CIWEM Chartered Institution of Water and Environmental Management

Urban Drainage Group

Event Duration Monitoring

Good Practice Guide

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Urban Drainage Group

Event Duration Monitoring Good Practice Guide 2021.

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Technical enquiries

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Version Control

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Contents

1 OVERVIEW

The purpose of this guide is to assist water companies with best practice for EDM to comply with the conditions within a discharge permit.

This guide collates current good practice on Event Duration Monitoring (EDM) of discharges from combined sewer overflows and other permitted storm overflows. Note that this document relates to EDM of discharges to the environment only and does not cover EDM of discharges to storm tanks which can be used to assess Pass Forward Flow (PFF) compliance. Emergency Overflows (including those which discharge to shellfish or bathing waters) are excluded from EDM as Emergency Overflows are only permitted to be active in emergency situations such as pump failure, not through typical operation.

This document covers the provision of EDM including selecting which assets are included in EDM, monitoring equipment and location, data capture and storage, and reporting. Technical guidance is given for some aspects, whilst others are covered by having robust internal procedures in place to ensure consistency.

The contents of this document will be reviewed periodically, in the light of improvements in technological capability and any changes to regulatory requirements.

The document is published for wider public and water industry benefit by CIWEM Urban Drainage Group and made available through its website. Subsequent updates will be curated by CIWEM Urban Drainage Group in collaboration with the industry.

2 RATIONALE FOR MONITORING

The Water Industry is setting out to improve the visibility of the performance of its sewerage networks to third parties including regulators and the public, specifically around storm discharges to the environment from Combined Sewer Overflows (CSOs) and other permitted storm overflows. To achieve this, England & Wales Water and Sewerage Companies have promoted more extensive implementation of Event Duration Monitoring (EDM) within AMP6 and 7, as part of their five yearly business plans.

This would take the form of logging the timing and duration of Storm Overflow (SO) spills, to enable summarised reports to be consistently produced, on an annual basis and/or the bathing water season. Where such monitoring is not already in place, further assets have been prioritised, based on the Water Industry National Environment Programme (WINEP) and focussed on environmental sensitivity.

Where locations are of a particularly sensitive nature, such as designated bathing waters, companies may seek to notify appropriate parties about spills, as they are happening or soon after. Ideally this would be on a near real-time basis, to allow potential impacts to be pro-actively managed. As examples, there are already several internet and mobile phone systems in operation around the UK by water companies and other third parties that help bathing water users make informed choices. Note that near real-time warnings are provided by Companies on a voluntary basis and are not a regulatory requirement.

The systems to provide this capability may require a commensurately higher level of technology and associated support systems than logging alone. Work is being done by water companies in partnership with the shellfish industry to ascertain whether similar systems would be beneficial for shellfish harvesters, so there is potential for real-time warning systems to be used at many more sites.

For recipients to be able to trust this information, it is key that reliable and accurate information is achieved with Companies using a consistent approach.

2.1 Selection of sites to be monitored

Beyond locations where there is already a regulatory requirement for monitoring, the selection of additional sites for SO monitoring should be based on environmental sensitivity.

For **England**, the Environment Agency has produced the following matrix to define the EDM requirements for a site.

<table>
<tr><th rowspan="2">Amenity Class</th><th colspan="3">No. of spills per annum</th></tr>
<tr><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><td>High</td><td rowspan="3">No EDM Required</td><td colspan="2">EDM plus telemetry warning
(Monitoring at 2 minute intervals*)</td></tr>
<tr><td>Medium</td><td colspan="2" rowspan="2">EDM
(Monitoring at 15 minute intervals)</td></tr>
<tr><td>Low</td></tr>
</table>

Figure 2-1- EDM Requirements Matrix

** Unless a lower frequency of monitoring agreed locally*

In **Wales**, EDM requirements have been defined following environmental sensitivity criteria, with a standard requirement to monitor the spill at 15 min intervals.

As spill frequency is the main driver for monitoring, where there is no pre-existing information, then Drainage and Wastewater Management Plans (DWMPs) are often the fundamental source of information, and are likely to contain useful relevant data for individual SOs, including the expected typical annual average frequency of discharge, and potential environmental impact.

For both England and Wales the required interval and date for starting to report events will be added to the environmental discharge permit. Therefore all sites that are required for EDM spill reporting will require an update to the permit.

