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**WAT-RM-07 Sewer Overflows v3.2**

December 2024

# Update Summary

## Version 1.0

First issue for Water Use reference using approved content from the following documents:

* Intermittent\_Sewage\_Discharges\_HT4.doc
* RM\_07\_PS\_SewerOverflowsV3.doc

## Version 1.1

* Revisions detailed in WAT-RM-07\_PS\_Sewer\_Overflows\_v2.doc
* Doc WAT-SG-01 now deleted, all references removed
* Other doc references updated to include WAT- prefix
* WAT-TEMP-21 reference added

## Version 2.0

* New base template applied, links to docs revised for new SEPA website.

## Version 3.0

* Expired CMS links reviewed and updated.
* Formula A revised, Storm Tank/Screening/Flow monitor/Sewer Network Licence info added.

## Version 3.1

* Fig 3 corrected (Special case options), outfall is dependent activity, modifications and removal of assets added.

## Version 3.2

* DWF calculation update.
* 2 hours storage at Formula ‘A’- FFT added
* Clarification relating to application of FIS/99%ile standards.
* Counting spills method added.
* Document has been restructured but technical content maintained.

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# Key points

The guidance applies to the following types of intermittent discharges:

* Combined sewer overflows (CSOs) at sewage treatment works (STWs) and on the sewer network.
* Storm tank overflows at STWs and on the sewer network.
* Emergency overflows (EOs) from pumping stations.
* Scottish Water network CSOs and EOs are authorised by sewer network licences.
* Existing discharges should be licensed to address any unsatisfactory criteria.

A new discharge should be designed to satisfy the [Urban Waste Water Treatment (Scotland) Regulations 1994](http://www.legislation.gov.uk/uksi/1994/2842/contents/made) (UWWTR) with reference to two key external documents:

* [Urban Pollution Management Manual](http://www.fwr.org/UPM3/)
* Urban Waste Water Treatment Regulations Guidance Note.

# Types of overflows

Intermittent discharges may occur at a STW or from a sewerage system (or network). Such discharges consist of:

* Combined sewer overflows (CSOs). These are discharges from combined sewers during rainfall to prevent flooding or inundation of areas with dilute sewage. A combined sewer takes both rainwater run-off and foul (sewage & trade) effluent.
* Storm tank overflows. Storm tanks at inland sewage treatment works are normally required to deal primarily with the polluting "first flush" of storm sewage; and
* Emergency overflows (EOs). Emergency overflows may be present where there are pumps or other equipment at risk from mechanical/electrical failure.

Pumping stations on a combined sewer often have both a CSO and an EO. The 2 types of overflow will have different conditions applying to them even though they may discharge to the environment through the same outfall pipe.

Figure 1 shows flow distribution for a typical sewerage network. Many sewerage networks will differ from this considerably.

**Figure 1: Typical sewage flow distribution**

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# Applying for a licence for an overflow

Before applying for a licence we recommend pre application discussions with SEPA at the earliest possible stage. This will allow discussion of the options available, the required standards to be achieved and ensure adequate modelling/monitoring data collection is carried out.

Any network improvements must be agreed and delivered via the agreed investment process.

Many CSOs and EOs on sewer networks have been brought together into sewer network licences. These reflect the wider scope of CAR which can regulate activities such as sewage collection, as well as actual discharges of sewage. The concept of network licences is consistent with the practice of licensing multiple activities in one document, such as for drinking water supply and hydropower schemes.

Licence conditions for intermittent sewage discharges define the structures required rather than the quality of discharge to be achieved. Although the application of numeric microbiological limits is possible, it is not practical to apply numeric standards in the majority of cases.

Licences should define:

* The acceptable spill setting which determines the storm water storage capacity and size of the downstream sewer.
* The level of treatment required which determines the level of screening, storage etc. to be provided prior to discharge.
* The requirements for recording of intermittent discharge events and in-sewer flow monitoring.
* The descriptive conditions which cover environmental standards such as "deposition of solids"

## Licence templates

SEPA will use the following licence templates as appropriate:

* Municipal Sewage Treatment Works Licence Template
* Combined Sewer Overflow Licence Template (CSO)
* Emergency Overflow Licence Template (EO)
* Sewer Network Licence Template

The sewer network licence template should be used for all network overflows licensed to Scottish Water, even if these only consist of a single overflow. Private (including PFI operated) overflows should be licensed using the CSO and EO templates. When private overflows are subsequently adopted by Scottish Water (for example a pumping station EO) then an application to include the overflow in the relevant network licence should be submitted to SEPA.

Sewer network licences authorise most Scottish Water overflows on the sewer network whether previously unauthorised or whether authorised by deemed registrations (previously COPA consents) or CAR licences. Overflows within the boundary of a STW should be included within the STW licence and not the sewer network licence.

