



Flea Treatment Pollution Crisis - An Independent Review

**Matt Shardlow MPhil
May 2026**

About the Author

Matt Shardlow is an ecological expert with 30 years of experience, particularly relating to the impacts of chemical pollution on wildlife. He has been a member of the UK Sheep-dip Steering Group (2005-10), founding chair of the Wildlife and Countryside Link Legal Strategy Group, founding chair of the Riverfly Partnership, and founding Chief Executive of Buglife – The Invertebrate Conservation Trust. He is currently a Secretary of State appointed member of the Broads Authority and an environmental consultant. In 2017 he discovered the phenomenon of flea treatment pollution of rivers and made recommendations to address the problem.

Citation

Shardlow, M.E.A. (2026) Flea Pollution Treatment Crisis – an Independent Review. Wildlife and Countryside Link, London.

This publication is the independent work of the author. The findings and recommendations contained within do not represent the collective views or institutional positions of Wildlife and Countryside Link or its member organisations.

Photos © Jackie Dent, Broads Authority, Francis C. Franklin, Jynto, Des Colhoun

Contents

Synopsis	5
1. Executive Summary.....	8
2. Recommendations	48
2.1. Primary Actions	48
2.2. Supporting Actions	49
2.3. Limited Input Reduction Actions	50
2.4. Regulation Fit for Purpose Actions	52
3. Context.....	54
4. Discovery.....	58
5. How Flea Treatments Pollute Waterbodies	60
6. Harm caused by Fipronil and Imidacloprid	65
7. Pollution Levels in English Water Bodies 2014-2024	77
7.1. Fipronil and Breakdown Product Pollution Levels	82
7.2. Imidacloprid Pollution Levels.....	87
7.3. Current Environmental Harm Levels	89
8. Pollution Reduction Models	91
8.1. Pollution Reduction Conclusions	95
9. Sources of Fipronil and Imidacloprid Pollution in Water Bodies	96
9.1. Flea Treatments.....	102
9.2. UK Agriculture	106
9.3. Imported Food.....	109
9.4. Ornamental Plant Imports	113
9.5. Home and Garden Biocides	116
9.6. Preservatives	119
9.7. Fabrics	119
9.8. Imported Pets.....	119
9.9. Illegally Imported Products	120
9.10. Industrial Sources	120
9.11. Conclusions on Pathways	122
9.12. Future Trends in Pathways.....	130
10. Application of the Environmental Principles	132
10.1. The Precautionary Principle.....	132
10.2. The Prevention Principle	133
11. Pollution Reduction Options	134
11.1. Reducing Flea Treatment Pollution	134
11.2. Reducing Agricultural Pollution	138

11.3.	Reducing Pollution from Minor Pathways	139
12.	Application of the Veterinary Medicines Regulations 2013.....	140
12.1.	Background.....	140
12.2.	Authorisation.....	141
12.2.1.	Benefit-risk Balance – incorporating a review of alternatives.	142
12.2.2.	Unnecessarily, Undesirable Effect on the Environment.	152
12.2.3.	Risks to the Environment Not Sufficiently Addressed.	152
12.2.4.	Conclusions on Authorisation Tests.....	152
12.3.	Assessment Reports	153
12.4.	Suspension and Revocation.....	155
13.	Application of the Water Quality Regulations	156
14.	Application of the Habitats Regulations.....	159
14.1.	Background.....	159
14.2.	Protection of Natura 2000 and Ramsar sites	160
14.3.	Protection of Habitat Directive Listed Species.....	161
14.4.	Protection of Birds Directive Listed Species	163
14.5.	Application of the Habitats Regulations in Current Situation	163
15.	International Agreements and Flea Treatments	164
15.1.	International Conventions.....	164
15.2.	Trade Agreements.....	168
16.	Parliamentary Debate	172
17.	Government Roadmap	173
17.1.	Reactions to the Roadmap	174
17.2.	Analysis of Roadmap Communication and Education Actions.....	176
17.3.	Analysis of Roadmap Evidence Gathering Actions.....	178
17.4.	Analysis of Roadmap Regulatory Actions	179
17.5.	Conclusion on the Roadmap.....	185
18.	Is the environmental regulation of veterinary medicines fit for purpose?	187
APPENDICES		197
	Appendix 1: Environmental Standards Explained.....	197
	Appendix 2: VMD Data on Flea Treatment Sales.....	203
	Appendix 3: Case Law Relevant to Application of the UK Habitats Regulations	207
	Appendix 4: Media Coverage	210

Synopsis

- Fipronil and Imidacloprid are causing severe and potentially irreversible harm to aquatic life, are likely to be impacting on bird populations as well as reducing pollinator populations in public parks, and are accumulating in fish.
- These chemicals, banned from use as pesticides, are highly toxic to aquatic life, very persistent and highly hazardous; Fipronil is also a 'forever chemical', a poly-fluoroalkyl substance (PFAS).
- Protected sites such as Special Areas of Conservation (SACs) and National Parks are in danger of irrevocable harm.
- In English rivers average levels of Fipronil are higher than levels shown to reduce population levels of aquatic invertebrates on nature reserves, and the average level of Imidacloprid in rivers is higher than the levels shown to reduce the abundance of aquatic life. Indeed, so high that levels in 21% of samples are sufficient to cause a 30% reduction in associated bird populations.
- In English waterbodies Environmental Quality Standards are exceeded by Fipronil in 81% of samples and by Imidacloprid in 43% of samples.
- There is clear evidence demonstrating the multiple pathways by which flea treatments enter water courses.
- Over the last 11 years 8,140 (or 14,410) kg of Fipronil and its breakdown toxins and 8,690 kg of Imidacloprid have travelled down British rivers into the sea.
- Since 1995 39,939 kg of Fipronil has been sold as flea treatments in the UK and, at the most, only 2,200 kg of Fipronil was available from other uses (730 kg from agriculture and a possible, but unlikely, 1,500 kg as residues on imported produce) – it is unequivocally clear that Fipronil pollution is, in the main, flea treatment pollution.
- Despite there having been almost no use of Imidacloprid (or Fipronil) in UK agriculture for 12 years there are likely to be continuing emissions of Imidacloprid from agricultural soils into water. However the large amounts coming through sewage treatment works indicate that flea treatments are probably the major contributor to Imidacloprid environmental pollution levels.
- Non-agricultural, and non-flea-treatment sources of these two chemicals can only account for 11% of Fipronil and 6.7% of Imidacloprid river pollution levels, even if it is unrealistically assumed that 100% of the applied or imported chemicals reach waterbodies without degrading.
- There has been no apparent decline in Fipronil use or pollution, but there has been a recent decline in Imidacloprid sales and pollution levels in rivers. However, even if the decline continues Imidacloprid pollution would continue to enter and damage ecosystems for decades.
- Modelling of pollution levels under reduction scenarios shows that a c.98% reduction in Fipronil pollution and a c.84% reduction in Imidacloprid pollution are needed to bring current pollution levels down to potentially acceptable levels.

- The Government Flea Treatment Roadmap has been widely criticised for the lack of urgency and absence of a timeline; I find the actions proposed to be weak, ineffective and not to have resulted in any significant change.
- The Government Roadmap depended on an international forum called VICH producing new guidelines on veterinary medicine environmental risk assessments. VICH is a veterinary medicines industry funded body that does not comply with the World Trade Organisation (WTO) principles for the development of international standards, and of which the UK is not a voting member. VICH has now decided that it will not be revising the guidelines, so the Roadmap is fundamentally undermined and we need a Plan B.
- The Government has international commitments to protect the environment, including in trade agreements, which must be fulfilled.
- The Secretary of State and Veterinary Medicines Directorate (VMD) have legal duties to ensure that new authorisations that will contribute to this unnecessary and undesirable environmental harm are refused, to update the product risk assessments for already authorised products in light of the new information, and to be certain that the authorisations are not resulting in harm to Natura 2000 or Ramsar sites.
- New evidence emerging this year has discovered significant amounts of previously undetected toxic breakdown products of Fipronil and Imidacloprid in sewage, as these compounds have not been looked for in the UK this raises the concern that we may be significantly underestimating the volume of toxic chemicals entering rivers as a result of the use of both parent chemicals.
- Fleas and ticks are a nuisance to pets and can spread disease, causing welfare issues, while occurrence is low and associated diseases are generally rare, risks are likely to increase due to environmental change.
- There are 35 chemicals authorised as flea treatments in Europe, 22 in the UK, and there are essential oil and non-chemical control options as well. While it remains unknown if the environmental risks presented by any of those chemicals are acceptable, it is likely that a number of treatment chemicals will be found to be less environmentally damaging. At this time, because alternative chemicals are available, there are no grounds for the Secretary of State to make or allow Fipronil or Imidacloprid use under an “exceptional” marketing authorisation.
- Current VICH environmental assessment guidelines for veterinary medicines allow countries to consider additional environmental impact assessment information in exceptional circumstances.
- Our international agreements allow us to completely set aside the VICH assessment guidelines, if they are “ineffective or inappropriate”, the VMD and the Environment Agency have already determined that in this context, the guidelines are “ineffective or inappropriate”, and therefore so are existing product risk assessments.
- Twenty four years ago the Environment Agency identified the guidelines as being ineffective and made recommendations to bring the guidelines up to a standard comparable with the regulation of other chemicals. This resulted in no change.
- If this pollution is not stopped at source then the environment agencies and VMD will have to take drastic pollution reduction measures to regulate and reduce levels emitted in trade effluent and sewage, and to prevent behavior by pet owners that causes

emissions. Solutions down this route are likely to be highly unpopular, counter-productive, unenforceable, very expensive, or all the above.

- Although not helped by budget cuts to the of the Environment Agency and Scottish Environmental Protection Agency (SEPA), reduced monitoring programmes and cuts to programmes addressing emerging issues, the slowness of the VMD to identify the issue and reduce Fipronil and Imidacloprid pollution levels significantly over the last 32 years is alarming.
- The VMD has still taken no action likely to significantly reduce pollution levels, they are consulting on a small tweak to market authorisation (from on the shelves to over the counter and online) this is unlikely to significantly reduce pollution.
- Additional concerns are identified relating to similar failures to prevent widespread, long-established and ongoing ecological damage from Sheep dips and pour-ons and anthelmintics (wormers).
- VMD post-marketing surveillance is clearly inadequate to detect and prevent damaging pollution before it occurs.
- It appears that the VMD routinely prioritises "unnecessary burden" concerns, domesticated animal health issues, and the interests of the veterinary and medicine industries, over its environment protection duties.
- The VMD's application of environmental regulations, including those relating to the Veterinary Medicines Regulations 2013, the Environmental Information Regulations 2004 and the Habitats Regulations 2017 appears to be blatantly ineffective and beset with unnecessary secrecy and opacity issues.
- The VMD has all the attributes that would make it vulnerable to regulatory capture by the industry it is regulating, and is displaying the behaviours that would be expected if that had occurred.
- Concerns about the suitability of the VMD to be an environmental regulator could not be excluded.
- Further delay is unacceptable, serious environmental harm from Fipronil and Imidacloprid must be halted.

Recommendations are made here that if implemented will:

- ❖ quickly reduce the levels of these pollutants,
- ❖ implement national and international legislative commitments,
- ❖ ensure that there is no repeat of this disaster as a result of switching use to the many alternative chemicals available, but finding out much later that they too have caused decades of harm to biodiversity,
- ❖ address the regulatory shortcomings identified and thereby stop future harm from veterinary medicines.

1. Executive Summary

If you prefer the references, methodology, data, graphs and analysis that fortify the take home messages, please skip forward to the main report - page 48.

Context

The quality of water in rivers, lakes, and seas is of vital importance for Human well-being, we are directly dependant on clean water for drinking, agriculture, and recreation, and benefit from the intricate ecosystems that thrive in healthy aquatic environments.

At the heart of these ecosystems are invertebrates which play essential by breaking down organic matter, recycling nutrients, and controlling algae through grazing. They also serve as a crucial food source for fish, birds, and other wildlife.

When invertebrate populations decline the results can include algal blooms, reduced oxygen levels, and the collapse of local food chains — effects that degrade water quality further, reduce ecosystem resilience, reduce the beauty of tourist destinations, cause the collapse of fisheries, and damage the local economy.

Preventing the pollution of terrestrial habitats is essential for safeguarding the environment, Human health, and the economy. Chemical pollution of terrestrial habitats can impact on food safety and availability, ecosystem services and biodiversity, resulting in economic harm.

The UK Government has made several international commitments to reduce pollution and restore freshwater ecosystems by 2030, eliminate marine pollution, address pollution from persistent toxins, halt biodiversity loss, and to respond urgently if there is a grave and imminent danger to biological diversity (UN Sustainable Development Goals, Convention on Biological Diversity, Kunming-Montreal Global Biodiversity Framework, Ramsar, OSPAR, Stockholm Convention).

Key implementing national legislation requires all water bodies to achieve 'good ecological and chemical status', in line with the Water Framework Directive; requires the maintenance of Natura 2000 sites (SACs and SPAs) in 'favourable condition', the Habitats Regulations; and includes a binding target to "halt the decline in species abundance by 2030", in the Environment Act 2021.

In 2024 there were around 10.6-13.5 million Dogs and 10.8-12.5 million Cats kept as pets in the UK. The numbers of Cats has been static in recent years, but the proportion of people owning Dogs grew from 23% in 2011 to 28% in 2024. The UK has one of the highest densities of Cats and Dogs in the world.

Fleas on pets are a nuisance for the animals and their owners, rarely they cause serious dermatitis, they are also capable of spreading treatable disease, although this is also rare, and they can transfer tapeworms to Cats and Dogs.

Prevalence of fleas on Cats and Dogs in the UK is low, with 1.17% of Cats and 0.25% of Dogs likely to have fleas present when attending veterinary consultations, there is a peak of occurrence in July-August.

Over 99% of fleas on Cats and 93% of fleas on Dogs are Cat Fleas under 2% are Dog Fleas, the remainder are fleas acquired from other hosts.

Many flea treatment chemicals formulated for use on companion animals are highly effective at reducing fleas on pets for long periods of time, indeed the dispersal of these chemicals in homes is effective at controlling populations in houses, such that there has been a decline in the use of flea sprays and powders for application in houses. Although there is evidence that Fipronil may not now be a reliable effective treatment against fleas.

Flea treatments on pets do not reduce outdoor environmental exposure to fleas, or background population levels of fleas.

Ticks present a greater risk of spreading disease and are regularly found on Dogs in particular. Lyme Disease, spread by the Castor Bean Tick, is the commonest risk, to Humans and to Cats and Dogs, as with Humans the disease can result in serious kidney, heart, or nervous system problems if untreated. Other diseases are usually mild or rare and, other than louping ill, are treatable.

It appears that the tick population and/or prevalence has been increasing in recent decades, particularly associated with the increasing prevalence of deer. Reductions in the density of Sheep are likely to create habitat conditions (longer vegetation) that favour ticks.

Increasing tick populations, alongside a warming climate, will bring increased disease risks.

Many tick treatment chemicals approved for use on Cats and Dogs are effective at providing control of ticks on the pet and may kill a feeding tick before any pathogens are transferred, but have no impact on the environmental prevalence of ticks.

In 2020 86.1% of Dog and 91.1% of Cat owners had administered a flea treatment to their pet in the preceding 12 months.

The Animal Welfare Act 2006, Section 9, makes it an offence for a person to not take reasonable steps, to the extent required by good practice, to ensure that the needs of an animal for which they are responsible are met, including the animal's need to be protected from pain, suffering, injury and disease.

The Animal Welfare (Sentience) Act 2022 established the Animal Sentience Committee which can produce reports to help to ensure that the Government has all due regard to the ways in which policy might have an adverse effect on the welfare of animals as sentient beings.

Discovery

In 2013 the European Union (EU) brought in a partial ban on the use of Imidacloprid and Fipronil as agricultural insecticide treatments, which became a full ban in 2018, mainly because they were wiping out populations of wild bees (Woodcock et al. 2016).

In 2014 an EU risk assessment was unable to exclude risks from Imidacloprid to the aquatic environment. Meanwhile in Japan the use of neonicotinoids and Fipronil has caused a catastrophic 99% decline in dragonfly populations.

In 2017 an analysis of UK water quality monitoring data, undertaken by myself, revealed widespread Imidacloprid pollution that frequently exceeded water quality standards, including pollution in urban rivers and in a Loch on a Scottish mountain where there could be no agricultural source of the chemical, the report implicated flea treatments as the most likely pollution source in those situations.

In summary my 2017 report recommended:

- urgent action to reduce Imidacloprid pollution in water bodies;
- the suspension of the use of Imidacloprid as a pet flea treatment;
- a thorough review of the use of ectoparasite treatments, including a full risk assessment in relation to the aquatic environment;
- considering permanent bans on flea treatments if chronic levels of pollution are originating via waste water treatment works;
- the Environment Agency applying formal water quality EQS standards for the chemicals;
- and formal engagement between the Environment Agency, SEPA, NRW, Chemicals Regulation Directorate and Veterinary Medicines Directorate on a joint project to develop more ecologically comprehensive pharmacovigilance and pesticidovigilance.

How Flea Treatments Pollute Waterbodies

The treatment of fleas and ticks with toxic chemicals has been increasingly recommended, and increases in the frequency of treatment have been encouraged by vets.

Fipronil and Imidacloprid are the most commonly used flea and tick treatments for Cats and Dogs. The chemicals spread from the point of application over the skin and hair of the animal, and will still be present on the animal two months after application.

After a pet is treated the chemical rubs off on people's hands and clothing and on pet bedding. When these are washed, or the animal itself is washed, the chemicals enter the sewage system.

Not only are Fipronil and Imidacloprid persistent toxins, they also breakdown into chemicals that are even more toxic, and just as persistent. These include Fipronil sulphone, Fipronil sulphide and Imidacloprid-olefin; however, in 2026 five new Fipronil breakdown PFAS (poly-fluoroalkyl substance) chemicals and the Imidacloprid breakdown product Desnitro-imidacloprid were identified for the first time in sewage, some at significant levels. Hence, as we have not been looking for these chemicals in the UK, we may be significantly underestimating the amount of toxic flea treatment waste entering the environment.

Mostly these toxins go straight through the sewage treatment works and into the rivers. Treatment can even convert the breakdown products back into the original chemical.

The treatments can also get into the environment through excreta, when pets jump into water bodies, contact with vegetation and when pets are rained on.

The Veterinary Medicines Directorate (VMD) is the responsible Defra agency and has the aim to "ensure that the medicines pose minimal possible risk to Human health and the environment in the UK".

In 2018 VMD commissioned research on the issue from the University of Sussex, the resulting four scientific papers published between 2021 and 2025 demonstrated that:

- Fipronil and Imidacloprid contamination is common in English rivers, often at levels well above safety thresholds and thus likely to impact aquatic ecosystems.
- Pollution levels and toxicity risk for Fipronil was even worse than Imidacloprid. The average level of Fipronil recorded was 5.3 times greater than its chronic toxicity limit.
- The main pathway source of environmental pollution was waste water treatment plants.
- Washing hands, bedding and pets are likely to be significant routes into the environment. 36.2% of Dogs treated with Fipronil or Imidacloprid went swimming in water bodies every month, 54.6% were washed every month and 87.8% of Dog-owners and 69.1% of Cat-owners washed their pet's bedding at least once every 3 months.
- Bathing, bed and handwash emissions are major pathways to the environment, they accounted for an estimated 20–40% of measured wastewater pollution.
- Handwashing after stroking pets was calculated to be the biggest single contributor of chemicals to waste water.
- Pets swimming in rivers and streams caused significant pollution.
- Emissions from all pathways continued to be significant for 28 days after treatment, the full period of the study.
- A regulatory review was necessary to protect the environment.

In addition Budd et al. (2023) showed that high levels of Imidacloprid and Fipronil were emitted in the sewage effluent from a pet grooming facility, and Webb et al. (2021) calculated that flea treatments could account for a large percentage of the Imidacloprid observed in urban sewage in Iowa.



Harm caused by Fipronil and Imidacloprid

Fipronil and Imidacloprid are classed as Highly Hazardous chemicals, and Fipronil is a PFAS 'forever chemical', they work by binding to receptors in neurons and disrupting nerve function, they are particularly toxic to insects.

Key Fipronil aquatic toxicity findings at environmentally relevant levels include:

- Short-term exposure to 0.0325 µg/L of Fipronil and 0.007–0.01 µg/L of Fipronil breakdown chemicals killed half of the larvae of Watery Midges.
- Chironomidae (several species) emergence rates declined by 50% at concentrations of 0.03, 0.06, 0.11, and 0.78 µg/L for Fipronil sulphide, Fipronil sulphone, Fipronil, and Fipronil amide respectively.
- 50% of Chironomid fly larvae stopped thrashing in response to touch after four days of exposure at 0.0077 µg/L, 0.0099 µg/L, and 0.032 µg/L for Fipronil sulfone, Fipronil sulfide, and Fipronil respectively.
- Noshime Dragonfly feeding was significantly reduced at Fipronil sulfone concentrations of 0.01 µg/L.
- Bay Opossum Shrimps were impacted after 28 days exposure to Fipronil sulphone above 0.0051 µg/L and Fipronil sulphide above 0.0046 µg/L.
- Sublethal effects on aquatic animals caused by Fipronil include oxidative stress, genotoxicity, neurotoxicity, and morphological changes.
- Genotoxic endocrine disruption occurred in the Harlequin Fly at 0.01 µg/L.
- Populations of Dragonfly nymphs in mesocosms (artificial ecosystems) decreased sharply due to synergistic effects of Fipronil and simulated climate warming.

Key Imidacloprid aquatic toxicity findings at environmentally relevant levels include:

- Exposure at 0.03 µg/L Imidacloprid for 28 days killed 10% of mayflies.
- Breakdown chemical Imidacloprid-olefin showed similar toxicity to Imidacloprid for the Pond Olive Mayfly, there was almost no elimination from body tissues over time, so impact likely to be greater.
- Abundance of the Little Blue-winged Olives in a mesocosm was greatly reduced after 10 days at 0.06 µg/L.
- Sub-tropical freshwater microcosms suffered impacts on zooplankton, mayflies and waterbugs above 0.03 µg/L. After 96 hours exposure at 0.0001 µg/L 10% of mayflies had been killed and 10% of copepods were killed at 0.0012 µg/L.
- Emergence rates of aquatic insects were reduced at 0.001 µg/L of Imidacloprid, levels above 0.017 µg/L caused a loss in taxa abundance and richness, impacts on mayfly abundance in streams was amplified when Clothianidin was also present.
- Six cyclopoid copepod species showed high mortality rates, even at concentrations typically found in the field.
- 5% of species in a controlled pond were predicted to be impacted by 0.013 µg/L.
- Macrofauna abundance in Dutch surface waters dropped sharply between 0.013 and 0.067 µg/L of Imidacloprid.
- At 0.03 µg/L Imidacloprid induced population declines of the larger zooplankton species and shifted the phytoplankton community to a graze resistant, gelatinous and toxic cyanobacteria-dominated ecosystem.
- 0.02 µg/L of Imidacloprid in surface water caused a 30% fall in bird numbers in the Netherlands over ten years.
- In Japan neonicotinoids caused an 83% decrease in average zooplankton biomass and caused the collapse of the local fishery.

- DNA lesions in aquatic crustaceans were observed from 7 µg/L.
- Genotoxicity to frogs was observed at 3 µg/L (the lowest tested concentration), resulting in swimming activity changes (lethargy, hyperactivity and seizures), body size reduction, and malformations in most of the animals.
- Imidacloprid in sewerage effluent in German streams reduced invertebrate quality values by 40% and consequentially reduced leaf litter degradation by 53%.

In addition Imidacloprid and Fipronil water pollution in South East Asia has caused the widespread loss of dragonflies. Red Dragonfly numbers decreased sharply to near extinction, just 1% remained in many regions of Japan.

Declines were worse in hot years and climate change is likely to increase the toxicity of Fipronil.

Tank et al. (2026) examined selected pesticides and their breakdown products on or in feathers collected from UK birds in 2020 and 2021. Fipronil was detected in 73% of feather samples, with Fipronil sulphone in 34% of samples and the sulphide in 3%; Imidacloprid was detected in 88%, the olefin was in 7% and the desnitro was not detected; Permethrin was detected in 99% of samples and Deltamethrin was not detected.

Two studies, Guldmond et al. (2019) and Diepens et al. (2023), showed that pet hair is contaminating bird nests with high levels of Fipronil and de Montaigu et al. 2025 found that the more Fipronil there was in the nests of British Blue and Great Tits the more likely it was that there would also be dead fledglings in the nest. Eggs were heavily contaminated.

The ponds on Hampstead Heath where Dogs are allowed to swim were polluted with levels of Imidacloprid and Fipronil likely to cause environmental harm.

Fipronil has been assessed by the Centre of Ecology and Hydrology and the Environment Agency as presenting the highest toxicity hazard to both Humans and ecosystems of all chemicals detected in English surface waters between 2014 and 2020.

The greatest water pollution threat to the estuarine Chichester Harbour in 2025 was found to be Imidacloprid.

Robinson et al. (2024) found that the River Test exceeded the PNEC (Predicted no Effect Concentration) for Imidacloprid in all seasons, which presented the highest ecotoxicological risk to the river, the authors called for control of its use.

A study on the Rivers Wensum and Tone was particularly shocking. Imidacloprid was frequently at concentrations exceeding ecological limits, and Fipronil routinely at such levels. More than 80% of fish contained Fipronil (4.69 ± 5.08 µg/kg) and 10% contained Imidacloprid (0.158 ± 0.503 µg/kg). The highest levels of Fipronil were 87.7 µg/kg in a fish muscle and 322 µg/kg in an invertebrate in Norwich. The latter concentration is 2,000 times higher than the concentration that would be likely to kill a species of case-less caddisfly. The authors emphasised “the need for stricter regulation of the most high-risk pesticides, particularly those used in veterinary care”.

The Rivers Waveney, Wensum and Yare are all heavily polluted with Fipronil and flow into the Broads, our only wetland National Park.

Schweiger et al. (2025) looked at pesticides and invertebrate populations in 13 streams on nature reserves in Germany. The highest toxicity levels were caused by Fipronil exceedances of ecological limits, these were the main driver of lower numbers of pollution sensitive species (e.g. dragonflies, mayflies and caddisflies). There were no agriculture or sewage treatment plant inputs into the streams, Dogs on walking trails next to the contaminated streams were the likely cause of pollution. Shockingly this ecosystem damage occurred in a situation where all Fipronil measurements were lower than the average level of Fipronil recorded in English waters between 2014 and 2024. Levels of Fipronil below one part in ten billion damage ecosystems.

Using the Environment Agency, Natural Resources Wales and Scottish Environment Protection Agency river invertebrate monitoring data to examine recent trends in aquatic invertebrates is problematic due to the sites being unrepresentative and a 75% decline in monitoring levels since the mid-1990s.

In the 1980s and 90s levels of oxygen downstream of waste water inputs were very low and levels of Ammonia were very high, resulting in severely impoverished stretches of river. The situation is much improved in relation to biological oxygen demand and ammonia levels and invertebrate populations have responded with a long term recovery. However, recovery has stopped and exposure to waste water from sewage plants is now limiting population levels of mayflies, caddisflies and stoneflies and preventing rivers recovering fully from past pollution.

Hadley et al. (2026) found that pollution intolerant species declined significantly with increasing concentrations of Imidacloprid ($r^2 = 0.75$, $p < 0.01$) but not Fipronil in the Roath Brook system in Wales. This effect reflected reductions in populations at sites affected by contaminated surface drains of over 90% for heptageniid mayflies and limnephilid caddisflies and a 30% reduction in Green Drake mayflies and baetid mayflies. Cause and effect could not be conclusively established due to the presence of other chemicals in the sewage. However, the high levels of Imidacloprid in the Brook could not be explained by a sewage plant discharge or a combined sewer overflow as neither exist in the catchment, the authors attributed the Imidacloprid levels to domestic sewer misconnections.

Prompted by an estimated 90% decline in damselfly numbers on an SSSI in the Broads National Park, in 2023 Hiscock et al. (in press) detected Fipronil, Fipronil sulphone, Fipronil sulphide and Imidacloprid in 97%, 84%, 93% and 90% respectively of samples from the Bure river and connected broads (lakes). Chronic toxicity limits were routinely exceeded and acute toxicity limits regularly exceeded. Slow flushing of flea treatments through the river connected broads resulted in sustained contamination and it seemed that Imidacloprid persisting in sediments was remobilised into the water column during wetter periods. It was estimated that annually 2.9 kg of Imidacloprid and 19.8 kg of Fipronil and its breakdown compounds travel down the River Bure. The authors conclude that 'Stricter regulation is needed to protect aquatic insects from ectoparasiticides'.

The pattern of reduced populations of insecticide sensitive species of invertebrate downstream of sewage treatment works and in streams where dogs swim is consistent with flea treatments causing the ecological damage in the field that is predicted by laboratory studies.

Neonicotinoids have caused bird populations declines in Europe and globally.



Between 2013 and 2022 Imidacloprid pollution reduced French insectivorous bird populations by 12.7% before 2018 and the reduction persisted for years, with populations still reduced by 9% even after the 2018 agricultural ban.

Declines in British Great Tit and Blue Tit populations and breeding performance, in the last 20 years are temporally and spatially consistent with flea treatments impacting on the breeding success of these two fur using birds.

Despite mass Honeybee deaths due to Fipronil flea treatment being reported to VMD over a decade ago, no action was taken.

Flea treatment contamination of Dandelions in Dutch public parks, with toxic levels of Fipronil, Imidacloprid, Dinotefuran and Permethrin detected, was predicted to have a negative impact on local populations of insects.

The United States Environmental Protection Agency (EPA) has concluded that Imidacloprid is likely to adversely affect 79% of federally listed endangered or threatened species and 83% of critical habitats

Recent Pollution Levels in English Water Bodies

Environment Agency data on the occurrence of Fipronil and Imidacloprid in 6,532 water samples from England between 2014 and 2024 was analysed, and compared against Environmental Quality Standards and toxicity endpoints.

Fipronil

- 90.2% of river samples contained Fipronil at an average level of 0.00992 µg/L – 13 times higher than Chronic Environmental Quality Standard (EQS) and three times higher than the Acute EQS.
- 83.1% of estuary samples contained Fipronil, the average level was 0.003 µg/L – four times the Chronic EQS and slightly lower than the Acute EQS.
- 64.7% of pond/lake/reservoir samples contained Fipronil, the average level was 0.0012 µg/L – nearly twice the Chronic EQS.
- 37.3% of sea samples contained Fipronil, the average level was 0.00088 µg/L – above the Chronic EQS.
- 88% of samples from water bodies (rivers, ponds, lakes, reservoirs, estuaries and the sea) were over the Field-Based Acceptable Concentration.
- 81% of waterbody samples were over the Chronic EQS level.
- 55% of waterbody samples were over the Acute EQS level.
- 25% of waterbody samples were at a level known to cause genotoxic endocrine disruption to the Harlequin Fly.

Fipronil Sulphone

- 71.3% of river samples contained Fipronil sulphone at an average level of 0.01455 µg/L – 86 times higher than Chronic EQS, and 11 times the Acute EQS.
- 53% of estuary samples contained Fipronil sulphone, the average level was 0.00088 µg/L – five times the Chronic EQS.
- 27.6% of pond/lake/reservoir samples contained Fipronil sulphone, the average level was 0.00041 µg/L – twice the Chronic EQS.
- 14.7% of sea samples contained Fipronil sulphone, the average level was 0.00008 µg/L.
- 67% of samples from water bodies (rivers, ponds, lakes, reservoirs, estuaries and the sea) were over the Chronic EQS level.
- 50% of water body samples were over the Acute EQS level.
- 15% of water body samples were at a level known to kill 50% of Watery Midges.

Fipronil Sulphide

- 38.9% of river samples contained Fipronil sulphide at an average level of 0.00052 µg/L – 3.7 times higher than the Chronic EQS threshold.
- 14.1% of estuary and 3.4% of pond/lake/reservoir samples contained Fipronil sulphide.
- 34.6% of samples from water bodies (rivers, ponds, lakes, reservoirs and estuaries) were over the Chronic EQS level.
- 23% of waterbody samples were over the Acute EQS level.

Imidacloprid

- 56% of river samples contained Imidacloprid at an average level of 0.01495 µg/L – double the Chronic EQS.

- 22.7% of estuary samples contained Imidacloprid at an average level of 0.00423 µg/L, 14% were over the salt water Chronic EQS.
- 11.8% of pond/lake/reservoir and 7.3% of sea samples contained Imidacloprid.
- 47% of water body samples were above the Field-Based Acceptable Concentration.
- 43% of freshwater water body samples were over the Chronic EQS.
- 7% of freshwater water body samples were above the Acute EQS Level.
- 29% of water body samples were above level where more than 5% of species are expected to be harmed and the abundance of aquatic macrofauna sharply reduced.
- 21% of water body samples contained high enough levels to cause a 30% reduction in associated bird populations.
- 16% of water body samples were above level that quickly kills 10% of mayflies.

Neither parent chemical demonstrated a clear trend in abundance in water bodies over the full period of the data set, but there was a significant decline in Imidacloprid pollution levels over the last nine years. However, the number of samples taken varies from year to year, and the more samples taken, the more likely it is that rare peaks will be caught and that the average level of pollution recorded will be higher.

Fipronil levels were wildly high with 81% of samples exceeding the Chronic harm threshold, 55% exceeding the Acute harm threshold and 88% of detections over the acceptable Field Concentration (AC_{field}).

It is undoubtable that this will be having a significant impact on aquatic life, including causing declines in sensitive species, causing genotoxic endocrine disruption and killing flies.

Levels of Fipronil sulphone were also very high and will be killing flies and preventing dragonflies from feeding.

Fipronil sulphide was also common, and the impacts of the different Fipronil compounds will be additive, causing a cumulative impact on aquatic life.

Imidacloprid was also regularly detected at levels known to cause harm including killing mayflies, reducing the abundance of aquatic life and reducing bird populations. Imidacloprid breakdown toxins are not currently monitored in the environment.

Pollution levels of Fipronil, its breakdown toxins and Imidacloprid are exceptionally widespread and high, with environmental quality standards being routinely exceeded, significant harm to aquatic communities can be concluded.

Reductions in Pollution Levels Needed to Meet Environmental Standards

The change needed to bring Fipronil and Imidacloprid within safe levels was modelled. A c.98% reduction in Fipronil and a c.90% reduction in Imidacloprid pollution were necessary to bring pollution down from 2014-2024 levels to levels that may be acceptable. Even so at 98% and 90% reduction levels 42% of samples were still above the Field-Based Acceptable Concentration (AC_{field}) for Fipronil and 14% above the AC_{field} level for Imidacloprid, with 3% of samples also failing the Fipronil chronic pollution standard and 5% failing the Imidacloprid Chronic EQS.

There appears to have been a recent decline in the levels of Imidacloprid pollution in waterbodies, probably due to declining input of legacy Imidacloprid from agriculture and a recent reduction in Imidacloprid flea treatment sales, therefore a c.84% reduction is required from current Imidacloprid pollution levels.

Only measures that are in combination capable of achieving a c.98% reduction in the amount of Fipronil, and a c.84% reduction in the amount of Imidacloprid, getting into waterways can resolve the ecological harm.



Sources of Fipronil and Imidacloprid Pollution in Water Bodies

A 2023 study by the UK Water Industry Research found that effluent from 93% of the waste water treatment plants they monitored exceeded the environmental standard for Fipronil and 100% exceeded the Imidacloprid standard. Pollution levels of both chemicals were highly correlated across the seasons.

The 2020-22 National Chemical Investigations Programme, a water industry initiative run by the UK Water Industry Research (UKWIR), included a project investigating substances of emerging concern, including Fipronil and Imidacloprid, in sewage treatment, it looked at levels in influent and effluent, and in rivers upstream and downstream of 30 treatment plants in England and Wales.

Fipronil and Imidacloprid exceeded the standards in river water downstream of the treatment plants, they were responsible for 69% of downstream exceedances.

Both chemicals were frequently recorded upstream of the sewage plant, but Fipronil was on average 25% higher in rivers downstream of the waste water treatment plant and Imidacloprid levels were raised by 50%.

Concentrations in sewage effluent were almost universally high, levels of Fipronil were slightly lower in the effluent than the influent, but levels of Imidacloprid were higher in the effluent than the influent.

Fipronil and Imidacloprid concentrations tended to be lowest between December and February and were strongly correlated with each other, which suggests they had the same source and that use was seasonally associated with warm months, which fits with the source being flea treatments.

The report concluded that the Government should give further consideration to policies around flea treatment use.

Perkins et al. (2024) used data from two of the treatment plants to calculate that 29.7 µg of Imidacloprid and 7.3 µg Fipronil was emitted in the sewage every day per every person served by the treatment plant. Scaled up to the UK population this would result in an estimate of 185 kg of Fipronil and 753 kg of Imidacloprid being emitted from sewage in the UK every year.

The UKWIR study did not record levels of breakdown toxins in the sewage, but we know from the Environment Agency's LCMS (Liquid Chromatography–Mass Spectrometry) water monitoring data that 30% of Total Fipronil in water bodies was in the form of Fipronil sulphone, sulphide and amine. Assuming the same proportions occur in effluent, this would give a Total Fipronil discharge of 264 kg. Proportions of Imidacloprid breakdown products in the pathways are unknown.

Five new toxic Fipronil breakdown products have been detected in sewage for the first time this year and a study reported that Desnitro-imidacloprid was ten times more abundant in sewage than Imidacloprid. These compounds have not been looked for in sewage or rivers in the UK.

Using LCMS data on the levels of Fipronil, Fipronil breakdown toxins and Imidacloprid in English waterbodies, with the annual volume of water discharged from English rivers, and extrapolating this to the UK level it is estimated that every year 740 (or 1,310) kg of Fipronil and 790 kg of Imidacloprid enters our rivers, and over the last 11 years about 8,140 (or 14,410) kg of Fipronil and 8,690 kg of Imidacloprid have travelled down British rivers into the sea.

In the last six years there has been growing concern around the world about the impacts of Fipronil and Imidacloprid in estuaries and marine sediments. Despite the chemicals being more toxic in saline water, there is a lack of studies on toxicity to marine species, and hence there are no Acute Environmental Quality Standards for marine habitats. However, there is a marine chronic standard for Imidacloprid, which is being frequently exceeded in British estuaries. The situation in marine sediments and in biota off the UK coast is not monitored and is unknown.

Fipronil and Imidacloprid are not currently listed for elimination or monitoring under the OSPAR convention on the Protection of the Marine Environment of the North-East Atlantic. Given the ongoing pollution consideration should be given to listing Fipronil and Imidacloprid.

Flea Treatments

Alongside Fluralaner, Fipronil and Imidacloprid now dominate the flea treatment market in the UK, in 2018 there were about 1,260 kg of Fipronil and 3,659 kg of Imidacloprid sold as flea treatments.

Assuming that sales have been static since 2020, there has in total been 39,939 kg of Fipronil and 51,689 kg Imidacloprid sold as flea treatments in the UK.

Two environmental assessments have been undertaken for Imidacloprid containing flea treatment products during their authorisation processes. Both assessments were very limited in scope and established environmental safety levels on the basis toxicity data from *Daphnia* waterfleas, which are exceptionally unaffected by Imidacloprid. The 4 µg/l predicted environmental concentration of Imidacloprid in the pour-on assessment should have been enough to set the red warning lights flashing.

Brown et al. (2025) reviewed the likely sources of Imidacloprid in waterbodies, the study was funded and partly authored by Elanco, the main Imidacloprid flea treatment manufacturer. They report that sales of Elanco Imidacloprid flea treatments have plateaued between 2014 and 2023, or declined from a 2016 peak, depending on your perspective. The paper concludes that “Current trends suggest further declines in surface water concentrations due to ongoing restrictions and responsible use programmes” and that “compliance with Environmental Quality Standards by 2039.....seems achievable in the UK given current trends”.

UK Agriculture

Between 2000 and 2025 about 322,000 kg of Imidacloprid was used in UK agriculture, there has been no significant agricultural use since 2014.

Fipronil has never been used as mainstream outdoor agricultural insecticide in the UK, and has not been used in any significant quantity since 2015. In total only about 730 kg was ever used in UK agriculture, in greenhouses and in nurseries.

Data on the behaviour of the two chemicals in the environment is rare, so no attempt was made to accurately estimate the rate at which agricultural residues still present in the environment are continuing to enter water bodies. Instead an extreme scenario was applied to calculate maximum possible parameters for the current volumes of these pesticides entering water bodies from agriculture, and a more realistic scenario was used to make a low estimate. Between 0.6 kg and 22.1 kg of Fipronil and 229 kg to 7,931 kg of Imidacloprid entered waterbodies from former agricultural uses in 2024.

The maximum possible estimated annual output of agricultural Fipronil could only account for 3% of the annual flux of Fipronil in rivers. Agricultural legacy Fipronil is not, on its own, a widespread significant concern.

It is not currently possible to accurately estimate the amount of Imidacloprid entering water from previous agricultural use, this pathway is likely to have been significant in contributing to environmental damage.

In other countries it is harder to assess what proportion of the Fipronil related pollution comes from flea treatments, as opposed to from agricultural use (current or past), in the UK this problem does not arise as flea treatments are the only potential source of large volumes of Fipronil. This key local evidential factor was apparently overlooked by some of the most significant assessments of the pathway analyses (EMA 2023, Joachim et al. 2025), leading them to underestimate the certainty that can be attached to the ability of flea treatments to enter waterbodies and cause very high levels of pollution.

Imported Food

UK testing of pesticide contamination on food produce in the previous 27 months was analysed – 5,023 samples (UK MRL Database).

There were no detections of either Fipronil or Imidacloprid on any cereals or cereal products, suggesting that these are not a significant import pathway into the UK for these insecticides.

There were no detections of either chemical on fruit and vegetables grown in the UK.

There were no detections of Fipronil and only five detections of Imidacloprid on fruit and vegetables grown in the EU.

There were three detections of Fipronil on fruit and vegetable grown in non-EU/UK countries, and all the detections were from legumes grown in South East Asia or South America. Concentrations in the food was low, but still exceeded the 5 µg/kg Maximum Residue Level (MRL).

There were 59 detections of Imidacloprid in fruit and vegetable grown in in non-EU/UK countries. This suggests that Imidacloprid is being widely used on crops imported into the UK. In some cases the levels of Imidacloprid were high, although the relevant MRL was not exceeded by any sample.

Assuming that the pesticide residues recorded in the imported samples are representative, it was estimated that in the 2024/5 financial year 0.15 kg of Fipronil (including Fipronil sulphone) and 4.83 kg of Imidacloprid was imported on vegetables and fruit.

It is possible that levels of Fipronil imported as residues on food were higher in the past, particularly on Tea, it is unlikely this would have amounted to more than a few kilograms a year, but may have contributed to levels in rivers due to the direct route.

Ornamental Plant Imports

Between 2020 and 2024 an average of 412,200 tonnes of plants were imported into the UK per year, 84% from the EU. Data on the levels of these chemicals in the imported products is very sparse and variable. There are no MRLs so there is no routine monitoring of pesticides on imported plants and cut flowers.

Based on fragmentary data a precautionary estimate is made of an annual importation of c.12.7 kg of Imidacloprid and 75.5 kg of Fipronil on plant products, but there is very low certainty, the actual figures may be considerably lower.

Some imported plants will be planted out of doors and pesticides will be able to reach water bodies through the soil, but most of these products will be kept indoors. Hand washing after handling cut flowers and vase water may be significant pathways. Ultimately much of these residues are likely to end up going to landfill, incineration or compost, although the chemicals can be re-released when compost is spread on the land.

Home and Garden Biocides

Fipronil and Imidacloprid are used in a small number of indoor pest control products.

With the exception of one product, Fipronil products could only be used by professional pest controllers, and the last authorisation of a Fipronil product ended in 2024 so there is no further input.

Imidacloprid is currently authorised for use in 14 products, poison baits for ants and cockroaches, these products are available to the public so may have a higher level of presence. There is also a professional-use-only wettable fly killing bait, which contains a high concentration of Imidacloprid.

Extrapolating the number of potential annual uses of these products in the UK from Local Authority data, an estimate of 1.5 kg per year is made to cover Fipronil inputs in recent years and a current annual Imidacloprid input of 32.5 kg/yr is estimated.

Imidacloprid biocides may account for up to 0.89% of current annual Imidacloprid inputs to the UK and, there are no longer any Fipronil biocides on the market in the UK, but historically they may have contributed 0.09% of the annual Fipronil input to the UK.

The route from these products to freshwater bodies is tenuous and convoluted as most of the product will end up in a landfill site, from which leaks into water courses are unlikely. Rain on patios and house flooding are potential routes into sewage works, or the wider environment.

Imidacloprid also has historic use as a garden pesticide and, although gardens cover just 1/12th of the area of arable land, there may still be a significant amount reaching water bodies from this legacy source. Inappropriate disposal of old Imidacloprid pesticide products, down sinks or drains, has the potential to add to current Imidacloprid pollution levels, but would create a pattern of rare peaks, rather than the widespread, consistent pollution levels currently observed.

Preservatives

It is possible that some Imidacloprid would enter the UK in building materials imported from the USA or other distant countries, but it seems highly unlikely there would be significant quantities involved; the route into rivers and lakes is particularly tenuous.

Fabrics

There have been no reported cases of Fipronil or Imidacloprid being detected in fabric or new clothing, and Fipronil and Imidacloprid used in growing cotton in not detected in the clothing product. Despite patents for Fipronil and Imidacloprid as insecticidal treatments for clothing, this does not appear to have been commercialised. It is safe to assume this is not a significant source of pollution.

Imported Pets

Between 350,000 and 640,000 Dogs and 32,000 and 370,000 Cats are brought into the UK every year. Flea treatment use is recommended before, during and after travel. Assuming that 50% have recently been treated with Imidacloprid and 50% with Fipronil then up to between 24 kg and 52 kg of Fipronil and 45 kg to 95 kg of Imidacloprid could be being imported on Cats and Dogs every year. This represents 2.35% of Fipronil and 1.92% of Imidacloprid being imported into, or sold in, the UK. This input will to some extent be balanced by pets leaving the UK, although there are no figures available for Cat or Dog export numbers.

Illegally Imported Products

While illegally imported flea treatments and pesticides have been seized in the UK, at the moment there is no evidence that this is a significant pathway.

Industrial Sources

Although less than one tonne of Fipronil and between two and 16 tonnes of Imidacloprid are exported every year, this still suggests that products containing these chemicals are being manufactured in the UK.

It is possible for Fipronil and Imidacloprid to be emitted from chemical manufacture facilities, or during the transit of the chemicals. There are no pollution incidents or other data to suggest this is happening, but environmental permitting is not public information and may be enabling some emissions to occur into the environment.

It is not possible to estimate if there is any pollution arising from the manufacture or transportation of these chemicals in the UK, but the pattern of pollution – widespread rather than highly localised - strongly indicates that this is not a major component of the observed pollution, so it is not considered further.

Conclusions on Pathways

To conclude this analysis of potential sources of Fipronil and Imidacloprid pollution:

- Only 4.8% of Fipronil and 1.4% Imidacloprid inputs to the UK are likely to originate from non-flea treatment uses.
- If it is assumed that all of the non-flea treatment UK imports end up in rivers before they degrade, then they could still only account for 10.4% of Fipronil and 6.3% of Imidacloprid river pollution levels.
- On the other hand about 44% (or 77%) of the total volume of Fipronil, and 21% of the total volume of Imidacloprid, sold in UK flea treatments in the last 12 years entered waterbodies it would explain 100% of the pollution observed in the last 11 years.
- The data suggests that currently 42% of Fipronil flea treatment may end up in rivers.
- Extrapolating from a single emissions study, swimming Dogs may contribute 1.3% (or 0.73%) of Fipronil estimated to be in rivers and 5.4% of Imidacloprid.
- Using the flea treatment pathways for Fipronil as a template for the more soluble Imidacloprid, it appears that current Imidacloprid pollution levels in rivers could be almost entirely attributable to flea treatment use.
- When the Covid impacted 2020 water monitoring data is set aside, there is a correlation between the in-year sale of Imidacloprid flea treatments and the level of Imidacloprid pollution recorded in rivers, however due to the unknown agricultural legacy inputs declining at the same time this is difficult to interpret.
- Even with worst case assessments, tackling non-flea treatment sources of the chemicals can only make a tiny, although potentially useful, contribution to achieving the necessary c.98% reduction in Fipronil and c.84% reduction in Imidacloprid pollution from current levels.
- Efforts to get this situation under control must focus on massively reducing the amounts of these two flea treatments getting into water bodies.

Future Trends in Pathways

There are no observable recent trends in Fipronil flea treatment use and waterbody pollution, although there are fluctuations, they have been, in essence, stable.

There is no indication that there has been any overall or recent significant reduction in either input or output of Fipronil. Nor is there any indication that levels will start to decline in the near future.

