Nutrient Management Board Meeting

2pm on Thursday 9 July 2020 – By Zoom

1. Welcome and apologies
2. Minutes of the last Board meeting of 29th January and matters arising
3. Brief Update on the situation in Herefordshire in relation to planning and development
4. Presentation of the TAG recommendations and appended papers
5. Discussion on source apportionment and recent data for the Lugg catchment
6. Discussion of recent media interest / campaign concerning potential cross border pollution from Wales
7. Updates from:
    i. Wye & Usk Foundation
    ii. Herefordshire Council
    iii. Powys County Council
    iv. Environment Agency
    v. Natural England
    vi. Natural Resources Wales (NRW)
    vii. DCWW
    viii. Farm Herefordshire
    ix. NFU
    x. Other Board members wishing to contribute
8. Member Training seminar
9. Questions from the public
10. Date of next meeting
11. AOB

Nutrient Management Plan Technical Advisory Group summary paper on updating the NMP Action Plan June 2020

Background

1. Herefordshire Council as the 'competent authority' under the Habitats Regulations, (The Conservation of Habitats and Species Regulations 2017) are legally required to assess the potential impacts of projects and plans, including planning applications, on internationally important sites which include the River Wye SAC (Special Area of Conservation). The River Lugg, which is a tributary of the River Wye and part of the SAC is currently failing its conservation objective for phosphate levels as a result of water pollution from both 'point' source; in particular sewage outlets and 'diffuse' source; agricultural run-off.

2. The council must carry out Habitats Regulation Assessment on any relevant planning application and must be able to determine, with scientific certainty, that there would be no 'Likely Significant Effect' (LSE) or no 'Adverse Effects on Integrity' (AEOI) on the designated site(s), from the project, either alone, or in combination with other plans and projects, in order for the planning application to be granted.

3. The approach taken by Herefordshire Council and Natural England, as the statutory consultee, has to date been that there is a route for development to be able to proceed in the River Lugg catchment, even when it may add to the existing phosphate levels in the river, as increases would be mitigated by the River Wye's Nutrient Management Plan (NMP). The NMP is a partnership project developed to reduce phosphate levels in the Wye catchment, including the River Lugg, to below the target level by 2027 in line with the Water Framework Directive.

4. However, this approach regarding development with potential phosphate impacts in the Lugg catchment is currently under review following the judgment in the case of *Cooperatie Mobilisation* (the Dutch Case) (Joined Cases C-293/17 and C-294/17) handed down in November 2018 by the Court of Justice of the European Union (CJEU).

5. Natural England provided initial advice to Herefordshire Council on 22nd July 2019 and subsequent further advice: In the light of the interpretation of the Dutch judgment (on the interpretation of the Habitats Directive, from which the Habitats Regulations arise in UK law), where a site is failing its water quality objectives, and is therefore classed as an unfavourable condition, there is limited scope for the approval of additional damaging effects and that the future benefit of measures cannot be relied upon in the Habitats Regulation Assessment where those benefits are uncertain at the time of the assessment.

6. Natural England have advised that for any plans or projects that have a significant effect (ie add to phosphate levels in the River Lugg) and which require Appropriate Assessment, the effects are currently uncertain, as in their

opinion there remains reasonable scientific doubt as to whether the NMP can provide appropriate mitigation (based on how much certainty this currently demonstrates).

7. Herefordshire Council are in talks with Natural England and other partners to liaise closely to find an effective solution as soon as possible. This includes discussions with the Nutrient Management Board. There remains potential for a positive Appropriate Assessment to enable development to proceed, on Natural England's advice, where it can be demonstrated that any impacts would be neutral (where avoidance / mitigation measures included in the plan or project, counterbalance any nutrient (phosphate) increase from the plan or project), or would lead to 'betterment'.

Purpose of this paper

8. This short paper will summarise the reasons why the Action Plan needs updating, why it is being done at the present time, what has changed since the last Action Plan (2014) and the suggested measures that will be added to the Action Plan following agreement by the NMP Board on 9 July 2020. The measures outlined in this paper have been discussed at the NMP Technical Advisory Group meeting that took place on 2 July 2020. There are papers associated with the proposed additions to the Action Plan and these have been provided to the NMP Board alongside this document.

9. The Nutrient Management Plan and the associated Action Plan were published in 2014. The Action Plan is designed to be updated when needed with additional measures to protect the River Wye Special Area of Conservation. This update was due to take place in early 2019 following a Technical Advisory Group meeting in December 2018 which focussed entirely on updating the Action Plan with new measures since the plan was published in 2014.

10. Due to the wide implications of the Dutch Judgement this update was not possible in early 2019 and is now taking place following extensive investigations into suitable measures to reduce phosphate in the Wye catchment by members of the NMP Technical Advisory Group. These proposed additions to the Action Plan are also able to take into account new data and evidence available since the original NMP was produced in 2014.

Evidence Review – Environment Agency and Natural England

11. An extensive evidence review has been carried out and a PDF document has been produced to illustrate the findings. This is to be found in the appendix to this paper and is entitled Catchment maps and apportionment with reasonable worse case P predictions.

12. Some of the data used for the maps relates to Water Framework Directive (WFD) status which is included as it can provide the latest information on possible hotspots where catchments need to be improved, however this data is not directly comparable to SAC requirements. WFD waterbody targets are not the same as targets related to the SAC.

13. Findings from this review may differ from data included in the original Nutrient Management Plan. This is due to several reasons which include updated computer modelling software, certainty on Dwr Cymru Welsh Water AMP 7 investments, updated calculations on effluent loading and improved information on diffuse sources of phosphate. The two latest models agree on these findings.

14. Key findings -

- The analysis has shown that there are very few sites that have a statistically significant change in the site mean over the past ten years.

- However, at some sites where a change has been detected, the limits of laboratory analysis does not allow a determination, with enough certainty, that there is a real change in the orthophosphate values over time. The older data was subject to a different level of analysis due to best available techniques at the time. Current technology allows for a more sensitive level of analysis.

- River Lugg current phosphate sources are 66% agriculture, 25% sewage treatment works, 9% other. DCWW AMP 7 improvements will be completed between 2020 – 2024 and these percentages will change slightly to 67% agriculture, 23% sewage treatment works and 10% other.

- Sources of phosphate in the sub catchments of the River Lugg vary depending on location. Sub catchments at the top of the Lugg catchment which have small populations and are largely agricultural are likely to generate higher percentages of phosphate from agriculture than from sewage works. Other sub catchments with a higher population and less agriculture are likely to produce higher percentages of phosphate from sewage works and less from agriculture. Examples of this variation are shown in the maps and the

next 6 bullet points below for 6 tributaries of the River Lugg (all current sources) :

- Stretford Brook – 35% agriculture, 62% sewage works, 3% other
- Honeylake Brook – 93% agriculture, 6% sewage works, 1% other
- Tarrington Brook – 6% agriculture, 91% sewage works, 3% other
- River Lodon – 37% agriculture, 49% sewage works, 14% other
- Curl Brook 43% agriculture, 56% sewage works, 1% other
- Pinsley Brook – 0% agriculture, 98% sewage works, 2% other

Post PR19 – Fully Permitted Scenario

- Target Concentration of 0.05mg/l is only predicted to be breached at the Mordiford Bridge sample point
- Predicted concentration = 0.055mg/l
- The predicted load at this location is 67.529kg/d compared with a target load based on the CSMG target of 0.05mg/l and flow of 1362Ml/d of 66.400kg/d
- Load to be removed after sewage works fair share has been achieved = 1.129kg/d
- Agriculture as a whole appears to be responsible for approx. 90% of this remaining deficit. Load removal from agriculture to ensure compliance with the CSMG = 2.5kg/d which is 5.5% of current agricultural load.
- This represents a fully permitted PR19 scenario, providing any growth can be accommodated within permitted headroom, we would expect this to be a worst case scenario.

Monitoring Review – Environment Agency

15. A review of Environment Agency phosphate monitoring has been carried out and a paper produced which is provided to the NMP Board. This paper is entitled Environment Agency- Gap analysis of the Wye/Lugg SAC Phosphate Monitoring in relation to the Nutrient Management Plan and SAC Conservation targets. (The upper reaches of the Rivers Wye and Lugg are in Wales and Natural Resources Wales (NRW) are currently reviewing their sampling programme and revisiting source apportionment calculations for phosphate).

16. This review assessed past and current EA monitoring in the River Wye catchment and provides suggestions for future monitoring.

17. Key findings –

- The Environment Agency monitoring programme is suitable to enable the assessment of the Wye SAC. Moving forwards work needs to be undertaken to ensure there is a flexible programme of monitoring for the NMP and SAC.

- More work is required to ensure that the evidence data set is targeted and monitoring resource is directed to areas of highest priority. Going forward, a large network of chemistry sampling is unsustainable and other techniques will need to be developed for example targeted use of phosphate sondes, remote sensing and rapid algal surveys. This will need to include a more agile monitoring programme that will use all the data sources available from statutory bodies and partner organisations to identify and fill the gaps in evidence needs to be developed.

- In particular, further analysis is required to determine whether there has been a significant step change in the level of orthophosphate at Redbrook and levels in the Welsh sections of the Wye and the Lugg. We would also like to further investigate why there appears to be an increase in orthophosphate levels between Huntsham Bridge, Symonds Yat and the site at Redbrook.

- We will revisit the programme in light of the analysis undertaken and provide further direction by the autumn.

Regulatory and Enforcement Plan – Environment Agency and Natural England

18. A paper entitled Environment Agency & Natural England Regulation and Management of Diffuse Agricultural Pollution has been provided to the NMP Board. This paper outlines how the Environment Agency targets regulatory and advisory activity to reduce phosphate arising from agricultural activities and how this is supported by schemes including Catchment Sensitive Farming.

19. Key points –

- A variety of intelligence is used to identify fields at high risk of soil run off and phosphate loss, this includes satellite imagery and land slope data.

- Between 2016 and 2019 more than 60 fields have been identified as high risk, potential to pollute or actually causing soil losses.

- The River Frome, a main tributary of the Lugg was targeted as a trial leading to 12 site-specific advice and guidance letters being issued, 5 formal warning letters, 8 farmers attending soil management awareness courses and 10 hectares of steep arable fields returned to permanent pasture following work with tenant farmers

- Outlines how The Reduction and Prevention of Agricultural Diffuse Pollution Regulations (Farming Rules for Water) 2018 will be used in an Environment Agency regulatory action plan to continue to address agricultural diffuse pollution over the coming years. These regulations have been introduced since the NMP and Action Plan were produced in 2014.

Integrated Wetlands – Wye and Usk Foundation / Herefordshire Council

20. A paper on this proposal is to be provided to the NMP Board from Wye and Usk Foundation.

Agricultural Measures – Farm Herefordshire

21. A paper entitled Proposals from Farm Herefordshire to the Nutrient Management Plan Technical Advisory Group has been provided to the NMP Board. This paper investigates measures that can be provided in the Wye catchment to reduce phosphate derived from agriculture and includes estimated amounts of phosphate that will be removed together with costs and benefits of the measures.

22. Summary of proposed actions to be added to the NMP Action Plan following approval by the NMP Board.

1.	Integrated wetlands at selected sewage treatment works
2.	Sediment traps
3.	Voluntary agreements to reduce on farm phosphate use
4.	Targeting the use of sewage sludge to control phosphate
5.	Arable reversion to absorb nutrients in flood water
6.	Continued enforcement of regulations including Farming Rules for Water introduced in 2018
7.	Regular reviews of Environment Agency monitoring programme to ensure it remains targeted and provides required information to assess the River Wye SAC
8.	Mitigation and offsetting of phosphates through the potential rewilding and/or non intensive agricultural use of farming land within the Lugg catchment
9.	Commissioning by Herefordshire Council of an 'Interim Plan' to better understand the present situation of phosphates within the Lugg catchment and to provide a calculator for phosphate reduction which can be used by both the regulators and developers. This will be supported by a Memorandum of Understanding between the regulatory agencies.

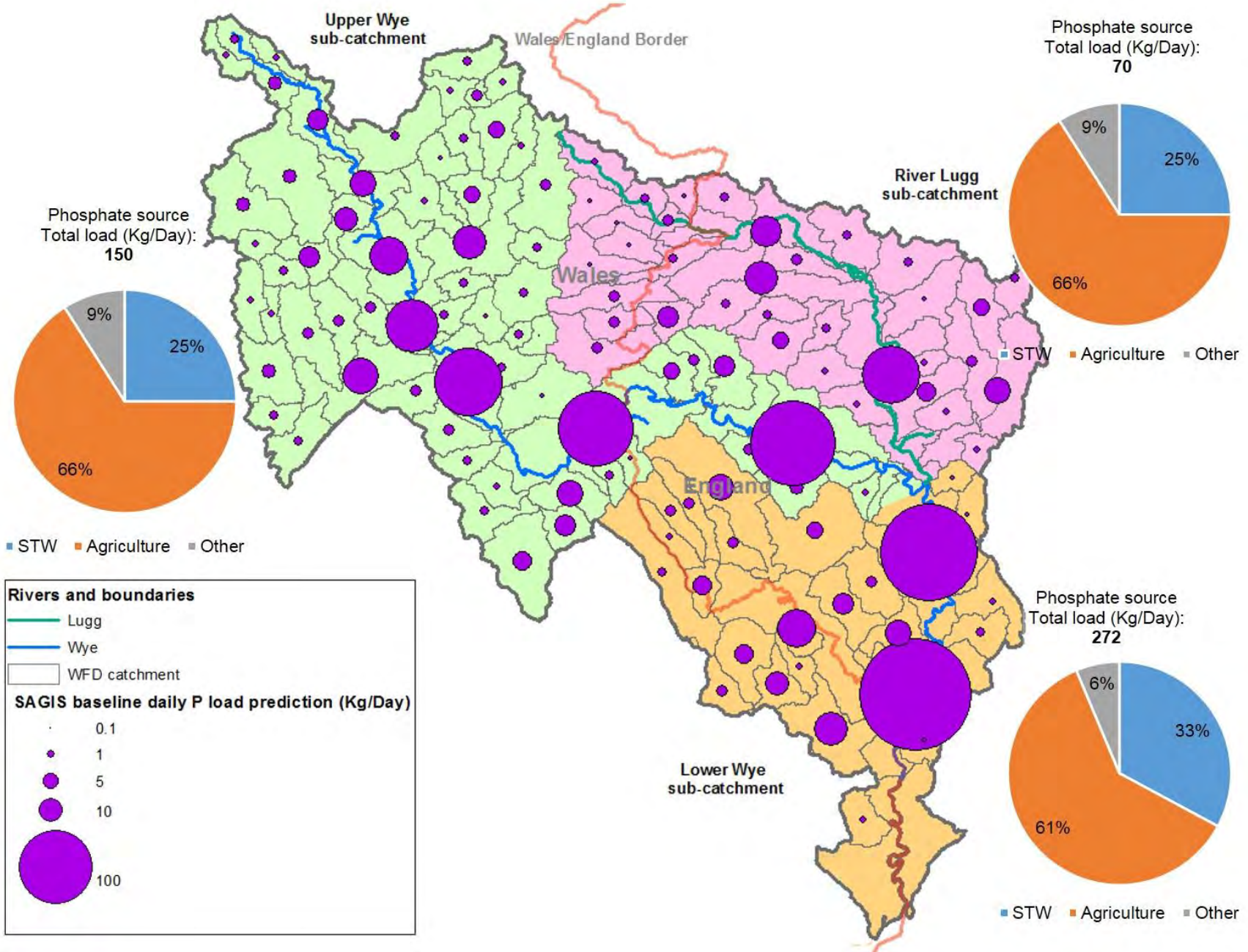
Evidence Review Environment Agency / Natural England
Phosphate in the Wye/Lugg SAC Catchment

The following maps and charts give a geographical overview of the most up to date modelling outputs in terms of phosphate sources and compliance with the phosphate targets that have been set by Natural England to protect the Wye/Lugg SAC.

Monitoring sites in the Wye SAC during 2017-19 were generally compliant with the Natural England phosphate targets, with the exception of the Lugg operational catchment (Lugg OC).. The Lugg OC is made up of a total of 35 WFD waterbodies, 11 of which are within Wales.

Modelling attributes one of the main single source of phosphate entering the Rivers Wye and Lugg to agriculture, both livestock and arable farming. The majority of this phosphate comes from diffuse inputs, meaning it is not generated at a single location, mostly through run-off of rainwater from agricultural land and assets such as farm tracks. The charts also show that Sewage Treatment Works (STW) are another notable source of phosphate. The additional lesser sources have been grouped in the category “Other”, this includes phosphate from highways, urban areas and industry, as well as combined sewer overflows, storm tank discharges and other sources of treated sewage unconnected to the sewer network, such as package treatment plants and septic tanks.

Phosphate load in Wye Catchment. Load is cumulative and does not reflect phosphate concentration as river flow will be greater downstream.



Post PR19 – Fully Permitted Scenario. If all growth is accommodated within permitted headroom at sewage treatment works.

- Target Concentration of 0.05mg/l is only predicted to be breached at the Mordiford Bridge sample point
  - Predicted concentration = 0.055mg/l

- The predicted load at this location is 67.529kg/d compared with a target load based on the CSMG target of 0.05mg/l and flow of 1362Ml/d of 66.400kg/d

- Load to be removed after sewage works fair share has been achieved = 1.129kg/d

- Agriculture as a whole appears to be responsible for approx. 90% of this remaining deficit. Load removal from agriculture to ensure compliance with the CSMG **= 2.5kg/d**

Load Removal in PR19

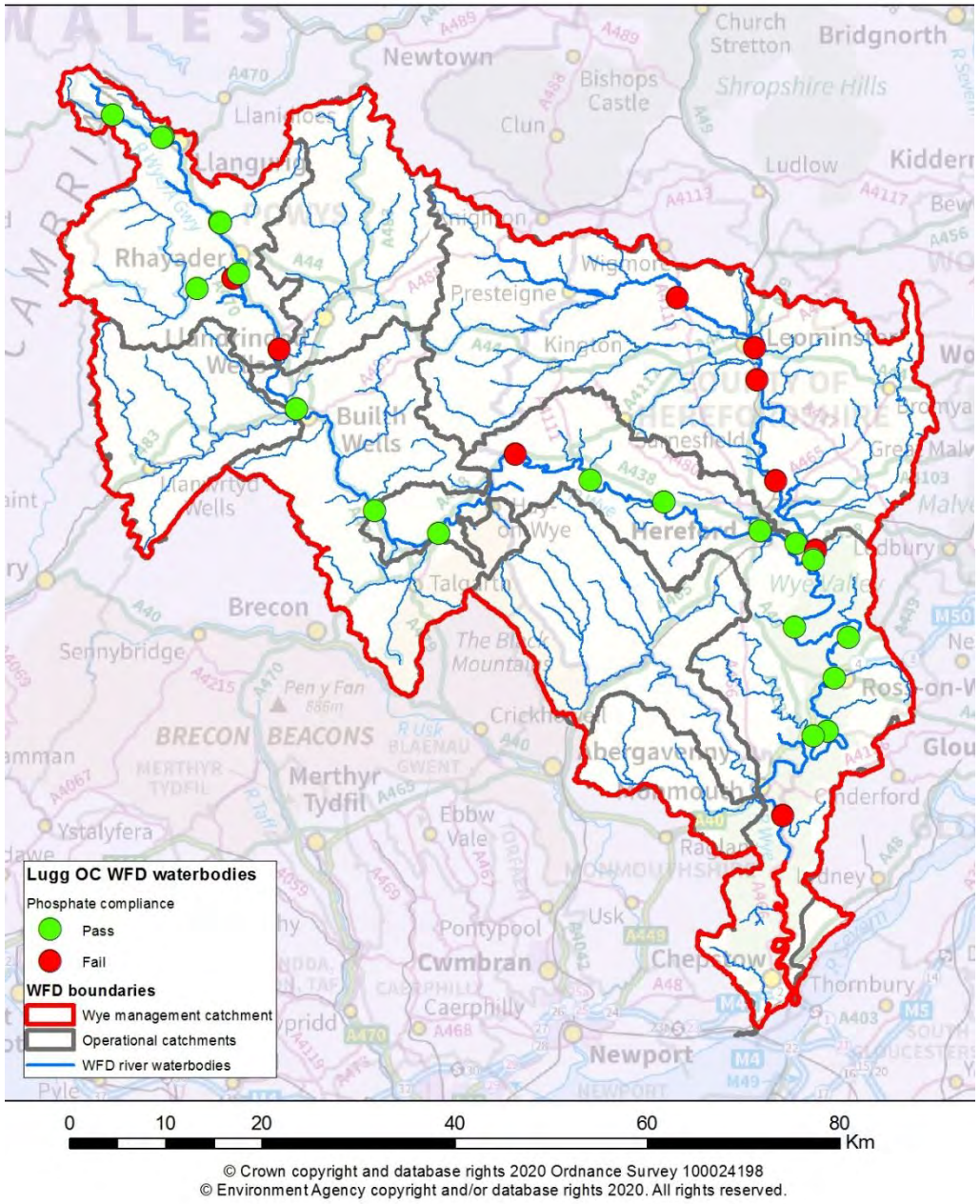
In terms of the load removal as a result of the planned PR19 schemes at Presteigne, Weobley and Leominster STWs, we can expect to see the following load reductions at strategic places within the catchment:
When looking at agricultural land and expressing the required target load against current input load, we see the following at the same locations within the catchment:

	u/s Leominster (50042)	d/s Leominster (50043)	Mordiford (50050)
Current Permit to PR19 @ Permit	-2.734kg/d	-6.605kg/d	-2.881kg/d
Current Permit to PR19 @ Current Flows	-2.705kg/d	-6.057kg/d	-2.905kg/d

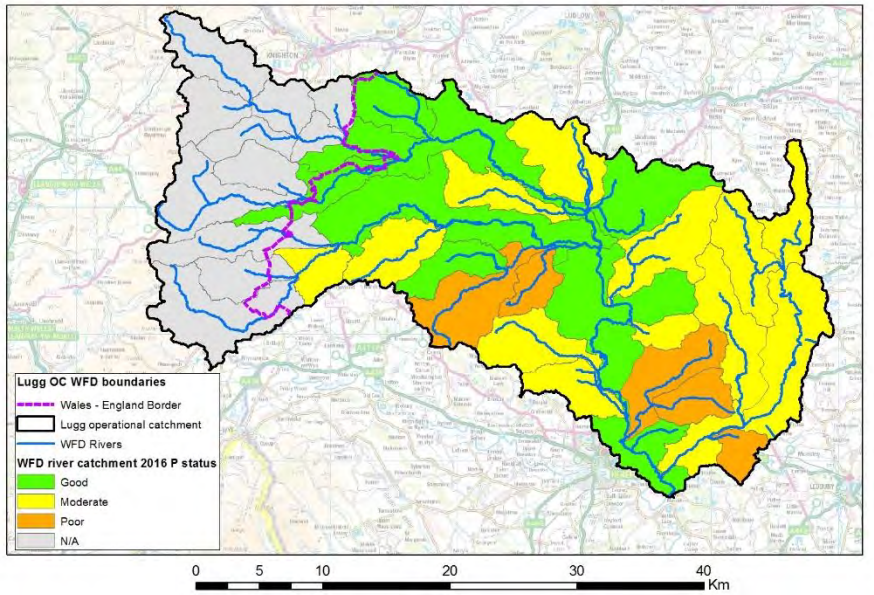
Location	Agricultural Load (kg/d)	Agricultural Load Target (kg/d)	Agricultural Load to Remove (kg/d)	% Agricultural Load to Remove
u/s Leominster	8.749	17.239	n/a	n/a
d/s Leominster	26.152	34.803	n/a	n/a
Mordiford	47.036	44.536	2.5	5.5%

Upstream and downstream of Leominster, the Lugg is predicted to pass post-PR19 improvement but that the river downstream of Moreton on Lugg and at Mordiford (confluence with River Wye), the target will be failed. The required load removal from agriculture is predicted to be 2.5kg/d or 5.5% of the current input load.

