68 litre per head served, or
- a storage equivalent of 2 hours at the maximum flow rate to the storm tanks?”

Yes = indicates satisfactory; No = substandard

The capacity and availability of storage needs to be assessed and compared with the requirements. This assessment should be based on the total population that could be served within the existing WwTW design horizons, so that the storm storage provision is in line with the [DWF](#) permitted volume.

Test 5: FPF equal to FFT (storm tank at a WwTW only)

“Is [FPF](#) equal to [FFT](#)?”

Yes = indicates satisfactory; No = substandard

This test will assess whether the WwTW is passing forward the correct amount of flow to treatment.

Test 6: Passing forward Formula A (SPS and SOs only)

“Is the SO passing forward [Formula A](#)?”

Yes = indicates satisfactory; No = substandard

Stage 2 – Permit Compliance

Important: This applies to SOs that discharge to TraC waters and inland waters.

Where non-compliances are readily addressed through maintenance or quick wins and compliance restored then they are unlikely to contribute to a classification of unsatisfactory. If a maintenance issue is identified, we would expect these to be resolved within 12 months from the date they are identified.

Test 1: Flow Passed Forward (FPF) permitted rate

“Is the SO meeting permitted [FPF](#)?”

Yes = indicates satisfactory; No = unsatisfactory; N/A = not specified in permit

Test 2: Screen requirements

Assess all relevant screening permit conditions.

“Is the SO compliant with its permitted screen requirements?”

Yes = indicates satisfactory; No = unsatisfactory; N/A = not specified in permit

Test 3: Storage requirements

“Is the SO compliant with its permitted storage requirements?”

Yes = indicates satisfactory; No = unsatisfactory; N/A = not specified in permit

The volume of storage specified in the permit must be available. Effluent returned from the storm tank to the continuation flow must be adequately managed to prevent loss of volume (for example by sediment build up or debris). Ensure efficient emptying of the storm tank. Storage capacity should not be unduly compromised from a failure to adequately empty the tank from a previous storm event.

Test 4: Rainfall/snowmelt condition

“Is the SO compliant with the rainfall/snowmelt condition?”

The discharge shall only occur when, and only for as long as, the flow passed forward is equal to or greater than the overflow setting indicated due to rainfall and/or snowmelt

Yes = indicates satisfactory; No = unsatisfactory; N/A = not specified in permit

To comply with this permit condition:

- a discharge shall only occur when the FPF is equal to or greater than the overflow setting due to rainfall or snowmelt, and
- all offline storage (storm tanks):
 - must be fully utilised before a discharge can occur, and
 - should only fill when the FPF is equal to or greater than the overflow setting indicated due to rainfall and/or snow melt, and
 - should be emptied and its contents returned to the continuation flow as soon as reasonably practicable.

To ensure clarity on how we will regulate this permit condition, we will use the following principles:

- Using our definition of drain down time of a sewer catchment, we will consider any overflow operating after “[one dry day](#)” as non-compliant with this permit condition.

- For the purposes of UWWTR, we consider rainfall or snowmelt to be that which has fallen on hardstanding in the urban catchment (for example including roofs, pavements, roads, yards, drives). Run-off from indirectly drained areas such as fields and hills, and inflow from field drains, rivers and streams is not included.
- Significant infiltration of groundwater is excluded for the purposes of assessing the rainfall and/or snowmelt condition. UWWTR requires that infiltration through ground and soil shall be minimised in accordance with best technology knowledge not entailing excessive cost (BTKNEEC). Groundwater is ultimately due to rain or snow melt that has percolated through the soil, but the precipitation event may have occurred many days, weeks or even years previously. It is not appropriate to drain significant groundwater flows via a foul sewer and for this flow to be included in achieving the permitted FPF rate if the infiltration rate exceeds the infiltration rate used in the calculation of the permitted FPF.
- Infiltration encompasses groundwater, water entering a sewer, drain, or manhole chamber due to leaking joints, cracks, or faults or via purpose formed routes such as land drains and illegal connections.

Stage 3 – Environmental impact assessment

The environment impact assessment is split into the following stages:

- Stage 3a – Aesthetic impact assessment
- Stage 3b – Invertebrate (biological) impact assessment
- Stage 3c – Water quality impact assessment

Stage 3a – Aesthetic impact assessment

Important This only applies to SOs discharging to inland waters.

Two site surveys and an assessment of incident and complaint records are required to complete an aesthetics impact assessment. This is due to the potential effects of bankside vegetation on access, visibility, and the potential for litter to collect. You should separate the two site surveys with a reasonable time span, by at least three months and ensure that one of the visits is when bankside vegetation is minimal (late autumn-spring). You should submit the data for both surveys, but the worst score from the two surveys must be used as the element score. The assessment is split into six aesthetic elements, which are scored separately and then a combined score is used to categorise the aesthetic impact as per Table 1 below:

Total score of 6 elements	Aesthetic impact	Aesthetic impact classification
0	No impact	Indicates satisfactory
1 – 10	Very low	Indicates satisfactory
11 – 25	Low	Unsatisfactory
26 – 50	Moderate	Unsatisfactory
51 – 75	High	Unsatisfactory

Total score of 6 elements	Aesthetic impact	Aesthetic impact classification
Greater than 75	Severe	Unsatisfactory

Table 1: Aesthetic impact and classification

Element 1: Pollution incidents

“Has the SO had any substantiated pollution incidents (category 1-3) that are attributed to hydraulic causes in the last 3 years (minimum)?”

Take the highest category and score this element as follows:

- If highest category of incident/s is Category 1, score 100
- If highest category of incident/s is Category 2, score 60
- If highest category of incident/s is Category 3, score 20

You should request information from us as part of this check. Pollution incidents with an environmental impact of category of 1, 2 or 3 are considered to have an adverse impact on the receiving water environment, so the SO would be classed as unsatisfactory.

Where an incident has been investigated and the root cause resolved these can be excluded from the assessment, but they should be made clear in the data submission as detailed in [Annex 2](#). These could include maintenance issues such as blockages and tree roots that have since been resolved.

Element 2: Substantiated complaints

“How many substantiated public complaints (to the WaSC, local authority or NRW) has the SO had, in the last 3 years (minimum), which have been attributed to hydraulic causes?”

Calculate a score for this element as follows:

- 0 complaints, score 0
- 1-4, score 10
- 5-9, score 20
- 10-14, score 30
- ≥ 15 , score 40

Element 3: Sewage litter

Sewage derived litter includes hygiene products, contraceptives, toilet paper, faeces, wet wipes, and earbuds.

At each SO, estimates should be made of the number of identifiable items of sewage derived litter at three locations (see Figure 4: Diagram showing three locations to count sewage litter):

1. In the immediate vicinity of each SO
2. Along a stretch of river extending 50 m upstream of each SO or SO group

3. Along a stretch of river extending 50 m downstream of each SO or groups of SO.

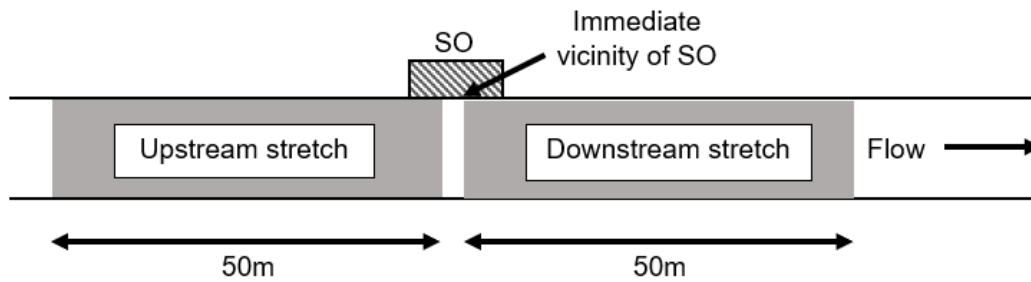


Figure 4: Diagram showing three locations to count sewage litter

When estimating items in the immediate vicinity of the SO, include any on the external structure (screen, flap valve, apron etc) and, for SOs set back from the water's edge, on the bank immediately in front of the SO. Do not include items in the river immediately in front of the SO as these will be counted in the downstream assessment.

For the upstream and downstream stretches select, where possible, a 50 m stretch starting at the SO. These should be as similar as possible. If, for example, there is a bridge adjacent to the SO, choose a stretch starting beyond the bridge. If the nature of the banks or watercourse changes such that a relatively uniform 50 m stretch cannot be found, then shorter but equal length stretches should be selected. For example, if the river enters a canalised section 30 m downstream, then stretches extending 0-30 m downstream and 0-30 m upstream of the SO should be selected (see Figure 5).

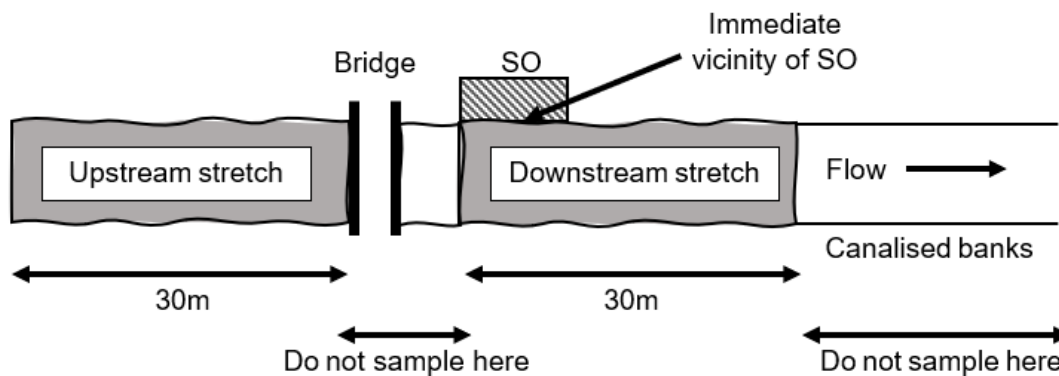


Figure 5: Diagram showing how to select upstream and downstream sewage litter sampling stretches to avoid non-uniform river sections

If it is not possible to identify similar upstream and downstream stretches, then this part of the assessment should be abandoned.

To assess the number of sewage-derived litter items, walk the length of each stretch once, counting visible items. Wherever possible, assess the stretch by wading in the water (ensuring that safety regulations/guidelines are met). Include items in the water, on the bank or beach and on overhanging vegetation. When a large amount of sewage litter is present, the number of items can be estimated to save time.

Where it is foreseeable that litter may be stranded and visible in areas downstream of the notional 50 m survey area, the survey should be extended to include this area. This will be important where the amenity class increases downstream of the immediate 50 m reach.

For example, where there is a park alongside the watercourse 300 m downstream of the outfall, then this would be included in the aesthetics assessment.

Where the upstream-downstream assessment of sewage derived litter has been made, the number of items of sewage derived litter attributed to the SO should be calculated by subtracting the upstream count from the downstream count. Compare this count with the immediate vicinity count and the higher of the two to determine the score as described below.