Imidacloprid does show a significant decline in river pollution levels over the last nine years. The decline is steeper than the recent decline in Imidacloprid flea treatment sales, suggesting that the decline in river pollution levels at least partly due to declining input from legacy agricultural use.

At recent rates of decline Imidacloprid flea treatments sales would reach zero in 2043 or 2067, resulting in 17 or 41 more years of Imidacloprid pollution. However, it is unrealistic to expect the Imidacloprid manufacturers to allow the decline and loss of their most important products and a market worth over £60m/yr in the UK alone.

While the more recent, 2016-24, trend in reduction in Imidacloprid flea treatment sales may result in regulatorily acceptable river pollution levels in 2039, the pollution reduction model predicts that there would still be 10% of samples failing the chronic freshwater EQS and 18% failing the acceptable field concentration (AC_{field}). If the shallower 2014-24 decline rate is projected forward then this results in a 41% decline in river pollution by 2039, 33% of samples would fail their freshwater chronic EQS, 2% would fail the acute EQS, 42% would fail the acceptable field concentration (AC_{field}) threshold and 12 percent of saline samples would fail their chronic EQS, which is unlikely to be regulatorily or morally acceptable.

Future trends in Imidacloprid sales are not predictable, in addition the continued reduction of river pollution levels due to declining agricultural legacy inputs cannot be relied upon as this source may already have declined down to a low level. Even if pollution levels do continue to decline without intervention, they would still be entering and persisting in the environment, resulting in decades of continuing damage.

Application of the Environmental Principles

Environmental Principles are in place to address issues such as this. The Government has produced guidance on how the principles should be applied in the UK.

The Precautionary Principle

The UK guidance on applying the precautionary principle says “Where there are gaps in the scientific evidence base, this should not be used as a reason for inaction if there is a plausible risk of serious or irreversible harm.”

The evidence is already clear, levels of Imidacloprid and Fipronil in UK waters are higher than the levels known to damage populations of aquatic insects, damage that may be irreversible,

hence the Precautionary Principle may no longer be relevant to any general decision to reduce the levels of pollution. However, regulatory action could rely on the Precautionary Principle to address sources, pathways or risks that have yet to be fully quantified, such as threats to birds and herbivorous invertebrates.

The Prevention Principle

Environmental damage has been confirmed, it is long-term and widespread, and there are clear ways that the harm can be prevented, therefore the Prevention Principle applies at this stage. The Government guidance states that “The prevention principle is applicable where a policy has the potential to cause a negative environmental effect. In circumstances where damage has already occurred, the principle should be used to prevent further damage from occurring and ensure that damage does not spread.”

Pollution Reduction Options

Measures capable of contributing to a c.98% reduction in Fipronil pollution and a c.84% reduction in Imidacloprid pollution from current levels were examined.

Reducing Flea Treatment Pollution

Preventing at Source

Revoking the authorisations for Fipronil and Imidacloprid flea treatments would be the quickest and most effective way of significantly reducing inputs into water bodies. Changing the authorisations to veterinary prescription-only may reduce use to some extent, but there is unlikely to be any option other than completely revoking the authorisation for Fipronil. It is likely that a ban on Fipronil use will shift users onto Imidacloprid, which would make it harder to achieve the necessary reductions in Imidacloprid emissions. Hence a full ban on Imidacloprid flea treatments is also likely to be required.

By Preventative Behaviour

There is no clear evidence that public or veterinary behaviour in relation to Imidacloprid and Fipronil flea treatment use and prescribing has become significantly more protective of the environment, although this may be part of the cause of reduced Imidacloprid flea treatment sales. Measures could be taken to change the behaviour of the public in relation to managing the flea treatments. Measures that users could take that would reduce pollution include:

- Using gloves when applying products and disposing of the gloves to landfill.
- Not allowing Dogs to swim in water bodies for two months after they are treated.
- Sending pet bedding of treated animals to landfill rather than washing it.
- Not washing pets in baths or basins for two months after they have been treated.
- Not stroking pets or allowing them to touch clothing for a month after treatment, or wearing protective clothing (including gloves) when doing so and disposing of that to landfill.

It is unlikely that the uptake of such measures will be sufficient to reduce emissions to an acceptable level voluntarily, regardless of what warning labels are put on packets.

There are no obvious examples of voluntary initiatives successfully reducing environmental pollution.

Regulatory measures could create new prosecutable offences generally or in 'water protection zones'. This could include requiring Dog proof fences along all rivers where there is nearby public access, banning Dogs from SSSIs and other wetland nature reserves, and making it an offence to allow treated pets to swim in water bodies or go outdoors, to wash contaminated pet bedding, to put out fur for birds, to stroke treated pets without disposable gloves, or to wash treated pets.

These options are likely to be expensive, highly unpopular, counterproductive, unenforceable or all of the above.

Preventing by Sewage Treatment

The relevant environmental agencies have the power to require those holding water discharge permits/authorisations to cease water discharge or to take additional action to prevent pollution.

Trade effluent from:

- pet grooming businesses,
- Dog wash facilities,
- Dog walking businesses,
- veterinary practices,
- kennels and catteries,
- pet shops,
- pet hospitals,
- animal shelters and rescue centres, and
- factories handling or manufacturing the relevant chemicals,

will or may contain high levels of Fipronil, Imidacloprid and other flea treatment chemicals. It is unlawful to discharge trade effluent without consent/authorisation from the sewage undertaker.

As persistent insecticides in trade effluent Fipronil, Imidacloprid, and potentially other flea treatment active ingredients, could be added to the prescribed/priority substances lists. A review of trade effluent consents could be undertaken to ensure that the relevant premises (see above list) are properly consented, and that the emissions of Fipronil, Imidacloprid and other flea treatment chemicals in trade effluent are being adequately controlled.

Trade effluent that does not enter the sewage system, but instead travels through private treatment plants or septic tanks does not require specific consent; pollution control is maintained through the permitting/authorisation of the discharge of treated sewage to a river or groundwater. Sewage discharged to waterbodies should not contain toxic levels of insecticides. Permits and authorisations for discharges of sewage from treatment facilities receiving trade effluent from categories of premises mentioned above or receiving significant volumes of domestic waste water, could, in line with the requirements of water quality regulations, be reviewed and revoked or amended. This would enable decisions to be taken with regard to the correct treatment of contaminated effluent.

Given the existing widespread exceedances of accepted safety limits for Fipronil and Imidacloprid in rivers, and the fact that current sewage treatment processes do not remove a

significant proportion of the Fipronil and Imidacloprid from the influent, it is very likely that it will be hard to find a sewage treatment plant that is able to accept trade waste containing Fipronil or Imidacloprid and not add to, or create, unacceptably high pollution levels in the receiving water body.

Activated carbon filters could be introduced into Sewage Treatment Plants to remove Imidacloprid and Fipronil from waste water. Fipronil could also be removed by applying the solar/photo-Fenton process using ferric citrate complex, which has shown to be quite effective at reducing Fipronil levels, as have membrane bioreactors. It is likely that a considerable amount of work would need to go into design and testing to ensure that new processes were effective and durable; at the moment there are some pilot activated carbon filter installations in UK sewage plants.

At a very conservative estimate introducing active carbon techniques to c.9,000 sewage plants is likely to cost in excess of £27 billion and increase annual treatment costs by £400 million. The introduction of this experimental technology is likely to take decades, so there would still need to be interim pollution control measures before they all came on stream.

Reducing Agricultural Pollution

Taking 30m wide strips of arable land adjacent to all ditches, streams and rivers out of production and putting them into pasture or grassland could significantly slow the rate of Imidacloprid flowing into rivers and the sea. This measure would be expensive and may have a minor impact on food production. Given that agricultural legacy Imidacloprid will have been in decline, the resulting water quality improvement may be limited, although it would have the benefit of reducing future pesticide pollution of water bodies.

Reducing Pollution from Minor Pathways

‘Maximum Residue Levels’ for Fipronil and Imidacloprid on imported food could be reduced to the Limits of Detection and detections enforced.

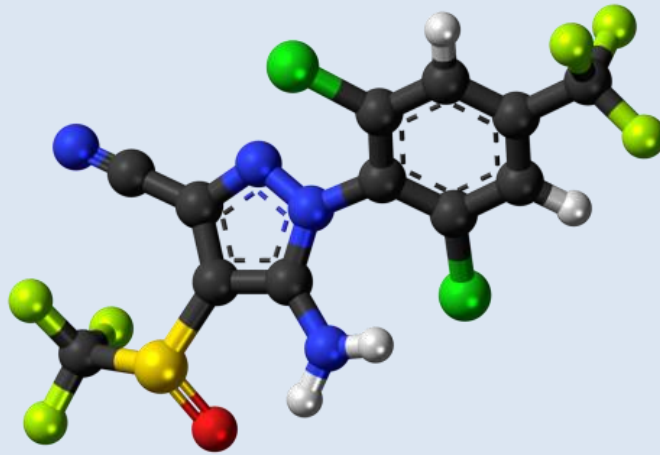
Limits could be set for the ‘Maximum Residue Levels’ for Fipronil and Imidacloprid on ornamental plants (e.g. potted plants, saplings and cut flowers). However, pesticide residues in these products are unregulated and the MRL legislation would have to be amended.

Changes to MRLs could be subject to WTO consultation and potential challenge, so are not short-term solutions.

All authorisations for the use of Imidacloprid as a domestic pesticide could be revoked, or at least restricted to professional pest controllers.

The importation of pets could be suspended from countries where Imidacloprid or Fipronil are authorised as flea treatments, or they could be thoroughly washed as they come through customs and the resulting water disposed of at a special facility.

As a PFAS ‘forever chemical’ action could be taken to restrict the use of Fipronil under the Government’s 2026 PFAS Plan.



Given the long range dispersal of these two chemicals in water, air (Fipronil) and on Cats and Dogs, the levels of bioaccumulation exhibited by Fipronil, their toxicity, and their persistence in the environment (and the even greater persistence and toxicity of their commonest breakdown compounds), both of these chemicals could be submitted to the Stockholm Convention secretariat for assessment as Persistent Organic Pollutants to be added to the annexes for international control measures. This would support MRL action, but would be a long-term process.

Application of the Veterinary Medicines Regulations 2013

The authorisation of veterinary medicines in the UK is governed by the Veterinary Medicines Regulations 2013 (VMR 2013). EU legislation, particularly Regulation (EC) No 726/2004, is also applicable in Northern Ireland.

The Veterinary Medicines Regulations 2013 allow for the authorisation of veterinary medicines in one of four supply categories; POM-V restricts a product to veterinarian prescription after a clinical assessment of the animal by a vet, POM-VPS requires a prescription, but this can be made by a pharmacist or other suitably qualified professional, NFA-VPS requires professional advice which means the medicine can be bought over the counter or online without a prescription, but has to be approved by a qualified staff member, AVM-GSL has no restrictions and products can be bought off the shelves by the public without a prescription or any professional involvement.

Royal College of Veterinary Surgeons (RCVS) guidance was tightened in September 2023 to clarify that for antiparasitic medicines prophylactic prescribing and prescribing without a prior physical examination is inconsistent with professional standards; this change was made partly due to concerns about environmental harm. However, a range of Fipronil and Imidacloprid products are available without a prescription so this measure is likely to have the unintended effect of pushing people away from the prescription only treatments (e.g. Afoxolaner and Sarolaner) and towards the more readily available Fipronil and Imidacloprid treatments.

Authorisation

When deciding whether to approve or refuse an application to authorise a Veterinary Medicine the Secretary of State (VMD) “must refuse” to authorise the product if any one of three equally weighted criteria are failed:

1) Benefit-risk Balance.

In addition to Fipronil and Imidacloprid 16 chemicals are authorised for use as flea treatments on Cats and 18 for use on Dogs in the UK. Eighteen of these chemicals are currently on the market as flea treatments in the UK. In addition 13 other flea treatment chemicals are approved in the EU. Flea and tick resistance to the chemicals is not generally a significant issue – although there is evidence of flea resistance to pyrethroids and resistance to, and reduced efficacy of, Fipronil.

There are other ways to manage fleas and ticks on pets including:

- Plant extract and mechanical flea and tick repellents;
- Physical traps and immobilisers;
- Flea combs;
- Tick removers;
- Regular vacuuming;
- Hot washing pet's bedding and other fabrics;
- Household flea sprays.

With many alternatives available it is not necessary to use Fipronil or Imidacloprid as flea treatments.

It should be noted that some of the plant extract based repellents contain chemicals that have insecticidal properties and are subject to environment risk concerns, but they have not been registered as veterinary medicines.

All approved flea treatment chemicals have been assessed as being Very Toxic to aquatic life by chemicals authorities (ECHA or EFSA) – except Nitenpyram and Pyriprole which have not been assessed by the agencies.

Despite recommendations made in 2002 by the Environment Agency and again in 2017 by Buglife there has been little progress in understanding the effects of flea treatments, other than Fipronil and Imidacloprid, on the environment.

Other than Imidacloprid and Fipronil, the only flea treatments routinely monitored in the UK environment are Diazinon (Dimpylate), Spinosad, Piperonyl butoxide, pyrethrins, Deltamethrin (not in all circumstances) and Permethrin.

In the England 2014-2024 LCMS dataset Diazinon was recorded in 52.6% of samples, it was above the Chronic EQS in 6.9% of samples and above the Acute EQS in 1.5%. Currently rivers in all regions of England are experiencing exceedances of invertebrate mortality endpoints for Diazinon, in 59% to 99% of water samples.

Sheep dip use is the most probable origin of Diazinon, it appears that the authorised flea treatments collars are no longer on the UK market. In January 2025 Natural Resources Wales banned disposal to land of used Sheep dip containing Diazinon due to high detections in the River Wye.

A 2023 study by the Rivers Trust and Wildlife and Countryside Link found that Permethrin pollution is causing a limited number of exceedances of safe limits.

In the England LCMS dataset Spinosad was recorded in 1.7% of samples, often associated with salad production, there are no EQS standards.

Piperonyl butoxide was recorded in just 0.1% of samples in the England LCMS dataset (all in 2023).

Afoxolaner, Selamectin, Flumethrin, Lotilaner and Sarolaner are all Highly Toxic to aquatic life and currently used as authorised flea treatments in the UK with sales of between 100 and 500 kg a year, there is no publicly available evidence about their pollution levels in the UK.

Thirteen chemicals currently authorised for use in UK flea treatments are not currently monitored in waterbodies.

Fluralaner, another PFAS 'forever chemical', is the third commonest domestic pet flea treatment in the UK, with 2,024 kg of sales in 2019. Fluralaner can be released into the environment by treated pets, at levels that exceed water quality standards, but we have do not know if there is any in the wider environment because no one has looked.

Diepens et al. (2023) is the only study looking at pollution pathways for any flea treatment alternatives to Fipronil and Imidacloprid. They found Fluralaner in in Dog urine, water bodies where Dogs had swam, and in animal hair in bird's nests, while Afoxolaner was detected in urine, but not in water or nests. In addition Guldmond et al. (2019) detected Fluralaner, Permethrin, Piperonyl butoxide and Pyriproxyfen in dead nestling birds; two samples of animal hair from the nests were also examined, in which Permethrin and Piperonyl butoxide were detected.

The swimming pathway finding is significant because Fluralaner was administered in tablet form rather than as a pour-on, meaning that we cannot assume that only externally applied treatments pose a risk to the environment. Although the pathway risk for tablets appears to be lower than for pour-ons and collars, this has not been demonstrated. The finding also raises concerns about the EU regulatory environmental risk assessment for Bravecto pour-on which concluded that no emission of Fluralaner to water was likely after the application site had dried.

An EU regulatory environmental risk assessment has also been completed for a Selamectin pour-on, which was only based on toxicology data from the notoriously insecticide robust *Daphnia* waterflea. It passed the assessment as a result of a decision that 50% of the water fleas dying was an acceptable impact, and some very creative, but not at all reassuring, mathematical manipulation.

While there are currently a large number and variety of chemicals authorised for flea treatment use, there is no guarantee that any of them would be safe to the environment if they were to be used in the volumes at which Fipronil and Imidacloprid are currently being used. However, with so many authorised products and with different application methods, modes of toxicity, persistence and dispersal characteristics, there is a good chance that one or more will be found to present a significantly lower environmental risk profile than those that Fipronil and Imidacloprid have realised.

Sufficient data and analysis is required to establish the toxicity levels to a range of vulnerable organisms and to predict environmental pollution concentrations for all flea treatments. This information must be required for all new authorisation applications for flea treatments. Without this information neither the balance test, nor the environment test can be meaningfully applied.

There is a risk that shifting use from one chemical to another will only result in the damage to the environment being shifted from one chemical to another, less well understood, chemical. It is therefore necessary to consider how to reduce overall use of all flea treatments that are very toxic to aquatic life.

The benefit-risk balance must be undertaken on the basis that the regulations will be applied to other flea treatment toxins and that their environmental safety will be assured, otherwise the benefit to the environment of taking action to ban Fipronil and Imidacloprid may not be realised in the mid-term.

It is necessary to consider how to reduce overall use of all flea treatments that present a potential risk to aquatic life, and to give serious attention to promoting, developing and encouraging the use of treatments and methods, chemical and non-chemical, that do not rely on extraordinarily potent and persistent generalist insecticides for their success

The Secretary of State can make an “exceptional” marketing authorisation “if there is no other product with a full marketing authorisation for the indicated condition in the target species”. So if, at some point in the future, there is a risk that there will be no chemical based flea treatments available, and there is clear evidence that non-chemical approaches are unable to provide a sufficient level of health protection, then a temporary authorisation could be made and kept under annual review until a less harmful option is found.

2) Unnecessarily, Undesirable Effect on the Environment.

When assessing any application for a marketing authorisation of a flea treatment the Secretary of State must refuse the application if it “will have an unnecessarily undesirable effect on the environment”.

The evidence of unnecessary and undesirable effects is now clear for Fipronil and Imidacloprid.

3) Risks to the Environment Not Sufficiently Addressed.

The Secretary of State must refuse to authorise a veterinary medicine if the risks to public or animal health or to the environment are not sufficiently addressed.

Any doubt remaining about the environmental impacts only serves to underline that the authorisation process has not sufficiently addressed the risks to the environment.

It is already the established position of the UK Government (VMD) that there is sufficient evidence to justify a significant redrafting of the Environmental Risk Assessment process that is applied to veterinary products “the VMD acknowledge that there are still several evidence gaps remaining we now consider that there are sufficient data to support a review of the internationally agreed Environmental Risk Assessment guidelines”. This would not be

necessary if VMD believed that environmental risks for the products had been sufficiently addressed.

Conclusions of Authorisation Tests

There is a clear path for new applications for authorisations for Fipronil and Imidacloprid flea treatments to be refused by the Secretary of State under Schedule 1, Paragraph 24 (2) of the 2013 Act. It appears that the products would either not meet the benefit-risk balance, failing that they have an unnecessarily undesirable effect on the environment, or, if there is a lack of certainty with regard to one of the chemicals or in relation to a particular product, then this would be because the assessment report was unable to sufficiently address the environmental risk – in which case the Secretary of State must refuse the application.

Other chemicals in new applications for flea treatment authorisations should also be required to provide data on toxicity and environmental fate, and should be accompanied by a plan to assess the environmental fate and pollution levels in the UK after approval.

If special precautions must be taken in order to avoid a product causing any unnecessary risk to the environment, then, if a market authorisation is granted, the Secretary of State must categorise a product as for prescription only.

Because there are so many alternative treatments available the conditions of Schedule 1, Paragraph 26(1) of the VMR 2013 are not met, so there is no need to consider making an “exceptional” marketing authorisation.

Assessment Reports

As new information of importance that relates to the environmental safety of Fipronil and Imidacloprid veterinary medicinal products has become available, the legislation requires the Secretary of State to update the assessment reports for these products.

While the regulators expect assessment reports to contain the information set out in the VICH guidelines, the legislation allows for the inclusion of whatever information the Secretary of State considers to be relevant. In this case each assessment report can be updated by the Secretary of State with the new evidence linking the chemical and category of products to environmental damage, the manufacturer could be given 2-3 months to respond and provide any relevant pharmacovigilance or toxicology information they have gathered or compiled.

The revised assessment reports would form the basis for taking further regulatory steps to eliminate the environmental harm and risks.

Suspension and Revocation

The tests used to determine if existing products should continue to be used are similar to those applied to new applications for authorisations. However, unlike new authorisations, when reviewing the assessment report, in England, Wales and Scotland (GB) the Secretary of State is enabled, not required, to take action, while in some circumstances in Northern Ireland the Secretary of State must take action.

This is complicated by the fact that in 2024 the legislation was amended so that in GB the regulatory routes to action are now subtly different to those in Northern Ireland.

In GB if the Secretary of State believes there is a negative benefit-risk balance then the marketing authorisation can be revoked or suspended or the supply of the product can be prohibited. If the Secretary of State believes that urgent action is needed to protect the environment then they can, on a temporary basis, suspend the marketing authorisation, or restrict the supply or use of the product. In addition the marketing authorisation can be revoked or suspended by the Secretary of State if the “pharmacovigilance system in relation to a veterinary medicinal product is inadequate”. Authorisation holders have not submitted any of the wealth of available evidence on this environmental safety issue to the VMD, so there appears to be a sound argument that their pharmacovigilance has been inadequate.

In Northern Ireland the Secretary of State must suspend an existing marketing authorisation if the risk-benefit balance is unfavourable. The Secretary of State may suspend a NI marketing authorisation at any time if satisfied it is necessary for the protection of the environment. In addition the marketing authorisation can be suspended by the Secretary of State if the “pharmacovigilance system in relation to a veterinary medicinal product is inadequate”. EU Regulations allow Member States to suspend the use of a veterinary medicinal product on its territory where urgent action is essential to protect the environment.

Regardless of the UK country in question, 28 days after being suspended, if there has been no appeal, the Secretary of State can choose to revoke a marketing authorisation.

Application of the Water Quality Regulations

The 2025 Independent Water Commission identified over 100 pieces of legislation relevant to how water is regulated which apply in England and in Wales and concluded that this was an “overly complex regime”. When Scotland and Northern Ireland are added to the picture the complexity increases significantly.

Despite the complexity, at a summary level all four countries operate broadly similar regulatory approaches water quality. In each country there is a national regulator with responsibility for water pollution control, and that regulator has an aim or purpose that includes, protecting the environment and reducing pollution and its effects, so as to contribute to sustainable development (the latter more so in Wales and less so in Northern Ireland). The aims are established in law, except in Northern Ireland where the regulator is established through NI Government policy.

In England and Wales the most directly relevant legislation in relation to maintaining water quality is the Environmental Permitting (England and Wales) Regulations 2016. They establish a framework for regulating a defined set of environmentally risky activities through a unified permitting system. Activities at facilities are covered, including most significantly in this context, water discharge and groundwater activities through which polluting matter is released to surface waters or groundwater. Accordingly, where pollution of receiving waterbodies arises from the operation of a water discharge or groundwater activity, that activity must be properly authorised and controlled under the environmental permitting regime.

Permits may be standard rules or bespoke, and they authorise only the specific activities assessed and granted. Any pollution outside that scope is unlawful, regardless of whether it is expressly prohibited elsewhere. The EPR provisions create a mandatory legal architecture that has pollution prevention at its core.

Regulation 12 prohibits the operation of water discharge and groundwater activities except in accordance with an environmental permit, and Regulation 38(1) makes it an offence to fail to comply with permit conditions.

Discharges to groundwater are even more strictly controlled by the EPR 2016 than discharges to rivers; the EA and NRW must, in exercising their relevant functions, “take all necessary measures — a) to prevent the input of any hazardous substance to groundwater, and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater”.

In England and Wales, sewage treatment facilities and septic tanks, that do not receive trade waste and that discharge less than or equal to two m³/day to ground water or five m³/day to surface water do not require a permit as long as they comply with General Binding Rules established by the Regulations. These rules include “not causing pollution”. Plants emitting up to 20m³/day of non-trade effluent can operate under a standard rules permit. This can require the operator to report to the agency any “emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution”, however monitoring is often limited to weekly visual inspections, which will not detect colourless toxins at parts per billion levels, or the associated loss of invertebrate life. This clear vigilance gap is a condition that is not fit for purpose in a permit that regulates the emission of very highly toxic insecticides. Sewage emissions that include trade effluent or that are greater than 20m³/day are subject to bespoke permits, which will include a variety of conditions, often including set limits on the emission of specified chemicals to avoid pollution occurring.

The most directly relevant regulatory framework in Scotland is the Environmental Authorisations regime under the Environmental Authorisations (Scotland) Regulations 2018, which broadly mirrors the EPA 2016. It establishes a system for regulating specified activities that pose environmental risks, including water discharge and groundwater activities through which polluting matter may enter rivers, lochs, or groundwater. Any such activity must be authorised by SEPA, and activities outside the scope of an authorisation are unlawful. SEPA has powers to impose standard conditions or bespoke conditions on authorisations, and it may take enforcement action for any non-compliance. In applying the regulations SEPA must take into account the general aim “that all appropriate measures are taken to prevent or, where that is not practicable, to minimise environmental harm”.

UK permitting and authorising conditions are substance-based, while Environmental Quality Standards (EQSs) established under the Water Framework Directive may be used to inform what levels are acceptable in the environment, and hence can be allowed to be emitted in permits, the prevention of pollution is not EQS-dependent – the absence of a statutorily adopted EQS cannot be relied upon to delay or negate the need to apply the measures in the EPR 2016 or EAR 2018 so as to prevent pollution. Any emission likely to cause ecological damage must be considered a potential pollution event, triggering regulatory action under the relevant regulations.

For example, Regulation 57 of the EPR 2016 authorises the EA and NRW to take preventative or precautionary action if there is a risk of serious pollution - “If the regulator considers that a

risk of serious pollution exists as a result of the operation of a regulated or otherwise authorised activity, it may arrange for steps to be taken to remove that risk”.

Fipronil and Imidacloprid flea treatment emissions have not to date been subject to specific environmental permit conditions or set discharge limits. Their emission from sewage facilities outside permit limits constitutes an unlawful discharge. The authorisation of a flea treatment by the Veterinary Medicines Directorate does not exempt operators from compliance with environmental permits. The water quality regulations operate independently of VMD approvals, and the emission of substances capable of causing pollution remains unlawful if not authorised under the permit/authorisation. Neither does the existence of an authorisation for the use of a chemical by another authority (VMD) provide a legal justification for the relevant environment agency to allow pollution to occur. The permitting and authorising systems do not operate on a “what is not prohibited is permitted” basis. If the discharge is outside the scope of the permit/authorisation, e.g. it is likely to contribute to significant pollution, then its emission has not been lawfully authorised and the affected permits, authorisations and rules would need to be reconsidered and varied or revoked.

Section 93 of the Water Resources Act 1991 (WRA 1991) enables the EA and NRW to designate ‘water protection zones’ and to prohibit or restrict activities, and to impose requirements on people undertaking activities to take steps to help achieve applicable environmental objectives, in such a zone. The purpose has to be to prevent or control “the entry of any poisonous, noxious or polluting matter into controlled waters [rivers, lakes, ponds, coastal waters and groundwater]”.

In addition, Sections 161 and 161ZA of the WRA 1991 enable the EA and NRW to undertake works and operations to prevent any poisonous, noxious or polluting matter or any waste matter from being present in, or likely to enter, any controlled waters or to remedy pollution impacts.

The ‘applicable environmental objectives’ in relation to sections 93, 161 and 161ZA are defined in regulation 13 of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and include preventing deterioration of the status of water bodies, and specific objectives established under the Water Framework Directive, including achieving good ecological and chemical status, and reducing pollution from priority substances. Objectives for groundwater are again stricter and include preventing or limiting the input of pollutants and reversing any significant and sustained upward trend in the concentration of any pollutant in groundwater. Objectives are further defined for each water body in the River Basin District Management Plans.

In Scotland retained sections of the WRA 1991 (exercised under the Water Environment and Water Services (Scotland) Act 2003), confer similar zone related and Water Framework Directive related duties and powers on SEPA, and captures both point and diffuse pollution where it causes environmental harm, especially for substances toxic at extremely low concentrations.

In Northern Ireland, discharges to water are regulated under the Water (Northern Ireland) Order 1999, including offences for the entry of poisonous, noxious or polluting matter into controlled waters, and the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017, which establish objectives for ecological and chemical status of waterbodies. Northern Ireland Environment Agency (NIEA) can take preventative or remedial action to protect water quality and can require authorisations for point-source discharges that

pose significant environmental risk. Smaller discharges, such as low-volume domestic sewage or minor trade effluents, may be subject to standard rules or exemptions, similar in effect to the General Binding Rules in England and Wales. However, unlike EPR 2016, Northern Ireland does not have a single consolidated “standard rules permit” regime, and authorisations are more commonly issued for larger discharges that could significantly impact water quality. Despite differences in thresholds, all discharges, regardless of volume, remain subject to the statutory duty to prevent pollution, and any discharge likely to cause ecological harm is unlawful.

Until EQSs are statutorily adopted in the UK in relation to Fipronil and Imidacloprid in waterbodies then they do not constitute a component of the chemical status objectives, but they are very relevant to the achievement of good ecological status. The risk of ecological harm from the input of flea treatments from swimming Dogs and other diffuse sources should also be considered alongside sewage inputs when framing the actions needed to meet the RBMP objectives in all the countries.

The EA, NRW, SEPA and the NIEA are not merely empowered but are statutorily mandated to prevent the entry of polluting matter into controlled waters. To permit the continued, unmonitored discharge of these highly toxic insecticides — capable of significant ecological harm at very low concentrations, as demonstrated in multiple regulatory and scientific assessments — ignores the 'strict liability' nature of water pollution offences. The law requires a precautionary and preventative approach; failure to act to prevent flea treatment pollution constitutes a failure of the regulators’ primary purpose to protect the environment for future generations.

Application of the Habitats Regulations

Background

The Habitats Directive 1992 and Birds Directive 2009 require EU Member States to put in place protection measures for Natura 2000 sites and listed species of plants and animals. Since Brexit these provisions are set out in domestic UK law by the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations). Indeed the requirements were extended to also cover Ramsar sites and their features in the Planning and Infrastructure Act 2025.

Protection of Natura 2000 and Ramsar sites

Any new plan or project that may have a significant effect on a Natura 2000 site, on its own, or in combination with other plans or projects, must be subject to a Habitats Regulations Assessment of its implications in view of the site's conservation objectives. The Directive does not define ‘plan’ or ‘project’ but the courts have determined that authorisations that will result in the release of chemicals into the environment should be subject to a Habitats Regulations Assessment to ensure that the competent authority (VMD in this case) has made certain that it will not adversely affect the integrity of any Natura 2000 site.

Protection of Habitat Directive Listed Species

In addition to the protection of sites, for the species listed in the Directive the UK must “take the requisite measures to establish a system of strict protection”, including safeguarding the ecological functionality of their breeding sites and resting places.

Species protected by the Habitats Regulations which may be impacted by Fipronil and Imidacloprid pollution, and which should be part of the Habitats Regulation Assessment, include bats (particularly species feeding in wetland areas), Pool Frog, Great Crested Newt, Natterjack Toad, Southern Damselfly, White-clawed Crayfish and Little Whirlpool Ram's-horn Snail.

Protection of Birds Directive listed species

The Birds Directive includes a duty for Member States to avoid pollution affecting birds, unlike the Habitats Directive, this is no longer applicable law in the UK, however policy decisions should consider our commitment to the EU in the TCA to “not weaken or reduce, in a manner affecting trade or investment between the Parties, its environmental levels of protection”.



Application of the Habitats Regulations in Current Situation

A Habitats Regulations Assessment is required for all authorisations of veterinary medicines that may result in the release of chemicals into the environment.

A Habitats Regulations Assessment enables the Competent Authority (VMD) to:

- determine if impacts will not occur,
- determine if impacts will occur whether they can be negated by mitigation measures,
- or refuse the authorisation.

In this case as there is already evidence of Fipronil and Imidacloprid causing environmental harm at levels that occur commonly in UK waters, indeed almost universal levels in the case of Fipronil, so the Screening Assessment for a product containing these chemicals will indicate the need a full Appropriate Assessment.

If, having completed the Appropriate Assessment, the VMD was still unable to be certain that no impact would occur to Natura 2000 or Ramsar sites, then, unless the Government agrees

that the very high hurdle of ‘overriding public interest’ was been met, then the authorisation would have to be refused.

Following established guidance, the assessment of the potential impacts of these products on the relevant species listed in the Habitats Regulations should be incorporated into this assessment process.

International Agreements and Flea Treatments

The regulation of internationally traded chemicals and products always needs to be considered in light of the UK’s international commitments.

Given that Fipronil and Imidacloprid are both highly hazardous, persistent substances (and pesticides) that are polluting rivers, lakes and seas, and are causing damage to biodiversity, there is a clear expectation from the environmental conventions that the UK should take regulatory action to prevent and eliminate the pollution.

International Conventions

The United Nations Sustainable Development Goals (UN SDGs) 2015 committed the UK to goals and targets, including:

- improve water quality by reducing pollution,
- minimise release of hazardous chemicals and materials,
- protect and restore water-related ecosystems,
- achieve the environmentally sound management of chemicals,
- significantly reduce marine pollution of all kinds,
- halt biodiversity loss,
- ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems.

The Convention on Biological Diversity 1992 commits the UK to:

- develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations,
- regulate activities where a significant adverse effect on biological diversity has been determined.

The subsidiary Kunming-Montreal Global Biodiversity Framework 2022 sets targets for the UK to:

- Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration.
- Reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: ... (b) by reducing the overall risk from pesticides and highly hazardous chemicals by at least half, including through integrated pest management, based on science, taking into account food security and livelihoods.

The Stockholm Convention 2001 on Persistent Organic Pollutants commits the UK to: take measures to regulate with the aim of preventing the production and use of new pesticides or new industrial chemicals which, taking into consideration the criteria in paragraph 1 of Annex D, exhibit the characteristics of persistent organic pollutants.

The Ramsar Convention 1971 Convention on Wetlands of International Importance commits the UK to:

- designate suitable wetlands for inclusion in a List of Wetlands of International Importance,
- formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands,
- arrange to be informed at the earliest possible time if the ecological character of any wetland included in the List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organisation or government responsible for the continuing bureau duties.

In relation to marine pollution, the OSPAR Convention 1992 requires Contracting Parties to: take, individually and jointly, all possible steps to prevent and eliminate pollution from land-based sources.

The Aarhus Convention 1998 (UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters) is an environmental treaty that grants the public three key rights: access to environmental information, participation in environmental decisions, and access to justice in environmental matters, promoting government accountability and environmental democracy.

The Convention is transposed in the UK via the Environmental Information Regulations (EIR 2004), and applies to the work of the VMD.

Environmental data provided by an applicant for a veterinary medicine authorisation and the provision of sales, prescription and pharmacovigilance data is required by law and hence the applicant cannot refuse to consent the release of the material; such data held by the VMD is not subject to copyright or intellectual property rights; and the convention specifically states that information on emissions into the environment cannot be withheld on grounds of commercial confidentiality. Public interest in environmental data also over rides the protection of trade secrets.

The VMD should therefore proactively publish all environmental data, study reports, associated with veterinary medicine authorisation, sale data and pharmacovigilance data for all medicines where there is a risk of emissions to the environment. The VMD already proactively publishes sales data for antimicrobials.

Trade Agreements

In addition to the environmental convention commitments, trade related treaties include commitments relating to the regulation of chemicals and the protection of the environment.

The World Trade Organisation Agreement on Technical Barriers to Trade (TBT) and the UK's current trade agreements have been examined in detail.

The UK's trade agreements contain firm commitments to protect the environment from pollution and are clear that it is the UK's right to set our own environmental standards, commitments include:

- To uphold, ensure and strive to increase high levels of environmental protection.
- To regulate in accordance with the Environmental Principles.
- To take measures to conserve biological diversity when it is subject to pressures linked to trade.
- To undertake Environmental Impact Assessments.
- Not to waive, fail to enforce or otherwise derogate from its environmental law, in order to encourage trade.

While the TBT and trade agreements are strongly supportive of using internationally agreed standards to assess the safety of chemicals, they are also clear that countries can opt out of applying "ineffective or inappropriate" standards, as long as affected states are informed beforehand, or afterwards if the environmental risk is urgent.

There are no TBT recognised internationally accepted standards for Veterinary Medicine regulation. The International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) is an international body consisting of regulators from USA, Japan and EU and an equal number of industry representatives. It has not submitted itself to the TBT Committee's Code of Good Practice and is not registered with TBT, it also does not comply with the WTO principles of international standard setting.

The VMD "now consider that there are sufficient data to support a review of the internationally agreed Environmental Risk Assessment guidelines" and have acknowledged that the current VICH guideline 'Environmental Impact Assessment (EIAs) For Veterinary Medicinal Products Part 1' is inadequate.

The New Zealand and EU treaties both make direct reference to VICH. The NZ agreement only commits us to "seek to collaborate, where appropriate" through VICH. The EU agreement is more detailed as well as having to "endeavour to cooperate" on the technical guidelines we must "use relevant international standards as a basis for the standards they [we] develop, except where such international standards would be ineffective or inappropriate, for example because of an insufficient level of protection."

Our trade agreements commit us to co-operating with the EU, for instance on their proposal to revise the VICH guidelines, and to seek to collaborate with New Zealand on preparing new guidelines, but as the current guidelines have been identified as being "ineffective or inappropriate" we are under no commitment from our trade agreements to apply them.

In any case, the current VICH Phase 1 guidelines say that in exceptional circumstances "Some VMPs that might otherwise stop in Phase 1 may require additional environmental information to address particular concerns associated with their activity and use." Rather than having to wait until the guidelines are revised, the VMD just needs to define the scope of environmental information needed, gather that information and assess it. Doing so would be perfectly in line with the current VICH guidelines and has been done at least four times before by the European Commission. If the data that VMD would like to have to assess the environmental risk of these products "are inadequate" then under the Veterinary Medicines Regulations the Secretary of State (VMD) must refuse to grant an authorisation for use.

Our Trade Agreements contain commitments relating to the benefits of creating a “predictable” regulatory environment for businesses.

It should be predictable for businesses that when a serious and urgent, but unforeseen, environmental harm arises the regulator will act according to national and international law and will not “fail to enforce or otherwise derogate from its environmental law, in order to encourage trade”, or fail to “take measures to conserve biological diversity when it is subject to pressures linked to trade”. There is existing case law that establishes this principle in relation to the regulation of these specific chemicals.

Parliamentary Debate

The issue of environmental damage from flea treatments has been widely reported in the media with at least 35 articles or pieces in the national media, in every instance raising concerns about the environmental harm (see Appendix 4 ‘Media Coverage’).

On the 25 March 2025 there was a Parliamentary debate titled “Veterinary Products in Waterways”.

In response to a lively discussion the Minister, Emma Hardy MP, stated that **“This Government will not turn the other way or continue to allow our rivers, lakes and seas to be polluted.”**

An Early Day Motion was established in March 2026 calling for action to reduce flea treatment pollution.

Government Roadmap

On 22 July 2025 the Government published a plan to address the presence of chemicals from pet flea and tick treatments in UK waterways.

Analysis of Roadmap Communication and Education Actions

Despite the Roadmap commitment to “enhance and promote consistent messaging....to reduce potential environmental impacts” it is not clear that current VMD guidance on the use of flea treatments represents any change from previous advice.

While a number of product labels have been updated since the Roadmap was published, they do not appear to contain new actions to reduce pollution and indeed continue to promote actions that are likely to contribute significantly to aquatic pollution, including:

- Treating pets weekly with Imidacloprid and monthly with Fipronil.
- Treating all Cats and Dogs regularly.
- Washing hands after use and skin and eyes if contaminated – despite this being the largest confirmed pathway from pets into rivers.

- Allowing Dogs to swim in the environment or for animals to be bathed 48 hrs after application - despite evidence that they still cause pollution incidents for more than 28 days.
- Allowing Dogs wearing a treated collar to swim in water courses if the collar is removed.
- Allowing stroking of animals after when treatment appears to be dry, despite evidence that this continues to be a significant pollution pathway weeks or months after treatment.

In addition the VMD labels state that Fipronil and Imidacloprid “may” cause harm to aquatic life, when the evidence is unequivocal that they do cause harm – this is misleading.

VMD has continued to authorise new products containing these chemicals and has not restricted them to prescription only, or significantly improved the label contents.

Even if the timid and misleading label advice was universally followed by users the resulting reduction in pollution would probably be negligible.

The communication and education actions all relate only to topical –externally applied - flea treatments – hence tablet based treatments are excluded.

Analysis of Roadmap Evidence Gathering Actions

The stated aims are somewhat vague, and while evidence gathering is worthy it is not clear why this has not been addressed in the last nine years.

Other than leaching of the persistent (but now banned) Imidacloprid seed treatment and its breakdown products from agricultural areas, it is fairly straightforward to demonstrate that none of the routes identified for investigation are likely to be significant contributors to the loading of rivers with Fipronil and Imidacloprid.

These are premium products, so off label and illegal use is unlikely to be common, and are in any case likely to be very hard to quantify.

Alternative treatments are already available. While environmental regulation of veterinary medicines is vanishingly weak, the better developed principles associated with agricultural pesticide regulation are very clear – the protection of the environment should not be trumped by other considerations.

Determining the optimal use of topical parasiticides is a perfectly reasonable research priority, but unless Cats and Dogs are being overdosed with these chemicals by a wide margin, which is very unlikely, the conclusions are unlikely to significantly assist with reducing pollution to acceptable levels.

It is unclear what ‘improving understanding of any issues relating to topical parasiticides’ might mean in practice.

The exclusion of tablet based – non-topical – flea treatments from any evidence gathering action, despite evidence that they can contaminate water and birds’ nests, will result in an incomplete picture of the risk posed to the environment by flea treatments.

Analysis of Roadmap Regulatory Actions

Environmental Quality Standard (EQS) values are a tool for use in implementing the Water Framework Directive. They are calculated using standardised data on toxic effects and established formulae (see Appendix 1: Environmental Standards Explained for more on this).

The Water Framework Directive contains a list of 'priority substances' that are all toxic pollutants. If the concentration of one of the priority substances in a waterbody exceeds an EQS then the water body cannot be classified as being in 'good' condition.

Since the UK left the EU the Water Framework Directive has been carried into UK legislation. The UK has a target of achieving 75% of waterbodies in good condition by 2027.

The EU has recently reached a political agreement to update the EU list of Priority Substances and the new list will include Imidacloprid, but not Fipronil. The resulting list and associated EQSs will be directly applicable to Northern Ireland.

Since leaving the EU there have been no updates to the UK list of Priority Substances. The devolution agreement means that Northern Ireland, Scotland and Wales have power over environmental legislation in their countries, so it is not clear how the list of Priority Substances would be amended in the UK.

While the Water Framework Directive in the UK remains the key driver of water quality improvements, it may also be a stranded asset that is unable to protect the UK environment from newly identified environmental pollutants. Certainly to date there has been no publicly visible efforts to update the UK Priority Substance list.

Recalculating the EQSs for Fipronil and Imidacloprid will only have a significant regulatory driver effect if the two chemicals are added to the Priority Substance lists, at the moment the UK Technical Advisory Group, that advises on WFD priority substances, is inactive, and there is no proven mechanism for adding new substances. Until this happens recalculating and agreeing new EQS figures for the two pollutants risks being an academic action.

The International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) is a trilateral (EU-Japan-USA) programme aimed at harmonising technical requirements for veterinary product registration. The UK is not a Founding Member, but is a Standing Member. Standing Members are observers and do not take part in any formal decision on topics or guidelines and do not sign-off any draft/final guideline. Decisions on guidelines have to be unanimous and are taken by the 12 Founding Members 50% of the Founding Members represent the producers of veterinary medicines and there are six representatives from the three veterinary medicine regulators. There are no Founding or Standing Members representing the environment.

The VICH guidelines do not prevent the UK taking further risk assessment and regulatory action.

Twenty-four years ago the Environment Agency recommended that Part 1 of the VICH guidelines needed to be rewritten because it was inadequate and failed to meet basic environmental risk assessment standards, such as those currently applied to other categories of chemicals. There appears to have been no progress on this in a quarter of a century.

A draft proposal to initiate a review of the relevant VICH environmental impact assessment guidance was tabled by the EU. It proposed action to start a review of the environmental impact assessment guidelines for veterinary medicines in late 2025. But in November 2025, at a meeting numerically dominated by industry representatives, the VICH Steering Committee confirmed that the ecotoxicology guidelines would not be reviewed.

The VMD's UK Pharmaceuticals in the Environment Group is of the view that "any regulatory drivers would require international agreement and is therefore a long-term action to help reduce the levels of Fipronil and Imidacloprid", but, now that VICH has decided to not to develop guidelines to address the situation, the only place left for us to develop international agreement on domestic veterinary medicine regulation measures would be in a bilateral partnership with the EU.

Northern Ireland faces additional challenges in relation to protecting the environment from veterinary medicines as it has full access to the Single Market and the public could thereby access veterinary medicines even if their use is banned in the UK. It is not clear how this would play out as the recent UK guidance on the topic makes no mention of the environment.

"The VMD will use the evidence gathered in the medium term to consider any future regulatory actions."

VMD have a 'long-term' action to consider future action; the long grass was to have led us into the longer grass of VICH deliberations. However, VICH has stubbornly and quickly refused to revise the guidelines. The refusal was an entirely predictable outcome, the only surprise being that VICH did not drag out the process of taking no action for a few more years. The chances that the industry led VICH committee would ever have produced guidance that might have increased the likelihood of regulators banning their most profitable products were always next to non-existent. This leaves us all with question marks about the decision to make VICH corporate responsibility a cornerstone of the UK Government's flea treatment roadmap.

As ingested flea treatments are excluded from the Roadmap's evidence and education actions there is unlikely to be any new information generated to assess the environmental risk non-topical products pose, or to enable the regulation of that risk.

On 16 April 2026 VMD and Defra launched a call for evidence on "pet flea and tick treatments in UK waterways" although limited to Fipronil and Imidacloprid, and while focused on river pollution, the call recognises there are "multiple pathways by which contamination may occur". The context is a proposal to stop selling Fipronil and Imidacloprid products on the shelves (AVM-GSL) and limit them to over the counter and online sales approved by a trained professional (NFA-VPS), to achieve a balance between environmental damage and animal welfare. The regulatory importance and legal significance of ensuring that the products do not harm the environment, and that the gathering of pharmacovigilance data is adequate to ensure environmental harm is not occurring, are not mentioned in the consultation.

Where 'special precautions' such as preventing dogs from swimming in waterbodies are necessary the VMR 2013 regulations require that the product is classified as prescription only, it is not clear therefore why all flea treatment products with such requirements are not already prescription only.

The evidence call also states that the Government will be "using this evidence to support an international review of environmental risk assessment guidelines" despite the fact that VICH

has already decided that there will be no review of the only existing international risk assessment guidelines.

As set out in this evidence review, it is highly improbable that just changing the prescribing status of Fipronil or Imidacloprid will achieve the respective 98% and 84% reductions in pollution levels.

Conclusion on the Roadmap

We are facing one of the most significant pollution events in recent history, most UK waterbodies are being polluted at levels that we know will be damaging ecosystem health, reducing populations of mayflies, caddisflies and dragonflies and risking further ecosystem collapse with serious ramifications for the health of the environment and its ability to support us and our economy.

The pollution from these flea treatments is pervasive; our rivers, our most protected wildlife sites, and our globally renowned landscapes, like the Wye Valley, River Test and the Broads National Park, may already be irreversibly damaged.

The existence of the Roadmap is in itself confirmation that the Government acknowledges that new and alarming evidence exists of high levels of harmful pollution from two flea treatment chemicals in the sewage effluent and the environment. This awareness triggers the duty under the VMR 2013 to consider whether those authorisations remain appropriate. It is not clear, given this awareness, why the first step was not to review the product authorisations.

The communication and education actions in the Roadmap are feeble and cannot, even with 100% compliance, make a significant contribution to the necessary reduction in pollution. In any case voluntary approaches that require significant behavioural change have a strong record of being ineffective in these situations.

It is disappointing that the Roadmap contains no commitments to address the lack of environmental information relating to other flea treatment chemicals. Some chemicals used as flea treatments have undergone no aquatic toxicity testing. The Roadmap could have committed to undertake aquatic toxicity testing, environmental monitoring and full environmental risk assessments for all products authorised as flea treatments.

The Roadmap has no clear aim – where is it going, what is it trying to achieve, when will we get there? Not only is it lacking a destination and timeline, now that VICH has opted out of its key role in the plan there is no longer a road to travel along. The UK could delay action further by waiting for the EU to develop its approach to the flea treatment crisis. But developing a new EU framework is likely to take years, when a solution is needed now, and could be delivered now within existing frameworks, and enabled by existing legislation. Urgent action is required to halt potentially irreversible damage and to achieve the “high level of protection” expected by the public.

It is unclear why all the actions that are likely to actually reduce flea treatment pollution are put in the ‘long term’ category – although this is not defined in the document one gets the impression this means ‘many years’. EQSs exist already and should be provisionally adopted, we do not need to wait for new guidelines to take urgent regulatory action now.

