



River Derwent (Yorkshire) SAC

Nutrient Modelling Summary

Date: October 2026

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Contents

Introduction	4
Models used	6
Scenarios.....	6
River Derwent SAC modelled outputs.....	7
Input load source apportionment	7
Catchment average concentrations and reductions.....	8
Maps - modelled reductions needed.....	9
Input load figures used to calculate source apportionment.....	14
References	Error! Bookmark not defined.
List of abbreviations	Error! Bookmark not defined.
Would you like to find out more about us or your environment?	15
incident hotline.....	16
floodline	16
Environment first.....	16

Introduction

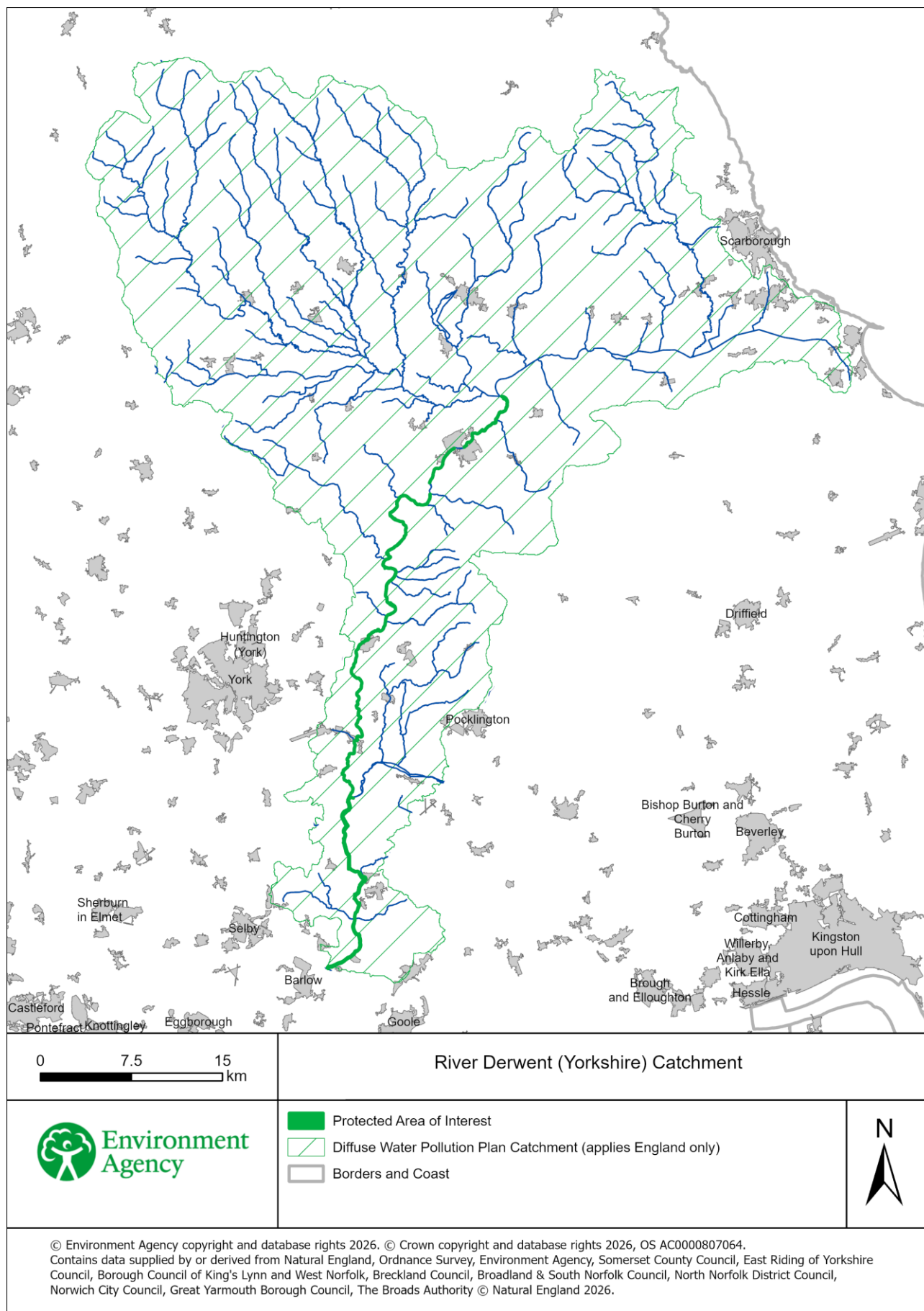
This document provides summary outputs from the Environment Agency's water quality modelling for the River Derwent (Yorkshire) Special Area of Conservation (Map 1). We provide catchment-scale source apportionment information and maps showing the scale of reductions needed to achieve protected area water quality targets. Our outputs will help those working on Diffuse Water Pollution Plans (DWPPs) and working on site restoration. We aim to support a general understanding of the catchment rather than give the level of detail needed to inform specific on-the-ground measures. Our detailed methodology is described in [Catchment statistics for nutrient pollution in protected areas](#).