## Licensing existing CSOs or EOs

In order to comply with the requirements of the UWWTR in relation to existing intermittent discharges, the UWWTR Guidance Note identifies unsatisfactory discharges (otherwise known as unsatisfactory intermittent discharges or UIDs) on the basis of six failure criteria:

* Causes significant visual or aesthetic impact due to solids or fungus or has a history of justified public complaint.
* Causes or makes a significant contribution to a deterioration in chemical or biological status.
* Causes or makes a significant contribution to a failure to comply with Bathing Water Quality Standards for identified bathing waters and/or Shellfish Waters.
* Operates in dry weather conditions.
* Operates in breach of licence conditions provided that they are still appropriate; and/or
* Causes a breach of water quality standards (EQS) or other EC Directive requirements.

An existing discharge which meets one or more of the above criteria is classed unsatisfactory and will require improvement to address the failing criteria only. For example, if the discharge is deemed unsatisfactory due to the presence of sewage solids in the watercourse, screening to the required standard will be the only substantial change when reviewing the licence.

Existing network overflows will be licensed in the SNL on an ‘as is’ basis. If the overflows are unsatisfactory this will be dealt with through SEPA’s Enforcement Policy and the agreed investment process.

The first SEPA inspection focuses on checking of current licence conditions and is a verification audit. Any consequent corrections to licence conditions should be achieved by a SEPA initiated variation.

However, any subsequent changes that Scottish Water wish to make to the licence will be via an operator initiated variation, as per WAT-RM-09, WAT-SG-87 and the [SEPA Charging Scheme](https://www.sepa.org.uk/regulations/authorisations-and-permits/charging-schemes/).

Guidance on undertaking sewer network licence inspections is provided in [WAT-SG-87: Compliance Monitoring for Sewer Network Licences.](https://www.sepa.org.uk/media/152983/wat_sg_87.pdf%22%20%5Co%20%22WAT-SG-87%3A%20Compliance%20Monitoring%20for%20Sewer%20Network%20Licences)

## Licensing new CSOs or EOs

Sewer flooding risks are expected to increase as a consequence of climate change. These risks can be minimised by the progressive reduction of sources of surface water runoff into the combined sewer and reduction in groundwater infiltration into sewers.

As well as alleviating flood risk, reducing inflows to sewers has other benefits. These include freeing up sewer capacity for future development, reducing pollution from CSOs, making the sewer network more adaptable and resilient to climate change, reducing the power consumed by pumping and treating the excess inflows and recharging groundwater supplies. By reducing surface water inflows to sewers, the need for new CSOs should therefore be kept to the absolute minimum.

Measures that reduce surface water (and groundwater) in sewers shall be considered before new or increased CSO discharges on an existing sewerage system are implemented. However, a new CSO may be considered acceptable as long as there is no unacceptable water quality impact.

For applications for new EO refer to [section 6](#_6._Pumping_station).

When a new Scottish Water overflow is constructed, an application should be submitted to include it in the relevant network licence (unless it is within the boundary of a STW in which case this will be varied as part of the STW licence).

This will be achieved by an operator initiated variation, with the relevant variation fee based on the population equivalent of the sewer network flowing into that asset. Refer to the SEPA Charging Scheme guidance.

The construction, modification or removal of an outfall at an overflow is considered as a dependent controlled activity that requires authorisation. The SNL template has a condition requiring the design and method statement for the outfall to be submitted and agreed by SEPA. This means that an engineering licence variation will not be required when an outfall is constructed/modified/removed.

Further information in relation to the modification of a SNL is held in the Regulatory Method [WAT-RM-09: Modifications to CAR Authorisations.](https://www.sepa.org.uk/regulations/water/guidance/)

# Designing CSOs to protect the water environment

CSOs can be located anywhere on the sewerage network:

* On a branch sewer remote from the STW.
* At a sewage pumping station; or
* On an inlet sewer to the STW.

It is usually preferable to base the design of a CSO on the output of sewer hydraulic and water quality impact models. Where there is a low risk to the water environment, termed a “low significance discharge” the cost of data collection for model construction or calibration may render this approach disproportionately expensive and incur significant delays in construction.

The UWWTR Guidance Note and the [Urban Pollution Management Manual](http://www.fwr.org/UPM3/) (UPM) advocate a graduated assessment of the level of investigation required to determine the impact of a CSO discharge on the receiving waters. Any network improvements must be agreed and delivered via the Quality and Standards (Q & S) investment process.

## 4.1. CSO discharges to watercourses

For low significance discharges to inland waters accepted practice is to require flows up to the equivalent to "Formula A" to be passed forward to the treatment works and flows in excess of this can discharge to the watercourse. Formula A is calculated according to the type of sewer catchment.