The domestic legislation and evidence is adequate to enable the VMD to undertake bespoke risk assessments for the chemicals. Indeed it must do this as the evidence presented here constitutes important new safety information as per Schedule 1, Paragraph 25 of the Veterinary Medicines Regulations 2013, its existence requires the Secretary of State to update the Assessment Reports. The current authorisations for Fipronil and Imidacloprid should be reviewed as soon as the Assessment Reports have been updated.

In addition, and now in parallel, domestic water quality legislation requires that action is taken to reduce pollution to surface waters and ground water. In the absence of regulatory action relating to the control of the substances at source the implementation of pollution control measures becomes a pressing legal requirement.

Governments may choose which approach to take to prevent flea treatment pollution, but they must select an approach that does not result in an unreasonable delay in effective regulatory action. The delay in taking action to reduce pollution is so long that it constitutes and unreasonable frustration of the statutory purposes of the EPA 1991, WQ 1992 and the VMR 2013. The environmental damage will have been done before action is taken. A long-term policy document does not remove pre-existing statutory duties.

The inaction and obfuscation of the Roadmap were an inadequate response to the crisis, with VICH stepping out of the plan it is now redundant.

There is nowhere left to hide, we cannot turn the other way and continue to allow our rivers, lakes and seas to be polluted, difficult environmental decisions need to be urgently taken to make our water bodies safe for life, to protect our most important wildlife sites and landscapes, and to safeguard the health of the UK people and its economy.

Is environmental regulation of veterinary medicines fit for purpose?

Inevitably the question arises 'How did we get to this point?' - Why did it take 23 years for Fipronil, and 20 years for Imidacloprid, flea treatment pollution of freshwaters to be detected and why has there been no significant regulatory action to reduce pollution levels in the subsequent nine years?

This review has highlighted a failure of the VMD to identify the likely environmental risks when the products were first authorised; has raised concerns that the VMD may not be undertaking its statutory 'competent authority' role in relation to assessing risk to protected sites and species under the Habitats Directive; has identified a failure to require pharmacovigilance data to be gathered by the authorisation holders on the presence of these chemicals in the environment; and has revealed that the VMD failed to take action in 2014-15 when environmental detections, laboratory studies and pharmacovigilance reports first indicated there could be a problem.

Rather than acting as they became aware of the new evidence the VMD chose to wait until after the last paper from the research that it commissioned in 2019 was published in April 2025 before announcing the next steps. In all this time there has been:

- no significant changes to restrictions on product labels,

- no requirement of additional environmental information to assess new applications for flea treatment authorisations,
- no review of the authorisation reports,
- no revocation or suspension of products,
- no change to the prescription status of the products.

Other VMD responses to significant environmental damage includes their inaction in addressing environmental harm from sheep dips in rivers and anthelmintic (wormer) impacts on soil and dung fauna. Indeed an approach that relies on non-existent post-marketing surveillance (pharmacovigilance) data to avoid real environmental damage appears inappropriate. The VMD's regulatory activity seems to be heavily influenced by "unnecessary burden" concerns, and their mode of operation is characterised by unnecessary secrecy and transparency issues.

38% of VMDs income is from the veterinary medicines industry, and it is perceived to be very close to its regulated industry. The VMD's structure and recent policy shifts suggest a "regulatory capture" where the interests of veterinary practices, livestock producers and pharmaceutical companies are prioritised over the public and environmental protection.

As a result veterinary medicines are a source of systemic environmental risk, and are contributing to widespread damage to biodiversity, including the 59% decline in flying insect numbers observed in the UK between 2021 and 2025

While outside the remit of this review to consider the regulation of other veterinary medicines in detail, it appears that the failure of the VMD to produce an appropriate regulatory response to the flea treatment pollution crisis is not an isolated incident. Instead, it reflects a broader pattern of regulatory inertia and a failure to integrate modern environmental values, standards and knowledge into the veterinary medicine decision-making framework.

Due to the growing number of unresolved environmental impacts from veterinary medicines and grave questions about the competency and commitment of the regulator to take environmental risks seriously, there is a need to review the environmental regulation activity of the VMD. This could be undertaken by the Office for Environmental Protection with support from the Environmental Standards Scotland and Future Generations Commissioner.

Options for reform, restructure and resources should be considered, this might range from improved resources and reporting for the VMD, to transferring authority on the assessment and management of environmental risk of veterinary medicines to agencies that have greater ecological competence and resources.

2. Recommendations

2.1. Primary Actions

These are necessary to bring current pollution down to acceptable levels and to ensure there is no repeat of this situation if use shifts onto alternative chemical flea treatments.

1. The environmental assessment reports of all flea treatments containing Fipronil and Imidacloprid must be updated - VMD – **URGENT**.
2. Assessment reports must include a Habitats Regulation Assessment to ascertain the likely impacts on protected sites and species - VMD- **URGENT**.
3. Once the assessment reports have been updated all authorisations for Fipronil and Imidacloprid flea treatments must be promptly reviewed and the necessary suspensions or amendments of authorisations made - VMD – **URGENT**.
4. Holders of authorisations for all other flea treatment products must be notified that within 12 months they will be expected to submit adequate data on the toxicity and environmental fate (freshwater, marine and terrestrial) of their products to enable their environmental risk to be adequately assessed – VMD – **URGENT**.
5. Within two years the assessment reports for all other flea treatments should be updated, reviewed and the necessary regulatory actions taken - VMD.
6. Existing proposed Environmental Quality Standards for Fipronil and Imidacloprid should be adopted for use in England, Scotland, Wales and Northern Ireland, and timed pollution reduction targets set – EA, SEPA, NRW, NIEA – **URGENT**.
7. 2,024 kg of the flea treatment Fluralaner was sold in 2018, it is crucial that we understand how much of this chemical is entering waterbodies. It should be added to the national lists of substances monitored in waterbodies and national projects initiated to establish the amount of Fluralaner in sewage effluent and rivers - EA, SEPA, NRW, NIEA – **URGENT**.
8. All active ingredients in flea treatments authorised for use and available in the UK should be added to the Water Framework Directive regulations, for monitoring purposes, and where environmental harm has been demonstrated (i.e. currently Fipronil and Imidacloprid) the relevant chemicals should be added to the Priority Substances lists – Defra, SG, WG, DAERA.

2.2. Supporting Actions

These actions will help to reduce pollution levels, but are not capable of resolving the current Fipronil and Imidacloprid pollution, or preventing any repeat, unless taken alongside actions 1-8.

9. Develop Environmental Quality Standards for use in England, Scotland, Wales and Northern Ireland, for all flea treatment active ingredients where the Assessment Report indicates the possibility of a risk to the aquatic environment and the product is in any case authorised, and add them to the national lists of substances monitored in waterbodies. If VMD is not convinced that risks to the environment have been sufficiently addressed in the Assessment Report authorisation must be refused, so this may no longer be required after the completion of Action 5 – EA, SEPA, NRW, NIEA, Defra, SG, WG, DAERA.
10. Produce an annual report examining the patterns and trends in flea treatment pollution in waterbodies and sewage effluent at a country level - EA, SEPA, NRW, NIEA.
11. Include all authorised flea treatment active ingredients and breakdown products in the Prioritisation and Early Warning System (PEWS) – EA.
12. Establish a Flea Treatment Environmental Crisis Stakeholder Forum, open to all organisations with an interest in the issue, to meet every four months and to receive and discuss progress reports on flea treatment pollution reduction - Defra.
13. Consider what actions may be required to reduce the environmental risk presented by flea treatment being imported into the UK on pets – APHA.
14. Produce and disseminate advice for land managers and nature reserve owners on how to manage Dogs near water bodies, including when and how to exclude them – NE, NatureScot, NRW, NIEA, Buglife.
15. Produce and publicise advice for the public on how to minimise the risk to birds from flea treatment contaminated animal hair – NE, NatureScot, NRW, NIEA, VMD, RSPB.
16. Produce and disseminate guidance for vets and the public on how to control fleas on Cats and Dogs without using persistent and potent insecticides – VMD, BVA, RCVS.
17. Consider a larger scale of implementation of broader grass buffer strips around waterbodies to reduce levels of pesticides entering ditches, rivers and streams from arable land and greenhouses - NE, NatureScot, NRW, NIEA.

18. Reduce 'Maximum Residue Levels' (MRL) for Fipronil and Imidacloprid on imported food to the Limits of Detection and ensure that detections result in enforcement – HSE, Defra.
19. Commission a study to determine the levels of pesticides entering the UK on non-food plant produce – particularly plants in soil and cut flowers. Commission a second study to examine the environmental fate of pesticides on plants in soil and cut flowers, particularly considering vase water and hand washing. Undertake an environmental and health risk assessment of the basis of the results. In light of the results consider adding plants imported for non-food purposes to the MRL system to control imports of pesticides on plants – APHA, SASA, DAERA, HSE, Defra.
20. Review and consider revoking all authorisations for the use of Imidacloprid as a domestic insecticide, and ensure no new Fipronil products are approved for this use – HSE, Defra.
21. Increase vigilance and regulatory action in relation to the illegal importation of flea treatments and pesticides into the UK – VMD, HSE.
22. Create a veterinary market environment that encourages positive innovation by a sustained increase in regulatory pressure on products that depend on highly toxic ingredients, and making funds available to support research into developing and assessing the harder to patent 'product of nature' chemicals and less intrinsically environmentally risky solutions – VMD, Defra, NERC, BBSRC.
23. Consider how to manage future risks associated with the trade of veterinary medicines and imported pets with regard to Northern Ireland and the Windsor Agreement – Defra, DAERA, Cabinet Office (Specialised Committee on the Implementation of the Windsor Framework).
24. Revise and reissue the Roadmap, covering all flea treatments and with a clear destination, timescales and targets for pollution reduction – Defra.

2.3. Limited Input Reduction Actions

These actions will only be required if the UK does not act in the next 12 months to reduce the inputs of Fipronil and Imidacloprid to the environment by c. 98% and c.84% respectively.

25. Undertake a review of all sewage treatment discharge permits, consents and authorisations, and all similar consents involving trade effluent from:
 - pet grooming businesses,
 - Dog wash facilities,
 - Dog walking businesses,
 - veterinary practices,

- kennels and catteries,
 - pet shops,
 - pet hospitals,
 - animal shelters and rescue centres, and
 - factories handling or manufacturing the relevant chemicals,
- and ensure that emissions of flea treatment chemicals through these routes do not contribute to the pollution of surface or ground water, or risk harm to Habitats Regulation protected sites – EA, SEPA, NRW, NIEA.
26. Designate Fipronil, Imidacloprid and Fluralaner as prescribed substances under the Trade Effluents Regulations 1989 to enable their appropriate management – EA, NRW, Defra.
 27. Consider flea treatment content of sewage effluent and inputs from swimming Dogs and other diffuse sources when setting and framing the actions needed to meet River Basin Management Plan objectives – EA, SEPA, NRW, NIEA.
 28. Use enforceable product label conditions to restrict activities by flea treatment users that can release Fipronil and Imidacloprid into the environment, failing that, put in place restrictions by creating new offences under Section 92 of the WRA 1991 in England and Wales, taking action to enforce the offence of discharging or depositing any poisonous matter into a waterway in relation to flea treatments in Northern Ireland (Water Order 1999), and creating new offences in Scotland by primary legislation. Using the environment agencies' powers to designate 'water protection zones' and prohibit or restrict activities within those zones, as required – VMD, EA, NRW, NIEA, SG.
 29. Add all toxic Fipronil and Imidacloprid breakdown products to water quality monitoring, including the five Fipronil derived PFAS 'forever' chemicals found in sewage for the first time in 2026 and Desnitro-imidacloprid which has been found at high levels in sewage – EA, SEPA, NRW, NIEA.
 30. Undertake monitoring of levels of Fipronil and Imidacloprid in marine water, sediments and biota as part of the Clean Seas Environmental Monitoring Programme – AFBI, Cefas, DAERA, SG Marine Directorate, EA, NRW, SEPA.
 31. Commission studies to understand the toxicity of Fipronil, Imidacloprid and their breakdown products to marine life and develop Chronic and Acute Environmental Quality Standards for saline waters – EA, SEPA, NRW, NIEA.
 32. If marine monitoring confirms hazardous levels of Fipronil and Imidacloprid in marine habitats, submit a proposal to OSPAR convention secretariat to add them to the List of Substances of Possible Concern – JNCC, Defra.
 33. Add Fipronil and Imidacloprid to the UK REACH list of Substances of Very High Concern (SVHC) and set a short deadline for their phase out – just enough time to allow production of the alternatives to step up – HSE, EA, Defra.

34. Submit Fipronil and Imidacloprid to the Stockholm Convention for assessment as Persistent Organic Pollutants – Defra.
35. Notify the Ramsar Secretariat that flea treatment pollution “has changed, is changing or is likely to change” the ecological character of UK wetlands and request the Secretariat to develop and provide specific recommendations on flea treatment regulation to the Contracting Parties – JNCC, Defra.

2.4. Regulation Fit for Purpose Actions

These actions will not directly address Fipronil and Imidacloprid pollution, but will help to ensure that environmental risks from veterinary medicines in the future are effectively identified and managed.

36. Assessment reports for veterinary medicines that pose a potential risk to the environment should take a bespoke approach to risk assessment, and should consider the relevant scientific literature, not just data provided by the applicant. Where products present a risk to aquatic life the report should consider impacts on mayflies, other vulnerable fauna, and ecosystem implications, not only *Daphnia* waterflea toxicity. Predicted environmental concentrations (PECs) should be judged against proper environmental quality standards, not low protection predicted no effect concentrations (PNECs). The VMD should involve stakeholders in developing a credible risk assessment process for the chemicals. Decisions should be precautionary and authorisations should be refused or revoked where there is insufficient data to exclude an environmental risk – VMD - **URGENT**.
37. Where environmental harm may occur if the active ingredient in a product occurs in the environment the authorisation holder should be required to monitor levels in the environment, and in pathways to the environment, as part of their pharmacovigilance commitments (in relation to water quality monitoring, if possible, they could provide funding to the environment agencies to cover the cost of incorporating the active ingredients in national monitoring) – VMD.
38. The UK should continue to collaborate with the EU to achieve reform of the environmental risk assessments guidelines for Veterinary Medicines, and to bring their environmental impact assessment into line with (or ahead of) the standards for the regulation of other potentially harmful chemicals. Engagement in the revision of the guidelines must involve all relevant Government agencies and independent experts, including environmental regulators and their experts, there must be an Aarhus Convention compliant public consultation on the new draft guidelines before they are approved for use in the UK – VMD, APHA, EA, NE, SEPA, NatureScot, NRW, NIEA, Defra.

39. The UK should consider withdrawing from our observer status on VICH due to the body's failure to provide for an appropriate high level of environmental protection – WG, SG, NIE, Defra.
40. Reverse the 75% reduction in aquatic invertebrate monitoring in England and Wales to enable long-term assessment of ecological pressures on aquatic ecology – EA, NRW, Defra, WG.
41. Prioritise understanding synergistic effects between insecticides and other biocides in research financing and consider how to incorporate the management of synergistic ecotoxicological risks into the regulatory landscape for chemicals – NERC, BBSRC, Defra.
42. Ensure that any future EU/UK agreement on veterinary product markets retains the current sovereign ability to ban or restrict the use of medicines in Britain and Northern Ireland to protect the environment - Cabinet Office, Defra.
43. The VMD should comply with the Aarhus Convention and EIR 2004 and, in relation to environmentally risky veterinary medicines, including all products containing chemicals highly toxic to organisms:
 - annually publish sales data,
 - publish all the environmental data and reports used to support authorisation decisions, and discussions relating to such reports at committee meetings,
 - publish the annual risk-benefit reports,
 - annually publish all pharmacovigilance reports from authorisation holders and the public that relate to environmental emissions, including the regulatory response to such reports,
 - ensure the public can engage in decision making, including initial authorisation decisions - VMD.
44. The VMD should curate and place/retain online in perpetuity all future responses to Freedom of Information and Environmental Information Regulations requests, and all responses received during the last 10 years, that contain information relevant to environmental emissions - VMD.
45. Consider amending the Veterinary Medicines Regulations to introduce and tighten duties to ensure that measures to monitor environmental risks and respond to environmental harm are unequivocally required, as recommended by WildFish - Defra
46. Undertake an investigation and formal review of the environmental regulation of veterinary medicines by the VMD and make recommendations for regulatory reform, restructure and resources – OEP (+ESS and FGC) - **URGENT**.

3. Context

Environmental pollution is an internationally recognised problem that impacts on biodiversity, ecosystem function, Human (*Homo sapiens*) health and the economy.

The quality of water in rivers, lakes, and seas is of vital importance for Human well-being, not only because of our direct dependence on clean water for drinking, agriculture, and recreation, but also because of the intricate ecosystems that thrive within these aquatic environments. At the heart of these ecosystems are invertebrates—organisms such as insects, crustaceans, molluscs, and worms—which play essential roles in maintaining water quality and ecological health.

Invertebrates are key indicators of water quality. Many species are highly sensitive to pollution, and their presence, diversity, and abundance provide a natural measure of ecosystem health. For example, freshwater species like mayflies and caddisflies only thrive in clean water.

Functionally, invertebrates support water ecosystems by breaking down organic matter, recycling nutrients, and controlling algae through grazing. They also serve as a crucial food source for fish, birds, and other wildlife. When invertebrate populations decline, these processes are disrupted. The result can be algal blooms, reduced oxygen levels, and the collapse of local food chains—all of which can degrade water quality further, reduce the ecosystem's ability to recover, reduce the beauty of tourist destinations, cause the collapse of fisheries and damage the local economy.

Poor water quality affects fisheries, agriculture, and drinking water supplies. It can increase water treatment costs and contribute to the spread of waterborne diseases. Declines in aquatic invertebrates and the ecosystems they support also reduce biodiversity and the natural services that healthy waters provide, such as flood regulation, food production and climate moderation.

Protecting water quality and supporting invertebrate populations is essential for safeguarding Human health, food security, and the sustainability of the natural systems we depend on.

Furthermore, preventing the pollution of terrestrial habitats is also essential for safeguarding the environment, Human health, and the economy. Chemical pollution of terrestrial habitats can:

- Cause soil degradation - affecting food safety and availability and ecosystem services.
- Result in the loss of biodiversity – killing organisms, reducing wildlife populations, disrupting food webs and impairing ecosystem function, reducing pollination rates, and resulting in economic harm.
- Damage Human health - causing respiratory problems, cancers, and developmental disorders as well as reducing recreational space and wellbeing.

Removing chemicals from the environment or from waste water can be very expensive, so preventing pollution is often more cost effective than attempting to remediate polluted land and water after the event.

The UK Government has made several international commitments to reduce pollution and maintain good water quality:

- The United Nations Sustainable Development Goals ([UN SDGs](#)), includes targets to reduce water pollution, protect water-related ecosystems, and improve water quality by 2030; achieve the environmentally sound management of chemicals; reduce marine pollution; protect marine ecosystems; conserve and restore terrestrial and freshwater ecosystems; and halt biodiversity loss.
- The Convention on Biological Diversity ([CBD](#)) includes obligations to protect threatened species and populations, to regulate activities impacting on biodiversity and to respond urgently if there is a grave and imminent danger to biological diversity.
- The [Kunming-Montreal Global Biodiversity Framework 2022](#) includes goals on pollution reduction and restoring freshwater ecosystems by 2030.
- The Ramsar Convention on Wetlands of International Importance ([Ramsar 1971](#)) commits signatories to designate and conserve wetlands, to coordinate on policies and regulations concerning wetland conservation, and to inform the Ramsar Secretariat if the ecological character of any wetland has changed, is changing or is likely to change as the result of pollution.
- The Oslo-Paris Convention ([OSPAR](#)) protects the North-East Atlantic and commits the UK taking all possible steps to prevent and eliminate pollution, including from land-based sources, protecting marine biodiversity, and improving coastal water quality.
- The Stockholm Convention on Persistent Organic Pollutants ([Stockholm Convention 2001](#)) commits the UK to address pollution from toxic chemicals that persist in the environment, accumulate in ecosystems, and threaten Human health and biodiversity.

The UK Government has passed several pieces of legislation that aim to regulate or eliminate pollution for the benefits of people and wildlife:

- The Water Framework Directive (WFD), which requires all water bodies to achieve "good ecological and chemical status." Under this, the UK must regularly assess and improve rivers, lakes, and coastal waters. The legislation includes a list of priority substances that must be monitored and which must not exceed set Environmental Quality Standards.
- The Conservation of Habitats and Species Regulations 2017 provides protection for Natura 2000 sites (SACs and SPAs), Ramsar sites, and listed species which must also be monitored and their favourable condition protected. These regulations include a requirement that government authorisations must undergo an Appropriate Assessment and the competent authority must be certain before authorisation that the decision will not impact on the integrity of a Natura 2000 sites or the designation criteria of a Ramsar site.
- Environment Act 2021 also includes legally binding targets, including to "halt the decline in species abundance by 2030".

In 2024 there were around 10.6-13.5 million Dogs (*Canis lupus familiaris*) and 10.8-12.5 million Cats (*Felis catus*) kept as pets in the UK ([PDSA 2024](#), [UK Pet Food survey 2024](#)). The numbers of Cats has been static in recent years, but number of people owning Dogs grew from 23% in 2011 to 28% in 2024 ([PDSA 2024](#)).

Significantly the UK has an exceptionally high density of Dogs and Cats, more than twice as dense as in France and eight times denser than Ireland, perhaps second only to Belgium outside small island/city states (Table 1).

Country	Cats and Dogs per Mile ²
Belgium	382
United Kingdom	262
Germany	191
South Korea	179
Italy	166
Switzerland	160
Hungary	148
Japan	137
Portugal	136
Poland	130

Table 1. Top Ten countries in terms of number of Cats and Dogs per square mile (data from [World Population Review](#) and [Wikipedia](#)).

Fleas on pets are a nuisance for the animals and their owners, rarely they cause serious dermatitis, they are also capable of spreading disease. Fleas can transfer the bacteria *Bartonella henselae* among Cats and Dogs. Dogs are symptomless, and Cats are usually symptomless, but when they scratch a Human they can cause a Cat scratch disease infection; symptoms in Humans may include a mild fever, but can result in localised infections, including in lymph nodes, or very rarely even the heart, which can be serious ([Abdullah et al. 2019](#)). Treatment is not usually required, but antibiotics are effective. *Mycoplasma haemofelis* is another bacteria that can be spread among Cats by fleas, it can cause severe anaemia in Cats which can be treated with antibiotics ([Tasker 2010](#)). Fleas are also intermediate hosts for Flea Tapeworms (*Dipylidium caninum*), which, after being ingested by Cats or Dogs, can be treated with wormers.

Prevalence of fleas on Cats and Dogs in the UK is low, with 1.17% of Cats and 0.25% of Dogs likely to have fleas present when attending veterinary consultations, there is a peak of occurrence in July-August ([Farrell et al. 2023](#)).

Over 99% of fleas on Cats and 93% of fleas on Dogs are Cat Fleas (*Ctenocephalides felis*) under 2% are Dog Fleas (*Ctenocephalides canis*) ([Bond et al. 2007](#)), the remainder are flea species acquired from Hedgehogs (*Erinaceus europaeus*), Rabbits (*Oryctolagus cuniculus*), bats or other hosts.

Many flea treatment chemicals formulated for use on companion animals are highly effective at reducing fleas on pets for long periods of time, indeed the dispersal of these chemicals in homes is effective at controlling populations in houses, such that there has been a decline in

the use of flea sprays and powders for application in houses ([Rust 2017](#)). However, Cat Fleas are generalists and occur in the wild on several hosts, therefore flea treatments on pets do not reduce outdoor environmental exposure to fleas, or background population levels of fleas.

Evidence suggests that Fipronil may not now be a reliable effective treatment against fleas ([Fisara et al. 2019](#), [Cooper et al 2020](#), [Ramon-Portugal et al. 2023](#)).

Ticks present a greater risk of spreading disease and are regularly found on Dogs in particular ([Abdullah et al. 2016](#), [Joachim et al. 2025](#)). Lyme Disease (*Borrelia burgdorferi*), spread by the Castor Bean Tick (*Ixodes ricinus*), is the commonest risk, to Humans and to Cats and Dogs; as with Humans the disease can result in serious kidney, heart, or nervous system problems if untreated. The bacteria *Anaplasma phagocytophilum* causes a usually symptomless infection, anaplasmosis, which can cause fevers and immunosuppression in Cats, Dogs and Humans, and can be treated with antibiotics ([Gandy et al 2022](#)). Babesiosis is a rare but potentially fatal disease of Dogs caused by the protozoan parasite *Babesia canis* ([de Marco et al. 2017](#), [Silvestrini et al. 2023](#)). It is spread by the Ornate Cow Tick (*Dermacentor reticulatus*), which is itself very localised on the coasts of west Wales and south west England and in Essex, although it may be increasing its range in southern England ([Medlock et al 2017](#)). However, it does not appear that *Babesia canis* is frequent in UK tick populations ([Sands et al 2022](#)). Babesiosis can be successfully treated with Imidocarb. Ehrlichiosis is a rare disease caused by the *Ehrlichia canis* bacteria, which is usually spread by the Brown Dog Tick (*Rhipicephalus sanguineus*), a tick species not found in the UK. However the disease has been detected in three Dogs that had not travelled overseas, suggesting that domestic transfer is possible ([Silvestrini et al. 2023](#)). Ehrlichiosis can be treated with antibiotics. The disease louping ill is a virus restricted to upland areas where it is spread by the Castor Bean Tick. It primarily infects Sheep (*Ovis aries*) and Red Grouse (*Lagopus scotica*), but Dogs, Cattle (*Bos taurus*), Humans and other species can also be infected. It causes neurological symptoms, including hypermetria, seizures, paralysis and death (rarely in Humans). There is no treatment, and although two vaccines have been developed, for use on Sheep, neither are currently available. Although still rare, incidents of louping ill in Dogs may be on the increase ([Milne 2025](#)). Flea treatments might protect Dogs from louping ill ([Elgueta et al. 2024](#)).

There is a common perception that tick populations and/or prevalence have been increasing in recent years. Although quantitative data is elusive Scharlemann et al. (2008) found that perceptions on most grouse moors and MoD estates were that tick populations had increased, and these perceived increases were often associated with increases in the deer population. The perceptions were corroborated by quantitative tick count data from Red Grouse chicks and culled deer. More recently evidence is less clear with increased awareness of tick related illness driving increased reporting, but potentially masking any actual trend in tick populations ([Gandy et al. 2022](#)). It is clear that in recent decades deer have increased in their distribution in the UK and this is likely to bring increases in tick abundance ([Dobson and Randolph 2011](#)). Furthermore reductions in the density of grazing animals, particularly Sheep, is likely to create habitat conditions (longer vegetation) that favours ticks.

Increasing tick populations, alongside a warming climate, will bring increased disease risks, including, for example, tick-borne encephalitis ([Callaby et al. 2025](#)).

Ticks on companion animals are picked up from the wider environment in areas where hosts such as deer and Sheep are common, ticks do not complete their lifecycle in houses. Many tick treatment chemicals approved for use on Cats and Dogs are effective at providing control

of ticks on the pet ([Pfister and Armstrong 2016](#)) and may kill a feeding tick before any pathogens are transferred, but they have no impact on the environmental prevalence of ticks. Modelling suggests that in certain circumstances, including low deer numbers, treating Sheep with toxic chemicals could reduce the environmental level of ticks ([Porter et al. 2011](#)), however the authorisation of veterinary medicines for Sheep use is an aside to flea treatments for companion animals.

Ticks have developed resistance to Fipronil in several countries ([Becker et al. 2019](#), [Gupta et al. 2020](#), [Shakya et al. 2020](#), [Bhagat et al. 2026](#)).

In 2020 86.1% of Dog and 91.1% of Cat owners had administered a flea treatment to their pet in the preceding 12 months ([Perkins and Goulson 2023](#)).

The [Animal Welfare Act 2006](#), Section 9, makes it an offence for a person to not take reasonable steps, to the extent required by good practice, to ensure that the needs of an animal for which they are responsible are met, including the animal's need to be protected from pain, suffering, injury and disease.

The [Animal Welfare \(Sentience\) Act 2022](#) established the Animal Sentience Committee and gave it the power to produce reports relating to the formulation and implementation of Government policy. The purpose of the reports is to ensure that the Government has all due regard to the ways in which the policy might have an adverse effect on the welfare of animals as sentient beings.

While not in the scope of this review it is important to note that exposure to a number of flea-treatment chemicals has been associated with human health impacts, including being significantly associated with lower cognitive and adaptive scores in children with autism spectrum disorder ([Goodrich et al. 2025](#)).

4. Discovery

In 2013 the EU brought in a partial ban on the use of Imidacloprid and Fipronil as agricultural insecticide treatments, which became a full ban in 2018, mainly because they were wiping out populations of wild bees.

These toxins also pose a high risk to aquatic life, which has been the focus of regulation in Canada, but was not a strong feature of regulatory responses in the EU or UK who focussed more on bees. However, in 2014 an [EU risk assessment](#) was unable to exclude risks from Imidacloprid to the aquatic environment, which is usually a precursor to a suspension or a revocation of the relevant authorisations to use the pesticide. Meanwhile in Japan the use of neonicotinoids and Fipronil caused a catastrophic 99% decline in dragonfly populations.

It took 10 years from Buglife [predicting](#) that neonicotinoid seed treatments were damaging populations of wild bees and aquatic insects and calling for them to be banned in agriculture until it eventually happened in the UK/EU, during this time there was huge environmental damage – for instance 40% of UK bee species in one study were driven to extinction in 10% or more of their distribution range ([Woodcock et al. 2016](#)). It is not known if populations of bees,

butterflies, moths, hoverflies, ground beetles and other invertebrates have recovered from the damage, or even if agricultural fields now contain safe levels of neonicotinoids.

In 2017 while analysing Government water quality monitoring data I discovered widespread Imidacloprid pollution that frequently exceeded water quality standards, including Imidacloprid pollution in urban rivers where there could be no agricultural source of the chemical, and in a Loch on a Scottish mountain in the Cairngorms that was supposed to be a pollution-free reference site ([Shardlow 2017](#)).

The only obvious alternative source of Imidacloprid in those water bodies was flea treatments for pets (probably more accurately they should be referred to as flea and tick treatments). I did some calculations which showed that if c.20% of the Imidacloprid flea treatments used in Leeds got into water courses that would explain the levels of Imidacloprid observed in Wyke Beck – a river with no agricultural catchment.

One of the other non-agricultural rivers affected is Somerhill Stream, and a couple of local people, Nathalie Baron and Anthony Bales, took samples above and below the sewage outfall and [showed that](#) the Imidacloprid was originating from the sewage works.

The 2017 Report included three recommendations relevant to flea treatments:

“3. Urgent action is required to reduce Imidacloprid pollution in water bodies and return them to a good chemical condition:

- The use of Imidacloprid as an externally applied veterinary medicine should be suspended in the UK - this is the measure most likely to rapidly reduce chronic pollution levels.
- A thorough review of the use of ectoparasite treatments, including a full risk assessment in relation to the aquatic environment, must be urgently undertaken. The report should make recommendations that address all risks of environmental harm. Currently ectoparasite medicines do not even come with a warning to pet owners indicating that they should keep treated animals out of streams, rivers, ponds and lakes.
- If it becomes apparent that chronic pollution of aquatic habitats by ectoparasite treatments is originating via storm drains and/or waste water treatment works outflows then mitigation measures may not be feasible and permanent bans may be required.

4. The Environment Agency should develop a clear regulatory approach to responding to neonicotinoid pollution. This should include:

- Adopting and applying formal EQS standards based on a rational assessment of risk, considering the wealth of evidence relating to Imidacloprid and the likely comparable toxicity of the other neonicotinoids.
- A clearly communicated approach to investigating and resolving neonicotinoid pollution events identified by monitoring.

6. Defra should establish an initiative to transform insecticide environmental risk management so as to ensure future generations have a better protected environment, in line with the Defra Chief Scientist’s recent call for improved “pesticidovigilance”. This should include:

- Formal engagement between the Environment Agency, SEPA, NRW, Chemicals Regulation Directorate and Veterinary Medicines Directorate on a joint project.
- The development of a new, independent, transparent and open approach that uses a more ecologically comprehensive evidence base in approving insecticide uses, monitoring environmental prevalence, researching environmental impacts, and reviewing post-approval use.”

5. How Flea Treatments Pollute Waterbodies

The treatment of fleas and ticks with toxic chemicals has been increasingly recommended and increases in the frequency and regularity of treatment have been encouraged by vets, in part because it enables practices to build returning customer relationships and a regular and reliable source of income. In addition, online retailers have been offering subscription schemes and special deals to customers which encourage them to buy more professional sale only veterinary products and flea treatments, the legality of which has been questioned at the VMD’s Veterinary Products Committee ([VMD 2023](#)). While flea treatments were once used to prophylactically address disease concerns when fleas and ticks were detected, they are now often used to prophylactically treat for the vectors directly.

Fipronil and Imidacloprid are the most commonly used flea and tick treatments for Cats and Dogs. Fipronil is licenced for use as a pour on and as a spray, while Imidacloprid is authorised for use as a pour on and in a collar. The principle is the same, the chemical spreads from the point of application over the skin and hair of the animal, killing any fleas or ticks that it makes contact with. The chemicals will also be absorbed into the animal’s skin and while they will be rubbed and washed off to some extent they will still be present on the animal two months after application, and for eight months or more if an impregnated collar is worn ([Rust 2020](#)).

Mammals metabolise over 80% of internalised Imidacloprid in the liver and can eliminate Imidacloprid in a few days ([Kumar, Verma and Kumar 2013](#)). Fipronil is less readily eliminated as it tends to accumulate in fatty tissues, it is mostly metabolised to Fipronil sulphone which is relatively resistant to metabolism ([Lacroix et al. 2010](#)). Therefore, while both can occur in excreta, Fipronil and its toxic breakdown products are likely to be at higher levels in that pathway than Imidacloprid.

After a pet is treated the chemical rubs off on people’s hands and clothing and on pet bedding. When these are washed, or the animal itself is washed, the chemicals enter the sewage effluent.

Mostly these insecticides go straight through the sewage treatment works and then on into the rivers. Studies have given a range of figures for the proportion of Fipronil and Imidacloprid removed by sewage plants (see Table 2 and more in Section 9 ‘Sources of Fipronil and Imidacloprid Pollution in Water Bodies’).

Pesticide	Observations	Reduction Range	Average reduction	Median reduction
Fipronil	7	-17-82%	21%	21%
Fipronil sulphide	5	32-77%	≥ 56%	62%
Fipronil sulphone	6	-68-50%	4%	17%
Fipronil amide	6	-20-88%	≥ 37%	≥ 41%
Total Fipronil	7	-44-87%	24%	33%
Imidacloprid	6	10-62%	≥ 41%	46%

Table 2. Estimated percentage of aqueous process stream removal of Fipronil compounds and Imidacloprid, based on sewage plant influent and effluent concentrations in the Palo Alto Regional Water Quality Control Plant that employs a trickling filter, an activated sludge system, clarifiers, dual medium filtration, and ultraviolet disinfection (from [Budd et al. 2023](#)).

Some of the reduction, particularly for Fipronil, is likely to be because molecules are attached to sediment particles which are removed during the treatment process, but some of the original compounds may simply have degraded to a toxic breakdown product. Increases may occur when sewage treatment transforms breakdown products back into the parent chemical ([Li et al. 2026](#)). However, sewage sludge can contain 31 to 160 µg/Kg of Fipronil ([Heidler and Halden 2009](#) and [Wheeler et al. 2025](#)), and if it is then spread on agricultural land this PFAS ‘forever chemical’ and neonicotinoids will be released into the environment.

The treatments can also get into the environment through excreta, when pets jump into water bodies, through contact with vegetation and when they are rained on.

Not only are Fipronil and Imidacloprid persistent toxins, they also breakdown into chemicals that are even more toxic than, and just as persistent as, the original chemical ([Weston and Lydy 2014](#), [Jinguji et al. 2018](#), [Miller et al. 2020](#), [Huang et al. 2021](#)). However, because breakdown products have not been through any regulatory approval process, their behaviour in their environment and toxicity is a lot less well known. So, although a number of studies have found them to be more toxic than their parent chemicals and commonly occurring in the environment, no statutory regulatory standards have been set for the breakdown products of these insecticides. However, studies that only consider the impacts in the environment of the parent chemicals are likely to underestimate the risk to life, and the toxic burden in the environment.

Understanding the breakdown products, their toxicity, persistence and environmental fate, is still developing, in 2026 five new breakdown products of Fipronil were discovered in sewage - Fipronil acid-amide, Fipronil-TP RPA 200761, Fipronil S-amide, Fipronil-TPenv2, and Dechlorofipronil – all are PFAS ‘forever’ chemicals with half-lives of over six months, all are toxic to invertebrates and fish, four are more bioaccumulative than Fipronil and some were detected at significant levels in sewage ([Li et al. 2026](#)). Also in 2026 Desnitro-imidacloprid was detected in sewage at levels 10 times higher than Imidacloprid ([Zhang et al. 2026](#)). The levels of these chemicals in the environment have not yet been investigated, and current estimates of levels of environment pollution resulting from use of the parent toxins are underestimates.

In addition, all neonicotinoid insecticides act in the same way on invertebrate nervous systems, so if neonicotinoids such as Clothianidin, Acetamiprid, Thiacloprid, Thiamethoxam, Nitenpyram, or Dinotefuran are also present (which they often are), they will directly increase the impact that the Imidacloprid has, and in the case of Clothianidin the effects can be synergistic ([Schmidt et al. 2022](#)).

Fipronil is hydrophobic and binds readily with sediment and organic matter, including animal and plant tissues (particularly with fats). Hence when the quantity in water is measured this is probably to some extent a reading of the amount bound up with materials suspended in the water column. When sediments or animal tissues have been sampled the concentrations are much higher than in the accompanying water. Despite this Fipronil was recently recorded in a cloud over France ([Bianco et al. 2025¹](#)), so is likely to be dispersed in the air as well as in ground water, raising additional issues of trans-border pollution.

There are many alternative flea treatments to Fipronil and Imidacloprid, including tablets which may be less liable to get into sewage and waterbodies. However, veterinary medicines for companion animals have usually had no ecotoxicity testing or fate prediction as they fall outside criteria used for assessing the environmental risks of veterinary medicines, so we often only know about the pollution levels and aquatic life harm of flea treatment chemicals that have also been used as pesticides in agriculture. For some of the flea treatment chemicals there have been no studies of environmental toxicity and we have no data on their occurrence in the environment. For example there have been no ecological toxicity studies done on Tigolaner or related compounds ([EMA 2019](#)). One exception is Fluralaner; Diepens et al. ([2023](#)) found Fluralaner in an artificial pool in which Dogs swam, at levels that exceeded Dutch water quality standards, and also in wild bird nests.

Addressing the data gap for flea treatments other than Fipronil and Imidacloprid is a priority (that does not appear to be being addressed in the UK), but that does not mean that action on reducing harm to aquatic life from Imidacloprid and Fipronil has to await full knowledge.

After the [Buglife report](#) was released and there was coverage in the media, and in 2019, the Veterinary Medicines Directorate responded by commissioning research on the issue from the University of Sussex.

This resulted in four scientific papers examining flea treatment pollution being published between 2021 and 2025.

[Perkins et al. 2021](#) Using Environment Agency data, examined the occurrence of Fipronil, Fipronil breakdown compounds and Imidacloprid in 20 English rivers from 2016-18. Confirmed that Fipronil and Imidacloprid contamination is common in English rivers, often at levels well above safety thresholds and thus likely to impact aquatic ecosystems. Pollution levels and toxicity risk for Fipronil was even worse than Imidacloprid. The average level of Fipronil recorded in all rivers was 0.017 µg/L - 5.3 times greater than its chronic toxicity limit. The mean sample site concentration was 0.0065 µg/L for Fipronil sulphone – 38.1 times greater than its chronic toxicity limit, and 0.00078 µg/L for Fipronil sulphide, resulting in a chronic risk quotient of 5.6, indicating a high risk to the aquatic environment. Imidacloprid was detected in 19 out of 20 sites at an average level of 0.0317 µg/L. Concentrations were highest immediately downstream of sewage treatment works and flea treatments were identified the likely source.

¹ They detected Fipronil at 0.01±0.01 µg/L and Fipronil sulphone at 0.003±0.002 µg/L in a cloud that had reached central France via the Arctic and North Atlantic.

[Perkins and Goulson 2023](#) A survey of 1,009 UK Cat and Dog owners. Confirmed that Fipronil and Imidacloprid are used in high volumes on pets and that washing hands, bedding and pets are likely to be significant routes into the environment. 36.2% of Dogs treated with Fipronil or Imidacloprid went swimming in water bodies every month, 54.6% were washed every month and 87.8% of Dog-owners and 69.1% of Cat-owners washed their pet's bedding at least once every three months. Imidacloprid spot-on treated Dogs estimated to swim, be bathed and have their bedding washed over 3.3 million, 5 million and 6.3 million times per year, respectively (see also Table 27).

[Perkins et al. 2024](#) Confirmed main pathway for environmental pollution was waste water treatment plants. Quantified household effluent emissions from 98 Dogs treated with spot-on flea treatments containing Fipronil or Imidacloprid, through bathing, bed washing and washing of owners' hands. Both chemicals were detected in 100% of washoff samples, with bathing accounting for the largest emissions per event (up to 16.8% of Imidacloprid and 24.5% of Fipronil). Modelled to account for the frequency of emitting activities, owner handwashing was identified as the largest source of household effluent emissions, with handwash emissions continuing for at least 28 days after product application, and accounting for an estimated 20–40% of measured wastewater pollution and 3.1% of Fipronil and 4.9% of Imidacloprid applied in spot-ons ending up in the sewers. Across all pathways 6.0% of Fipronil and 9.1% of Imidacloprid applied to Dogs entered the sewers. They calculated that the modelled flea treatment pathways could account for 23% of Fipronil observed in sewage and 29 or 42.9% of Imidacloprid. Emissions from all pathways continued to be significant for 28 days after treatment, the full period of the study, emissions from washing pet bedding did not decline over the period of the study.

[Perkins et al. 2025](#) Confirmed that pets swimming in rivers and streams caused significant pollution. Current guidance supplied with the medicines is that Dogs should not be allowed to swim until 3 days after treatment with Fipronil and after 5 days with Imidacloprid [but recent approvals only say 2 days, see below], but both chemicals were still being washed off in sufficient amounts to cause a pollution incident after 28 days (see also Table 3). Called for a regulatory review to protect the environment.

Teerlink et al. ([2017](#)), in one of the first studies of flea treatment pollution, washed Dogs treated with Fipronil pour-ons in baths and found that on average Dogs washed after 2 days deposited 21% of the treatment into the water, those washed after 7 days deposited 16% and after 28 days 4%. The highest single wash-off recovery was 86% of the Fipronil.

There are multiple routes by which Fipronil and Imidacloprid can get into rivers and lakes from flea treatments (Figure 1), these have not been fully quantified, but it has been established that several of the routes shown in the figure are currently carrying significant amounts of flea treatments into the aquatic environment.

Several pathways have not been studied which may add considerably to the level of pollution in sewage, including laundering of pet-owner clothes and bedding, cleaning of indoor surfaces, Human showering, laundering of towels used to dry dogs, other people stroking the pet, and flushing of animal waste down the toilet.

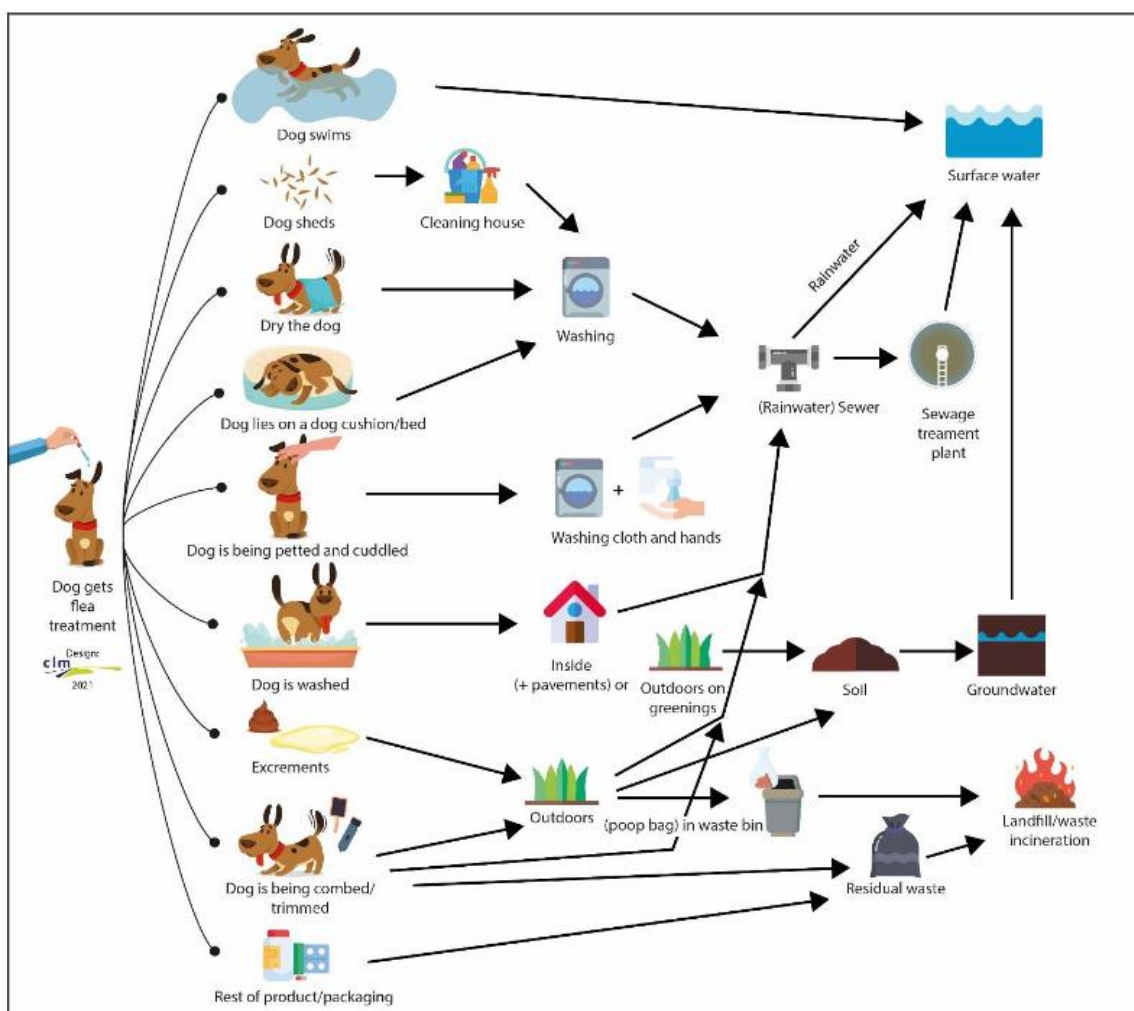


Figure 1. Emission pathways of flea and tick medication from Dogs into the environment (CLM - from [Mul et al. 2021](#)).

Perkins et al. ([2025](#)) measured the emissions from 49 swimming Dogs treated with spot-on Fipronil or Imidacloprid, on days 5, 14 or 28 post-application. Even after 28 days the average amount of Fipronil released would cause the waterbody to be six times higher than the Acute EQS (Environmental Quality Standard). Washing after five days would result in a seven times exceedance of the Imidacloprid EQS and after 28 days the water pollution would be just below the Acute EQS (Table 3).

In addition, Budd et al. ([2023](#)) showed that high levels of Imidacloprid (av. 1.4 µg/L, max > 5.5 µg/L) and Fipronil (av. 0.74 µg/L, max > 1.5 µg/L) were emitted in the sewage effluent from a pet grooming facility; Webb et al. ([2021](#)) calculated that flea treatments could account for a large percentage of the levels of Imidacloprid observed in urban sewage in Iowa; and De Marchi et al. ([2025](#)) found that wastewater from an animal shelter in Italy contained 0.18 µg/L of Imidacloprid, 0.50 µg/L of Fipronil, and 0.20 µg/L of Fipronil-sulphone, with these concentrations remaining stable for 60 days.

Time since application	Av. Fipronil recovered per wash	Fipronil Predicted Environmental Concentration $\mu\text{g/L}$	Av. Imidacloprid recovered per wash	Imidacloprid Predicted Environmental Concentration $\mu\text{g/L}$
5 days	4.0%,	0.2136	10.1%,	0.404
14 days	0.8%	0.0427	1.8%	0.072
28 days	0.4%	0.0213	1.4%	0.056

Table 3. Wash-off recovery from 49 Dogs, and predicted environmental concentration resulting from a 45 kg Dog treated with spot-on Fipronil or Imidacloprid swimming in a 100 m³ waterbody 5, 14 and 28 days post-application (from [Perkins et al. 2025](#)).