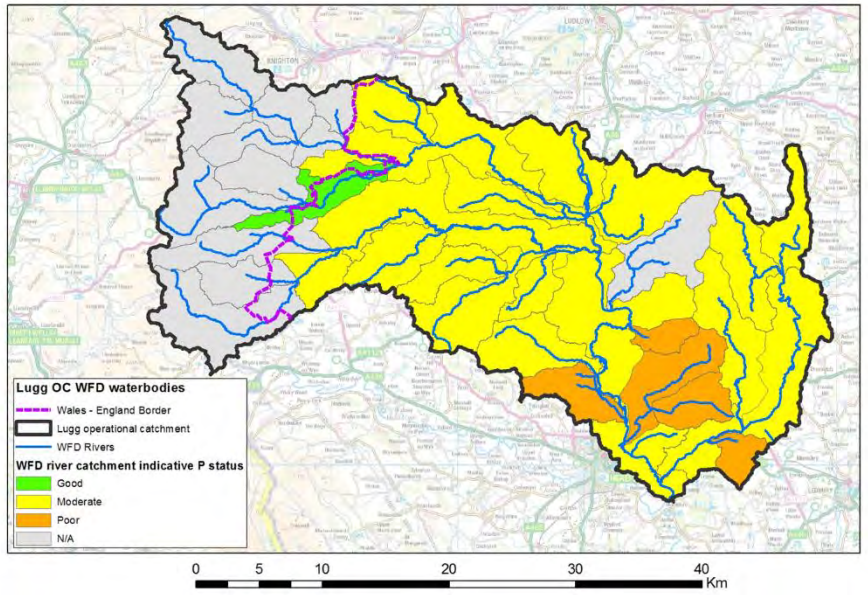
Wye SAC Phopshate compliance, 2017-19



Lugg WFD 2016 Phopshate Status



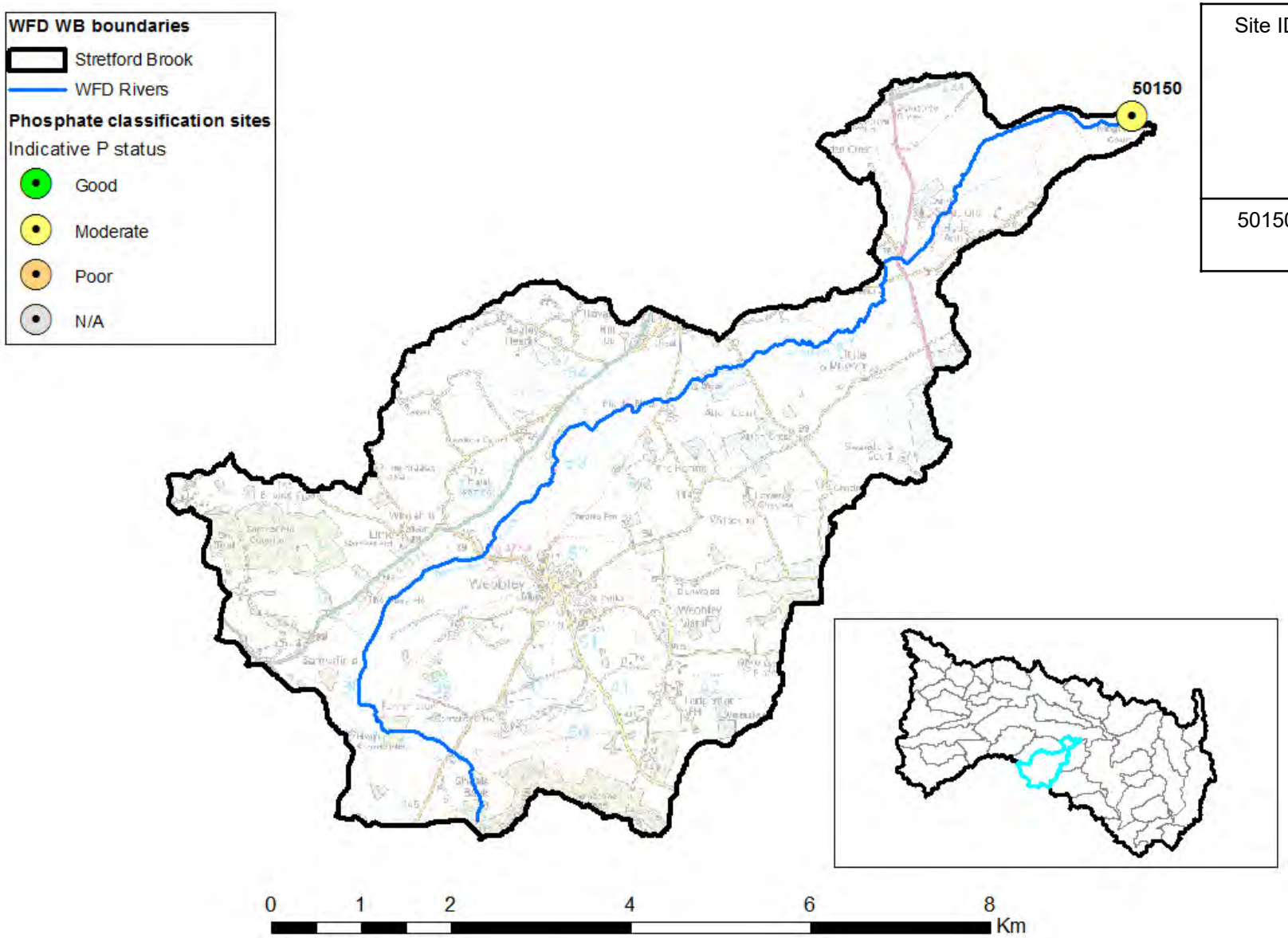
Lugg 2017-19 indicative phosphate status



- Phosphate sites within the Wye SAC are generally compliant with the exception of Lugg OC between 2017-19.
- Phosphate compliance standards for the SAC differ from the standards used for WFD classification.

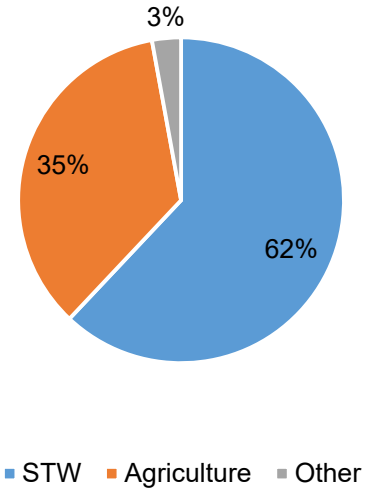
- The Lugg operational catchment (OC) contains 35 WFD waterbodies (WB).
- 24 of the WBs are under the EA's jurisdiction, 11 NRW's.
- 30 sites have been used to classify phosphate in the English WBs.
- Available phosphate data between 2017-19 for indicative status is not a full 3 years as required for WFD classification at most sites.
- The majority of sites only have data for early 2017 and 2019, there is considerable variation in the number of samples available.

GB109055036580: Stretford Bk - source to conf R Arrow

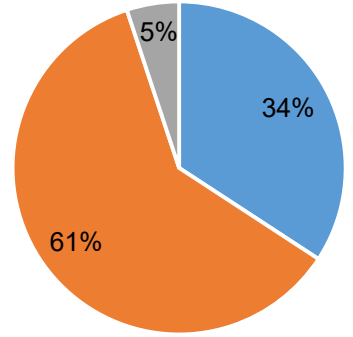


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50150	Poor: 0.221	38	Moderate: 0.189	9	0.081

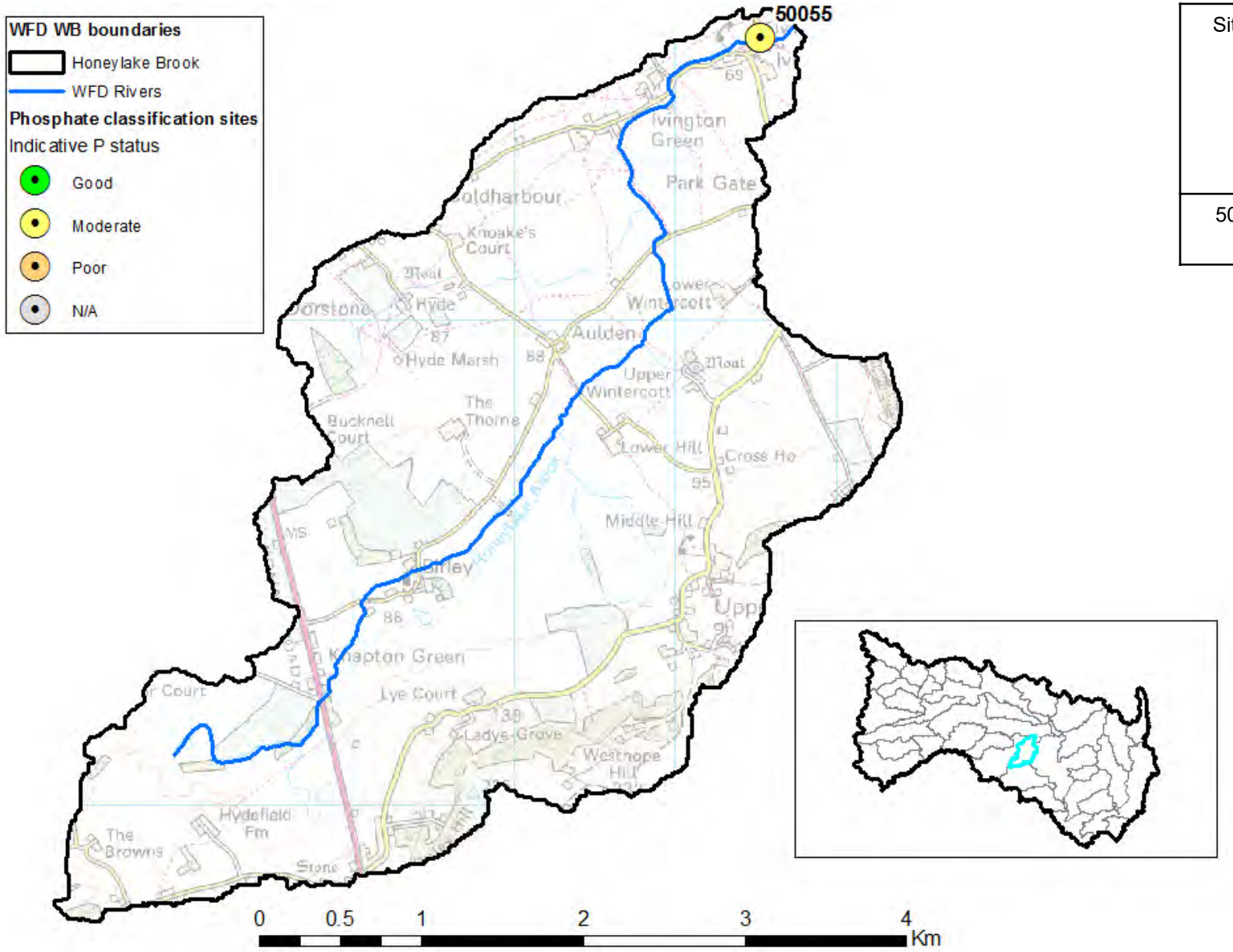
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 5.207



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.98

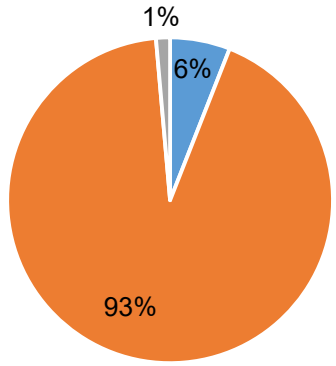


GB109055036610: Honeylake Bk - source to conf Little Arrow

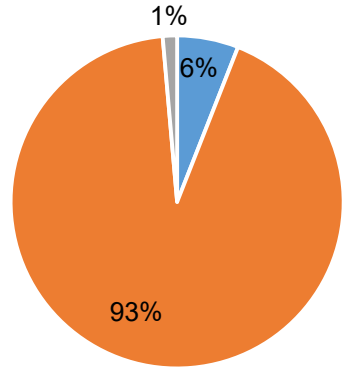


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50055	Poor: 0.226	36	Moderate: 0.165	10	0.081

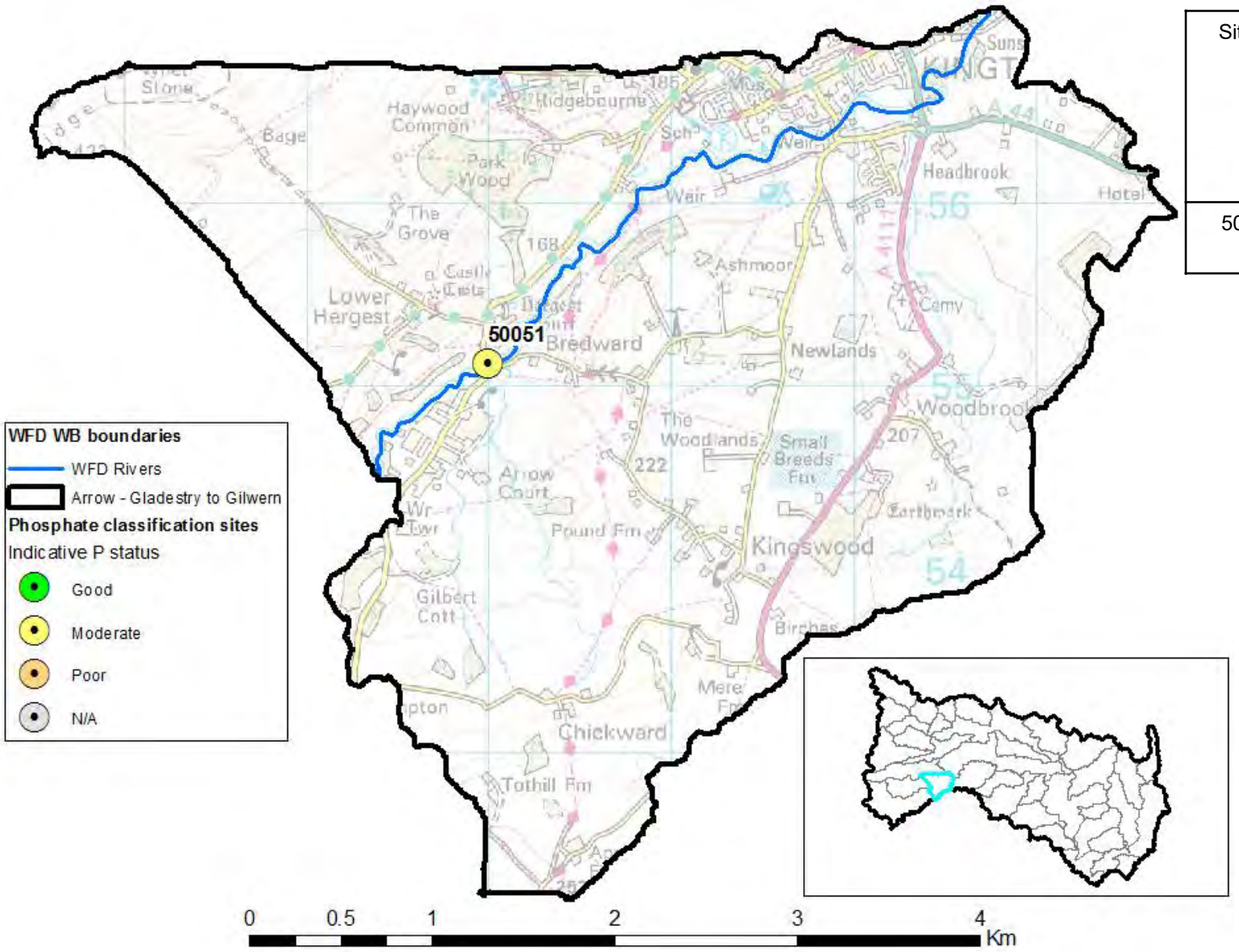
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.29



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.29

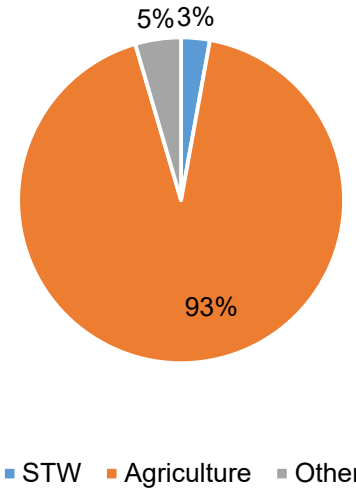


GB109055036620: Arrow - conf Gladestry Bk to conf Gilwern Bk

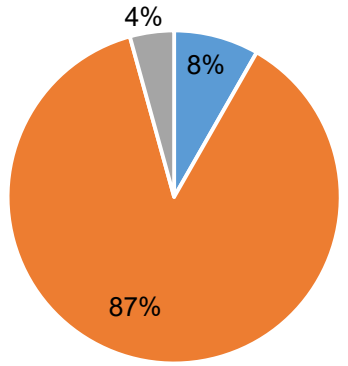


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50051	Moderate: 0.063	12	Moderate: 0.057	6	0.036

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 9.843

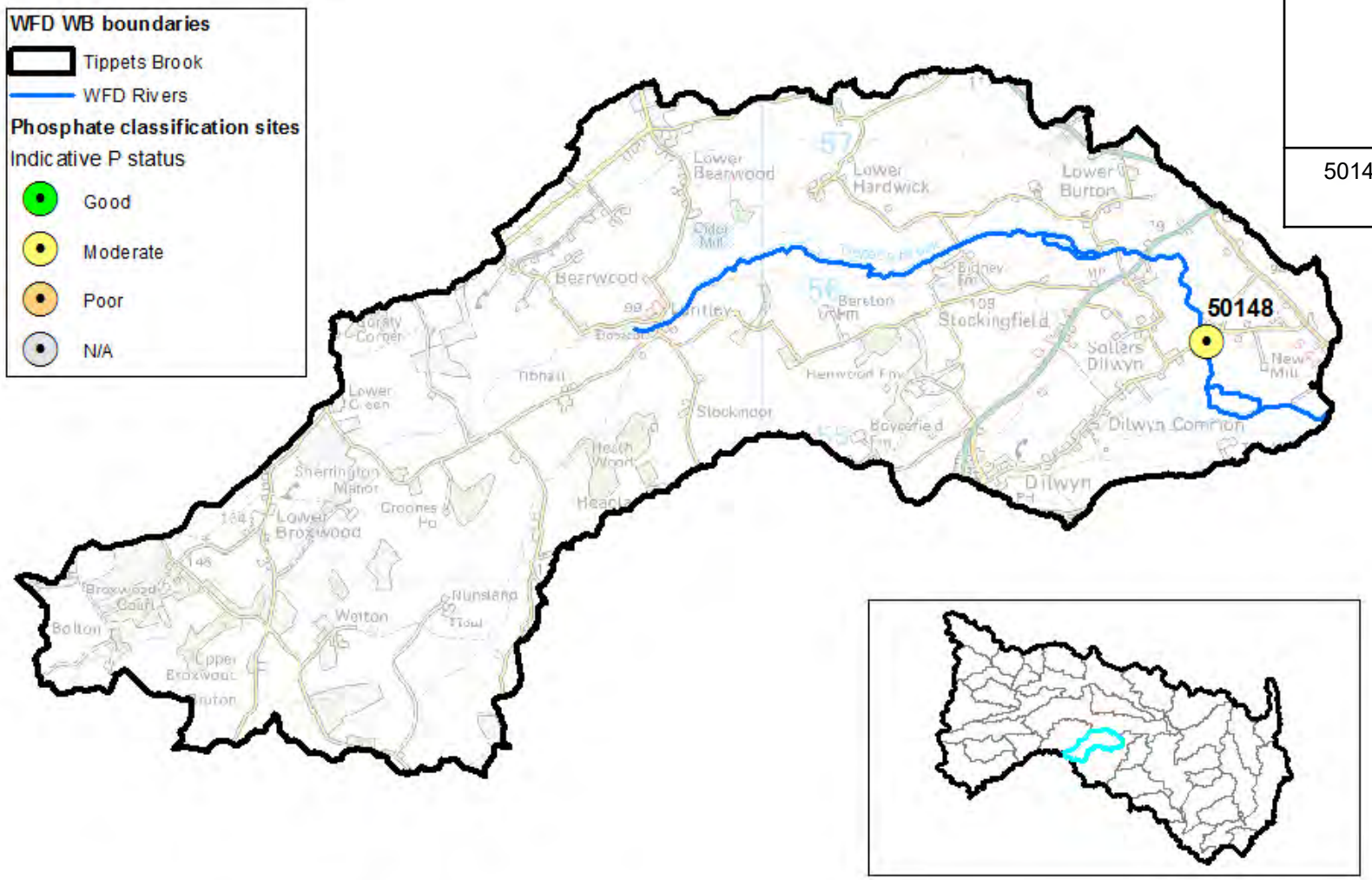


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 10.424

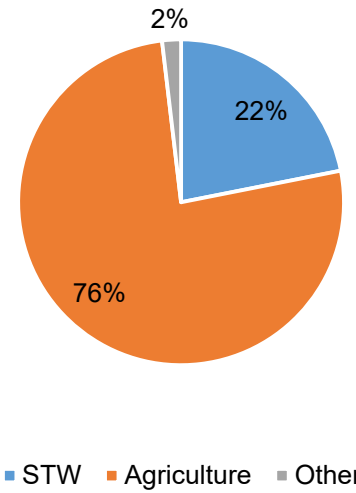


GB109055036630: Tippets Bk - source to conf Stretford Bk

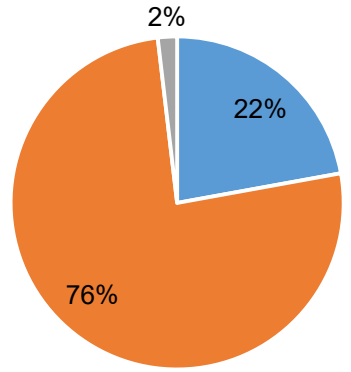
Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50148	Good: 0.076	12	Moderate: 0.130	8	0.077