This monitored data can then be used for decision making in the national environmental programme by the water company and either EA or NRW as appropriate.

3 THE MONITORING ENVIRONMENT

The extent of the information chain involved in SO monitoring is illustrated below. To achieve consistent and reliable monitoring of SO performance requires the adoption and consistent implementation of good practice across the whole information chain, including:

- Selection of monitor location
- Selection of appropriate equipment
- Quality of installation
- Inherent reliability of equipment
- Operation and maintenance of sites
- Ongoing quality control of information
- How finalised reports are produced.

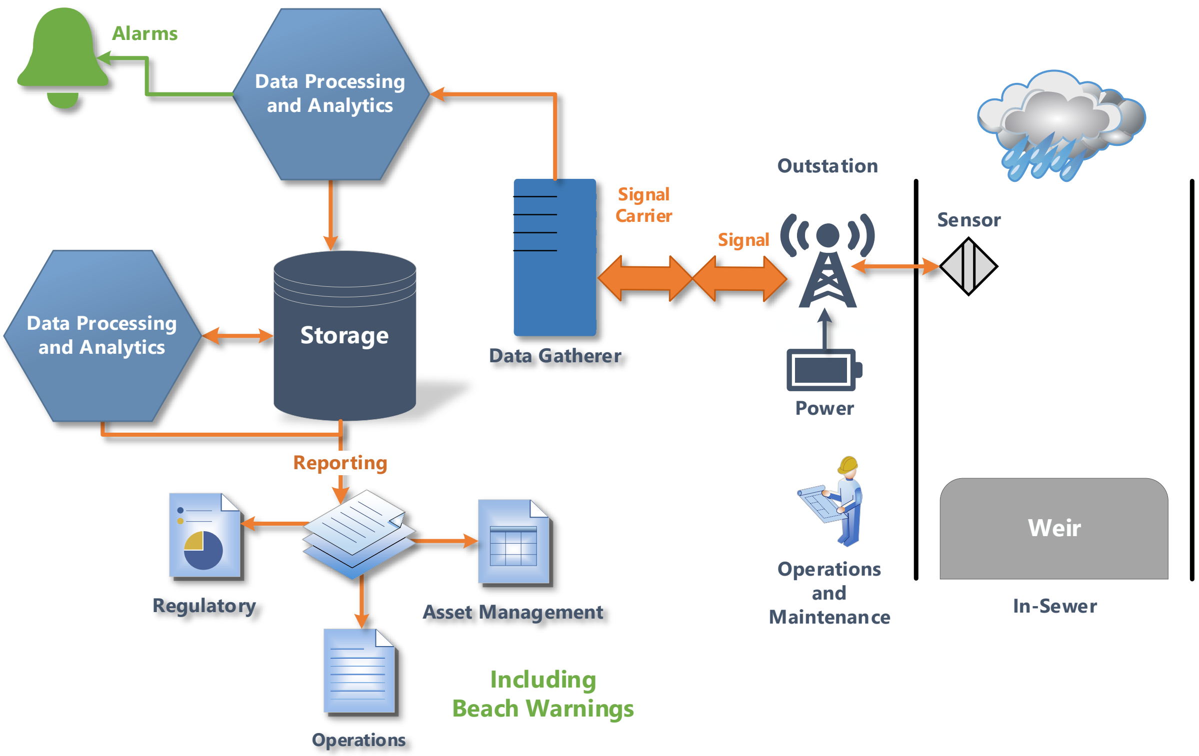

Figure 3-1- Event Duration Monitoring Principles

4 OVERALL MONITORING LOCATION

4.1 Monitoring Requirements

The key requirement for EDM equipment is that it accurately and reliably monitors and logs information about spill events:

- It should be clear from the information provided by the EDM equipment whether there was an overflow event or not.
- The EDM equipment should also work for a majority of the time and not have major gaps in the data.
- In the event of data loss or equipment faults, it should be easy to identify the issue and then rectify it as quickly as practicably possible.

These requirements influence other decisions including where to locate the equipment, what power source to use, what equipment to use and how the equipment should communicate.

The data from the EDM equipment has an operational benefit to water companies apart from just meeting regulatory reporting requirements. The data and any alarms or notifications can provide useful information about the operation of the wastewater assets and networks and aid a faster response to operational issues, e.g. blockages and equipment failures. Although seen in a positive light, the use of EDM for this maintenance management is not covered by this document.