6. Harm caused by Fipronil and Imidacloprid

Fipronil and to a greater extent Imidacloprid have been subject to considerable environmental impact research due to being widely used pesticides. They are both classed as Highly Hazardous chemicals by the Pesticide Action Network ([2021](#)). Fipronil and its breakdown chemicals are some of the most toxic PFAS ‘forever chemicals’ ([Donley et al. 2024](#)).

Neonicotinoids, such as Imidacloprid, and the PFAS Fipronil work by binding to receptors in neurons. Fipronil creates a continuous nerve signal that causes hyper stimulation and eventually destroys the nerve, as the number of nerves destroyed increases the animal dies, while neonicotinoids block the signals, resulting in reduced mental function, paralysis and death. The potency of these chemicals vary wildly between different groups of animals, but, from what studies are available, insects are most dramatically affected at field realistic levels, crustaceans, molluscs and birds are usually somewhat less impacted, while mammals and fish are least affected.

Key Fipronil aquatic toxicity findings at environmentally relevant levels include:

- Short-term exposure to 0.19 $\mu\text{g/L}$ of Fipronil killed half of the larvae of the Striped Black Fly (*Simulium vittatum*) ([Overmyer et al. 2005](#)).
- Short-term exposure to 0.153 $\mu\text{g/L}$ of Fipronil killed half of the first-instar larvae of a net-spinning caddisfly the Short-lined Sedge (*Cheumatopsyche brevilineata*) ([Yokoyama et al. 2009](#)).
- Short-term exposure to 0.89 $\mu\text{g/L}$ of Fipronil killed half of the larvae of the chironomid Nuisance Midge (*Polypedilum nubiferum*) ([Stevens et al. 2011](#)).
- Short-term exposure to 0.0325 $\mu\text{g/L}$ of Fipronil killed half of the larvae of the Watery Midge (*Chironomus dilutus*) ([Weston and Lydy 2014](#)).
- Short-term exposure to 0.007–0.01 $\mu\text{g/L}$ of Fipronil breakdown chemicals killed half of the larvae of the Watery Midge (*Chironomus dilutus*) ([Weston and Lydy 2014](#)).
- 28 days exposure to Fipronil at 0.081 $\mu\text{g/L}$ resulted in reduced larval growth and emergence of the Harlequin Fly (*Chironomus riparius*) ([Monterio et al., 2019](#)).
- Chironomidae (several species) emergence rates declined by 50% at concentrations of 0.03, 0.06, 0.11, 0.78, and 0.97 $\mu\text{g/L}$ for Fipronil sulphide, Fipronil sulphone, Fipronil, Fipronil amide, and Fipronil de-sulphinyl, respectively ([Miller et al. 2020](#)).

- 50% of Chironomid larvae stopped thrashing when touched after four days of exposure at 0.0077 µg/L, 0.0099 µg/L, and 0.032 µg/L for Fipronil sulfone, Fipronil sulfide, and Fipronil respectively ([Weston and Lydy 2014](#)).
- Noshime Dragonfly (*Sympetrum infuscatum*) feeding was significantly reduced at Fipronil sulfone concentrations of 0.01 µg/L ([Jinguji et al. 2018](#)).
- The Mexican freshwater shrimp (*Hyalella azteca*) was as sensitive to Fipronil and Fipronil Sulphone as the Watery Midge (*Chironomus dilutus*) ([Liu et al. 2024](#) (but see also [Weston and Lydy 2014](#))).
- Bay Opossum Shrimps (*Americamysis bahia*) were impacted after 28 days exposure to Fipronil sulphone above 0.0051 µg/L and Fipronil sulphide above 0.0046 µg/L ([Lima et al. 2000](#)).
- Brown Shrimp (*Farfantepenaeus aztecus*) suffered impaired movement after one day of exposure to Fipronil at 0.005 µg/L ([Al-Badran et al. 2019](#)).
- Sublethal effects on aquatic animals caused by Fipronil include oxidative stress, genotoxicity, neurotoxicity, and morphological changes ([Mamboungou et al. 2024](#)).
- Genotoxic endocrine disruption occurred in the Harlequin Fly (*Chironomus riparius*) at 0.01 µg/L ([Pinto et al. 2024](#)),

Key Imidacloprid aquatic toxicity findings at environmentally relevant levels include:

- Exposure at 0.03 µg/L Imidacloprid for 28 days killed 10% of mayflies ([Roessink et al. 2013](#)).
- Mayflies of the genera *Baetis* and *Epeorus* showed reduced reproductive success when exposed to Imidacloprid at 0.1 µg/L, no male *Epeorus* emerged at 0.25 µg/L after 20-day exposure ([Alexander, Heard & Culp 2008](#)).
- A 24-h pulse of Imidacloprid at 0.1 µg/L caused feeding inhibition for several days in the Coquette Flat-headed Mayfly (*Epeorus longimanus*) ([Alexander et al. 2007](#)).
- A suite of effects on mayfly swimming behaviour/ability and respiration were observed following exposures to Imidacloprid at 1 µg/L ([Bartlett et al. 2018](#)).
- Breakdown chemical Imidacloprid-olefin showed similar toxicity to Imidacloprid for the Pond Olive Mayfly (*Cloeon dipterum*), there was almost no elimination from body tissues over time, so impact likely to be greater ([Huang et al. 2021](#)).
- Abundance of the Little Blue-winged Olives (*Baetis tricaudatus*) in a mesocosm was greatly reduced after 10 days at 0.06 µg/L ([Nowell et al. 2018](#)).
- In sub-tropical freshwater microcosms Sumon et al. ([2018](#)) found impacts on zooplankton, mayflies (*Cloeon* sp.) and *Notonecta* sp. waterbugs above 0.03 µg/L. After 96 hours exposure at 0.0001 µg/L 10% of *Cloeon* sp. mayflies had been killed and 10% of *Diptomus* sp copepods were killed at 0.0012 µg/L.
- Cabrera et al. ([2024](#)) found impacts of Imidacloprid on flies and crustaceans in an Amazonian mesocosm and calculated a 21-d NOEC of 0.05 µg/L for the Medium Speckle-winged Quill mayfly (*Callibaetis pictus*).
- When mixed with Clothianidin Imidacloprid impacted on emergence rates of midges, blackflies and mayflies in mesocosms at 0.001 µg/L, there was a synergistic effect leading to a trophic cascade and an increase in algal abundance. Synergistic effects were also observed in relation to reduced mayfly abundance in Californian streams. Levels of Imidacloprid alone above 0.017 µg/L caused declines in mayflies and a loss in taxa abundance and richness. Impacts in ecosystems were greater than predicted from laboratory studies ([Schmidt et al. 2022](#)).

- 28 days exposure to 0.91 µg/L of Imidacloprid killed half of the larvae of a chironomid midge, *Chironomus tentans* [=dilutus?] and 0.59 µg/L killed a quarter of them ([Stoughton et al. 2008](#)).
- The Harlequin Fly (*Chironomus riparius*) had reduced growth and emergence rates when exposed to 1.2 µg/L Imidacloprid and a significant delay in time-to-emergence when larvae were exposed to 0.4 µg/L ([Pestana et al. 2009](#)).
- Half of the larvae of the Watery Midge (*Chironomus dilutus*) failed to emerge after exposure to 0.39 µg/L of Imidacloprid ([Cavallaro et al. 2016](#)).
- At 0.59 µg/L, the lowest level tested, Colombian Watery Midge (*Chironomus columbiensis*) fecundity was reduced ([Montaño-Campaz et al. 2023](#)).
- Six cyclopoid copepod species showed high mortality rates, even at concentrations of Imidacloprid typically found in the field in Japan ([Suzuki et al. 2024](#)).
- 5% of species in a controlled pond predicted to be impacted by 0.013 µg/L Imidacloprid ([Li et al. 2025](#)).
- Brown Shrimp (*Farfantepenaeus aztecus*) suffered impaired movement after five days of exposure to Imidacloprid at 0.5 µg/L ([Al-Badran et al. 2019](#)).
- Macrofauna abundance in Dutch surface waters dropped sharply between 0.013 and 0.067 µg/L of Imidacloprid ([Van Dijk et al. 2013](#)).
- In mid-latitude floodplains in the USA aquatic insect richness and abundance declined with higher neonicotinoid toxic equivalencies in wetland water and sediments ([Kuechle et al. 2022](#)).
- At 0.03 µg/L Imidacloprid effects were observed on water boatmen *Gerris* sp., a copepod *Diatomus* sp. and the Four-spined rotifer (*Brachionus quadridentatus*). Imidacloprid induced population declines of the larger zooplankton species (*Diatomus* sp. and Ostracoda) and shifted the phytoplankton community to a graze resistant, gelatinous and toxic cyanobacteria dominated ecosystem ([Dimitri et al. 2021](#)).
- In tropical ecosystem mesocosms 0.02 µg/L Imidacloprid reduced macroinvertebrate (including Pond Olive mayfly (*Cloeon dipterum*), Angler's Curse mayfly (*Caenis horaria*) Chironomidae sp., Culicidae sp., Dytiscid water beetles and water bugs) and zooplankton populations and caused increased algal growth. There was no recovery in the populations of macro-invertebrates 21 weeks after the last dosing ([Merga and Van den Brink 2021](#)).
- 0.02 µg/L of Imidacloprid in surface water caused a 30% fall in bird numbers in the Netherlands over ten years ([Hallmann et al. 2014](#)).
- In Japan neonicotinoid applications caused an 83% decrease in average zooplankton biomass in spring and caused the collapse of the local fishery, Smelt (*Hypomesus nipponensis*) harvest fell from 240 to 22 tonnes in Lake Shinji ([Yamamuro et al. 2019](#)).
- DNA lesions in aquatic crustaceans were observed from 7 µg/L with a significant increase in damage as concentrations increased ([Nugnes et al. 2023](#)).
- Genotoxicity to the Southern Foam Frog (*Leptodactylus luctator*) and Cuvier's Foam Froglet (*Physalaemus cuvieri*) was observed at 3 µg/L (the lowest tested concentration), resulting in swimming activity changes (lethargy, hyperactivity and seizures), body size reduction, and malformations in most of the animals ([Samojeden et al. 2022](#)).
- Imidacloprid in sewerage effluent in German streams reduced invertebrate quality (SPEAR) values by 40% and consequentially reduced leaf litter degradation by 53% ([Münze et al. 2017](#)).

In addition Imidacloprid and Fipronil water pollution in South East Asia has caused the widespread loss of dragonflies. Nowhere has the loss of this cultural icon and ecosystem shaping predator been more poignant than in Japan, once known as Dragonfly Island. During the 1990s Red Dragonfly (*Sympetrum frequens*) numbers decreased sharply to near extinction,

just 1% remained in many regions of Japan ([Nakanishi et al. 2020](#)). This was caused by the application of Fipronil and Imidacloprid to rice fields—the main breeding sites of the Red Dragonfly ([Nakanishi et al. 2021](#)), Fipronil and Clothianidin (another neonicotinoid) killing the larvae of Common (White-tailed) skimmer (*Orthetrum albistylum*) and Scarlet Skimmer (*Crocothemis servilia*) ([Kasai et al. 2016](#)), and Fipronil and Imidacloprid killing larvae of the Noshime Dragonfly (*Sympetrum infuscatum*) ([Jinguji et al. 2013](#)). In addition to reducing dragonfly numbers in rice paddies Imidacloprid also reduced numbers of aquatic beetles and flies ([Hayasaka et al. 2019](#)).

Declines were worse in hot years and climate change is likely to make the toxicity of Fipronil and Imidacloprid worse ([Huang et al. 2023](#)). Populations of dragonfly nymphs in mesocosms (artificial ecosystems) decreased sharply due to synergistic effects of Fipronil and simulated climate warming ([Ishiwaka et al. 2024](#)).

Now that the problem of flea treatment pollution has been recognised internationally, there has been a slew of new scientific evidence that underlines the extreme damage these chemicals can, and are, causing.

In a study of streams in five US regions the most common pesticides with 21 day chronic threshold exceedances were Imidacloprid (32% of sites (81% of samples exceeded the level)) and Fipronil (4% of sites (8% of samples)) and they were among the four most significant chemical stressors to invertebrate communities at the regional scale ([Nowell et al 2024](#)).

The ponds on Hampstead Heath where Dogs are allowed to swim were polluted with levels of Imidacloprid and Fipronil likely to cause environmental harm ([Yoder et al. 2024](#)).

A Centre for Ecology and Hydrology and Environment Agency study in 2021 ([Spurgeon 2021](#)) applied ecological and human health hazard assessments to the occurrence of 1,114 chemicals in surface waters and ground waters. In the EA LCMS (Liquid Chromatography–Mass Spectrometry) dataset (the same data as used in this study, although 2014-20 in their study) Fipronil was ranked as the highest hazard to ecology and, in terms of daily intake toxicity, also the highest hazard to human health. Fipronil sulphide, Imidacloprid and Diazanone, another flea treatment and pesticide, were also ranked in the top 30 hazard lists for surface and/or groundwater samples.

The greatest water pollution threat to the estuarine Chichester Harbour was found to be Imidacloprid ([Uhlhorn et al. 2025](#)).

Robinson et al. ([2024](#)) found that the River Test exceeded the PNEC (Predicted No Effect Concentration) for Imidacloprid in all seasons, and was the biggest ecotoxicological risk to the river; the authors called for control of its use. The author also recorded an associated 97% decrease in aquatic fly abundance over four years in the Test and Itchen ([Robinson 2025](#)).

Imidacloprid was also the chemical with the highest toxic risk in London rivers, with concentrations increasing over time to 0.154 µg/L in Aug-Sept 2021 ([Egli et al. 2023](#)).

A study on the Rivers Wensum and Tone was particularly shocking ([Ramage et al. 2025](#)). Not only were Imidacloprid and Clothianidin (another (non-flea treatment) neonicotinoid) frequently at concentrations well above the level where ecological impacts occur, and Fipronil routinely at such levels, Fipronil was found to be concentrating in animals. More than 80% of

fish contained Fipronil ($4.69 \pm 5.08 \mu\text{g}/\text{kg}$) and 10% contained Imidacloprid ($0.158 \pm 0.503 \mu\text{g}/\text{kg}$). The highest levels of Fipronil were $87.7 \mu\text{g}/\text{kg}$ in a Common Roach (*Rutilus rutilus*) muscle and at $322 \mu\text{g}/\text{kg}$ in an invertebrate in Norwich. The latter concentration is 2,000 times higher than the concentration that would be likely to kill a species of case-less caddisfly. The River Wensum travels through Norwich into the Broads our only wetland National Park (also see ‘Fipronil and Imidacloprid in English Waters 2014-2024’ for data on toxic levels of Fipronil and Imidacloprid in the Broadland rivers the Yare and Wensum). The authors emphasised “the need for stricter regulation of the most high-risk pesticides, particularly those used in veterinary care”.

Studies of the impacts of toxic pollutants in the field are rare, they require a lot of data, a lot of time – often several years – and can be beset with difficulties in interpreting the data due to the many factors that can affect the results, including weather, multiple chemical pollutants, synergistic effects between the chemicals and correlations between different factors. They also usually produce correlations, rather than the more robust statistics that can be produced in situations where the effect can be controlled. Therefore the recent publication of [Schweiger et al. 2025](#) has been unexpectedly early in this narrative.

Schweiger et al. looked at pesticides and invertebrate populations in 13 streams, on nature reserves in Germany. Pesticide levels were assessed against the AC_{field} environmental standard (see Appendix 1 ‘Environmental Standards Explained’ for a further explanation of this and other relevant parameters). The highest toxicity levels were caused by Fipronil exceedances of the AC_{field} , these were the main driver of lower numbers of pollution sensitive species (e.g. dragonflies, mayflies and caddisflies).

As Fipronil was only authorised for emergency agricultural applications in Germany, agricultural use cannot account for the occurrence of Fipronil on these nature reserves, furthermore only one of the streams contained sparse Human settlement and none contained any sewage treatment plant inputs. The authors noted that “contaminated sites were close to hiking trails, sporadic dog bathing may have contributed to the observed threshold exceedances”.

They did not measure Fipronil degradation products, or levels of the pesticides in sediments, so it is likely that the concentration of bioactive ‘Fipronil’ was underestimated. The study shows that in the field levels of Fipronil below one part in ten billion damage ecosystems. Most shockingly this ecosystem damage was easily detected in a situation where all eight of the highest measurements of Fipronil in the study ($0.0001542\text{-}0.008768 \mu\text{g}/\text{L}$) were lower than the average level of Fipronil recorded in English waters between 2014 and 2024 ($0.00992 \mu\text{g}/\text{L}$) (see ‘Fipronil and Imidacloprid in English Waters 2014-2024’).

It should be noted that most data on the aquatic toxicity of Fipronil, Imidacloprid and their breakdown products relates to acute, short-term, mortality assessments, with some data on emergence rates and population levels. However, the biggest environmental damage these chemicals caused to bee populations was as a result of impacts on reproduction rates, movement levels, orientation success, foraging efficiency and long-term survival. Sub-lethal effects alone are sufficient to destroy populations of wild animals and cause their extinction. These effects can occur at orders of magnitude of concentration below the levels that kill the animals in a few hours, but for Fipronil and Imidacloprid there have been very few studies of long-term or sub-lethal effects on aquatic invertebrates.

There have been no studies done to relate widespread Fipronil or Imidacloprid levels in water bodies to long-term changes in the fauna at geographic scale. The Environment Agency (EA), Scottish Environment Protection Agency (SEPA) and Natural Resources Wales (NRW) routinely monitor invertebrates in rivers (e.g. [BIOSYS](#)), however the ability of the datasets to detect changes related to specific chemical pollutants over time is limited. Samples are not always taken in the most affected areas, for instance in the Broads there are no invertebrate sample points below Norwich on the Yare or Wroxham/Hoveton on the Bure, the two biggest wastewater input points.

EA and NRW monitoring has declined by about 75% since the mid-1990s, making discerning recent trends problematic ([Outhwaite et al. 2025](#), also see [Brown et al. 2025](#)). Furthermore spatial use of flea treatments is likely to closely match the distribution of Human inputs to waste water and rivers, so Fipronil and Imidacloprid input from flea treatments is likely to closely correlate in space and time with inputs of other urban pollutants such as Human medicines, household chemicals and illicit drugs, which means that directly attributing any impacts on invertebrate abundance or occurrence to one or more chemicals is challenging.

In the 1980s and 90s levels of oxygen downstream of wastewater inputs were very low and levels of Ammonia were very high, resulting in severely impoverished stretches of river. Since the mid-1990s the situation is much improved in relation to biological oxygen demand and Ammonia levels, and invertebrate populations have responded with a long-term recovery. As a result long-term trends in invertebrate abundance and richness show a significant improvement ([Outhwaite et al. 2020](#), [Whelan et al. 2022](#), [Qu et al. 2023](#)). However, there is evidence that the improvement trend has stopped in recent years due to inputs from sewage works ([Whelan et al. 2022](#), [Pharaoh et al. 2023](#)). Urbanisation has negative direct relationships with species richness and the abundance of sensitive species (mayflies, stoneflies and caddisflies) across England and Wales ([Pharaoh et al. 2024](#)). Exposure to wastewater is now limiting population levels of mayflies, caddisflies and stoneflies ([Qu et al. 2023](#)), and preventing rivers recovering fully from past pollution ([Windsor et al. 2019](#)). While improving, more heavily urbanised catchments still have reduced levels of pollution-sensitive species and lower taxonomic richness than less urbanised catchments, they have a way to go before they return to former good conditions ([Pharaoh et al. 2023](#)).

Powell et al. ([2022](#)) looked at the Environment Agency invertebrate data collected between 2002 and 2019 and identified increasing abundance trends for caddisflies, stoneflies and beetles, but a 19.5% decline in mayflies, and smaller declines in flies and true bugs. However, Wilkes et al. ([2025](#)) examined the same data set, but without applying measures to control for sampling frequency, and, while highlighting problems with bias and lack of consistent monitoring, calculated increases over the time period for mayflies, stoneflies and caddisflies, but declines for dragonflies, true bugs, beetles and groups of flies. We know mayflies, caddisflies, dragonflies, true bugs and some groups of flies are sensitive to Fipronil and neonicotinoids, but there is little data on the other insect groups.

Hadley et al. ([2026](#)) surveyed invertebrate populations at six sites on the Roath Brook system in Wales and examined their relationship with levels of Imidacloprid and Fipronil in the water. Pollution intolerant species declined significantly with increasing concentrations of Imidacloprid ($r^2 = 0.75$, $p < 0.01$) but not Fipronil. This effect reflected 90% reductions in populations of heptageniid mayflies (mostly the Olive Upright (*Rhithrogena semicolorata*)) and limnephilid caddisflies (mostly *Potamophylax* spp.) and a 30% reduction in Green Drake mayflies (*Ephemera danica*) and baetid mayflies (mostly Large Dark Olive (*Baetis rhodani* agg.))

at sites affected by contaminated surface drains. Cause and effect could not be conclusively established due to the presence of other chemicals in the sewage. However, the high levels of Imidacloprid in the Brook could not be explained by a sewage plant discharge or a combined sewer overflow as neither exist in the catchment, the authors attributed the Imidacloprid levels to domestic sewer misconnections.

The pattern of reduced populations of insecticide sensitive species of flying insects downstream of sewage treatment works and in streams where dogs swim is consistent with flea treatments causing ecological damage in the field that is predicted by laboratory studies.

In the Broads National Park, according to Natural England, damselfly numbers are estimated to have declined by an estimated 90% since 2010 within the Woodbastwick Fens and Marshes reserve (Bure Valley), with similar reductions observed across other easily monitored insect groups (Hiscock et al. in press²). The authors monitored neonicotinoid and Fipronil pollution in the Bure system during 2023 (the wettest recorded year in the Broads). Fipronil, Fipronil sulphone and Fipronil sulphide were detected in 97%, 84% and 93% of samples respectively. Maximum readings were 2.466 µg/L for Fipronil, 0.443 µg/L for Fipronil sulphone and 1.026 µg/L for Fipronil sulphide. Mean concentrations of Fipronil (0.701 µg/L) and Fipronil sulphone (0.080 µg/L) were substantially higher than their respective chronic toxicity limits (0.00077 µg/L and 0.00017 µg/L). Fipronil exceeded the acute EQS limit at all locations on between 55–92% of occasions, Fipronil sulphone on 42–100% of occasions and Fipronil sulphide on 67–100% of occasions. Imidacloprid was recorded in 90% of samples with a maximum level of 1.227 µg/L and an average level of 0.078 µg/L. Mean levels exceeded the chronic EQS for Imidacloprid all locations and 9 of the 10 locations also exceeded the acute EQS on at least one occasion (8-27% of dates depending on location). There was only a slow flushing of flea treatments through the river connected broads (lakes) resulting in sustained contamination and evidence of Imidacloprid persisting in sediments and being remobilised into the water column during wetter periods. It was estimated that annually 2.9 kg of Imidacloprid and 19.8 kg of Fipronil and its breakdown compounds travel down the River Bure. The authors conclude that ‘Stricter regulation is needed to protect aquatic insects from ectoparasiticides’.

It should also be noted that as well as aquatic pollution effects there have also been relationships found between the abundance of these chemicals and the death of birds and declining bird populations ([Hallmann et al. 2014](#), [de Montaigu et al. 2025](#)).

Hallmann et al. (2014) discovered that, above 0.02 µg/L Imidacloprid concentrations in waterbodies, bird populations in the Netherlands tended to decline by 3.5 per cent on average annually. They analysed a range of land use factors in two time periods, before and after the introduction of Imidacloprid. This showed that the pattern of decline appeared only after the introduction of Imidacloprid, and that the negative relationship remains after correcting for land-use changes known to affect bird populations in farmland.

In the USA the increase in neonicotinoid use in agriculture led to statistically significant reductions in bird biodiversity between 2008 and 2014. Grassland bird species declined by 4% per year and insectivorous birds by 3% ([Li et al. 2020](#)).

² Hiscock, K.M., Balashova, N., Hinchliffe, A. and West, W (in press) Neonicotinoids and fiproles in the floodplain wetlands of the Bure Marshes, Norfolk, UK.

In a review of the relationship between bird populations and neonicotinoid pollution Molenaar et al. (2024) concluded that the direct effects of exposure to neonicotinoids is likely to be contributing to bird population declines globally.

Perrot et al. (2025) showed that between 2013 and 2022 Imidacloprid pollution reduced French insectivorous bird populations by 12.7% before 2018 and the reduction persisted for years, with populations still reduced by 9% even after the 2018 agricultural ban.

Several studies show that neonicotinoid insecticides used in agriculture have detrimental effects on bird health. This includes reduced clutch size, eggshell thinning, behavioural impacts, reducing body mass, and increased mortality in various bird species (Mineau and Palmer 2013, Millot et al. 2017, Sabin and Mora 2022, Molenaar et al. 2024), significant navigation impairment in White-crowned Sparrows (*Zonotrichia leucophrys*) from Imidacloprid (Eng et al. 2017) and appetite suppression in Red-winged Blackbirds (*Agelaius phoeniceus*) (Eng et al. 2025).

Fipronil, when ingested via treated seeds, can reduce egg laying in Red-legged Partridges (*Alectoris rufa*) (Lopez-Antia et al. 2015).

The focus of most bird toxicology studies have been to examine the treated seed pathway, but birds that do not eat seeds have also been found to be contaminated with neonicotinoids including Honey Buzzard (*Pernis apivorus*) and hummingbirds (Byholm et al. 2018, Bishop et al. 2022), and, pertinent to the pollution of the sea with flea treatments, sea birds (Distefano et al. 2022).

Tank et al. (2026) examined selected pesticides and their breakdown products in feather samples from UK Blackbirds (*Turdus merula*), Blue Tits (*Cyanistes caeruleus*), Chaffinches (*Fringilla coelebs*), Dunnock (*Prunella modularis*) and Goldfinches (*Carduelis cardueli*) collected in 2020 and 2021. The study included four flea treatment ingredients Fipronil, Imidacloprid, Permethrin and Deltamethrin, as well as toxic breakdown compounds Fipronil sulphone, Fipronil sulphide, Desnitro-imidacloprid and Imidacloprid-olefin. Fipronil was detected in (or on) 73% of feathers, with Fipronil sulphone in 34% of feather samples and the sulphide in 3%; Imidacloprid was detected in 88%, the olefin was in 7% and the desnitro was not detected; Permethrin was detected in 99% of samples and Deltamethrin in no samples. The peak Imidacloprid concentration was higher than that of any of the other 22 chemicals measured, at 157.29 µg/kg, peak Fipronil was 3.24 µg/kg, Fipronil sulphone was 2.63 µg/kg, and Permethrin 59.4 µg/kg.

Toxicity studies relate dose to outcome, usually death, but the levels in the animal's system resulting from the dosing are rarely reported, nor has the relationship between insecticide levels in/on feathers and in the bird's body been established. It is therefore not yet possible to draw conclusions about the levels recorded in bird feathers and how the bird's reproduction, development or gene expression may be being impacted.

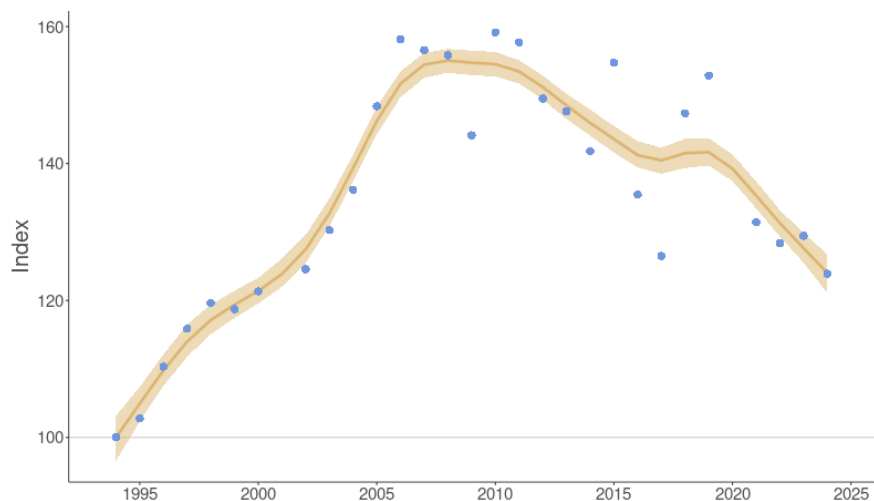
Two studies Guldmond et al. (2019 and here) and Diepens et al. (2023) showed that pet hair is contaminating bird nests with high levels of Fipronil and de Montaigu et al. (2025) found that the more Fipronil there was in the nests of British Blue and Great Tits (*Parus major*) the more likely it was that there would also be dead fledglings in the nest. Levels of Fipronil in their eggs was as high as 65.82 µg/kg and levels of Imidacloprid as high as 60.38 µg/kg (de Montaigu et al. 2026). Diepens et al. also found considerable quantities of flea treatment on

Dogs that had never been treated, the pathway was not studied, but may be Dog-Dog transmission.

About 74% of 249 examined species of Western Palearctic songbirds incorporate mammal hairs into their nest lining ([Harničárová and Adamík 2016](#)). Frequency of use of animal hairs varies between species, locations and season. Great Tits are particularly heavy users, but other species such as Blue Tits, Coal Tits (*Periparus ater*), Starlings (*Sturnus vulgaris*) and flycatchers routinely use animal hair.

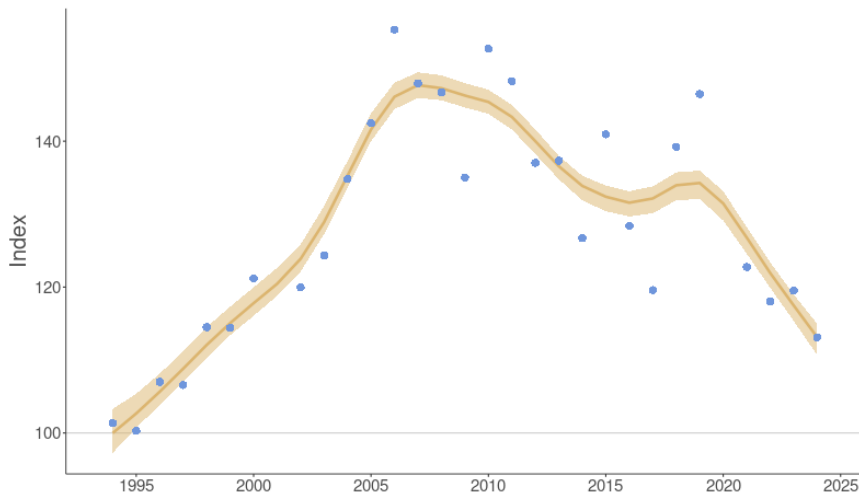
Although Great Tit and Blue Tit are still listed as Green status on the most recent Birds of Conservation Concern review ([2021](#)) the BTO data shows that both species are currently in decline (Graphs 1 and 4) and have poor ratios of fledglings to adult birds (Graphs 3 and 6):

In Scotland the Great and Blue Tit population shows no clear recent trend, but in England their recent declines are even more marked than their UK declines (Graphs 2 and 5).



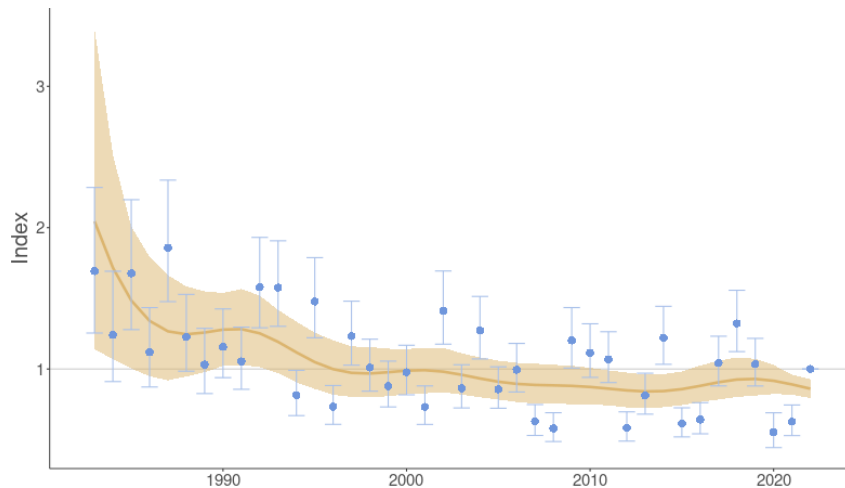
The smoothed trend line shows how the number of birds has changed through time. To make it easier to compare among species, this is expressed as an 'index', set to 100 in the first year. An easy way to interpret this is to say for every 100 birds that were present in the first year, the trend line shows how many were present in any subsequent year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 1. Great Tit population abundance in United Kingdom Long term trend (1994-) Heywood, J.J.N., Massimino, D., Balmer, D.E., Kelly, L., Marion, S., Noble, D.G., Pearce-Higgins, J.W., White, D.M., Woodcock, P., Wotton, S. Gillings, S. (2025) The Breeding Bird Survey 2024. BTO Research Report 765. British Trust for Ornithology, Thetford.



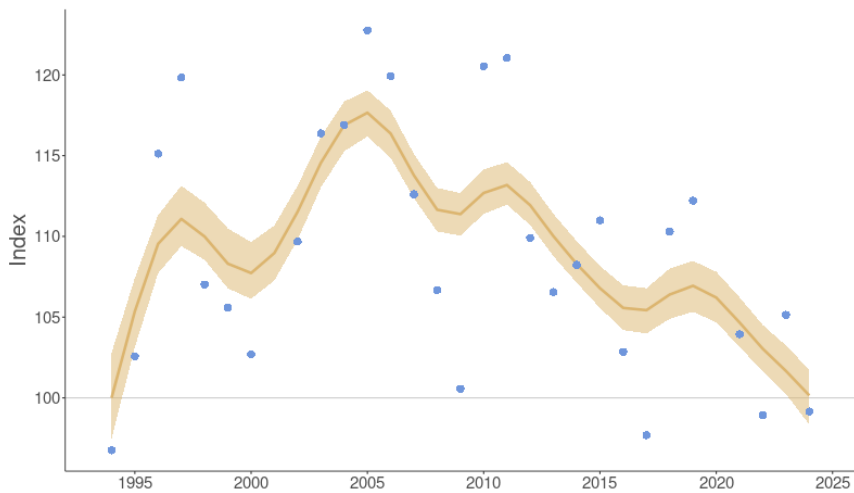
The smoothed trend line shows how the number of birds has changed through time. To make it easier to compare among species, this is expressed as an 'index', set to 100 in the first year. An easy way to interpret this is to say for every 100 birds that were present in the first year, the trend line shows how many were present in any subsequent year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 2. Great Tit population abundance in England Long term trend (1994-) BTO data (Heywood et al. 2025).



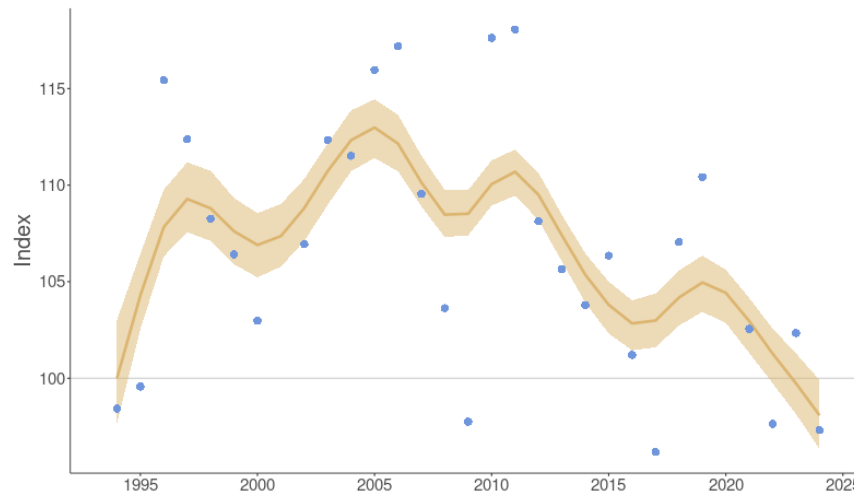
The smoothed trend line shows how the number of young birds caught per adult has changed through time. This is a measure of 'whole-season' productivity as it combines the effects of the number of breeding attempts made and the proportion of chicks that fledge and survive their first few weeks out of the nest. To make it easier to compare among species, this is expressed as an 'index', set to 1 in the final year. An easy way to interpret this is to say for every young bird raised now, the trend line shows how many were raised in a previous year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 3. Great Tit breeding performance in Britain and Ireland – Whole season productivity [BTO 2024](#). BirdTrends 2023: trends in numbers, breeding success and survival for UK breeding birds.



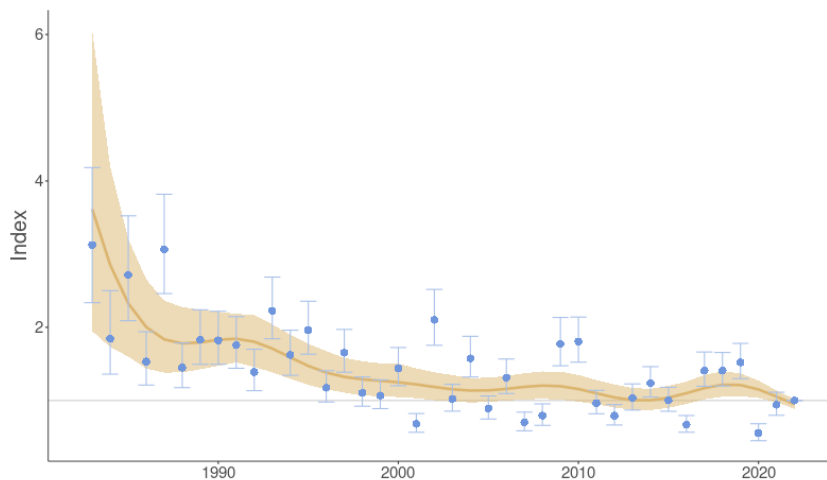
The smoothed trend line shows how the number of birds has changed through time. To make it easier to compare among species, this is expressed as an 'index', set to 100 in the first year. An easy way to interpret this is to say for every 100 birds that were present in the first year, the trend line shows how many were present in any subsequent year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 4. Blue Tit population abundance in the United Kingdom Long term trend (1994-) BTO data (Heywood et al. 2025).



The smoothed trend line shows how the number of birds has changed through time. To make it easier to compare among species, this is expressed as an 'index', set to 100 in the first year. An easy way to interpret this is to say for every 100 birds that were present in the first year, the trend line shows how many were present in any subsequent year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 5. Blue Tit population abundance in the England Long term trend (1994-) BTO data (Heywood et al. 2025).



The smoothed trend line shows how the number of young birds caught per adult has changed through time. This is a measure of 'whole-season' productivity as it combines the effects of the number of breeding attempts made and the proportion of chicks that fledge and survive their first few weeks out of the nest. To make it easier to compare among species, this is expressed as an 'index', set to 1 in the final year. An easy way to interpret this is to say for every young bird raised now, the trend line shows how many were raised in a previous year. The shaded area shows uncertainty around the trend line (based on 85% confidence limits) and values for individual years are shown as dots.

Graph 6. Blue Tit breeding performance in Britain and Ireland – Whole season productivity [BTO 2024](#). BirdTrends 2023: trends in numbers, breeding success and survival for UK breeding birds.

Declining Great and Blue Tit populations, particularly in England, and declining breeding performance, are trends that would be consistent with flea treatments impacting on the breeding success of these two fur using birds. Although the breeding success appears to have been in decline since the early nineties (when Fipronil flea treatments were introduced), the population declines appear to have started around 2006 when Imidacloprid flea treatment use picked up. If flea treatments were causing declines in these species then we would expect that decline to be most locally pronounced in areas with higher Human population and recreation density, and higher temperatures, as appears to be the case.

Insects, particularly those feeding on contaminated plant material are vulnerable to flea treatment pollution.

For instance plants growing in polluted water and soil can absorb Fipronil and Imidacloprid ([Caccavo et al. 2025](#), [Romeh 2009](#)) which is likely to create a toxic risk to insects feeding on the leaves, roots and stems, and could contaminate nectar and pollen creating a specific risk to bees and other pollinating insects in the vicinity of watercourses and in areas heavily used by Cats and/or Dogs.

Mahefarisoa et al. ([2021](#)) reported links between similar veterinary medicines used in agriculture and impacts on bees. Flea treatments have been implicated in Honeybee (*Apis mellifera*) deaths in three incidents. In 2014 Imidacloprid was detected in dead Honeybees from a hive adjacent to an area of grass where Dogs wearing flea collars containing Imidacloprid would regularly lie and where the bees had been seen to crawl.

Bees can be attracted to Imidacloprid ([Kessler et al. 2015](#)) and a 250 mg dose delivered to a large breed Dog contains enough Imidacloprid is equivalent to kill 25 million Honeybees ([Little and Boxall 2020](#)), so flea treatment poisoning of bees is a clear risk. However, although there was little use of Imidacloprid as an agricultural pesticide in 2014, it would still have been

present in wild flowers near agricultural fields and the bees could also have been exposed via biocide use ([VMD 2017](#)).

In two incidents reported to the VMD Fipronil was implicated in the deaths of thousands of Honeybees, from 14 hives in 2015, and in 2016 there was an incident in which four Honeybee hives failed next to a Dog rehoming centre, the levels of Fipronil detected in the dead bees were consistent with this being the cause of death ([VMD 2018](#)). Fipronil was not used as an agricultural insecticide in 2015 or 16 so unless the bees managed to access a Fipronil containing ant bait, these are flea treatment related. There does not appear to have been any regulatory response to these pharmacovigilance red flags.

Butterflies are at risk, when reared on leaves containing less than 1 µg/kg of Fipronil the adult Large White butterflies' (*Pieris brassicae*) egg production dropped by 55%, and 22% of their eggs were unviable, above 2 µg/kg lifespan was reduced ([Gols et al. 2020](#)).

Buijs et al. ([2026](#)) measured the levels of some flea treatments in Dandelions (*Taraxacum officinalis*) in public parks in the Netherlands. Of the authorised flea treatments Fipronil, Fipronil sulfone, Fipronil sulphide, Imidacloprid, Dinotefuran and Permethrin (cis and trans) were all detected in the Dandelions. Fipronil and Permethrin were most commonly encountered, in 53% of samples. The dry weights detected were: total Fipronil 3.7-10.5 µg/kg, Imidacloprid 13.7–17.2 µg/kg, Dinotefuran 27.7 µg/kg and total Permethrin 5.7-41.8 µg/kg (Dinotefuran flea treatments often also contain Permethrin). The authors concluded that “it is probable that the concentrations found will have a significant negative impact on local insect populations”.

Pollinators may be particularly at risk from the relatively high volume off-label use of Fipronil to treat Horses (*Equus caballus*) for chorioptic mange ([Haseler et al. 2023](#)).

There are calls to include bees in the environmental risk assessments for veterinary products ([UNAF 2018](#)).

The United States Environmental Protection Agency (EPA) has concluded that Imidacloprid is likely to adversely affect 79% of federally listed endangered or threatened species and 83% of critical habitats ([EPA 2022](#)).

7. Pollution Levels in English Water Bodies 2014-2024

To better understand current and recent pollution levels of Fipronil and Imidacloprid Environment Agency data on the occurrence of Fipronil and Imidacloprid in 6,532 samples from the Liquid Chromatography–Mass Spectrometry (LCMS) water monitoring programme in England between 2014 and 2024 was analysed ([data](#)).

The data is not all collected systematically, for instance it may be collected in response to a pollution incident, so may be biased, conclusions need to be drawn with care. Also the 2014 and 2020 data sets are small and probably less comparable to the other years, particularly as fewer records reduce the chances of recording low frequency, high concentration events. Indeed, due to Covid monitoring was disrupted and only undertaken for three months in 2020 and for eight full and three partial months in 2021. Never-the-less, with 6,532 samples, all tested for Fipronil and Imidacloprid (and latterly for some Fipronil breakdown toxins as well),

the data can give us a picture of the levels of Fipronil and Imidacloprid that wildlife is routinely encountering in English streams, rivers, lakes and coastal waters.

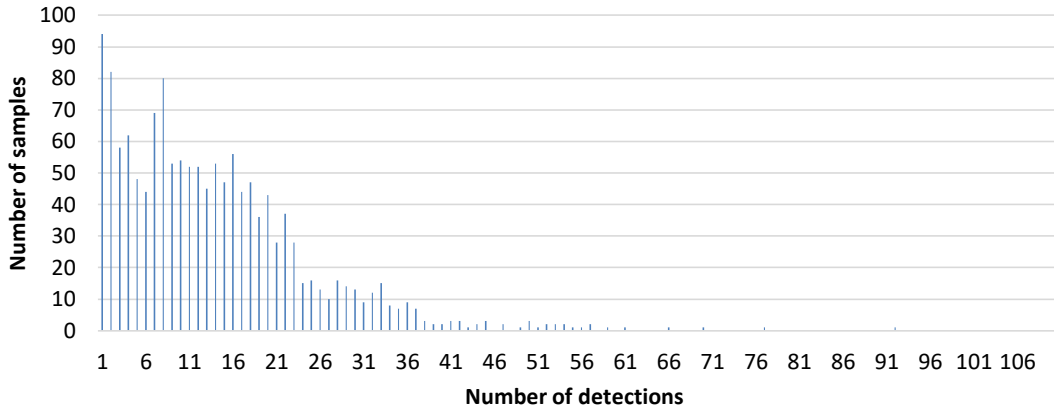
Samples are classified by the source of the water sample (Table 4). Eleven sites contain samples allocated to more than one source, in some cases this appears to be due to several sources being investigated under one location reference, in others (e.g. Lake Windermere ‘river’ source) there may be an error in the source recording, while in other instances (e.g. Tees Estuary - River and Estuary - and Swale Estuary – Estuary and Sea) the same location may have been classified differently on different visits, or, as the Latitude and Longitude provided represents the centre of the location, samples may have been taken from more and less marine points. The source classification has been accepted at face value for the purpose of further analysis. It is not clear what ‘Any Water’ refers to and one of the two samples contains anomalously high readings, although it was apparently sampled in response to a pollution event.

Water source	Number of sites	Number of samples	No. target chemical detections	Average number of detections/sample
River	130	4,485	284,773	63.5
Pond/Lake/Reservoir	15	34	954	28.1
Estuary	43	313	16,226	51.8
Sea	21	150	3,678	24.5
Groundwater	229	1,418	19,601	13.8
Sewage	3	10	497	49.7
Surface	4	16	353	22.1
Trade Effluent	3	104	2,989	28.7
Any Water	2	2	16	8.0

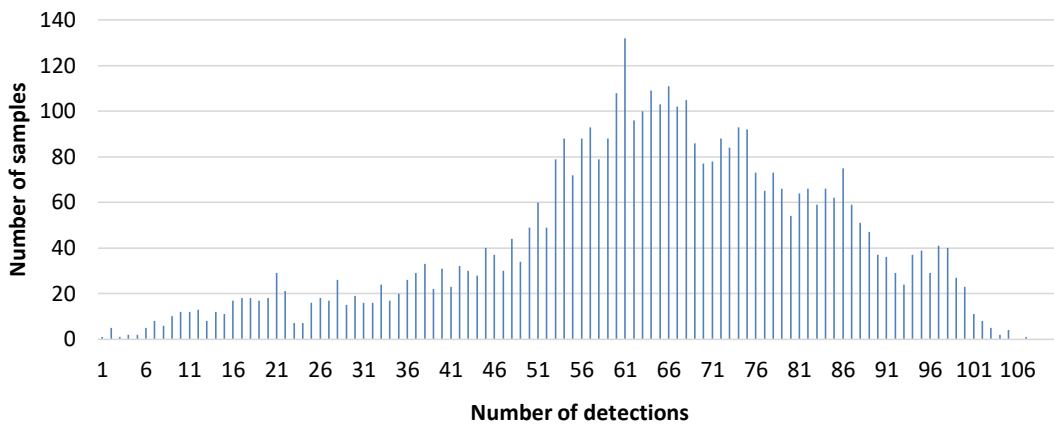
Table 4. Summary of 2014-2024 EA LCMS data by water source category.

Samples are tested against the Environment Agency National Laboratory Service target list of chemicals, and detections recorded. Non-detections are not recorded, so samples with no detections are not recorded. This creates a difficulty with calculating average concentrations of a pollutant as the number of zeros cannot be deduced from the data presented.