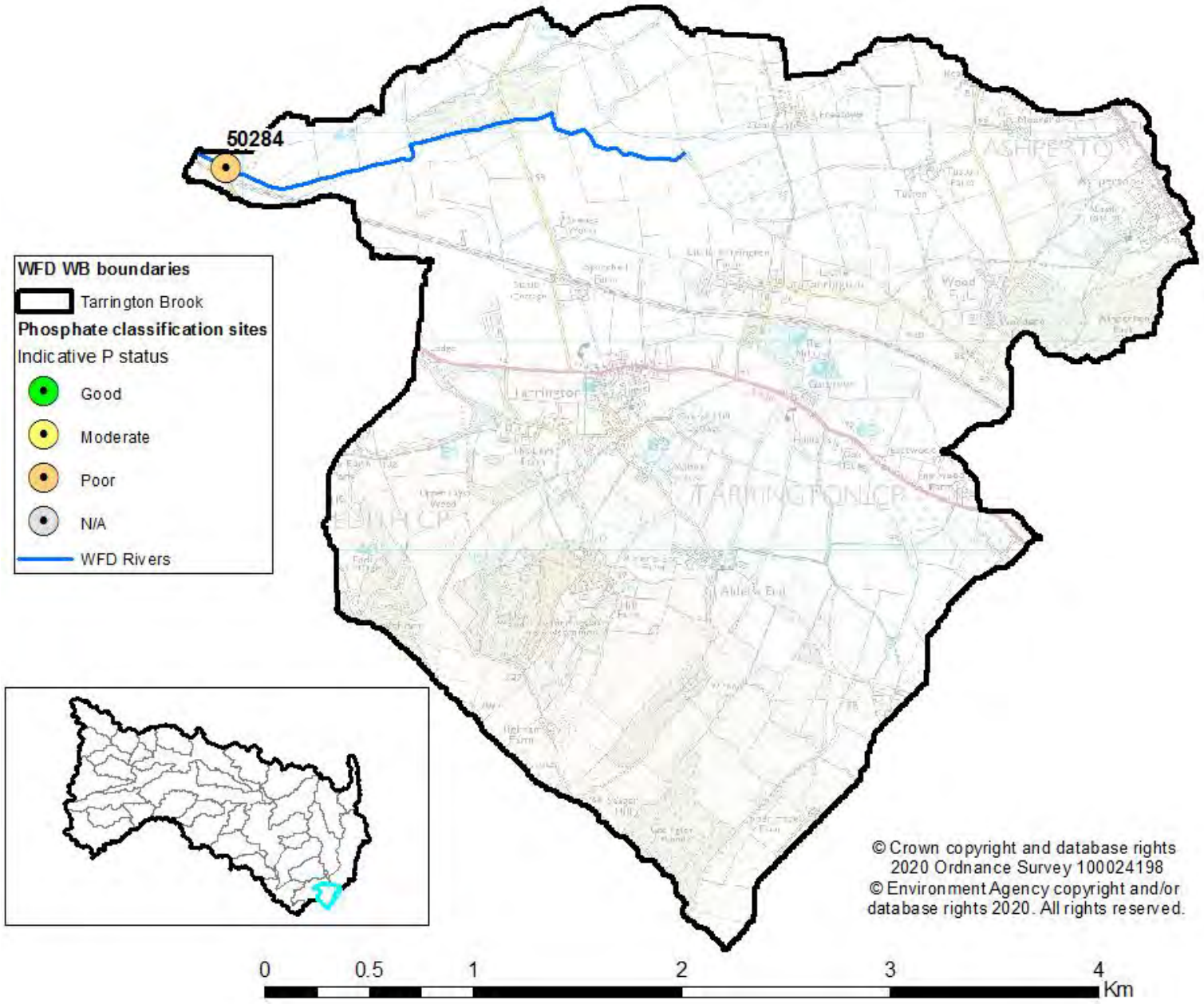
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 1.737



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.737

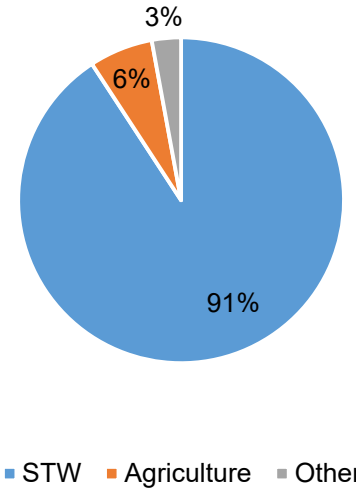


GB109055036650: Tarrington Bk - source to conf R Frome

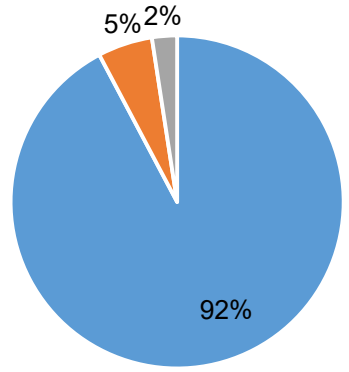


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50284	Poor: 0.304	12	Poor: 0.284	8	0.082

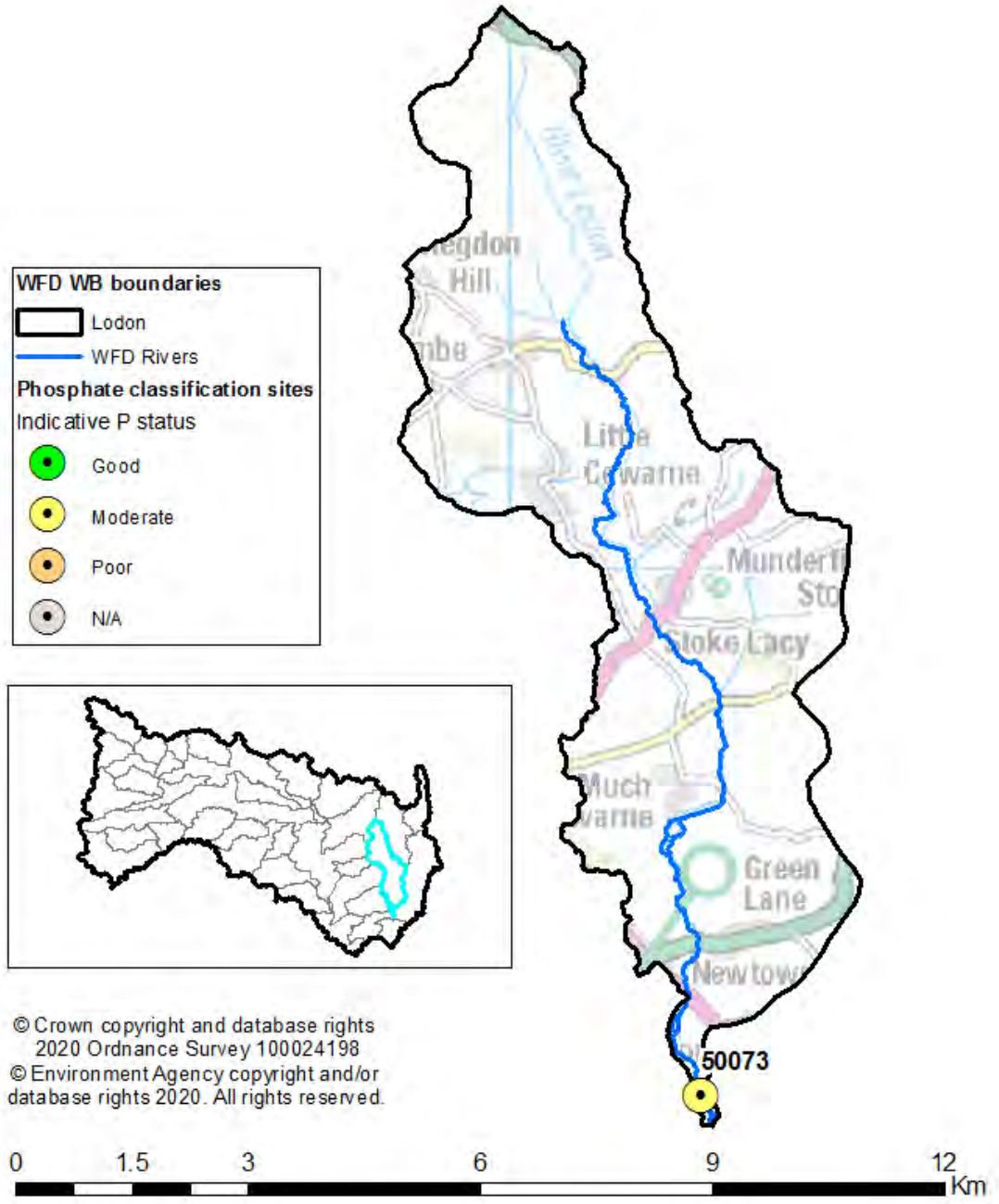
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 0.942



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.121

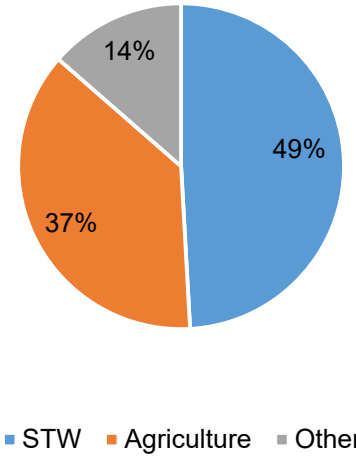


GB109055036660: Lodon - source to conf R Frome

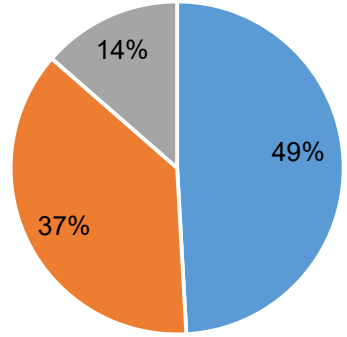


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50073	Moderate: 0.186	36	Moderate: 0.148	12	0.083

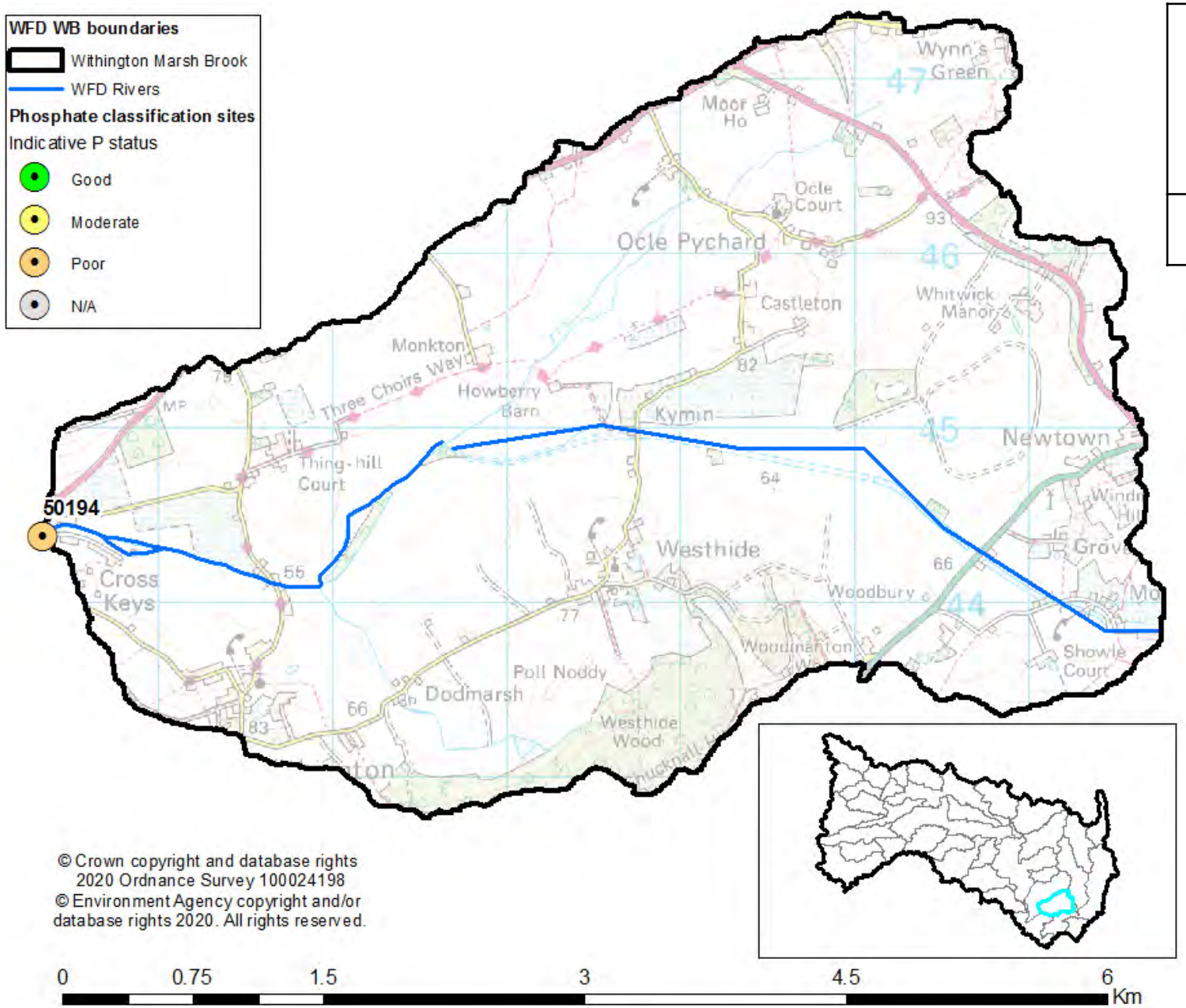
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.428



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.428

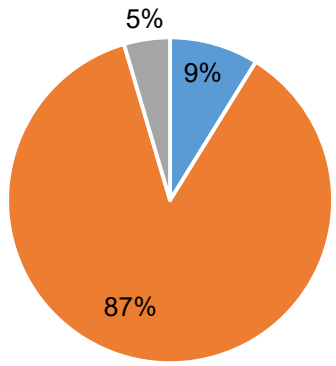


GB109055036710: Withington Marsh Bk - source to conf R Little Lugg

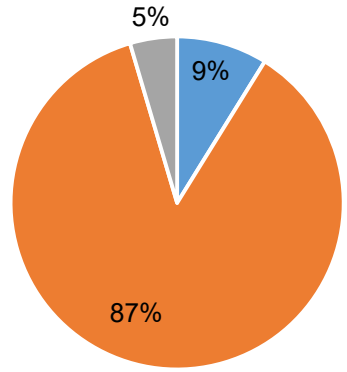


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50194	Poor: 0.255	36	Poor: 2095	12	0.085

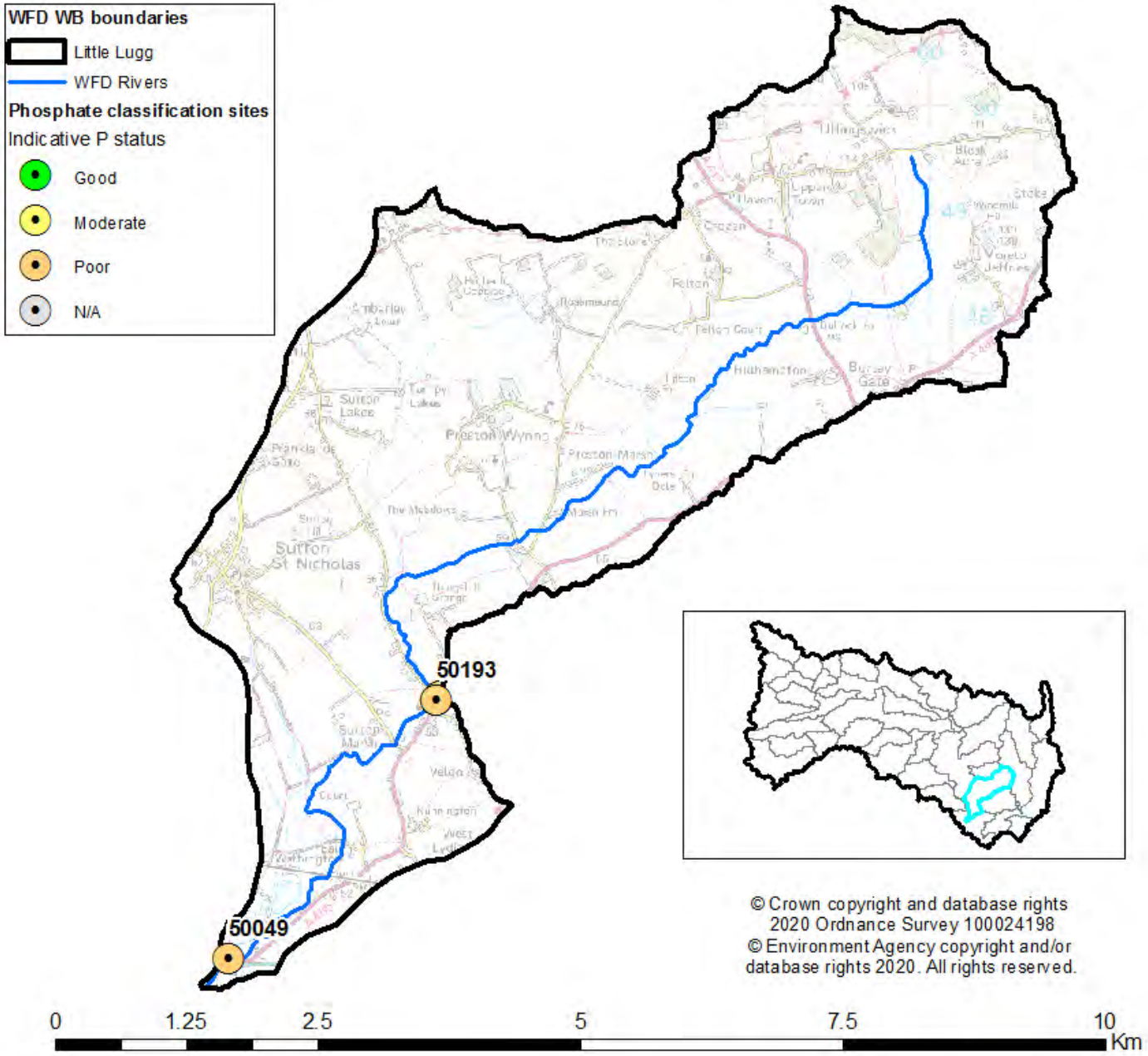
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 1.267



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.267

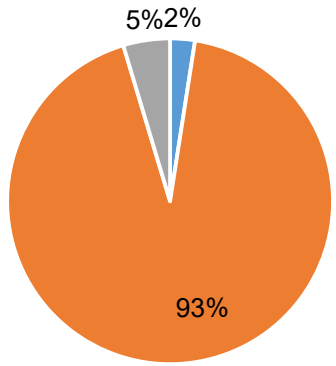


GB109055036720: Little Lugg - source to conf R Lugg

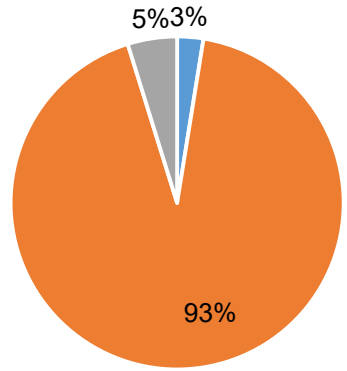


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50193	Poor: 0.237	36	Poor: 0.210	13	0.085
50049	Poor: 0.264	12	Poor: 0.346	10	0.087

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 6.872



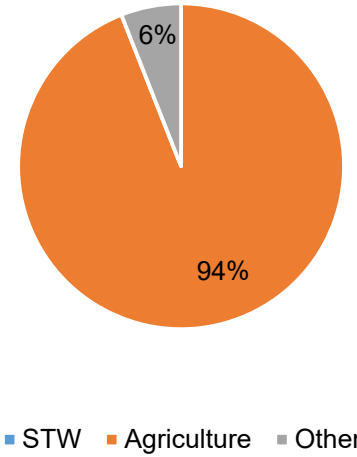
Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 6.649



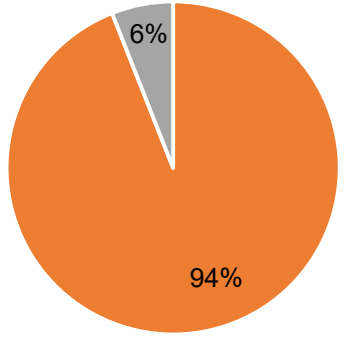
GB109055036740: Bodenham Bk - source to conf R Lugg

Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50195	Moderate: 0.184	12	Poor: 0.388	5	0.083

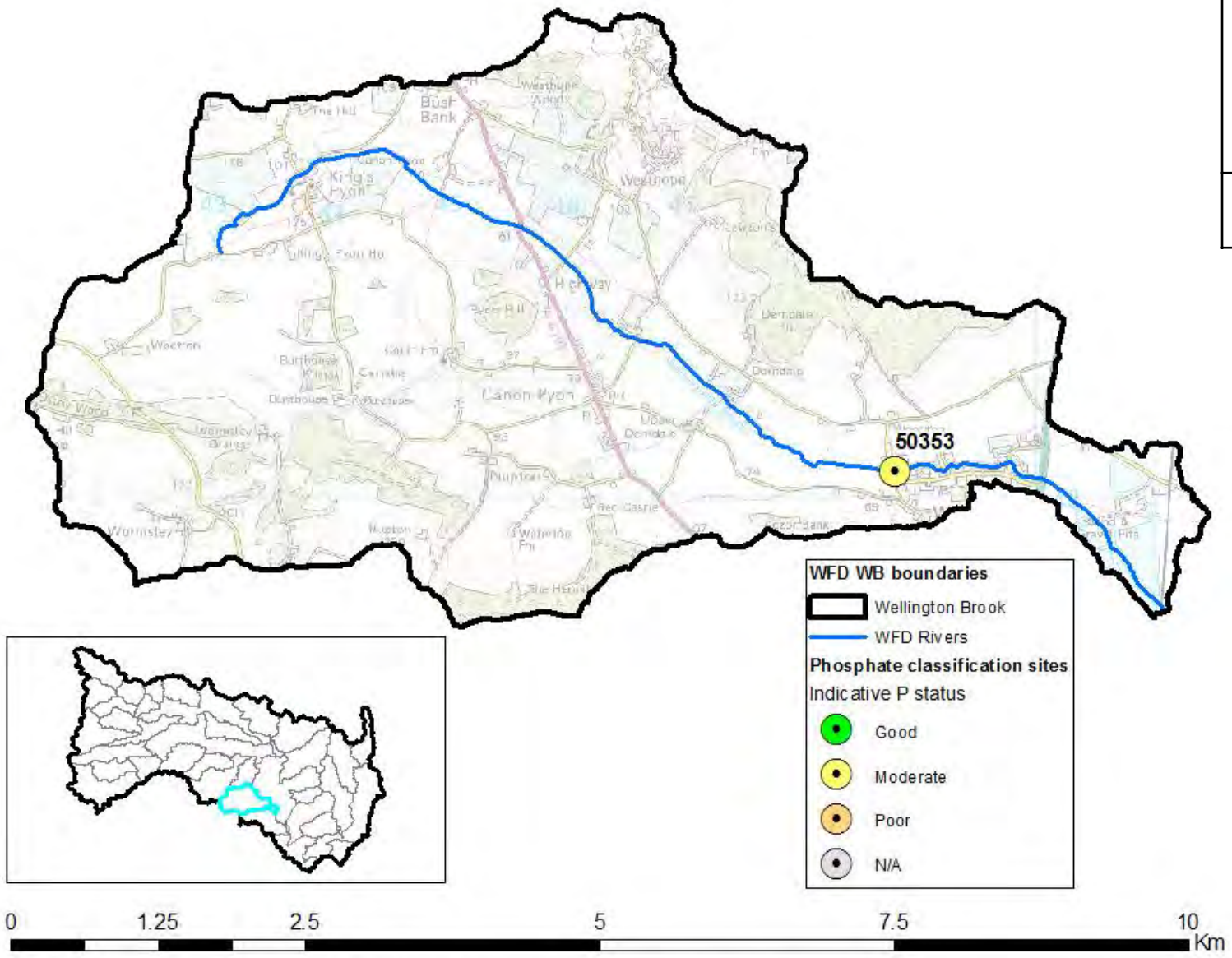
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 6.872



