



independent | trusted | innovative

Achieving phosphorus compliance

Water companies are facing tighter permit limits for wastewater treatment plants as a result of changes to phosphorus standards and regulatory pressure to adopt Best Available Technology.

Installing and operating tertiary treatment processes is expensive and often difficult, however reducing phosphorus inputs from other sectors, especially agriculture, can be a more sustainable and cost-effective strategy. Phosphorus offsetting schemes also have the potential to deliver multiple environmental benefits but require detailed planning and targeted delivery to be fully effective.

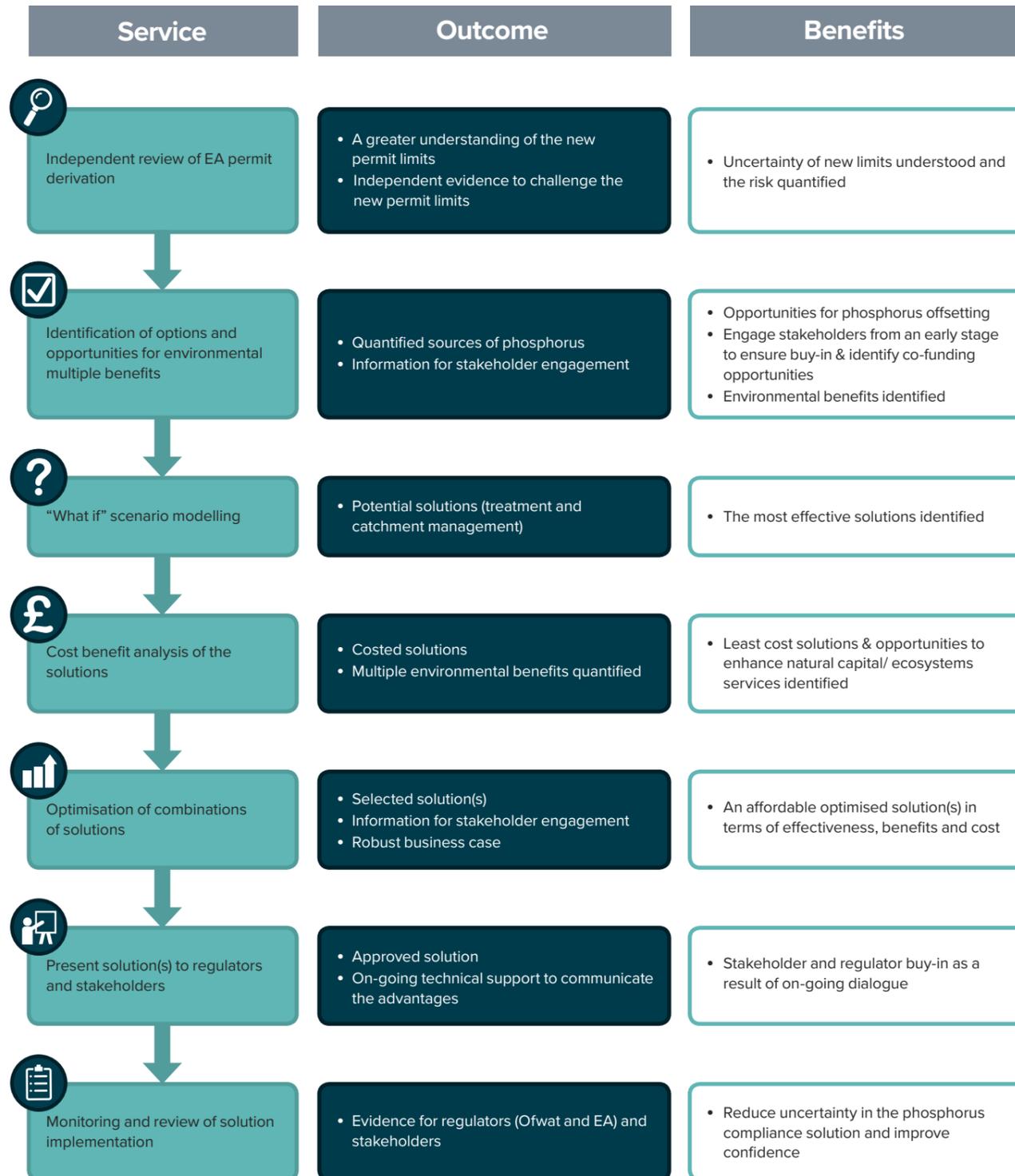
WRC's experienced catchment scientists, process scientists and modellers can support with building the business case, designing and optimising schemes, and evaluating their effectiveness.