We used the phosphate Common Standards Monitoring Guidance (CSMG) targets applicable to the River Derwent catchment. Natural England and the Environment Agency agree these targets for water dependent protected areas and publish them on the [Catchment Data Explorer](#).

Alongside Simcat SAGIS models, we used the Farmscoper v5 decision support tool and applied the revised polluter pays principle methodology (v0.17) used during PR24 planning to define the sector share for the point and diffuse sectors.

Our outputs highlight the dominant nutrient sources under a range of scenarios, including future estimates based on planned water company investment up to 31 March 2030 (AMP8) and the wider implementation of rural land use measures.

We have not incorporated additional nutrient contributions from any future development and growth including housing. Any additional future nutrient load will be assessed through the planning process led by the Local Planning Authority or through our permitting process.



Map 1. River Derwent (Yorkshire) SAC and catchment with protected area highlighted.

Models used

We used the Price Review (PR) PR19 and the PR24 [Simcat SAGIS models](#) for this work. Simcat SAGIS (Source Apportionment Geographical Information System) integrates ArcGIS-based digital information management and visualisation with SIMCAT (Simulated Catchment), the Environment Agency's water quality model.

The PR19 Simcat SAGIS model is calibrated to 2010 to 2012 data, following nationally agreed model build and calibration standards across UKWIR (UK Water Industry Research). Outputs from this model are used to establish the sector share under the revised polluter pays principle. Similarly, the PR24 Simcat SAGIS model is calibrated to 2014 to 2020 data, following UKWIR agreed model build and calibration standards.

The calibration process optimises the agreement between measured and simulated values through reasonable and systematic adjustments to model parameters and input data. We adjust the inputs where there is least confidence, those representing diffuse sources of pollution. The associated project overview document details the datasets included in the models. To assess confidence in the models, we compare the measured and simulated values. While Simcat SAGIS provides a robust framework for decision-making in wastewater investment, we have less certainty in the diffuse load estimates. As a result, we have lower confidence when using the models to assess the outcomes of measures that target diffuse sources, including those used here and in the DWPPs.

Scenarios

The modelling scenarios (Table 1) evaluate the effectiveness of nutrient reductions in point and diffuse sources to meet protected site targets and the diffuse sector share of those targets. As the diffuse sector share is met in the designated reaches in the Actual (2014 to 2020) scenario, modelling of reductions in rural land use losses was not necessary. We have based the point sector measures on the AMP8 water industry national environment programme agreed in December 2024 ([PR24 WINEP](#)).

Table 1: Summary description of the point and diffuse measures represented in the Simcat SAGIS Scenarios modelled.