4.2 Equipment Location

Choosing the optimum location to monitor and locate equipment is probably the most important consideration with EDM. The four key principles are:

- Accuracy: the sensor must monitor the spill location accurately and with minimal data noise or interference.
- Repeatability: the EDM equipment should consistently return the same measurement data (limited variability) for comparable spill events i.e. trigger for a spill, flow depth.
- Reliability: the EDM equipment's location should promote reliability: minimising the likelihood of damage and making maintenance or repairs easier.
- Safety: the EDM equipment should be able to be operated and maintained as safely as possible, designing out or minimising risks in these activities.

It should be noted that the limiting factor for many repairs and maintenance activities to locations in roads may be obtaining permission to work, e.g. road closure applications and organising traffic management.

4.2.1 Equipment inside the chamber

It is likely that some or all of the EDM equipment will be located within a sewer chamber, tank or sump. These principles apply to that equipment:

- The sensor must be able to accurately monitor whether there has been an overflow event.

- It is preferable to measure the wet side of an overflow location, i.e. where the normal dry weather flow is.
- Monitoring the dry-side of an overflow location can be difficult as there can be more sensor errors and interference, especially at low / empty levels, and there is greater risk of influence from river levels and tidal variations backing up SO outfalls.
- When monitoring on the dry side of an overflow a suitable spill level needs to be assigned to consider data noise while also recording spills accurately.
- The sensors should be located where they are unlikely to pick up false readings and / or produce noisy data, e.g. from step irons, screens or other assets;
- Where the true overflow location is in a secondary chamber, it may be desirable to monitor the spill from the primary chamber if the data will be more accurate and reliable, the maintenance access will be easier and safer, and the spill level can be accurately transferred;
- The EDM equipment in the sewer chambers should be located so that they do not obstruct the normal sewer flow and minimise the likelihood of entraining rag or other foreign objects.
- The sensor should be located where it is unlikely to be accidentally knocked or damaged in the course of normal operational or maintenance activities (e.g. cleaning or manhole entry).
- Where possible, the EDM equipment should be located where it is unlikely to become submerged unless that is required for the operation of the equipment.
- Where maintenance or repairs require a temporary removal of the EDM equipment, this event should be logged, and relevant notifications provided within the business so that it is closely managed and recorded to ensure there is not a significant gap in EDM data coverage.
- Where an overflow is likely to be submerged by incoming tidal or river levels, options for monitoring this impact should be reviewed and actioned where practicable.

4.2.2 Equipment outside the chamber

These principles apply to where equipment is not located at the actual spill location inside the sewer chamber, tank or sump.

- Where possible, placing EDM equipment in roads or other hazardous locations should be minimised, e.g. only placing the sensor in a sewer chamber and the logger should be in a safely accessible location such as the pavement.
- The EDM equipment should be located where it is unlikely to be damaged in use, e.g. hit or crushed by vehicles.
- Where equipment is located in kiosks, the kiosks should be secure.
- Where radio frequencies will be used for communication, consideration needs to be given to where to locate the antennas so that they can provide good and reliable communication.
- Locating antennas inside chambers provides the best form of protection from damage or tampering but it impedes communication. Placing antenna outside chambers including within boxes and in bollards can improve the communication performance of radio frequency communications. This may require permission from the local authority and / or landowner.

4.2.3 Accessibility

- The EDM equipment should be accessible for maintenance. Under the Construction (Design and Management) Regulations 2015, consideration needs to be given to minimising foreseeable operational risks[1].
- Where possible, EDM equipment should be accessible from the surface to avoid entry into a confined space.
- Consideration should be given to using swing arms or swivel brackets to aid safe access to the equipment.
- Where EDM equipment is installed in locations with very restricted access (e.g. very busy major roads), consideration should be given to equipment redundancy and using multiple sensors.
- It may be necessary or prudent to secure access agreements to some monitoring locations (e.g. on private land) and efforts should be taken to minimise the impact of this, particularly if it can be avoided or designed-out.