Where multiple SOs discharge into a stretch of river, sewage litter should be assessed upstream and downstream if the group of SOs and the highest 'immediate vicinity' count should then be compared with the difference between the upstream and downstream count and the highest of the count used to determine the score as described below.

Separately score the immediate vicinity count and the difference between the upstream and downstream count as follows:

- 0 items, score 0
- 1-10, score 5
- 11 – 25, score 10
- 26 – 50, score 15
- >50, score 20

Use the highest score for the element score.

Element 4: Sewage fungus on outfall

"Is sewage fungus present on the outfall?"

Present = score 5, absent = score 0

Element 5: Sewage fungus on substrate

"Is sewage fungus present on substrate downstream of mixing zone?"

Yes = score 25, No = calculate the mean % cover within mixing zone and score as follows:

- 0% mean cover, score 0
- >0% but <2%, score 5
- 2-10%, score 10
- 11-25, score 15
- 26-50, score 20
- >50, score 25

Where possible, assess the percentage cover of sewage fungus on the substrate (riverbed) at three locations, explained below and illustrated in Figure 6: Diagram showing where to sample stones to assess sewage fungus.

At each site, pick up ten cobble-sized stones (usually defined as >64 millimetre – <256 millimetre) and estimate the percentage cover of sewage fungus over the whole stone, including top and bottom to the nearest 10%. Ensure that the stones are taken from locations at each site that are similar in terms of flow, depth, and riverbed composition. Record the value for each stone separately.

Three sites:

1. A suitable site within about 50 m upstream of the SO.

The percentage cover of sewage fungus upstream of the SO is not used for scoring purposes, but if present, the site should be investigated further to ascertain the cause.

2. Within the [mixing zone](#), immediately downstream of the SO and adjacent to the bank on which the SO is situated.
3. After the mixing zone downstream of the SO.

If sewage fungus is present assign a score of 25.

If it is not present downstream, then average the percentage cover for the ten stones assessed within the immediate mixing zone.

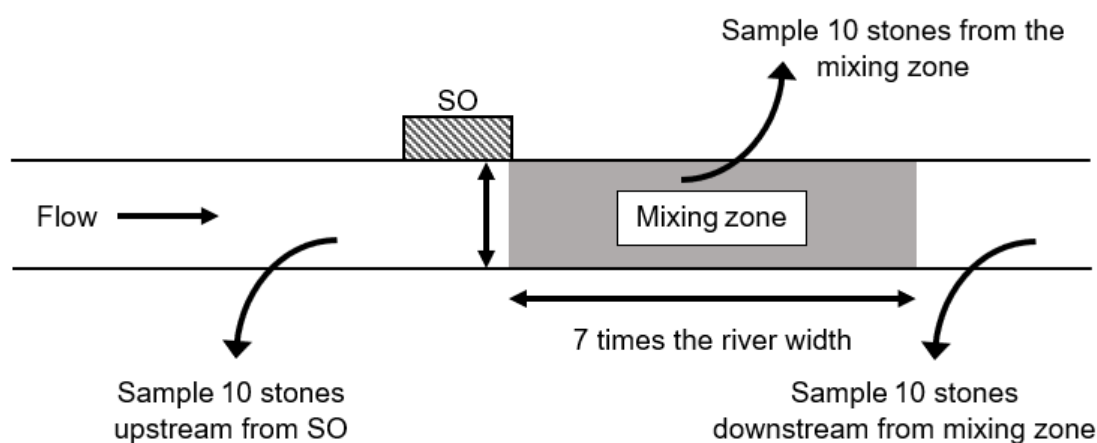


Figure 6: Diagram showing where to sample stones to assess sewage fungus

Element 6: Amenity value

“What is the highest amenity value within 1 km downstream of the overflow?” Use judgement as appropriate.

Determine the amenity value and score using Table 2 below.

Moderate and high amenity sites will always trigger, as a minimum, a ‘very low impact’ aesthetic impact category (as per Table 2) even where there is no evidence of debris, public complaint, or pollution incidents. This is because two seasonal aesthetics surveys may not be sufficient to identify a problem. The SO will always pose a risk of aesthetic impact and complaint in areas of moderate to high amenity.

Amenity value	Examples	Score
High	<ul style="list-style-type: none"> • Influences an area where bathing and water contact sport (immersion) is regularly practised (for example wind surfing, sports canoeing) • Receiving watercourse passes through formal public park • Formal picnic site • Designated shellfish waters • Designated bathing waters • Waters designated under the Conservation of Habitats and Species Regulations 2017 that are Sensitive Areas 	10
Moderate	<ul style="list-style-type: none"> • Boating on the receiving water • Popular footpath/coastal path adjacent to waterbody • Recreation and contact sport (non-immersion) areas • A watercourse that passes through a housing development or frequently used town centre area (for example bridge, pedestrian area, shopping area) • It is linked, through substantiated “reasons for failure”, to an element of the Water Framework Directive classification being less than Good 	5
Low	<ul style="list-style-type: none"> • Basic amenity use only • Casual riverside access on a limited or infrequent basis, such as a road bridge in a rural area, footpath adjacent to watercourse 	0
None	<ul style="list-style-type: none"> • Seldom or never used for amenity purposes • Remote or inaccessible area 	0

Table 2: Amenity value example criteria

Stage 3b – Invertebrate (biological) impact assessment

Important This only applies to SOs that discharge to inland waters.

Introduction

Where it is possible to collect representative benthic invertebrate samples immediately upstream and downstream of the overflow, impact will be assessed using abundance weighted Whalley Hawkes Paisley Trigg (WHPT) indices with the River Invertebrate Classification Tool (RICT). This is the method used for WFD assessments ([River Assessment Method Benthic Invertebrate Fauna: Invertebrates \(General Degradation\) UKTAG, 2014](#)). The method is designed to detect impacts due to organic pollution and is also sensitive to toxic pollutants. The RICT was developed by the three UK environmental agencies to classify the ecological quality of rivers.

Invertebrate sampling is only appropriate in simple scenarios where there is a single storm overflow discharging to that reach of the river. You should not carry out an invertebrate assessment (instead go to [Stage 3c](#) and model the water quality impact) if any of the following apply:

- multiple outfalls in close proximity
- there are other sources of pollution which could account for differences in invertebrate quality between sampling sites upstream and downstream of the outfall
- if the SO discharges into a degraded urban watercourse where background / upstream invertebrate quality has a WFD status of Poor or Bad then this method should also not be used
- there are physical constraints that prevent sampling.

If none of the above apply you must carry out an invertebrate impact assessment.

A minimum of two separate seasonal samples are required – one taken in the spring (March – May), and one taken in the autumn (September – November). These should be consecutive but could either be the spring and autumn of the same calendar year or autumn and the following spring. You should also visit in the summer to record the environmental variables (habitat information), but if this is not possible, then you may be able to use 'Model 44' in RICT which allows you to input the NGR grid reference and it will use GIS to assign site base data for you.

Methodology

1. Record observed NTAXA and calculate ASPT scores

The number of abundance weighted WHPT scoring families found during sampling (WHPT NTAXA), and their individual abundance weighted scores for sensitivity to organic pollution are recorded. An average score per taxon (ASPT) for the sample is then calculated.

2. Predict scores if site undisturbed (or reference scores) using RICT

The observed abundance weighted WHPT NTAXA and ASPT values are compared to the values that might be expected under undisturbed or reference conditions for that site.

These undisturbed or reference scores are predicted by statistical models in the RICT software.

3. Calculate Environmental Quality Ratio using the observed and predicted scores

The observed values of WHPT ASPT and WHPT NTAXA are compared to the predicted values to generate an Environmental Quality Ratio (EQR). EQRs close to 1.0 indicate that invertebrate communities are close to their natural state. Use Table 3: EQR ratios for different WFD invertebrate status classes to assign an invertebrate status class.

EQR values for WHPT NTAXA	EQR values for WHPT ASPT	Invertebrate status class
≥ 0.8	≥ 0.97	High
≥ 0.68	≥ 0.86	Good
≥ 0.56	≥ 0.72	Moderate
≥ 0.47	≥ 0.53	Poor
< 0.47	< 0.53	Bad

Table 3: EQR ratios for different WFD invertebrate status classes

4. Calculate a mean EQR for the two seasons (spring and autumn)

A mean EQR is then calculated for the two seasons.

5. Estimate confidence of status class difference using RICT Compare Module

The RICT uses Monte Carlo processes to simulate uncertainty in observed and expected EQRs due to factors such as sampling variation, error in measuring environmental variables, and laboratory processing errors (bias). The software typically uses 10,000 'shots' to build up a distribution of potential EQRs to estimate confidence of status class.

Use the RICT Compare Module's 'Compare – At a Glance' report to compare the quality of the upstream and downstream sampling sites. The report shows the percentage number of simulations where the downstream sample is in a different status class to the upstream sample for both WHPT NTAXA and ASPT. Use the scoring system in Table 4 and Table 5 below for both indices (WHPT NTAXA & ASPT):

Percentage of simulations the downstream sample is one or more classes worse than upstream (%)	Score	Multiply score by no. of classes the downstream sample is worse than upstream
1-4	1	Yes
5-9	2	Yes
10-29	4	Yes
30-49	6	Yes

50-70	8	Yes
71-90	10	Yes
>90	12	Yes

Table 4: Invertebrate impact scoring for WHPT NTAXA & ASPT

Total score	Invertebrate impact	Overall SO classification
1	No impact	Indicates satisfactory
2 – 3	Very low	Indicates satisfactory
4 – 5	Low	Unsatisfactory
6 – 7	Moderate	Unsatisfactory
8 – 9	High	Unsatisfactory
10 – 11	Very high	Unsatisfactory
12 – 15	Severe	Unsatisfactory
16 – 19	Very severe	Unsatisfactory
20 or more	Extremely severe	Unsatisfactory

Table 5: Invertebrate impact for WHPT NTAXA & ASPT

6. Calculate overall classification

As shown in Table 5, if there is evidence of at least a 'Low impact' on invertebrates, the SO will be classified as unsatisfactory.

Overall classification is based on the worst status class assigned for the multi – season mean WHPT NTAXA and WHPT ASPT.

The worst score for WHPT NTAXA and ASPT should be used to assign impact. The scoring process will be repeated for each of the individual spring and autumn samples, and the overall mean of the seasons to produce a short-term and long-term impact assessment (Table 6).

Type	Description	Impact
Short-term	Worst single season impact result for WHPT NTAXA and ASPT	No impact – extremely severe
Long-term	Worst of WHPT NTAXA and ASPT for the overall multi season (spring & autumn impact)	No impact – extremely severe

Table 6: Short-term and long-term impact assessment

7. Check existing data

Where available, existing biological monitoring data for fish and invertebrates used for WFD classification may be used to provide additional evidence that the overflow is not causing an environmental impact. For example, where representative sampling points are present downstream of the overflow, in close proximity, or in locations likely to be sensitive to discharges from the overflow, and these consistently record good or high status, then this may be used as evidence to support no impact classifications.