Scenario Name	Point Sector Measures	Diffuse Sector Measures	Model Used
Actual (2014 to 2020)*	Observed discharge flow and quality (2014 to 2019). Where not available, defaults used.	Current activities as represented post model calibration.	PR24 Calibration
2030 Optimistic	Water company AMP8 quality permit limits incorporated where applicable**	Current activities as represented post model calibration.	PR24 Calibration
2030 At Permit	All discharges represented at permitted flow and quality values up to and including AMP8**	Current activities as represented post model calibration.	PR24 At Permit

*Previously referred to as the 'recent' scenario.

**Does not include any discharge flow increases that may be required to support growth.

River Derwent SAC modelled outputs

We estimate the phosphate input load source apportionment for the Derwent to be 44% point source and 56% diffuse source in the Actual (2014 to 2020) scenario. Rural land use (53%) dominates the diffuse sector (Table 2). Under the 2030 At Permit scenario, the point source contribution increases to 47% and the rural land use sector reduces to 50%.

We estimate the baseline (2009) sector share of the protected site target to be 38% diffuse and 62% point. This gives a sector share of 0.019mg/l for the diffuse sector and 0.031mg/l for the point sector (Table 3). The estimated catchment average sector concentrations in the Actual (2014 to 2020) scenario exceed the sector share for both sectors (Table 3). For the sector share to be met, the diffuse sector concentrations need to reduce by an estimated 38% and the point sector concentrations by 7%. In both the 2030 Optimistic scenario and the At Permit scenario, the point sector concentration meets the point sector share (Table 3).

While the catchment average diffuse sector concentration exceeds the diffuse sector share of the target, diffuse sector concentrations in the designated reaches of the catchment are modelled as meeting the diffuse sector share as shown in the maps.

Input load source apportionment

Table 2 shows the estimated phosphate input load source apportionment figures for each scenario modelled. We have greatest confidence in the point sector loads where monitoring data is available. Confidence reduces where the contribution from the sector is based on estimates rather than observed data, such as the diffuse sectors. Apportioning the input loads gives an indication of which sector is the dominant nutrient source.

Table 2: Estimated phosphate input load source apportionment from the catchment endpoint.

Scenario	Point Sources	Rural Land Use	Urban	Septic Tanks	Other
Actual (2014 to 20)	44.1%	52.7%	2.2%	1.0%	0.1%
2030 Optimistic	36.2%	60.0%	2.5%	1.1%	0.1%
2030 At Permit	47.5%	49.5%	2.0%	0.9%	0.1%

Catchment average concentrations and reductions

The in-river modelled concentrations arise from the input loads, after the influence of river dilution and natural decay processes in the river have been simulated. Table 3 shows the in-river concentration as a sector catchment average to be consistent with the revised polluter pays principle methodology (v0.17) used in the PR24 water company price reviews.