4.2.4 Environmental Considerations

Some environments may be difficult to monitor. Consideration should be given to:

- Whether the chamber, location or site is in an DSEAR-rated zone and so suitably rated equipment will be required.
- Whether the location is prone to fat, oil, foam or rag build-up, as regular maintenance or cleaning needs may affect sensor and location selection.
- Where the flow is turbulent and difficult to monitor, it may be necessary to measure over benching, in a different part of a chamber or use different equipment.
- The weather, as high winds and exposure to excessive heat or cold can impact the accuracy and reliability of EDM equipment.
- Location of nearby foliage or trees may affect selection of the EDM equipment type as leaves and debris can result in false readings if they enter the monitoring area.

[1] Construction (Design and Management) Regulations 2015, Regulation 9 – Duties of a Designer https://www.hse.gov.uk/pubns/priced/l153.pdf

5 EQUIPMENT SELECTION

The three main factors to consider in choosing EDM equipment are the power source, means of communication and the type of sensor required.

5.1 Selection of Power Source

The equipment can either be mains-powered or battery-powered. Each Water Company has reviewed the level of risk attributed to mains-powered vs battery-powered and reached a balanced approach between upfront capital expenditure and long term maintenance cost.

Mains powered EDM equipment has a benefit for low risk of power failure and the need to replace batteries. However, the upfront capital costs are often a higher value.

Battery-powered EDM equipment has a strong benefit of being a lower initial capital cost, but may have larger long term maintenance requirements to manage the power loss risk.

If a battery operated device is chosen, the following are further considerations:

- Less frequent data exchange is recommended to save battery life.
- The logger should be able to have bigger memory to store the readings – at least for 15 days to ensure no data is lost whilst waiting for battery replacement.
- Other power sources such as wind or solar, where practical, can also be considered. These sources of power could also be considered if there is an option for battery back-up.

5.2 Selection of Means of Communication

There are various methods of collecting data from the EDM equipment. Generally, the approach for communication routes will be linked to whether a mains powered or battery based install has been undertaken.

Mains powered sites will also typically have a fixed telemetry arrangement with a battery powered monitor typically having a modem-based communication route. In a few cases a manual collection will be undertaken. However, this case should only be undertaken where all other options have been exhausted.

- Using fixed telemetry (e.g. wired connections) is the most reliable form of communication because there is the least chance of disruption to the communication between the EDM equipment and central telemetry system.
- Using radio frequencies (e.g. 2G, 3G, NBIoT, LPWAN) is common for battery-powered units and is beneficial due to the reduced capital cost implications. The risk of dial-in reductions would need to be balanced by the monitor data storage capacity and the technology in place to review any data loss during daily dial-ins.
- Performing manual data collection should be used as a last resort because of the effort and natural restrictions to collecting the data;
- Where radio communication will be used, signal surveys should be conducted first to find the optimum location for the antenna and type of antenna. The choice of location will be influenced by signal performance, accessibility and other practicalities (e.g. not placing a bollard in the middle of the pavement).

- When using radio communication, consideration should also be given to interference from other sources, notably whether cars may be parked on top of the antennas.

5.3 Sensor Selection

There are various types of sensors or configurations. A few of which are listed below, however there is new technology being developed all the time. The type of sensor preferred will depend on the location and configuration of the monitoring location.

These are listed below:

- Ultrasonic sensor
- Radar sensor
- Multiple Sensor Options
- Pressure transducer (PTI)
- Conductivity probes
- Float or Tilt switches
- Storm pumps events

Ultrasonic Sensors

Ultrasonic sensors measure distances by sending out sound waves and recording how long they take to return.

- Ultrasonic sensors give additional benefits due to recording lower depth levels. This gives further history and behaviour of the levels in the location and so provide useful additional information to understand the spill events (e.g. pre- and post-spill event sewer performance).
- Ultrasonic sensors have a span (the working range) and a blanking distance – the sensor cannot measure distances too close to the sensor head. Consideration should be given to these factors when assessing whether equipment is suitable for use in a particular location.
- Ideally, the ultrasonic sensor should be able to measure the whole range of the location although sometimes it is necessary to clip this if there are objects causing bad reflections/bad readings (e.g. a curved bottom tank or objects in the location);
- The sensor heads should ideally be positioned so that they never come into contact with the measured medium because otherwise the head can become dirty and struggle to read properly.
- Where contact with the working medium cannot be avoided, submergence shields may be used to protect the sensor head.
- In locations with height restrictions, it is possible to mount ultrasonic sensors horizontally and use them in conjunction with a 45^0 deflector plate. Deflector plates introduce an additional point of failure and may produce noisy data and suffer problems with condensation collecting on them.