Stage 3c – Inland water quality (WQ) modelling impact assessment

Important This section only applies to SOs that discharge to inland waters.

Introduction

If you are assessing an SO that discharges to inland waters and have carried out an invertebrate impact assessment as specified in [Stage 3b](#), you do not need to complete a WQ assessment.

If you wish to carry out a WQ impact assessment you can submit this with the classification assessment evidence, but the invertebrate impact assessment will take precedence.

If it was not possible to carry out an invertebrate impact assessment for one of the reasons specified in Stage 3b, you must carry out the water quality impact assessment methodology as detailed below.

This stage assesses whether the SO is likely to cause an environmental impact using WQ modelling.

You should explain the risk-based approach to the level of modelling you have used to determine the impact.

Carry out initial screening

Determine if the overflow is likely to cause water quality issues and jeopardise water quality standards, by checking the following:

“Does the SO meet all three dilution criteria below?”

- the SO must pass forward a retained flow of Formula A (or equivalent storage) over the full duration of spills
- the dilution in the receiving water must be >8:1 (Q95 river flow: sewer DWF)
- there is no potential for interaction with other discharges”

Yes = assign a water quality classification of ‘very low’ and no need to use a water quality model

No = water quality modelling is required to assess the impact of the overflow

WQ assessment for SO discharges to inland waters

The assessment should quantify the impact of the storm overflow on either:

- the duration of 99 percentile exceedance, or
- 99 percentile quality for total ammonia and BOD, and the number of exceedances of the fundamental intermittent standards (FIS) for dissolved oxygen and un-ionised ammonia.

This should be undertaken as a relative assessment by comparing the impact of the urban drainage system on downstream river quality with and without the discharge from the SO.

New models are not required in all cases. Where they are 'fit for purpose', existing sewer and river impact models from recent drainage planning or UPM studies should be used.

Model complexity levels

Although a verified sewer model is required to assess impact, it is not expected that complex sewer quality and dynamic river quality modelling is carried out in all cases. The [UPM-manual.pdf](#) (Foundation for Water Research, 2018) provides guidance on modelling the impact of storm discharges.

The level of complexity involved depends on the complexity of the problem and the potential cost of any solutions. A complex problem, for example where many storm overflows discharge into a river channel which contains structures such as weirs or sluices likely to affect quality, will need more detailed models and data collection. In contrast, simplified impact approaches will be sufficient for simple scenarios, for example where a single or very small number of overflows discharge into a simple river reach and dilution levels are relatively high.

There are four levels of complexity:

1. Level 1 is the simplest form of impact assessment. Time series outputs from the verified sewer model are mixed with random picks of upstream river flow and quality selected from statistical distributions. Default or sampled values for storm sewage BOD and total ammonia concentrations can be used and applied as an event mean concentration. The river reach is simplified to a trapezoidal channel. Hydraulic equations are used to estimate the depth and velocity of the mixed flow of river and storm sewage. A simplified water quality model usually representing the main oxygen demand processes (BOD decay and nitrification) and re-aeration is used to predict levels of dissolved oxygen and un-ionised ammonia at the end of the reach. Checks against 99 percentile standards and initial un-ionised ammonia can be made at the point of mixing.
2. Level 2 is similar to level 1. However, instead of a stochastic approach to representing upstream river flow, a river flow time series is used. This allows the flow, and therefore dilution available in the river at the time of a spill, to be better represented. As in level 1, simplified river hydraulics and water quality are still used to predict the time of travel for pollutants along the reach, and the depth and velocity of flow used to predict re-aeration rates.
3. Level 3 studies use calibrated flow routing models to predict time of travel along longer and more complex water bodies more accurately. This allows better representation of advective pollutant transport. More complex water quality simulation can be used with the model calibrated for the key parameters – BOD, ammonia, and dissolved oxygen – using observed event sampling and water quality sonde data. Storm sewage quality is represented using observed sampling data or calibrated sewer quality models.

4. Level 4 is the most complex form of impact model. Calibrated hydrodynamic river models used to simulate the varying depth and velocity of flow within the watercourse. Advection and dispersion is calibrated against observed data (e.g., dye tracing). Various levels of water quality simulation are possible with calibration and verification against event sampling and water quality sonde data.

For all levels, a long (minimum 10 year) historic or synthetic rainfall time series representative of the catchment is required.

Further on potential modelling approaches and levels of complexity is provided below.

Potential modelling approaches and the four levels of complexity

Urban drainage inputs

- SO flow:
 - Levels 1-4: verified sewer model
- Storm sewage quality:
 - Levels 1 & 2: Event mean concentrations using default values (e.g., Dempsey, 2005) or sampled values
 - Levels 3 & 4: Sampled values or calibrated sewer quality model
- WwTW flow:
 - Level 1: Statistical distribution from MCertified data
 - Levels 2-4: Predicted flow time series from verified sewer model
- WwTW quality:
 - Levels 1-4: Statistical distribution from sampled effluent quality

Boundary river conditions

- Upstream river flow
 - Level 1: Statistical distribution from gauged data or ungauged estimate
 - Levels 2-4: 10-year historic flow time series from EA gauging station or calibrated rainfall runoff model
- Upstream river quality
 - Levels 1-4: Statistical distribution from EA routine samples

River model

- Hydraulic
 - Levels 1&2: Simplified channel, steady & uniform
 - Level 3: Calibrated flow routing model
 - Level 4: Calibrated hydro-dynamic model
- Water quality
 - Levels 1&2: Simplified WQ processes & re-aeration using default values for rate coefficients
 - Level 3: Advective pollutant transport, WQ simulation calibrated from event sampling & sonde data
 - Level 4: Calibrated advection – dispersion model, WQ simulation calibrated from event sampling & sonde data

Rainfall series

- Levels 1-4: 10-year representative historic or synthetic time series.

Impact scoring

The worst water quality score from the two types of assessment (99 percentile quality and FIS) should be used as follows:

(1) 99 percentile quality

Two approaches are available depending on the type of modelling tool used:

i. Estimate of 99 percentile

Select the relevant 99 percentile BOD and total ammonia standards for the receiving water according to WFD water body typology. These standards can be obtained from the [UPM-manual.pdf](#). Foundation for Water Research, 2018). As an example, Table 7 below shows the 99 percentile classes for water body types 3, 5 and 7. Where there is a drop in 99 percentile status class between the modelled upstream and downstream assessment points assign a score of 45.

WFD status for water body types 3, 5 and 7	99 percentile for biological oxygen demand (BOD) (mg/l)	99 percentile for total ammonia (mg/l)
High	9.0	0.7
Good	11.0	1.5
Moderate	14.0	2.6
Poor	19.0	6.0

Table 7: 99 percentile standards for WFD water body types 3, 5 and 7

Where the overflow does not cause a drop in status class but causes a degree of within class deterioration, assign a score according to the percentage within class deterioration as shown in Table 8 below. Use the worst score returned for the BOD and total ammonia assessments.

Percentage within class deterioration	Score
1 – 10	5
11 – 25	15
26 – 50	25
51 – 75	35
>75	45

Table 8: 99th percentile within class deterioration scores

ii. Duration of exceedance

Where modelling tools are used which do not calculate a 99th percentile, but instead estimate the duration for which a 99th percentile standard is exceeded, then use the scoring system in Table 9 below in conjunction with the 99th percentile BOD and total ammonia standards for good status. The impact duration with the worst score should be used.

Impact duration	Allowable exceedances (number/year)	Score
1 hour	87.6	+ 0.5 points for every 1.0/year increase in exceedances
6 hours	14.6	+ 3.0 points for every 1.0/year increase in exceedances
24 hours	3.65	+ 12.0 points for every 1.0/year increase in exceedances

Table 9: Scoring system for duration / number of 99th percentile exceedances

(2) Fundamental intermittent standards (FIS)

Select the relevant fundamental intermittent standards for the receiving water according to fishery type (sustainable cyprinid, sustainable salmonid, and salmonid spawning). The FIS for dissolved oxygen and un-ionised ammonia are available here [UPM-manual.pdf](#) (Foundation for Water Research, 2018). Compare the frequency of FIS exceedances in the receiving water with and without the storm discharge. For example, the FIS for dissolved oxygen in sustainable cyprinid waters (correction factors are also required) are shown in Table 10 below.

Frequency (return period)	DO concentration (mg/l) 1 hour	DO concentration (mg/l) 6 hours	DO concentration (mg/l) 24 hours
1 month	4.0	5.0	5.5
3 months	3.5	4.5	5.0
1 year	3.0	4.0	4.5

Table 10: Fundamental intermittent dissolved oxygen (DO) standards for sustainable cyprinid waters

Use the scoring system in Table 11 where the discharge causes a deterioration (increase) in the frequency of allowable exceedances:

Frequency (return period)	Allowable exceedances (number/year)	Score
1 month	12	+ 1.5 points for every 0.5/yr increase in exceedances
3 months	4	+ 4 points for every 0.5/yr increase in exceedances
1 year	1	+ 6 points for every 0.2/yr increase in exceedances

Table 11: Scoring system for increases in FIS exceedances for un-ionised ammonia and dissolved oxygen

Determine SO classification for WQ impact

The worst score obtained from the FIS and 99 percentile assessments should be used for the water quality impact classification set out in Table 12: Water quality impact and classification below.

Water quality score	Water quality impact	Overall SO classification
0 – 5	No impact	Indicates satisfactory
6 – 9	Very low	Indicates satisfactory
10 – 19	Low	Unsatisfactory
20 – 29	Moderate	Unsatisfactory
30 – 39	High	Unsatisfactory
40 or more	Severe	Unsatisfactory

Table 12: Water quality impact and classification

A score of 'Low impact' or worse results in the SO being classified as unsatisfactory.

Stage 3c – TraC water quality (WQ) modelling impact assessment

Important The guidance in this section should only be used for SOs that discharge to TraC waters.

Overview

The Transitional and Coastal (TraC) water quality assessment is split into four steps which are listed below. Completing these four steps will result in a classification of the asset for water quality impact.

Step 1 – preliminary assessment to provide an understanding of the receiving water and an indication of whether it is particularly sensitive to the discharge, e.g. if it is a protected water.

Step 2 – consideration of the potential long-term impacts of the SO on the receiving water through a significant load assessment, with the discharge categorised in terms of its contribution to the total load.

Step 3 – consideration of dilution of the discharge in the receiving water. Where dilution is low, a subsequent analysis considers the extent of the discharge mixing zone against established Environmental Quality Standards (EQS) using either simple plume models or 1D river models for small estuaries where local mixing may be limited.

Step 4 – calculation of combined water quality impact score.

You will need to provide the evidence supporting Steps 1, 2 and 3 to us in a report(s). The report(s) should contain relevant methodologies, results, analysis and conclusions. Any assumptions used should be included.