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 6.649

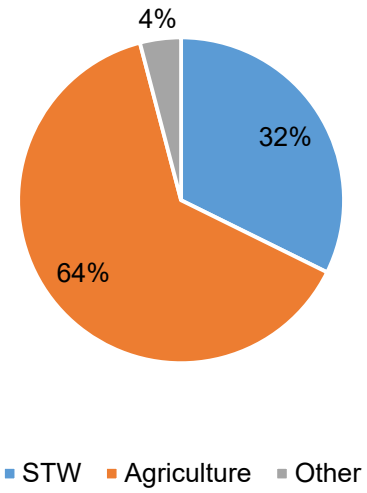


GB109055036750: Wellington Bk - source to conf R Lugg

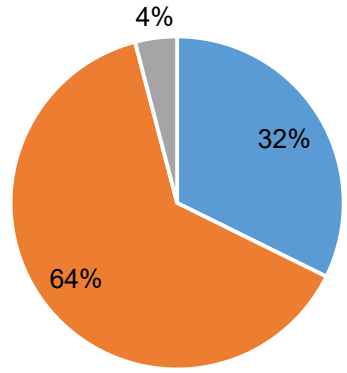


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50353	Moderate: 0.097	11	Moderate: 0.090	6	0.083

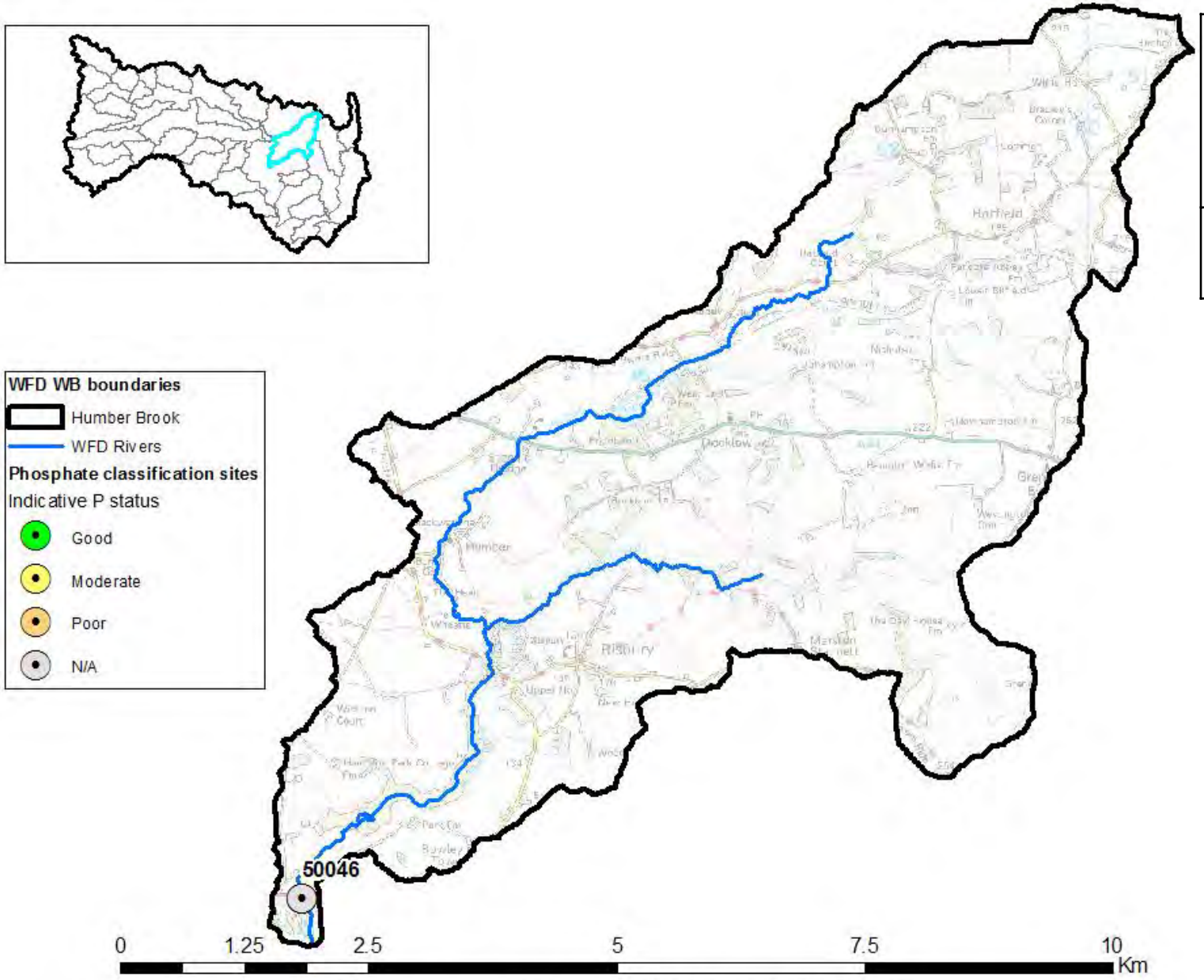
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 0.701



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 0.701

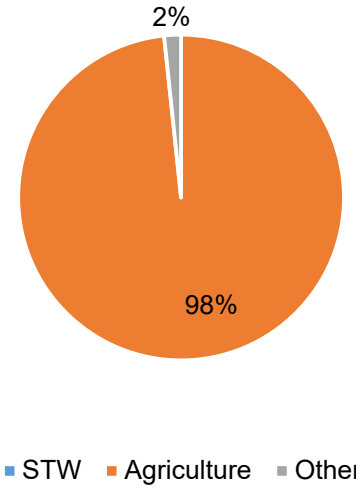


GB109055036771: Humber Bk - source to conf R Lugg

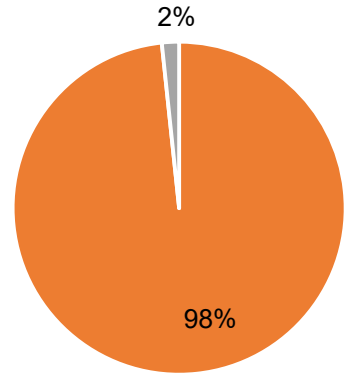


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50046	Moderate: 0.100	12	N/A (last monitored 2016)	N/A	0.081

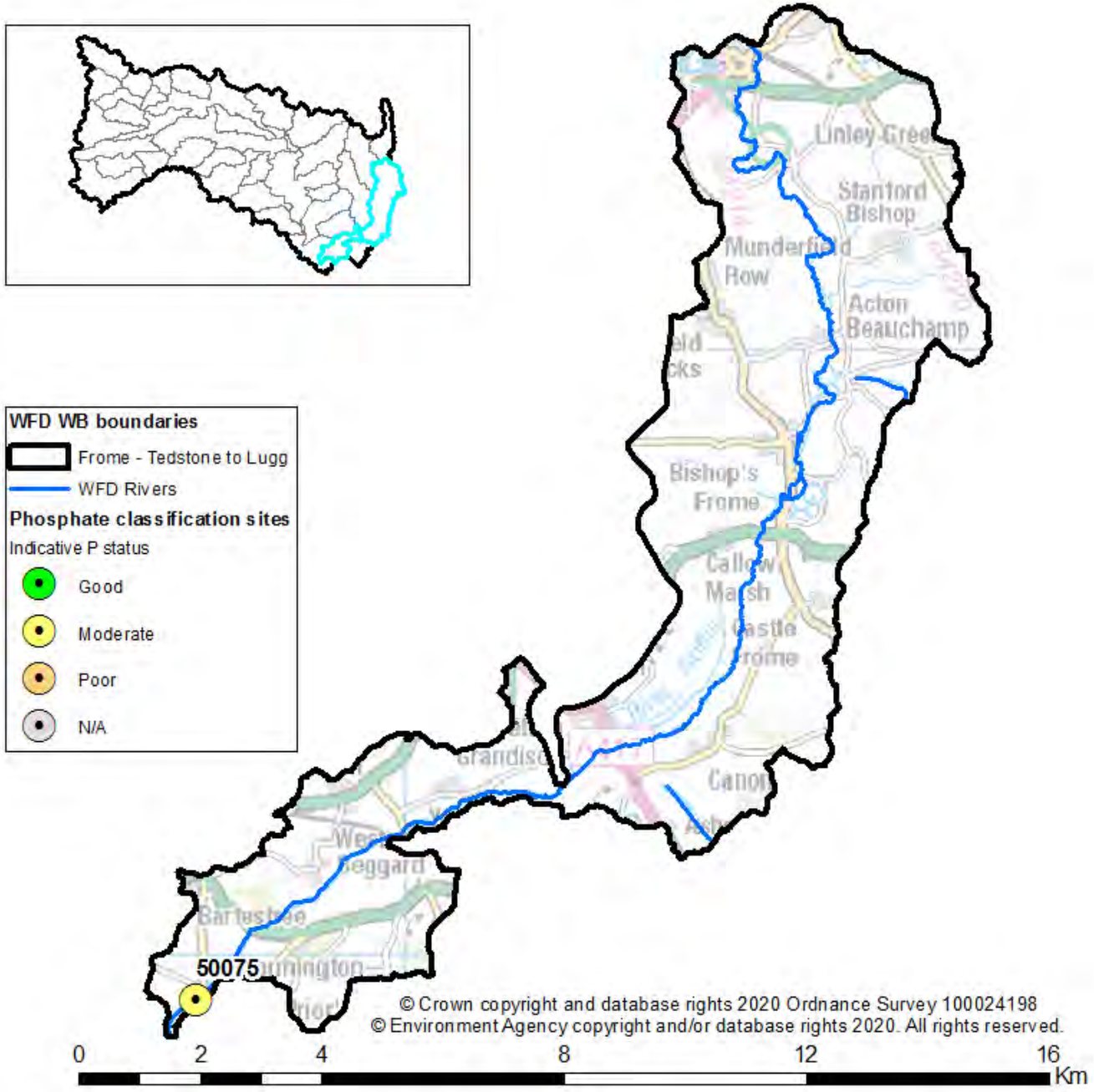
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 0.245



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 0.245

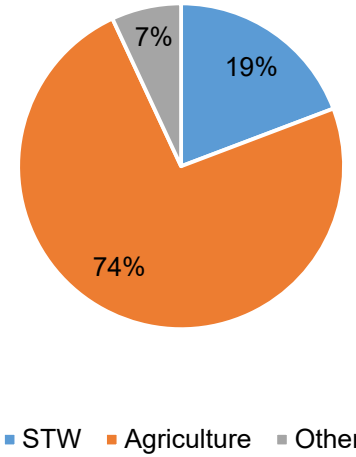


GB109055036780: Frome - conf Tedstone Bk to conf R Lugg

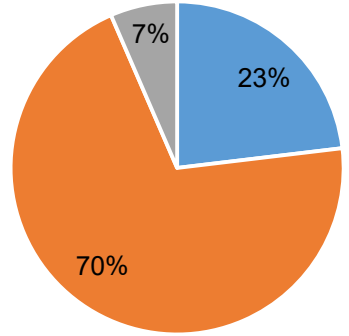


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50075	Moderate: 0.165	12	Moderate: 0.186	10	0.086

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 15.992

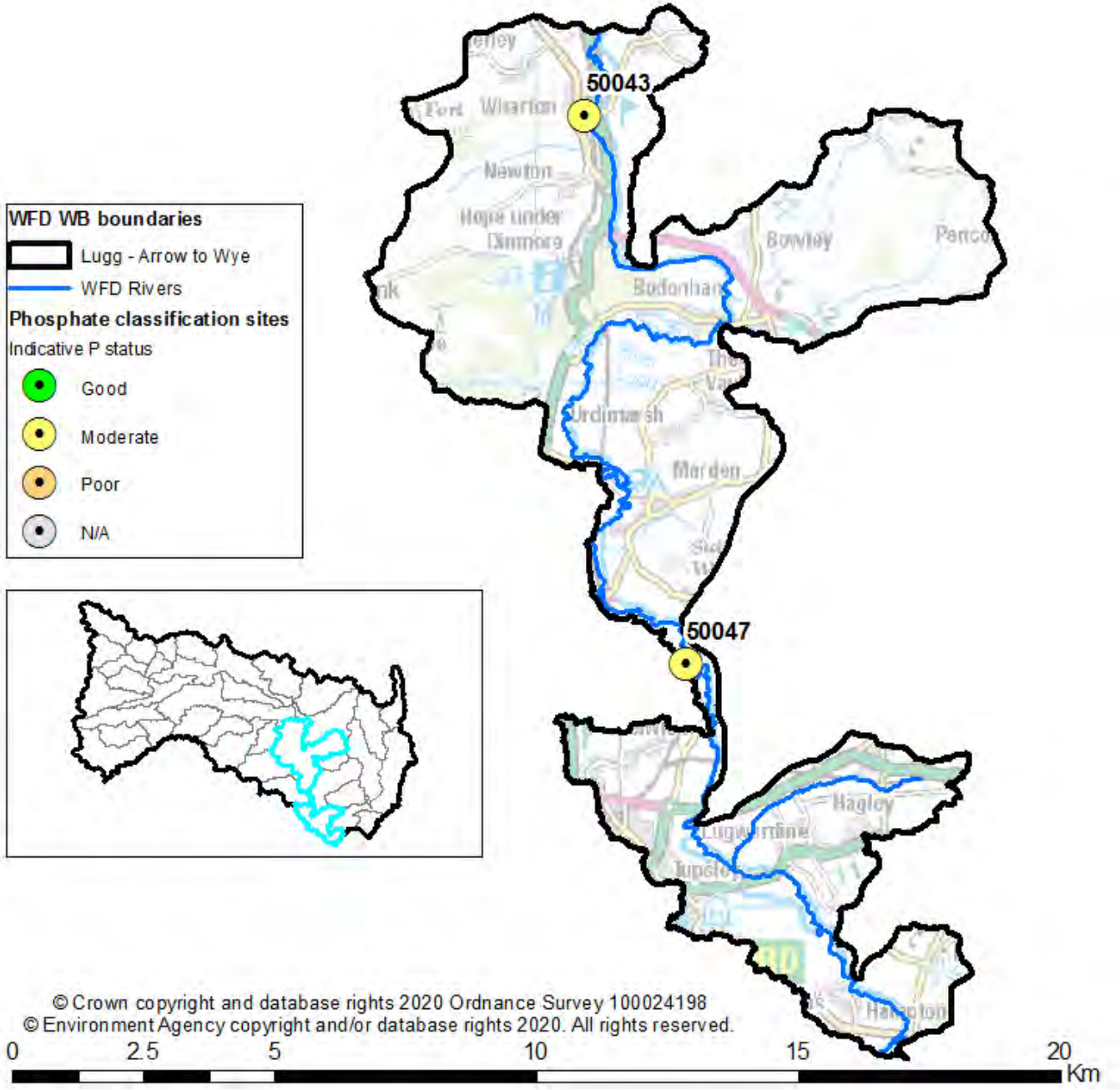


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 16.990



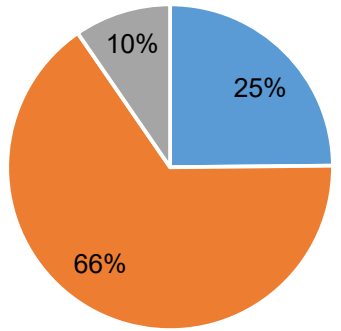
STW Agriculture Other

GB109055036790: Lugg - conf R Arrow to conf R Wye

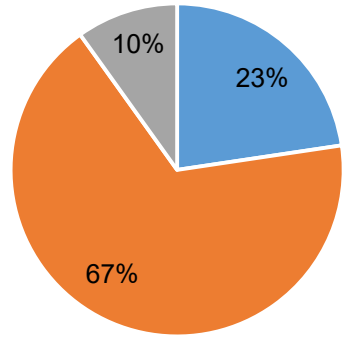


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50043	Good: 0.049	27	0.073	11	0.070
50047	Good: 0.051	27	0.122	8	0.074

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 15.992

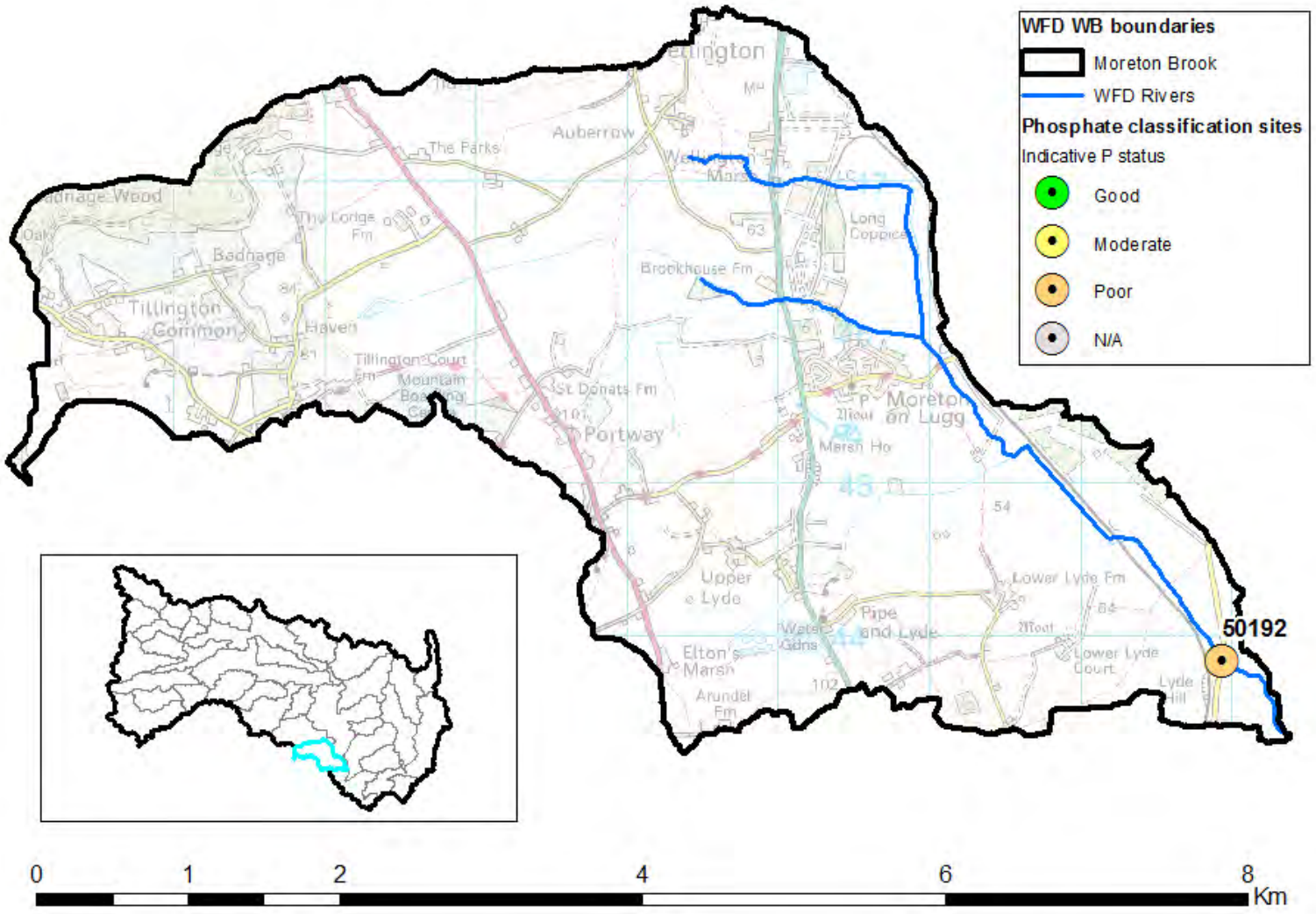


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 16.990



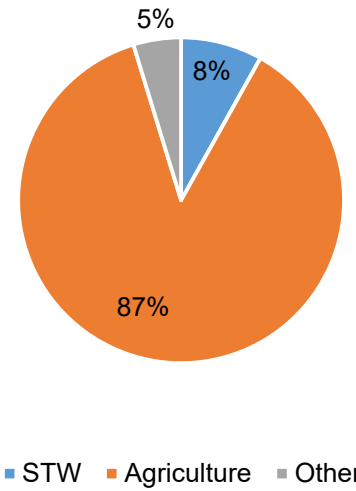
STW ■ Agriculture ■ Other

GB109055037180: Moreton Bk - source to conf R Lugg

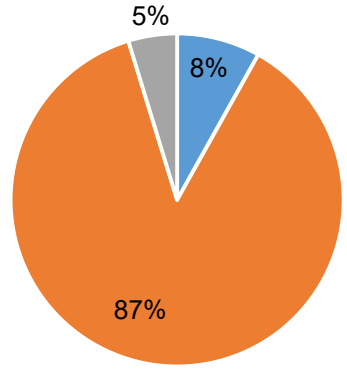


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50192	Moderate: 0.156	34	Poor: 0.241	9	0.084

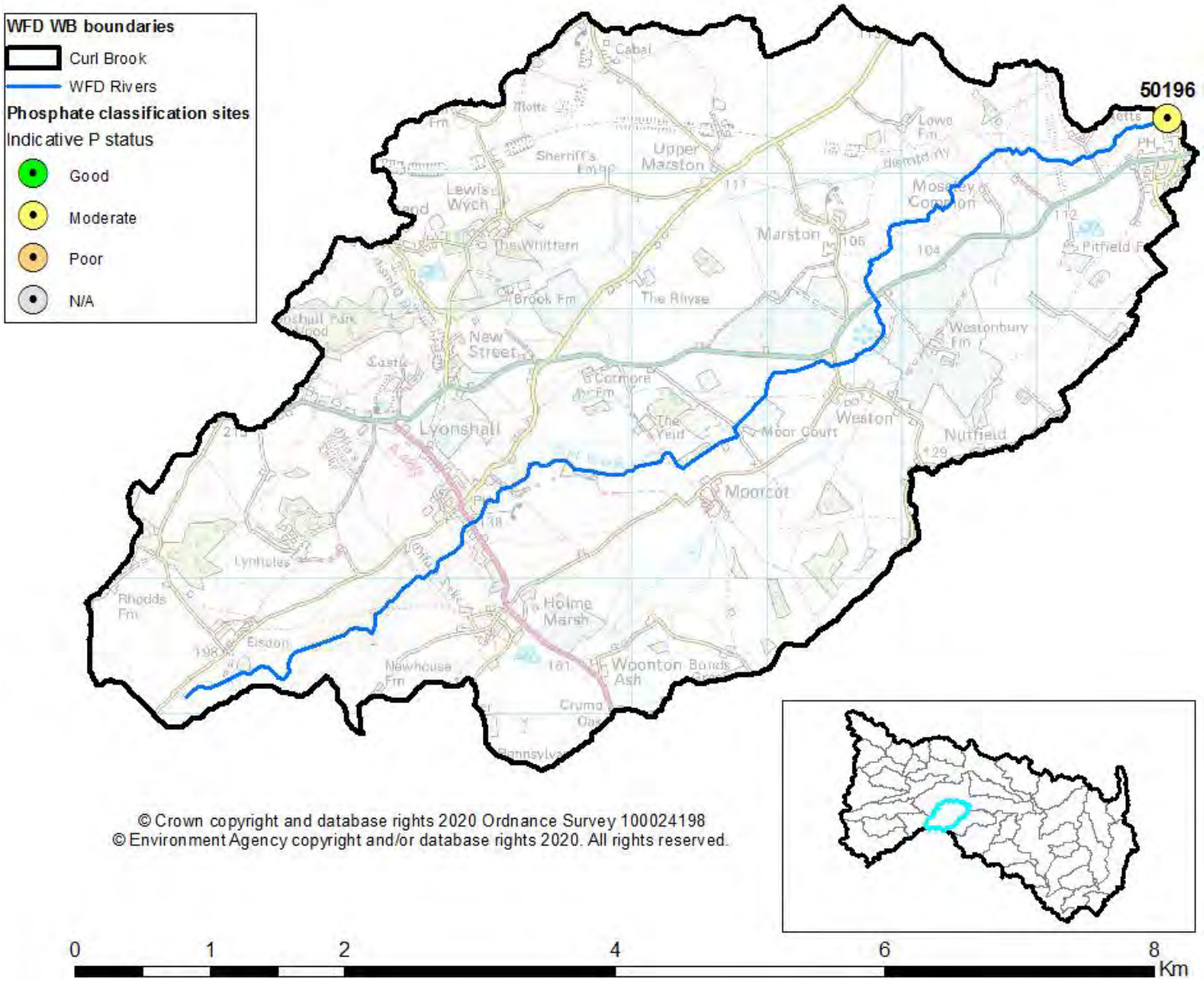
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 1.196