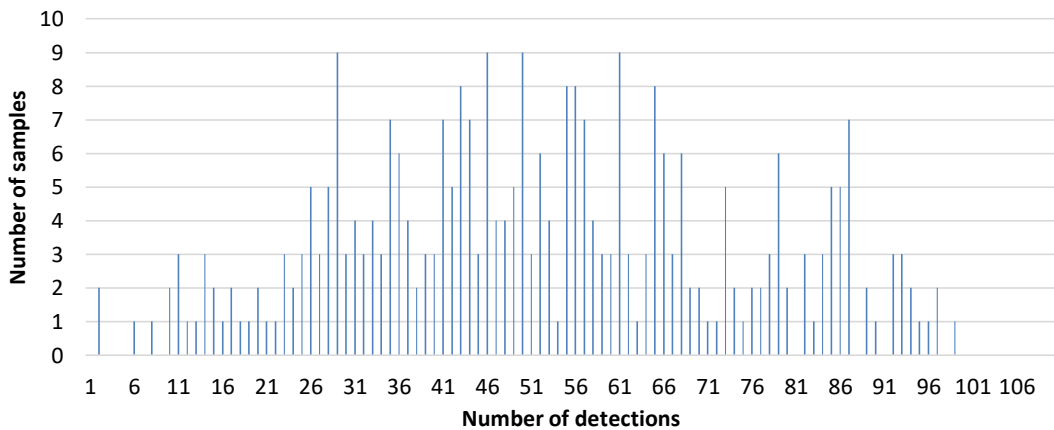
To judge if there are likely to be many unreported (zero detection) samples the frequency of detections in samples was plotted for each of the five main sample source categories.



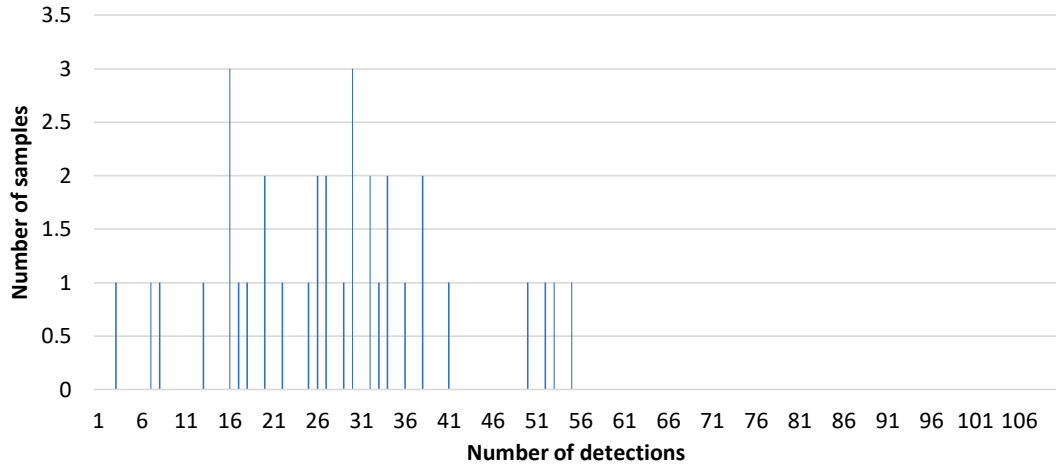
Graph 7. Number of detections all chemicals per sample – Groundwater.



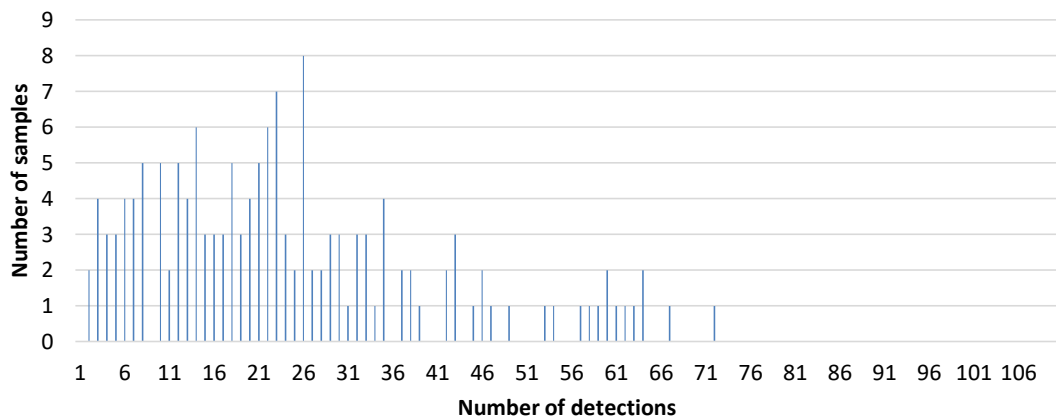
Graph 8. Number of detections all chemicals per sample – River.



Graph 9. Number of detections all chemicals per sample – Estuary.



Graph 10. Number of detections all chemicals per sample - Pond/Lake/Reservoir.



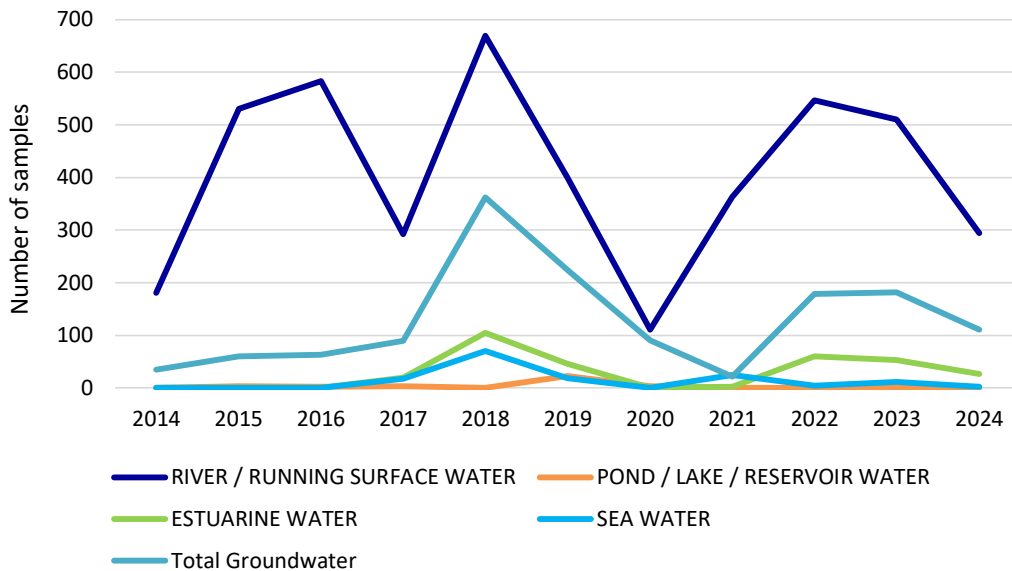
Graph 11. Number of detections all chemicals per sample – Sea.

Groundwater (combining the three categories of groundwater in the dataset) has a significantly skewed detection profile suggesting that there are likely to be a significant number of zero return samples (Graph 7), hence the occurrence and average concentrations of chemicals for this source are likely to be over estimates. On the other hand the detection profile for rivers shows that only 0.25% of river samples detected 1-5 chemicals (Graph 8), so the number of zero detections is likely to be insignificant and we can have confidence in the statistics derived for river water. Estuary, pond/lake/reservoir, and sea had intermediate detection profiles, with estuary being least skewed (Graph 9) and sea being most skewed (Graph 10), however none are anywhere near as zero skewed as the groundwater, suggesting that these sources are unlikely to return a high number of zero detection samples and hence frequency and average detections are likely to be a reasonable representation of the pollution situation across the monitored sites.

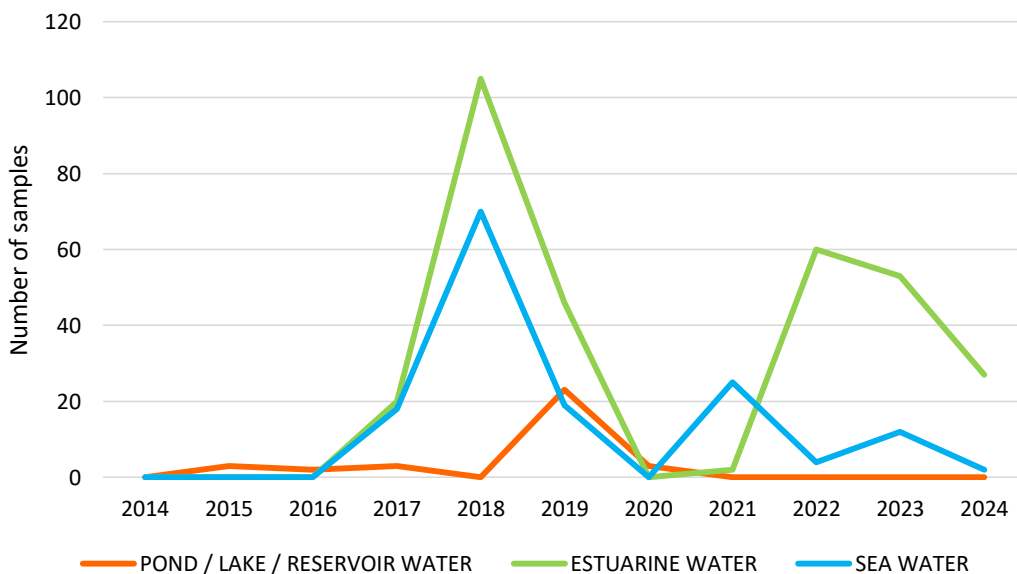
Fipronil or Fipronil sulphone were recorded at low levels in three ‘trade effluent’ samples. Imidacloprid was recorded at the very high 27 µg/L in one of the two ‘any water’ samples. There were no relevant detections in ‘surface water’. The ‘surface’, ‘trade effluent’ and ‘any waters’ categories contain only a small number of sites and are therefore not generally relevant to levels of Fipronil and Imidacloprid, so are not considered further. Results for ‘sewage’ and ‘groundwater’ are shown, but should be interpreted with caution due to the low number of ‘sewage’ sites and the zero skew of the ‘groundwater’ data.

While most samples are from Rivers (including other ‘flowing surface waters’) the number of samples taken each year varies significantly, with over five times as many samples being taken in 2018 compared with 2014 and 2020 (Graph 12).

Inter-year variation in sampling is even more stochastic for the other sources. There were no Estuary or Sea samples taken in 2014-2016 or again in 2020, so data is biased towards recent years, in contrast there were no Pond/Lake/Reservoir samples taken in 2018 or since 2020 so data is absent in the later period, and furthermore 70% of the Pond/Lake/Reservoir samples were taken in 2019 (Graph 13).



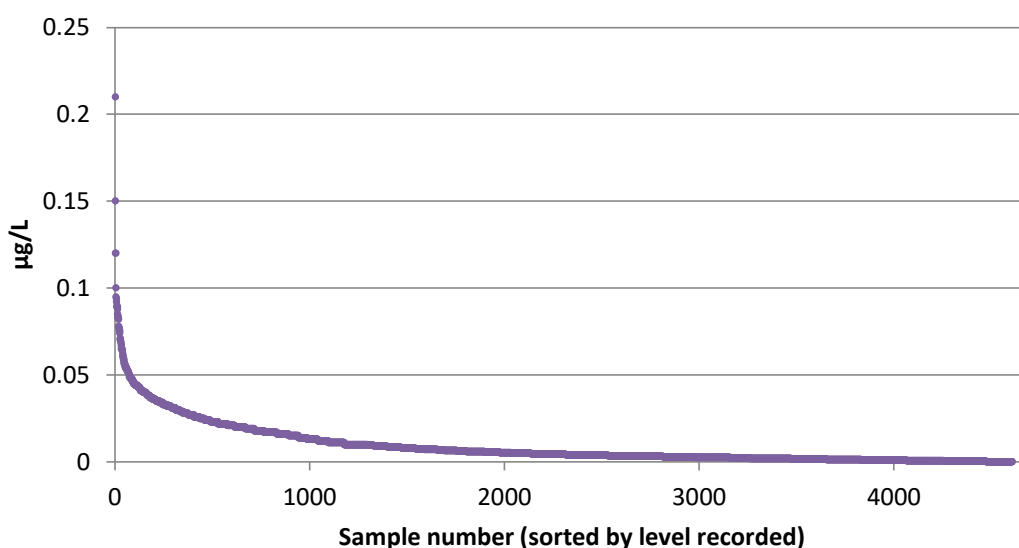
Graph 12. Number of samples taken in each habitat source by year.



Graph 13. Number of samples taken in each habitat source by year (only three smallest categories).

7.1. Fipronil and Breakdown Product Pollution Levels

There were very frequent low level detections of Fipronil and very infrequent high level detections (Graph 14).



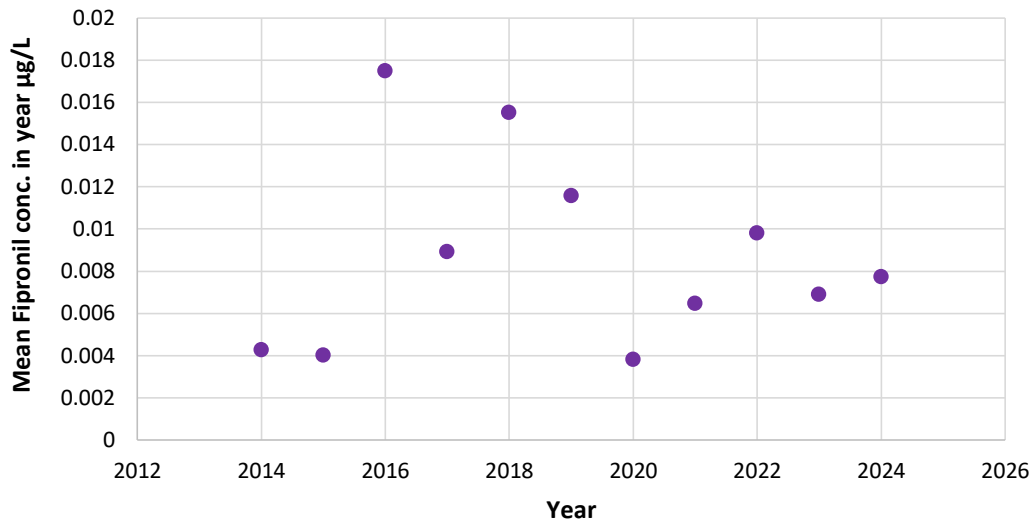
Graph 14. Fipronil concentrations measured in samples from all sources in the LCMS dataset – two highest readings, 3 and 0.98 µg/L, excluded.

Although Fipronil has been on the target list from before 2014, Fipronil sulphide and sulphone were only added during 2017, and Fipronil amide was not monitored until 2022. Only samples from years where the chemical was checked for are included in the data analysis and modelling for that chemical. However calculations of Total Fipronil include the earlier years when the breakdown toxins were not measured are therefore underestimates.

Water source	River	Pond/Lake/ Reservoir	Estuary	Sea	Ground water	Sewage
Fipronil parameter						
Fipronil detections	90.2%	64.7%	83.1%	37.3%	15.5%	80.0%
Fipronil total µg	44.5086	0.0408	0.9377	0.1319	0.2329	0.4419
Fipronil average/sample µg/L	0.00992	0.00120	0.00300	0.00088	0.00016	0.04419
Fipronil sulphone µg/L detections	71.3%	27.6%	53.0%	14.7%	10.4%	100.0%
Fipronil sulphone total µg	46.3438	0.0120	0.2747	0.0122	0.1293	0.2097
Fipronil sulphone av/sample µg/L	0.01455	0.00041	0.00088	8.13E-05	0.00010	0.02621
Fipronil sulphide detections	38.9%	3.4%	14.1%	0%	2.4%	75.0%
Fipronil sulphide tot µg	1.6408	0.0004	0.0267	0	0.0270	0.0089
Fipronil sulphide av/sample µg/L	0.00052	1.38E-05	8.53E-05	0	2.14E-05	0.00111
Fipronil amide detections	14.6%	0%	2.1%	0%	5.5%	0%
Fipronil amide total µg	0.1695	0	0.0017	0	0.0148	0
Fipronil amide av/sample µg/L	0.00013	0	1.21E-06	0	3.14E-05	0
Total Fipronil µg	92.6627	0.0532	1.2408	0.1441	0.4040	0.6605
Total Fipronil av/sample µg/L	0.02066	0.00156	0.00396	0.00096	0.00029	0.06605

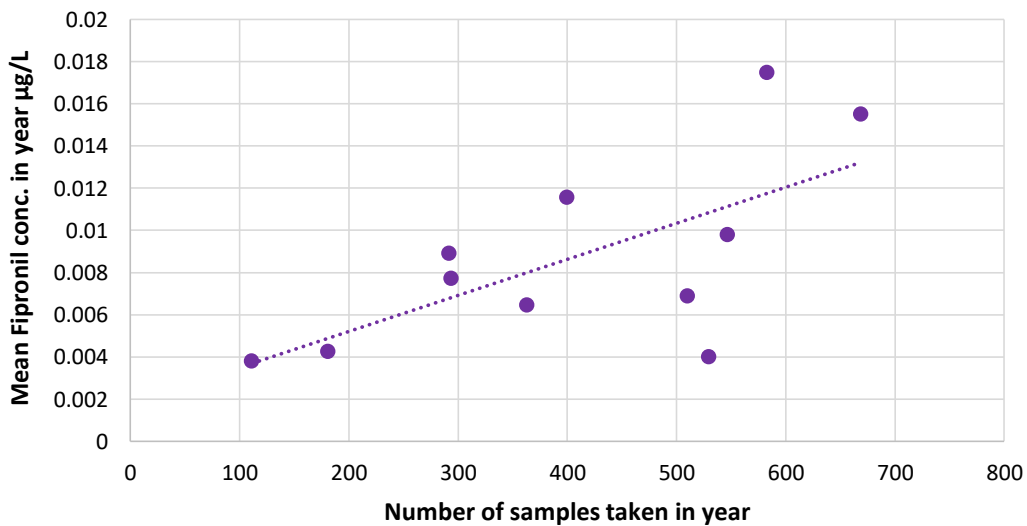
Table 5. Detections and levels of Fipronil and its breakdown toxins in each water body type (EA LCMS data).

Over 90% of River samples contained Fipronil, the average level of Fipronil recorded was 0.0099 µg/L – 13 times higher than freshwater Chronic EQS (Table 5).



Graph 15. Average Fipronil concentration in each year EA LCMS data – Rivers.

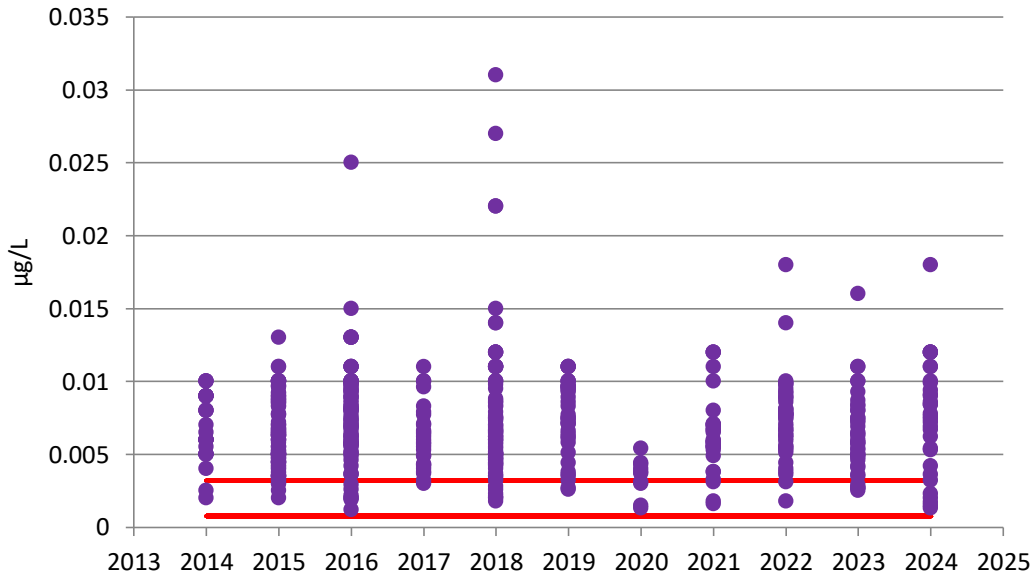
The average concentration of Fipronil in Rivers in England varies between years and shows no significant trend ($r^2=0.005$, $F=0.046$, $p\text{-value} = 0.83$), but has a (non-significant) tendency to increase over the last five years ($r^2=0.36$, $F=1.7151$, $p=0.2816$) (Graph 15).



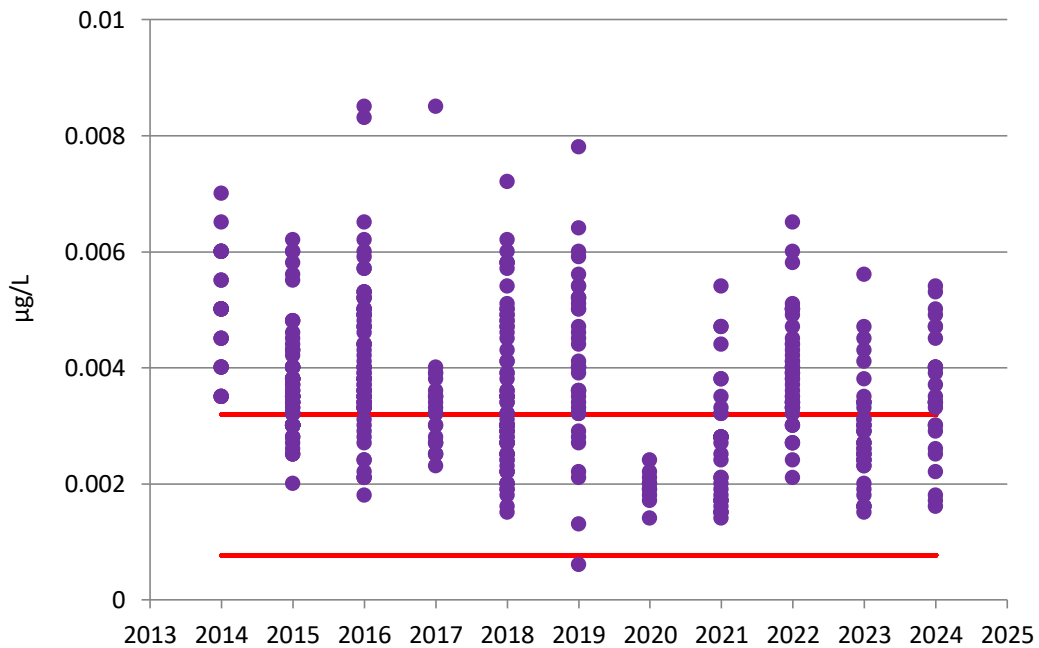
Graph 16. Average Fipronil concentration and number of samples taken in same year EA LCMS data – Rivers.

However, there was a significant relationship between the number of River samples taken and analysed in any year and the average Fipronil concentration recorded in the year ($r^2=0.43$, $F=7.0376$, $p = 0.02635$) (Graph 16). This suggests that the average level recorded depends on

the number of rare high concentration events captured by the sampling. In years with low numbers of samples the rare events were missed, resulting in an underestimation of pollution levels, whereas more rare events were measured in years with many samples. These rare high concentrations could be caused, for example, by an animal recently swimming in the water body, the disposal of a treatment into the waste water system, or an incident in the production or supply lines of the chemical. If more samples were taken it is possible that more rare high concentration events would be detected and the averages recorded would be higher.

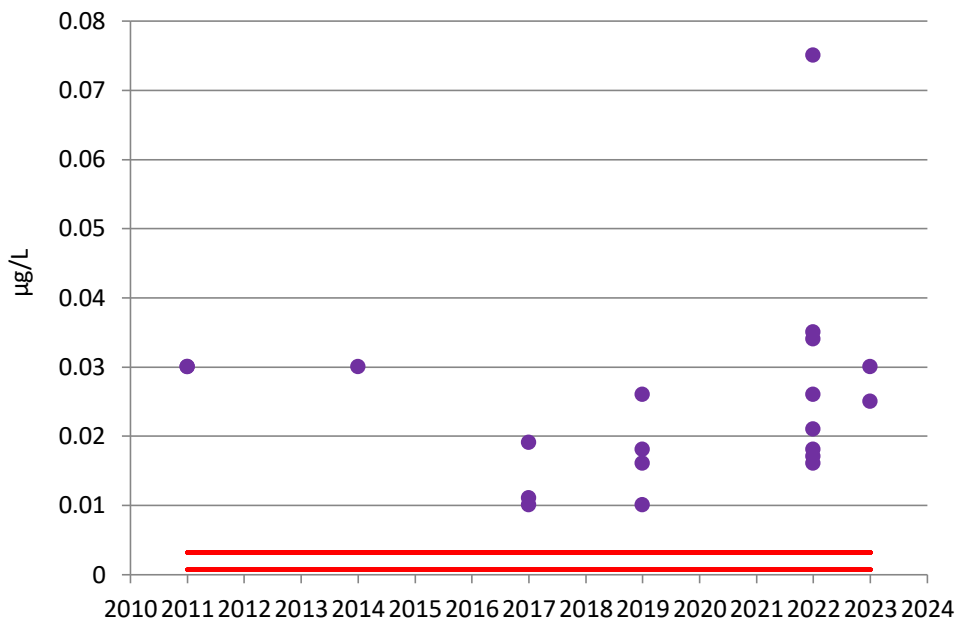


Graph 17. Fipronil in River Waveney EA LCMS data with EQS Chronic and Acute thresholds $\mu\text{g/L}$ (highest reading 0.12 in 2018 excluded).



Graph 18. Fipronil in River Wensum EA LCMS data with EQS Chronic and Acute thresholds $\mu\text{g/L}$ (highest reading 0.045 in 2014 excluded).

In some rivers such as the Waveney and Wensum the levels of Fipronil were always over the Chronic harm threshold and almost always over the Acute harm threshold (Graphs 17 and 18).



Graph 19. Fipronil in River Yare EA GCMS data with EQS Chronic and Acute thresholds µg/L.

The Gas Chromatography Mass Spectrometry (GCMS) data from the EA also has some Fipronil measurements, but it is a smaller data set and the detection methods are variable (i.e. different chemicals are looked for in different samples). However Graph 19 shows the GCMS Fipronil detection data for the River Yare in Norfolk.

Thus, considering the study in the Bure by Hiscock et al. (in press) all the main rivers entering the Broads National Park routinely contain excessively high levels of Fipronil.

As well as occurring in 90.2% of River samples, Fipronil was detected in 64.7% of Pond, Lake and Reservoir LCMS samples, this category includes a number 'reference sites' - remote water bodies that should have no pollution – which may disguise the actual prevalence of Fipronil pollution in standing waters.

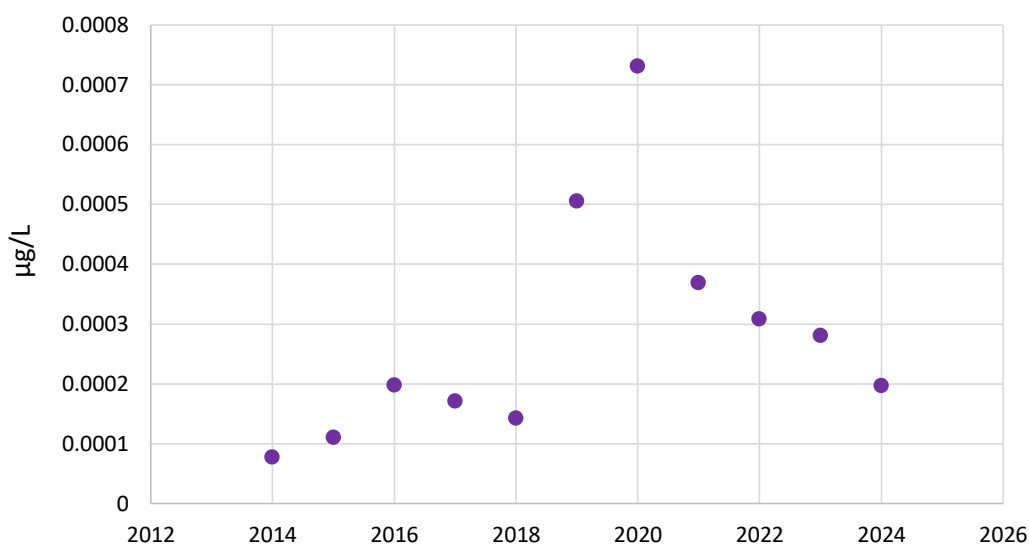
Fipronil was detected in 83.1% of Estuary samples and 37% of Sea samples, although at lower levels than in rivers. Toxicity of these chemicals is usually higher in saline water, so the levels recorded in Estuaries are particularly concerning.

The average level of Fipronil in sewage was five times higher than the average level in Rivers, but note the small sewage sample size.

15.5% of reported groundwater samples were contaminated with Fipronil. Groundwater detections were generally at low concentration and showed no trend over time ($r^2=0.1625$, $F=1.7465$, $p=0.2189$) (Graph 20).

While the toxicity and environmental safety limits of the Fipronil breakdown products have been less studied than Fipronil, the evidence suggests that Fipronil amide is slightly less toxic

than Fipronil, while the sulphide and sulphone are more toxic ([Weston and Lydy 2014](#), [Miller et al. 2020](#) (although not for all species [Liu et al. 2024](#))).



Graph 20. Average Fipronil concentration in each year EA LCMS data – Groundwater.

Fipronil sulphone was detected in more than 71.3% of River samples and 53% of Estuary samples, over a quarter of Pond/Lake/Reservoir samples, in 14.7% of Sea samples and in 10.4% of recorded Groundwater samples. The average level in Rivers was 0.01455 µg/L, the highest average in any water body category, 86 times higher than Chronic EQS and over half the level recorded in Sewage samples (Table 5).

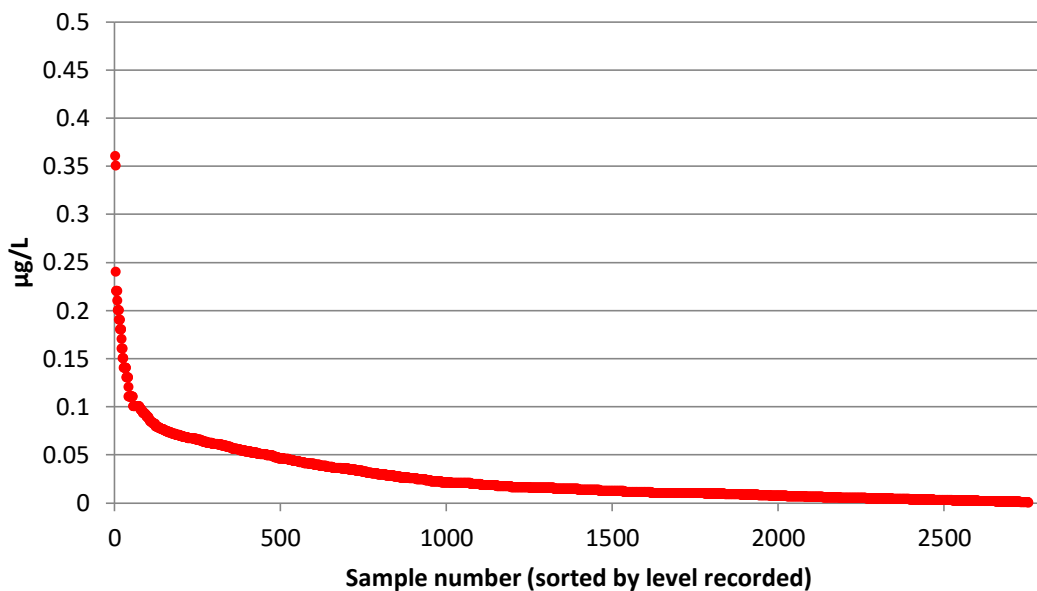
On 16 November 2023 an exceptional reading of 35 µg/L Fipronil sulphone was taken on the River Ivel in Bedfordshire, nearly 100 times higher than the next highest reading of Fipronil sulphone in the LCMS dataset. The reading was also unusual as there was no Fipronil in the sample. Usually Fipronil sulphone occurs as a breakdown product of Fipronil and the two compounds occur together, normally with significantly more Fipronil than Fipronil sulphone. However, the Ivel (and to some extent the nearby Ouse, Nene and Sincil Dyke) are unusual in that they often return readings of Fipronil sulphone without Fipronil, and when they do occur together there can be more sulphone present than its parent chemical. It is not clear if this anomalous local situation is a result of specific water chemistry, biological metabolism, sewage treatment, bio-solid use or another unusual pollution source. Hence the exceptional reading has been retained in the analysis, however it should be noted that this single, questionable, reading is responsible for 0.0078 µg/L (over 1/3rd) of the 'Total Fipronil' average 0.0207 µg/L in Rivers – if the reading was discounted, the average 'Total Fipronil' reading for rivers would be 0.01286 µg/L and for Fipronil sulphone 0.00356 µg/L.

Fipronil sulphide was routinely encountered, occurring in 38.9% of River samples, 14.1% of Estuary samples, 3.4% of Pond/Lake/Reservoir samples and 2.4% of Groundwater samples. Water body pollution was highest in Rivers at 0.00052 µg/L, over 3.7 times higher than the Chronic EQS threshold and half the level recorded in Sewage samples. The sulphide was not detected in Sea samples (Table 5).

Fipronil amide was less frequently detected, occurring in 14.6% of River samples, 2.1% of Estuary samples and 5.5% of Groundwater samples. Water body pollution was highest in rivers at an average of 0.00013 µg/L. The amide was not detected in Pond/Lake/Reservoir, Sea or Sewage samples (Table 5).

7.2. Imidacloprid Pollution Levels

There were many low level detections of Imidacloprid, although not as many as Fipronil, and few high Imidacloprid levels were recorded, however in the mid-range Imidacloprid was more frequently at higher levels than Fipronil (Graphs 21 and 14).



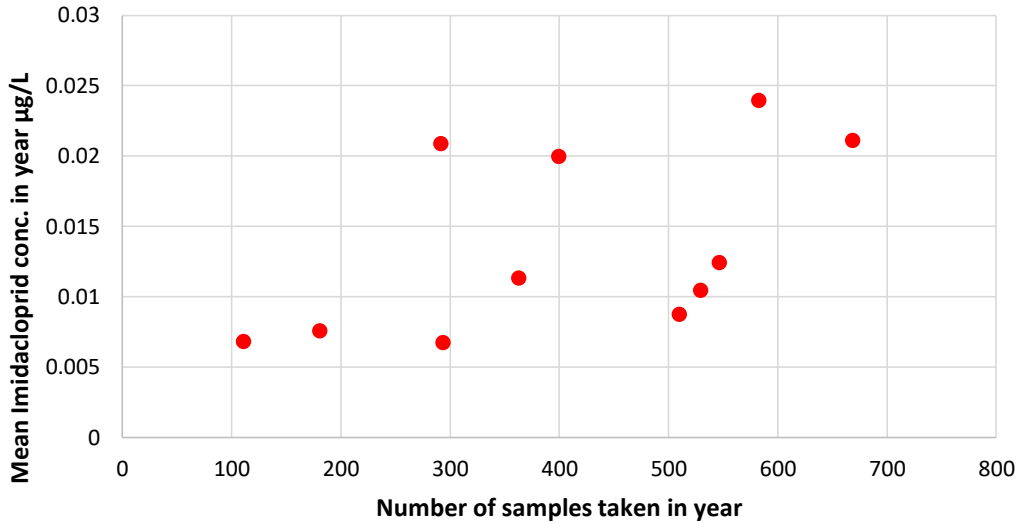
Graph 21. Imidacloprid concentrations recorded from all sources in the EA LCMS dataset – three highest readings 27, 3 and 0.84 µg/L excluded.

Imidacloprid parameter/Water Source	River	Pond/Lake/Reservoir	Estuary	Sea	Ground water	Sewage
Imidacloprid detections	56.0%	11.8%	22.7%	7.3%	10.9%	50.0%
Imidacloprid total µg	67.0610	0.0206	1.3229	0.0272	4.2518	0.5380
Imidacloprid average/sample µg/L	0.01495	0.00061	0.00423	0.00018	0.00300	0.05380

Table 6. Detections and levels of Imidacloprid in each water body type (EA LCMS data).

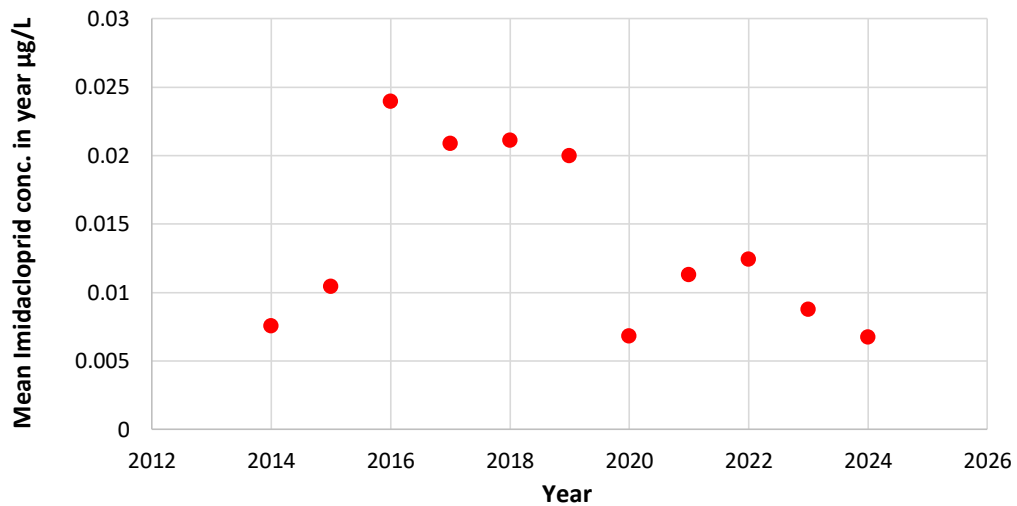
Imidacloprid was detected in 56% of River samples, at an average level of 0.01495 µg/L, more than double the Chronic pollution threshold. In Estuaries Imidacloprid was under half as frequent and concentrated with 22.7% exceedances and 0.00423 µg/L. Imidacloprid was also detected, at lower average concentrations, in 11.8% of Pond/Lake/Reservoir samples, 10.9% of Groundwater samples and 7.3% of Sea samples (Table 6).

Levels of Imidacloprid were 3.5 times higher in Sewage than Rivers.



Graph 22. Average Imidacloprid concentration and number of samples taken in same year EA LCMS data – Rivers.

Like Fipronil there was an apparent tendency for higher average Imidacloprid levels in rivers when more samples were taken in the year, but unlike Fipronil the trend is not significant ($r^2=0.2802$, $T=1.8719$, $p\text{-value} = 0.094$) (Graph 22).



Graph 23. Average Imidacloprid concentration in each year EA LCMS data – Rivers.

While Imidacloprid levels in rivers showed no clear trend over the full period of the data ($r^2=0.1325$, $F=1.374$, $p=0.2712$) (Graph 23) there was a significant decline in Imidacloprid pollution levels in rivers over the last nine years (2016-2024) ($r^2=0.7758$, $F=24.2267$, $p=0.00171$).

7.3. Current Environmental Harm Levels

The detections in all waterbodies (i.e. excluding Sewage, Surface Water, 'Any Water' and Trade Effluent) were compared against environmental safety thresholds and against toxicity outcomes from scientific studies of different groups of organisms. The thresholds used are listed in Table 7 and are referenced in Appendix 1. Environmental Quality Standards are developed using standard techniques, the most recent calculations were used, none have been statutorily adopted yet, although the Imidacloprid EQSs are due to be adopted by the EU. Although the only test species occurring in the wild in the UK is the Harlequin Fly (*Chironomus riparius*), close relatives of the other test species occur in comparable ecological niches in the UK. In any case the test species are representative generally and are unlikely to include the species that are most sensitive to the chemicals.

Thresholds developed for use with freshwater pollution were applied to all samples where a comparable saline water (Estuary and Sea) threshold was not available. Fipronils and Imidacloprid tend to be more toxic in saline habitats, so using freshwater derived thresholds is likely to underestimate the harm caused. Only Imidacloprid has a separately calculated saltwater Chronic EQS ([Moeris et al. 2021](#)) (the previously proposed EU saltwater EQS was the same as the freshwater EQS), enabling the data to be split and assessed against the relevant threshold. The No Observed Effect Concentration level for the saltwater Bay Opossum Shrimp (*Americamysis bahia*) was only applied to Sea and Estuary detections of Fipronil sulphone and sulphide.

No EQS standards have been calculated for Fipronil amide, there are few relevant toxicity studies, and concentrations in the samples were generally low, with only two detections over 0.002 µg/L, so this breakdown chemical was not analysed against thresholds.

Threshold	Fipronil µg/L	Fipronil sulphone µg/L	Fipronil sulphide µg/L	Imidacloprid µg/L
AC _{field} Acceptable field concentration	0.000097			0.0035
Freshwater Env Quality Standard - Chronic	0.00077	0.00017	0.00014	0.0068
Predicted No Effect Concentration	0.00077			0.0083
Freshwater Env Quality Standard - Acute	0.0032	0.0013	0.00062	0.057
Salt Water Env Quality Standard - Chronic				0.002
DGV95 – 5% of species potentially affected	0.018			0.11
No Observed Effect Concentration for saltwater Bay Opossum Shrimp (<i>Americamysis bahia</i>)		0.0051	0.0046	
Kills 50% of Watery Midges (<i>Chironomus dilutus</i>)	0.0325	0.007	0.007	
50% of chironomid larvae stop responding to touch	0.032	0.007697	0.0098818	
Genotoxic endocrine disruption to Harlequin Fly (<i>Chironomus riparius</i>)	0.01			
Noshime Dragonfly (<i>Sympetrum infuscatum</i>) feeding reduced		0.01		
5% of pond species impacted				0.013
Abundance of macrofauna reduced				0.013
Causes 30% reduction in bird populations				0.02
Kills 10% of mayflies				0.03

Table 7. Published environmental safety thresholds and specific impact levels for Fipronil, its breakdown toxins and Imidacloprid.

Threshold	Fipronil	Fipronil sulphone	Fipronil sulphide	Imidacloprid
AC _{field} Acceptable field concentration	88%			47%
Freshwater Env Quality Standard – Chronic (freshwater Imidacloprid samples only)	81%	67%	34.6%	43%
Predicted No Effect Concentration	81%			30%
Freshwater Env Quality Standard - Acute	55%	50%	23%	7%
Salt Water Env Quality Standard – Chronic (salt water Imidacloprid samples only)				14%
DGV95 – 5% of species potentially affected	15%			1%
No Observed Effect Concentration saltwater Bay Opossum Shrimp (<i>Americamysis bahia</i>) (salt water samples only)		2%	0%	
Kills 50% of Watery Midges (<i>Chironomus dilutus</i>)	5%	15%	0.1%	
50% of chironomid larvae stop responding to touch	6%	14%	0%	
Genotoxic endocrine disruption to Harlequin Fly (<i>Chironomus riparius</i>)	25%			
Noshime Dragonfly (<i>Sympetrum infuscatum</i>) feeding reduced		9%		
5% of pond species impacted				29%
Abundance of macrofauna reduced				29%
Causes 30% reduction in bird populations				21%
Kills 10% of mayflies				16%

Table 8. Percentage of EA LCMS samples exceeding environmental safety thresholds in rivers, ponds, lakes, reservoirs, estuaries and sea 2014-2024.

Safety thresholds for aquatic ecology were routinely exceeded (Table 8).

Four of the five chemicals frequently exceeded the safety thresholds with readings over the chronic harm threshold in more than 34% of samples, often by significant margins. Rivers are in greatest jeopardy, but harm extends to estuaries, ponds, lakes, reservoirs and the sea.

Fipronil levels were wildly high with 81% of samples exceeding the Chronic harm threshold and 55% exceeding the Acute harm threshold. 88% of detections were over the Acceptable Field Concentration (AC_{field}) ([Liess et al. 2021](#)).

It is undoubtable that this will be having a significant impact on aquatic life. The average level of Fipronil detected in English waterbodies was higher than the highest concentration detected in a study that found that Fipronil pollution caused declines in pollution sensitive aquatic invertebrates on nature reserves in Germany ([Schweiger et al. 2025](#)). In 25% of samples Fipronil occurred at levels that cause genotoxic endocrine disruption in the Harlequin Fly (*Chironomus riparius*) ([Pinto et al. 2024](#)), 5% were over the level capable of killing 50% of the related Watery Midge (*Chironomus dilutus*) and 6% of detections were over the level where 50% of chironomid larvae stop responding to touch ([Weston and Lydy 2014](#)).

Fipronil sulphone was also routinely present at very high concentrations, with 67% of samples exceeding the Chronic harm threshold and 50% exceeding the Acute harm threshold (Table 8).

Again impacts on aquatic life are inevitable as 14% of Fipronil sulphone detections were sufficiently strong to kill 50% of the Watery Midge (*Chironomus dilutus*), 10% were high enough to stop chironomid larvae responding to touch ([Weston and Lydy 2014](#)), and 9% of samples were at levels that stop dragonfly larvae from feeding ([Jinguji et al. 2018](#)). In Estuaries and the Sea 2% of samples were over the level where impacts on the saltwater Bay Opossum Shrimp (*Americamysis bahia*) are expected ([Lima et al. 2000](#)).

Fipronil sulphide was present at high concentrations, with 34.6% of samples exceeding the Chronic harm threshold and 23% exceeding the Acute harm threshold (Table 8).

The impacts of the different Fipronil compounds will be additive, causing a cumulative impact on aquatic life.

Imidacloprid routinely occurred at environmentally damaging levels with 43% of freshwater samples exceeding the Chronic harm threshold and 7% of samples exceeding the Acute harm threshold. 47% of detections were over the acceptable Field Concentration (AC_{field}) ([Liess et al. 2021](#)). In Estuaries and the Sea 14% of samples exceeded the Salt Water Chronic Environmental Quality Standard, and the average concentration in samples from estuaries was double the EQS threshold ([Moeris et al. 2021](#)).

Although the frequency of EQS exceedances was lower for Imidacloprid than for Fipronil, there has been more research into the field impacts of Imidacloprid, enabling more sophisticated ecological response predictions. 29% of samples contained Imidacloprid at levels that will sharply reduce the abundance of aquatic animals and impact 5% of species present ([Van Dijk et al. 2013](#), [Li et al. 2025](#)), 16% of samples could kill 10% of mayflies ([Roessink et al. 2013](#)) and 21% of samples contained high enough levels to cause a 30% reduction in associated bird populations ([Hallmann et al. 2014](#)).

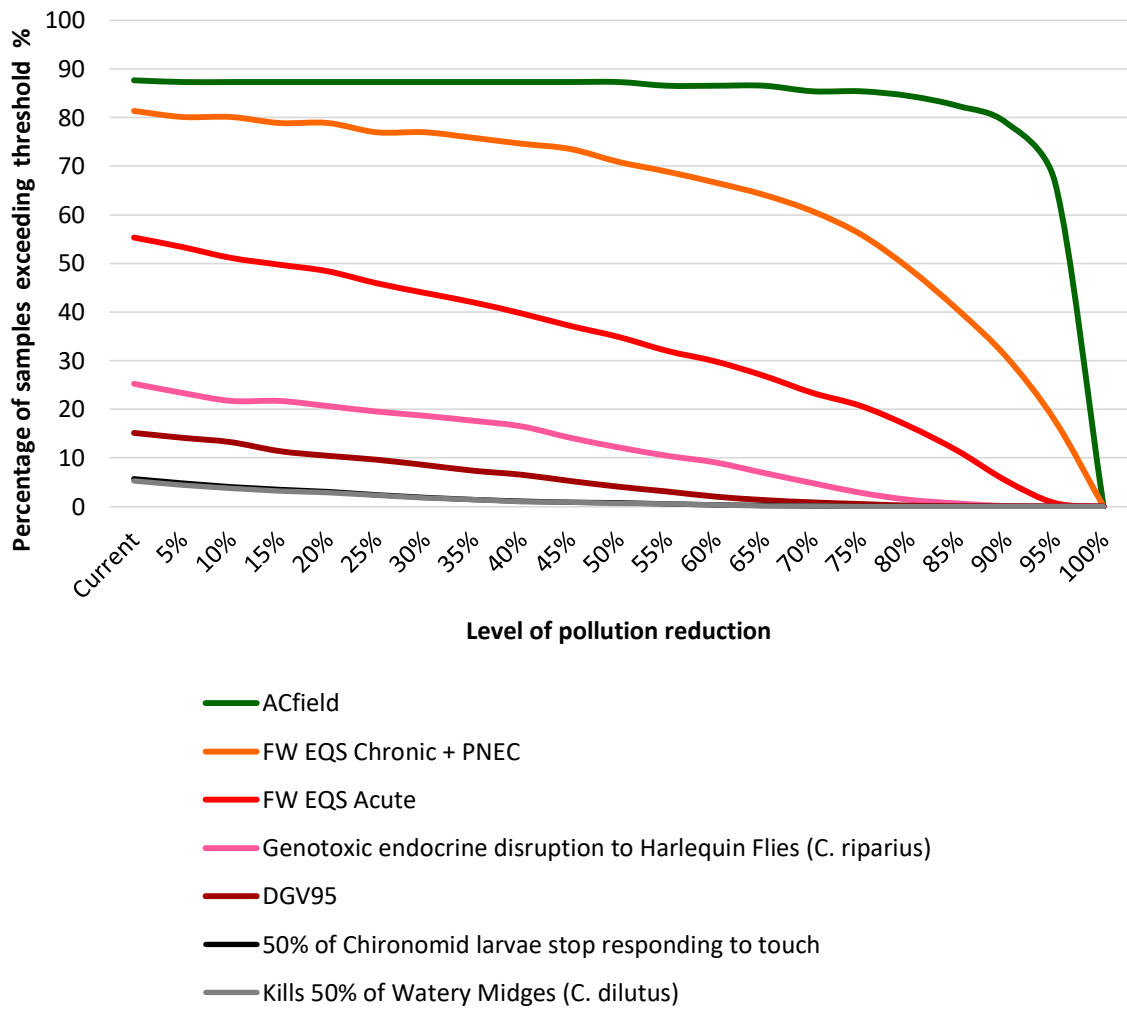
Hadley et al. ([2026](#)) tested water at 62 sites across a variety of river systems in Wales, and detected Fipronil in 44%, and Imidacloprid in 77%, of samples, with 36% of samples over the Fipronil Chronic EQS level and 31% of samples over the Imidacloprid Chronic EQS level.