Other NEP drivers will be used to assess combined impacts from discharges to:

- Bathing Waters (BW_INV)
- Shellfish Water Protected Areas (SW_INV)
- TraC waters and Marine Protected Areas (W_HR_MWQ_INV1 or W_HR_MWQ_NDINV1).

WQ Assessment for SO discharges to TraC waters

Step 1 - Preliminary Investigation

The preliminary investigation is used to identify the characteristics of the receiving water and the nature of the discharge within a set of general descriptive criteria that can provide inputs to the assessment. You will need to complete the Tables provided in Appendix A. The main areas of investigation are provided below; more detail can be found in Appendix A.

Receiving water designations

You should identify the Water Framework Directive (WFD) Transitional and Coastal (TraC) water body into which the asset discharges. You should also determine if it is also covered by designations, such as a:

- Marine Protected Area (MPA) designation including Special Area of Conservation (SAC), Special Protection Area (SPA), or RAMSAR site,
- SSSI or
- Urban Wastewater Treatment Regulations (UWWTR) Sensitive Area.

The investigation should check that there are no other drivers for the SO within the NEP and whether there have been any previous investigations that might have assessed the impact of the overflow or could provide valuable information.

Receiving water type

Transitional and coastal waters cover a wide range of environments including:

- dispersive open coastal waters
- large estuaries
- small tidal channels, inlets and creeks where dispersion is limited by depth and the proximity of one or more banks.

The receiving water area is the area into which the discharge effluent will disperse before it reaches concentrations close to background level, i.e. the point at which the discharge plume is indistinguishable from the receiving water; it can also be defined by the level of impact, i.e. if there are local opportunistic macroalgae issues. The receiving water can be characterised by its dimensions (width, length, depth) and the tidal range which determines the volume of seawater exchanged on each tide. The dimensions of the water body, tidal range and velocity at or near the discharge location are required. You will need to define the receiving water type.

You can access information to help you from public domain sources such as Admiralty Charts, OS Maps, LiDAR surveys, tide tables, water level / flow gauges etc. Tidal currents will be the least available data; these frequently require specific surveys to obtain. Coastal models can also be used, however, it is important to understand the limitations of the model and whether the model output is representative of the discharge location.

The discharge and its location within the receiving water

Estimates of the discharge rate and volume are required as a basis for the marine impact assessment. A time series of SO discharge is required to undertake significant load assessment and dilution / dispersion assessments. In the absence of time series data, estimates of spill volume and frequency can be used. The concentrations of pollutants in the discharge must also be estimated from sample data, network model output or the use of a representative default value based on data from similar local discharges or literature.

Information describing the outfall should be available from the discharge permit, and as-built drawings, water company asset database etc. Key information are the outfall diameter and invert level which may need to be confirmed by site visit: an error in these values could significantly affect dilution and mixing calculations.

The location of the discharge is defined as its geographic location and the level of the discharge invert. There are 3 types of discharge including:

- a shallow outfall with a free discharge (above water surface)
- an outfall that is submerged (below water surface) throughout the tide
- an outfall that is partially submerged at some states of tide and partially exposed at others

Each of these discharge types will have different characteristics of dispersion. A partially submerged outfall will exhibit the characteristics of both free and submerged discharge depending on tidal state. The relation of the discharge invert / soffit level to bed level and tide level are required as key inputs to dilution assessments. Understanding the location of the discharge relative to seabed, banks and larger water bodies is important to identify suitable methods and tools for dilution and mixing assessments, and plans or photographs of the outfall and its relationship to the receiving water can be very helpful.

Other sources

Identify and collate data on other significant discharges to the water body. This information is required to quantify the relative contribution of the SO load to other loads impacting the water body. As a minimum, the location and load (flow and concentration) for other discharges to the receiving water, e.g. rivers and WwTWs, should be collated from available sources such as:

- gauged river flow from NRW or Environment Agency (where applicable) gauging stations
- measured water quality from routine NRW or EA sampling
- MCERT or similar flow records from WwTWs
- Water quality compliance sampling from WwTWs.

Where recorded flow data from a WwTW is not available, permitted DWF multiplied by 1.25 can be used to provide an estimate of mean daily flow. Network model results could also be used. Where sampling data are not available, data from similar sites or default values (as a last resort) should be used.

Step 2 – Significant load assessment

A significant load assessment should be undertaken for the SO and include other significant sources discharging to the receiving water. The analysis is best applied to more conservative pollutants such as nutrients which, in TraC waters and particularly estuaries, tend to reach a dynamic equilibrium. Nitrification is a potential issue in estuaries and inlets and can lead to the risk of eutrophication.

To assess the impact of SOs on water bodies and protected areas you will need to assess the load to that water body. In its simplest form, a significant load assessment can be undertaken to examine loadings to a water body or part of a water body; this assessment method does not take account of individual upstream loadings however and instead lumps them in with the river loading.

You should complete a significant load assessment in cases where a source apportionment approach (undertaken as part of the MWQ_INV drivers) has not been agreed with us. However, we require a more localised approach where there are localised water quality issues with localised algae growth (please see Table 19 for areas with localised issues).

If you conduct a significant load assessment as part of this work, you may be asked to complete a source apportionment assessment at a later date.

A significant load assessment allows the magnitude of the SO pollutant load to be quantified and compared to other sources entering the water body. The load from the SO and other sources over a specific timeframe should be calculated as a percentage of the total load.

For riverine loads, you should estimate mean daily load; a timeseries of load can be calculated using a timeseries of flow data over a typical year.

For loads from a WwTW, you should estimate mean daily load using the MCERT data (or other flow records) and water quality compliance data.

For SOs, network model output and available concentration data should be used to derive a timeseries of the daily load over a typical year or 10 year dataset for each SO discharging to the receiving water. Where concentration data are not available, data from similar sites should be used (or default values, where necessary).

Significant load assessment may not be appropriate for open coast environments. If it is decided not to undertake a significant load assessment for reasons of open coast environment, justification should be provided.

Impact scoring

The SO load contribution as a percentage from either the significant load assessment should be scored as per Table 13 and added to Table 15.

Table 13 - Load contribution (for an asset contributing alone) scoring

Load contribution	Score
≤ 1 %	0
> 1 %	10

Step 3 – Dilution and Mixing Zone Assessments

The local impacts of specific SO discharges should be assessed using dilution assessment. The approach adopted will depend on the results of the preliminary investigation and the dilution in the receiving water body.

Assessment requirements

In an estuary near the tidal limit

Where the discharge is to a channel that is at the headwaters of an estuary and where there is limited tidal effect on dilution, the impact of the SO should be assessed in the same way as a discharge to a river – Go to Stage 3c of the Rivers methodology (pp 36) and follow the water quality impact assessment for rivers.

A fully submerged discharge

Where the discharge is permanently submerged, even at low water, an initial dilution assessment should be undertaken against a target dilution of 15:1. This approach uses established dilution assessment techniques to estimate the 70 %ile dilution over a spring and neap tide. Where 15:1 dilution is not achieved, a mixing zone assessment should be undertaken.

All other discharges

Partially submerged and free discharges to all receiving water types require a more detailed assessment than simply a dilution assessment. This is because it is necessary to identify an area of impact, particularly under conditions of low ambient flow / depth and high discharge flow. A mixing zone assessment is required in these circumstances.

Mixing Zone Assessment

Dilution assessment only provides an indication of the capacity of the receiving water to disperse and dilute the discharge effluent. The actual concentration of pollutants within the receiving water, and therefore the likely impact of the discharge on the local ecology, will depend on the discharge concentration and the ambient concentration of the water body. EQSs are set for contaminants based on the impact of the pollutant on marine invertebrates and other organisms, such as fish, and these must be met within a specific distance of the discharge to avoid detrimental impact. The area of impact (where concentration is above the EQS) is referred to as the mixing zone. Dilution calculations or a mixing zone model can be used to determine the extent of the mixing zone by calculating the concentration at distances from the outfall and identifying the distance at which the EQS is achieved.

Further detail for Dilution and Mixing Zone Assessments is provided in Appendix C.

Impact scoring

If it has been determined that the flow is to a tidal river and the river methodology should be followed, do not complete Table 15.

Scoring will be determined using methodologies set out in European CIS guidance (CIS, 2010) for coastal waters and following methodologies of other European countries (i.e the Netherlands and Germany) interpreted for estuaries (Skorbiłowicz et al. 2017).

Otherwise, follow Table 14 and complete Table 15 following your dilution and mixing zone analysis. If a 1D or 2D hydrodynamic model has been utilised, the outcome from this should be incorporated. The worst case initial dilution / mixing zone should be used.

Table 14 - Score matrix for dilution and mixing zone assessments

Dilution / mixing zone assessment outcome	Score
Coastal / transitional dilution > 15:1 (Test 1)	0
Coastal - mixing zone < 2000 m ³ ; Estuaries - Length of 10 x width of estuary, < 1000 m; width < 25 % wetted width MLWS (Test 2 if fail test 1)	0

Dilution / mixing zone assessment outcome	Score
Coastal - mixing zone $\geq 2000 \text{ m}^3$; Estuaries - Length of 10 x width of estuary, $\geq 1000 \text{ m}$; width $\geq 25 \%$ wetted width MLWS	10

Step 4 – overall score

Combine your scores from Steps 2 and 3 as per Table 15. You will need to take the worst case from each scenario.

Table 15 – Example combined score matrix

Assessment	Score
Load contribution score	
Dilution / mixing assessment score	
Sum of scores	

Table 16 – Water quality impact and classification

Water quality score	Water quality impact (individually)	Overall SO classification
0	No impact / very low	Indicates satisfactory
10	Low / Moderate	Unsatisfactory
20	High / Severe	Unsatisfactory

5. References

1 EU Common Implementation Strategy document “Guidelines for the identification of Mixing Zones under the EQS Directive” (2008/105/EC) and accompanying technical note “WFD Technical Background Document on Identification of Mixing Zones”; December 2010.

2 <https://www.gov.uk/topic/environmental-management/environmental-permits>

5 SEPA Policy 28: Initial Dilution and Mixing Zones for Discharges from Coastal and Transitional Outfalls. Now incorporated within WAT-SG-11: Modelling Coastal And Transitional Discharges. https://www.sepa.org.uk/media/152879/wat_sg_11.pdf

8 EU Common Implementation Strategy document “Guidelines for the identification of Mixing Zones under the EQS Directive” (2008/105/EC) and accompanying technical note “WFD Technical Background Document on Identification of Mixing Zones”; December 2010.

9 European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 (S.I. No. 386 of 2015) – amendment to European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009)

10 The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Skorbiłowicz, M, Skorbiłowicz¹, E., Wójtowicz¹, P., and Zamojska, E. 2017. DETERMINATION OF MIXING ZONES FOR WASTEWATER WITH RECEIVER WATERS. Journal of Ecological Engineering 18(4): 192-198.