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.196

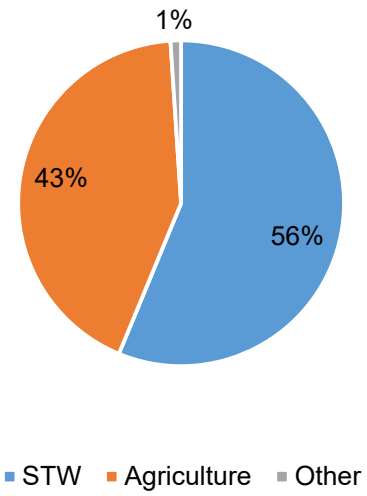


GB109055041820: Curl Bk - source to conf R Arrow

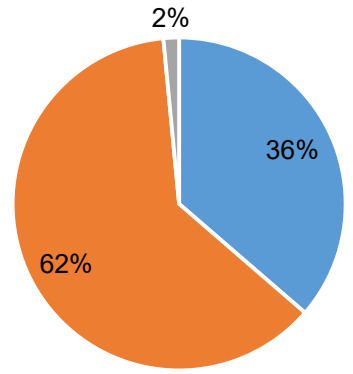


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50196	Moderate: 0.085	36	Moderate: 0.072	13	0.067

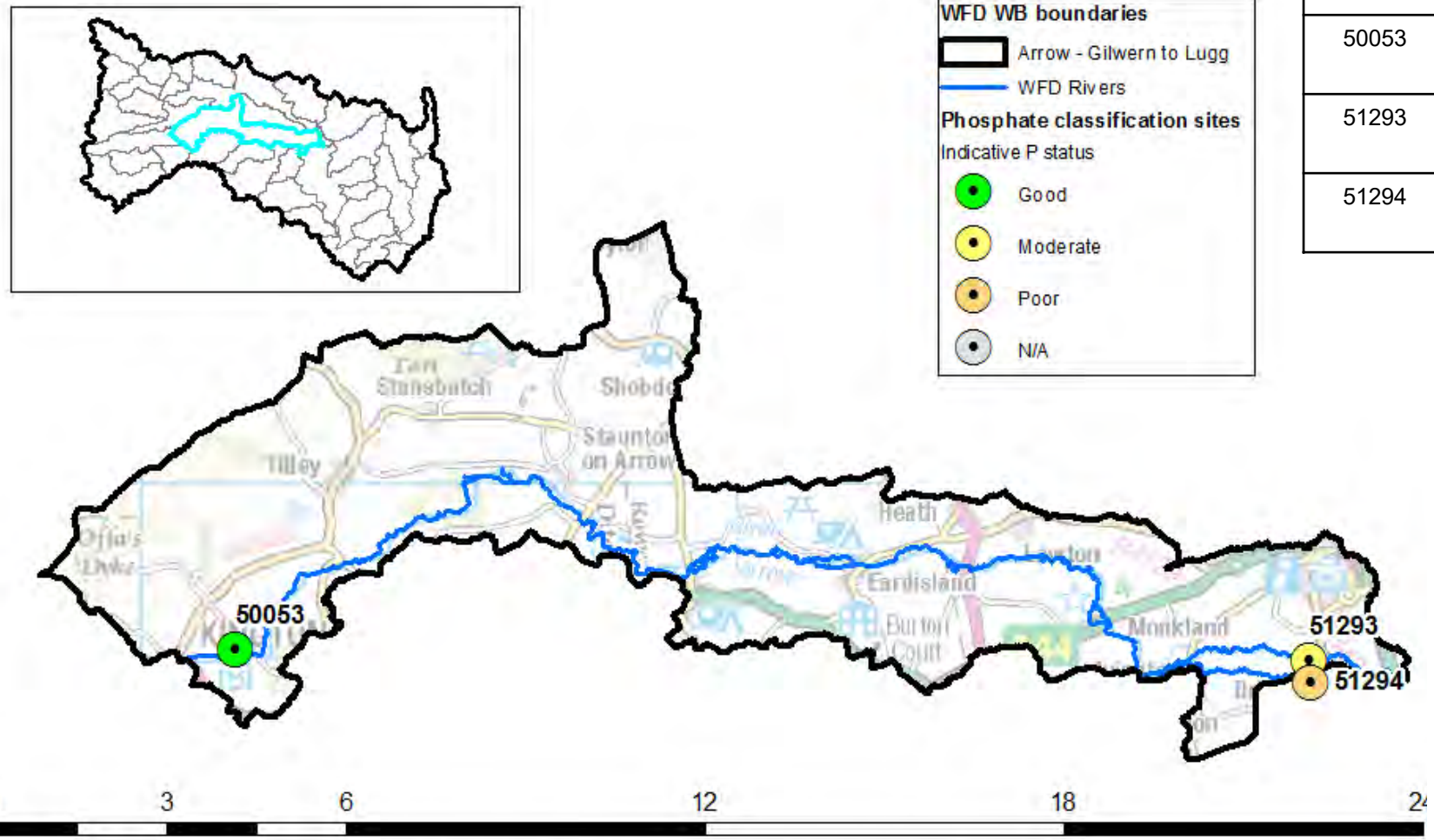
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 1.857



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.277

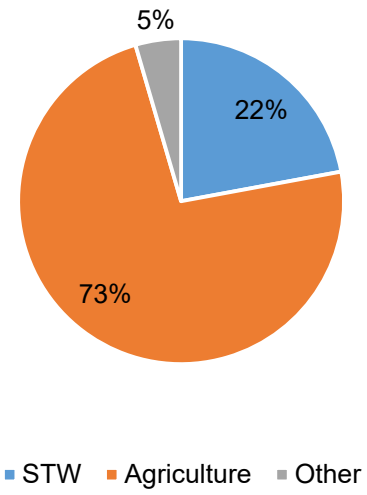


GB109055041840: Arrow - conf Gilwern Bk to conf R Lugg

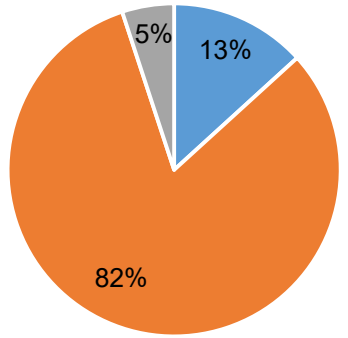


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50053	Good: 0.025	12	Good: 0.038	7	0.045
51293	Good: 0.061	12	Moderate: 0.086	10	0.067
51294	Moderate: 0.076	38	Poor: 0.195	12	0.067

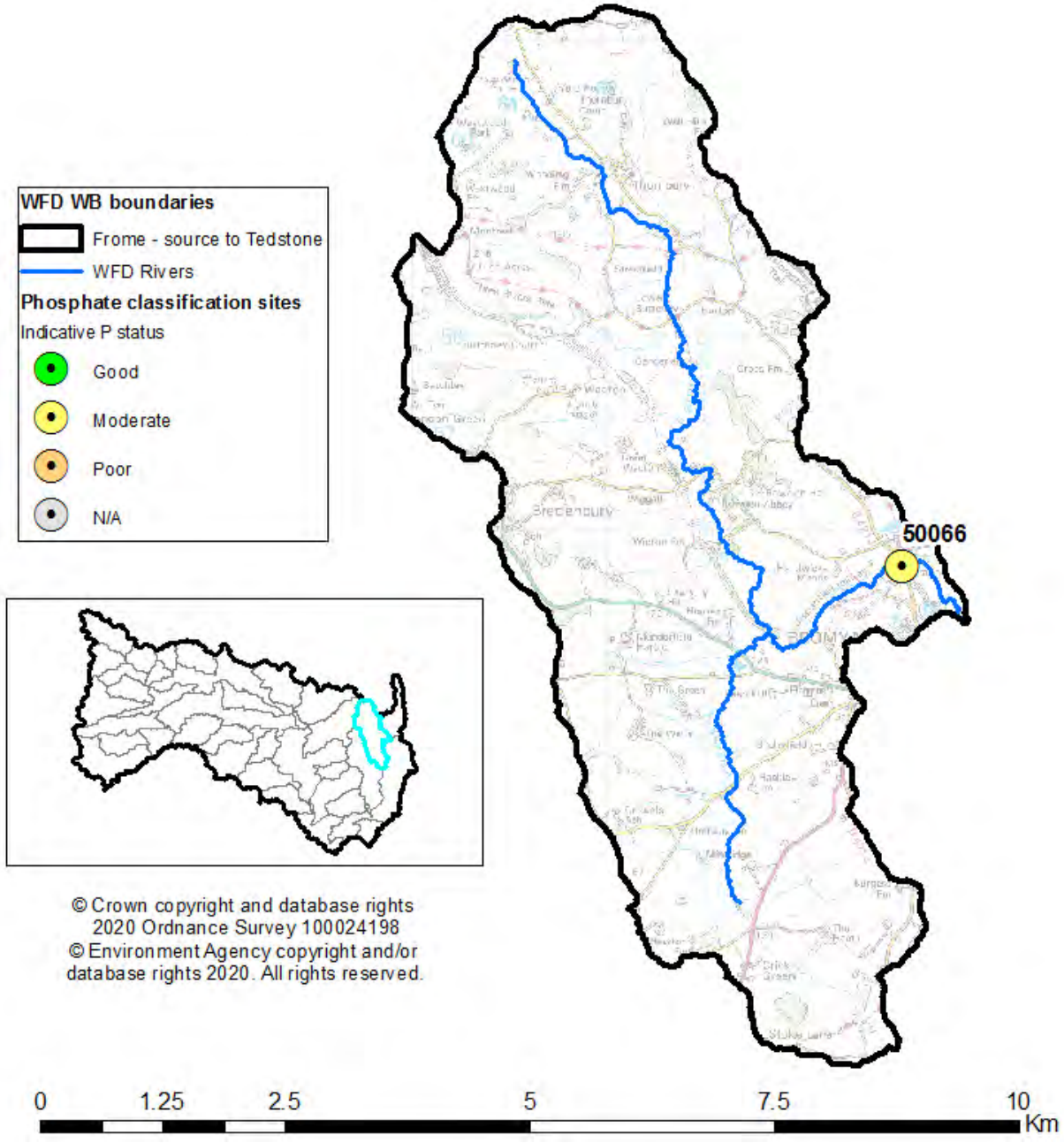
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 23.896



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 21.44

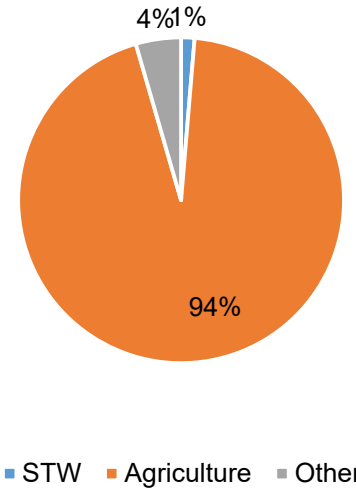


GB109055041850: Frome - source to conf Tedstone Bk

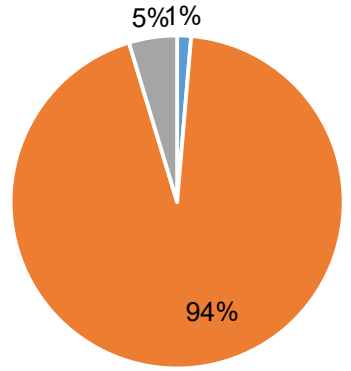


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50066	Moderate: 0.156	36	Moderate: 0.125	8	0.070

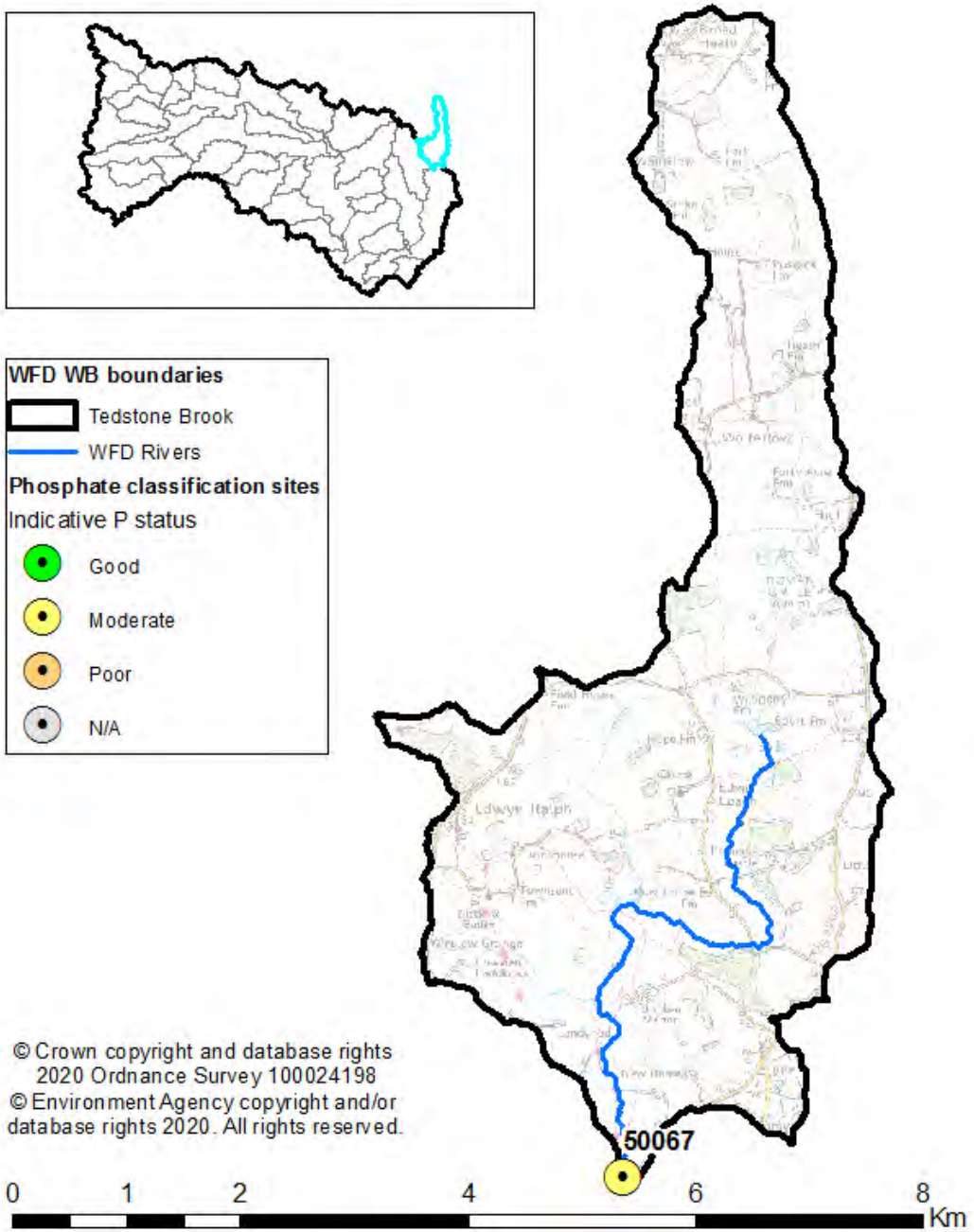
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 5.831



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 5.745

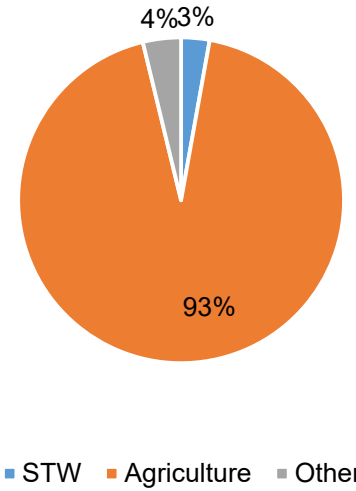


GB109055041860: Tedstone Bk - source to conf R Frome

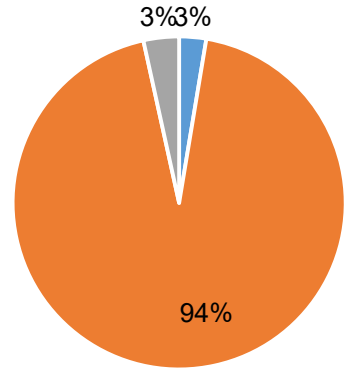


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50067	0.125	37	0.090	8	0.071

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.144

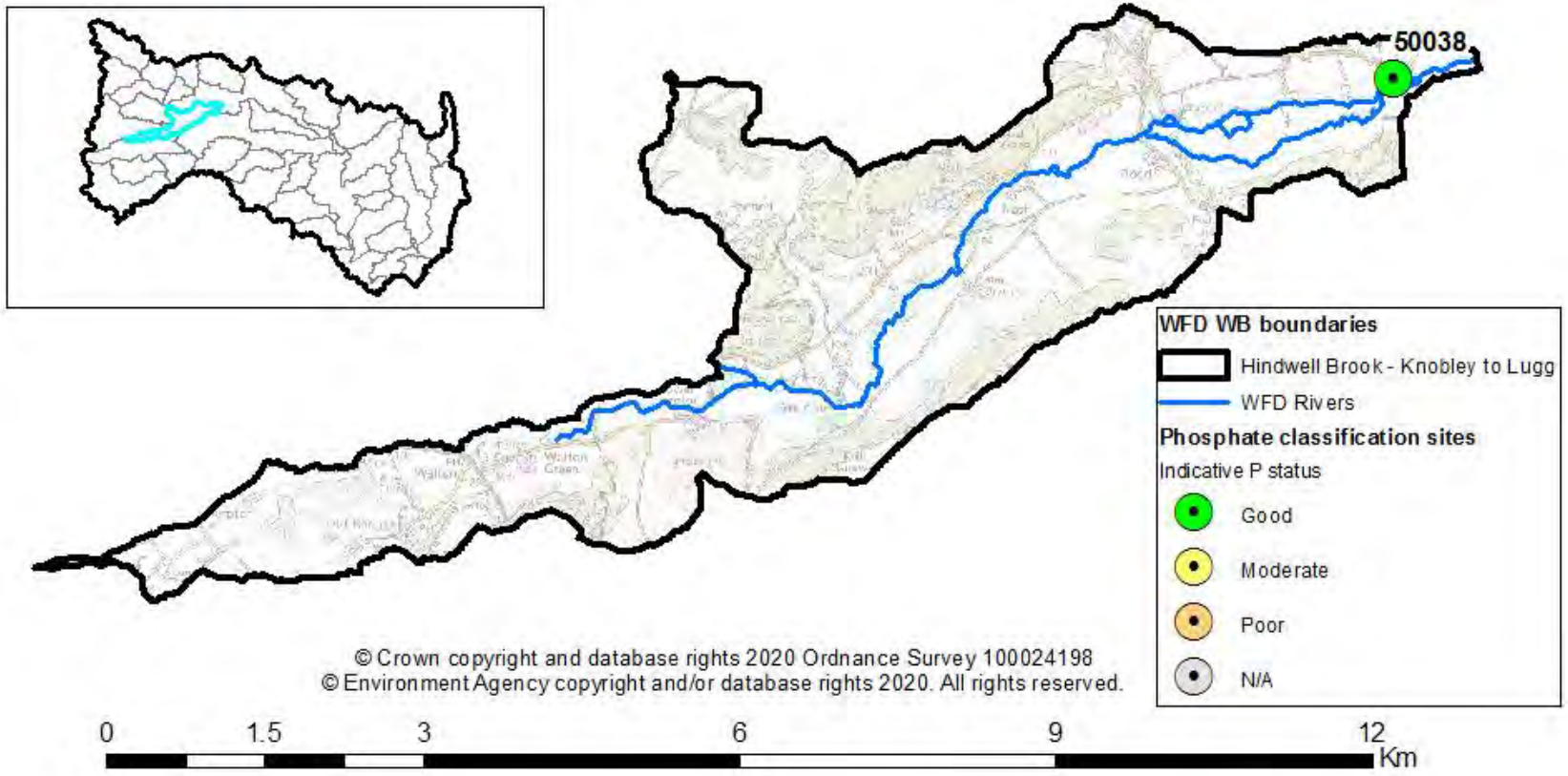


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.304

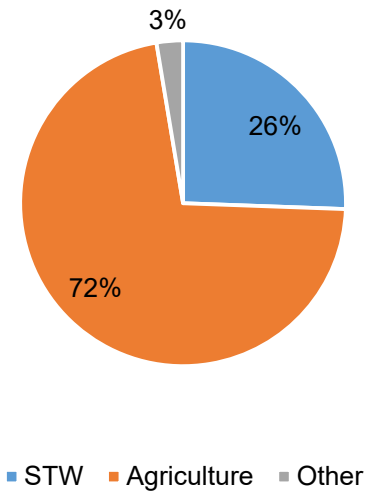


GB109055041930: Hindwell Bk - conf Knobley Bk to conf R Lugg

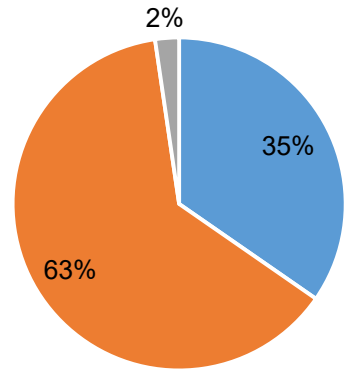
Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50038	Good: 0.035	12	Good: 0.045	7	0.053



SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.042

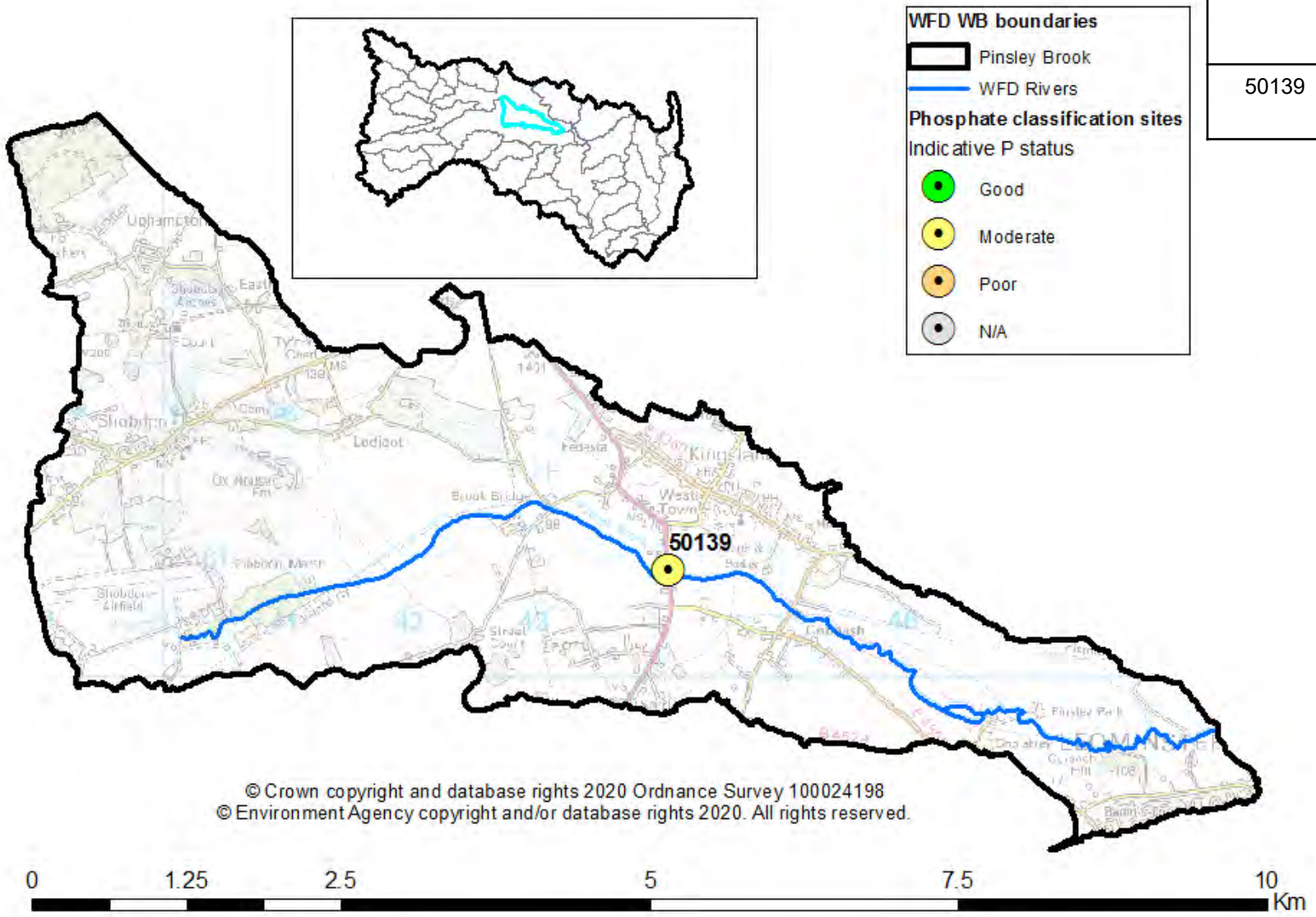


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.305

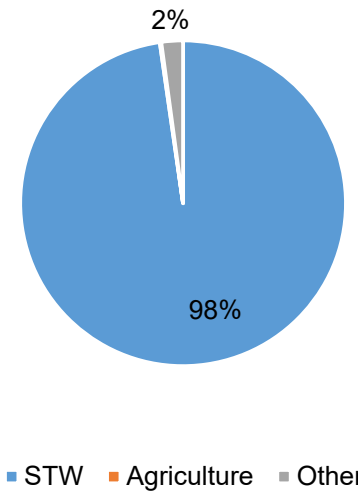


GB109055041940: Pinsley Bk - source to conf R Lugg

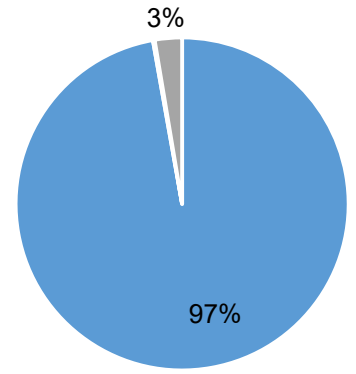
Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50139	Moderate: 0.130	37	Moderate: 0.110	11	0.069



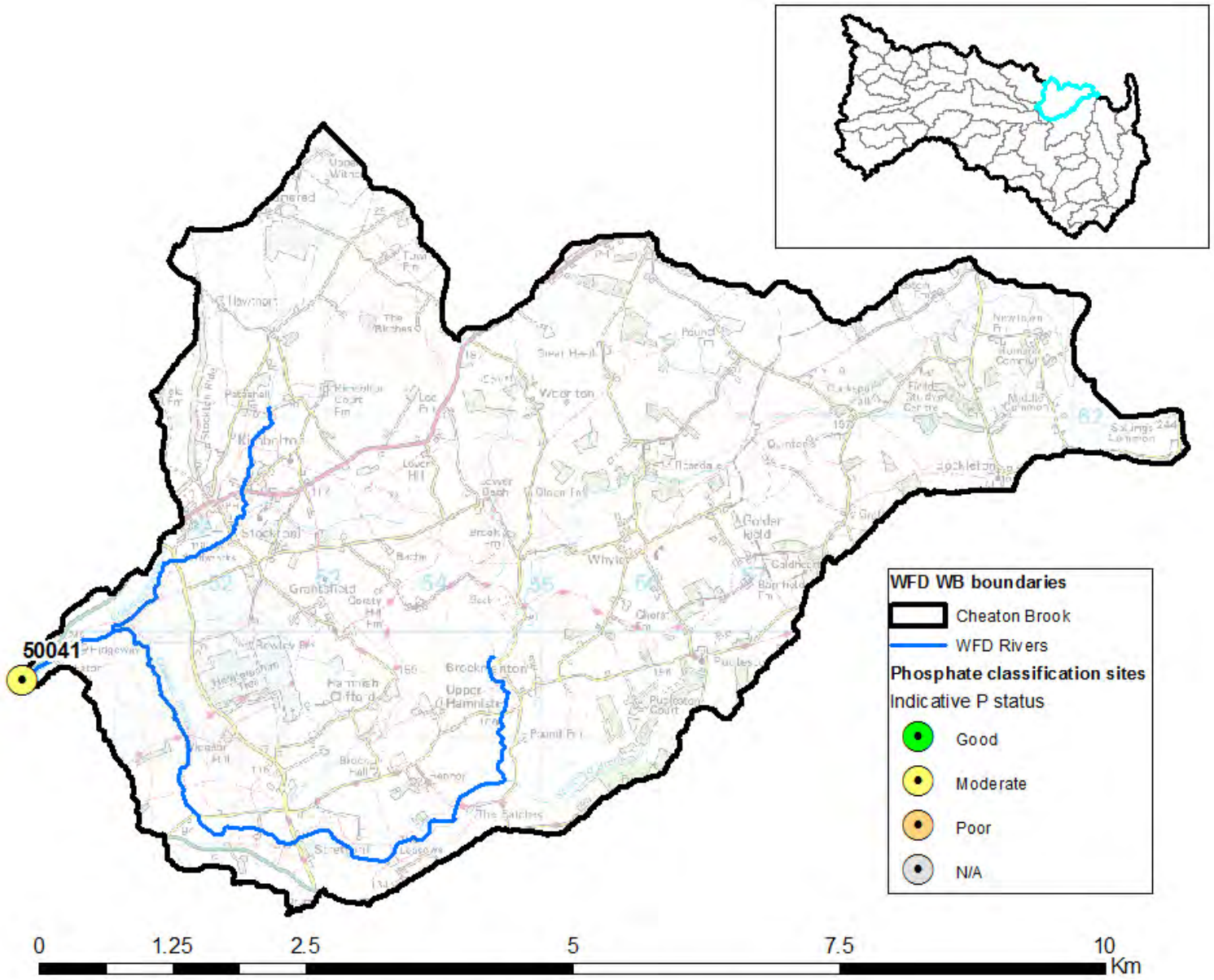
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.816



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.289

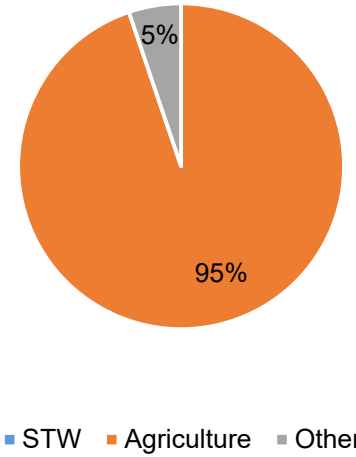


GB109055041950: Cheaton Bk - source to conf R Lugg

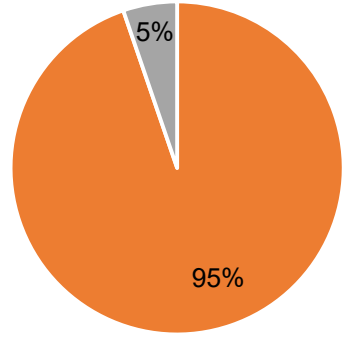


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50041	Good: 0.057	12	Moderate: 0.123	10	0.081

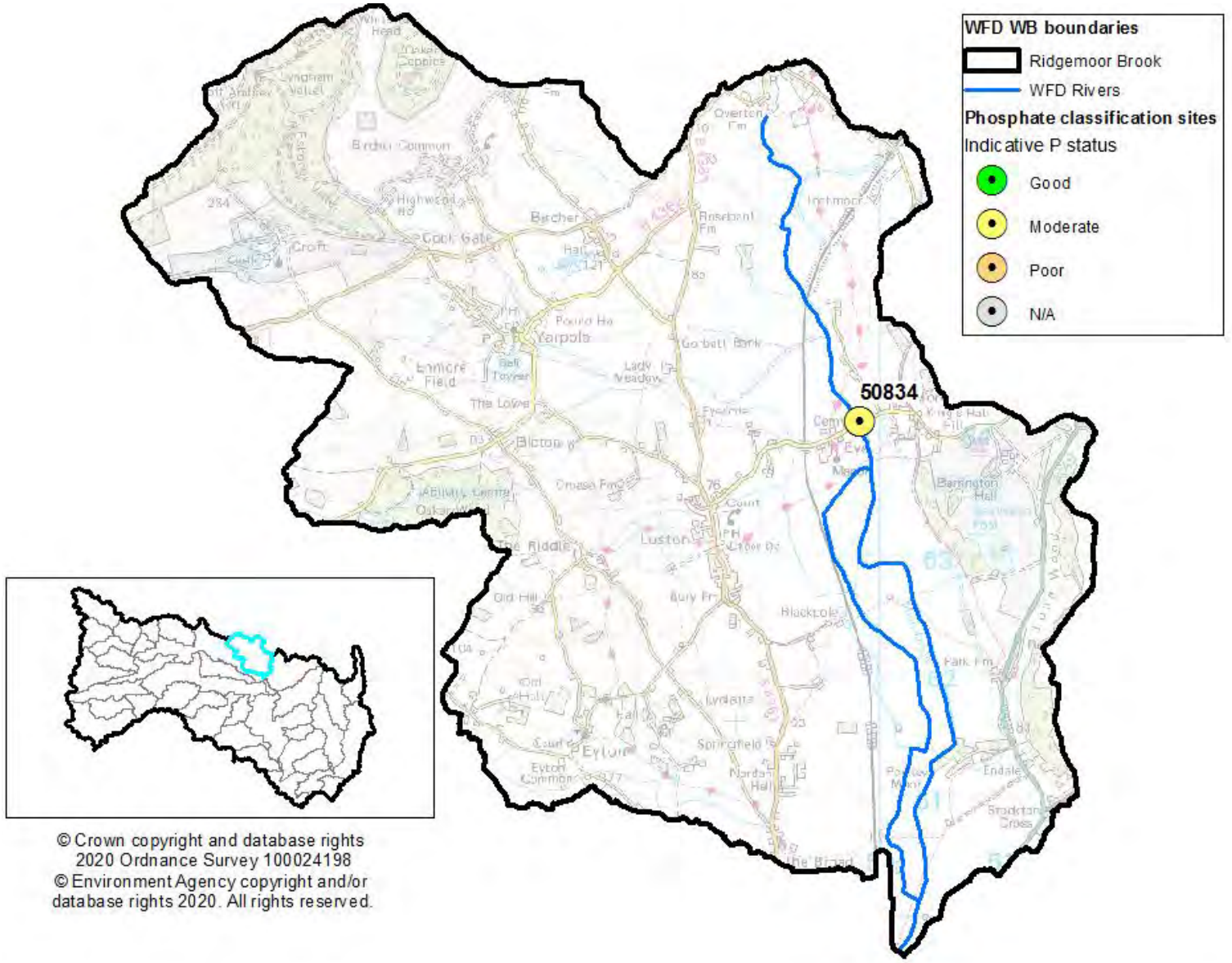
SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.289



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.266

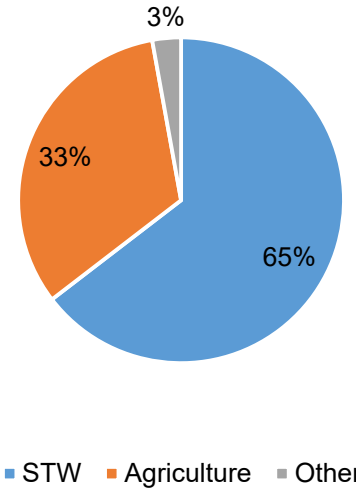


GB109055042000: Ridgemoor Bk - source to conf R Lugg

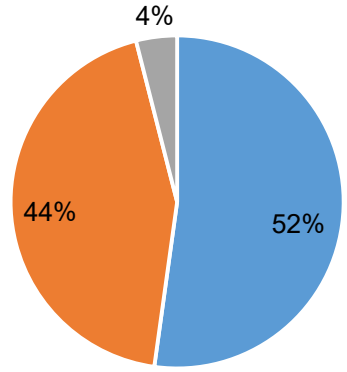


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50834	Moderate: 0.081	12	Moderate: 0.082	10	0.075

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 1.593

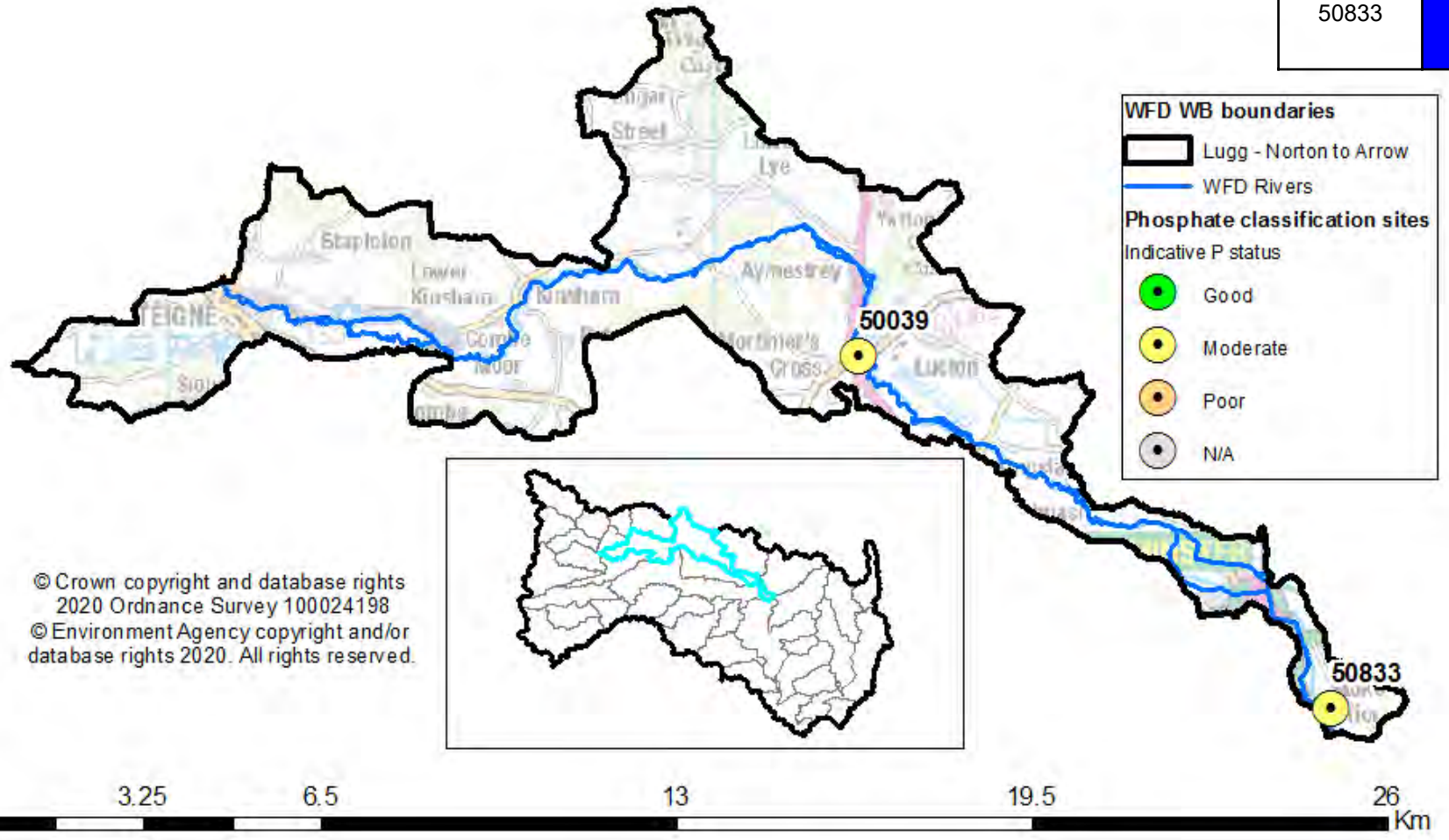


Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 1.137

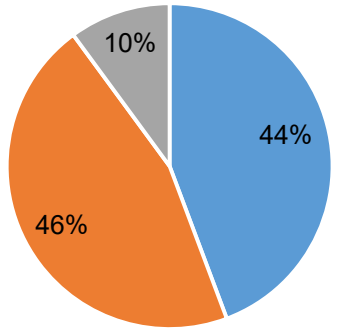


GB109055042030: Lugg - conf Norton Bk to conf R Arrow

Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50039	Good: 0.049	12	Moderate: 0.072	18	0.058
50833	High: 0.037	36	Moderate: 0.087	7	0.07

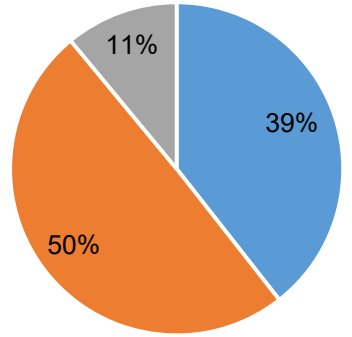


SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 19.198

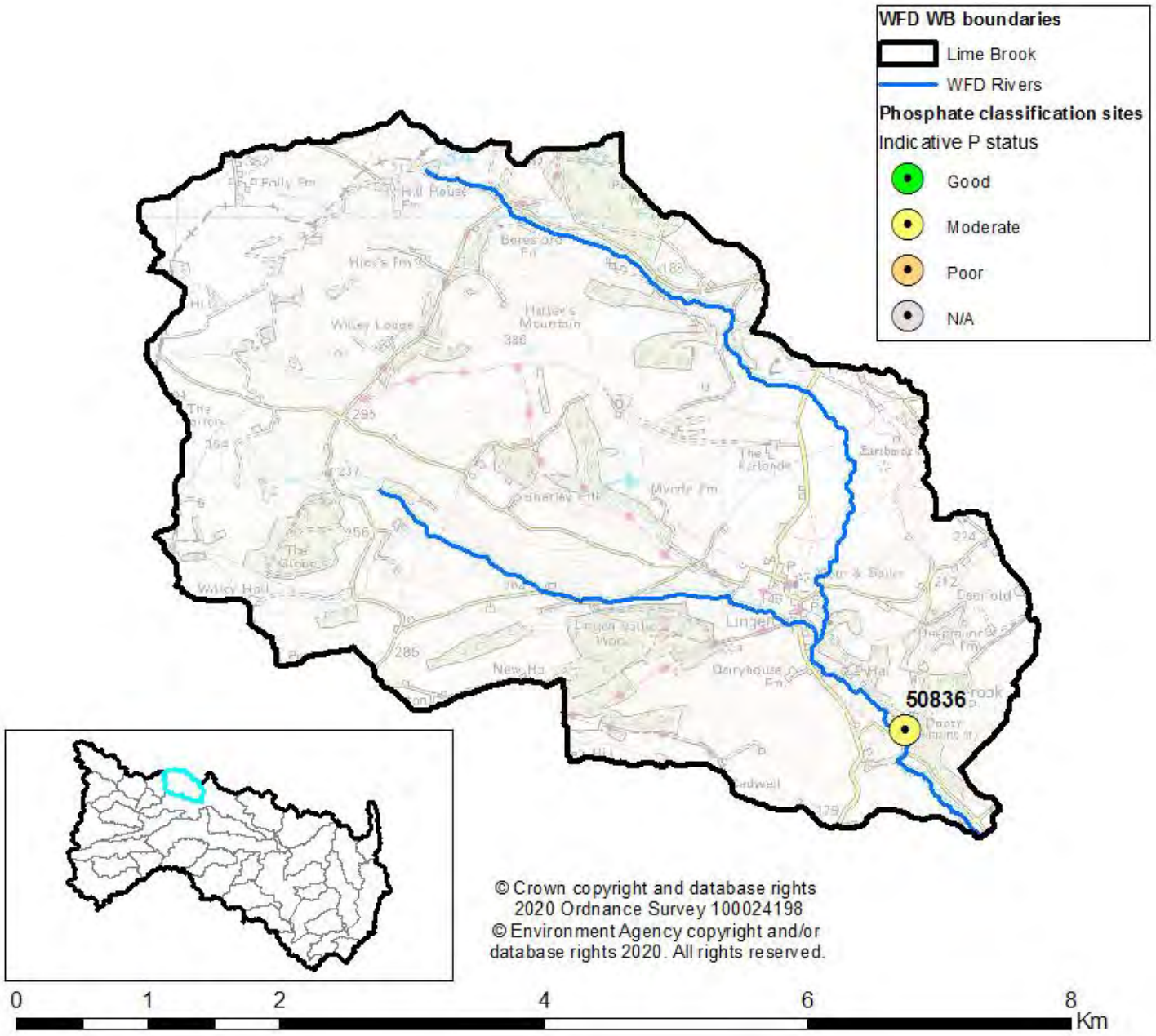


STW ■ Agriculture ■ Other

Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 17.598

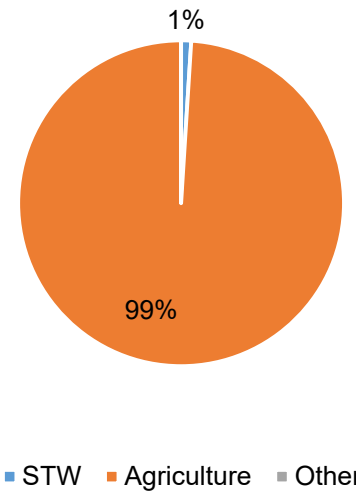


GB109055042060: Lime Bk - source to conf R Lugg

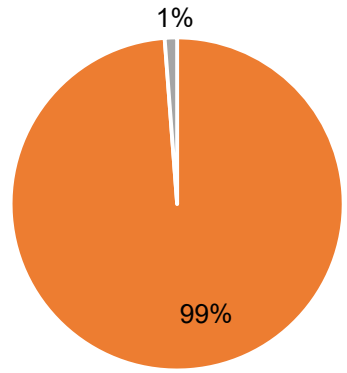


Site ID	WFD 2016 status		2017-19 indicative P status		Good/Moderate boundary
	Status & mean P	No. of samples	Status & mean P	No. of samples	
50836	Good: 0.044	12	Moderate: 0.071	4	0.05

SAGIS Phosphate source contribution predictions for current conditions
Total P Kg/Day: 2.090



Source contribution predictions for PR19 at permitted limits
Total P Kg/day: 2.098



Environment Agency- Gap analysis of the Wye/Lugg SAC Phosphate Monitoring in relation to the Nutrient Management Plan and SAC Conservation targets.