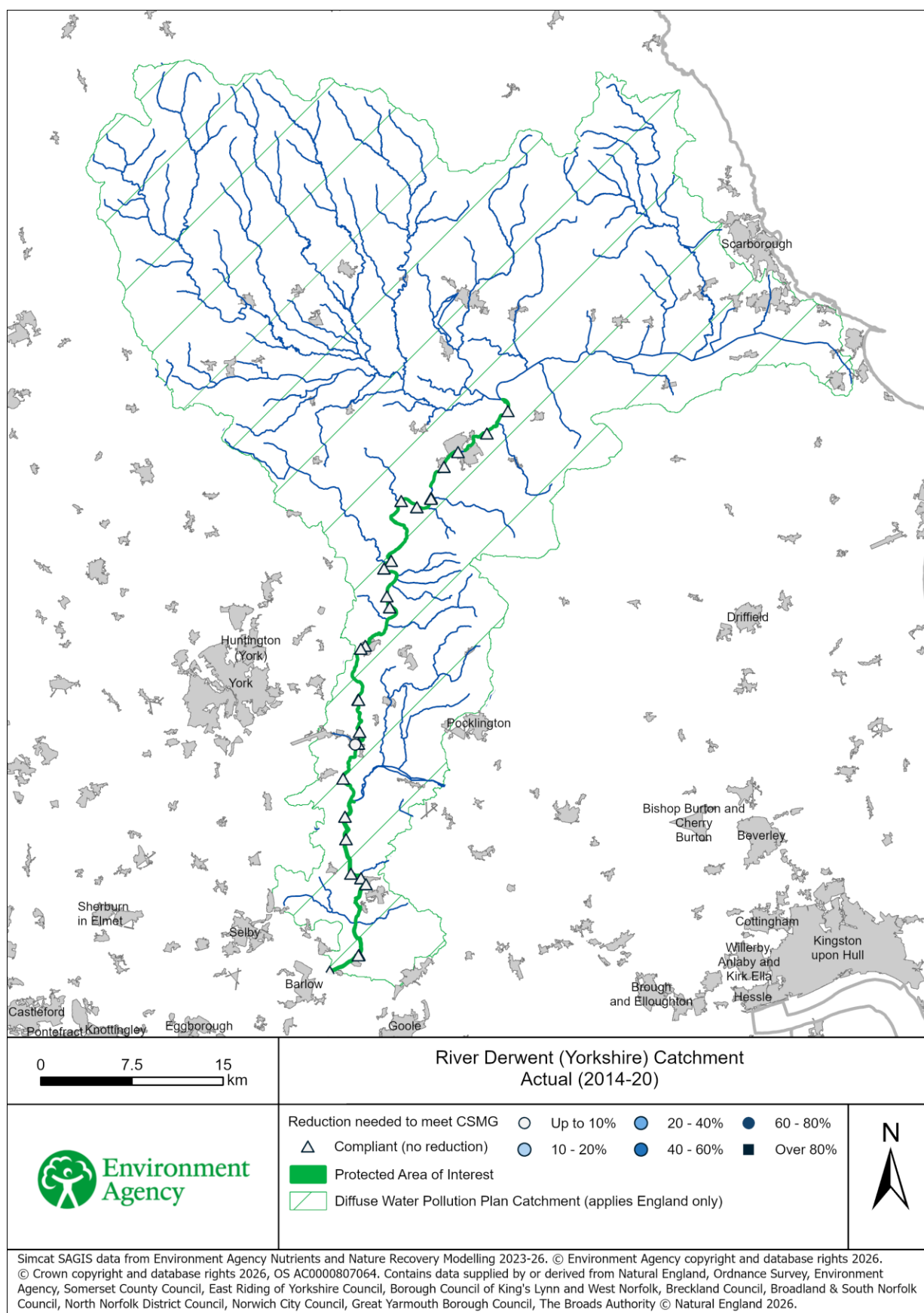
Apportionment by concentration and by load can be different because inputs from different sources tend to occur under different river flow conditions. Inputs from treatment works occur continuously while diffuse source inputs tend to occur under higher river flow conditions where there is greater dilution available in the receiving water. As a result, a kilogram of phosphorus discharged from a treatment works will have a relatively greater impact on in-river concentrations than the equivalent input from diffuse sources.

Table 3: Catchment average phosphate sector share alongside modelled catchment average concentrations (mg/l) and estimated percentage reductions across all scenarios.