6. Appendix A – Preliminary information

Gather relevant receiving water information and record them in Table 17. Record the receiving water characterisation information and outfall information in Table 18. Some definitions for Table 2 are provided in the text below.

Table 17 – Water body and protected area information

	Name and ID (or N/A)	Classification or feature condition due to nutrients / Shellfish or bathing water classification
WFD water body		
WFD ecological class		
WFD class DIN		
WFD class Phytoplankton		
WFD class Opportunistic Macroalgae		

	Name and ID (or N/A)	Classification or feature condition due to nutrients / Shellfish or bathing water classification
Localised algal growth issues (Table X)?		
Does the SO discharge to a WFD protected area (i.e. SAC, SPA, RAMSAR, SSSI)?		
Does the SO discharge within 2 km of a designated shellfish water or bathing water?		

Table 18 – Characterisation of receiving water and SO discharge

	Type (<i>delete as appropriate</i>)	Notes (<i>delete / complete as appropriate</i>)
Receiving water type	<i>Coastal – open coast</i> <i>Coastal – tidal inlet</i> <i>Transitional – large estuary</i> <i>Transitional – small estuary</i> <i>Transitional – tidal creek</i> <i>Transitional – tidal river</i>	Open coast, single boundary / shore Enclosed, single outlet to coast, no river flow Large water body, one boundary at bank Small water body, both banks relevant Small channel, no river inflow Tidally influenced channel, dominant river flow
Receiving water properties	Depth Channel dimensions Tidal range Tidal currents	Water depth at outfall Width at MHWS / MLWS, MSL Mean spring / neap tidal range Available information of tidal velocity / flux
Outfall information	Outfall location	Distance from shore,

	Type (delete as appropriate)	Notes (delete / complete as appropriate)
	Discharge depth Outfall size Discharge flow Discharge volume Discharge duration Concentration	Discharge submerged, partially submerged, free Diameter DWF or similar Discharge volume during storm and 10-year or typical year average Discharge duration during storm and 10-year or typical year average Typical concentration of effluent

Table 19 – localised issues with opportunistic macroalgae growth

Characteristic	Water body	Specific area of problem
Opportunistic macroalgae	Milford Haven Outer	Sandy Haven
Opportunistic macroalgae	Milford Haven Outer	Castle Pill
Opportunistic macroalgae	Milford Haven Outer	Angle (embayment SW of Old Point House)
Opportunistic macroalgae	Milford Haven Inner	Cosherston Pill
Opportunistic macroalgae	Milford Haven Inner	Pembroke river

Receiving water type

Coastal waters are unbounded except for a single shoreline. They have a salinity of between 34 and 36.

Transitional (transitional) waters are partially enclosed with a free connection to the open sea at the mouth; they have one or more rivers feeding into them. Salinity varies along the length of the estuary in response to mixing driven by tidal inputs from the sea and freshwater inputs from rivers. The salinity will be 0 at the river boundary and likely between 34 and 36 at the coast.

Tidal creeks are similar to an estuary but they have little or no freshwater input.

Tidal inlets are partially or mostly enclosed coastal bodies with little freshwater input. They are characterised by a narrow constriction through which the sea passes which will reduce the exchange between the inlet and the sea.

Tidal rivers are at the upper end of the estuary where the tidal forcing is limited to a few hours per tidal cycle; the rest of the time the river flow dominates.

Discharge location

A **fully submerged** outfall is submerged (water above soffit) at all states of tide under normal conditions, i.e. is located below mean low water spring tide (MLWS). The outfall may be exposed at particularly low astronomical tides.

A **partially submerged** outfall is submerged (water above soffit) for only part of the tide.

A **free discharge** outfall is not submerged at any states of tide under normal conditions, i.e. is located above mean high water spring tide (MHWS) ⁷. The outfall may be submerged at particularly high astronomical tides.

Discharge flow / discharge volume

The rate of discharge from a SO can vary over time. The flow used should be appropriate to the calculation being undertaken and could be a timeseries, a mean flow during an event, an annual mean flow or peak flow. Where modelled / measured discharge flow is available, this should be used.

Potential methods to determine flow are:

- Where model output is available a flow distribution cumulative histogram can be determined from which mean and percentiles flows can be derived to determine dilution and mixing zone under a range of flow conditions.
- Where volume and duration of discharge events are known a distribution of mean flows can be derived by dividing the volume by duration of each event. This should provide reasonable assessment of the flow averaged over an event but may not give a representative worst case flow.
- Where there is no flow data a worst case approach (high discharge flow) is recommended as a precautionary approach with flow derived from available information on DWF, PFF, SO hydraulics, pipe full flow etc. A range of flows between PFF (zero SO discharge) and the likely maximum SO discharge rate can then be used.

Ultimately, judgement is required to derive representative flow(s) for a given SO and a similar approach to that used for river assessment should be adopted. Where there is uncertainty, it is recommended sensitivity testing is undertaken using a range of flow for dilution and mixing zone assessments.

Discharge volume is defined as the volume discharged from a SO during a single event or over a given period.

Discharge concentration

The concentration of a pollutant may vary over time due to the relative proportions of domestic flow and runoff entering the sewer. A similar approach to river assessment should be taken. Discharge concentration should ideally be measured as this can vary between locations. In the absence of measured concentrations, samples from nearby similar discharges or downstream WwTW inlet sampling can be used. Alternatively, network model results, where available, or default concentrations, can be used where no other data is available.

7. Appendix B – Significant load assessment

A significant load assessment for ammonia and BOD should be undertaken to identify the relative contribution from SOs during storm events. However, the decay of these pollutants in the natural environment means the assessment can only be used to identify discharges that may potentially contribute a significant load and should not be extrapolated to an impact.

Loading analysis only defines the inputs to the receiving water and cannot be used to identify concentrations at specific locations within the water body. In the event that SO loads are a relatively high proportion of load, and may be sufficient to affect nutrient concentrations, a simple box modelling approach should be adopted to estimate an average concentration over representative timeframes from which the effects of spill reduction can be assessed.

Where the load from a SO is less than 1 % of the total this is unlikely to cause a significant impact on the water body. Loads greater than 1 % have potential to cause some impact alone. However, where there are already water body failures, We have a duty to restore water bodies to Good status (or High where there has been a deterioration) and achieve favourable conservation status. As a result, where the apportionment is >1 %, consideration should be given to improving the asset to achieve water body and protected area objectives. The 1 % threshold may need revision if it results in no or too many assets coming out as unsatisfactory. We have agreed a sensitivity testing period with DCWW.

Nutrients

For nutrients, WFD TraC waters are classified in terms of winter DIN. WFD DIN classifications are also currently used in MPA feature condition assessments.

You will also be asked to model phosphorus inputs and if inputs from a particular asset are high you may be asked to reduce the loading from that asset to reduce the chance of eutrophication.

1.3. Data

You will need to obtain various data to support your study. These include:

1. River gauging data from us

2. In situ water quality data from the river, estuary and coast from us. This will include, depending on type of study, nutrients (DIN, ammonia, nitrate, nitrite, organic N, and orthophosphate)
3. Permit information including dry weather flow
4. Discharge concentration data for any point sources. You may need to conduct additional monitoring of WwTWs or SOs. If you are unable to obtain data from these assets, suitable alternatives (assumptions) made be used; this must be agreed with us upfront.

Should you not be able to conduct monitoring to identify suitable values, you should liaise with us; default values for storm sewage can be used if required:

- 1 mg/l for P (Ainger et al 1998)
- 6.7 mg/l N (Metcalf and Eddy, 1991).

Defaults for other determinands given in the rivers assessment may be used if required.

1.4. Area and timeframes

Identifying a suitable area and timeframe for the assessments is essential to avoid over or under estimation of specific sources. All significant inputs over the area and timeframe must be included within the assessment using best available flow and concentration data.

It is necessary to define a representative receiving water area to identify other potential pollutant sources to include in the significant loads assessment. The basis for the definition of the receiving water area is the area into which the discharge effluent will disperse to concentrations close to background level – i.e. the point at which the discharge plume is indistinguishable from the receiving water. In coastal areas this might be the area within one tidal excursion of the discharge point. For tidal inlets and most estuaries it is recommended the receiving water area cover the water body from the upstream tidal limit to the downstream limit where the estuary meets the large coastal water. In larger estuaries, where discharges are unlikely to impact the entire water body, it may be more practicable to define a smaller area based on one tidal excursion. The receiving water area may need to be extended where the discharge plume is likely to interact with other discharges, or where a large continuous discharge, e.g. a river or WwTW enters the receiving water.

A number of timeframes are recommended for a full assessment, particularly where the SO contributes a relatively large proportion of the load (>10%) or where the discharge is to a sensitive water or an area with high nutrient concentrations:

- To assess the additional loads from SOs during storm conditions an individual event can be assessed, e.g. 10th largest over a year or equivalent. Where the contribution is high (>10%), further events of reducing magnitude should be assessed to determine if there is a point at which the contribution from the SO is reduced.
- An annual assessment allows the overall effect of spill frequency reduction to be considered.

8. Appendix C – Dilution and Mixing Zone Assessments

Dilution and mixing zone assessments are used to determine whether there is sufficient mixing in the receiving water body. They are used for contaminants with an Environmental Quality Standard (EQS). The most appropriate method for determining dilution is entirely dependent upon the characteristics of the discharge and the receiving water.

You should use the information identified in the Preliminary Investigation to determine which of the below methodologies apply. Evidence to support the choice of approach should be provided in your report.

1.5. Initial dilution assessments

Estuary near tidal limit – River dilution approach

When the discharge is close to the tidal limit of an estuary the low flow condition is likely to be dominated by the river discharge during when the tide is out. During this time the majority of the channel is exposed and flow restricted to the bottom of the channel. As the tide comes in the flow will reverse for the period up to high water and then reverse, during this time the tidal flux will provide additional dilution.

The approach adopted to determine dilution under the River approach (Q95 river flow and DWF discharge flow) is considered acceptable in this case, as this will give the minimum dilution available during low tide. The Q95 flow should be based on measurement or modelling of flow at, or just above the tidal limit. The tidal limit can normally be identified from OS 1:25000 maps by the letters NTL (Normal Tidal Limit).

The period during which river flow dominates will depend on the elevation of the channel bed above the low water tide level, and could vary from minutes to hours. During the preliminary assessment the bed level at the discharge should be compared with the nearest available tide level data (e.g. UKHO tide tables or on-line tide predictions) from which the period during which tide is below bed level can be determined. Where this period is greater than 2 hours either side of low water the River WQ modelling approach is adopted; otherwise, the discharge should be considered as transitional.

Where 8:1 dilution is not achieved, a more detailed assessment to assess localised impacts should be applied. This should include investigations of DO sags or ammonia peaks (against relevant percentile, AA or MAC EQS), using established river modelling techniques (see Stage 3c pp30).

Fully Submerged Discharge – Initial Dilution

Where a discharge is fully submerged, i.e. the outfall soffit level is submerged at low water on a spring tide, a near-field dilution assessment can be undertaken.