 As dilution decreases and risk to the water environment increases discharge become of “medium or high significance” and need progressively more detailed catchment modelling and water quality impact assessment.

Formula A produces a more protective solution than 99%iles using simple modelling required for medium significance discharges, and similarly 99%iles result in a more protective solution than FIS standards using complex modelling. However, this assumption may not be valid in all circumstances.

The general approach to be taken is set out below but the approach to be adopted should be agreed with SEPA’s Informatics / ESIU (Environmental and Spatial Informatics Assessment Unit) at pre-application discussion stage.

### 4.1.1 Low significance discharges

Low significance discharges are where:

* The dilution is greater than 8:1 (DWF @ 5% low river flows); and
* There is no interaction with other discharges; and
* The population equivalent is less than 10,000.

All 3 criteria should apply. If not, you should refer to the medium significance criteria.

Minimum pass forward flow at overflows based on Formula A will normally be adequate. This assumes that available dilution will be sufficient to protect the river quality. Where an environmental problem is known, more detailed modelling may be required.

#### Formula A for a fully combined system

Formula A = DWF + 1360P + 2E

Where DWF = PG + Imax + E

Where:

P = Population served

G = Water consumption / head / day (typically 150 litres)

IMax= maximum possible infiltration

E = Trade Effluent Flow (litres)

The figure used for infiltration I, Imax is the maximum possible infiltration rate. This is because the overflow setting of Formula A needs to be appropriate throughout the year (see [WAT-SG-13](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/) for more information regarding Imax).

#### Formula A for a fully separate system

Flow to full treatment, Formula A = 3DWF = 3PG + Imax + 3E

(The multiple of 3 for domestic and trade effluents allows for normal variations of these flows throughout the day, whereas infiltration does not vary significantly during the day).

#### Formula A for a part combined and part separate system

If there is a significant proportion of the catchment draining to a separate system use:

Flow to full treatment, Formula A = DWF + 1360Pc + 2PsG + 2Et

Where:

Pc = population served by combined sewer

Ps = population served by separate foul sewer

Et = trade flows from the total area

DWF = Pt G + It + Et

Pt = total population

It = total infiltration Imax

It is suggested that, in catchments where less than 20% drains to separate sewers, the simpler combined formula should be used.

Formula A normally equates to approximately seven times the value of the Dry Weather Flow.

Retention of flows (by for example, including a storm tank at the network CSO) in excess of Formula A may be required, depending on the available dilution. This is outlined later in this guidance (see [section 5](#_5._Designing_Storm).).

In dry weather, instantaneous flows can increase substantially due to diurnal variation during peak periods, e.g. early morning and evening. However, peak flows may not arrive at the STW until several hours later depending on the size of the sewerage network, pumping station operation etc.

### 4.1.2 Medium significance discharges

Medium significance discharges are where:

* The dilution less than 8:1, and
* There is little or no interaction with other discharges, and
* The population equivalent is less than 10,000.

SEPA will accept schemes demonstrated in accordance with the relevant 99%ile quality standards for the river. Simple stochastic river impact modelling, applied in association with sewer hydraulic models, is normally required. 99%ile standards (for BOD, total ammonia and un-ionised ammonia) are used when mass balance calculations form the basis of the modelling. Repeated mass balance calculations are carried out to estimate a frequency distribution of the determinand for the river downstream of the CSO discharge. The 99%ile value from this distribution can then be checked against the standard.

In addition to assessing against 99%ile standards, assessment to show that Fundamental Intermittent Standards (FIS) can be met may be required where the appropriate environmental data is available. Where the relevant environmental data is unavailable, assessing against 99%ile standards is normally acceptable.

### 4.1.3 High significance discharges

High significance discharges are where:

* The dilution is less than 2:1; or
* There is interaction with other discharges; or
* The population equivalent is greater than 10,000.

FIS modelling should be undertaken. FIS requires river water quality data.

FIS have been developed for dissolved oxygen (DO) and un-ionised ammonia. These standards are expressed in terms of concentration/duration thresholds for a range of return periods. If a river meets these standards with the proposed intermittent discharge then the aquatic life in the river should have adequate protection against the effects of short term exposure to storm sewage discharges.

For schemes that improve water quality and comply with FIS, it will be sufficient to demonstrate that the proposed scheme will achieve the relevant 90 (or 10) and 95 percentile WFD standards and that the cost of meeting the 99%ile standards is disproportionate to the benefit of meeting the 99%ile.

Where there is a risk of deterioration in river quality (for example a growth project), FIS solutions will only be acceptable provided that Scottish Water can demonstrate that the proposed scheme allows the relevant 99%ile WFD standards to be met.

Where the appropriate environmental data is unavailable to enable FIS to be carried out, Scottish Water is required to demonstrate to the satisfaction of SEPA that the gathering of the data would be disproportionate. Where Scottish Water is unable to demonstrate this, FIS will be required.