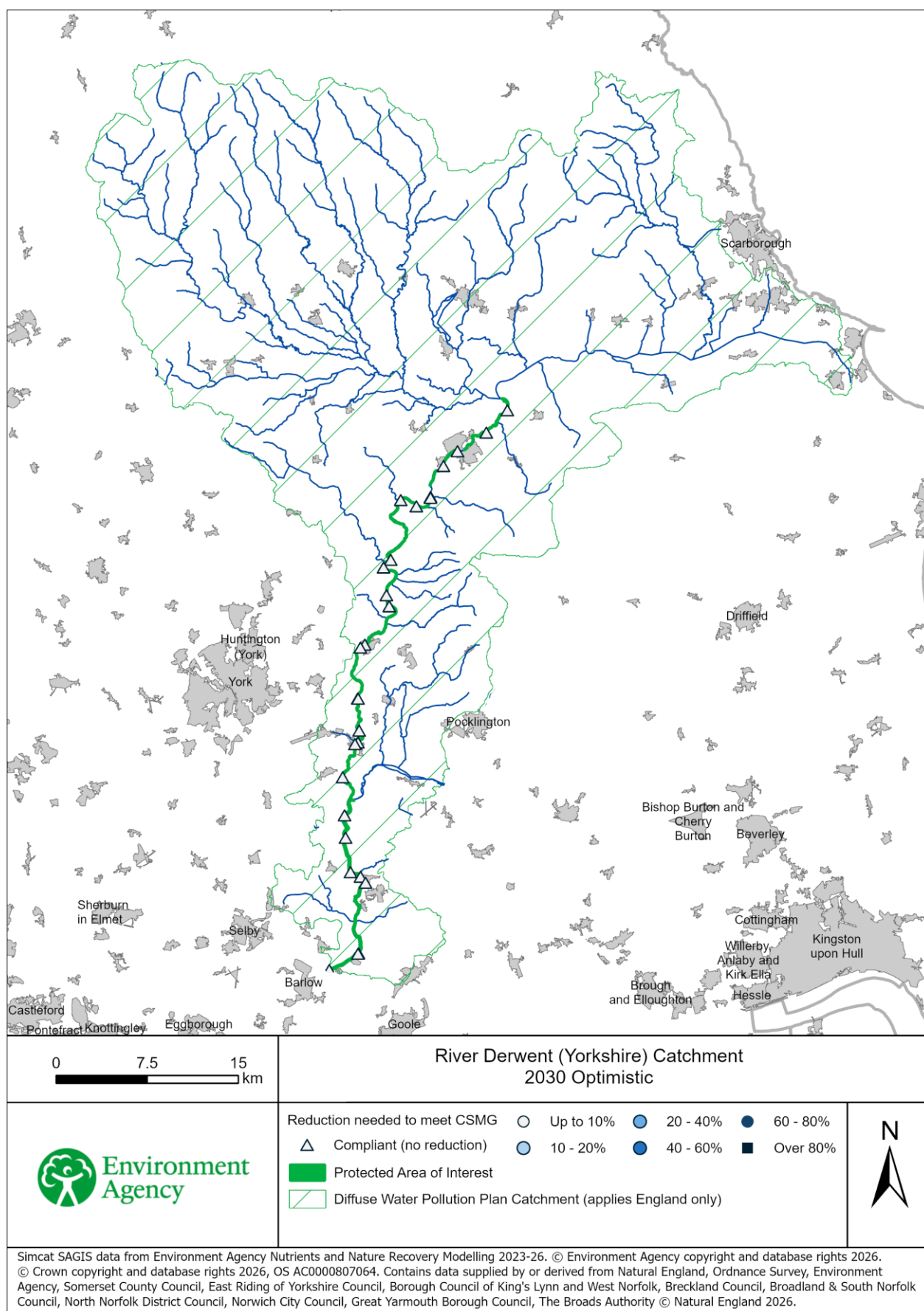
Scenario and Assessment Metric	Diffuse	Point	Total
Baseline (2009) Sector Share of the target	38%	62%	
Catchment average sector share of the target (mg/l)	0.019	0.031	0.050
Actual (2014 to 2020) - modelled sector concentration (mg/l)	0.031	0.033	0.064
Actual (2014 to 2020) - reduction to meet sector share	39%	7%	22%
2030 Optimistic – modelled sector concentration (mg/l)	0.031	0.023	0.054
2030 Optimistic – reduction to meet sector share	38%	0%	7%
2030 At Permit – modelled sector concentration (mg/l)	0.031	0.029	0.060
2030 At Permit – reduction to meet sector share	38%	0%	16%