Radar Sensors

- Although not as readily used in sewer systems as ultrasonics, the cost of radar sensors may mean this monitoring approach can have the same benefit as an ultrasonic with potential for less risks like submergence errors.

Multiple Sensor Options

- It is sometimes necessary to use multiple monitoring points and sensors to determine actual overflows to the environment for reporting requirements in line with the permit conditions.

Pressure Transducers

- Pressure transducers are useful where an ultrasonic sensor is unable to provide accurate and reliable data, e.g. where there is fat or foam present.
- A pressure transducer will usually not measure levels below a set point and so there will be an artificial floor to the data, below which the level is unknown.
- Pressure transducers can experience 'drift' over a long period of time if not appropriately maintained and calibrated.
- Typically "in flow" monitors will require more frequent maintenance than "out of flow" alternatives

Conductivity Probes

- Conductivity probes and other digital sensors can provide cheaper and simpler monitoring although the simple output (spill/no spill; true/false) means that additional information is required to determine whether the sensor is reading correctly. For example, with the analogue information from an ultrasonic sensor, the rise and fall of the levels can be observed which can be used to determine whether the recorded spill values are correct or a monitor error

Float / Tilt Switches

- Float or Tilt switches are a basic digital switch. They offer similar benefits to conductivity probes, but they can be left in the incorrect position after high levels and provide unreliable data. Wiring them in "fail-safe" mode will help in calculating the device operational time.

Storm Pumps

- Utilisation of pump run signals can be used to determine when a storm discharge is occurring. This is when the pump is the source of discharge to the environment.

5.4 On-site information

It can be useful to display some information about the site operation and settings on-site. However, as a minimum the information about how the site has been set-up and monitored should be held somewhere by the operating company.

- Level plates can provide useful information about the significant measurements in a location, e.g. invert level, spill level.
- Datum points can be useful to verify measurements, especially when adjusting, recalibrating or replacing EDM equipment.
- Equipment with displays can provide useful and readily available on-site information;

- Not all data from EDM equipment can be accessed directly (even by connecting the unit to a laptop/portable monitor) and in particular, battery-powered EDM equipment may just be accessed via a remote telemetry system.
- Consideration should be given to whether storing information on-site is the best solution for information management, particularly in ensuring that it is the most current information.

6 DATA COLLECTION AND TRANSMISSION

The key driver for the EDM requirements at any location will be the EA Discharge Permit conditions. This will state the logging frequency for the location, and this is currently every two or fifteen minutes depending on the assessment of the location.

- The logging frequency of the EDM equipment shall be at least as good as those defined within a site EA Discharge Permit conditions.
- The time and date that the data was logged should be easily identifiable.
- Some equipment, particularly battery powered EDM equipment may log data at the set logging frequency but only transmit it at a lower frequency (e.g. daily transmissions) in order to maximise battery life.
- If the data is also of an operational benefit, there may be a desire to exceed the EA Discharge Permit conditions. For instance, to transmit the data in near real-time to maximise the monitor's operational benefit.
- If the data is to provide an operational benefit, it is preferable that battery-powered units transmit alarm/spill event data in near real-time even if other data is sent less frequently.

6.1 Data Gatherer

Data can be relayed back to the parent station using a number of systems. What is key for the parent station is the amount of traffic that will be transmitting signals at any one time.

Where telephone lines are used, a number of options are available:

- Direct dial back – These feature most commonly in SCADA systems.
- Multiplexing – This allows a number of phone lines into the parent station, increasing capacity, and also allowing traffic to be prioritised.
- Hub stations with broadband capabilities are now becoming more common.

Where there is significant data traffic, then as well as increasing the capacity of signal transmission, managing the timing of device polling and data transfer can balance the loading on both the signal transmission systems, and the associated onward data processing.

6.2 Signal Marshalling

Once signals have arrived at the parent station, they are then marshalled into data storage. This is analogous to putting the information into the correct pigeon holes.

This is the stage at which alarms can be generated from incoming signals and passed to control rooms for operational responses.

Given the volume of signal traffic involved at this stage, it is important that routine data processing is scheduled to allow this to take place.