Early consultation with SEPA, is advised since there are a wide range of river and sewer modelling techniques, with any combination of simple and complex models~~.~~

The 99%ile and FIS standards can be found in the [standards directions](https://www.gov.scot/binaries/content/documents/govscot/publications/regulation-directive-order/2014/08/scotland-river-basin-district-standards-directions-2014/documents/00457867-pdf/00457867-pdf/govscot%3Adocument/00457867.pdf?forceDownload=true) and are related to typology. The typology for the receiving watercourse can be obtained from SEPA.

SEPA modellers will verify the output from models used by Scottish Water. Separate guidance on modelling is included in the following

* [WAT-RM-28: Modelling for Water Use Activities](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/)
* [WAT-SG-02: Modelling Continuous Discharges to Rivers](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/)
* [WAT-RM-37: Regulation of Discharges to Freshwater Lochs](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/)
* [WAT-SG-11: Modelling Coastal and Transitional Discharges](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/)

Any modelling should consider the impact on inland bathing water and any drinking water sources. The Microbiological standards for bathing waters are set out in [WAT-RM-13 Microbiological Discharges.](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/)

## 4.2 CSO discharges to coastal and transitional waters

As with discharges to inland waters, the degree of assessment should be proportionate to the risk or “significance” of the discharge.

The criteria for determining modelling requirements for CSOs discharging to coastal and transitional waters is provided in below, reproduced from Annex H of the UWWTR Guidance Note.

The water quality standards that must be met by intermittent discharges to coastal and transitional waters are detailed in [WAT-RM-13: Regulation of Microbiological Discharges](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/).

### 4.2.1 Low significance discharges

Low significance discharges are where:

* There are no Bathing or Shellfish Waters.
* There is no interaction with other discharges.

In these cases Formula A should be used unless there are special reasons for departing from this approach.

### 4.2.3 Medium significance discharges

Medium significance discharges are where:

* The population equivalent is between 2,000 - 10,000 and
* The discharge affects Bathing or Shellfish Waters.

In these cases, a Simple Model (sewer hydraulic model with frequency assessment of overflow spill) is required to determine if the spill frequency is acceptable.

### 4.2.3 High significance discharges

High significance discharges are where:

* The population equivalent >10,000 and
* The discharge affects Bathing or Shellfish Waters.

In these cases, complex models will be required (sewer hydraulic model with frequency assessment of overflow spill and an option for coastal dispersion model and impact assessment).

### 4.2.4 Acceptable spill frequency

New intermittent sewage discharges to sites designated as Bathing Waters or classified as Shellfish Waters should be avoided where possible. However, where unavoidable and justification is agreed with the applicant, the minimum design criteria should be such that spills do not exceed:

* 3 significant spill events on average per bathing season into bathing waters or
* 10 significant spill events on average per annum into shellfish waters.

If the outfall soffit (top of the outfall pipe) is above mean low water springs, it normally must not spill more frequently than 1 in 5 years. For design purposes, a spill of >50m3 will be deemed significant.

If this spill frequency is exceeded, the applicant will need to demonstrate compliance with water quality standards through modelling.

In certain situations, depending on location, sewer modelling showing ≤3 significant spills per season or ≤10 spills p.a. may not always be protective of the bathing water or shellfish water. Eg A shallow enclosed bay and/or a high p.e may require marine modelling. This may be particularly the case for existing CSOs discharging into a failing bathing or shellfish water, where the contribution from other sources such as sewage or farm runoff may result in the 3 or 10 spill threshold not being protective.

For existing CSOs if the discharge is satisfactory in relation to the UWWTD 6 criteria SEPA will licence the status quo. If the discharge is unsatisfactory in relation to the UWWTD 6 criteria SEPA will only require the significant spill criteria to apply if there is a non-compliance of a bathing water or a shellfish water. If the bathing or shellfish water is compliant then SEPA will licence the existing PFF and will require that the UWWTD non-compliance is addressed.

#### Counting Spills for use during design of a new or modified overflow

You must count spills using the 12/24 counting method:

1. Start counting when the first discharge occurs.
2. Any discharge (or discharges) in the first 12-hour block is counted as one spill.
3. Any discharge (or discharges) in the next, and subsequent 24-hour blocks, are each counted as one additional spill per block.
4. Continue counting until there’s a 24-hour block with no discharge.

For the next discharge after the 24-hour block with no discharge, you begin again with the 12-hour and 24-hour block spill counting sequence.

#### Aggregate Spills

Where there are multiple, intermittent discharges that affect the same Bathing or Shellfish Water then these will be assessed on aggregate.

Spills over the whole catchment should be considered and those which do not have an impact can be discounted, if justified.