Maps - modelled reductions needed

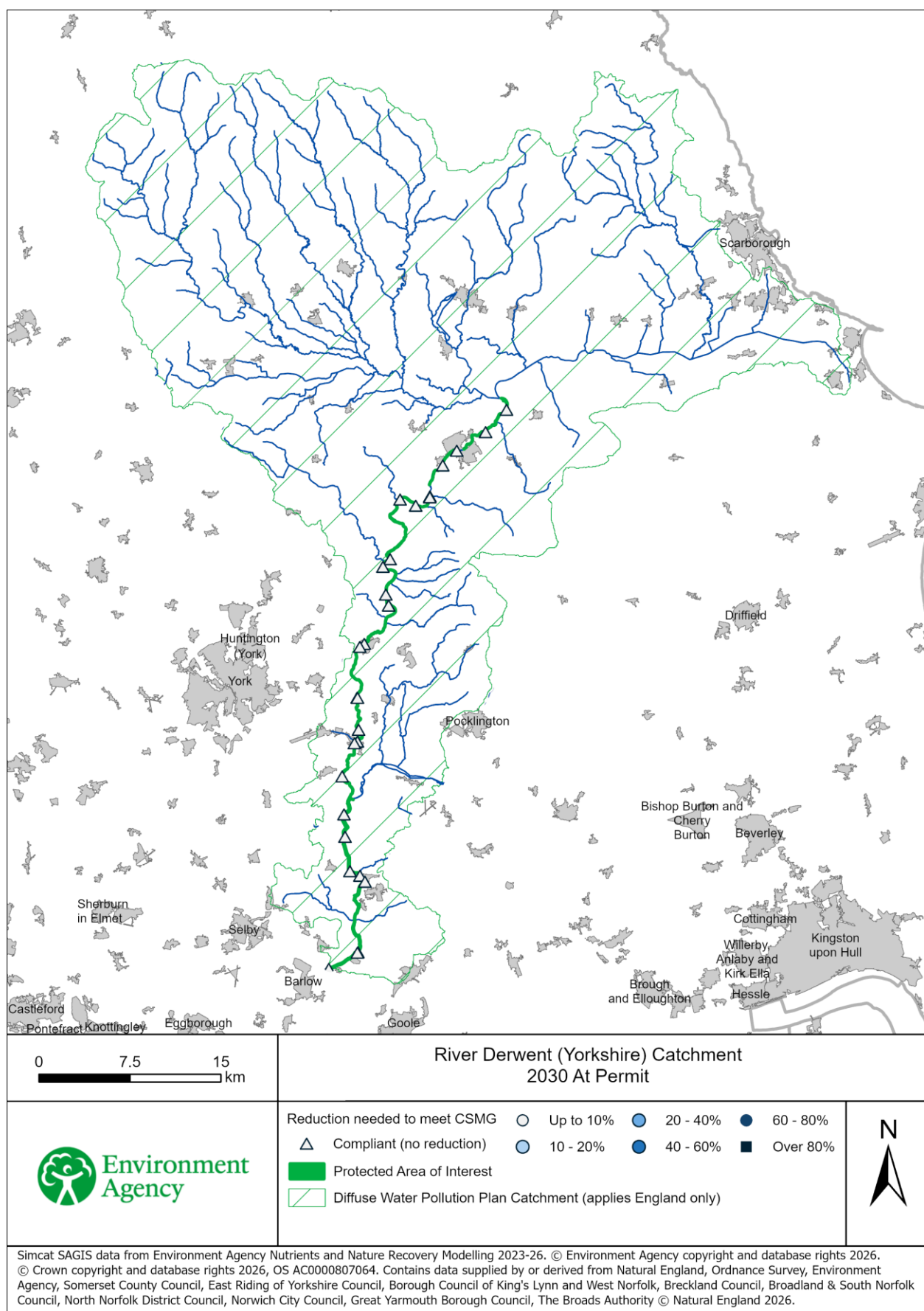
The catchment average information above provides an overview of the sector concentrations and reductions at the catchment scale. The detailed catchment maps reinforce that all but one of the modelled locations in the designated reaches are estimated to meet the target in the Actual (2014 to 20) scenario (Map 2). In the 2030 At Permit scenario, all modelled locations are estimated to meet the target (Map 4). Similarly, Map 5 confirms that the diffuse sector share of the target is met in all locations in the designated reaches. Data is plotted for each modelled plotting point where there is a real-world feature, for example, monitoring point or discharge location.



