

Appendix B

Regulatory Aspects

APPENDIX B BACKGROUND INFORMATION RELATING TO THE COLIFORM STANDARDS FOR PROTECTING BATHING WATERS

This Appendix provides background information to the spill frequency and coliform standards presented in Section 2.4 and Table 2.5 of Section 2 of the UPM3 Manual.

B.1 Background to development of the standards

To meet the mandatory Faecal coliform standard of the 1976 Bathing Water Directive, at least 95% of samples in a bathing season must have concentrations of 2000 / 100 ml or less. In the UK it is recognised that it is not possible to design improvements such that we can guarantee compliance with the Directive at every bathing water in every year. Hence it is necessary to set a confidence level for achievement of compliance. In the UK this has been set at 95%. This means that if a scheme which was so designed performed exactly as expected, then the Bathing Water would meet the mandatory standard, on average, in 19 years out of 20. This is considered to be a reasonable design target. The risk of not meeting the standard is **5 %**.

Setting the confidence of compliance to 95% allows a water quality standard to be set, as follows. Of the 20 samples collected each bathing season, if 0 or 1 sample exceeds 2000 Faecal coliforms / 100 ml, then the water is compliant. If two or more samples exceed 2000 Faecal coliforms / 100 ml, then the water is non-compliant. Using binomial statistics we can calculate that if the concentration of Faecal coliforms in the Bathing Water is 2000 / 100 ml or less for **98.2%** of the Bathing Season, then there is a 95% probability that if we collect 20 independent samples, the Bathing Water will be compliant with imperative standards.

A threshold value of 2000 Faecal coliforms / 100 ml for no more than **1.8%** of the Bathing Season is given in Table 2.5 of the Core UPM manual for the mandatory value of the 1976 Bathing Water Directive.

To derive performance standards for intermittent discharges from CSOs and storm tanks requires assumptions to be made about the duration of impact of a single spill. It is assumed that the duration of impact above 2000 Faecal coliforms / 100 ml from any one spill will be 12 hours following cessation of the spill (this allows a complete tidal cycle for dilution and dispersion). Therefore for spill durations of up to 12 hours (which may comprise of one or more individual spill events), the impact at the Bathing Water is assumed to be up to 24 hours. Given that the fundamental overall design standard is for 2000 Faecal coliforms to be exceeded for no more than 1.8% of the bathing season, which equates to **2.75** days per bathing season, the spill frequency standard for CSOs and storm tanks has been set to **3 spills per bathing season**, assuming that each spill impacts for no more than 24 hours.

The fundamental design standard for Faecal coliforms to meet the guideline standards of the 1976 Bathing Water Directive can be computed in the same way as for the mandatory standard. Using the approach outlined above results in a design standard of no more than 100 Faecal coliforms / 100 ml for 89.6% of the bathing season, which means the standard can be exceeded for about 16 days. Similarly for Faecal streptococci, the design standard is no more than 100 Faecal streptococci for 95.8% of the bathing season, which means that the standard can be exceeded for about 6 days. Because the impact durations for guideline standards will be longer than for imperative standards it is considered that the 3 spills per

bathing season standard, which was originally derived to meet the mandatory standard, is nevertheless sufficiently protective to achieve the 'tighter' guideline standards.

B.2 Development of the standards for the revised Bathing Water Directive

A similar approach to identifying thresholds has been undertaken in the UK for the revised 2006 Bathing Water Directive. However, in view of much lower levels of indicator organisms under consideration it may be appropriate to reduce the risk level from 5 % to 1% . Table 2.5 provides a range of acceptable durations (1.8 – 2.4 %) that correspond to a risk of between 1 and 5 %.

Two statistical approaches (parametric and non-parametric) have been used to assess the confidence of failing the FS standards for the revised 2006 Bathing water Directive should intermittent discharges operate at the 3 spills per bathing season standard. Both approaches demonstrated that the 3 spills per bathing season standard achieves both the 2006 Directive's Sufficient and Good classifications with less than 5% risk of failure. However, to ensure that the Excellent standard is met with a less than 5% risk of failure requires intermittent discharges to operate no more than 2 times per bathing season on average.