### 4.2.5 Outfall location

All new CSO outfalls discharging to coastal and transitional waters should have the top of the pipe (soffit) submerged when the tide is at Mean Low Water Springs (MLWS). To do this the pipe will have to extend beyond the MLWS mark. This is unless exceptional circumstances apply, as described in [WAT-SG-28 Good Practice Guide – Intakes and Outfalls.](https://www.sepa.org.uk/media/150984/wat_sg_28.pdf) Further guidance on exceptional circumstances is provided in the UWWTR Guidance Note.

## 4.3 Minimum screening requirements for CSOs

Treatment requirements for CSOs will almost exclusively relate to the level of screening required to control aesthetic impacts arising from the discharge of solid materials. In very specific cases, treatment may extend to settlement facilities (e.g. storm tanks). The level of screening required is determined on the basis of the receiving water amenity use.

This section sets out SEPA’s minimum requirements for screening. However, Scottish Water may choose to put in two dimensional 6mm screens at CSOs predicted to overflow more frequently than 1 in 5 years. For those predicted to discharge less frequently than 1 in 5 years, no screening is required unless there is a particular environmental need.

Screens normally have a bypass to prevent flooding if the screen becomes blinded. The screen should be designed so that it has sufficient hydraulic capacity to cope with events up to and including the 1 in 5 year event without becoming blinded and bypassed.

Screens can either be static or mechanically raked. Scottish Water will determine whether to put in a static or manual screen. Static screens will begin to blind when the overflow operates, therefore this will need to be taken into consideration when designing new or replacement screens and additional screen area should be considered to account for this.

The screen must be designed to cope with the frequency and duration of spills predicted from the time series analysis.

Account should be taken of the planned screen cleaning regime. In addition, screens should be oversized to cope with situations where the influent to the overflow is likely to be highly loaded with debris. An example of where this is relevant is where the sewered catchment has only partly combined drainage. Another example is where upstream sewers are laid at slack gradients. This can lead to solids settling out in dry weather and being flushed to the screens during storm.

For a given flow rate, mechanical or auto-cleaning screens are generally smaller in area than a static screen of equivalent capacity. Therefore, if the raking mechanism fails the screen will blind more quickly and bypass more readily. Where mechanically raked screens are installed, telemetry is required to notify the operator in the event of screen failure.

Retrofitting screens to an existing chamber should only be undertaken where the engineer is confident the installed screen and chamber achieve the objectives for screening performance and are not bypassed. Evidence to support the design should be provided with licence applications. Post scheme appraisal monitoring may be required to confirm retrofitted screens are not bypassed more often than once in 5 years on average.

Screens and chambers must be designed not to increase flood risk. This is particularly important when retrofitting screens to existing chambers.

Screening requirements should be discussed with SEPA at an early stage.

### 4.3.1 Screens required for high amenity locations

A high amenity location influences:

* A designated Bathing water
* An area where bathing and water contact sport (immersion) is regularly practised (e.g. wind-surfing, sports canoeing);
* An area where the receiving watercourse passes through a formal public park or there is a formal picnic site;
* Designated Shellfish waters,
* Waters designated under the Birds and Habitats Directives that are Special Protection Areas or Special Areas of Conservation.
* designated Marine Conservation Zones

A 6mm solids separation will be required and screening of flows for a rainfall return period of greater than 1:5 years may be required.

### 4.3.2 Screens required for moderate amenity locations

A moderate amenity location influences:

* An area where there is boating on the receiving water.
* An area where there is a popular footpath adjacent to the watercourse.
* An area where a watercourse passes through a housing development or frequently used town centre area (e.g. bridge, pedestrian area, shopping area).
* An area where there is recreation and water contact sport (non-immersion).

A 6mm solids separation will be required. This applies to all flows up to a 1:5 year rainfall return period.

### 4.3.3 Screens required for low amenity locations

 A low amenity location influences:

* An area that has basic amenity use only;
* An area that has casual riverside access used on a limited or infrequent basis, such as a road bridge in a rural area, footpath adjacent to a watercourse.

A 10mm solids separation is required for all flows up to a 1:5 year rainfall return period or best engineering design.

### 4.3.4 Screens required for non-amenity locations

A non-amenity location influences:

* Areas that seldom or never used for amenity purposes;
* Areas that are remote or inaccessible.

A 10mm solids separation is required for all flows up to a 1:5 year rainfall return period or best engineering design.

### 4.3.5 Screens required for existing CSOs

Existing satisfactory discharges will be licenced as the status quo. Existing unsatisfactory discharges for 1 criterion only will be licenced to remove the reason for the unsatisfactory status. If the reason for this failure is aesthetic or if 2 or more unsatisfactory criteria are failed the screen design should be based on the amenity of the location.

