Event Duration Monitoring; from beach to river reach

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Background

The public acceptability of storm discharges from the combined sewer network has gained increased profile over recent years. Media campaigns by organisations such as the Marine Conservation Society, Surfers Against Sewage, The Sunday Times and the BBCs Panorama programme, have ensured that questions around the legitimacy and performance of Combined Sewer Overflows (CSOs) remains high on the political agenda. In addition, in 2009, an infraction proceeding was brought against the UK by the EU over CSO performance in line with requirements of the Urban Waste Water Treatment Directive (UWWTD). One of the outcomes of the proceedings was that the on-going performance of CSOs could not be readily demonstrated by the sector and that no mechanism was in place for articulating performance information to regulators or the wider public

As a culmination of these pressures, in July 2013 Richard Benyon, MP, and then Minister for the Natural Environment and Fisheries, made his views clear in a letter addressed to industry Chief Executives. The Minister stated that discharges from CSOs were increasingly becoming a reputational issue, in a way not dissimilar to leakage from supply, taking the view that the performance, management and operation of CSOs remained a regular cause for concern for water users and the wider public. His intention was that vast majority of overflows should be monitored by 2020 and that individual companies should have plans in place to address frequently spilling overflows.

This paper outlines the approach adopted to address the Ministers concerns and convert both political, regulatory and public desire to reality. Public use and valuation of watercourses is considered to firstly prioritise investment in monitoring to better understand CSO performance and then to support the decision making process in developing solutions to address the causes of CSO operation.

Public needs and regulatory drive

CSOs act as a legitimate safety valve to ease system pressure during storm conditions and prevent flooding to land or customers property. What has emerged from recent debate is the additional dimension of public acceptability of these assets, particularly those in sensitive locations or which discharge frequently.

Historically, the focus has been on the aesthetic and receiving water quality impact of CSO operation with screening and storage requirements identified throughout AMP3 and AMP4 for unsatisfactory intermittent discharges. These programmes were largely effective in dealing with the obvious

physical and environmental impact associated with the discharge of unscreened effluent and sewage detritus to the environment. In AMP5, greater emphasis has been placed on the risk to human health with the revised Bathing Water Directive and Shellfish Water Directive introduced monitoring obligations for industry discharges to designated waters.

The legislation serves to preserve, protect and improve the quality of bathing and shellfish waters in order to protect human health and a duty was placed on the industry to provide Event Duration Monitoring (EDM) at key assets, recording when and for how long they spill. From a Yorkshire Water perspective, investment under these drivers has delivered telemetry hardware & supporting architecture to provide visibility of discharges and plant operation at 20 designated bathing water sites. A notification service is also being trialled with spill information being communicated to third parties such as Beach Managers & Surfers Against Sewage. The ability to inform beach users requires telemetry data in real or near time as well as a thorough spill validation procedure to prevent false warnings that could unnecessarily impact on beach use and public perception.

Looking towards AMP6, the National Environment Programme (NEP) provides the vehicle through which the Environment Agency (EA) identifies measures to be included in the Periodic Review 2014 (PR14). Measures may take the form of schemes, investigations or monitoring and included in the PR14 NEP, is an obligation to provide EDM at storm overflows which discharge to high amenity waters. Appendix B of the NEP provides a description of high amenity waters as where regular water based activities are carried out such as canoeing or sailing by clubs.

Defining amenity

Whilst the definition of high amenity provided in the NEP is fairly clear & succinct, it is important to question whether this definition would capture all locations where the public may engage and interact with the water environment. Certainly considering the public health aspect, those locations where water contact sports occur remain of primary importance. However, it is also important to consider those locations where a watercourse may be valued by the public as an integral part of the wider landscape and / or ecosystem.

With reference to previous guidance on amenity value for screening requirements at CSOs, criteria were developed covering four drivers; if the watercourse had recreational value through water contact sport, aesthetic value through its place in the wider landscape, was accessible to the general public or was environmentally sensitive through designations and / or WFD classifications.

Analysis was carried out within a GIS to provide a picture of watercourse amenity value at regional level. A prioritisation framework was then developed to determine monitoring and investment requirements. The traditional amenity banding of high, medium and low was eschewed in favour of a broader consideration of what the public would actually require from the proposed investment. Where there was a risk to human health, through water based recreation, a telemetry system capable of providing real or near time monitoring was promoted to provide the capability to warn water users of asset operation. Where the criteria demonstrated a more general public acceptability concern, either through environmental or aesthetic reasons, the capability required was to provide a post spill reporting service to understand frequency of operation and associated impact.