Impacts in the waterbodies are likely to be higher than predicted as there is no data for common breakdown products of Imidacloprid – particularly Imidacloprid-olefin, but also potentially Imidacloprid-urea, 5-Hydroxy-imidacloprid and Desnitro-imidacloprid.

Pollution levels of Fipronil and its breakdown toxins and Imidacloprid are exceptionally widespread and high, with environmental quality standards being routinely exceeded, significant harm to aquatic communities can be concluded.

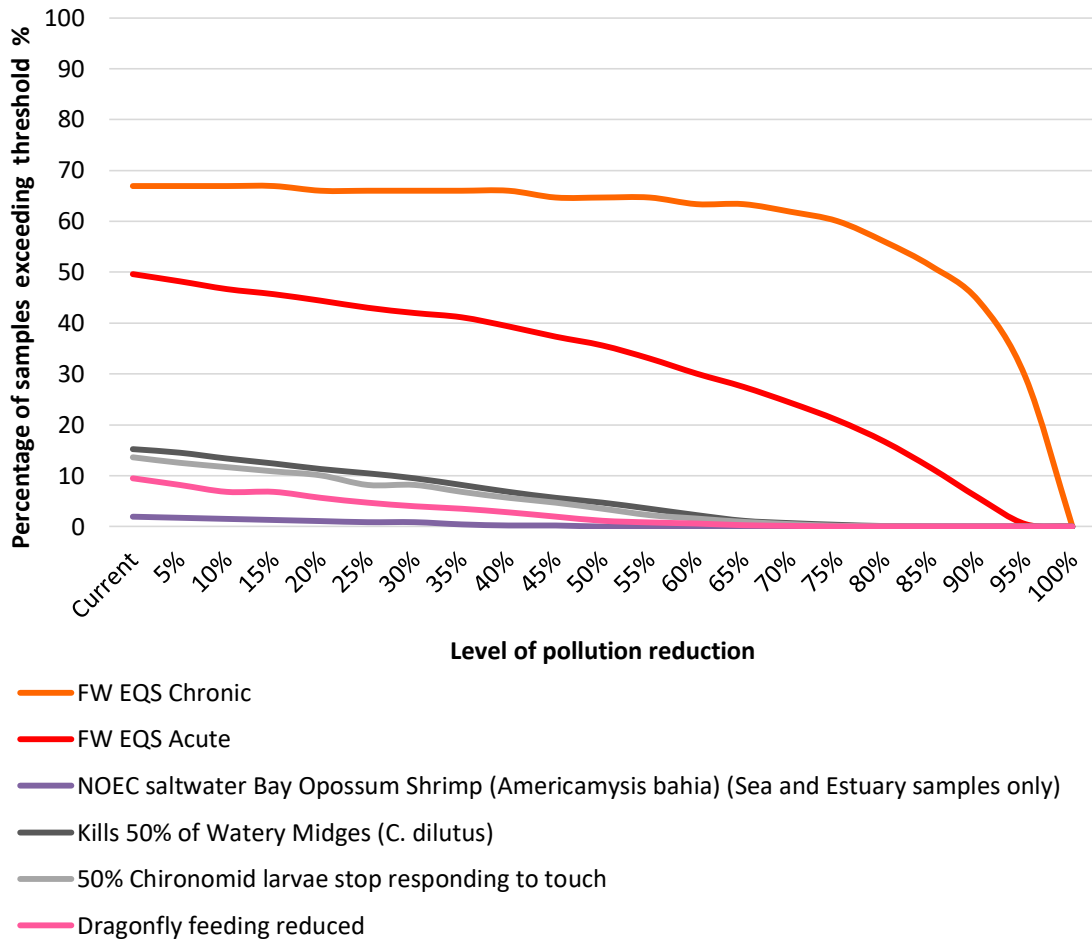
8. Pollution Reduction Models

Levels of Fipronil, Fipronil sulphone, Fipronil sulphide and Imidacloprid are currently causing unacceptably frequent and high exceedances of the relevant environmental quality standards in waterbodies. To predict the levels of exceedances that would be associated with reduced levels of pollution the concentration levels in River, Sea, Estuary and Pond/Lake/Reservoir samples were incrementally reduced and the resulting improvements to the exceedances that would be associated with reduced pollution levels were modelled.



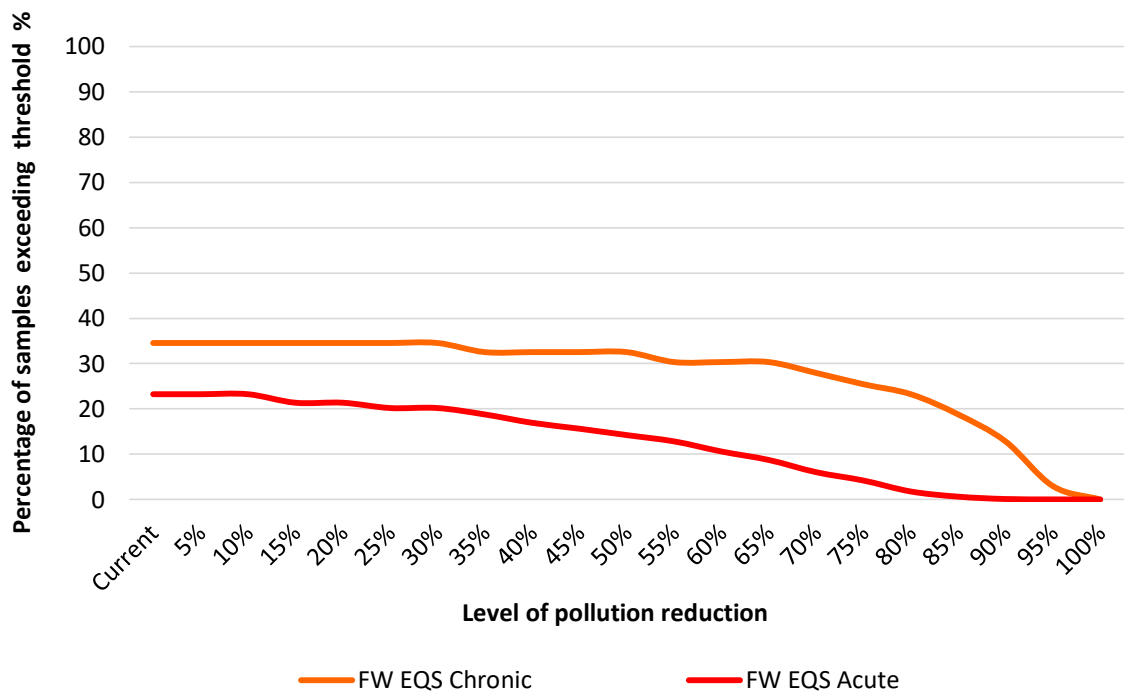
Graph 24. Fipronil pollution reduction model, current levels = 2014-2024 levels.

Fipronil AC_{field} , Chronic EQS and PNEC exceedances are very resistant to pollution reduction because the thresholds are low, close to the limit of detection. A 90% reduction in Fipronil pollution would bring Acute EQS exceedances down to 5% of samples, but 31% of samples would still exceed the Chronic EQS levels and 79% would still exceed the AC_{field} level. A 95% reduction in pollution would result in only 1% of samples exceeding the Acute EQS, but 18 percent of samples would still exceed the Chronic EQS, and 67% of samples would still exceed the AC_{field} . A 98% reduction in pollution would result in only 3% of samples exceeding the Chronic EQS and PNEC, but 42% of samples would still exceed the AC_{field} . A 99% reduction in pollution would eliminate the Chronic EQS and PNEC, but would still cause 26% of sites to exceed the AC_{field} threshold (Graph 24).



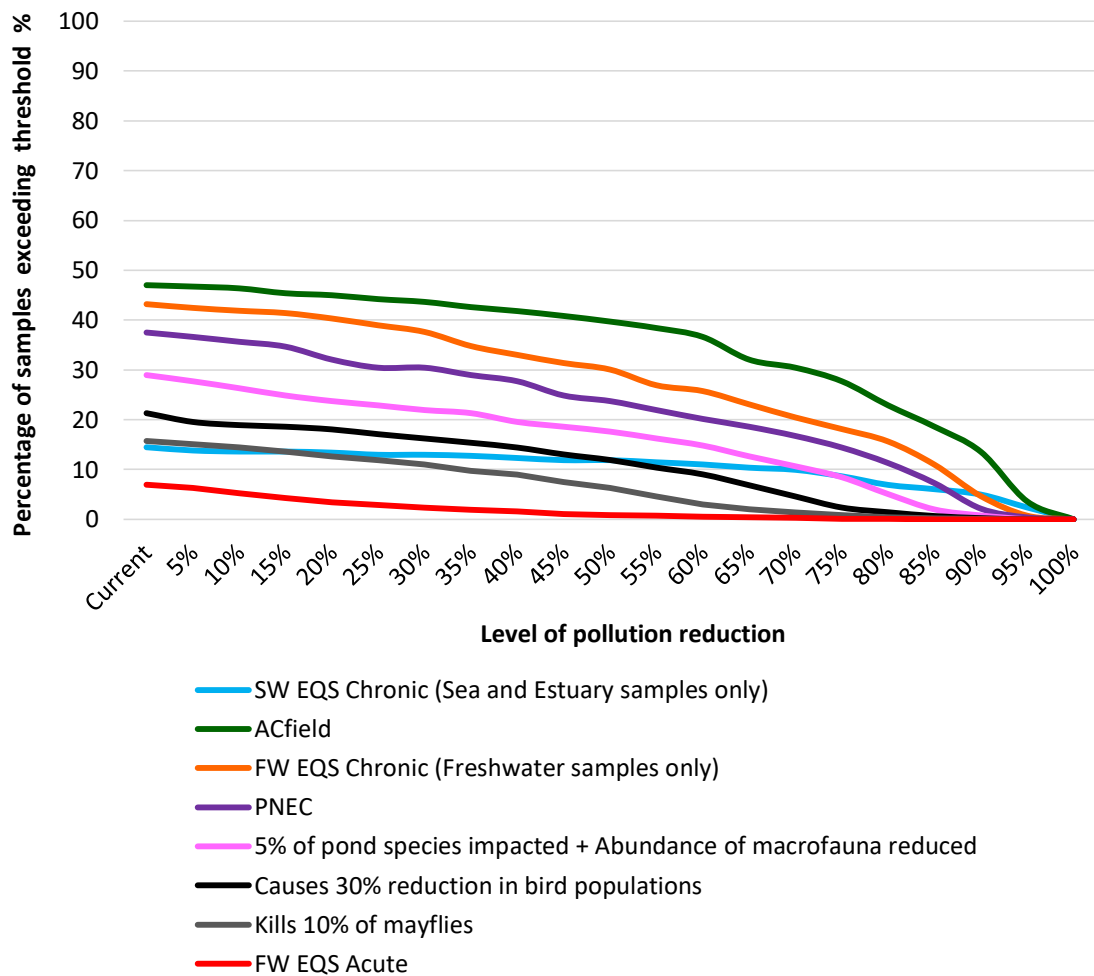
Graph 25. Fipronil sulphone pollution reduction model, current levels = 2017-2024 levels.

A reduction in Fipronil sulphone pollution levels of 95% would almost eliminate Acute EQS exceedances (0.49%), but 29% of samples would still exceed the Chronic EQS. A 98% reduction in pollution levels would bring the Chronic exceedances down to 12% of samples and a 99% reduction would bring them down to 2.8% (Graph 25).



Graph 26. Fipronil sulphide pollution reduction model, current levels = 2017-2024 levels.

A reduction in Fipronil sulphide pollution levels of 95% would almost eliminate Acute EQS exceedances (0.03%), and only 3% of samples would still exceed the Chronic EQS (Graph 26).



Graph 27. Imidacloprid pollution reduction model, current levels = 2014-2024 levels.

A reduction in Imidacloprid pollution levels of 90% would eliminate Acute EQS exceedances, but 5% of freshwater and saline water samples would still exceed their respective Chronic EQS and 14% would still exceed the AC_{field} level. A reduction of 95% would almost eliminate freshwater chronic exceedances (0.7%), would reduce salt water chronic exceedances to 2% and reduce AC_{field} exceedances to 5% of samples.

While there are no trends in levels of Fipronil in water bodies over the period of the data, for Imidacloprid there appears to have been a decline in levels in rivers over the last nine years. Between 2022 and 2024 the average concentration of Imidacloprid in water bodies was 0.0089 µg/L compared with 0.01375 µg/L between 2014 and 2024, suggesting that there has already been a 36% reduction in Imidacloprid levels.

8.1. Pollution Reduction Conclusions

Pollution levels are high, and these chemicals are highly toxic at very low levels, so thresholds are resistant to pollution reduction.

It will take a c.98% reduction in Fipronil pollution levels and a greater than 90% reduction in Imidacloprid pollution from 2014-2024 levels to reach a point where Environmental Quality Standard exceedances of these chemicals in waterbodies might be ecologically acceptable – or that would be regulatorily required if the chemicals were included on the Water Framework Directive list of Priority Substances.

Even so at 98% and 90% reduction levels 42% of samples would still be above the Field-Based Acceptable Concentration (AC_{field}) for Fipronil and 14% above the AC_{field} level for Imidacloprid, with 3% of samples also failing the Fipronil chronic pollution standard and 5% failing the Imidacloprid Chronic EQS standards.

While AC_{field} is not applied in regulatory context yet in the UK, it is a figure that provides a better tailored protection for aquatic invertebrates from these types of chemicals ([Vormeier 2023](#)) (see Appendix 1 'Environmental Standards Explained'), and, as we know from Schweiger et al. ([2025](#)), Fipronil occurrences over the AC_{field} levels cause measurable damage to aquatic invertebrate populations in streams.

As there has already been an apparent reduction in Imidacloprid pollution levels, this now equates to a c.84% reduction being required from current Imidacloprid pollution levels.

Unfortunately, on this basis only measures that are in combination capable of achieving a c.98% reduction in the amount of Fipronil, and a c.84% reduction in the amount of Imidacloprid currently getting into waterways, can resolve this ecological harm, or at least meet regulatory equivalent standards.

Even if new pollution stopped today the chemicals are persistent or PFAS 'forever chemicals', and their breakdown products are more toxic and also persistent, so it would probably take years, perhaps many years, before the pollution falls to harmless levels.

9. Sources of Fipronil and Imidacloprid Pollution in Water Bodies

The veterinary medicines/pesticide industry points out that Fipronil and Imidacloprid have current or past uses other than in flea treatments that may be contributing to the burden of these toxins in freshwaters. Industry body NOAH, whose members include Beaphar a major producer of Fipronil products for pets, and Benchmark who are behind [controversial](#) proposals to use Imidacloprid in sea lochs ([McCrae et al. 2021](#)), [claim](#) that "There are multiple sources of pesticide substances including biocides, pest control, agriculture and even imported treated textiles". Other sources of these two chemicals do need to be assessed.

The National Chemical Investigations Programme is a water industry initiative run by the UK Water Industry Research ([UKWIR](#)). The 2020-22 programme included a project investigating substances of emerging concern in sewage treatment, it looked at levels in sewage treatment plant influent and effluent, and in rivers upstream and downstream of 30 treatment plants in England and Wales. Fipronil and Imidacloprid were both included in the monitoring. Predicted No Effect Concentration (PNEC) levels were chosen against which to judge exceedances - 0.0121 µg/L for Fipronil (from ECHA dossier) and 0.0048 µg/L for Imidacloprid

(from EU biocides assessment). Comparing these figures with the more generally or recently applied standards set out in Table 7, the Imidacloprid standard they used looks reasonably protective, but the Fipronil standard looks out of date as it is 15 times higher than the generally accepted Chronic Environmental Quality Standard.

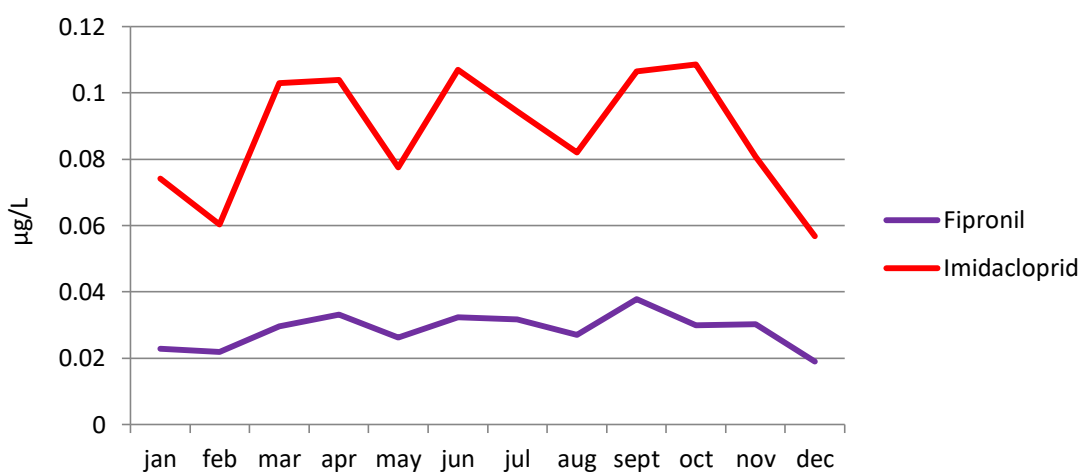
Seven of the 32 substances in the study exceeded the selected quality standards in the effluent, but only three substances exceeded the standards in river water downstream of the treatment plants – Fipronil, Imidacloprid and the flame retardant Decabromodiphenyl ether (UKWIR 2023). Despite the high bar for Fipronil, the two flea treatment chemicals were responsible for 69% of downstream exceedances.

	% upstream sites exceeding PNEC	% influent exceeding PNEC	% effluent exceeding PNEC	% downstream sites exceeding PNEC
Fipronil	0%	33%	93%	15%
Imidacloprid	35%	100%	100%	75%

Table 9. Percentage of sample sites with average levels exceeding PNEC limits in UKWIR data.

Although Fipronil did not exceed the PNEC upstream of treatment plants, it was still routinely detected below the limit of quantification in upstream water. If the detection limit of the study was improved and a recent Fipronil EQS was used instead of an old PNEC then it is likely that there would also be upstream exceedances for Fipronil. The PNEC for Fipronil was still exceeded in effluent from 93% of the treatment plants and Imidacloprid exceeded the PNEC in effluent at 100% of treatment plants (Table 9). While the upstream exceedances for Imidacloprid support a continued input from agriculture, basically the pattern for both chemicals were similar – considerably more pollution downstream of treatment plants. Flea treatments can also enter headwaters, particularly via swimming Dogs or septic tanks.

In the presented data Fipronil was on average 23% higher in rivers after they had passed the sewage treatment plants and Imidacloprid levels were 51% higher. However, looking at paired samples from the dataset Perkins et al. (2024) calculated that Imidacloprid levels were five times higher downstream (0.0076 µg/L upstream vs. 0.035.0 µg/L downstream).



Graph 28. Average Fipronil and Imidacloprid concentrations in sewage effluent from 30 treatment plants by month (Aug 2020 to Dec 2021 UKWIR data).

Averaged across 10 sewage treatment plants levels of Fipronil in effluent were 13% lower than in the influent, suggesting a very limited reduction due to sewage treatment, however, Imidacloprid was 100% higher in effluent than in influent suggesting the treatment doubled the amount of Imidacloprid. While increases in the levels may be the result of the timing of samples or release from sediments ([Zhang et al., 2023](#)) there is no evidence to support these theories, instead it may be that the sewage treatment is converting undetected breakdown products back into the original chemical. Li et al. ([2026](#)) detected increases in Fipronil in sewage passing through sewage treatment plants and determined that at least some of the increase was due to the breakdown product Fipronil sulphide being converted back into Fipronil by the sewage treatment. Zhang et al. ([2026](#)) found that Desnitro-imidacloprid occurred in sewage at levels 10 times higher than the parent Imidacloprid. The UKWIR study did not assess levels of any breakdown compounds or how changes to water chemistry might be affecting concentrations.

Very high average readings in rivers included Fipronil at 0.045 µg/L in Mill Dike, R. Don (Adwick Le Street STP) and 0.035 µg/L in Clackers Brook, R. Avon (Bowerhill STP) and Imidacloprid detections at 0.182 µg/L in Clackers Brook and 0.16 µg/L in the River Uck (Uckfield STP).

Fipronil and Imidacloprid concentrations tended to be lowest between December and February and were strongly correlated with each other (Correlation Coefficient = 0.81) (Graph 28), which suggests they had the same source and that use was seasonally associated with warm months, which fits with the source being flea treatments.

The report concluded that the Government should give further consideration to policies around flea treatment use.

Perkins et al. ([2024](#)) used data from two of the treatment plants to calculate that 29.7 µg of Imidacloprid and 7.3 µg Fipronil was emitted in the sewage every day per every person served by the treatment plant. Scaled up to the UK population this would result in an estimate of 185 kg of Fipronil and 753 kg of Imidacloprid being emitted from sewage in the UK every year.

The UKWIR study did not record levels of breakdown toxins in the sewage, but we know from the LCMS water monitoring data that 30% of Total Fipronil in water bodies was in the form of Fipronil sulphone, sulphide and amine (ignoring the single high sulphone reading). Assuming the same proportions occur in effluent, this would give a Total Fipronil discharge of 264 kg. Proportions of Imidacloprid breakdown products in the pathways are unknown.

However, the 30 treatment plants in the study (of which only 12 had influent and effluent data) may not be representative of the 9,000 UK treatment plants, or levels of the chemicals in effluent discharges from septic tanks and small sewage treatment works. The effect of increasing numbers of releases of unknown volumes of untreated sewage, may also be significant. Flea treatments entering the environment directly (e.g. swimming Dogs, fur, and excreta) would be additional to these estimates.

Rivers are not static repositories for pollution, they flush their contents out to sea, therefore data on pollution levels in rivers can be used to estimate the amount of pollutants entering rivers every year.

Adding together the [discharges](#) of the nine biggest rivers in England, and assuming that there is a similar per km² discharge rate in rivers draining the remaining area of England, gives a

rough estimate of river discharge in England of 1,400 m³/second or 28.2 trillion litres per year (Table 10).

Catchment	Discharge m ³ /second	Catchment Area km ²
Severn	107.4	21,000
Trent	89	10,435
Thames	65.4	9,948
River Ure/River Ouse	69.8	4,847
River Tyne	45.2	2,936
River Eden	53.7	2,400
River Aire	36.5	2,057
River Mersey	37.1	4,680
Rest of England	896	74,629
Total England	1,400	132,932

Table 10. Discharge rates of major English Rivers and estimate of the discharge from the remainder of England.

Applying the average readings of Fipronil and Imidacloprid from River samples in the 2014-2024 Environment Agency LCMS data set (0.00992 and 0.01495 µg/L respectively) this gives approximate discharges from English Rivers of 438 kg of Fipronil and 660 kg of Imidacloprid per year.

In addition there are large amounts of the toxic Fipronil breakdown products in the rivers, with average readings of Fipronil sulphone 0.01455 (0.00356 if one unusual reading is set aside) µg/L, Fipronil sulphide 0.00052 µg/L and Fipronil amine 0.00013 µg/L; which equates to annual discharges of 642 (or 157) kg, 23 kg and 5.7 kg per year respectively. This brings the Total Fipronil discharge estimate to 624 kg, or 1109 kg including the single very high Fipronil sulphone reading.

In addition there will be more Fipronil and Imidacloprid in rivers in Northern Ireland, Scotland and Wales. Sources of Fipronil are associated with people and their habitations, so as 15.6% of the UK population lives outside England ([ONS](#)) the Fipronil volume was increased in proportion to population to give a UK estimate. Imidacloprid pollution arises from both people and arable land and 17% of the UK's arable land is outside England (England [stats](#) and UK [stats](#)). Imidacloprid levels were increased in proportion with the mean of the population and arable land to reflect the shared sources. Therefore it is estimated that every year 740 (or 1,310) kg of Total Fipronil and 790 kg of Imidacloprid enters UK rivers.

Over the last 11 years about 8,140 (or 14,410) kg of Fipronil and 8,690 kg of Imidacloprid have travelled down British rivers.

These estimates also serve to demonstrate the scale of Fipronil and Imidacloprid related pollution that is entering UK seas. Water in a river takes 20-30 days on average to reach the sea, during which time some of the Fipronil and Imidacloprid will degrade, longer if the chemical cycles in and out of sediments and biota on its journey. Taylor et al. ([2021](#)) examined pesticide levels down the catchment of the River Rother, a chalk stream in the South Downs National Park, in 2017-18. They recorded Fipronil and Imidacloprid frequently downstream of

a sewage treatment plant, but unlike Imidacloprid, Fipronil detections became less frequent further downstream. Fipronil has a greater affinity to lipids and is more quickly absorbed by organisms and/or sediments than Imidacloprid, but greater degradation of Fipronil (perhaps to metabolites) may also be an important factor. Given the wide variance in environmental degradation rates recorded for the two chemicals, uncertain relationships with reservoirs in sediments and organisms, and metabolite complexity, the degradation rates on the journey to the sea have not been calculated.

The LCMS data set includes 463 sample results from Estuaries and Seas. Fipronil was detected in 83.1% of Estuary samples (av. 0.003 µg/L) and 37.3% of Sea samples (av. 0.00088 µg/L). Fipronil sulphone is also common in UK marine environments with detections in 53% of Estuary samples (av. 0.00088 µg/L) and 14.7% of Sea samples (av. 0.0000813 µg/L). Fipronil sulphide and amide were absent from Sea samples but occurred in Estuaries (14.1 and 2.1% of samples respectively). Imidacloprid was detected in 22.7% of Estuary samples (av. 0.00423 µg/L) and 7.3% of Sea samples (av. 0.00018 µg/L).

Comparatively little is known about the impacts, or persistence, of these chemicals in the marine environment. The standard chemical authorisation processes do not require toxicity data for marine species, so even former pesticides lack data. Information tends to only arise as a result of academic studies. For instance Goff et al. ([2017](#)) found that Fipronil is less soluble at higher salinities and, perhaps as a result, more toxic to Blue crabs (*Callinectes sapidus*) at higher salinities; while increasing salinity makes Imidacloprid more toxic ([Song and Brown 2006](#)).

There do not appear to have been any studies on the presence or impacts of Imidacloprid or Fipronil in UK seas. However, Moeris et al. ([2021](#)) established a Chronic saltwater Environmental Quality Standard for neonicotinoids (including Imidacloprid) and then sampled four Belgian harbours and nearby seas. Imidacloprid exceeded the Chronic EQS in half the harbours and total neonicotinoids in the sea was close to its EQS level. In the UK 3% of Sea and 20% of Estuary samples in the LCMS dataset exceeded this EQS. The EU's draft Acute Imidacloprid saltwater EQS is primarily derived from freshwater data and Fipronil saltwater EQSs have not been established, despite the prevalence, and increased toxicity, of Fipronil in marine waterbodies.

Distefano et al. ([2022](#)) recorded average concentrations of Imidacloprid at 8.8 µg/kg in Mediterranean Gulls (*Ichthyaetus melanocephalus*), and 5.8 µg/kg in Sandwich Terns (*Thalasseus sandvicensis*), around the Lagoon of Venice, suggesting accumulation up the marine food chain.

In 2020 approximately 7,000 tonnes of neonicotinoids were used in China ([Zhang et al. 2024](#)), of which 3–4,000 tonnes was Imidacloprid ([Wang et al. 2020](#)). Imidacloprid is used in agriculture and flea treatments, among other uses, in China.

China is a major manufacturer of Imidacloprid, annual production was 13,500 tonnes in 2010 with 8,000 tonnes being exported ([Shao et al. 2013](#)) and had reached 23,000 tonnes in 2016, making China the biggest producer of Imidacloprid ([Zhang and Jiang 2023](#)).

China is also the largest Fipronil producer, with an estimated 5,800 tonnes produced in 2023 ([Market Growth Reports 2025](#)). However, in China Fipronil has had limited agricultural use since 2009 and was fully banned in 2019, so there has been no agricultural use since 2020,

however, it is still used for structural/landscape pest control, and treatments for pets/livestock ([Shi et al. 2023](#)). Liu et al. ([2024](#)) predicted a lethal risk from Fipronil and Fipronil sulphone in 14% of Chinese surface waters.

Neonicotinoid pollution levels in Chinese freshwaters are posing serious ecological risks to non-target species and the human food chain ([Yang et al. 2025](#)). Neonicotinoid pollution has also been growing rapidly in Chinese coastal areas, presenting a chronic ecological risk to marine organisms ([Ying et al. 2024](#), [Wang et al. 2025](#)). One of the largest inputs is from the Yangtze River which has average total neonicotinoid levels of 0.14 µg/L; Gao et al. ([2024](#)) calculated that 40.27 tonnes of neonicotinoids were washed out to sea every year in the Yangtze, and 33% of their samples exceeded the chronic toxicity threshold, indicating an “urgent need for intervention programs to guarantee the safety of the river for aquatic life”. Furthermore, the sediments for hundreds of km out to sea are heavily contaminated with neonicotinoids. Chen et al. ([2022](#)) found an average concentration of total neonicotinoids in marine sediments in the seas around the Yangtze River of 11.9 µg/kg (range: 4.77–29.9 µg/kg), and found that the pollutants resulted in a transformed bacterial community. The Yangtze is also heavily polluted with Fipronil and its breakdown compounds, with an 85.4–91.7% detection rate and a median concentration of 0.00049 µg/L ([Shi et al. 2023](#)).

Five hundred km north in Jiaozhou Bay He et al. ([2021](#)) found average concentrations of neonicotinoids at 0.013 µg/L and Total Fipronil at 0.001 µg/L in the estuary and 0.0008 µg/L and 0.0002 µg/L respectively in the Bay. Inputs of neonicotinoids from two rivers and a sewage treatment plant were identified as certain chronic toxicity risks. Nearby in the Bohai Sea Imidacloprid and Fipronil were abundant and high risks were identified for aquatic species ([Naumann et al. 2022](#)).

A thousand miles south of the Yangtze the Lingdingyang Estuary outputs on average 76.8 tonnes of neonicotinoids per year causing 65% of sediment samples to exceed the chronic pollution threshold, Imidacloprid was the commonest neonicotinoid in sediments (average 7.66 µg/kg) ([Zhang et al. 2022](#)). Yan et al. ([2024](#)) estimated that 3.9% of neonicotinoids used in the Pearl River Basin (83% used in agriculture) were transported to the South China Sea via the Lingdingyang Estuary.

In the Seto Sea, Japan, neonicotinoids and Fipronil were measured in estuarine water and their toxicity to three locally collected shrimp species was assessed; some water samples contained Imidacloprid and Fipronil exceeding the freshwater benchmarks for aquatic invertebrates. The authors found the levels of neonicotinoids recorded in the sea were lower than the effect levels, but Fipronil levels had a negative effect on all three shrimp species ([Hano et al. 2019](#)).

In an Indonesian estuary Imidacloprid occurred in the water at an average of 0.009 µg/L and exceeded ecological toxicity thresholds in 31% of samples ([Putri et al. 2022](#)). Meanwhile Imidacloprid has been exceeding EQS standards in San Francisco Bay ([Buzby et al. 2020](#)) and Du et al. ([2022](#)) identified a high risk to the Watery Midge (*Chironomus dilutus*) from Fipronil related pollution of estuarine sediments associated with the Los Angeles River; Fipronil sulfone was identified as the major contributor of these effects.

UK marine environment monitoring is coordinated by the Clean Seas Environmental Monitoring Programme. Other than in compliance with the Water Framework Directive (the data reviewed here) there is no monitoring of Fipronil or neonicotinoids ([CSEMP Green Book](#)).

As a result there is no data on the prevalence or trends in these toxins in UK `marine sediments or organisms.

The OSPAR Convention on the Protection of the Marine Environment of the North-East Atlantic contains a [List of Chemicals for Priority Action](#), Contracting Parties (including the UK) are committed to monitoring the listed chemicals in the marine environment and working towards the elimination of discharges, emissions, and losses to the marine environment.

Chemicals on the OSPAR [List of Substances of Possible Concern](#) must be monitored and reported, but do not need to be eliminated. Neither Fipronil nor Imidacloprid are on either list.

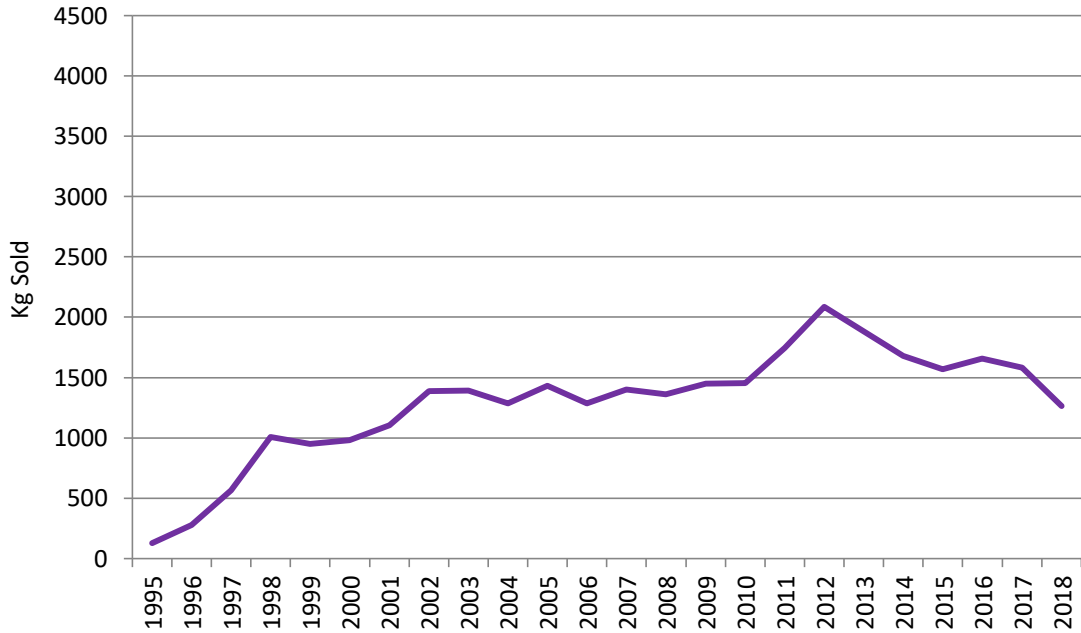
While the OSPAR [website](#) acknowledges that neonicotinoids “ended up in the marine environment in concentrations large enough to be a threat in some coastal areas” the assumption appears to be that the 2018 agricultural ban will have resolved the issue. Indeed, the only pesticides that contracting parties are committed to monitor in the sea are organochlorides, which were last commonly used in the 1970s and 80s. Since then pesticide regulation has acted to prevent the need to add new biocides to the OSPAR convention, in effect the pesticide regulation process bans the chemical if there is a significant risk to the marine environment.

On paper the same should happen with veterinary medicines, however if the UK is unable to effectively regulate the environmental impacts of veterinary medicines then consideration should be given to adding Fipronil and Imidacloprid to the OSPAR List of Substances of Possible Concern and requiring parties to monitor the levels in marine water, sediments and fauna.

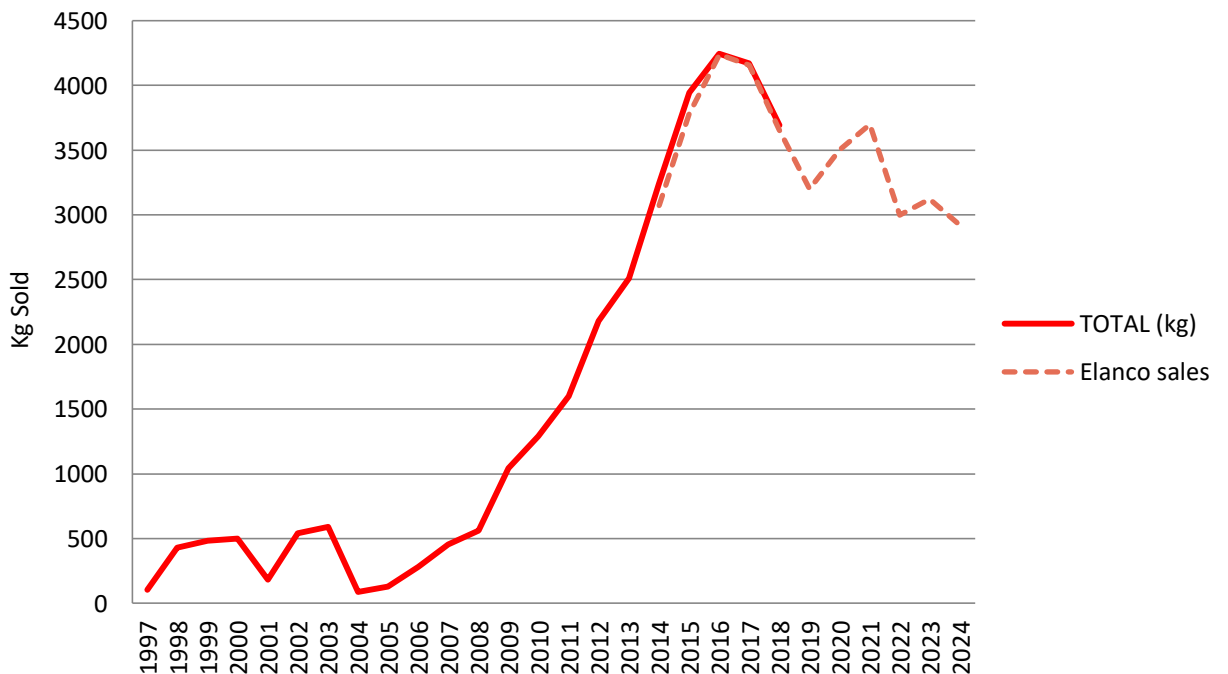
9.1. Flea Treatments

Alongside Fluralaner, Fipronil and Imidacloprid now dominate the flea treatment market in the UK, in 2018 there were about 1,260 kg of Fipronil and 3,659 kg of Imidacloprid sold as flea treatments in the UK (VMD Data).

The UK flea, tick and heartworm treatment market was worth £268.99 million in 2024 ([Deep Market Insights](#)), with estimated Fipronil sales in the UK of £55-65 million/yr and Imidacloprid sales of £60-90 million/yr.



Graph 29. Total UK sales of Fipronil flea treatment (kg) 1995-2018 (VMD data – Appendix 2).



Graph 30. Total UK sales of Imidacloprid flea treatment (kg) 1997-2018 (VMD data– Appendix 2) and Elanco sales plus competitor estimate 2014-2024 ([Brown et al. 2025](#)).

Fipronil became a frequently used flea treatment in the late 1990s and has had a variable but essentially stable annual volume of sales for the last decade (Graph 29).

Sales of Elanco Imidacloprid flea treatments, the market leading brand, plus a competitor estimate, were similar in 2014 and 2024 - 3,050 kg and 2,919 kg, and showed no significant

decline (Pearson's $r^2=0.29$, $p=0.089$), but with a peak of 4,237 kg in 2016 from which there was a significant decline to the 2024 figure (Pearson's $r^2=0.76$, $p=0.002$) ([Brown et al. 2025](#)) (Graph 30). This would represent a 30% decline in sales (although the 2014-24 data suggests only a 15% decline). Other Imidacloprid flea treatments are on the market and may be taking more of the market share that Elanco estimate, which could nullify any recent decline in Elanco's sales, however in a 2020 survey of Dog and Cat owners Perkins and Goulson ([2023](#)) reported that 100% of people using Imidacloprid were still using Elanco products.

Assuming that Fipronil sales have been static at 1,500 kg/yr since the last available three years of data (2016-18), and that Elanco's sales estimates for Imidacloprid from 2019-24 make adequate provision for generic Imidacloprid products, that came on the market in 2022-23, there has in total been 39,939 kg of Fipronil and 51,689 kg Imidacloprid sold as flea treatments in the UK.

In addition Fipronil is allowed to be used on Pigeons (*Columba livia domestica*) and cage birds on the basis of a small animal (or [Schedule 6](#)) exemption, which means there is no formal authorisation process. There are anti-mite sprays on the [market](#), despite the Schedule 6 list insisting that all products for use on birds should be pour-ons, not sprays. Fipronil is not used on, or near, commercial chickens (particularly in light of the 2017 egg contamination scandal ([van der Merwe et al. 2019](#))), so volume of use on small animals is likely to be minor, but may be significant. Similarly Imidacloprid is allowed to be used on Ferrets (*Mustela furo*), Rabbits and small rodents, but all relevant products also appear to be registered as Cat treatments, so this should not be an additional unaccounted Imidacloprid burden.

In 2020 Elanco Animal Health acquired Bayer Animal Health and became the UK market leader for Imidacloprid based flea treatments; the Imidacloprid containing Seresto collar became Elanco's top product globally ([Elanco 2020](#)).

Twice Imidacloprid containing flea treatments have been subjected to an environmental risk assessment (Phase 2) by the EU's Committee for Veterinary Medicinal Products (CVMP). Advocate, a pour-on containing Imidacloprid and Moxidectin (a wormer), was assessed in 2009 ([CVMP 2009](#)) and Seresto, the collar containing Imidacloprid and Flumethrin (a synergistic pyrethroid insecticide), was assessed in 2019 ([CVMP 2019](#)).

The 2009 assessment of Advocate considered that excretion was not a significant pathway, and instead modelled an incident involving the release of a full dose into a waterbody. It predicted pollution levels of 4 µg/l of Imidacloprid in a 100m³ waterbody. Undisclosed toxicity data (*Daphnia* waterflea studies?) were used to calculate a Predicted No Effect Concentration of 850 µg/L. Even before 2009 studies of Imidacloprid had shown very harmful effects to mayflies at levels as low as 0.1 µg/L ([Alexander et al. 2007](#), [Alexander, Heard & Culp 2008](#)), so it is difficult to understand how 850 µg/L was considered to be a suitable safety benchmark. The European Medicines Authority (EMA) authorised the product with a four day limitation on swimming on the label (due to concerns about Moxidectin!).

The more recent risk assessment for Seresto collars was only briefly covered in the publicly available Assessment Report:

“A tailored risk assessment was performed by the applicant in order to assess the risk of an increase of the environmental concentration of the active ingredients. The applicant showed that no losses of the active ingredients of the collar itself are

expected. Further, the applicant simulated a bathing and rain fall exposure resulting from losses of the active ingredients of the animals' fur. Two toxicity studies on waterflea were provided. The risk for sediment dwelling organisms was discussed. The assessment concluded that no risk for daphnids and sediment dwelling organisms resulted. No Warnings are therefore required."

The Seresto assessment did not consider hand washing, bedding washing, excreta, or swimming, all pathways since revealed to be important pollution routes. It is not clear if an assessment was made predicting environmental concentrations and comparing against environmental quality standards, but given all the toxicity data now widely available, and the acceptance in the scientific community for the last decade that *Daphnia* waterfleas are exceptionally unaffected by Imidacloprid ([Morrissey et al. 2015](#)), it is difficult to comprehend why an environmental regulator is still allowing *Daphnia* studies to be submitted in an environmental safety assessment for any Imidacloprid product.

In 2020 Elanco (as Bayer Animal Health) funded a study that concluded that "the modelled data indicate that these VMPs [Veterinary Medicine Products] make only a very small contribution to the levels of Imidacloprid observed in the UK water monitoring programme. Further, calculated concentrations do not exceed ecotoxicological threshold values indicating acceptable chronic safety to aquatic organisms." ([Anthe et al. 2020](#)).

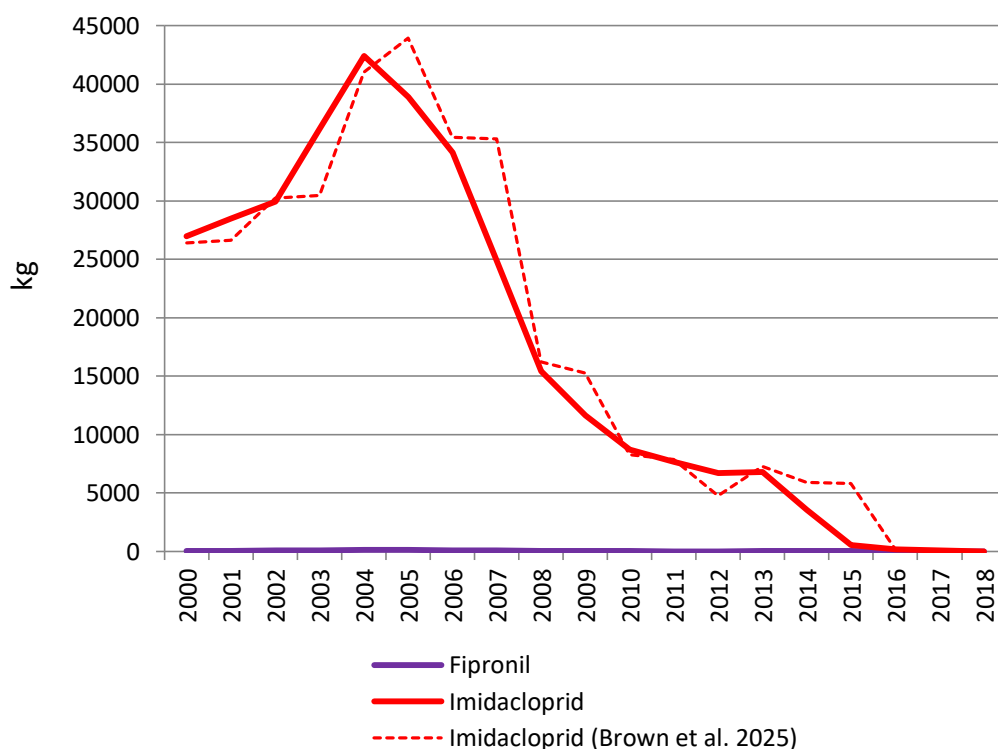
However, the calculations used in their model contained grossly unrealistic assumptions that were applied in a way that would inevitably grossly underestimate the emissions. The paper was deconstructed by Perkins et al. ([2021](#)) who showed that if the model was corrected, by no longer assuming that pets could only emit pollution for only one day after treatment, then the outputs of the model were able to explain the levels of Imidacloprid observed in UK rivers and lakes. This was despite the model assuming zero input to waterways from hand washing (the most significant pathway) or swimming Dogs. However, several other irregularities in the data used to frame the model led Perkins et al. to conclude "the model presented by Anthe et al. provides no reliable conclusions about the contribution of veterinary medicinal products to the levels of imidacloprid in UK waterways".

Brown et al. ([2025](#)) is a second Elanco funded (and partly authored) review of the likely sources of Imidacloprid in waterbodies. The authors determine that several possible sources of Imidacloprid are not likely to be significant contributors to current pollution levels and acknowledge that Imidacloprid from flea treatments is contributing to the pollution. They identify the uncertain levels of Imidacloprid currently entering waterbodies from former agricultural use as being a potentially significant source of background pollution, and domestic biocides and legacy emissions from, now banned, domestic pesticides, particularly disposal of old garden pesticides into drains, as likely sources of unquantified contributions to current pollution in sewage. The study reports that sales of Elanco Imidacloprid flea treatments have plateaued between 2014 and 2023, or declined from a 2016 peak, depending on your perspective. In addition they observe a decline in Imidacloprid levels in the LCMS/GCMS dataset between 2016 and 2023 across all four UK countries (although they do not claim the decline to be significant), and identify declines in Imidacloprid levels for a small number of monitoring sites with long stretches of data. The paper concludes that "Current trends suggest further declines in surface water concentrations due to ongoing restrictions and responsible use programmes" and that "compliance with Environmental Quality Standards by 2039.....seems achievable in the UK given current trends".