6.3 Data Storage

Assessing the volume of data to be stored is the critical aspect of data storage. Factors affecting the volume of storage required include:

- The number of sites.
- The data retention period.
- Whether raw incoming data is retained as well as validated data
- The extent of regulatory audit trail required.
- Whether processed data is only generated 'on the fly' or is also permanently stored.

The digital storage location should also take long term trend analysis requirements into consideration alongside short term alarm management. This is to ensure the wider company and utilise the data to its full potential.

6.4 Maintenance & Calibration Checks

Equipment should be appropriately inspected and maintained to ensure reliability and repeatable operation. Latest inspection information should be accessible to analysts to support understanding of data quality and consistency.

Periodic physical and calibration checks should be undertaken to ensure reliability and repeatable data measurements.

7 INFORMATION VALIDATION

This stage centres on data checking that is not already covered at the site. This stage can be an alternative point at which alarms are generated by the system.

There is a balance to be struck in deciding the degree of data checking required, particularly when information is used for warning purposes. Even in these circumstances, depending on the number of sites and the degree of checking employed, checking times can vary from minutes to hours. It is also important to note that many of these checks are carried out manually by companies, so are resource intensive. Note that where warnings are provided, checking is not generally carried out until after the warnings have been issued. Depending on the numbers of warnings being generated, this validation stage can take from minutes to hours, and can involve the need to send people to site.

To avoid the risk of long records containing no data, it is advisable to check the events recorded at all sites at least quarterly, to see whether events have been recorded. Where no events are recorded, the long term event trend for the site should be checked to see if this is likely to be due to real circumstances, or an equipment malfunction.

It should also be considered that no system is likely to have 100% reliability in spill recording, when viewed over the long term. The current aim, as specified by the regulatory bodies is for each monitor to be in a reporting function for at least 90% of the year. Further development in terms of reliability of data returned is yet to be developed and will be reviewed by the water companies and regulatory bodies as part of the ongoing overflow task and finish group.

Current reporting can take four basic forms:

- Annual reporting of logged spills to the regulatory body (EA or NRW).
- Ad hoc reporting of logged spill information.
- Near real-time warnings of SO operation.
- Advance warnings of obstructions or developing sewerage issues.

In most cases the first of this list is the only permit defined requirement for each monitor with the further three only being in place where the water company has outlined agreed funding with OFWAT as part of their 5 year planning.

7.1 Routine reporting

Routine annual reports are the current regulatory requirement in terms of calendar annual performance and where needed for the bathing water season. This regulatory requirement is required at the overflows with updated permits following the process outlined in section 2.1. EDM data required for such reporting includes the 12/24 spill count, total duration of all discharges and the availability of data (operability) at that asset during the reporting period. The summary reporting should not exclude any spills on the basis of their significance. These are the main outputs of EDM. More detail on the 12/24 spill counting method can be found in section 7.5.

Whilst routine reporting will consolidate the amount of data supplied to the regulator, it is recommended that the raw data is retained for a period of at least six years, to allow further analysis or investigation at a later date, should this be required.

7.2 Near real-time warnings

The regulatory driver for EDM data is for reporting purposes however an additional benefit of the data is that it can be used for real-time warnings of SO operation.

Warnings can be generated in near real-time to indicate that SOs have the potential to start discharging, are starting to discharge or have stopped. An alarm prioritisation / filtration process may be required to reduce volume of false positive alarms, and to bring to attention those alarms that require action.

Currently, work on near real-time notification in relation to the revised Bathing Water Directive is well advanced in a number of Water and Sewerage Companies. Alerts can be disseminated to the public or various stakeholders as a result of a discharge from an asset, or any combination of assets. In relation to shellfish protected areas, a similar capability is being trialled in several areas. As learning develops in relation to the information provided for bathing water and possibly in the future shellfish protected areas, it is recommended that the need for other warnings or reporting be reviewed.

7.3 Performance Change warnings

Along with near real-time warnings of spills the monitors could also be used to help understand where performance levels are changing. For instance, this could include a build-up of sediment or the starting stages of a blockage occurring within the pipe, or changes in baseflow due to seasonal variation. This information can help inform planned maintenance of the sewer system either via a post processing trend analysis approach or via algorithm based or an Artificial Intelligence based analysis.

In these cases, the level of monitoring (logging and polling frequency) along with grouping of monitors, may be different to what is required simply to understand the overflows performance.