## 4.4 Maintenance requirements for CSO screens

Mechanically raked screens should be automatically cleaned. However static screens if not properly cleaned, can blind and the bypass can operate, resulting in the premature discharge of unscreened sewage. In order to avoid this, an appropriate screen cleaning regime should be implemented based on the requirements of the individual CSO.

Overflows that are known to operate more often may need more frequent cleaning. In order to plan efficient cleansing visits, telemetry can be used to indicate when a spill has occurred and also when the screen is bypassed (for instance due to the screen being blinded).

It would be good practice to record the degree of blinding of the screen prior to cleansing and compare this with design expectations. Repeated excess blinding may require a redesign of the screen or chamber.

CSOs can suffer from structural deterioration, for instance due to loose bricks falling out causing a partial blockage. These obstructions can quickly rag up with silt building up behind leading to a dry weather overflow. Premature overflows can also be caused by sediment build up due to slack gradients. Drainage Area Studies may provide useful information in this regard.

# 5. Designing Storm tanks

Storm tanks protect water quality by:

* Reducing the frequency and strength of discharges.
* Delaying any discharge until rainfall increases receiving watercourse flows.
* Delaying the discharge until it is weak enough to have minimal impact.
* Increasing the total amount of sewage retained for pass forward or treatment.

## 5.1 Storm tank capacity

Storm tanks may be located on the sewer network or at various locations at a STW.

Storm tanks at the inlet to sewage treatment works will provide settlement for flows that exceed the design flow to full treatment (FFT). The industry design standard FFT is 3DWF (i.e. 3PG + Imax + 3E). Storm tanks should be capable of providing either:

* 2 hours storage at 3DWF.
* 2 hours storage at Formula ‘A’- FFT.
* A storage volume equivalent to 68 litres per head, for flows in excess of 3DWF up to Formula A as detailed in Appendix H1 of the UWWTR Guidance Note or by sewer hydraulic and water quality impact modelling.

Generally, 2 hours at Formula ‘A’ – FFT is used to calculate storage requirements in cases where FFT is greater than or less than the standard 3DWF. (This provides 2 hours storage at the maximum flow rate to the storm tank).

Once inlet flows have reduced below FFT, the contents of the storm tank should be returned to the head of the works to receive full treatment. This return can be made manually by operating a valve, or preferably automatically, when the inlet flow falls below a preset level.

If required, the capacity of storm tanks in the network, i.e. at pumping stations, will need to be based on environmental quality modelling. For example, some pumping stations that pump direct to the STW pump FFT flows and have adequate storage based on 68l/h or 2hours at 3DWF or 2 hours at Formula 'A' – FFT. This is similar to what would happen at the treatment works but this reduces pumping requirements to the STW.

In addition to the above storm tanks, further storage capacity may have to be provided at the STW for CSOs on the inlet sewer depending on the available dilution (see [section 4.1](#_4.1._CSO_discharges)).

SEPA must be satisfied that the proposed capacity will meet the necessary water quality standards. Modelling is likely to be required for more significant discharges in accordance with ([section 4.1](#_4.1._CSO_discharges)). The modelling requirements will be the same for a CSO at a STW as a CSO on a network.

## 5.2 Storm tank configuration

Frequently the 68l/hd (or equivalent) storage requirement at STWs has been incorporated into the primary tanks by increasing their size. This arrangement has the disadvantage that it does not capture the stronger first flush of sewage, but merely displaces the existing sewage in the primary tanks. It does not delay the onset of a storm discharge and does not increase the amount of sewage passed forward for full treatment.

A more satisfactory arrangement consists of a storm tank of 68litres/head (or equivalent) provided as an entirely separate tank for the capture and treatment of storm sewage. Flows between FFT and Formula A are discharged to this tank which should be empty at the start of a storm and is emptied as soon as possible afterwards. Such an arrangement should therefore be considered where there is a water quality impact and a works comes to an appropriate stage in its lifetime for such an asset capability or investment process review.

The relative advantages of 'blind' versus 'flow through' storm tanks should be considered. In low dilution situations where multiple storm tanks may be provided, it may be preferable to have the first storm tank 'blind', since it stores the initial more highly polluting 'first flush'. In this case the first storm tank has no outlet and simply stores the "first flush" which is later pumped back through the treatment works. Should the storm conditions continue, the other storm tanks, which are ‘flow through’ will start to fill. However, by the time they overflow to the watercourse, the river flow should have risen to accommodate storm water flows. The advantage of 'flow through' tanks is that they allow at least partial settlement of the incoming sewage before overflow. Flow through storm tanks are the accepted practice at most STWs with storm tanks.