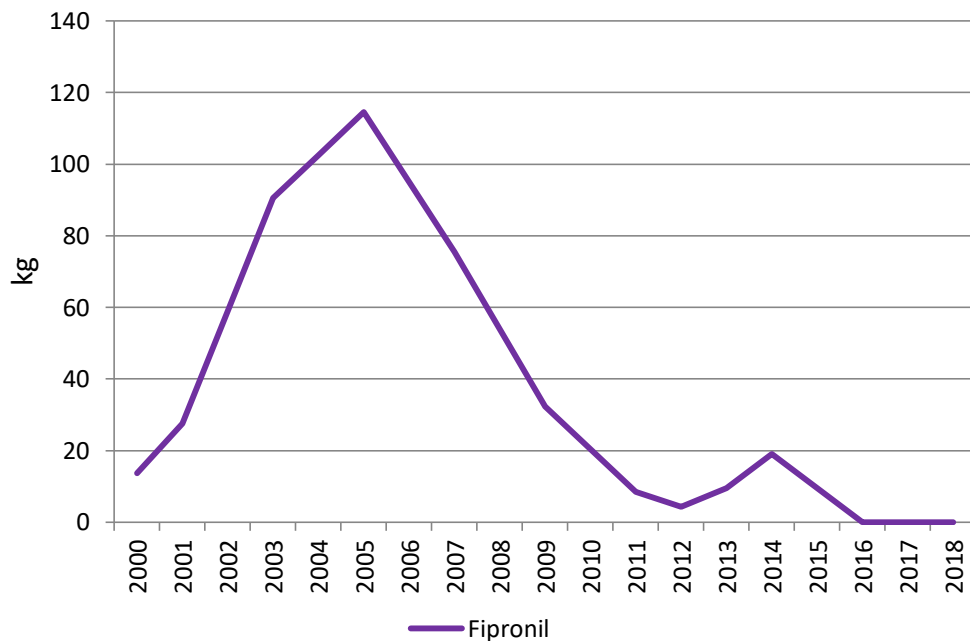
9.2. UK Agriculture

Imidacloprid was widely used in very large quantities as a seed treatment on arable crops, but has not been used outdoors since 2014, and had limited UK use on young trees and ornamental plants until 2020 – so there is currently zero input into the system from contemporary use of these chemicals in UK agriculture.

The Government publishes annual [PUSstats](#) surveys of the amounts of pesticides used in different sectors, the surveys are repeated on multi-year cycles (every second year for arable). The data is searchable in the [PUSstats database](#). Data was extracted from the database for each survey in each year and was interpolated for each use for unsurveyed years. Summing the annual figures it is estimated that, between 2000 and 2018 about 322,000 kg of Imidacloprid was used in British agriculture. Brown et al. (2025) derived their figures from a previous version of the PUS website accessed in May 2021, which provided total annual values for all crops, not just those surveyed in the year, which gives a higher estimated volume of 341,000 kg of Imidacloprid. However, the data used by Brown et al. was retracted for a reason and after careful consideration by Fera statisticians. The estimate assumed that in unsurveyed years usage remained the same as the previous surveyed year, which could result in there appearing to be usage after a pesticide was banned (Lewis Ridley, Fera, pers comm). When the usage is in decline assuming stable use in the following years can result in an overestimation of use, as can be seen in Graph 31. This review identified smallish discrepancies in the Imidacloprid data reported in relation to outdoor vegetable crops in 2007 and 2011; Fera corrected this in January 2026 and the corrected data was used here. There is no perfect solution to the unsurveyed years, in this report I have used interpolated data based on the figures reported in the database.



Graph 31. Weight of Imidacloprid and Fipronil used in UK agriculture 2000 - 2018 (PUSstats data and alternative PUSstats data via [Brown et al. 2025](#)).



Graph 32. Weight of Fipronil used in UK agriculture 2000 - 2018 (PUSstats data).

Fipronil has never been used as a mainstream outdoor agricultural insecticide in the UK. The two main uses were controlling Vine Weevils (*Otiorhynchus sulcatus*) in nurseries, and on vegetables growing in greenhouses, with a small amount used as an arable seed treatment in 2014. There has been effectively no use of Fipronil in UK agriculture since 2014. In total only about 730 kg of the insecticide was used in UK agriculture (Graph 32).

The pesticides and their breakdown products are likely to continue to seep into rivers for many years after they were applied, however Shardlow (2017) observed comparatively low levels of the similar neonicotinoid Thiamethoxam in areas where it had historical high use, but where it had not been used for two years, so there is hope that over a few years the amount of Imidacloprid entering waterbodies from former agricultural use will decline to low levels (and may have already done so).

It is likely that much of the Imidacloprid in groundwater samples is former agricultural pesticide, and that some of the Imidacloprid in groundwater will end up in rivers, although the levels observed in groundwater are generally much lower than in rivers, so this will currently more often than not result in dilution of Imidacloprid levels in rivers.

It has been shown that Imidacloprid can continue to seep into rivers at high levels from historical agricultural use (Boye et al. 2022), but the legacy contribution to current water pollution levels cannot be calculated directly due to uncertainties about the environmental fate of Imidacloprid.

To be able to accurately estimate how much agriculturally used Fipronil and Imidacloprid and their toxic breakdown compounds might be still entering the water courses, 12 years after they stopped being applied, we would need to know the decay rates of the pesticides and

their breakdown compounds, and we would need to know how quickly the chemicals move through the countryside. Highly soluble chemicals will move through the landscape much faster than chemicals with low solubility or an affinity for sediment or living tissues. Slow moving, persistent chemicals may take many years to reach a water course. Relevant data is sparse, particularly field tested data on real world behaviour, and in relation to breakdown toxins. There is likely to be a low level of certainty in any decay curve or flow rate calculation chosen to try to make an accurate prediction of the current contribution to Imidacloprid levels in waterbodies from former pesticide use.

Fortunately, it is not necessary to be accurate at this stage, if we assume zero rates of decay and that both chemicals will travel to water at an even pace with 5% of the applied pesticide reaching water bodies each year over of the 20 years following application this gives us an upper estimate of what amount could currently be entering water bodies from agricultural use. This results in a maximum possible output into rivers in 2024 for Fipronil of 22.1 kg and for Imidacloprid of 7,931 kg.

At the other end of the scale we know that these chemicals are persistent, but it seems unlikely that after 12 years in the environment a high proportion of these chemicals will still be in their original or breakdown toxin format, and if they are, then they are more likely to be in an immobile or slow moving repository rather than in highly active movement. Therefore, making some rather less improbable assumptions than those made to calculate the maximum possible estimate – 25% of each chemical degrades to harmless compounds or is flushed out to sea every year, with only 10% of the remaining residue reaching rivers every year -, the low likely output estimate from former agricultural uses into rivers in 2024 is 0.6 kg of Fipronil and 229 kg of Imidacloprid.

The maximum possible estimated annual output of Fipronil from agriculture could only account for 3% of the annual flux of Fipronil in rivers. In addition, Fipronil use in agriculture was localised; greenhouses and nurseries do not occur upstream of most sample points, however 90% of river samples contain Fipronil, this cannot be explained by the localised agricultural use.

Agricultural legacy Fipronil is not, on its own, a significant concern.

On the other hand it is not currently possible to accurately estimate the amount of Imidacloprid entering water from previous agricultural use, this pathway was, and may still be, significant in contributing to current environmental damage.

Hadley et al. (2026) compared levels of Imidacloprid and Fipronil at 62 sites across a variety of river systems in Wales, they used Caffeine levels as a proxy for sewage levels and found that there was a stronger correlation between Imidacloprid levels and Caffeine ($r = 0.61$) than there was with Fipronil ($r = 0.45$). Frequent and considerable exceedance above environmental limits in Welsh urban settings were linked to wastewater treatment, misconnected sewers and elevated Caffeine concentrations rather than current or past agricultural Fipronil or Imidacloprid uses. This suggests that at least in the less arabalised regions of the UK sewage loading is the dominant source of Imidacloprid pollution in rivers.

While UK agriculture is a historical source that may still be contributing some Imidacloprid to the burden in rivers in the lowlands, agriculture cannot be contributing significantly to UK Fipronil pollution.

In other countries it can be hard to assess what proportion of the Fipronil related pollution comes from flea treatments as opposed to agricultural use (current or past), in the UK this problem does not arise as flea treatments are the only potential source of large volumes of Fipronil. This key local evidential factor was apparently over looked by some of the most significant assessments of the pathway analyses ([EMA 2023](#), [Joachim et al. 2025](#)), leading them to underestimate the certainty that can be attached to the ability of flea treatments to enter waterbodies and cause very high levels of pollution.

9.3. Imported Food

Outside the UK Fipronil and Imidacloprid still have agricultural and horticultural uses, although these are very limited in the EU. Residues of pesticides used to grow the crops, or present in the environment where the crops are grown, often remain on, or in, the produce when it is exported and sold to consumers. To limit the risk to Human health goods imported into the Human food chain are subject to statutory 'Maximum Residue Levels' (MRL) of pesticides that the produce must comply with. For Fipronil the MRL is 5 µg of 'Fipronil + its breakdown toxins' per kilogram of produce ([UK MRL Database](#)). The MRLs for Imidacloprid are more complex, with different levels, between 50 and 10,000 µg/kg being set for different types of produce. The EU has passed legislation to reduce their MRLs for two neonicotinoids – Thiamethoxam and Clothianidin - down to zero (or in practice the Limit of Detection) ([EU Reg. no. 2023/334](#)), but this legislation is not yet in force, and Imidacloprid still has a range of MRLs in the EU, although they are most commonly lower than the UK (between 10 and 15,000 µg/kg) ([EU MRL Database](#)).

In the 2024/5 financial year the UK imported 5.6 million tonnes of fruit and vegetable and 6.6 million tonnes of cereals ([UK Produce Import Data 2024/5](#)).

It stands to reason that a significant proportion of residues of persistent pesticides on food will enter the sewage system, either from washing, in cooking water, or after being excreted by the consumer, although some residues on peelings or food waste will end up in landfill. The small quantities involved in any single household pathway and the subsequent dilution of the residues, mean it is likely that the levels from this source in the sewage effluent of a house will probably be below the technically achievable Limit of Detection. There would also be obvious ethical issues with feeding people pesticides at levels that would be detectable in the effluent. As a result there do not appear to have been any studies undertaken to quantify the proportion of pesticide residues on food that ends up in the consumer's sewage effluent.

The UK Government undertakes an annual monitoring programme to check for pesticide residues on food, the results of which are reported [here](#).

The GB and Northern Ireland MRL data for a period of 27 months – January 2023 to March 2025 - was examined for all Fipronil and Imidacloprid detections on food. The Limits of Detection were 5 µg/kg for Fipronil and 10 µg/kg for Imidacloprid – meaning that levels of the chemicals below those concentrations would not be detected. Fipronil in the data refers to a sum of Fipronil and Fipronil sulfone, both of which are measured. Fipronil sulphone is the commonest breakdown toxin from Fipronil in UK waterbodies and exceeds its chronic toxicity limit in 67% of waterbody samples.

There were no detections of either chemicals on any cereals or cereal products, suggesting that these are not a significant import pathway into the UK for these insecticides. Hence cereals were not considered further and the analysis focussed on the data from fruit and vegetable samples.

There were no detections of either Fipronil or Imidacloprid on 1,522 samples of fruit and vegetables grown in the UK, suggesting that UK grown food is not being grown with these now banned agricultural pesticides, and crops are not being significantly contaminated from residues or pollution in the environment.

There were no detections of Fipronil on 1,559 samples of fruit and vegetables grown in the EU, suggesting that EU grown food is not being grown with Fipronil, which was completely banned from agricultural use in the EU in 2017. There were only five detections of Imidacloprid (Table 11), which was banned from outdoor agriculture in 2018, this may indicate infrequent unauthorised uses of Imidacloprid, circumstances where the crop is being significantly contaminated from Imidacloprid residues or pollution in the environment, or still permitted greenhouse uses.

Product category	Country of Origin	Year	Imidacloprid Residue $\mu\text{g}/\text{kg}$
Grapefruit	Spain	2024	20
Grapefruit	Spain	2024	40
Lemons	Spain	2023	23
Rice	France	2025	20
Rice	Italy	2025	20

Table 11. Imidacloprid detections on EU produce imported into the UK, January 2023 to March 2025 ([MRL database](#)).

There were three detections of Fipronil in 1,942 samples of fruit and vegetable grown in non-EU/UK countries, and all the detections were from legumes grown in South East Asia or South America (Table 12).

Product category	Product	Country of Origin	Year	Fipronil Residue $\mu\text{g}/\text{kg}$
Beans with pods	Yard Long Beans	Thailand	2023	70
Beans with pods	Long Beans	India	2024	30
Peas in pods	Trimmed Sugar Snap Peas	Peru	2023	7

Table 12. Fipronil detections on non-EU produce imported into the UK, January 2023 to March 2025 ([MRL database](#)).

Concentrations in the food was low, but still exceeded the 5 $\mu\text{g}/\text{kg}$ MRL. This suggests that Fipronil has some specific applications, but is not being widely used on crops imported into the UK.

In addition 30 µg/kg was also detected on Long Beans (*Vigna unguiculata*) from Thailand in July 2025, but recent data is published without sample sizes, so could not be further included in the analysis.

There were 59 detections of Imidacloprid in the 1,942 samples of fruit and vegetable grown in non-EU/UK countries (Table 13). This suggests that Imidacloprid is being widely used in non-EU countries on crops then imported into the UK. In some cases the levels of Imidacloprid were high, although the relevant MRL (which is 1,000 µg/kg for chillies) was not exceeded by any sample.

Product category	Number of detections	Average Imidacloprid µg/kg	Max µg/kg	Countries
Beans with pods	3	93	200	Kenya (2), India (1)
Chilli pepper	8	129	700	Egypt (3), India (2), Morocco (2), Senegal (1)
Grapes	8	72	200	Peru (5), South Africa (2), India (1)
Grapefruit	12	44	70	Israel (8), South Africa (3), Morocco (1)
Limes	3	27	60	Peru (2), Mexico (1)
Melon	10	17	30	Brazil (9) Honduras (1)
Oranges	3	27	30	Egypt (2), South Africa (1)
Peas in pods	4	20	40	Guatemala (3), Peru (1)
Potatoes	1	30	30	Egypt
Rice	1	20	20	India
Soft citrus	5	26	50	Morocco (3), South Africa (1), Peru (1)
Tomatoes	1	20	20	Morocco

Table 13. Imidacloprid detections on non-EU produce imported into UK, January 2023 to March 2025 ([MRL database](#)).

Origin	Fruit million tonnes	Vegetables million tonnes	Total
EU	1.1	1.7	2.8
Non EU/UK	2.3	0.5	2.8
Total	3.4	2.2	5.6

Table 14. Importations of Fruit and Vegetables into the UK in 2024/5 financial year ([UK Produce Import Data 2024/5](#)).

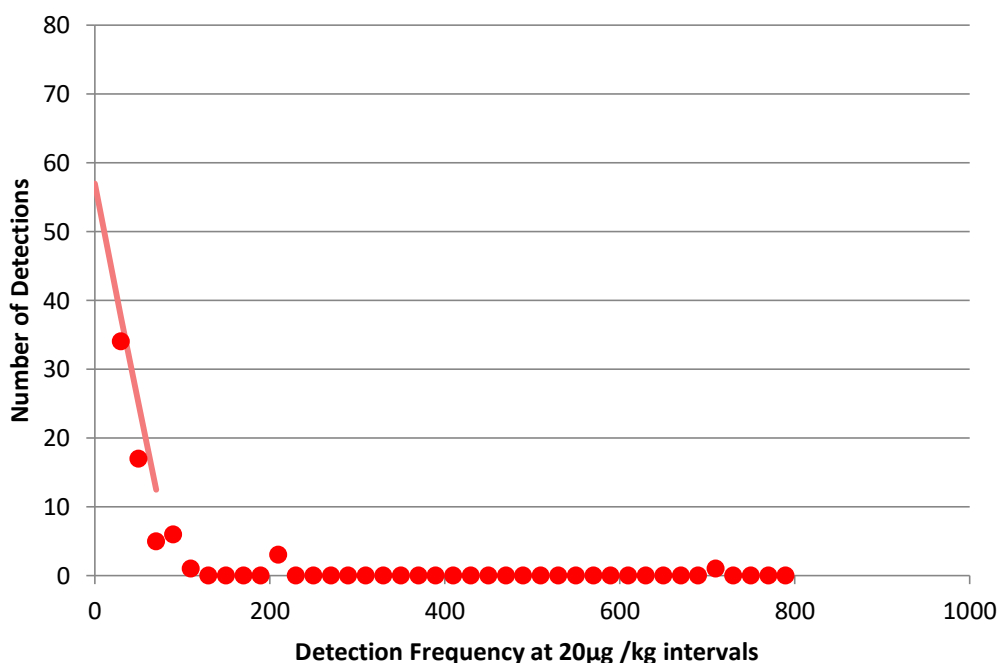
Assuming that the pesticide residues recorded in the samples are representative, the results can be extrapolated using trade data (Table 14) to estimate how much Fipronil and Imidacloprid is imported on fruit and veg each year. This results in an estimate of 0.15 kg of Fipronil (including Fipronil sulphone) (Table 15) and 4.58 kg of Imidacloprid being imported in the 2024/5 financial year.

Origin	Number of Samples	Total Fipronil Detected/ μg	Number of detections	Average $\mu\text{g}/\text{kg}$ of samples	Fruit and Veg Imported 2024/5 FY /million tonnes	Total Fipronil imported kg
UK	1,522	0	0	0	N/A	N/A
EU	1,559	0	0	0	2.8	0
Non EU/UK	1,942	104	3	0.05355	2.8	0.15
Total	5,023	104	3	0.02070	5.6	0.15

Table 15. Estimated weight of Fipronil arriving in UK on imported food.

There are some inherent difficulties with estimating imported volume of pesticides from the MRL data. Firstly the Limits of Detection were $5 \mu\text{g}/\text{kg}$ for Fipronil and $10 \mu\text{g}/\text{kg}$ for Imidacloprid, which means that below those levels we do not know how frequent the low levels of contamination are. Secondly, because the sample size is so small compared with the amount of food imported it is likely to miss rare, but potentially very high, readings.

We can attempt to make an estimate of the number of readings that might fall outside the recorded figures by fitting a line to the graph. There is not enough data on Fipronil to attempt this, but Graph 33 is a frequency plot for Imidacloprid occurrence.



Graph 33. Frequency of Imidacloprid contamination levels on imported fruit and vegetables UK 2023-Q1 2025 ([MRL database](#)).

With only one point above $250 \mu\text{g}/\text{kg}$ there is no meaningful conclusion to be drawn about the possible frequency of very high readings (which are generally rare across all MRL monitoring), but it is clear that the frequency of measurements increases rapidly the closer the measurement is to zero. This suggests there might be 45 additional un-measured occurrences between 0 and $5 \mu\text{g}/\text{kg}$ on sampled produce, which would equate to an extra 0.25 kg of

Imidacloprid currently going under the radar, and a total estimate of 4.83 kg of Imidacloprid being imported on produce in 2024/5 (Table 16).

Brown et al. (2025) looked at the Imidacloprid levels on produce between 2016 and 2022 using the same dataset and showed that there had been a drop in the frequency of Imidacloprid detections from 5% in 2016 to 1% in 2022. A decline is unsurprising considering regulatory changes to pesticide use in the EU, but as different categories of food are tested each year, and categories are on multi-year cycles, caution is needed, and a decline diagnosis has to be tentative at this stage.

Origin	Number of Samples	Total Imidacloprid Detected/ μg	Number of detections	Average $\mu\text{g}/\text{kg}$ of samples	Fruit and Veg Imported 2024/5 FY /million tonnes	Total Imidacloprid imported kg
UK	1,522	0	0	0	N/A	N/A
EU	1,559	123	5	0.07890	2.8	0.22
Non EU/UK	1,942	3,021	59	1.55561	2.8	4.36
0-5 $\mu\text{g}/\text{kg}$ estimate	5023	225	45	0.04479	5.6	0.25
Total	5,023	3,144	64	0.01274	5.6	4.83

Table 16. Estimate of weight of Imidacloprid arriving in UK on imported food.

It is likely that inputs of both Imidacloprid and Fipronil may have been higher in the past. For example there was concern about Fipronil levels on Tea (*Camellia sinensis*) exports from China. Fipronil was banned in China as an agricultural pesticide spray in 2009 (and as a seed treatment in 2020) and levels in Tea have been declining but were still at an average of 0.7 $\mu\text{g}/\text{kg}$ in 2017/18 (Ren et al. 2023). In 2024 113,334 tonnes of Tea was imported from countries such as Kenya, India and Rwanda (GTAIC 2025), where it is unclear if Fipronil is approved for use on Tea. If all imported Tea was contaminated at an average of 0.7 $\mu\text{g}/\text{kg}$ that would mean that 0.08 kg/yr of Fipronil would have passed through our tea cups.

However, last time UK pesticide residues were measured in Tea was in 2015 and no Fipronil or Imidacloprid was detected, and there is no evidence that Fipronil is currently being used on Tea crops. Indeed, while the EU RASFF window has 33 reports of imported Fipronil residues across the EU since 2021, none relate to Tea. While this may not be a current issue, it is possible that Fipronil was imported in the past on Tea and other crops in greater amounts than is now the case, and may therefore have made a contribution of a few kilograms to past pollution levels. Resulting residues from former importations may be making a current contribution to water pollution, but as the pathway from food to sewage treatment works is so direct it is likely that most will already have been flushed out to sea.

9.4. Ornamental Plant Imports

Between 2020 and 2024 an average of 412,200 tonnes of plants were imported into the UK per year, 84% from the EU (Plant Health trade figures). However, plants recently imported into the EU before being exported to the UK, have the EU as their point of origin in the

paperwork, making the actual growing origin hard to determine. About 80% of trade is in cut flowers, 5% is live plants and the remainder is non-food plant products including fruits, vegetables, seeds and timber. Unlike food there are no MRLs in place for ornamental plants, cut flowers or imported saplings, and there is no formal monitoring of pesticide levels in imports.

Ornamental plants are subject to a heavy pesticide regime, and ecotoxicity per hectare is much higher than for food crops ([Yin et al. 2023](#)). In a number of countries Fipronil and Imidacloprid are still authorised for use on cut flowers, for example in Malaysia ([Danish Environmental Protection Agency 2021](#)).

Greenpeace ([2014](#)) detected Imidacloprid in 43% of 83 ornamental plants on sale in Europe but no Fipronil. The highest Imidacloprid concentration reported was 8,891 µg/kg and the average level was 287 µg/kg – however there are some mistakes in the report and I lack confidence in these figures!

[Lentola et al. 2017](#) examined the levels of pesticides in plants on sale in UK garden centres (presumably in 2016?), they detected Imidacloprid on 38% of samples and at an average rate of 3.9 µg/kg, but no Fipronil.

A study of pesticides on flowers on sale in Belgium detected Imidacloprid and Fipronil at eye wateringly high maximum levels ([Toumi et al. 2016](#)), but no averages are given (Table 17).

	Roses		Gerberas		Chrysanthemums	
	% of Detections (out of 50)	Maximum Concentration (µg/kg)	% of Detections (out of 50)	Maximum Concentration (µg/kg)	% of Detections (out of 50)	Maximum Concentration (µg/kg)
Imidacloprid	42%	3,000	0	<0.01	15%	930
Fipronil	14%	680	0	<0.005	5%	750

Table 17. Imidacloprid and Fipronil on flowers on sale in Belgium (Toumi et al. 2016).

Roses do appear to be particularly problematic!

A study of pesticide residues on gloves worn by florists handling cut flowers in Belgium (presumably also 2016?) detected Fipronil in 40% of samples at an average concentration of 0.281 µg/kg, while Imidacloprid was in 75% of samples at an average level of 0.072 µg/kg ([Toumi et al. 2017](#)).

A study of ornamental plants in Germany in 2021 by BUND ([BUND 2021](#)) detected Imidacloprid but no Fipronil.

Fipronil was detected on ornamental plants in Austria and Germany between 2011 and 2021 by Cowoyka et al. ([2024](#)), but the frequency and levels were not reported.

Porseryd et al. ([2024](#)) detected Imidacloprid on ornamental plants on sale in Sweden in 2022, but not Fipronil. The average levels on 54 samples were 2.19 µg/kg in leaves (two detections), 7.49 µg/kg in roots (four detections) and 19.84 µg/kg in the soil (five detections).

Kenya and Colombia are the biggest exporters to the UK of non-EU cut flowers ([OEC 2025](#)). In a study of pesticide residues in cut flowers imported from Kenya, Ecuador and Colombia the Danish government found Imidacloprid in 17% of samples at an average level of 113 µg/kg and

Fipronil (sum) + Fipronil desulfinyl in more than 60% of samples, at a similar frequency of detection in produce from all three countries, and at an average level of 915 µg/kg (DEPA 2024).

A study by Pesticide Action Network Netherlands in 2025 found Imidacloprid at an average level of 15.4 µg/kg in flower bouquets of unknown geographic origin, Fipronil was not detected.

No data could be found relating to residues on saplings or hardy nursery stock. Brown et al. (2025) conclude that this is likely to be a very minor local source, if a source at all.

The data is perplexing, often Fipronil is not detected, it has apparently never been detected in the UK on these products, but when it is detected the levels are often higher than the Imidacloprid levels. Only in the Danish study is it clear that the breakdown compounds of Fipronil were also measured. Sample sizes are small, raising concerns that peaks of occurrence are likely not to be included in the data, resulting in underestimates. Some of the data pre-dates the EU ban on Fipronil and outdoor use of Imidacloprid ban and is therefore likely to be an overestimate of current EU residue levels. Applying residue levels based only on recent imports of Non-EU produce is also going to result in an overestimate.

Using the average tonnage of total imported plant products to estimate the levels of Fipronil and Imidacloprid that might have been imported into the UK in 2024, and averaging across the pathway data, we might be looking at an annual importation of c.12.7 kg of Imidacloprid and 75.5 kg of Fipronil on plant products (Table 18). The estimate of 12.7 kg of Imidacloprid may be high, because the Danish data only relates to Non-EU produce, on the other hand it is the biggest sample of cut flowers in the analysis, and cut flowers account for 80% of imported produce in this category. The same applies to the Fipronil estimate.

Study	Year	Material	Origin	Fipronil per sample µg/kg	Estimated Imported kg of Fipronil	Imidacloprid per sample µg/kg	Estimated Imported kg of Imidacloprid
Lentola et al.	2016	Leaves of ornamental plants	Unknown	0	0.0	3.9	1.6
Porseryd et al.	2022	Leaves of ornamental plants	70% EU, 30% Unknown	0	0.0	2.19	0.8
Porseryd et al.	2022	Soil in ornamental plants	70% EU, 30% Unknown	0	0.0	19.84	8.2
Danish EPA	2023	Cut flowers	Africa and S. America	915.83	377.5	113.33	46.7
PAN	2025	Bouquets of flowers	Unknown	0	0.0	15.4	6.4
Average					75.5		12.7

Table 18. Recent measurements of Fipronil and Imidacloprid on ornamental plants from the literature.

Ornamental plant production is pesticide intensive. Pereira et al. (2021) reviewed the issues associated with the contamination of ornamental plants with pesticides and concluded that “the absence of MRL for non-edible flowers can be crucial for the trade of contaminated products across borders, including pesticides banned in importing countries”.

Some imported live plants will be planted in gardens, greenhouses or the countryside from which Fipronil and Imidacloprid will be able to leach in soil water into watercourses. Egress from gardens, woods and hedgerows is likely to result in a comparatively small percentage of the imported chemicals reaching water courses. Hand washing after handling cut flowers and vase water may be a significant pathway. Houseplants and cut flowers are likely to end up on compost heaps, in landfill or incinerated. Compost may re-release the chemicals if spread on land.

9.5. Home and Garden Biocides

Fipronil has been used in a very small number of indoor pest control (biocide) products. These are enclosed poisons where ants or cockroaches are encouraged to enter a vessel, become contaminated with the pesticide and travel back to their nests/refuges to poison other ants or cockroaches.

There were five products containing Fipronil authorised for use in the UK. With one exception these products could only be used by professional pest controllers, so the volume sold is likely to be small. As of 2024 none of the Fipronil products are currently authorised ([UK authorised biocidal products HSE](#)).

Imidacloprid is currently authorised for use in 14 products again as poison baits for ants and cockroaches, and also as gels, these products are available to the public so may have a higher level of presence. In the past there were also authorisations for Imidacloprid fly sprays, but currently the only authorised product for flies is a bait for professional use only.

Most of these products will end up in a landfill site (disposal of bait and house dust) but some will be spread around houses and gardens by ants and cockroaches and could travel on clothes or hand washing into the sewage system. Since 2002 landfill sites with any risk of leaching must be lined with a waterproof membrane to avoid the pollution of ground water ([UKGOV](#)), so hopefully will not leak, at least until after all the Imidacloprid and Fipronil has decayed away. Brown et al. (2025) consider house cleaning, use on patios, rain and flooding (e.g. [Thuyet et al. 2012](#)) to be likely routes for Imidacloprid to enter sewage treatment plants and the environment. Brown et al. also highlight use of biocide products in agricultural barns and sheds as a potential source of Imidacloprid in sewage.

Sales numbers may be held by the HSE, but they are not in the public domain, so some assumptions will need to be made to create an upper limit to the likely contribution of these sources to pollution in the UK.

In 2016 there were 5,904 UK Local Authority pest control call outs for cockroach and 16,464 for ants ([BPCA 2016](#)). It is not known how many of these resulted in a pesticide being used, or, if that did happen, the frequency with which Fipronil, Imidacloprid or another approved chemical (which include Dinotefuran, Phosphine and various pyrethroids) were used. Nor is it clear what proportion of incidents the Local Authority figure represents, there are likely to be

more incidents dealt with in the private pest control sector than by local Authorities. If we assume that the 2016 Local Authority call outs all resulted in a treatment and represent only 5% of current treatments, this would give 118,000 cockroach and 329,000 ant treatments per year in the UK.

Tables 19-22 set out the relevant ant and cockroach products on the market with the number of doses and weight of, and % content of Imidacloprid and Fipronil in each product.

Product	Form and dose	Product weight kg	Treatments 25 m ² / 2 bait stations/ 5 blobs/ 1 nest	Imidacloprid %	Number of treatments = 0.5 kg of Imidacloprid
MoBe Ant Gel	Gel 0.3g/m ²	0.035	4.7	0.01	666,667
MoBe Ant Station	15x1.4g Bait stations, 1 per 4m ²	0.021	2.4	0.01	571,429
Xtermin8 Prob Ant Bait Station	2x5g Bait stations	0.01	1	0.01	500,000
Imidasect Ants	Gel 2x1cm drops=0.2g	0.035	4.7	0.01	666,667
Maxforce Pushbox	20x2g bait stations	0.04	10	0.03	416,667
Max Force Quantum	Gel 1.5x5mm drops (0.3g)/m ²	0.035	7	0.03	333,334
SBM Ant Killer Granules	Granules 5g/nest	0.2	40	0.05	200,000

Table 19. Treatment and content properties of Imidacloprid ant baits currently on the market in UK.

Product	Form and dose	Product weight kg	Treatments 25 m ² / 2 bait stations/ 5 blobs/ 1 nest	Imidacloprid %	Number of treatments = 12 kg of Imidacloprid
MoBe Roach Gel	Gel 0.15g/m ²	0.14	56	2.15	148,837
Victor Gel	Gel 0.2g/m ²	0.035	7	2.15	111,628
Imidasect Cockroach	Gel 1 cm blob=0.25g	0.035	35	2.15	111,628

Table 20. Treatment and content properties of Imidacloprid cockroach baits and treatments currently on the market in UK.

Product	Form and dose	Product weight kg	Treatments 25 m ² / 2 bait stations/ 5 blobs/ 1 nest	Fipronil %	Number of treatments = 2 kg of Fipronil
Home Defence Ant Stop! Bait Station	2x10g bait stations - 1 per nest	0.02	2	0.05	400,000

Table 21. Treatment and content properties of Fipronil ant baits until recently on the market in UK.

Product	Form and dose	Product weight kg	Treatments 25 m ² / 2 bait stations/ 5 blobs/ 1 nest	Fipronil %	Number of treatments = 0.5 kg of Fipronil
Ravosit	Gel 0.07g/m ²	0.035	20	0.05	571,429
Goliath Gel	Gel 2x3-4mm blobs (0.06g)/m ²	0.035	23	0.05	666,667

Table 22. Treatment and content properties of Fipronil cockroach treatments until recently on the market in UK.

1 kg of Fipronil would allow for 400,000 ant treatments and 0.5 kg of Fipronil would allow for 619,000 cockroach treatments.

Assuming (unrealistically) that all cockroach and ant treatments use Fipronil it is estimated that there could have been an annual biocide use of 1.5 kg of Fipronil.

Assuming equal market shares for the different Imidacloprid ant treatments, 0.5 kg of Imidacloprid would allow for about 479,000 ant treatments. Similarly, assuming equal market shares for the Imidacloprid cockroach treatments, 12 kg of Imidacloprid would allow for about 124,000 cockroach treatments.

In addition SoFast is a professional-only fly killing product, containing a high level of Imidacloprid. It consists of granules that are wetted and can then be sprayed or painted onto a surface, which may include use in agricultural buildings. Other fly sprays and fumigators available, usually using pyrethroids, and more similar products containing Azamethiphos are also on the market in the UK (although they do not appear to be specifically authorised, but are available for use by professionals as they are authorised in the EU!). 20 kg of Imidacloprid would allow for 4,000 sales of 1kg tubs and 20,000 treatments.

Assuming (unrealistically) that all cockroach and ant treatments use Imidacloprid and allowing for use as a fly treatment it is estimated that there could currently be an annual biocide use of 32.5 kg of Imidacloprid.

Unlike Fipronil, Imidacloprid was, up until 2015, also authorised for use as a garden pesticide. There are 503,000 hectares of gardens in the UK ([RHS 2025](#)), just 1/12th of the area of arable land ([GOV 2025](#)). Garden usage of pesticides is not monitored, so quantities involved are unknown, but as with arable use, some garden use may still be shedding old Imidacloprid into water bodies. While this is likely to be a much lower volume than that seeping into water from arable land, it may still be significant. The inappropriate disposal of old pesticide products, down sinks or drains, has the potential to add to current Imidacloprid pollution levels, however this would result in rare peaks of very high concentration, and would not explain the observed widespread, consistent pollution levels.

9.6. Preservatives

Imidacloprid is licenced in some non-EU countries as a preservative that is incorporated into wood and building products. Fipronil has been proposed for similar uses, but it is not clear that there are any current such uses of Fipronil permitted. It is possible that some Imidacloprid would enter the UK in building materials imported from the USA or other distant countries, but it seems highly unlikely there would be significant quantities involved, and again the route into rivers and lakes is tenuous.

9.7. Fabrics

Pesticides on clothing have a direct route into sewage via washing machines.

Imidacloprid and Fipronil are used on cotton crops, so some may still be on the material after it has been processed and turned into clothing. However, there does not appear to ever have been cases of Fipronil or Imidacloprid being detected in fabric or new clothing. Chopra et al. ([2011](#)) found that while Fipronil used in growing cotton was found on lint, it was not detected in the final clothing product. Preetha et al. ([2018](#)) detected no Imidacloprid in cotton lint grown with the insecticide. So this is a tenuous possible source at best.

Although there are patents for Fipronil and Imidacloprid as insecticidal treatments for clothing, I could find no evidence that these have ever been commercialised.

Brown et al. ([2025](#)) also found no evidence that fabric was likely to be a significant source of Imidacloprid pollution.

It is safe to assume fabrics are not a significant source of pollution.

9.8. Imported Pets

According to Government statistics about 350,000 Dogs and 32,000 Cats are brought [into the UK](#) every year. International [guidelines](#) from the European Scientific Counsel Companion Animal Parasites state that “It is essential that pets are treated with an effective..... acaricide before, during and after travel”. Assuming that 50% of travelling Cats and Dogs have recently

been treated with Imidacloprid and 50% with Fipronil then up to 24 kg of Fipronil and 45 kg of Imidacloprid is being imported on Cats and Dogs every year.

However, an [owner survey](#) by the “People's Dispensary for Sick Animals” indicated that in 2024 640,000 Dogs and 370,000 Cats were imported into the UK in 2024. In theory all Cats and Dogs should pass through the Government’s pet travel scheme or commercial import route. But in practice up to half of all puppies on offer for sale in the UK may have been illegally imported ([Four Paws 2023](#)). With no pet controls on the Ireland-Northern Ireland Border, or between Northern Ireland and mainland UK there is an easy illegal import route. If these figures are correct then the upper limit to the amount of Fipronil imported rises to 52 kg of Fipronil and 95 kg of Imidacloprid.

This is likely to constitute the largest unregulated importation of these chemicals to the UK. However, it will to some extent be balanced by pets leaving the UK, although there are no figures available for Cat or Dog export numbers.

Pets brought in from overseas may have a different profile of flea treatment chemical use, this may particularly be the case, and have significant environmental implications, if the authorisations in different countries further diverge in the future.

9.9. Illegally Imported Products

The internet enables products to be purchased from overseas that are not authorised for use in the UK, this is illegal for veterinary medicines under the VMR 2013. While most European and North American companies and websites check the location of the purchaser, not all websites are so careful and responsible. A [study](#) by Greenpeace in 2018 was able to purchase several unauthorised pesticides and import them into the UK, one ant treatment contained Diazinon (Dimpylate) which is also authorised as a flea treatment. In 2021 it was [reported](#) that the Veterinary Medicines Directorate, had seized more than 40 different illegal medicines. In 2024 the VMD seized over 13,000 unauthorised horse medicines sold illegally online by a single distributor and in the last year VMD [seized](#) three lots of illegally imported flea treatments for pets, although all involved insecticides that are available in UK approved flea treatments.

The importation of flea treatments may be a significant pathway into the UK, including potentially for insecticides not approved for use in the UK, but at the moment there is no evidence that this is a significant pathway.

9.10. Industrial Sources

It is also possible for Fipronil and Imidacloprid to be emitted from chemical manufacture facilities, or during the transit of the chemicals.

While information about amounts of chemicals manufactured in the UK is not publicly available, certain chemicals that are banned in the UK or listed by the [Rotterdam Convention](#) are included on the UK Prior Informed Consent ([PIC](#)) list. The UK PIC list does not cover veterinary medicines, but does cover pesticides, hence Fipronil and Imidacloprid are on the list

and their import and export must be reported. Recent HSE [PIC annual reports](#) show that the UK has in recent years imported and exported Fipronil and Imidacloprid:

Fipronil Imports

2023: 0.209 tonnes from China and Switzerland
2022: 0.0023 tonnes from Switzerland
2021: 0.0517 tonnes from China and Switzerland
2020: 0.001 tonnes from China

Fipronil Exports

2023: <1 tonne to Hong Kong and China
2022: <1 tonne to Hong Kong and China
2021: <1 tonne to Hong Kong and China
2020: <1 tonne to Hong Kong and China

Imidacloprid Imports

2023: 0 tonnes
2022: 20.88 tonnes from EU and China
2021: 4.41 tonnes from EU
2020: 0 tonnes

Imidacloprid Exports

2023: 2.13 tonnes to Tunisia
2022: 5.18 tonnes to Belarus, Sudan, Tunisia
2021: 3.88 tonnes to Belarus, EU, Tunisia
2020: 15.86 tonnes to Georgia, Russian Federation, Sudan, Tunisia, Ukraine

It is not clear if the exportation relates to chemicals manufactured in the UK, or to products created using imported chemicals which are then exported. The imported Fipronil may have gone into the manufacture of biocides (or been in the form of biocides), but although at that time authorised for use in the UK, biocide products may also have been exported to Hong Kong, and import and exports of Imidacloprid more or less balance off as well, so no conclusions can be drawn about volumes of imports that may enter UK pathways. However, it is also clear that processing, manufacture and export involving both chemicals is happening here.

Chemical factories manufacturing or, more likely, processing these chemicals may be subject to environmental permits relating to emissions of the chemicals to water or air, but this information is not publicly available.

While permitted emissions of Fipronil and Imidacloprid or associated pollution incidents due to spillages, etc. may be a factor relevant to the pollution of waterbodies, it is not possible to analyse this further. However, factory emissions are highly localised and any water pollution arising from them will be limited to the catchment within which the factory sits. This would create a pollution pattern of a low detection rate in the LCMS, but with high and localised peaks. Although there are occasional high peaks recorded, manufacturing related pollution does not fit with the pattern of widespread high levels of pollution of both chemicals in rivers.

While it is not possible to estimate if there is any pollution arising from the manufacture, processing or transportation of these chemicals in the UK, the pattern of pollution strongly

indicates that this is not a major component of the observed widespread pollution, so it is not considered further.

9.11. Conclusions on Pathways

Flea treatments, including those imported on pets, are responsible for at least 95.3% of the current inputs of Fipronil to the UK and 98.6% of the current Imidacloprid inputs. Even given generous estimates, non-flea treatment use only accounts for 4.8% of Fipronil inputs and 1.4% of Imidacloprid inputs (Figures 2 and 3).

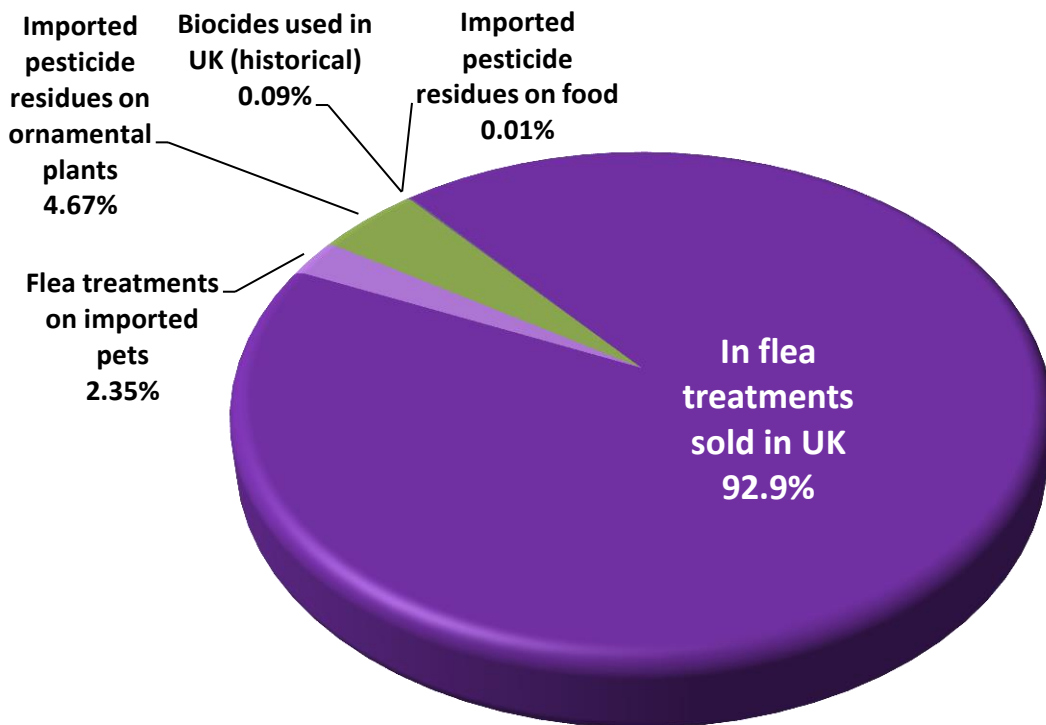


Figure 2. Contributions to total UK annual Fipronil input. Estimated annual inputs of Fipronil in the UK expressed as percentages of total amount sold and imported in consumer usable products (input).

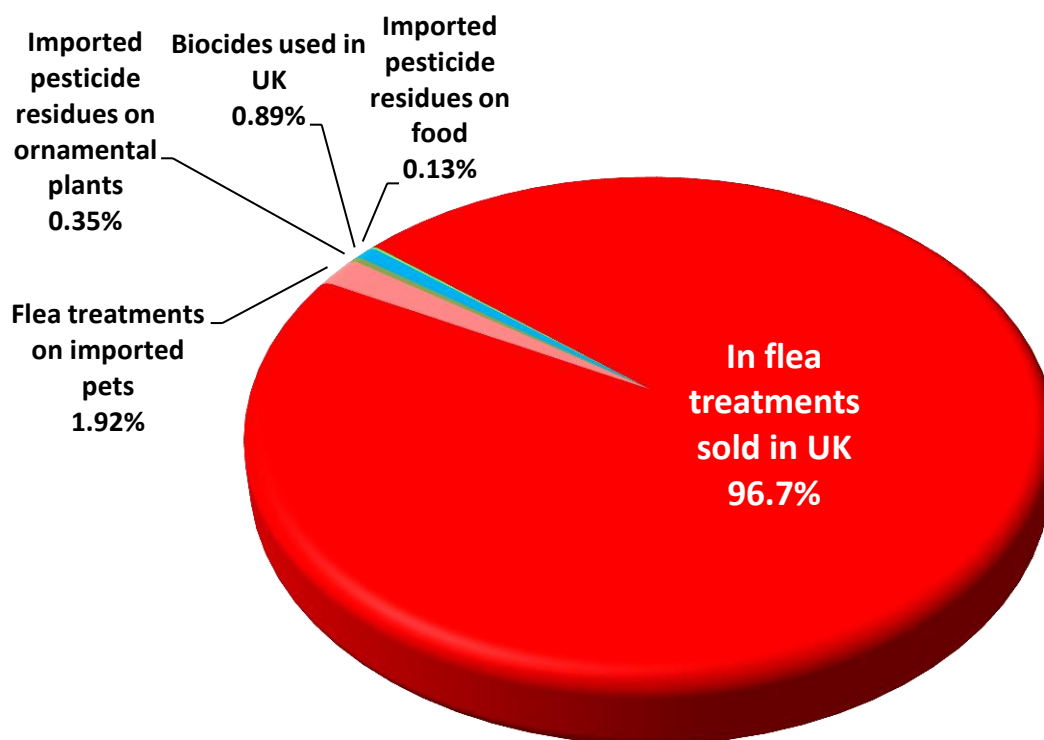


Figure 3. Contributions to total UK annual Imidacloprid input. Estimated annual inputs of Imidacloprid in the UK expressed as percentages of total amount sold and imported in consumer usable products (input).

Pathway	Fipronil Annual Flux	Imidacloprid Annual Flux
Discharge from British rivers to the sea	740 - 1,310 kg	790 kg
Discharge from sewage works	264 kg	753 kg
In flea treatments sold in UK	1,500 kg*	3,520 kg**
Low estimate (likely) and maximum (just about possible) annual input to rivers from former agricultural uses	0.6 - 22.1 kg	229 - 7,931 kg
Imported pesticide residues on food	0.15 kg	4.83 kg
Imported pesticide residues on ornamental plants	75.5 kg?	12.7 kg
Biocides used in UK	1.5 kg	32.5 kg
Imported in treated building materials	0 kg	0 kg?
Imported in treated fabrics	0 kg	0 kg
Flea treatment on imported pets	24 - 52 kg	45 - 95 kg
Flea treatment on exported pets	-?	-?
Illegally imported products	0 kg?	0 kg?
Total non-flea treatment, non agriculture sources.	77 kg	50 kg
Total Used/Released per year in UK	1,602 – 1,651 kg	3,844 - 11,596 kg

Table 23. Estimated current annual fluxes of Fipronil and Imidacloprid in the UK (*average VMD sales data 2016-18, ** VMD sales data 2014-2018 and average of Elanco sales estimates 2019-24 ([Brown et al. 2025](#))).

Table 23 gives the UK fluxes in Fipronil and Imidacloprid in kg, including the fluxes from rivers and sewage treatment works calculated previously.

The estimated input from each pathway was put into the context of the potential contribution the pathway could make to observed river pollution levels (Table 24).

Pathway	As a percentage of annual Fipronil river pollution	As a percentage of annual Imidacloprid river pollution
In flea treatments sold in UK	115 or 203%	446%
Low estimate (likely) and maximum (just about possible) annual input to rivers from former agricultural uses	0.05 to 3%	29 to 1,004%
Imported pesticide residues on food	0.01 or 0.02%	0.6%
Imported residues on ornamental plants	6 or 10%?	1.6%
Biocides used in UK	0.1 or 0.2%	4.1%
Amount imported in imported building materials	0%	0%?
Amount imported in imported fabrics	0%	0%
Amount on imported pets	2 to 7%	6 to 12%
Illegally imported products	0%?	0%?

Table 24. Potential contribution of input pathway to river pollution, assuming 100% of input reaches the rivers, expressed as percentages of the estimated current annual emissions of Fipronil and Imidacloprid from the UK in river water.