Multiple Companies have developed in-house methods for generating early warnings which range in sophistication.

7.4 Ad hoc reporting

At times additional requests do occur in regards often in the form of Environmental Information Regulation (EIR) requests. Whilst such reports use the same basic information as the routine reports, as they are not actioned as part of a batch process, they can be time consuming to produce.

Data provided for ad hoc requests should be in the 12/24 spill count format in the interest of consistency. A definition of this method is likely to be required with the EIR response.

Requests often focus on individual, or localised groups of storm overflows, to the requestor's geographical area. As such, more scrutiny of the individual datasets can be applied, and therefore anomalies with previously disseminated data can be identified. Care needs to be taken in this instance, and where changes have been made this should be notified to the requestor, as well as to either the EA or NRW. To date, the EA have confirmed that if they are to receive such a request for annual data returns, no amendments will be made to the data originally submitted.

Where new reporting requirements come about in the future, then they need to be considered in terms of ease of production of the reports, as well as usefulness to the end user.

7.5 Defining a discharge

Prior to reporting spills, it is first necessary to define what constitutes a discharge. Individual discharge data are then used to calculate the 12/24 spill count and discharge duration. Companies have developed systems and processes internally to store records of discharges, validate their accuracy and then convert to 12/24 spills.

The 12/24 hour spill counting method is the industry standard for reporting to the EA or NRW.

The method has been defined as follows:

- Start counting when the first discharge occurs.
- Any discharge (or discharges) in the first 12-hour block are counted as one spill.
- Any discharge (or discharges) in the next, and subsequent 24-hour blocks, are each counted as one additional spill per block.
- Continue counting until there is a 24-hour block with no discharge.
- For the next discharge after the 24-hour block with no discharge, the 12-hour and 24-hour block spill counting sequence starts again.

Whilst the complexity of storm overflows varies widely, generally speaking the start timestamp of a discharge should be set when the corresponding signal is triggered. This signal can be derived from analogue level monitors, digital switches, outfall pump start signal, or otherwise (see section 4.1). The discharge stops when the storm overflow stops discharging to the environment. Again, this end time should be timestamped when the stop signal is received. It is worth noting that some assets or permits may then require further manipulation to accurately define an individual discharge, typically seen in sites with two weirs/monitors, or multiple pump start signals that require combining.

All storm discharges should be included in reporting spills from a particular asset. No removal of discharge data should occur on the basis of spill significance, duration, volume, sensitivity of receiving waterbody or possible dilution of discharge. It is expected that filtering should only occur where inaccurate data are being received.

It is understood that no monitoring equipment is ever 100% accurate and free of erroneous signals. Additionally, discharge signals can be received as a result of Company or contractor actions in the form routine maintenance, chamber entry or other intervention. Where there is strong evidence that the EDM data are inaccurate, they may be removed from reported data. Strong evidence may include on-site confirmation that an overflow is not discharging, unrealistically high levels/rate of changes of levels etc. Certain scenarios may also allow for a second backup signal to be checked which can prove that a discharge could not have occurred (for example an analogue level in the same chamber that is low). Where level data are confirmed or believed to be inaccurate, maintenance requests should be submitted to resolve issues, and records of issues and reasons for data removal kept.

Identification of spurious data may occur through many means, for example ongoing recording of erroneous discharge signals for alarm/blockage identification, checks of high frequency spill data, checking of discharges outside of heavy rainfall periods or internally generated error messages within telemetry protocols. Various Companies are also approaching external data scientists for assistance in spurious data identification. It is acknowledged that it is preferable to embark upon means that ensure spurious data are not received in the first instance (for example by careful placement/selection of monitoring equipment) has been discussed previously.

Once a validated data set has been achieved the full set of data should be processed to generate the number of 12/24 discharges for the full year.

8 OPERATIONS & MAINTENANCE ACTIVITIES

Operations and maintenance procedures for sites should be suitably developed and documented. A process for identifying malfunctions, be they related to communications, data quality or otherwise, is required. Following identification of a fault, processes for initiating a maintenance site visit (or remote correction) should be developed.

Those procedures should include:

- Testing of equipment and settings
- Visual inspection of equipment for any damage or misalignment.
- Whether devices used for regulatory reporting will be physically tagged.
- Clarity over use of information where sites supply information for more than one purpose.
- Confirmation that issue does not persists after a maintenance visit.