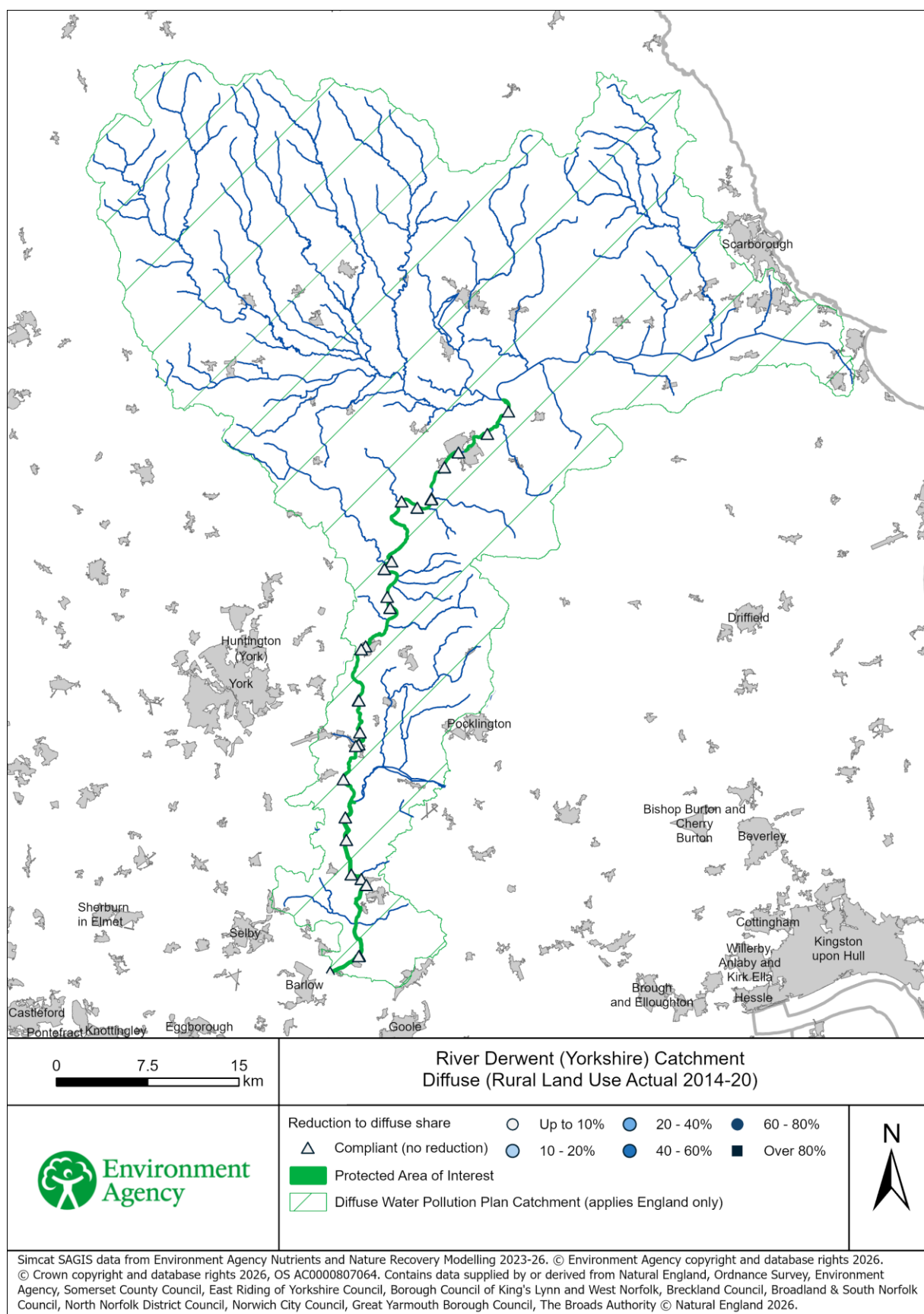
Map 2. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the Actual (2014 to 20) Scenario. All except one location meet the target. Up to 10% reduction in concentration is estimated at one location.