A number of initial dilution formulae are available, e.g. Cederwall and WRc, and can be applied using a simple calculation, e.g. the EA's ELSID spreadsheet. The initial dilution

formulae also provide an indication of the plume width at the water surface, which gives a useful indication of the area of impact at the surface.

Dilution is a function of discharge flow and it is therefore important to select a representative SO discharge rate for the dilution calculation. You will need to review available discharge data, e.g. network model output to determine the distribution of flow from the SO. The average flow for each discharge event can also be determined by dividing the discharge volume by spill duration.

Some options are available for dilution assessment (Table 20). In cases a) and b) the dilution is calculated using the ambient depth and velocity at intervals, typically 0.5 hours, over a mean spring tide and a mean neap tide; the Eas initial dilution spreadsheet can be used for this. For a Monte Carlo assessment the depth and concurrent velocity are randomly selected from the incremental data and dilution calculated for a randomly selected flow. This is repeated, typically 1000 or more picks, and the mean, minimum and 70 %ile dilutions selected from a histogram derived from the results.

Table 20 – dilution approaches

	Approach	Description
a	Typical dilution	Determine the dilution under average discharge flow using the average flow determined from the flow distribution or the analysis of spill volume and duration. This provides a good indication of dilution that would be expected over the range of likely discharge flows. If the average dilution is marginally greater than to 15:1 (e.g. between 15:1 and 20:1) it is recommended that the calculation is repeated at higher discharge flow to determine the worst case dilution under high flow conditions for comparison.
b	Worst Case Dilution	Determine the worst case minimum dilution using a high discharge flow e.g. 70 %ile flow for the flow distribution or average flow for the 10 th largest spill event. If the 15:1 dilution criterion is achieved it is reasonable to assume this would be achieved under the majority of discharge conditions.
c	Statistical Assessment (Monte Carlo)	Determine dilution using a Monte Carlo approach where flow, water level and depth are randomly selected from a distribution and dilution calculated. This approach provides the most robust assessment as it considers the full range of flows and ambient conditions.

The method adopted will depend on the available data and may need to be adapted to derive a best estimate of dilution. Where flow data is limited a worst-case approach (high discharge flow) is recommended as a precautionary approach with flow derived from available information on SO hydraulics, PFF, pipe full flow etc. This should be supported by further calculations over the range of anticipated flow (e.g. average flow, low flow) to understand potential variability and the frequency at which low dilutions may occur.

Where data describing the ambient depth and velocity is not available, or there is uncertainty in the available data, it is recommended that sensitivity to depth and velocity is assessed and a matrix of dilutions produced.

The minimum depth and velocity at which 15:1 dilution is achieved under a range of discharge flows can then be determined and an informed decision of likely impact made.

Where the dilution calculation is considered reliable, but is close to 15:1, it is recommended that further calculations are undertaken, with slight changes in key parameters, e.g. higher flow, small decrease / increase in depth and velocity to understand the sensitivity of dilution to key variables.

The following should be considered:

- where the average dilution is $\leq 15:1$ but $\geq 8:1$, or there is uncertainty in the result due to lack of data, the assessment should be reviewed with us to determine if the lower dilution is acceptable. For example, if the time during which dilution is expected to be below the 15:1 dilution criterion is small, a short period of lower dilution may be acceptable, particularly where SO discharge duration is short.
- where the results of the assessment indicate the 15:1 dilution criterion is not met, this indicates the discharge may have impact on the local environment and a further mixing zone assessment is required.

1.6. Mixing Zone Assessment

A mixing zone assessment is used to determine the distance from the discharge where the Environmental Quality Standard (EQS) for a specific pollutant is achieved and thereby determine the area likely to be impacted, i.e. the area where the concentration is above the EQS.

The dilution of a discharge occurs through mixing with the ambient receiving water due to turbulence and other processes. The mixing process can be divided into three distinct regions:

- Near-field – region between discharge and surface over which buoyant mixing occurs; the buoyant plume entrains receiving water through turbulence and shear.
- Mid-field – region where plume is mixing horizontally across the water surface and vertically to create a 3D cone-like shape; mixing driven principally by turbulence.
- Far-field – area where plume is mixed vertically through the water column, where mixing is dominated by horizontal advection and dispersion and where the plume covers a large area until concentrations reach those equal to background.

In many situations significant dispersion may not be achieved immediately after discharge (near-field), particularly at low tide when minimum ambient flow and depth provide least mixing, but may be achieved a short distance downstream as the plume mixes and disperses across the ambient flow. It may therefore be necessary to use a number of methods / tools to assess mixing from near- to far-field.

Methodology

A range of potential methods for determining near- and mid-field mixing in different receiving water types are presented in Figure 7 and discussed in Table 21. Further information can be found in the “Guidelines for the identification of Mixing Zones under the EQS Directive”. Some methods will provide only dilution, but this can then be applied to a discharge concentration to determine concentration and estimate a mixing zone. Where sufficient mixing to meet the EQS cannot be achieved within the mid-field region and the area impacted is potentially large, it may be necessary to consider more detailed far-field modelling. Far-field modelling may also be required to test scenarios to test for connectivity between a SO and a designated Bathing Water or Shellfish Water; we will advise you if you are required to test for connectivity between protected areas and the SO.

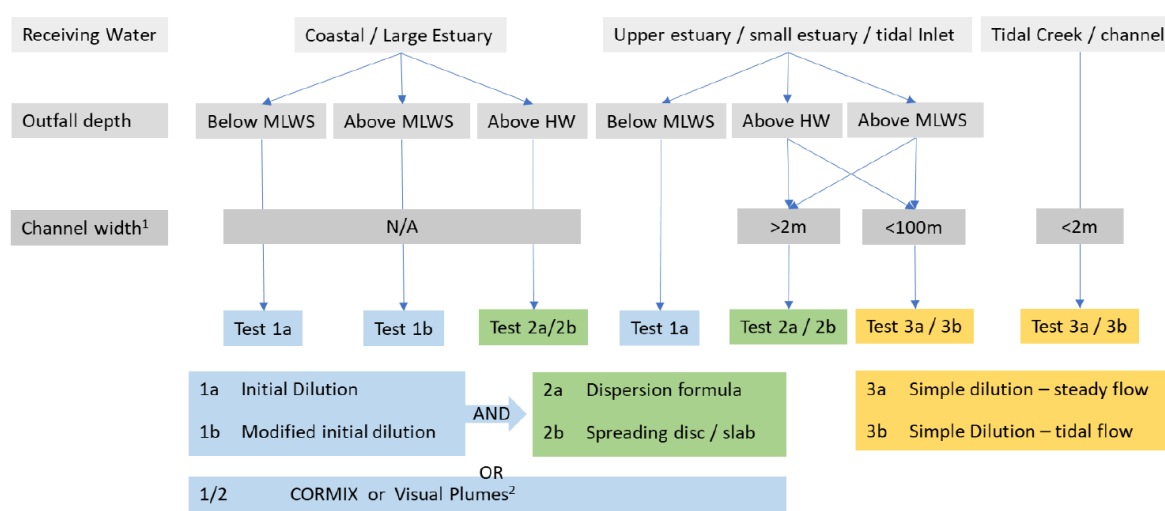


Figure 7 – Dilution assessment decision tree

Table 21 – Available dilution and mixing zone methods and applications

Test	Method	Application	Assumptions	Dimensions
1a	Initial dilution	<p>Discharges from long sea outfalls located below MLWS to open waters of estuaries or coastline.</p> <p>Nearfield modelling of buoyant plume using similar methods to those used for initial dilution assessments for continuous discharge – e.g. Cederwall, ELCID, CORMIX.</p>	<p>Outfall is permanently submerged (below MLWS).</p> <p>No land boundaries</p>	Open water, discharge below MLWS

Test	Method	Application	Assumptions	Dimensions
1b	Modified initial dilution	<p>Discharges from short sea outfalls located between MLWS and MHWS, to open waters of estuaries or coastline.</p> <p>Nearfield modelling of buoyant plume using methods used for initial dilution (1a).</p> <p>Requires use of e.g. 2a / 2b for those periods when the outfall is not submerged.</p>	<p>Outfall is partially submerged (above MLWS, but below MHWS).</p> <p>Behaves as a spreading disk / slab when not submerged.</p> <p>Land boundaries will limit dispersion through plume attachment.</p>	<p>Open Water, discharge between MLWS and MHWS</p> <p>Minimum of 0.5 m of water over the outfall at lowest water depth.</p>
2a	Simple Dispersion formula (e.g. Fischer equations)	<p>Medium to large shallow channels where tidal flow is dominant, discharge is at the bank / shoreline and plume disperses longitudinal and laterally over the channel width, Or; Larger tidal inlets or river channels discharging to coast / beach, Or; Open coastline with short outfall discharging to beach above MHWS.</p> <p>Variation of depth and flow requires series of concentrations over the tidal cycle.</p> <p>Methodology should allow the length of the mixing zone to be calculated in order to assess potential area of impact.</p> <p>May need to be combined with 1a) if tidal channel is above mean low water level and</p>	<p>Plume does not occupy full width / depth of channel.</p> <p>Uniform channel dimensions and flow field over the mixing zone.</p>	<p>Channel width >2m and <100m</p> <p>Channel depth <10m at high tide</p> <p>Bank discharge</p>
2b	Spreading disc / slab model	<p>Medium to large channels and open water where tidal flow is dominant.</p>	<p>Single Discharge.</p> <p>Assumes uniform flow field and that depth / channel</p>	<p>Channel width >2m; channel</p>

Test	Method	Application	Assumptions	Dimensions
		<p>Mixing zone assessment. More advanced application of dispersion formula using spreading disc model, e.g. PLUMES or CORMIX. Applied where simple dispersion formula cannot be used e.g. where there is insufficient depth for initial dilution or available depth is insufficient to achieve required dilution or mixing zone.</p> <p>Variation of depth and flow requires series of calculations over the tidal cycle.</p> <p>Methodology should allow the length / diameter of the mixing zone to be calculated in order to determine potential area of impact, especially where discharge may contain high loads of pollutants or is in a sensitive receiving water.</p>	dimensions do not vary over mixing zone.	depth <10m at high tide.
3a	Simple dilution, steady state flow	<p>Upper estuary / tidal river with narrow cross-section and predominantly fluvial flow.</p> <p>River flow is high and primary source of mixing and dilution, or represents minimum dilution condition for a worst case tidal scenario. As per River approach.</p>	<p>Single Discharge.</p> <p>Discharge by river flow is dominant form of dilution over majority of tidal cycle.</p>	<p>Channel width <2 m at low water;</p> <p>channel depth < 5 m at HW.</p>
3b	Simple dilution, variable flow	<p>Upper Estuary / tidal river or tidal creek with narrow cross-section where tidal flow dominates.</p> <p>Variation of depth and flow requires series of dilutions to be calculated over the tidal cycle and dilution calculated as a min, mean or percentile.</p> <p>May need to be combined with 3a) if tidal channel is above</p>	<p>Single Discharge.</p> <p>Discharge plume mixes fully across the channel width.</p>	<p>Channel width <2 m;</p> <p>channel depth <5 m at HW.</p>

Test	Method	Application	Assumptions	Dimensions
		mean low water level and dilution is due to fluvial flow for extended periods.		