# 6. Pumping station EOs

For small, separately sewered catchments (i.e. where there are separate pipes for surface water and foul sewage) it should be possible to 'design out' the need for an EO by utilising storage in the pump wet well and upstream sewers, by use of telemetry to warn of pump failure and/or high levels of sewage in the wet well, and agreeing an appropriate response time. In such situations, there would be a presumption against providing an EO. Should an EO be deemed essential, which must be justified, then it must be licensed subject to conditions to ensure that measures such as telemetry alarms (refer to [WAT-SG-13: Municipal Sewage Treatment Works)](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/), are taken to minimise the frequency, duration and impact of any discharge.

Where the installation of an EO can be justified, then to minimise the risk of a discharge, the UWWTR Guidance Note advises a minimum storage capacity equivalent to 1-2 hours storage at 3DWF (3PG + I + 3E). However, overflows at sensitive locations may warrant significantly greater storage times.

Where operation of the EO would result in partially treated, secondary or tertiary treated effluent being discharged, precautions such as storage tanks may not be justified.

Should a CSO be required at the same location as a pumping station with an EO, there is a risk that if the pumps fail during a CSO overflow event, the result will be the EO operating i.e. the whole sewer volume discharging to the watercourse. The storage volume requirement at such a site should be assessed on a case by case basis as each discharge location will present different risks.

In certain high risk situations the discharger should be asked to model the scenario of the CSO and the EO operating at the same time against 99%ile river standards to gauge the likely short-term effect on the river. This should demonstrate whether or not a storage requirement over and above the usual EO requirement will be necessary. See also [WAT-SG-13](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/).

The EO and CSO storage capacity should be over and above that provided within the pump well for the normal fill/pump sequence. This is to ensure that the required storage capacity is always available to be used prior to the operation of the EO and CSO.

12-18mm bar screening is acceptable, however the discharger may chose to put in 10mm bar screening.

# 7. Monitoring and telemetry requirements

## 7.1 Screen monitoring/telemetry

Where mechanically raked and other powered screens are newly installed, telemetry must be installed to notify the operator in the event of screen failure.

Monitoring of screen operation, performance and bypass operation may be required as a licence condition and may include the requirement for telemetry to notify the operator of screen operation or bypass.

Screen monitoring may be required due to one or more of the following reasons:

* Post scheme appraisal monitoring to confirm screen not bypassed more than 1 in 5 years on average.
* Sensitive receiving water environment.
* Uncertainty in capacity of proposed screen or performance of retrofitted screen.
* Previous poor performance.
* To notify the operator of a need for a clean up of sewage debris downstream.

The operator may wish to apply additional monitoring to that required by the licence in order to identify the need for manual screen cleansing or a sewage debris clean up.

## 7.2 Overflow monitoring/telemetry

Modelling of CSO spill frequency is based typically upon very limited sewer flow data. The installation of event monitors or flow loggers or the provision of access facilities to install these monitors needs to be considered for all new and modified CSOs. However, the installation of event recorders and particularly flow monitoring devices can constitute a significant proportion of scheme costs. For the majority of schemes, once the collection system has been brought up to UWWTR standards, or an existing intermittent discharge has been categorised as satisfactory, the need for monitoring is minimal.

Flow/event monitoring requirements at STWs are detailed in [WAT-SG-13](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/).

### 7.2.1 Event Monitoring

Event monitoring provides the date and start and stop time of overflow events. Such monitoring may be required for a number of reasons:

* To validate model predictions and to ensure that sufficient data is available for future reviews.
* To ensure that spill frequencies are as modelled and designed, specifically at medium or high sensitivity sites
* To investigate water quality problems which may arise from premature operation.

Installation of these monitors may be temporary.

The event recording requirements for new or modified CSOs on the sewer network are:

* Discharges liable to impact bathing and/or shellfish waters will require the installation and use of permanent event monitors to provide an annual record of spill frequency and to enable SEPA to audit performance against the design spill standard.
* Discharge from ≤2000 pe require access to install an event monitor.
* Networks serving >2000pe require overflow event recorders for new or modified overflows unless modelling shows the overflow will discharges less frequently than 1 in 5 years.

### 7.2.2 Flow Monitoring

In-sewer flow monitoring provides more useful information than event monitoring which is dependent on rainfall events and characteristics.

Flow monitors can provide information on whether pass forward flows are being maintained or dry weather flows being exceeded and can also provide estimates of spill volumes.

The flow recording requirements for new or modified CSOs on the sewer network are:

* For all discharges there must be the ability to install flow monitoring devices both upstream and downstream of the CSO.
* If the design spill frequency for discharges liable to impact bathing and/or shellfish waters is exceeded and/or there are impacts on water use, the installation of flow monitoring devices in the upstream and downstream sewer may be required.
* For discharges >2000pe to a watercourse, where the dilution is less than 8:1 (river Q95 flow:sewer DWF) then permanent flow monitoring is required downstream of the discharge and the ability to install flow monitoring upstream of the discharge is required. The exception to this is where:
* There is a gravity sewer downstream with an overflow which cannot be adjusted. However permanent flow monitoring is required where pass forward flows may be controlled by an adjustable penstock, weir plate, or by variations in pumping (i.e. CSOs at pumping stations).
* The modelling indicates that the overflow will discharge less frequently than 1 in 5 years.