Following discussions between the EA and the industry on amenity value and requirements for EDM within PR14, a risk based approach was developed with the final version released late September 2013. This provided a standardised risk based framework and agreed data sources to determine amenity value and the appropriate monitoring standards. The existing analysis was aligned to this taking account of the introduction of a spill significance threshold of greater than 20 spills per annum as an acceptability criteria determined from the EU infraction proceedings.

Monitoring requirements

The requirements set out in the EA risk based approach are banded in terms of the monitoring significance. Significance A sites, where there is a risk to public health, require telemetry in real or near time with a spill monitoring interval of 2 minutes. Significance B sites, where there is an amenity driver other than public health, and Significance C sites, where there is no amenity driver but spill in excess of 20 spills per annum, require spill monitoring at an interval of 15 minutes. All sites identified in significance bands A, B or C carry annual reporting obligations with the number and duration of events reported using the DEFRA 12/24 format[1].

There are considerations to be addressed in selecting the appropriate systems to deliver these monitoring requirements. For the real or near time monitoring of the Significance A sites at a 2 minute interval, this almost certainly requires powered telemetry with direct link to data gathering systems. For spill monitoring at a 15 minute interval for the Significance B and C sites, battery powered systems with GPRS connections to data gatherers can provide a suitable low cost option dependant on individual site needs. To aid in these decisions, a Good Practice Guide has been developed in collaboration between the EA and the industry to outline good practice in data capture, processing, storage and validation.

Although monitoring of the sewer network and CSOs may already exist in the industry, the focus has historically been on aspects of serviceability, such as blockage detection. The use of telemetry to define the start of a spill is essentially a dual purpose so care must be taken to ensure that the point of overflow to the water environment is accurately defined and calibrated. This is of particular importance considering the intentions of EDM to make spill reporting more transparent. The reporting of false spill events into the public domain is obviously undesirable and carries significant reputational as well as regulatory consequences

Beyond monitoring of frequently spilling overflows

The link between monitoring and the wider asset management cycle also needs to be considered and with the on-going development of Drainage Area Plans (DAPs), monitored spill data can be used to verify modelled response against actual conditions. However, this should be a two way process with DAP models used in return to understand the reasons why an overflow is spilling. As the causes of discharges can be varied, for example, hydraulic issues such as surface water inflow or infiltration, or temporary issues such as soft blockages or blinding of CSO screens, the appropriate response is also varied and carries a wide range of cost and process implications. These could be capital, operational or focussed on customer education.

[1] The DEFRA 12/24 format states that any spill or number of spills occurring in the first 12 hours from spill start is counted as 1 spill and then for spills within each subsequent 24 hour period, 1 additional spill is counted.

In responding to the ministers request that companies have a plan in place to deal with frequently spilling overflows, we need to consider the customers willingness to pay for any required improvements. From a comprehensive study of both domestic and business customers of Yorkshire Water, it was observed that whilst there remains a willingness to pay for all levels of service, the level is approximately 50% less at PR14 than it was at PR09. Of relevance to this paper is that whilst there is a willingness to pay for both Bathing Beach Quality and River Water Quality at PR14, the former is up 57% whilst the latter is down 93% from PR09. This research suggests that we need to take care in promoting investment cases for frequently spilling overflows and that any decisions are made in line with customer needs throughout the next AMP. As well as informing the general debate on the role CSOs play in managing and regulating flows in the sewerage network, we also need to ensure that the majority voice of the public is captured and opinion is not overtly influenced by emotion driven by media savvy campaigns.

Looking to the comparison made by the Minister on CSO discharges becoming a reputational issue not dissimilar to leakage, this poses an interesting question on how we look at systems in light of public opinion. Whilst the cost of leakage is clear to the wider public and there is an obvious appetite to address, it is not clear what appetite there currently is to support investment in frequently spilling overflows. Here the traditional view of sewerage as a waste needs to be challenged as technologies to generate fuel from waste water sludge become more proven and established in the market. This line of thought can and should be used to inform the cost benefit analysis of improvement works to deliver dual benefit, both in safeguarding the water environment and treating sludge as a valuable fuel that should not be lost in transmission to the works.

Summary

The culmination of external pressures placed on the industry to make CSO spill information more transparent have made the monitoring of all CSOs across the UK a reality by 2020. Public use and valuation of watercourses is key in determining where to monitor whilst technical, cost and reliability factors need to be considered when making investment decisions. Spill information can, and should, be used as an integral part of a wider asset management cycle allowing robust plans to be developed to demonstrate both the scale of the issue and the possible causes for overflow operation. This allows for an informed dialog to be entered into with the public to determine the appetite and willingness to pay for improvements in overflow performance at a given location. As part of this debate, the environmental and societal benefits of carrying out such works need to be recognised and articulated in both customer facing communication and industry investment planning scenarios.