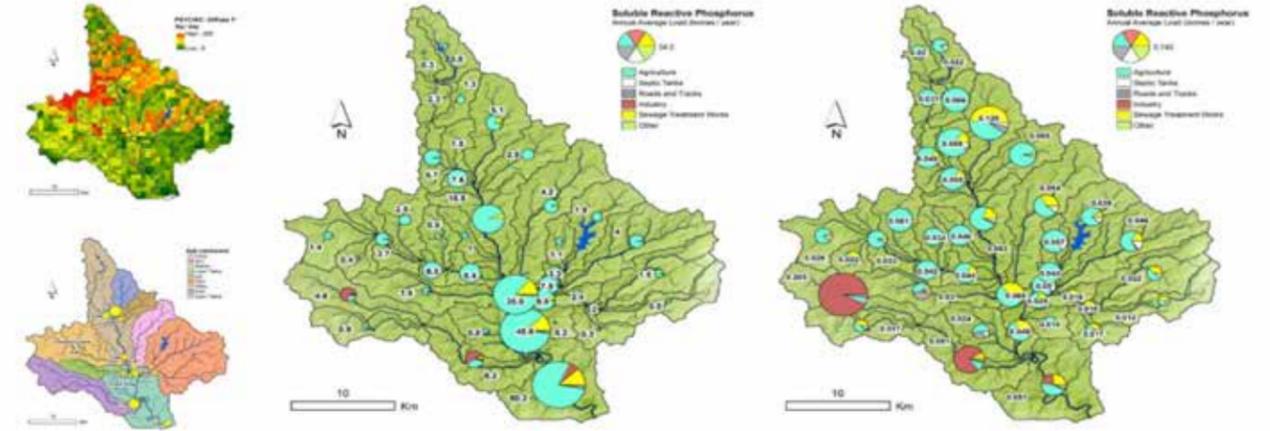


The process to help achieve phosphorus compliance

Trusted by both regulators and water companies, WRC has developed a seven-step process that will help your company achieve compliance with wastewater permits at lowest cost. The process allows for active stakeholder engagement throughout to facilitate an on-going dialogue which achieves stakeholder buy-in to the final solution.



The phosphorus compliance toolbox



The SAGIS tool

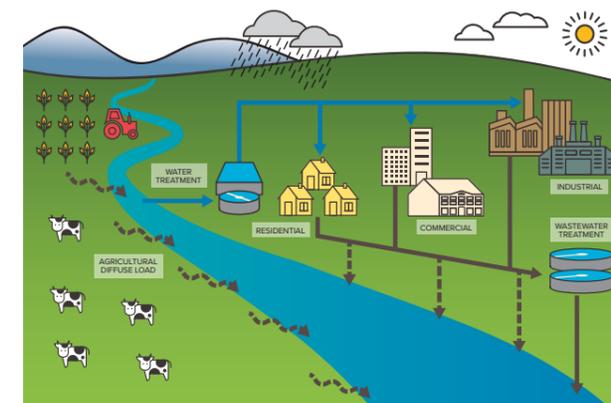
SIMCAT-SAGIS

WRC has considerable and long-standing experience applying SIMCAT and SAGIS; for environmental regulators, water companies and industrial customers.

The Environment Agency's SIMCAT software is a river water quality model that has been used in the UK and overseas for over 30 years. It is able to predict flow and quality distributions at any point in a river catchment. SAGIS is a GIS based tool that collates a wide range of spatial data and converts it into a form that can be used by SIMCAT. Together, SIMCAT-SAGIS facilitates the apportionment of loads and concentrations of chemicals from different sectors to WFD water bodies.