Further detail on the tools in Table 21 can be provided if required.

It should be noted the tools identified in Table 21 are steady state uniform models and generally do not account for changing ambient flow conditions or changing channel geometry or depth. Where mixing zones are relatively small these limitations are not significant as the change in depth / geometry is unlikely to be large and high dispersion can be achieved within a short timescale. Care should be taken to restrict the mixing zone assessment within these limits. For example, a discharge during a period of low velocity and shallow depth (e.g. low water) may take a relatively long time to disperse over the area of the mixing zone. During this time the depth and velocity may increase as the tidal conditions change. In this worst-case condition if a mixing zone cannot be established an alternative period should be considered.

Applicable EQS Values

The EQS values for coastal and transitional waters are different to those in river waters; in some cases, there is no specific equivalent. As a guide the values presented in Table A-5 are recommended as a starting point but should be confirmed with us. Where other pollutants (e.g. metals, organic compounds) may be present in the discharge at high concentrations these should be reviewed with us and suitable EQS values agreed. Discharge concentrations should be derived from sampling of the discharge, network model results or assumption.

Table 22 – EQS standards for TraC waters

Parameter	EQS	Comments
BOD	9 mg/l 95 %ile: High ≤3 mg/l Good ≤4 mg/l	Simple standard for assessment of single SO discharge unlikely to cause significant impact on DO based on 99 %ile. The European Union Environmental Objectives Regulations 2015 ⁹ recommend values for physico-chemical conditions supporting the biological elements of WFD.
Unionised ammonia	21 µg/l AA	It may be necessary to calculate ammonia and unionised ammonia concentrations at a range of pH, temperature and salinity based on local conditions and provide a range of values around the mean.
DO	N/A	Given the localised nature of the dilution assessment there is insufficient time for ammonia and BOD to reduce

Parameter	EQS	Comments
		<p>DO concentration. 99 %ile BOD and ammonia standards provided above should minimise impact on DO.</p> <p>However, if the DO concentration in the discharge is known to be low then an assessment can be undertaken assuming a minimum EQS value of 5 mg/l in Good class waters and 3 mg/l in Moderate class waters.</p> <p>Full assessment requires far-field modelling to determine 5 %iles for comparison with WFD standards¹⁰.</p>

The mixing zone assessment should determine the distance at which the EQS is achieved, in order to determine the area of impact. Advice from us should be sought as to whether the area impacted is acceptable.

A matrix of mixing zones should be established for a range of ambient conditions and discharge flows to assess sensitivity and determine typical and worst case impacted from which a representative mixing zone can be established, e.g. an average based on the likely distribution of the conditions modelled.

The purpose of mixing zone assessments should be considered. Mixing zone assessments provide an indication of the immediate zone of impact of a discharge, under specific steady state conditions, and cannot assess longer term or wider impacts within the water body, or the effects of reducing discharge volume or frequency – other than that the calculated impact will occur for less time and less frequently. Long term impacts that reflect the steady build-up of a substance in the receiving water body over time scales can be considered approximately uniform throughout the receiving water, since they will be mixed by processes such as dispersion and tidal flushing, and should be assessed using the significant load assessment.

Small water bodies with limited dispersion

In the case of discharges to small tidal creeks or channels that are only inundated for short periods around high water, the available dilution is likely to be very limited and over much of the tide the channel will act much like a dry ditch. Where the channel reach is relatively small, it is recommended that the intersection where the small channel joins another more dispersive water body be used as an effective point at which to calculate dilution.

However, consideration should be given to the length and area of the creek compared to the larger estuary water body. You should limit this approach to instances where the creek represents less than 5% of the area of the waterbody. The area of the creek upstream and downstream of the discharge should be considered as the discharge will impact the upstream reach on the flood tide.

Dilution and Mixing Zone Assessment Outcome

Where the assessments indicate potentially significant impact or where there are multiple, grouped SOs, it is recommended that further assessment is undertaken to assess

dispersion and compliance with EQS over the larger far-field area, particularly with respect to compliance with 5 %ile DO standards. The requirements and scope for any additional investigation should be discussed with us.

Far-Field Impacts - Dynamic Models

To assess impacts beyond the mixing zone, particularly over large timescales and distances required for e.g. assessment of impacts on DO, a dynamic modelling approach is generally required. Most SOs likely to have an impact will be in relatively restricted waters where dilution and dispersion are limited, typically narrow parts of estuaries. In this case a 1D model could be used to give a reasonable representation of the estuary channel. The effects of tidal generated flows will need to be included by adding a tidal water level boundary at the downstream limit of the model.

Cross-sections can be simplified to use a simple trapezoidal section that reflects the general shape of the estuary and the variation in bottom and top width from the tidal limit to the estuary mouth. The downstream boundary should be sufficiently far downstream that boundary conditions will not significantly impact model results.

It is suggested that discharges to an estuary where the mean width at the discharge location is less than 250 m can be modelled using a 1D approach. Wider sections, 500m up to 1000 m, could be included toward the downstream boundary, provided there are no SO discharges in these areas. Many estuaries could potentially be represented in this manner. However, a number of factors should be considered:

- This approach assumes that mixing of the plume across the channel is rapid and occurs within a relatively short distance. Within this mixing zone, concentrations will be higher than predicted by the model. Model output within this region is therefore unlikely to be unreliable, but can be assessed using the mixing zone model (described above) to verify the likely distance required to achieve the EQS.
- Where geometry along the estuary reach varies rapidly, a larger number of sections may be required and should be derived from available cross section surveys, bathymetric charts / surveys and or LiDAR data.
- Where channel width is wider than 250 m or the flow field is complex, a simple 2D model may be more appropriate.
- Unlike a river model a transitional model is driven at both the upstream (freshwater) and downstream (tidal) boundaries. The definition of the downstream boundary requires information on tidal regime (water levels) over an extended period. These can be derived from existing coastal models or tidal harmonics and timeseries available from the UK Hydrographic Office (e.g. Total Tide software). A timeseries covering the entire model period is required. Downstream concentration data may also be required to account for background concentrations where these are significant. Data can generally be obtained from WFD monitoring.

1D/2D Models

This approach would be required for large or multiple intermittent discharges that impact on sensitive waters that are too large or complex to be accurately assessed using mixing zones studies or a simple 1D dynamic model.

If a water company has a model available and ready for use, this may well provide more robust outputs than the tools defined in this document (which are for using in the absence of 'better' tools).

Where an existing model is used a number of factors should be considered:

- A model developed for bathing or shellfish water studies will therefore require update to consider physico-chemical processes.
- The time required to set-up and run a model for a FIS / percentile application may be excessive, and is therefore best considered for multiple assets within an area or assets where a more detailed assessment is required, e.g. significant cost benefit.

New model build is only justifiable where there are multiple large intermittent discharges to particularly sensitive receivers with evidence of CSO impact. In this case the added value of the models for cost benefit assessment may be justified.

It should also be noted that 2D Dynamic models have limited use in the near field regions close to outfalls, as the relatively small (10 m to 200 m) three dimensions (along and across the plume and vertically from surface to bottom) near field mixing zone cannot be resolved in a 2D dynamic model. 2D models therefore tend to overestimate dilution close to the discharge point, unless a suitably resolved mesh is used or a particle tracking model is adopted. Mixing zone studies may still be required with the 2D model used for more farfield impacts and percentile / FIS assessments.

Stage 4 – Other evidence

You should consider any other available sources of known information. If a SO causes an environmental impact which has not been evidenced in any other stage of the classification assessment, the information should be summarised in the submission to us.

“Is there any other evidence that demonstrates that the SO is having an environmental impact, alone or in combination with other discharges, on the following protected sites (but not limited to):

- a deterioration in biological or chemical status of the receiving water (Water Framework Directive) or a water body downstream
- a failure in bathing quality standards for a designated bathing water
- a failure in shellfish quality standards for designated shellfish water
- unfavourable conservation status of protected site features (including a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, or Site of Special Scientific Interest (SSSI))
- an impact to an UWWTR sensitive area designation
- an impact to a drinking water protected area
- groundwater Source Protection Zones (SPZ)”?

Yes = provide a summary in your submission; No = confirm no other evidence known in submission

“Is any other information available for the SO (that has not already been used in Stages 1-3) that evidences environmental impact?”

Yes = provide a summary in your submission; No = confirm no other evidence known in submission

Other information could include, but is not limited to:

- Historic surveys of the SO or receiving water
- Sewer network model results that are likely to have been generated during the production of Drainage and Wastewater Management Plans (DWMPs) or other programmes that could be utilised to assist in the classification of SOs
- Other data that may have been gathered and assessed during the DWMP or other programmes, including but not limited to as-built drawings and/or surveys
- Any known intermittent issues impacting on chemical or biological water quality.

Annex 2 – data collection and submission requirements

General information on SO

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
1	Permit reference (or unique identifier if unpermitted)	No EPR or NPS prefix, no variation number suffix	Must match permit reference on public register	Submit
2	Site name		If permitted, must match public register	Submit
3	WaSC asset ID			Submit
4	Sewerage catchment			Submit
5	Storm discharge asset type	SO on sewer network / Storm discharge at pumping station / Inlet SO at WwTW / Discharge from storm tank at WwTW / Other storm discharge asset type (specify)	Same as used on EDM returns	Submit
6	NGR of SO location	Use 12 figure grid ref, for example SN5110064321		Submit
7	NGR of discharge point	Use 12 figure grid ref, for example SN5110064321		Submit
8	Receiving water category	River / TraC / Other (specify)		Submit
9	Permitted BW / SFW trigger no.	BW## / SFW## / N/A	e.g., BW5, SFW14	Submit
10	Has SO had a SOAF assessment	Yes / No		Submit
11	Any confirmed NEP schemes for this SO	Provide planned start and end dates with a short description of the scheme		
12	Representative rain gauge/s identification		Include station name and number	Submit
13	Approx river width (m)			Submit
14	Photos of SO, outfall and sampling locations	Must be date and time stamped		AOR
15	Outfall type	Bankside / Short sea outfall / Long sea outfall	Also state if permanently submerged	Submit
16	Outfall condition	Good / Damaged /		Submit

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
		Overgrown / Other (specify)		
17	Does SO discharge directly or indirectly into a SAC catchment?	Yes / No		Submit
18	Name of receiving WFD waterbody			Submit
19	Waterbody ID of receiving waterbody			Submit

Event Duration Monitoring (EDM) data

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
20	EDM annual datasets used for assessment	State years		Submit
21	Excluded annual EDM datasets	State years	If any in last 3 years have been excluded due to maintenance issues that causes high spills	Submit
22	Reason for dataset exclusion	Free text		Submit
23	Any known issues with EDM data accuracy or operability	Yes / No	At least 90% monitor operability expected	Submit