June 2020

Key headlines:

- The analysis has shown that there are very few sites that have a statistically significant change in the site mean over the past ten years.
- The Environment Agency monitoring programme is suitable to enable the assessment of the Wye SAC. Moving forwards work needs to be undertaken to ensure there is a flexible programme of monitoring for the NMP and SAC.
- However, at some sites where a change has been detected, the large number of less than values in the data does not allow a determination, with enough certainty, that there is a real change in the orthophosphate values over time.
- More work is required to ensure that the evidence data set is targeted and monitoring resource is directed to areas of highest priority. Going forward, a large network of chemistry sampling is unsustainable and other techniques will need to be developed for example targeted use of phosphate sondes, remote sensing, rapid algal surveys. This will need to include a more agile monitoring programme that will use all the data sources available from statutory bodies and partner organisations to identify and fill the gaps in evidence needs to be developed.
- In particular, further analysis is required to determine whether there has been a significant step change in the level of orthophosphate at Redbrook and levels in the Welsh sections of the Wye and the Lugg. We would also like to further investigate why there appears to be an increase in orthophosphate levels between Huntsham Bridge, Symonds Yat and the site at Redbrook.
- We will revisit the programme in light of the analysis undertaken below and provide further direction by the autumn.

Detailed data analysis

Following on from previous work undertaken by Vicki Howden of Natural England and Martin Fenn from the Analysis and Reporting team in the Environment Agency, the latest available orthophosphate data has been examined using the statistical package Aardvark to assess whether there has been a change in orthophosphate levels over a ten year period from 2010 to the beginning of 2020 and the compliance with the three year mean and three year growing season mean in line with the CSMG guidelines to determine compliance with the targets for the SAC.

Table 2 details the results of the Manhattan Cusum plot analysis undertaken to determine the long term trend in orthophosphate values over the past 10 years (2010-2020). There have been very few sites that have a statistically significant change in the site mean over the past ten years. It is therefore not possible to determine with enough certainty that there is a real change in the orthophosphate values over time.

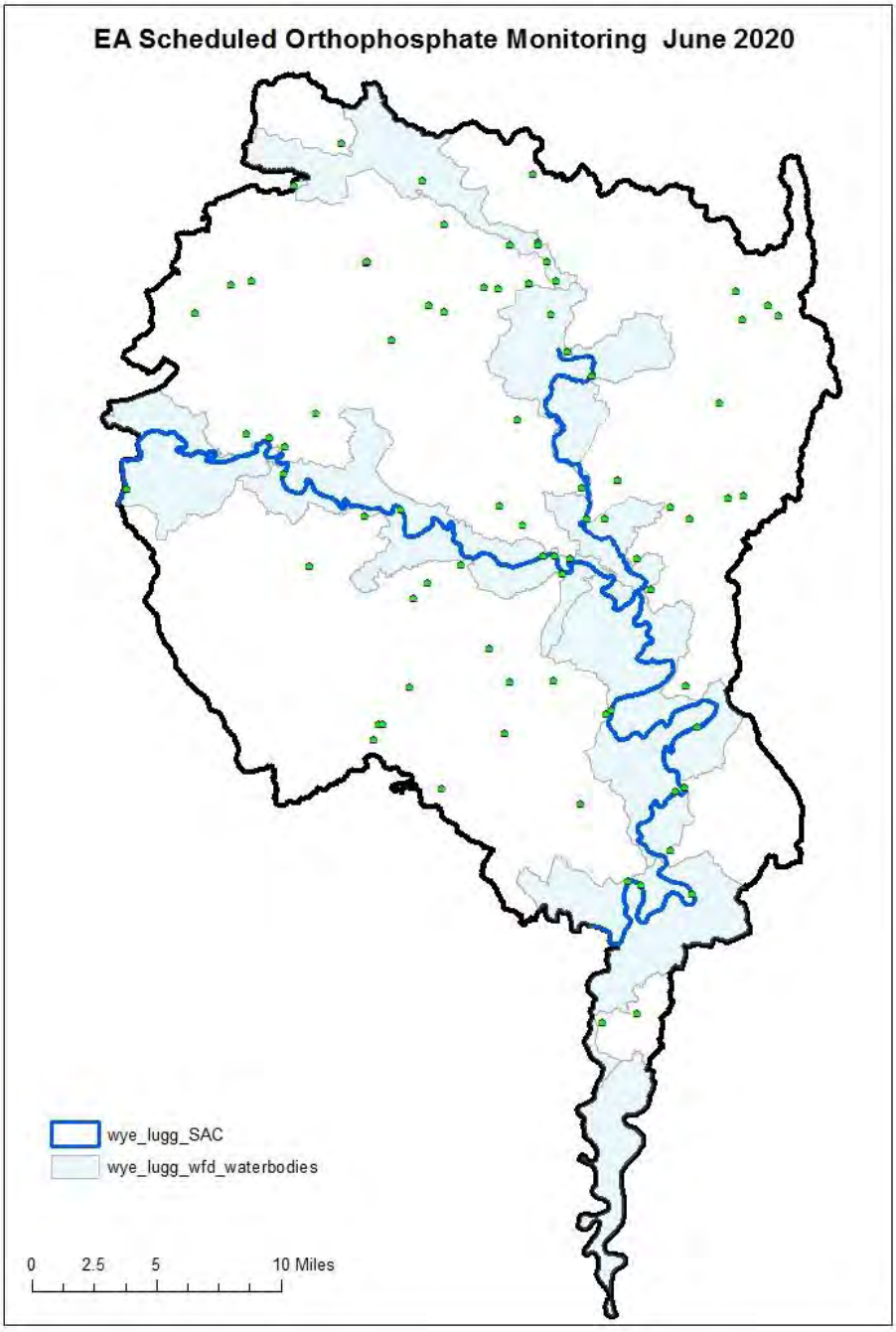
Table 2:

Site id	Sample point name	2010 to 2020 Trend
50021	R WYE AT WHITNEY TOLL BRIDGE	No trend detected - lack of data
50183	RIVER WYE AT BREDWARDINE BRIDGE	No trend detected
50022	R WYE AT BRIDGE SOLLARS BRIDGE	No trend detected
50023	R WYE AT VICTORIA BRIDGE, HEREFORD	No trend detected
50024	R WYE AT CARROTS POOL	Increase - large number of < values
50807	R WYE HOLME LACY BRIDGE	Increase - large number of < values but also step change
50026	R WYE AT HOARWITHY BRIDGE	No trend detected
50810	R WYE HOLE-IN-THE-WALL FOOTBRIDGE	No trend detected
50027	R WYE AT WILTON BRIDGE	Increase at the 5% significance level- large number of < values
50028	R WYE 800M D/S KERNE BRIDGE, GOODRICH	No trend detected
50029	R WYE AT HUNTSHAM BRIDGE, SYMONDS YAT	No trend detected
50039	R LUGG AT MORTIMERS CROSS BRIDGE	No trend detected
50042	R LUGG AT EATON BRIDGE,LEOMINSTER	No trend detected
50043	R LUGG AT FORD BRIDGE	Increase - decrease in frequency of sampling (lack of data).
50047	R LUGG AT WERGINS BRIDGE	Increase - decrease in frequency of sampling (lack of data)
50050	R LUGG AT MORDIFORD BRIDGE	No trend detected

The 3 year orthophosphate means observed on the River Wye are shown in Figure 1 and the 3 year growing season mean in figure 2. The sites are shown in downstream order.

All sites within the West Midlands area are compliant with the SAC conservation targets with the exception of Whitney Toll Bridge.

This site has a limited data set with only 6 samples taken within the 3 year period and 1 sample that has an orthophosphate level nearly 5 times the mean. The growing season mean could not be calculated due to lack of data. The NRW site at Redbrook at the downstream of the West Midlands area, fails compliance with the 3 year mean. Further analysis within the Aardvark package is required to determine whether there has been a significant step change in the level of orthophosphate at this site and further investigation as to why there appears to be an increase in orthophosphate levels between Huntsham Bridge, Symonds Yat and the site at Redbrook.



Map 1 Planned EA Orthophosphate monitoring June 2020

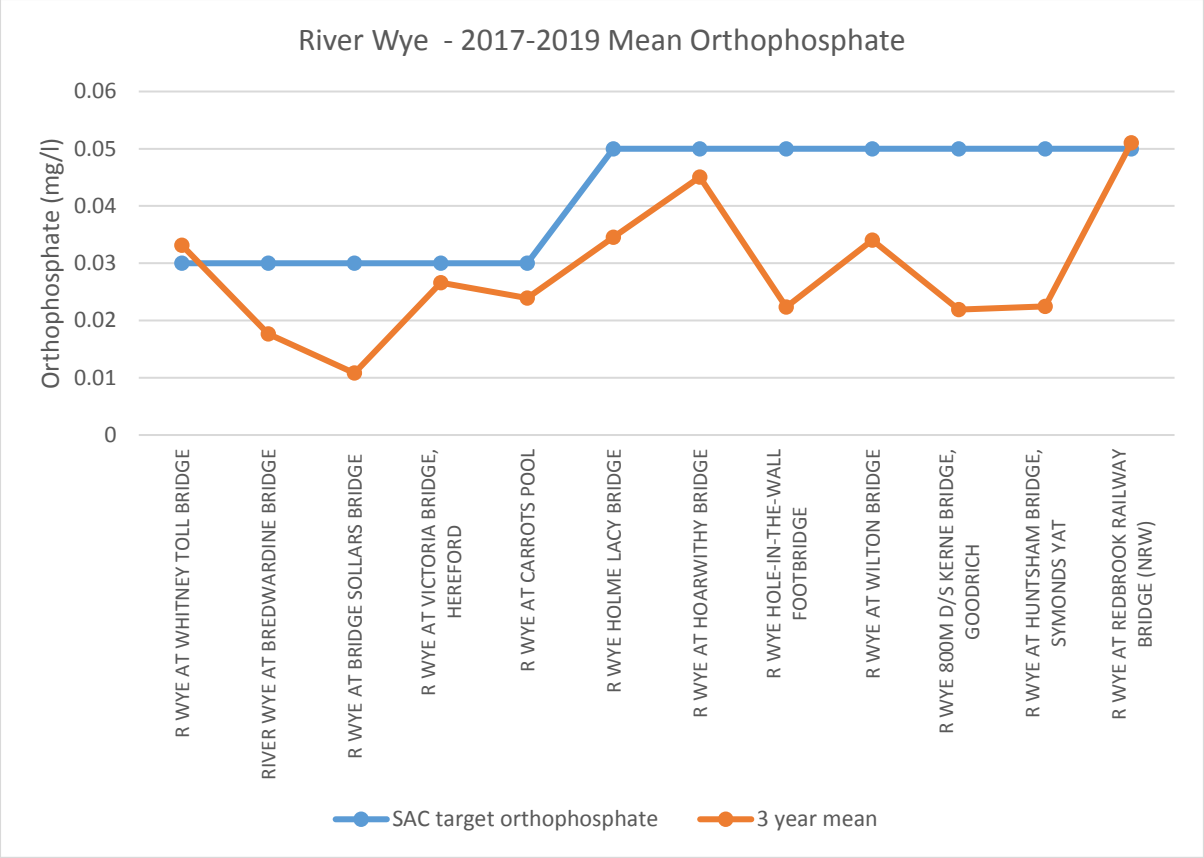


Figure 1: 3 year mean orthophosphate values on the River Wye (in downstream order).

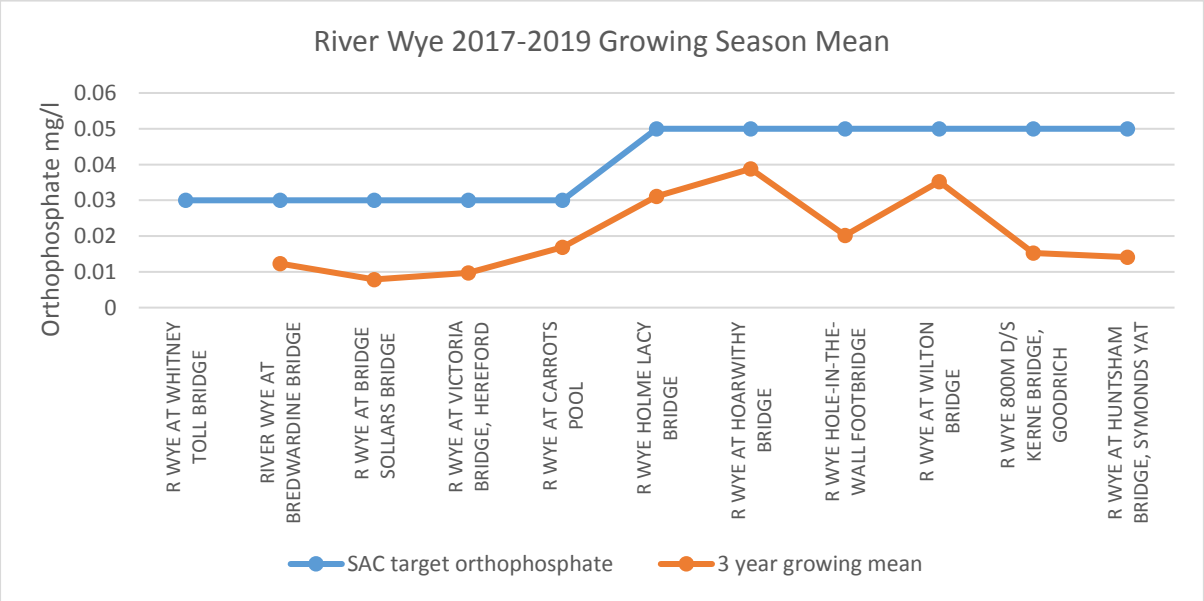


Figure 2. 3 year growing season mean orthophosphate values on the River Wye (in downstream order).

In contrast to the Wye, all the Lugg sites fail to meet the conservation targets.

This can be seen in Figure 3 for the 3 year mean and Figure 4 for the 3 year growing season mean.

The sites at Mortimer's Cross and Ford Bridge are not within the SAC although are designated as SSSI. The Manhattan Cusum plot for Ford Bridge detects a significant increase in orthophosphate data in early 2019 although this is based on very few samples as only quarterly data has been collected since 2015. Data is only available for 2019 at the Eaton site and consequently the growing season mean is not calculated. The Wergins Bridge site does not have a robust dataset available to draw any definite conclusions although the most recent data available from the end of 2019 suggests that the mean orthophosphate values is now close to the SAC target value.

The importance of ensuring that there is a robust data set available in order to determine compliance against the conservation targets in the Lugg catchment is clear and required to improve certainty of status and any trends detected.

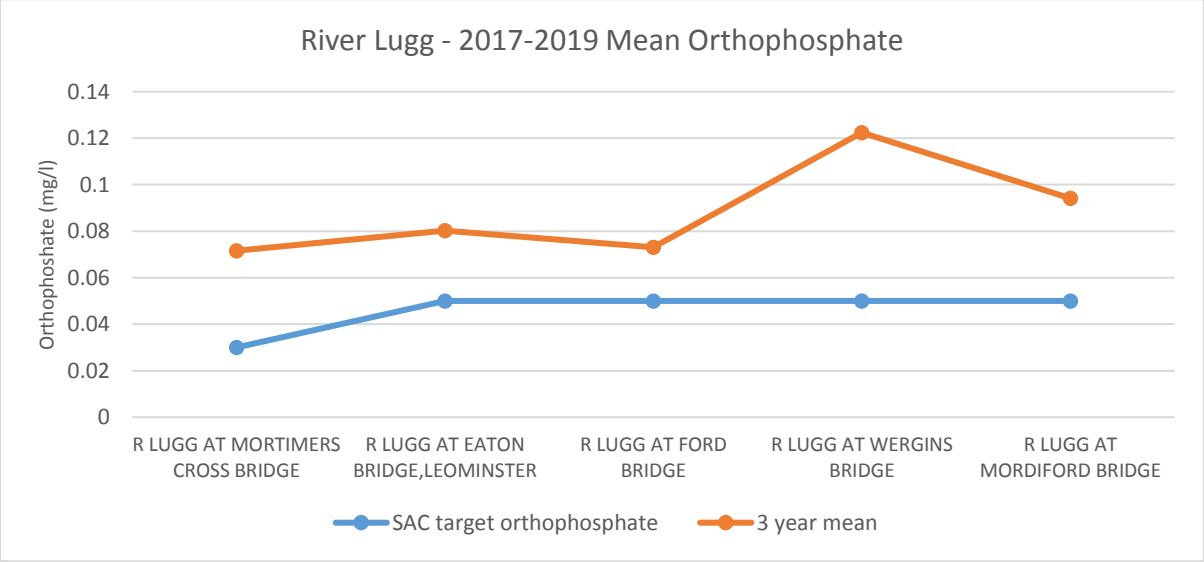


Figure 3. 3 year mean orthophosphate values on the River Lugg (in downstream order).

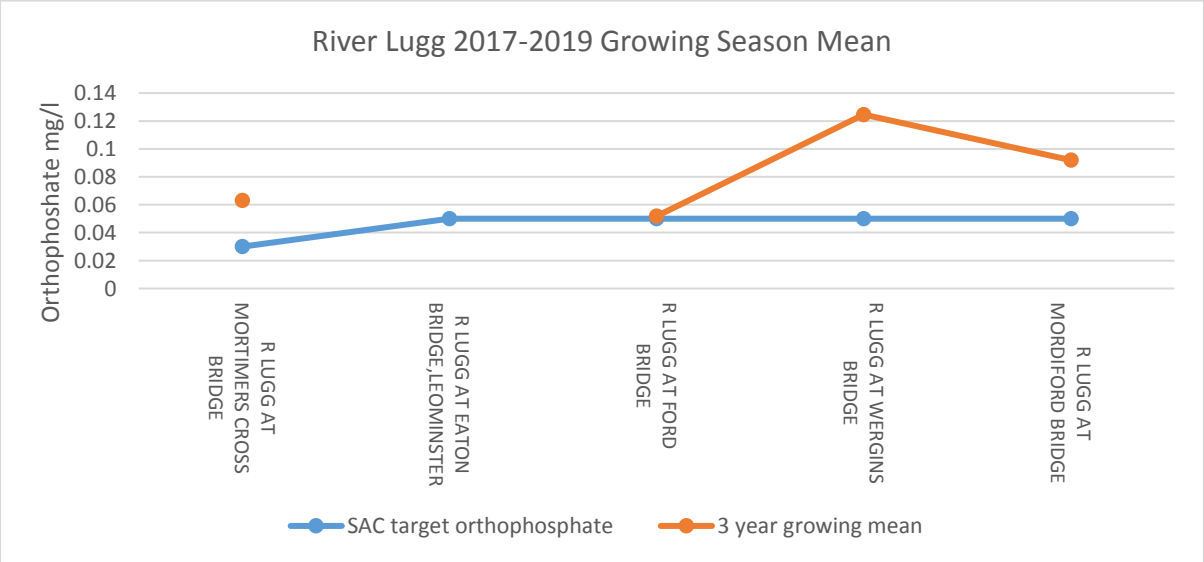


Figure 4. 3 year growing season mean orthophosphate values on the River Lugg (in downstream order).

Additional work has been undertaken to look at orthophosphate data within the wider Lugg WFD waterbodies and further analysis will need to be undertaken before a robust monitoring programme can be developed. The orthophosphate levels in these waterbodies have been assessed against the WFD standards and not the SAC target and are therefore not a like for like comparison but are useful in assessing possible areas of high phosphate loading and worthy of further investigation.

Proposals for future monitoring

In the short term, Environment Agency monitoring sites requested in the national Monitoring Commission for 2020/21 should be reinstated and monitoring should commence when the Covid 19 situation allows. All physical and chemical monitoring should be on a monthly calendar to the required sensitivity of analysis.

In the longer term, a specific programme for the purpose of the NMP should be progressed to determine the status of orthophosphate within the Wye and Lugg Catchments.

Despite issues with data, it is clear that the Lugg is non-compliant and an action plan should be produced to identify the specific areas of concern and the action required to tackle these, within the wider Lugg catchment.

More work is required to ensure that the evidence data set is fit for purpose and resource can be targeted to areas of highest priority. Going forward, a large network of chemistry sampling is unsustainable and other techniques will need to be developed for example targeted use of phosphate sondes, remote sensing, rapid algal surveys etc.

Due to the large number of WFD waterbodies within Lugg catchment and limited recent data, further analysis of the existing data is required before determining the most appropriate programme. This will ensure that any future monitoring resource is targeted to where most needed and will be able to show the effect of any improvement measures.

We will also look to develop a more agile monitoring programme that will use all the data sources available from the statutory bodies and partner organisations to identify and fill the gaps in evidence needs to be developed.

It is recommended that this future programme is jointly developed by EA and NRW in consultation with Natural England.

Proposals from Farm Herefordshire to the Nutrient Management Plan Technical Advisory Group

Options to reduce phosphate levels in the Wye Catchment from Diffuse-Agri Sources

Following the presentation of the TAG options to the NMP Board on the 29th January 2020, partners of the Farm Herefordshire (FH) initiative have worked together to explore what action is required to deliver improved "certainty" of reduction in the levels of phosphate in the River Wye catchment (particularly the River Lugg) from agricultural sources.

The items below review, and where possible, expand upon each agri/diffuse option that was previously proposed, and adds additional approaches for consideration.

For continuity we have used the same format as the original TAG proposal. Farm Herefordshire would echo the caveats presented to the TAG that: "each option requires further investigation into feasibility, and it should be noted that several of these options will require considerable time to be implemented and effective. An estimate of the complexity of each option has been outlined (simple, medium, complex) together with timescales (short within 6 months, medium within a year, long term over one year)."

It is important to stress that only by increasing soil health across the whole catchment will there be a long-term solution to flooding and nutrient loss. Bespoke approaches, such as silt traps and better use of sewage sludge, will produce benefits in reducing phosphate loads, but only through better management of our soils, and improvement in soil structure, will the problem be brought under control in perpetuity. Ensuring that effective soil and water management takes place within the Wye Catchment must be the highest priority of the Technical Advisory Group and the NMP Board.

a. Sediment / Silt Traps

The Environment Agency (EA) defines Rural Sustainable Drainage Systems (RSuDs) as a system that comprise individual or multiple linked component structures replicating natural processes, designed to attenuate water flow by collecting, storing and improving the quality of run-off water within rural catchments. For the NMP, the main purpose of RSuDS would be to improve water quality by reducing the impacts of diffuse agricultural pollution from rainfall runoff that currently discharge direct to a watercourse.