SIMPOL ICM

SIMPOL ICM, WRC's ultra-fast, flexible, integrated environmental modelling package delivers long term simulation of the whole water cycle, and represents water resources, water treatment and distribution driven by customer demand. The clean water systems are coupled with the urban wastewater systems and river catchments, and produce flow and quality results in response to rainfall and temperature variations.



Whole catchment planning using WRC's SIMPOL ICM tool

Cost-Benefit Analysis

Commissioned by UKWIR, WRC produced a framework for quantifying the benefits of catchment management initiatives implemented by the UK water industry. The framework provides a conceptual approach for determining the cost-effectiveness of catchment management schemes. It offers practical advice and guidance on measuring the impact of schemes and monetising the resulting benefits.

WRC's Catchment Management team have followed this framework and conducted numerous Cost-Benefit Analyses of water company PR14 and PR19 catchment management schemes to support optioneering and investment planning.

Farmscoper

The Farmscoper (FARM SScale Optimisation of Pollutant Emission Reductions) model, developed for Defra, is a decision support tool that is used to assess diffuse agricultural pollutant loads at farm scale and quantify the impacts of farm mitigation methods on these pollutants. WRC have used results from Farmscoper in a range of projects, most recently to conduct a protected sites options appraisal for three Natura 2000 sites.

Monitoring and evaluation

WRC can advise on cost-effective monitoring strategies to gather the evidence needed to quantify the benefits of phosphorus offsetting schemes and inform ongoing operational delivery.

Integrating water quality sampling with geospatial environmental datasets using advanced data science techniques, we are experienced in interrogating data to measure the effectiveness of catchment schemes and identify opportunities for monitoring cost savings.



CASE STUDY

Combining catchment modelling of phosphorus with cost-benefit analysis to inform PR19 investment planning

The Outcome

WRc delivered a software solution that provided the client with cost-benefit ratios for potential phosphorus permits at over 70 wastewater treatment works, which also maximised on the environmental benefits. The software included the facility to update costs with new information, allowing the client to undertake future economic analysis.

The overall benefit to the client was a more targeted PR19 programme to achieve phosphorus compliance by meeting Water Framework Directive targets, where it was deemed feasible.

The Problem

In 2017, a water utility commissioned WRc to assess the water quality benefits and associated wastewater treatment costs of implementing more stringent phosphorus wastewater treatment works permit limits to meet Water Framework Directive targets in the south of England. The aim was to assess the costs and benefits for a range of permitting scenarios, to identify a cost beneficial programme of investments.

“What if” scenario modelling

Forecasts of river quality enhancement were produced by running SIMCAT models in several different permit setting scenario modes. These included a best feasible effluent quality scenario, to reflect the practicable limits of treatment performance. One scenario also included feasible e.g. 10% reductions in diffuse agricultural phosphorus loadings, and identified opportunities to partially offset permit tightening by targeting agricultural inputs.

Cost benefit analysis

WRc used the scenario modelling to produce a Cost-Benefit Analysis software solution that enabled the client to assess the likely impacts of potential PR19 phosphorus limits at over 70 wastewater treatment works. The solution took the outputs from the catchment modelling – expressed as permit limits for four scenarios and the associated kilometres of river with improved phosphorus status – and combined them with forecasts of the wastewater treatment works CAPEX and OPEX associated with each permit limit. The water quality benefits of phosphorus enhancement were monetised in line with the Environment Agency’s Water Appraisal Guidance for valuing environmental and social impacts, and divided by the forecast treatment costs to estimate a benefit-to-cost ratio for each wastewater treatment works.

For further information contact Andrew Davey

Tel +44 (0)1793 865023

Email andrew.davey@wrcplc.co.uk

Water Research Centre Limited, Frankland Road,
Blagrove, Swindon, Wiltshire SN5 8YF

wrcplc.co.uk | [@WRCplc](https://www.instagram.com/wrcplc)