Companies vary in approaches to physical tagging of EDM equipment. Response times from identification/notification of issues also vary between companies and depend on other external factors and other non-controllable access issues such as locations requiring traffic management, permission to enter or vehicle obstructions. It is agreed between water companies and the EA / NRW that where the availability of operational data is lower than 90% for the routine reporting period, an explanation should accompany the return submission.

9 INTERPRETATION OF SPILL INFORMATION

At present, the focus of spill monitoring is to establish a consistent and reliable spill monitoring regime across the majority of intermittent discharges in the UK.

The next stages of analysis to review the EDM data outputs is undertaken following the SOAF (Storm Overflow Assessment Framework) process which is outlined separately within Water UK documentation. This process is being followed by English and Welsh Water Companies from the start of AMP7 (April 2020) in line with their OFWAT determined plan.

REFERENCES AND BIBLIOGRAPHY

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GLOSSARY AND ABBREVIATIONS

12/24 spill count – A methodology to count spills using 12 and 24 hour spill blocks. The process of calculating the 12/24 count is defined below:

- *Spill counting starts when the first discharge occurs at a given overflow.*
- *A sequence of 'blocks' is defined as starting at this time. The first block lasts 12 hours and subsequent blocks last 24 hours. The end times of the blocks are thus 12 hours, 36 hours, 60 hours and so on every 24 hours after the start of the first discharge.*
- *Any discharge within the first 12-hour block classes as 1 spill.*
- *Any discharge(s) in the next and subsequent 24-hour blocks are each counted as 1 additional spill per block.*
- *This counting continues until there is a 24-hour block with no discharge at a given overflow.*
- *If a 24-hour block with no discharge is observed, the 12 hour and 24-hour block spill counting sequence begins again from the next spill event.*

AMP – Asset Management Programme – Five year asset management cycle undertaken by the water industry (AMP6 = 2015-2020; AMP7 = 2020-2025)

CSO – Combined Sewer Overflow – A network relief pipe designed to release pressure in combined sewer flows during periods of heavy rainfall to reduce the risk of sewer flooding.

EA – Environment Agency – public body responsible for the protection and enhancement of the environment in England.

EDM - Event Duration Monitoring – telemetry monitoring of an overflow to determine the duration of intermittent discharges from the asset.

EDM monitor (full kit):

- EDM monitor logger – internal storage and communication device that will transmit recorded EDM data
- EDM monitor sensor – sensor that records depth data from the sewer to inform of duration and time of discharge.
- EDM monitor antenna (if applicable) – aerial to improve radio communications to allow battery operated loggers to transmit data.

EIR - Environmental Information Regulations – EIR requests are similar to the Freedom of Information Act but are limited specifically to information regarding the environment.

Emergency Discharge – An overflow that allows discharges to the environment during periods of emergency, i.e. power failure in order to reduce the risk of sewer flooding upstream. The overflow is not permitted to discharge during times of heavy rainfall due to hydraulic overload.

NRW – Natural Resources Wales - public body responsible for the protection and enhancement of the environment in Wales.

OFWAT – Water Services Regulation Authority – Government body responsible for the economic regulation of the water and sewerage industry in England and Wales.

Overflow or Discharge - A raw overflow/ discharge event is captured by the EDM monitor and then counted with other overflows/discharge events to calculate the spill number using the 12/24 counting method.

Permit – A consent for intermittent discharges from sewer overflows and wastewater treatment works regulated by the Environment Agency.

PFF – Pass Forward Flow – Flow that is required to be retained in the sewerage network before an intermittent discharge to either the environment or storm tanks.

SCADA – Supervisory Control and Data Acquisition – Control system and graphical user interface frequently used for the management of telemetry.

Shellfish/Bathing Water – designated area used by large numbers of bathers as defined by the Bathing Waters Directive.

SO – Storm Overflow – an overflow within the wastewater network and treatment site where storm flows discharge to the environment.

SOAF – Storm Overflow Assessment Framework – A programme of investigations to address the problems cause by discharges from storm overflows considered to operate at too high a frequency.

Spill - A counted spill using the 12/24 hour counting methodology.

T&F Groups – Task and Finish Groups – Time limited group set up with the aim of delivering a specified objective.

WINEP – Water Industry National Environment Programme – a set of actions requested of all water companies in England to complete between 2020 and 2025