

Evidence

www.environment-agency.gov.uk

Review of urban pollution management standards against WFD requirements Project summary

A new report looks at whether the control of urban pollution levels in UK's water meet EU standards.

During storms and heavy rain, urban drains can overflow and pollute rivers and streams. This pollution can have an environmental impact on our rivers and streams, so it's important that we control it and maintain the quality of our waterways.

For many years, water quality standards for urban pollution were outlined in the second edition of the *Urban Pollution Management Manual* (UPM2). Regulators and water companies used UPM2 to prepare permit applications and design works to manage problem flows from wastewater pipes.

However, in 2000 new legislation was introduced – the EU Water Framework Directive (WFD) – which has new water quality and ecological standards. This meant the UPM2 standards had to be reviewed against the requirements of the WFD.

This project reviewed the UPM2 standards to establish whether they are still valid, or whether they need to be modified. The project was made up of four tasks:

- Task A: Review the data on which the UPM2 standards were based and carry out a literature review of recent toxicity studies.
- Task B: Establish an effects matrix based on the toxicity data.
- Task C: Compare the effects matrix with existing UPM2 standards.
- Task D: Propose UPM2 standards to meet WFD requirements.

This report describes the results of Tasks A to D. The key findings are summarised below.

Task A – Review literature and data

The review found additional data on the sensitivity of aquatic organisms to dissolved oxygen and/or unionised ammonia, and confirmed the effects of

repeated exposure to pulses of unionised ammonia and the influence of the frequency of exposure.

After evaluating the toxicity data and comparing with other standards for short-term exposure, the report concludes that the fundamental intermittent standards in UPM2 (UPM2 FIS) are generally fit for purpose.

The one-hour, six-hour and 24-hour standards for different exposure periods are generally appropriate. For dissolved oxygen, this finding is largely based on a direct comparison of the 24-hour toxicity data with the corresponding UPM2 FIS for once-a-year exposure. For unionised ammonia, species sensitivity distribution (SSD) modelling was used to derive thresholds for short-term mortality in salmonid (such as salmon and trout) and cyprinid (such as carp and minnow) species which were compared with six-hour and 24-hour UPM2 FIS for a once-a-year exposure.

There is evidence that the ratio of toxicity values in UPM2 are slightly lower than the toxicity ratios reflected in the data. Smaller ratios of toxicity values than those of UPM2 FIS mean that the shorter term (one-hour and six-hour) standards should protect against long-term damaging effects as well as short-term mortality in fish.

In summary, for sustainable salmonid and cyprinid fishery ecosystem types, UPM2 FIS provide protection against short-term mortality and longer term effects on the physiology, growth and reproduction of the fish. For dissolved oxygen, the standards are also generally protective against macroinvertebrate drift.

Task B - Establish effects matrix

Initial effects matrices were developed for dissolved oxygen and unionised ammonia using data on lethal and sub-lethal concentrations. The effects matrix was developed taking into account the requirement of biological classification under the WFD.

Based on the effects matrix, threshold limits were calculated for each substance to ensure salmonid and cyprinid fisheries could be protected.

For dissolved oxygen, the estimated threshold limit for salmonid fisheries was 4.0 mg/l and for cyprinid fisheries was 3.0 mg/l. These values should ensure protection of salmonid and cyprinid fisheries respectively from short-term mortality and macroinvertebrate drift, irrespective of the duration of exposure. Based on the complete dataset for unionised ammonia and applying the SSD approach, a range of estimated threshold limits were calculated for salmonid and cyprinid fisheries, and are presented in the report.

Task C - Compare effects matrix with standards

Comparing UPM2 FIS with the threshold limits derived from the effects matrix showed that, for most concentration/duration/frequency combinations, the standards for dissolved oxygen and unionised ammonia provide a margin of safety for salmonid and cyprinid fisheries, and protect against reduced dissolved oxygen and elevated unionised ammonia levels. The use of a safety factor accounts for unknowns such as untested species and is consistent with the process used to derive other environmental quality standards. Overall, the UPM2 FIS are considered fit for purpose and, based on the available data, provide an adequate degree of protection.

Task D - Proposed UPM standards for WFD

Comparing UPM2 FIS with the thresholds calculated from the effects matrix suggests that UPM2 FIS are fit for purpose and no modifications are required.

For most concentration / duration / frequency combinations, the standards for both dissolved oxygen and unionised ammonia provide a margin of safety for salmonid and cyprinid fisheries. They should also provide a degree of protection against potential effects of lower dissolved oxygen and elevated unionised ammonia. Therefore, when a fishery meets the standards, no long-term behavioural and physiological effects and no short-term fish and macroinvertebrate deaths should be caused by polluted overflows as a result of storms or heavy rainfall occurring at least once a year. Meeting UPM2 FIS should ensure a water body maintains good quality status.

The 99 percentiles for biochemical oxygen demand (BOD) and total ammonia developed by the Environment Agency for WFD ecological statuses were established by interpolating the corresponding 90 percentile values of each River Ecosystem Class. Meeting these standards should protect freshwater aquatic life from short intermittent urban wet weather events and ensure that waterbodies maintain good quality status despite occasional polluting overflows from urban drains.

The report makes the following recommendations:

- The use of fundamental intermittent standards (FIS) reviewed in this report should be translated into the revised version of the *Urban Pollution Management Manual*.
- The FIS should continue to be used by regulators and water companies in preparing permit applications and in designing improvement works to address unsatisfactory intermittent wet weather flows from urban wastewater networks.
- The outcome of the review regarding the ongoing use of FIS and 99 percentiles should be presented to the United Kingdom Technical Advisory Group to confirm their suitability for use under the Water Framework Directive.

October 2012

Internal Status: Released to all regions

External Status: Publicly available

Project manager: Paul Simmons, Environment and Business Directorate

Research Contractor:

WRc plc.
Frankland Road
Blagrove
Swindon
Wiltshire
SN5 8YF

This project was funded by the Environment Agency. The Evidence Directorate provides scientific knowledge, tools and techniques to enable us to protect and manage the environment as effectively as possible.

Further copies of this summary are available from our publications catalogue: <http://publications.environment-agency.gov.uk> or our National Customer Contact Centre: T: 08708 506506
E: enquiries@environment-agency.gov.uk.

© Environment Agency.