A wide range of systems and designs are available. Some are based on a 'constructed wetland' i.e. a water holding pond, planted up to slow the flow and to utilise some of the nutrients, with a silt trap structure at the inflow. The removal rate therefore increases when the phosphorous taken up by the wetland is considered. Others include features within existing agricultural drainage systems that can be regularly emptied of captured sediment. These approaches can reduce land take and may be easier to manage.

A network of sediment trapping interventions could be installed across the landscape to reduce sediment flows. Sediment trapping has been trialled for many years by the Game & Wildlife Conservation Trust (GWCT) at their Loddington Farm. Studies have also been undertaken by the University of East Anglia (UEA) on the effectiveness of sediment traps installed in the Wensum catchment. The UEA study found that U-shaped traps were more effective at reducing sediment loading than linear shaped (figure 1).

Figure 1: Images of U shaped and linear shaped silt traps installed in the Wensum catchment by Norfolk Rivers Trust and Norfolk Internal Drainage Board.

Analysis of the effectiveness of the linear trap (the least effective silt trap design) found the following – Retention rate (kg/ha/y) column is of most relevance:

Table 3
Wetland CW3 retention rates and economic damage costs for the first 12 months of operation (November 2016–November 2017). Values in parentheses represent the 'low' and 'high' pollutant prices assigned by the UK government.

Parameter	Retention (kg)	Retention rate (kg ha^{-1} y^{-1})	Pollutant price (£ kg^{-1})	Mitigated damage cost (£)
Sediment	7253	305	0.054 (0.047–0.061)	391.66 (340.89–442.43)
Total phosphorus	11.6	0.5	12.79 (2.77–22.66)	148.36 (32.13–262.86)
Total nitrogen	29.7	1.3	0.43 (0.24–0.62)	12.77 (7.13–18.41)
Organic carbon	400	17	–	–
		Total mitigated damage cost		552.79 (380.15–723.73)
		Cost of wetland CW3		3411
		Annual maintenance cost		145–182
		Payback time		5–17 years

Other studies concluded that silt traps can provide around 50% effective phosphate removal. For example, figures from work on the River Eye SSSI with the installation of silt traps has resulted in a total phosphorous removal rate in the region of 50%. This concurs with research work undertaken by Lancaster University where it has been determined that phosphorous removal efficiencies of well-designed sediment traps are likewise around 50%. (nwleics.gov.uk)

On a precautionary basis for development, North West Leicestershire District Council estimated that the installation of silt traps would remove 25% of total phosphorous when considering development in the Mease catchment.

Silt traps start to remove phosphorous as soon as they are installed and will therefore deliver phosphorous reductions immediately, allowing development to come forward. The ongoing management and maintenance requirements mean that they are less sustainable in terms of delivering benefits over the lifetime of the development unless maintenance is factored in. Maintenance of silt traps needs to be carried out on a regular basis, monitored and funded appropriately.

Benefits – reduced phosphate entering River Lugg catchment, aesthetic and amenity. Delivers multiple benefits in terms of water quality, flood mitigation and biodiversity. The damage costs mitigated by pollutant retention within the UAE linear silt trap during the first 12 months of operation were ~£392 for sediment, ~£148 for Total P and ~£13 for Total N. This gives a combined total mitigated damage cost for the linear trap of £553 (range=£380–724) per year. With it costing £3411 to install (£1400 for design; £2011 for construction) and having annual

maintenance costs of £145–182, this mitigated damage cost means an estimated payback time of 5–17 years, with a best estimate of 8 years. U-shaped wetlands had higher design (£2800 per wetland) and construction (£4034 per wetland) costs. Construction cost estimates based on other studies range between £280 to £3100 depending on size, fencing and lining costs.

Potential Funding

1. Herefordshire Council NFM grants are available for 6 priority catchments in Herefordshire that could support infield water retention including Sediment traps, attenuation ponds and Swales.
2. Countryside Stewardship contains similar items as those listed above. Catchment Sensitive Farming officers can also provide access to a range of specialist advice which includes water pathway management, water holding structure design and natural flood management
3. Infrastructure to be funded, or part funded, through Community Infrastructure Levy (CIL), section 106 or section 278 funding e.g. Stroud District Council
4. Allocation of future Flood Coastal Risk Management/flood budgets

Challenges – needs monitoring, maintenance to ensure appropriate levels of vegetation are maintained, disposal site for the silt & nutrients on suitable land. Some results indicated a silt trap can actually increase phosphates if it does not establish sufficient vegetation to filter and absorb nutrients. This is because deposited biological material can itself become a phosphate source. The life span of structures will also depend on the quality of the maintenance.

Complexity – simple / medium. Funding and delivery of ongoing maintenance.

Timescale – short / medium.

Supporting evidence: UAE Salle Estate Silt Trap Study. WWT Constructed Farm Wetlands Guide.

b. Further regulations such as Water Protection Zones (WPZs)

This item will not be considered further by the Farm Herefordshire partners until it has been demonstrated that enforcement of existing regulations cannot achieve the required improvements.

Original Text: WPZs are one of a wide range of regulatory and voluntary mechanisms that may be used to prevent water pollution in urban and rural environments. There are many regulations such as Farming Rules for Water that can address some of the issues in the Wye Catchment. WPZs require polluters to start, stop or limit certain activities, depending on the nature of the problem. This includes point-source water pollution (from a single origin) and diffuse water pollution (from dispersed sources which are collectively significant).

Each WPZ is bespoke. It might cover a whole catchment or target localised areas. Breaching the requirements of a WPZ is an offence.

If the Environment Agency want to implement a WPZ, a business case is prepared for Defra to show that additional measures to reduce pollution are needed. If Defra agrees, a draft WPZ order is produced for public consultation and parliamentary approval. So far, only one WPZ has been designated, in relation to the River Dee on the English-Welsh border. It was designated in 1999 to control the storage of dangerous substances in the freshwater catchment area. Its objective is to protect drinking water abstractions from regulated substances entering the surface water system.

Benefits – reduced phosphate entering River Lugg catchment, legally enforceable.

Challenges – needs comprehensive business case, needs parliamentary approval, likely to be challenged by landowners and businesses.

Complexity – high.

Timescale – long.

c. Enforcement of existing regulations in a targeted area

Original Text: The River Axe Catchment in Devon has used a 3-year regulatory farm visit campaign by the Environment Agency to undertake advice led regulatory audits. These visits led to infrastructure improvements and increased understanding of the impact of nutrients on nearby watercourses and protected areas. The EA currently targets work programmes to areas of high priority.

Serious consideration needs to be given to tailoring the approach taken in the Axe catchment to the Lugg. Consideration should be given to which regulatory requirements should be enforced as a priority, in order to deliver the most significant reduction in phosphate losses from diffuse agricultural sources e.g. Basic Rules, Silage Slurry, Agri Fuel Oil Regs, Nitrate Vulnerable Zone Regs etc. Regulation is not within the remit of Farm Herefordshire, it can only be undertaken by the Statutory Bodies and therefore we look to them as Strategic Partners within the FH initiative, as well as lead partners for the River Wye Nutrient Management Plan, to undertake this assessment and deliver the approach as appropriate.

Benefits – reduced phosphate entering River Lugg catchment, legally enforceable, can create long term on-farm improvements. River Axe example found that every pound spent by the Environment Agency in regulatory visits resulted in investment of £33 for infrastructure improvements. Improvements to Water Framework Directive status and Habitats Directive classifications.

Challenges – Based on the Axe this approach costs approximately £1,400/holding.

Complexity – Simple.

Timescale – medium.

Supporting evidence: River Axe Pilot Approach to Enforcement

d. Voluntary agreements with farmers to reduce on farm phosphate use

FH partners are keen to take a more active role in promoting the benefits and necessity for accurate Nutrient Management Planning on farm including farm events/case studies/videos. In addition to the above, consideration needs to be given to how the initial findings of the Lancaster University RePHoKUs project, in terms of the Wye soils ability to hold on to phosphate, can be utilised and communicated to the agricultural community.

The Floodplain Meadows Partnership scientists based at the Open University and local agronomists also share the understanding that P levels in virtually all Wye catchment soils can already provide the necessary P that crops require without additions being applied. The limiting factor is that soils are not biologically active enough to make this P available to crop plants. This can be a win-win solution based on prioritising soil health and farm profitability in all farm management decision making.

Actions which need to be explored:

- Better targeting of applications to avoid building phosphate indices & match crop requirement.
- Prevention of P applications to those soils/fields already in excess in order to "run-down" indices.
- Use of GPS mapping to demonstrate "Proof of Placement" which confirm no over application/overlaps and appropriate buffer strips - as utilised in New Zealand (figure 2).

Figure 2: Example of NZ proof of placement map

An approach will be made to EnTrade to ascertain the feasibility of utilising a system like theirs to establish a market-place that could facilitate the required action on the ground. Funded action would need to go above the regulatory baseline.

Benefits – reduced phosphate entering River Lugg catchment, can create long term on farm improvements.

Challenges – Funding to develop and deliver this type of voluntary scheme needs to be identified.

Complexity – Medium.

Timescale – Medium.

Supporting evidence: To follow and could utilise FARMSCOPER standard metrics.

e. Arable reversion to absorb nutrients in flood water

(This is a rewording of the original text “Conversion of high nutrient land to semi natural habitat”)

The flood plain area of the River Wye catchment is estimated to be 176,471ha (NRW figures). Of this area, 10,093ha is considered to be at high risk of flooding and FH proposes that this land, as a minimum, has the capacity to trap silt and phosphate in significant quantities through sensitive management practices such as zero-till, continuous cover cropping including grassland reversion/management.

Floodplain meadows provide an important ecosystem service by trapping sediments during floods. As much as 40 tonnes of sediment per hectare can be retained by floodplain meadows. The phosphorus contained in that sediment is effectively trapped by the meadow and then gradually exported in terms of an agricultural product, the annual hay crop, for several decades. In this way, floodplain meadows serve as an ideal cleansing filter turning a potential problem (nutrient-laden sediment) into a useful product (hay). To exploit the nutrient-cycling functions of floodplain meadows, they should be cut and managed as an agricultural crop and the example below shows increase of 9 kg / ha / year in soil P.

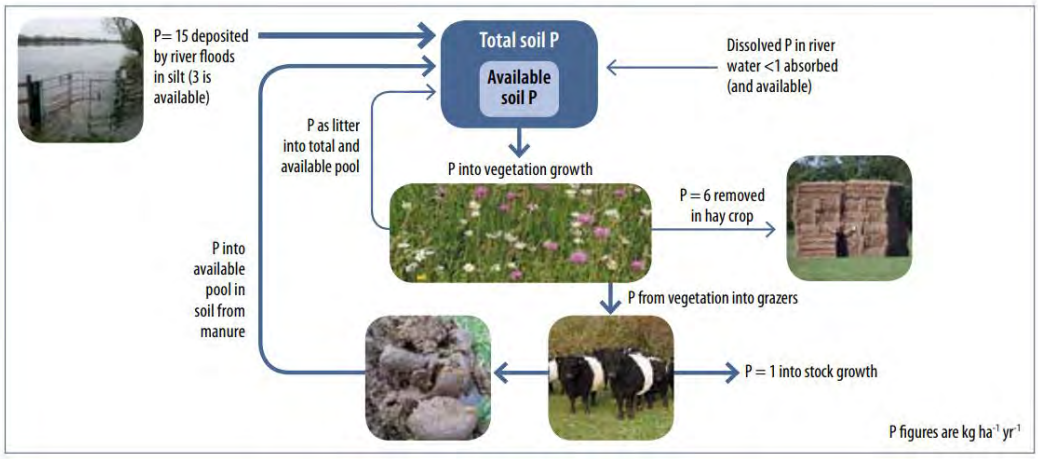


Figure 6.2 The P cycle on a floodplain meadow showing the amount of P in kg ha^{-1} yr^{-1} deposited and removed in a year with a major flood. In this instance the total pool of P stored in the soil will have increased by 9 kg ha^{-1} over the year.

Compare these to typical losses in Wye catchment taken from Atkins NMP report 2014

Environment Agency

NATURAL ENGLAND

River Wye SAC Nutrient Management Plan - Evidence base and options appraisal

ATKINS

Table 7-3: FARMSCOPER modelled typical phosphate losses for River Wye catchment farm types

		Horticulture	Roots & Combinable with Poultry Manure	Mixed combinable	Upland Grazing	Lowland Grazing
		Numbers are expressed as typical phosphate loss in Kg P/yr				
England	Wye	17	464	533	218	258
	Lugg	8	290	238	143	133
Wales	Wye	17	516	535	172	n/a*
	Lugg	n/a*	n/a*	n/a*	161	n/a*

(*n/a because that farm type is not present in that particular sub catchment)

Options are currently available in Stewardship schemes with annual payments for income forgone (£311/ha/yr in CS). One-off capital costs for restoration of flower rich grassland range from £600-£800/ha depending on method and seed source (Natural England and Herefordshire Meadows). A Severn Trent grant STEPS030 pays £500/ha/yr over 5 years for meadow habitat creation. Payments are due to be significantly increased in future ELMs when full account is taken of ecosystem services offered by floodplain management. After the two local 1-in-100-year floods in the last six months farmers are re-calculating true gross margins for cultivated cropping on flood plains.

Floodplain management can only store part of the losses produced from typical farm types throughout the catchment. It is increasing soil health across the whole catchment that provides a long-term solution to flooding and nutrient loss – this wider approach could be attempted through the mechanisms proposed in the voluntary agreements (option d) outlined above.

Benefits - Reducing silt and phosphate in Rivers Lugg and Wye and long-term benefits for soil health. Saving farmers cost of applying P due to healthy soils having more plant-available P in healthy soils. Could be funded through existing support streams if a proactive approach was taken to localised targeting of funds/future bidding.

Challenges: Comparison of increasing soil health with other options in FARMSCOPER model. Need more evidence for P losses from different farm systems including zero-till, cover/ catch/ companion cropping and rotational grazing. Willingness to calculate true gross margins for cultivating crops in floodplains with increasing flood frequency and decline in soil health.

Complexity: Simple.

Timescale: Short/Medium. Driver of ecosystem services payments in ELMs or innovative use of FCRM flood budgets could accelerate pace of change.

Supporting evidence: Floodplain Meadows Handbook

f. Additional Proposal: Appropriate use of sewage sludge

Sewage sludge is currently spread on agricultural land as a fertiliser, the quantities produced from works within the catchment are currently unknown to the NMP Board. As Phosphate stripping continues to be added to works during the proposed AMP7 improvements the level of Phosphate being returned to the land/catchment will also increase.

There is an opportunity for Dwr Cymru (DCWW) and Severn Trent Water (STW) to demonstrate best practice in the disposal and subsequent use of sewage sludge to align with the objectives of Option d above. This could be achieved by:

- Improved targeting of land spreading activities to avoid increasing P indices
- Use of GPS mapping by all DCWW spreading contractors to demonstrate “Proof of Placement” as detailed above.

Benefits – reduced phosphate entering River Lugg catchment, can create long term on farm improvements, and demonstrates corporate responsibility for DCWW and STW.

Challenges – Willingness of DCWW and STW to implement

Complexity – Simple

Timescale – Short

g. **Additional Proposal: Plant Nutrient Diversion Proposal**

As the volume of sewage sludge, AD solids and animal manures increases in response to the growth of the economy and population of Herefordshire, a new strategy is required to address the existing excess of nutrients entering the ecosystems in the Wye and Lugg catchments.

Nutrients, including phosphates, from Waste Water Treatment Works and agriculture can be diverted from land application into a controlled processing and recovery plant. The diverted nutrients can be weighed and evaluated at the point of delivery to, and exit from, the plant. The reduction in nutrients released to the environment can be verified and if required the quantity of each nutrient can be entered into a trading platform or planning 'offset' programme.

Recovery of nutrients in a specialist plant will produce electrical and heat energy, the resulting ash can be utilised in building materials. If the ash from poultry litter is segregated it can also be used as a high value fertiliser that can be exported outside of the catchment to the rest of the UK where it will displace poultry ash currently imported from the Netherlands and other countries.

A proposal was prepared in 2015/16 for a processing and recovery plant that would provide this service. It will produce much needed renewable electricity and significant energy for district heating and cooling to nearby businesses and housing. The fuel to produce this energy is principally poultry litter, sludge/biosolids, local wood and green waste, and possibly bi-products of the paper recycling industry. The plant will process the majority of poultry litter and biosolids arising in the area and ensure that these materials that contain high loadings of nutrients are in a form that can be safely recycled or exported from the county.

The developers intend to progress the project and would welcome engagement with the NMB and their constituent members to ensure that the objectives and intentions of the development are fully aligned with the NMB, Environment Agency, Herefordshire Council and the producers of the potential feed stocks. If successful, the process/technology could produce 13 to 15 Mw of renewable electricity and heat contributing significantly to the counties aim to move towards net zero.

A similar proposal has recently received planning consent in Shropshire and other plants are operational in the East of England. so this is proven technology.

Benefits – Reduced phosphate entering River Wye catchment. Useful by products for export out of catchment. Source of renewable energy and heat, Externally financed

Challenges – Suitable location, Planning, Permitting, Grid Connection.

Complexity – Medium/high.

Timescale – Medium/high. (Estimated as 18 months from the completion of planning and permitting).

Footnote: The above proposals have been compiled by partners working within the Farm Herefordshire initiative, which focusses solely on the English Wye. Many of these actions/proposals are also equally applicable to the Welsh Wye to reduce the levels of Phosphate from diffuse-agri sources, and should also be considered by Powys County Council and Natural Resources Wales.

Footnote 2: There are technical papers and online references supporting the statements made in the document. However, it proved too onerous to integrate into the text. If further information is needed on any of the subject areas these can be supplied.

Herefordshire Nutrient Management Plan Board – 9th July 2020

Environment Agency regulation of Diffuse Agricultural Pollution

Recent modelling data suggests the main source of phosphate entering the Rivers Wye and Lugg originates from agricultural sources. The vast majority of this comes from diffuse inputs, meaning it does not come from a single location. Runoff of rainwater containing phosphate is the principal method of transport from agricultural land to watercourses.

Often runoff originates quite a distance from the watercourse, finding its way by gravity via roads, highway drains, paths, ditches and other fields. Agriculture is a highly mobile industry with crop rotation meaning high risk sites may change location each year.

Since 2016 the Environment Agency in the West Midlands has been using almost real time satellite imagery to target agriculture regulatory activity. Fields of bare soil with no growing crops or grass covering them are clearly much more likely to lose their soil. Bespoke computer mapping software has been developed to identify where these fields are by using images captured by the Sentinel 2 satellite.

Environment Agency LIDAR data provides highly accurate detail of slope. Which can be overlaid on satellite images to highlight high risk locations where slope, bare soil and vulnerable soil time overlap.

Using a smart phone or iPad our officers are able to take this modelling in to the field and use it to pinpoint their inspections. A huge time saver considering the scale of the problem. They are also able to record images and videos of these sites and save them spatially or geographically. This evidence and intelligence is used to assist discussion on poor practice with farmers and plan future visits.

Work over the past few years has identified landowners and parcels of land where there have been run off incidents and poor practice. Advice and guidance has been given to these landowners and we have seen some improvements in farming practices as a result, including changes in land use and the ending of growing certain crops such as potatoes or maize on specific fields.

Between 2016 and 2019 more than 60 holdings have been identified as high risk, potential to pollute or actually causing soil losses.

The River Frome, a main tributary of the Lugg was targeted during 2017/18 as a trial leading to:

- 12 advice and guidance letters have been issued
- 5 warning letters
- 8 farmers attending soil management awareness courses
- 10 hectares of steep arable fields returned to permanent pasture following work with tenant farmers

New Regulations

The Reduction and Prevention of Agricultural Diffuse Pollution Regulations (Farming Rules for Water) was introduced in 2018 and has provided the Environment Agency with a new framework to address the issues of soil run-off with new advice, guidance and enforcement powers. Under these regulations, land managers must now take reasonable precautions to prevent soil erosion. The Regulations are advice led and normally require that farmers are provided with advice and guidance on compliance with the Regulations. In the most serious and negligent cases and where advice has previously been given but not heeded, more formal action including prosecution is appropriate.

Successful compliance and enforcement action has recently been taken under the new regulations resulting in landowners changing practice: e.g. changing crop types, creating buffer strips, placing land in stewardship schemes.

In coming months to assist the agricultural sector in protecting the environment and ensuring compliance with the regulations the Environment Agency will be providing businesses with advice and guidance of the Farming Rules during our routine regulatory visits. In addition additional resources will be targeted to provide specific advice and guidance in high risk areas. A wide range of data (e.g. drone images, satellite information, soil types, slope angle, soil run-off modelling, water chemistry, ecological surveys, pollution incidents, repeat offenders) will help identify these locations.

Environment Agency Herefordshire Regulatory Action Plan for addressing agricultural diffuse pollution – 2020-2021

Building on the experience gained developing Soil Patrol and the introduction of new statutory Regulations in 2018 the Environment Agency will implement a regulatory action plan during 2020 and 2021 for tackling diffuse pollution from agriculture with a focus on the Lugg catchment.

The plan has four broad strands:

1) **Improving Data and Intelligence -** ensuring regulatory activities are driven by evidence which is current and robust.

    - Capture and analyse data across the catchments in collaboration with partner organisations.
    - Make increased us of soil sampling results (required under new Regulations) to further refine mapping and targeting of high risk areas
    - Environment Officers to carry out ‘walkover’ surveys and aerial-drone surveys in high risk sub-catchments.

2) **Targeting Resources** – taking action where it is needed most

    - Resource will be prioritised initially to the river Lugg (and sub-catchments) and then to the river Wye.
    - Analysis of multiple data layers (water chemistry, WFD status, ecological condition, soil run-off modelling) will inform new Catchment Evidence Packs. This will help identify the highest risk locations within the catchments to ensure Environment Officers can effectively target limited resources across geography.
    - Resources will also be focused where Environment Officers have identified high risk sites through routine farm inspections, local intelligence, incident response, or catchment surveys.

- We will focus on locations with serious environmental impacts from previous incidents, or where we have identified repeat offenders or long-standing soil erosion issues.

3) **Increasing Awareness & Improving Land Management Practices** – helping land managers to comply

- Advice and guidance letters will be sent to land managers in high risk areas, explaining the regulations and the requirements to prevent agricultural diffuse pollution (e.g. risk assessing, mitigation measures, soil testing)
- Land managers will be sign posted to additional sources of information and appropriate stakeholder organisations.
- Further awareness raising of the regulations and good practice to prevent diffuse pollution will be communicated through farm visits, social media platforms, local press and/or stakeholder liaison as appropriate.

4) Improving Regulatory Compliance

a. Environment Officers now have new guidelines clarifying how to implement the 2018 Regulations and how to carry out enforcement action. This will increase the effectiveness of our regulatory work.
b. The Regulations aim to improve land management practices through advice and guidance. However, where we encounter repeat offenders or serious environmental impacts, we will move rapidly to collect evidence required for appropriate enforcement action.
c. Formal Warning Letters have already been issued for soil loss incidents, resulting in positive changes to land management practices. This will continue at new locations and where ignored, or there are repeat incidents, then further enforcement action will be taken.
d. Compliance with the regulations will also form a part of our routine farm visits as well as our incident response.

The plan will be kept under review and progress against the activity areas detailed above will be reported regularly to the Nutrient Management Plan Board