Stage 1: Minimum design standards

Test 1: Dry day discharges

No.	Data field	Data/information validation	Submit / AOR?
24	Does the SO have any <u>dry day discharges</u> in the last 3 years (minimum) that are due to hydraulic reasons?	Yes / No / N/A	Submit
25	Analysis report	Demonstrate how the dry day definitions have been applied to the rainfall and EDM data, including deviations from overarching methodologies that you may refer to. Include description of assessment method and data sources. Provide a summary representation of outputs, using graphs as appropriate	Submit
26	Classification	Unsatisfactory / Indicates satisfactory	Submit

Test 2: Heavy rainfall spills

No.	Data field	Data/information validation	Submit / AOR?
27	In the last 3 years (minimum) is the SO only spilling due to heavy rainfall?	Yes / No / N/A	Submit
28	Analysis report	Demonstrate how the heavy rainfall definition have been applied to the rainfall and EDM data, including deviations from overarching methodologies that you may refer to. Include description of assessment method and data sources. Provide a summary representation of outputs, using graphs as appropriate	Submit
29	Classification	Substandard / Indicates satisfactory	Submit

Test 3: 6 mm screening requirements

No.	Data field	Data/information validation	Submit / AOR?
30	Are the minimum 6mm screening requirements achieved?	Yes / No	Submit
31	Type of screen present	4 mm 1D, 4 mm 2D, 6 mm 1D, 6 mm 2D, 10 mm 1D, 10 mm 2D, other, none	Submit
32	Classification	Substandard / Indicates satisfactory	Submit

Test 4: Settled storm storage (storm tank only)

No.	Data field	Data/information validation	Submit / AOR?
33	What can the settled storm storage deal with?	At least 3DWF / At least 2hrs equivalent storage / Neither	Submit
34	Classification	Substandard / Indicates satisfactory	Submit

Test 5: FPF equal to FFT (storm tank at a WwTW only)

No.	Data field	Data/information validation	Submit / AOR?
35	Is FPF equal to FFT?	Yes / No	Submit
36	Classification	Substandard / Indicates satisfactory	Submit

Test 6: Passing forward Formula A (SPS and SOs only)

No.	Data field	Data/information validation	Submit / AOR?
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37	Is the SO passing forward Formula A?	Yes / No	Submit
38	Formula A (l/s)		Submit
39	Classification	Substandard / Indicates satisfactory	Submit

Stage 2: Permit compliance

Test 1: Flow Passed Forward (FPF) permitted rate

No.	Data field	Data/information validation	Submit/AOR?
40	Is the SO meeting permitted FPF?	Yes / No / N/A	
41	Permitted FPF (l/s)	Value or N/A	Submit
42	Actual FPF (l/s)		Submit
43	How is actual measured	Observed / Modelled	Submit
44	Classification	Unsatisfactory / Indicates satisfactory	Submit

Test 2: Is the SO compliant with its permitted screen requirements?

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
45	Is the SO compliant with its permitted screen requirements?	Yes / No / N/A		
46	Permitted screen requirement	4 mm 1D, 4 mm 2D, 6 mm 1D, 6 mm 2D, 10 mm 1D, 10 mm 2D, other, N/A		Submit
47	Screen present	4 mm 1D, 4 mm 2D, 6 mm 1D, 6 mm 2D, 10 mm 1D, 10 mm 2D, other, none		Submit
48	Screen replacement date	End of Life (EOL) / Upgrade required	Upgrade date needs to be agreed with us	Submit
49	Classification	Unsatisfactory / Indicates satisfactory		Submit

Test 3: Storage requirements

No.	Data field	Data/information validation	Submit / AOR?
50	Permitted storage requirement (m ³)	m ³ or N/A	Submit
51	Storage available (m ³)	m ³	Submit

52	Following cessation of rainfall how is storm tank contents returned to FFT?	Auto / Manual / None	Submit
53	Classification	Unsatisfactory / Indicates satisfactory	Submit

Test 4: Rainfall/snowmelt condition

No.	Data field	Data/information validation	Submit / AOR?
54	Is the SO compliant with the rainfall/ snowmelt condition?	Yes / No / N/A	Submit
55	If no, give reason	Free text	Submit
56	Classification	Unsatisfactory / Indicates satisfactory	Submit

Stage 3a: Aesthetics assessment

Site visit information

No.	Data field	Data/information validation	Submit / AOR?
57	Date of Spring assessment	DDMMYY	Submit
58	Date of Autumn/Winter assessment	DDMMYY	Submit
59	Discharging at time of visit?	Yes / No	AOR
60	Discharge colour/quality	Clear / Grey / Other (specify)	AOR
61	Weather at time of visit	Free text	AOR
62	Weather in last 24 hours	Free text	AOR
63	Are any of the following present: oil sheen, silt or sediment at outfall or downstream substrate, odour?	Free text	AOR
64	Is there a visible plume?	Yes / No	Submit

Element 1: Pollution incidents (hydraulic related)

No.	Data field	Data/information validation	Submit / AOR?
65	WIRS reference number/s		Submit
66	WIRS reference number/s excluded as due to maintenance issues		AOR
67	Highest environmental impact category of hydraulic WIRS	Cat 1 / 2 / 3 / 4 / None	Submit
68	Element score	100 / 60 / 20 / 0	Submit

Element 2: Substantiated complaints

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
69	No. received by WaSC		Include dates, details, references	AOR
70	No. received by Local Authority		Include dates, details, references	AOR
71	No. received by NRW		Include dates, details, references	AOR
72	Total no. of complaints			Submit
73	Element score	0 / 10 / 20 / 30 / 40		Submit

Element 3: Sewage litter

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
74	If assessment is for a group of SOs, provide all permit/unpermitted unique refs	Permit refs or N/A-single asset assessed		Submit
75	Stretch starts how many metres u/s of outfall (m)			AOR
76	Length of stretch (m)			AOR
77	No. of items of sewage litter upstream			Submit
78	Stretch starts how many metres d/s of outfall (m)			AOR
79	Length of stretch (m)			AOR
80	No. of items of sewage litter downstream			Submit
81	Difference between u/s and d/s count			Submit
82	Score for u/s d/s difference	0 / 5 / 10 / 15 / 20		Submit
83	No. of items of sewage litter in immediate vicinity & on structure			Submit
84	Score for immediate vicinity	0 / 5 / 10 / 15 / 20		Submit
85	Element score	0 / 5 / 10 / 15 / 20	Use worst score between u/s d/s difference & immediate vicinity	Submit

Element 4: Sewage fungus on outfall

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
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86	Is there fungus on outfall	Present / Absent		Submit
87	Element score	0/5	0 for absent, 5 for present	Submit

Element 5: Sewage fungus on substrate

Upstream of SO

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
88	% Coverage on 10 stones u/s of SO	%	Not used for scoring, but should investigate cause	AOR
89	Average % coverage on u/s substrate	%		Submit

Within mixing zone 0-50 m downstream of SO

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
90	% Coverage on 10 stones d/s of SO	%	To nearest 10%	AOR
91	Average % coverage on d/s substrate	%		Submit
92	Score	0 / 5 / 10 / 15 / 20 / 25		Submit

Beyond mixing zone

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
93	% Coverage on 10 stones d/s of SO	%	To nearest 10%	AOR
94	Average % coverage on d/s substrate	%		Submit
95	Score	0 / 25	0 = absent, 25 = present	Submit
96	Element score	0 / 5 / 10 / 15 / 20 / 25	Use highest of two scores (92 and 95)	Submit

Element 6: Amenity value

No.	Data field	Data/information validation	Submit / AOR?
97	Amenity category	High / Medium / Low / None	Submit
98	Reason for category	Free text	Submit
99	Element score	0 / 5 / 10	Submit

Total aesthetics impact

No.	Data field	Data/information validation	Submit / AOR?
100	Total of 6 element scores		Submit
101	Aesthetic impact	None / Very low / Low / Moderate / High / Severe	Submit
102	Classification	Satisfactory / Unsatisfactory	Submit

Stage 3b: Invertebrate (biological) assessment

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
103	Assessment data and outputs		Includes WHPT indices, EQR, Sims	AOR
104	Worst short-term invertebrate impact (spring)	No impact / Very low / Low / Moderate / High / Very high / Severe / Very severe / Extremely severe		Submit
105	Worst short-term invertebrate impact (autumn)	No impact / Very low / Low / Moderate / High / Very high / Severe / Very severe / Extremely severe		Submit
106	Worst long-term invertebrate impact (spring and autumn)	No impact / Very low / Low / Moderate / High / Very high / Severe / Very severe / Extremely severe		Submit
107	Overall invertebrate classification	Unsatisfactory / Indicates satisfactory	Use worst out of three above	Submit

Stage 3c: WQ impact assessment

No.	Data field	Data/information validation	Additional guidance	Submit / AOR?
108	Does the SO meet all three dilution criteria?	Yes / No	Yes = Very low impact	Submit
109	If no, provide a summary report of WQ modelling undertaken and conclusions			Submit
110	Which parameters have failed			Submit
111	Overall WQ impact	No impact / Very low / Low / Moderate / High / Severe		Submit
112	Classification	Unsatisfactory / Indicates satisfactory		Submit

Stage 4: Other evidence

No.	Data field	Data/information validation	Submit / AOR?
113	Is there any other evidence that demonstrates that the SO is having an environmental impact, alone or in combination with other discharges, on any protected sites?	Yes / No	Submit
114	If yes, provide a summary report	Free text	Submit
115	Is any other information available for the SO (that has not already been used in Stages 1-3) that evidences environmental impact?	Yes / No	Submit
116	If yes, provide a summary report	Free text	Submit
117	Classification	Unsatisfactory / Indicates satisfactory	Submit

Overall proposed classification

No.	Data field	Data/information validation	Submit/AOR?
118	Overall proposed classification	Unsatisfactory / Substandard / Satisfactory	Submit
119	Submission date	Date submitted	Submit

Abbreviations

AOR	Available on request
DWMP	Drainage and wastewater management plans
EDM	Event duration monitoring
EOL	End of life
FFT	Flow to full treatment
FPF	Flow passed forward
HRA	Habitat Regulations Assessment
LIL	Last in line
MCERTS	Monitoring certificate scheme
RFI	Request for information
SAC	Special Areas of Conservation
SO	Storm overflow

SOAF	Storm overflow assessment framework
SPA	Special Protection Areas
SPS	Sewage pumping station
SSSI	Site of Special Scientific Interest
TraC	Transitional and coastal waters
TSR	Timeseries rainfall
UPM	Urban Pollution Manual
UWWTR	Urban Wastewater Treatment Regulations
WaSC	Water and sewerage company
WFD	Water Framework Directive
WIRS	Wales Incident Recording System
WWTW	Wastewater treatment works