If licence says reporting or recording should be ‘as agreed in writing with SEPA’, then it should be decided whether this is required. This should be done on a risk assessed basis i.e. reporting required for higher risk/low dilution situations.

## 7.3 Sewage pumping station with storm overflows

These should be dealt with as for CSO structures. However, a measurement of pump capacities can provide the pass forward flow, and a record of pump run-times may enable estimations to be made of the volumes of sewage passed forward. However, pump rates may deteriorate over time. In high-risk locations event recorders and inlet flow structures/recorders may be justified.

## 7.4 Recording and reporting

The details of recording and reporting vary according to the licence.

For flow monitors this may include the pass forward flows and DWF.

For event monitors this may include the start/stop time and date of each overflow event.

Further details for STWs are provided in the Recording and Reporting sections in [WAT-SG-13](https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/).

For overflows on the sewer network, routine reporting should be conditioned in the licence if there is an environmental need such as low dilution.

# Annex 1: Types of overflows

## A1.1 Combined sewer overflows (CSOs)

CSOs are a feature of most existing sewerage systems where surface water i.e. rainwater from roofs, yards and roads and foul (sewage & trade) effluent flows are combined in one single pipe. With increasing rainfall, the combined sewer reaches its hydraulic capacity and a release mechanism is required in order to prevent flooding or inundation of areas (including domestic property and commercial premises) with dilute sewage. CSOs should operate intermittently and only in response to rainfall and/or flooding events. They may discharge to inland, coastal or transitional (i.e. estuarine) waters.

When rainfall occurs in an area, the rain runs off from permeable surfaces, i.e. grassland and natural ground, more slowly than from impermeable or developed areas such as roofs, roads and pavements. As a consequence, flows in the combined sewer increase more rapidly than in the receiving watercourse. It is therefore necessary to retain these initial storm flows in the sewer until the watercourse flow has increased sufficiently to cope with a discharge of dilute sewage when the CSO overflows. Retention is provided by:

* the sewers downstream of CSOs being adequately sized; or
* by the provision of storage capacity in the CSO chamber, upstream sewer or in storm settlement tanks at the sewage treatment works or in the sewer network.

By reducing surface water and groundwater inflows to sewers, the need for new CSOs can be kept to the absolute minimum.

## A1.2 Storm tanks

Storm tanks at inland sewage treatment works are normally required to deal primarily with the polluting "first flush" of storm sewage at a time when flows in the receiving watercourse will not have responded to rainfall as quickly as the impermeable areas served by the combined sewer.

In coastal and transitional waters, some form of storm water retention system may also be required to deal with these "first flush" scenarios, especially where the microbiological quality of receiving waters is an issue.

The sizing of storm water retention systems, if they are necessary (e.g. to reduce spill frequency from the sewer network), is normally based on sewer hydraulic modelling and modelling of the receiving waters.

## A1.3 Emergency overflows

Emergency Overflows (EOs) are designed to cater for mechanical and/or electrical failure, rising main failure or blockage in the downstream sewer. Such equipment may be mechanically-raked screens or pumps or flow control devices. EOs are not CSOs as they are not designed to operate in response to rainfall. They may be present on separate sewerage systems as well as combined sewerage systems.

Emergency overflows of sewage, although they should be very infrequent, can have a more severe effect on watercourses than CSO discharges as there may be no dilution effect from any rainfall. The sewage discharge may be stronger and the flow in the watercourse may be low. For small, separately sewered catchments (i.e. where there are separate pipes for surface water and foul sewage).

# Annex 2: Background to sewer network licences

Network licences change the focus from managing individual overflows to managing whole sewer networks. This links SEPA’s approach to the output from drainage area studies undertaken by Scottish Water.

Network licences focus on the management of sewer networks, therefore providing the most effective means of controlling the risks of pollution. For example, they allow SEPA to inspect against and for Scottish Water to demonstrate their compliance in relation to the management conditions, within the SNL.

Network licences allow SEPA to be more proactive in requiring flow data collection and specifying how sewers should be modelled. The Scottish Water investment process typically involves the development of drainage area studies which provide the basis upon which SEPA’s and Scottish Water’s understanding of networks is progressed. The licensed sewer networks are based upon the network served by a particular STW. For networks with non-compliant or unsatisfactory assets, this may require agreed investment in an overall strategic solution and/or improvements at an individual asset – e.g. fitting of screens.

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