Map 3. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the 2030 Optimistic Scenario. All modelled points meet the target.



Map 4. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the 2030 At Permit Scenario. All modelled points meet the target.



Map 5. Estimated reductions needed in diffuse phosphate concentrations to meet the diffuse share of the target in the Actual (2014 to 2020) Scenario. All modelled points meet the diffuse sector share of the target.

Input load figures used to calculate source apportionment

Table 4: Estimated phosphate input loads (kg/d) and input load source apportionment after calibration, before in-river processes.

Scenario	STW (kg/d)	Intermittents (kg/d)	Industrial (kg/d)	Rural Land Use (kg/d)	Urban (kg/d)	Septic Tanks (kg/d)	Highways (kg/d)	Point (%)	Rural Land Use (%)	Urban (%)	Septic Tanks (%)	Other (%)
Actual (2014 to 2020)	53.76	0.70	3.62	69.31	2.84	1.29	0.10	44.1%	52.7%	2.2%	1.0%	0.1%
2030 Optimistic	36.30	0.71	3.64	67.39	2.83	1.29	0.10	36.2%	60.0%	2.5%	1.1%	0.1%
2030 At Permit	62.34	0.70	3.42	69.31	2.84	1.29	0.10	47.5%	49.5%	2.0%	0.9%	0.1%

References

Defra (2019a). A national scale assessment of current and future actions to reduce diffuse pollution of water by agriculture. [Report by ADAS for Defra project WT1594](#): 1-47.

Environment Agency (2022). Water quality: what 3 future environmental land management schemes can achieve by 2027. [Water quality: what 3 future environmental land management schemes can achieve by 2027](#).

Gooday, R. D., Anthony, S.G., Chadwick, D.R., Newell-Price, P., Harris, D., Duethmann, D., Fish, R., and A. L. a. W. Collins, M. (2014). Modelling the cost-effectiveness of mitigation methods for multiple pollutants at farm scale. [Science of the Total Environment](#) (468-469): 1198-1209.

List of abbreviations

ADAS – UK-based independent agricultural and environmental consultancy, previously National Agricultural Advisory Service (NAAS).

AMP8 WINEP – Asset Management Plan 8 (2025 – 2030) Water Industry National Environment Programme - [Water industry national environment programme \(WINEP\) methodology - GOV.UK](#)

CSMG – Common Standards Monitoring Guidance – includes guidance on the appropriate standards and targets for designated sites [Common Standards Monitoring Guidance for Freshwater Habitats | JNCC Resource Hub](#)

DWPP – Diffuse Water Pollution Plan

NEAP-N – ADAS model providing annual 1 km grid loadings of nitrate.

PR – [Price Review https://www.ofwat.gov.uk/regulated-companies/price-review/](https://www.ofwat.gov.uk/regulated-companies/price-review/)

PSYCHIC – ADAS model providing annual 1 km grid loadings of Phosphate.

SAC – Special Area of Conservation

SAGIS – Source Apportionment Geographical Information System

SPA – Special Protection Area

SSSI – Site of Special Scientific Interest

UKWIR – United Kingdom Water Industry Research

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