Using the lower estimate of annual Fipronil river pollution - 740 kg per year - calculated from the 2014-24 LCMS data set, we can try to piece together where the Fipronil in the rivers is coming from. The annual current input from all non-flea treatment sources only amounts to 99.1 kg, but this is an estimate of current pollution inputs, while the 740 kg figure is an average based on 2014-2024 data, the average annual Fipronil discharge from the high (unrealistic) estimate agricultural discharge model suggest that an average of 33.8 kg/year of Fipronil could have been emitted during that period, so this may be the more appropriate figure to use than the 22.1 kg current estimate, giving a total of 111 kg from non-flea treatment sources. Therefore, and still assuming that 100% of non-agricultural Fipronil inputs end up in rivers, the remaining 629 kg/year must be coming from Fipronil flea treatments. This would represent at least 42% of annual Fipronil flea treatment sales ending up in rivers.

Imidacloprid is much more soluble than Fipronil (Fipronil 3.78 mg/L ([PPDB](#)) v.s. Imidacloprid 610 mg/L ([PPDB](#))), can be similarly persistent (data varies wildly ([Zhang et al. 2018](#))), and is less likely to bind to soil (Fipronil absorption capacity K_f value is 11.8 mL/g ([PPDB](#)), Imidacloprid is only 2.23 mL/g ([PPDB](#))). Indeed Perkins et al. ([2025](#)) demonstrated that Imidacloprid is over twice as likely to wash off a swimming Dog when compared to Fipronil. Both chemicals have very similar flea treatment uses and resulting pathways. It is reasonable to therefore estimate that if 42% of Fipronil flea treatment is ending up in rivers then at least 42% of Imidacloprid flea treatment is also likely to end up in rivers – this would equate to 1,476 kg/year of Imidacloprid.

Data from sewage treatment plants suggests that 264 kg of Total Fipronil and 753 kg of Imidacloprid travel through sewage every year. This would mean that 476 kg/year of current Fipronil flea treatment product was coming through other routes – including pet excreta,

direct environmental exposure, shed fur, swimming Dogs, re-entry from sewage sludge and domestic sewer misconnections ([Hadley et al. 2026](#)). This would in turn infer that 727 kg/year of Imidacloprid enters water through those routes, however the EA data results in an estimate of just 790 kg/year of Imidacloprid in rivers (not 1,476 kg/year), so either the LCMS data has resulted in an underestimate, or it is unlikely that 42% of Imidacloprid in flea treatments enters waterbodies. The volume of Imidacloprid breakdown products in sewage and water bodies is unknown and may account for the discrepancy. Zhang et al. ([2026](#)) found that Desnitro-imidacloprid occurred at concentrations 10 times higher than Imidacloprid in 21 sewage treatment plants in Shanghai, this chemical has not yet been looked for in UK sewage or rivers and could explain the apparent current gap in accounting for Imidacloprid derived pollution.

While Imidacloprid levels in rivers therefore appear to be lower than would be predicted by inference from the better understood flea treatment pathway fate of Fipronil, this may be because toxic breakdown products of Imidacloprid are not being monitored.

At this point we should remind ourselves that the UK sewage data is from a small number of sewage works over just 17 months, so may not be representative, and from a study that had a Fipronil Limit of Detection of 0.01 µg/L (which is higher than 23% of Fipronil detections in rivers), meaning a substantial amount of the Fipronil would have been missed. Furthermore, the river pollution estimate is based on a dataset of river samples that are not random or selected to provide an assessment of average conditions. The EA LCMS water quality data is likely to contain a disproportionate number of samples from more polluted places, so may result in an overestimate of the weight of the chemicals in all rivers.

On the other hand direct input pathways from pets into the environment via shed fur, swimming and excreta have not been fully quantified, and may be considerably more significant than has previously been realised. For example emissions studies have only lasted for 28 days and have yet to detect the point where a flea treatment stops emitting to the environment, so there could be a long tail. Certainly, recent evidence of Fipronil damaged streams in isolated forests where people walk Dogs, and flea treatments entering bird's nests and contaminating Dandelions in parks at toxic levels, are reminders that non-sewage routes can be significant ([Schweiger et al. 2025](#), [Montaigu et al. 2025](#), [Buijs et al. 2026](#)).

Perkins et al. ([2025](#)) calculated that 0.8% of Fipronil and 1.4% of Imidacloprid, on Dogs, ended up in the environment via swimming. Perkins and Goulson ([2023](#)) found that 86.1% of Dog and 91.1% of Cat owners had administered a flea treatment to their pet in the preceding 12 months and Cooper et al. ([2020](#)) found that 23.6% of Cats and 35% of Dogs had been treated with insecticidal flea products that were still 'in date'. There are 10.6-13.5 million Dogs and 10.8-12.5 million Cats kept as pets in the UK ([PDSA 2024](#), [UK Pet Food survey 2024](#)). We can estimate that about 50% of treatments are on Cats and 50% on Dogs. However the weight of active ingredient in a Cat product is lower than in a Dog product, and Dog products are scaled by dose depending on the size of the animal.

Data on the sizes of British Dogs was collected by Hunter and Murison ([2025](#)), this was used to estimate the numbers of Dogs treated in each size category.

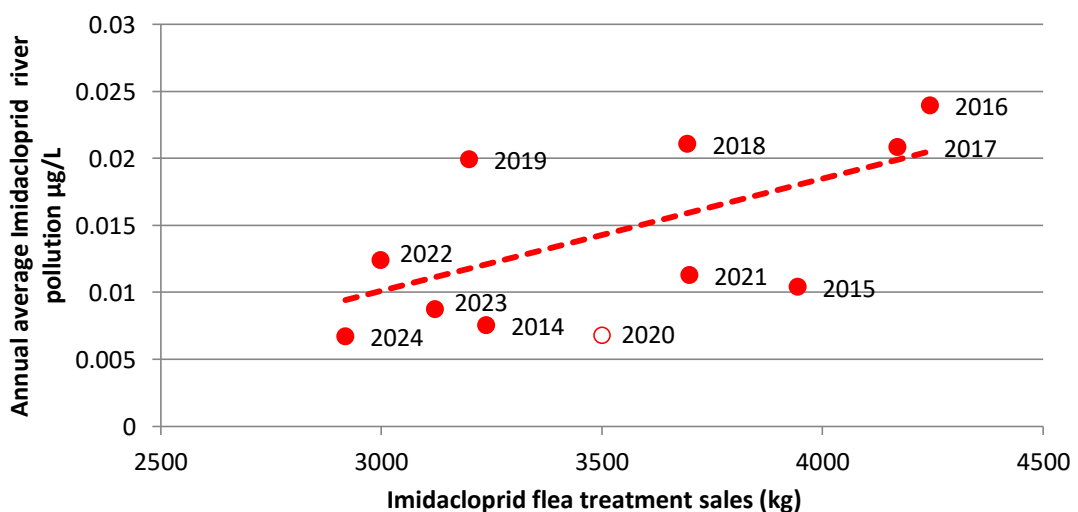
The balance between the frequency of the different categories of use - Imidacloprid pour-on, Imidacloprid collar and Fipronil pour-on was estimated using survey data from ([Perkins and Goulson 2023](#)).

This results in an estimate of 9.6 kg Fipronil and 42.6 kg Imidacloprid entering waterbodies from swimming Dogs every year. This would equate to just 1.3% or 0.73% of Fipronil estimated to be in rivers and 5.4% of Imidacloprid.

The ‘annual river pollution estimate (kg)’/‘annual sewage estimate (kg)’ ratio for Total Fipronil is 2.8 (ignoring the single anomalous sulphone reading), but for Imidacloprid it is 1.1, suggesting that sewage outputs contribute over twice as much to resulting Imidacloprid levels in rivers when compared with Fipronil. In addition, while Fipronil was on average 25% higher in rivers downstream of the sewage treatment plant, Imidacloprid levels were raised by 50% by passing the sewage works. As Fipronil flea treatment is the only pathway into sewage works that can account for the vast majority of observed pollution levels, so it stands to reason that Imidacloprid in flea treatments, which represents 98.6% of Imidacloprid available to enter the sewage system, is likely to be accounting for the doubly high levels in sewage. Hence flea treatments could account for all, or nearly all, of the currently observed Imidacloprid pollution in rivers.

Imidacloprid water pollution from heavy former agricultural use will have been in decline over the last 12 years, this is paralleled with a significant decline in Imidacloprid pollution levels in rivers over the last nine years. As agricultural use drew to a close between 2009 and 2015, so Imidacloprid use in flea treatments increased rapidly, although to-date annual kg use in flea treatments has never gone over 10% of peak annual agricultural sales.

There is a correlation between the weight of Imidacloprid sold and the annual average Imidacloprid pollution level in rivers between 2014 and 2024. The sampling in 2020 was disrupted by Covid, and had fewer river samples than any other year; fewer samples mean a greater risk of under recording infrequent peaks and hence underestimating pollution levels; in addition there may have been extended storage of samples in 2020 resulting in decayed samples and an underestimate of pollution levels ([Brown et al. 2025](#)). When 2020 was removed from the analysis there was a significant relationship ($r^2=0.403$, $p=0.0486$) (Graph 34).



Graph 34. Correlation between the in-year sale of Imidacloprid flea treatments and the level of Imidacloprid pollution recorded in rivers 2014-2024 (minus 2020) (VMD data– Appendix 2, [Brown et al. 2025](#), EA LCMS data).

The regression line of this relationship between Imidacloprid sales and Imidacloprid water pollution (Graph 34) crosses the x-axis at 1,790 kg of Imidacloprid sales. If Imidacloprid from flea treatments was the only source of pollution then this would imply that reducing flea treatment sales to 1,790 kg would result in zero river pollution. This is highly unlikely to be the case from what we understand of the pathways, we would expect the input of Imidacloprid from sources such as hand and bedding washing and Dog swimming to be linear relationships, the emissions would scale directly – 1,000 treatments would create 10 times the level of river pollution of 100 treatments – and the regression would therefore pass through the x-axis at zero – there would be no pollution only when there was no flea treatment use.

If Imidacloprid flea treatment did not have a linear effect on river pollution levels, but instead had a relationship that was nonlinear then this could explain the x-axis crossing point. In that scenario a greater proportion of Imidacloprid would get into rivers when flea treatment use was high and a smaller proportion would reach rivers at a lower level of flea treatment use. This could conceivably be the case if Imidacloprid at low levels was metabolised by bacteria or absorbed into sediments in sewage works, and if these processes were overwhelmed at high pollution levels, allowing a greater proportion of Imidacloprid to reach rivers. This would mean that the linear regression line in Graph 34 would be part of a line that curves increasingly shallowly towards zero. If this was the case then Imidacloprid in flea treatments could still be responsible for 100% of the observed 2014-2024 river pollution. However, there is no evidence of pathway mitigating effects that might result in a significantly non-linear relationship between Imidacloprid flea treatment use and river pollution levels.

A more likely explanation for the x-axis crossing point is that river pollution from agricultural sources was also declining, most likely as a function of a logarithmic relationship in which the amount reaching rivers reduces by a reasonably fixed percentage every year due to residues degrading to other compounds or being expelled to sea. Hence this regression line represents two causative factors, both in decline, and the steepness of the regression line is due to both factors operating simultaneously. If over the last decade Imidacloprid river pollution from agricultural legacy has declined to the point where it is now a minor contributor to river pollution, then its contribution to any future decline in river pollution will also be minor.

Due to the unknown volume and rate of decline in agricultural legacy inputs during this period, the correlation between flea treatment sales and Imidacloprid river pollution levels cannot be interpreted as convincing evidence that there is a closer relationship between Imidacloprid river pollution levels and flea treatment use, than there is with former agricultural use; at the same time it demonstrates that the existence of a relationship between declining flea treatment use and declining river pollution is tenable.

Twenty sample points in 18 rivers in the Environment Agency's LCMS (Liquid Chromatography-Mass Spectrometry) dataset had more than 30 samples between 2016 and 2024. 2020 was excluded from the analysis due to Covid related monitoring disruption. Of these 18, six rivers showed a significant decline in average annual Imidacloprid levels over the period, the remaining 12 rivers shown no significant trend although most had lower levels in 2023+2024 than in 2016+2017, only the Rivers Eden and Douglas showed an increase in average annual Imidacloprid pollution levels across the time period and only the Eden and Irwell recorded higher concentrations in 2023+2024 than in 2016+2017 – Table 25.

In 2016-17 there were 879 samples taken on these rivers and in 2023-24 there were 733 samples taken (the Ouse at Naburn Lock aside). However, it should be noted that there was a change in sampling intensity between 2016-17 and 2023-24, with a reduction in the number of samples taken at all points with more than 50 samples in total, on average a 32% reduction, and an increase in the number of samples taken at all sites with less than 50 samples – on average 234% more samples were taken at these points in 2023-24. Declines at sites with fewer samples in 2023-24 than 2016-17 many have been overestimated, and underestimated at sites with more samples in 2023-24.

Sampling point	Number of samples 2016-2024	R ²	p	% change between 2016-7 and 2023-4
R. Nene – Wansford Old Road Bridge	368	0.9518	0.00003559	-66.4
R. Ivel – Tempsford Depot Footbridge	319	0.9158	0.0001931	-74.2
Somerhill Stream -Old Forge Farm	44	0.8748	0.001972	-65.5
R. Great Ouse – Roxton Lock	320	0.8156	0.002111	-67.6
R. Wensum – Sweet Briar Road Bridge	363	0.7959	0.00289	-74.5
Sincil Dyke – Washingborough	48	0.7596	0.01059	-94.7
R. Ouse – Nether Poppleton	332	0.4941	0.05181	-94.5
R. Waveney – Ellingham Mill	380	0.4479	0.0695	-52.8
R. Ancholme – Horkstow Bottom	30	0.3893	0.1343	-87.5
R. Lugg – Mordiford Bridge	341	0.3879	0.09908	-94.4
R. Ancholme – Cadney Bottom	363	0.3784	0.1046	-82.5
R. Chelt – Princess Elizabeth Way	37	0.3739	0.1446	-97.2
R. Teme - at Powick	52	0.3596	0.1547	-97.3
R. Test – Longbridge	44	0.2679	0.2341	-70.3
R. Ouse – Naburn Lock	34	0.2167	0.4295	N/A
R. Eden – Sheepmount	33	0.1958*	0.3201	+ ∞
R. Blyth – Bedlington Bridge	39	0.1064	0.4752	-100
R. Douglas – Wanes Blades Bridge	35	0.03659*	0.7166	-25.8
R. Tame – upstream of Coleshill STW	46	0.02099	0.7566	-7.0
R. Irwell – Old Ringley Bridge	34	0.01367	0.8029	+18.3

Table 25. Trend in average annual Imidacloprid pollution levels at the 20 sample points (across 18 rivers) with more than 30 LCMS samples taken between 2016 and 2024. R² - bold = significant, -* = an increase, all others are declines. Last column shows the change from the 2016-17 average annual level to the 2023-2024 average annual level. There were no samples taken at Naburn Lock in 2016 or 17.

Rivers with significant declines in Imidacloprid levels tended to be those with significant inputs of both sewage discharges and arable runoff. Unfortunately none of the 20 sampling points have significant arable inputs without also having significant sewage inputs, so arable inputs cannot be examined alone. Rivers with significant declines in Imidacloprid pollution levels are all large river systems in East Anglia containing significant arable areas. Somerhill Stream was an exception as it showed a significant decline but is a water course with significant sewage input but no arable input. Other than Somerhill Stream, sampling points receiving significant

sewage input, but low levels of arable input, did not demonstrate significant declines in Imidacloprid levels.

To summarise the analysis of potential sources of Fipronil and Imidacloprid pollution:

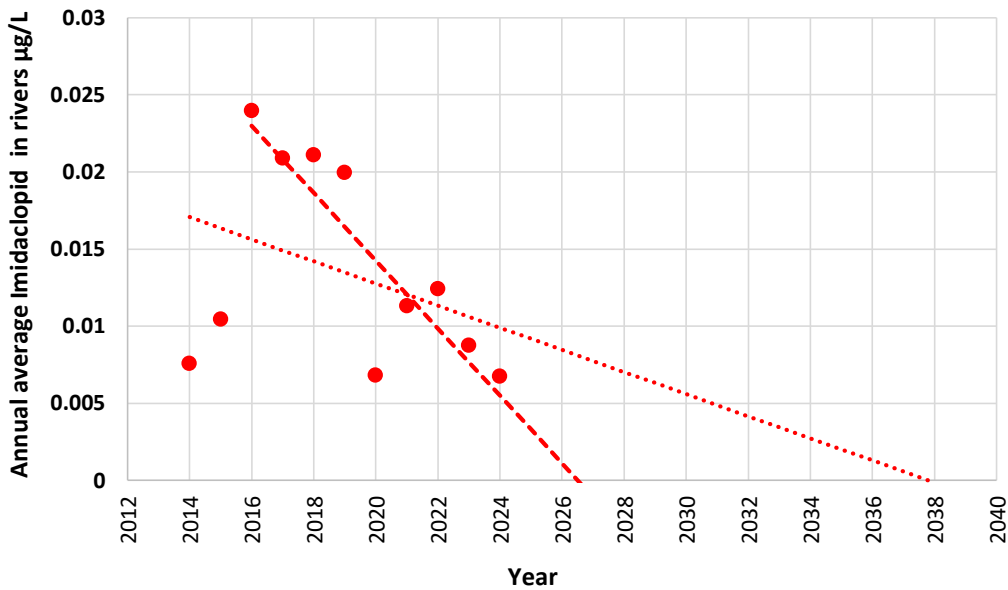
- Over the last 11 years about 8,140 (or 14,410 kg) of Fipronil and 8,690 kg of Imidacloprid have travelled down British rivers.
- Since they were approved in the 1990s there has been in total 39,939 kg of Fipronil and 51,689 kg Imidacloprid sold as flea treatments in the UK.
- Between 2000 and 2025 about 322,000 kg of Imidacloprid was used in UK agriculture, but there has only ever been about 730 kg of Fipronil used in UK agriculture. There has been effectively no use of either chemical in UK agriculture since 2015.
- We can rule out agriculture as a significant contributor to the amount of Fipronil pollution currently being observed in the UK.
- The biggest unknown is the weight of Imidacloprid entering waterbodies as a result of former agricultural use, however over time this pathway should decline to very low levels of input, and may indeed have done so already.
- Imidacloprid levels in rivers appear to have declined over the last nine years.
- The volumes of chemicals imported on non-food plant produce (ornamental plants) is poorly understood, relatively high estimates were made on a worst case basis of 75.5 kg Fipronil imported per year and 12.7 kg of Imidacloprid.
- Small amounts come into the UK as residues on food, but for the other purported importation routes there is no evidence that these chemicals are arriving in the UK and the subsequent routes into water bodies are tenuous.
- However 2.35% of Fipronil and 1.92% of Imidacloprid being imported into, or sold in, the UK (inputs) may be arriving on imported pets.
- Imidacloprid biocides may account for up to 0.89% of current annual Imidacloprid inputs to the UK and, there are no longer any Fipronil biocides on the market in the UK, but historically they may have contributed 0.09% of annual Fipronil input to the UK.
- Only 4.8% of Fipronil and 1.4% Imidacloprid inputs to the UK are likely to originate from non-flea treatment uses.
- If it is assumed that all of the non-flea treatment UK imports end up in rivers before they degrade, then they could still only account for 10.4% of Fipronil and 6.3% of Imidacloprid river pollution levels.
- On the other hand about 44% (or 77%) of the total volume of Fipronil, and 21% of the total volume of Imidacloprid, sold in UK flea treatments in the last 12 years entered waterbodies it would explain 100% of the pollution observed in the last 11 years.
- The data suggests that 42% of Fipronil flea treatment ends up in rivers.
- Using the flea treatment pathways for Fipronil as a template for the more soluble Imidacloprid, it appears that current pollution levels in rivers could be almost entirely attributable to flea treatment use.
- Therefore, even with worst case assessments, tackling non-flea treatment sources of the chemicals can only make a tiny, although potentially useful, contribution to achieving the necessary c.98% reduction in Fipronil and c.84% reduction in Imidacloprid pollution from current levels.
- Efforts to get this situation under control must focus on massively reducing the amounts of these two flea treatments getting into water bodies.

9.12. Future Trends in Pathways

There are no observable recent trends in Fipronil flea treatment use and waterbody pollution, although there are fluctuations, they have been, in essence, stable. The other potentially significant minor Fipronil sources are residues on ornamental plants, residues on imported animals and legacy agricultural use. We have no trend data relating to Fipronil on ornamental plants, or residues on imported pets, both of which currently depend on the regulatory actions of other countries. It is safe to assume that the residue washing into waterbodies from the small amount of former agricultural use will be in decline from its already minor input levels.

There is no indication that there has been any overall or recent reduction in either input or output of Fipronil. Nor is there any indication that levels will start to decline in the near future.

In contrast to Fipronil, Imidacloprid does show a significant decline in pollution levels over the last nine years.



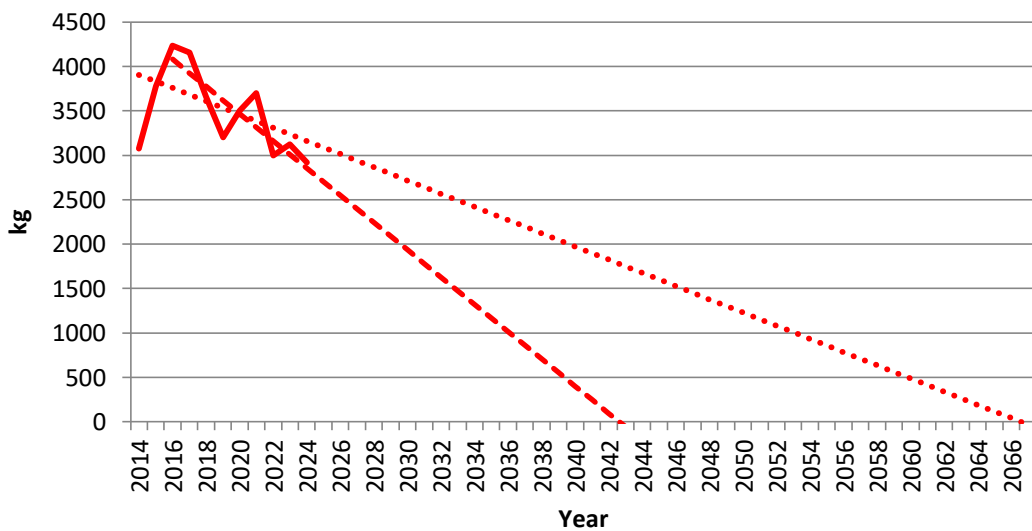
Graph 35. Forward projections of average Imidacloprid river pollution levels. Dashes = 2016-24 trend extrapolated, Dots = 2014-24 trend extrapolated

If the 2016-2024 significant downward trend in Imidacloprid pollution was to continue then there would be zero pollution in 2027! However, if the two previous years are included the line is much shallower and hits zero in 2037, 11 years of continued pollution.

However, we cannot rely on future decline in Imidacloprid from former agricultural use being a significant factor, indeed it would be consistent with the evidence to conclude that agricultural inputs may have already declined to the point of being a minor contributor to current Imidacloprid pollution levels.

Sales of Imidacloprid flea treatments have been in recent decline, about 30% decline from the 2016 peak (although not statistically significant). If this trend was to continue then sales

would reach zero in 2043, but if the trend calculation includes 2014 and 2015 then the slope is shallower and would hit zero in 2067; scenarios that would result in 17 or 41 more years of Imidacloprid pollution.



Graph 36. Forward projections of Imidacloprid flea treatment use based on Elanco sales data and estimates Dashes = 2016-24 trend extrapolated, Dots = 2014-24 trend extrapolated.

However it would be naïve to think that the current decline will necessarily continue. Industry paper Brown et al. (2025) says “it is expected that veterinary use of topical products containing IMI will remain stable or even decline in future years”. It is unlikely that the manufacturers of Imidacloprid flea treatments will encourage the loss of their leading product and over £60m of annual income in the UK alone.

The current decline in sales could be due to reduced prescribing and sales from vets who are increasingly concerned about environmental impacts, if so this may continue for a while, but as long as the products are available without prescription changes to prescribing practice will only have a limited effect. Of course the decline in Imidacloprid sales may be simply due to new products, some cheaper, and some with alternative active ingredients, taking a greater market share.

There is no evidence that the recent decline in Imidacloprid flea treatment sales will be sustained.

In relation to the minor Imidacloprid inputs: residues on EU derived food and ornamental plants is likely to decline, but, as most of the current contamination is imported from countries outside the EU, this pathway is unlikely to decline further unless Imidacloprid pesticide use is restricted in the exporting countries; there is also no indication that either the use of Imidacloprid in biocides, or the amount being imported on pets, is likely to decline.

Brown et al. (2025) conclude that at current trends the UK could achieve acceptable water quality standards by 2039. If the more recent, 2016-24, steeper decline in sales is projected forwards, and we assume that all river pollution now comes from flea treatments, and assume that there is a direct linear relationship between the amount used and the levels in rivers, then by 2039 there will be a 84% decline in Imidacloprid pollution levels from 2014-24 levels. Applying the pollution reduction model produces a forecast that at that point 10% of samples

would be failing their freshwater chronic EQS, 18% would fail the acceptable field concentration (AC_{field}) threshold and 6% of saline samples would fail their chronic EQS. While some damage would still be occurring, this level may be regulatorily acceptable. However, if the shallower 2014-24 decline rate is projected forward then this only results in a 41% decline in river pollution by 2039, 33% of samples would fail their freshwater chronic EQS, 2% would fail the acute EQS, 42% would fail the acceptable field concentration (AC_{field}) threshold and 12% of saline samples would fail their chronic EQS, which is unlikely to be regulatorily or morally acceptable.

There is no evidence that current trends will continue, sales of Imidacloprid flea treatments may recover, and it is likely that the legacy flow from agriculture has fallen almost all of the distance it has to go, so significant future decline is not a safe bet. Even if Imidacloprid pollution levels do continue to decline there would be decades of continuing emission and damage, particularly as it is contaminating groundwater, which will continue to discharge to surface waterbodies for many years.

10. Application of the Environmental Principles

Environmental Principles are in place to address circumstances such as these. The Government has produced [guidance](#) on how the principles should be applied in the UK.

10.1. The Precautionary Principle

The precautionary principle is a well-established component of environmental regulation. It is necessary because environmental harm, often serious and sometime irreversible, can take many years to detect (in this case about 20 years) and can continue for many years if proof is required that the predicted outcomes are actually occurring in the field, which in some cases may be practically impossible to establish. Without the precautionary principle environmental harms stack up causing compound environmental destruction and, instead of environmental damage being halted quickly, it is allowed to continue for many years, potentially causing irreversible damage and species extinctions that could have been avoided.

Applied in regulatory circumstances where there is doubt the precautionary principle has a strong track record of stopping harm and there are few or no cases where subsequent to its application it was found to be unnecessary ([EEA 2001](#)).

The UK guidance on applying the precautionary principle says:

“The UK government is a signatory to the 1992 Rio Declaration. Its definition of the precautionary principle states that ‘where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation’.

When to use the precautionary principle: The precautionary principle is applicable where there is plausible evidence of a risk that a particular policy could cause serious or irreversible damage to the environment, alongside a lack of scientific

certainty about the likelihood or severity of this damage. The precautionary principle supports policymakers in their management of that risk.”

“Where there are gaps in the scientific evidence base, this should not be used as a reason for inaction if there is a plausible risk of serious or irreversible harm.”

“there must be sufficient evidence that the risk of serious or irreversible damage is plausible and real”.

It has already been shown that the levels of Imidacloprid in UK waters are frequently sufficient to cause harm to bird and aquatic invertebrate populations in the field, the average levels of Fipronil are higher than the levels known to damage populations of aquatic insects on nature reserves, and plants in public parks are contaminated at levels toxic to insects. These are serious environmental harms, and because the impacts are occurring on nature reserves as well as in main rivers the damage done to aquatic ecosystems may be irreversible. This is because the loss of invertebrate life can result in a shift in the aquatic ecosystem to become blue-algae dominated system which may not be easy to reverse, and if species are exterminated on nature reserves and in National Parks as well as in main rivers then the risk of very rare species being driven to widespread irreversible extinction is high, particularly if upstream reservoirs of the species are impacted so there is nowhere from which the species can recolonise the catchment.

While the Precautionary Principle may no longer be relevant to any general decision to reduce the levels of pollution, there may be parts of any regulatory action that could rely on the Precautionary Principle to address sources, pathways or risks that have yet to be quantified. For instance the use of Imidacloprid in ant baits is at the moment unquantified and although there is no established pathway into the aquatic environment and their environmental fate is currently unknown, restricting their use or withdrawing the relevant authorisation would be a potential precautionary step to reduce or eliminate the risk that they are contributing to pollution levels.

While there have been correlations between the chemicals and declining bird populations and dead birds in contaminated nests, if ministers remain in doubt as to whether a particular correlation is sufficient proof of an effect (as appears to be the case in this [ministerial statement](#)), the precautionary principle may be invoked. Similarly the impact of these chemicals in the marine environment is largely unstudied, so refusing to allow Imidacloprid use on marine fish farms could be a precautionary step to limit the burden of Imidacloprid in coastal waters.

10.2. The Prevention Principle

Environmental damage has been confirmed, it is long-term and widespread, and there are clear ways that the harm can be prevented, therefore the Prevention Principle applies at this stage. The Government guidance states that:

“The prevention principle means that government policy should aim to prevent environmental harm. This principle underpins many aspects of environmental

policy to ensure that environmental damage, such as CO₂ emissions, pollution or biodiversity loss, is avoided.”

“The prevention principle should generally be used in preference over the rectification at source principle or polluter pays principle, as these principles are used in instances when prevention cannot be achieved.”

“The principle is most effective when it is considered at an early stage, ideally before any environmental harm has occurred. The policymaker should therefore attempt to apply the prevention principle as early as possible. The prevention principle is applicable where a policy has the potential to cause a negative environmental effect. In circumstances where damage has already occurred, the principle should be used to prevent further damage from occurring and ensure that damage does not spread.”

11. Pollution Reduction Options

A range of measures could be taken to reduce levels of aquatic pollution from Fipronil and Imidacloprid, these must focus primarily on flea treatments as these are contributing the vast majority of current pollution and this is the only pathway capable for producing a c.98% reduction in Fipronil pollution and a c.84% reduction in current Imidacloprid pollution.

Reducing the rate at which Imidacloprid leaches into waterbodies from agricultural soils, if possible, may make a significant difference. Other pathways can also be addressed, but these pathways together contribute less than 10.4% of the Fipronil pollution and 6.3% of the Imidacloprid pollution, so cannot alone achieve the scale of change required. Potentially irreversible harm is already occurring so it is important that reductions are applied quickly.

11.1. Reducing Flea Treatment Pollution

Preventing at Source

Flea treatments are licenced for use by the Veterinary Medicines Directorate under the Veterinary Medicines Regulations 2013 (SI 2013/2033). Revoking the authorisations for Fipronil and Imidacloprid flea treatments would be the quickest and most effective way of significantly reducing inputs into water bodies. Risk assessment allowing, this could be done in a phased way to enable the public, vets and the producers of alternative flea treatments to adapt. For example, one or both chemicals could be retained as prescription only, but with clear guidance that prophylactic and repeat prescribing is not permitted. However, it is unlikely that this measure alone would reduce pollution levels by the required amount, so additional action would be required. In particular it seems unlikely that this measure, plus pathway management measures, could reduce Fipronil pollution by 98%, so ultimately there is unlikely to be any option other than completely revoking the authorisation for Fipronil. It is likely that a ban on Fipronil use alone would shift users onto Imidacloprid, which would make it harder to achieve the necessary reductions in Imidacloprid emissions. Hence a full ban on Imidacloprid flea treatments is also likely to be required.

Preventing by Changing Behaviours

It has been nine years since this pollution problem was identified, and despite considerable media attention (see Appendix 4), there is no clear evidence that public behaviour in relation to Imidacloprid and Fipronil flea treatment use has become significantly more protective of the environment. In 2024 86% of Dog owners in London were unaware of the potential environmental impacts of flea treatments ([Yoder et al. 2024](#)). It may be that sufficient numbers of vets are aware of the pollution issues to change prescribing practice, but the Imidacloprid sales decline is the only evidence available to suggest that there may have been a significant change in flea treatment practices. Measures could be taken to change the behaviour of the public and professionals in relation to managing the flea treatments. Measures that users could take that would reduce pollution include:

- Using gloves when applying products and disposing of the gloves to landfill.
- Not allowing Dogs to swim in water bodies for two months after they are treated.
- Sending pet bedding of treated animals to landfill rather than washing it.
- Not washing pets in baths or basins for two months after they have been treated.
- Not stroking pets or allowing them to touch clothing for a month after treatment, or wearing protective clothing (including gloves) when doing so and disposing of that to landfill.

To achieve the necessary levels of pollution reduction there would probably need to be c. 90% uptake of these behaviour changes. It seems unlikely that this will happen voluntarily, regardless of what warning labels are put on packets.

There are no obvious examples of voluntary initiatives successfully reducing environmental damage, UK initiatives to voluntarily reduce peat use in gardens, reduce pollution from lead shot and reduce pesticide pollution from farmland have all comprehensively failed ([McCarthy and Morling 2015](#), [PAN 2019](#), [ENDS 2021](#), [Wildlife Trusts 2022](#), [Green et al. 2022](#)). Furthermore while other voluntary initiatives have focussed on changing the behaviour of a small number of professionals, this issue is considerably more challenging as it would require behaviour change from c.17 million people.

While a voluntary approach to reducing household emissions from flea treatments is unlikely to be successful alone, in combination with a prescription only approach, in which there are more effective authorisation use conditions and a vet is able to stipulate the requirements of use, they may however make a significant contribution to a modest short-term reduction in pollution levels. Five years ago the British Veterinary Association, British Small Animals Veterinary Association and British Veterinary Zoological Society 'Policy position on responsible use of parasiticides for cats and dogs' ([2021](#)) asked the VMD to consider making all over-the-counter parasiticides prescription only, and this was also recommended by Imperial College London ([2023](#)). In November 2025 the VMD announced that it was planning a review of over-the-counter authorisations for flea treatments ([VetTimes 2025](#)). The review of prescribing statuses for Fipronil and Imidacloprid was initiated with a call for evidence on 16 April 2026 ([Call for evidence launches on pet flea and tick treatments in UK waterways](#)), but does not go as far as proposing a change to prescription only, this consultation is considered in more detail in 17.4. Analysis of Roadmap Regulatory Actions.

It would be possible in theory to exclude Dogs completely from contact with rivers using Dog proof fences along all rivers where there is nearby public access, and banning Dogs from SSSIs and other wetland nature reserves. This measure would be very expensive, difficult to

implement quickly, bad for wildlife dispersal and is likely to affect the recreation and landscape enjoyment of people in a highly counterproductive manner.

In the past members of the public in England and Wales could potentially have been prosecuted under Section 85 of the Water Resources Act (WRA) 1991 for causing pollution if they allowed a pet recently treated with insecticides to swim in water bodies within two months of treatment, but that law was repealed in 2010. Discharging or depositing any poisonous matter into a waterway remains an offence in Northern Ireland (Water Order 1999).

Section 92 of the WRA 1991 could be used to create new offences relating to flea treatment pollution, but this would be a significant shift in the regulatory focus of the Act and may require proof of a significant pollution event to enable prosecution. In addition creating similar offences in Scotland would require primary legislation. The most legally straightforward and proportionate approach to make undertaking activities known to cause pollution from flea treatments an offence would be to use the Veterinary Medicines Regulations (VMR) 2013, by making it a mandatory condition of authorisation that flea treatments with aquatic toxicity prohibit certain polluting activities for a specified period, with breach of a condition constituting an offence under the existing misuse provisions. Making washing pet bedding, stroking treated pets, allowing Dogs to swim in waterbodies and washing treated pets illegal for extended periods of time after treatment is unlikely to be acceptable to pet owners, and enforcement would be challenging.

Environment agencies' powers to designate 'water protection zones' and to prohibit or restrict activities, and to impose requirements on people undertaking activities to take steps to help achieve applicable environmental objectives, in such a zone, could be used to prohibit activities causing flea treatment pollution. The general prohibition of post-application hand washing, pet washing, Dog swimming etc. would probably be more tidily achieved through enforceable use conditions on product labels, but there may be advantages to a zonal approach to some elements, applying requirements to take steps, or the application of sewage treatment restrictions, that could be provided for through this route.

In addition consideration needs to be given to how to stop birds encountering pet fur. Birds can pick up hair shed outdoors, from floor sweepings that are left outside, or from people collecting pet hair and providing it to garden birds in 'hair feeders'. Pets could be kept inside if they shed fur within two months of being treated, sweepings sent to landfill, and the practice of putting out fur for birds to use halted. Again this could be achieved by authorisation conditions under the VMR 2013.

Preventing by Sewage Treatment

The relevant environmental agencies have the power to require those holding water discharge permits/authorisations to cease water discharge or to take additional action to prevent pollution.

Trade effluent from:

- pet grooming businesses,
- Dog wash facilities (e.g. Figure 4),
- Dog walking businesses,
- veterinary practices,
- kennels and catteries,

- pet shops,
- pet hospitals,
- animal shelters and rescue centres, and
- factories handling or manufacturing the relevant chemicals,

will or may contain high levels of Fipronil, Imidacloprid and other flea treatment chemicals. It is unlawful to discharge trade effluent without consent/authorisation from the sewage undertaker (Water Industry Act 1991 (England and Wales), Water and Sewerage Services (NI) Order 2006 and Sewerage (Scotland) Act 1968).



Figure 4. A Dog wash facility installed in a country park, with waste water emitting to the sewer at the bottom left of the photo.

In England and Wales when a trade effluent contains ‘prescribed substances’ then it is treated as ‘special category effluent’. A sewage undertaker cannot accept trade effluent containing ‘prescribed substances’, without the approval of the EA or NRW. This enables a discussion about whether it is appropriate to accept the effluent into the sewage system as trade waste, and, if so, what levels of the substance is allowable, or if it needs to be treated as hazardous waste and dealt with through a bespoke treatment process. Prescribed substances are listed in the relevant regulations and include some persistent insecticides, but not Fipronil or Imidacloprid (Trade Effluents (Prescribed Processes and Substances) Regulations [1989](#)). Northern Ireland and Scotland do not have a directly comparable list of substances, instead relying on the Water Framework Directive list of priority substances for similar measures.

As persistent insecticides in trade effluent Fipronil, Imidacloprid, and potentially other flea treatment active ingredients, could be added to the prescribed/priority substances lists. A review of trade effluent consents could be undertaken to ensure that the relevant premises

(see above list) are properly consented, and that the emissions of Fipronil, Imidacloprid and other flea treatment chemicals in trade effluent are being adequately controlled.

Trade effluent that does not enter the sewage system, but instead travels through private treatment plants or septic tanks does not require specific consent; pollution control is maintained through the permitting/authorisation of the discharge of treated sewage to a river or groundwater. Sewage discharged to waterbodies should not contain toxic levels of insecticides. Permits and authorisations for discharges of sewage from treatment facilities receiving trade effluent from categories of premises mentioned above or receiving significant volumes of domestic waste water, could, in line with the requirements of water quality regulations, be reviewed and revoked or amended. This would enable decisions to be taken with regard to the correct treatment of contaminated effluent.

Given the existing widespread exceedances of accepted safety limits for Fipronil and Imidacloprid in rivers, and the fact that current sewage treatment processes do not remove a significant proportion of the Fipronil and Imidacloprid from the influent, it is very likely that it will be hard to find a sewage treatment plant that is able to accept trade waste containing Fipronil or Imidacloprid and not add to, or create, unacceptably high pollution levels in the receiving water body.

Activated carbon filters could be introduced into Sewage Treatment Plants to remove Imidacloprid and Fipronil from waste water ([Sanz-Santos et al. 2022](#), [Negro et al. 2025](#)). Fipronil could also be removed by applying the solar/photo-Fenton process using ferric citrate complex, which has shown to be quite effective at reducing Fipronil levels ([Junior et al. 2020](#)). It also appears that conventional activated sludge treatment that also incorporates a membrane bioreactor can reduce the levels of Fipronil in treatment plant effluent ([Li et al. 2026](#)). Bioremediation may also have potential in reducing Fipronil or Imidacloprid in sewage ([Guatam and Dubey 2022](#), [Jaiswal et al. 2023](#)), but may not be applicable to large volumes of waste water. It is likely that a considerable amount of work would need to go into design and testing to ensure that new processes were effective and durable; at the moment there are some pilot activated carbon filter installations in UK sewage plants (e.g. [Cranfield University](#)).

At a very conservative estimate introducing active carbon techniques to c.9,000 sewage plants is likely to cost in excess of £27 billion and increase annual treatment costs by £400 million. Costs that would no doubt be passed on to all consumers, which would not conform with the Polluter Pays Principle. There might be additional benefits from the introduction of this technology, but there may also be a question as to where all the activated carbon would come from. More to the point in this context, the introduction of this experimental technology is likely to take decades, so there would need to be interim measures before they all came on stream: which brings us back to a suspension of the authorisations for Fipronil and Imidacloprid use in flea treatments.

11.2. Reducing Agricultural Pollution

There is an unquantified legacy of Imidacloprid currently seeping from agricultural soils into water courses. Taking arable land adjacent to water courses out of production for five years and putting them into pasture or grassland could significantly slow the rate of Imidacloprid flowing into rivers and the sea, this would give the Imidacloprid and its persistent toxic breakdown products more time to degrade to safe compounds. To be effective in achieving a

68-100% reduction in concentration reaching the water bodies the buffer strips along all ditches, streams and rivers would probably need to be 30m wide ([Dunn et al. 2011](#)). This measure would be expensive and may have a minor impact on food production. Given that agricultural legacy Imidacloprid will have been in decline, the resulting water quality improvement may be limited, although it would have the benefit of reducing future pesticide pollution of water bodies.

11.3. Reducing Pollution from Minor Pathways

In addition to addressing flea treatment pollution, reducing importation sources of Imidacloprid and Fipronil residues further could assist with achieving the high rates of pollution reduction necessary to stop the environmental harm.

‘Maximum Residue Levels’ for Fipronil and Imidacloprid on imported food could be reduced to the Limits of Detection and detections enforced to reduce the amount of Fipronil and Imidacloprid entering the environment.

Limits could be set for the ‘Maximum Residue Levels’ for Fipronil and Imidacloprid on ornamental plants (e.g. potted plants, saplings and cut flowers). However, pesticide residues in these products are unregulated and, as they are not food, they currently fall outside the remit of the MRL legislation, which would have to be amended and an appropriate regulatory framework created.

Changes to MRLs could be subject to WTO consultation and potential challenge, so are not short-term solutions.

All authorisations for the use of Imidacloprid as a domestic pesticide could be revoked, or at least restricted to professional pest controllers.

The importation of pets could be suspended from countries where Fipronil or Imidacloprid are authorised as flea treatments, or they could be thoroughly washed as they come through customs (efficacy of different washing methods would need to be established) and the resulting water disposed of at a special facility (i.e. not into the sewers).

Fipronil is a poly-fluoroalkyl substance (a PFAS ‘forever chemical’), in February 2026 Defra Minister Emma Hardy launched the new UK Government ‘PFAS Plan: building a safer future together’, saying

“PFAS contamination threatens public health, wildlife and the quality of our natural environment. Acting now is essential to prevent irreversible harm and to ensure that our regulatory frameworks keep pace with scientific evidence.”

Action 2.3 of the PFAS plan commits to “Progress towards the addition of more PFAS substances to the UK REACH candidate list of substances of very high concern (SVHCs), subject to consultation.”

Being on the list of ‘substances of very high concern’ would mean that packaging would have to carry additional warnings and a sunset date would be set for the phasing out of the

chemical. It is sometimes called the substitution list as the replacement of the chemicals becomes a priority.

Fipronil is one of the most toxic and widely polluting PFAS chemicals in the UK, it has been ranked as the highest toxic hazard to humans and the environment in English waterbodies ([Spurgeon 2021](#)).

Adding Fipronil and Imidacloprid to the SVHC list would be one approach to regulating pollution levels, but as there is only one significant use and many alternative chemicals are already available for that use, there is only a need to take this route if there is no means to regulate the flea treatment use directly; it would only delay the removal of the chemicals from the market.

Given the long range dispersal of these two chemicals in water, air (Fipronil) and on Cats and Dogs, the levels of bioaccumulation exhibited by Fipronil, their toxicity, and their persistence in the environment (and the even greater persistence and toxicity of their commonest breakdown compounds), both of these chemicals could be submitted to the Stockholm Convention secretariat for assessment as Persistent Organic Pollutants to be added to the annexes for international control measures. This would support MRL action, but would be a long-term process.

12. Application of the Veterinary Medicines Regulations 2013

12.1. Background

The authorisation of veterinary medicines in the UK is governed by Schedule 1 of the Veterinary Medicines Regulations 2013 ([VMR 2013](#)). EU legislation, particularly Regulation (EC) [No 726/2004](#) 'Community procedures for the authorisation and supervision of medicinal products for Human and veterinary use and establishing a European Medicines Agency', is also applicable in Northern Ireland.

The Veterinary Medicines Directorate (VMD) is the relevant Defra agency and one of the agency's aims is to "ensure that the medicines pose minimal possible risk to human health and the environment in the UK".

In recent times there has only been one veterinary regulatory decision taken to protect the environment – the decision in 2017 by the EU Standing Committee on Veterinary Medicinal Products to ban Zinc oxide from use on Pigs (*Sus domesticus*) because it posed a risk to aquatic life ([Risk Assessment](#)). In 2013 the UK Water Framework Directive Technical Advisory Group had identified 7.5% of English freshwater waterbodies and 15.7% of saline waterbodies as failing to achieve good condition due to Zinc pollution, while 41% of Welsh freshwaters were also failing to achieve good status due to levels of Zinc ([UK WFD TAGE 2013](#)). However, the [VMD argued](#) in the EU fora on behalf of the veterinary medicines industry– pushing for an exceptional 10 year phase out process. This was not granted and the standard maximum 5 year phase out was allowed by the legislation. Following '[behind the scenes](#)' work by industry representatives the VMD agreed to allow any of Zinc oxide in the supply chain to be used after the date of the ban. As a result, instead of stopping the pollution in 2022, as was done in

other European countries, the UK only stopped the pollution in 2024 (and some may still be occurring). Having allowed stockpiling it is now reported that VMD is sympathetic to the return of Zinc oxide and is working 'closely together' with the manufacturer on a possible future marketing authorisation ([Loeb 2022](#), [For Farmers 2023](#)).

The Veterinary Medicines Regulations 2013 allow for the authorisation of veterinary medicines in one of four supply categories:

- Prescription Only Medicine–Veterinarian (abbreviated to POM-V);
- Prescription Only Medicine–Veterinarian, Pharmacist, Suitably Qualified Person (abbreviated to POM-VPS);
- Non-Food Animal–Veterinarian, Pharmacist, Suitably Qualified Person (abbreviated to NFA-VPS);
- Authorised Veterinary Medicine–General Sales List (abbreviated to AVM-GSL).

Only AVM-GSL medicines can be bought off the shelves by the public without a prescription; POM-V restricts a product to veterinarian prescription after a clinical assessment of the animal by a vet; POM-VPS requires a prescription, but this can be made by a pharmacist or other suitably qualified professional; and NFA-VPS requires professional advice which means the medicine can be bought over the counter or online without a prescription, but has to be approved by a qualified staff member. The VMRs 2013 (VMRs) set out that before prescribing a POM-V medicine the veterinary surgeon must carry out a clinical assessment of the animal, and the animal must be under their care. The terms 'clinical assessment' and 'under...care' are not defined by the VMRs, but are defined in guidance by the Royal College of Veterinary Surgeons (RCVS). The [guidance](#) was tightened in September 2023 to clarify that for antiparasitic medicines prophylactic prescribing and prescribing without a prior physical examination is inconsistent with professional standards; this change was made partly due to concerns about environmental harm and came [into force](#) in January 2024. However, a range of Fipronil and Imidacloprid products are available without prescription, so this measure is likely to have the unintended effect of pushing people away from the prescription only treatments (e.g. Afoxolaner and Sarolaner) and towards the more readily available Fipronil and Imidacloprid treatments.

12.2. Authorisation

When deciding whether to approve or refuse an application to authorise a Veterinary Medicine the Secretary of State (VMD) “must refuse” to authorise the product if one of these three criteria are failed:

- “(1) the benefit-risk balance of the veterinary medicinal product is unfavourable;
- (2) the way that the product will be used will have an unnecessarily undesirable effect on the environment.
- (3) the risks to public or animal health or to the environment are not sufficiently addressed.”

The third criterion is new and only came into force in May 2024 ([Veterinary Medicines \(Amendment etc.\) Regulations 2024](#)).

While statements by VMD appear to place a greater emphasis on the first criteria “to help ensure that the balance between the benefits and risks of authorised medicines remains favourable” ([VMD flea treatment statement 2025](#)), in law all three criteria have equal weight.

12.2.1. Benefit-risk Balance – incorporating a review of alternatives.

When assessing any application for a marketing authorisation of a flea treatment the Secretary of State has to make a “benefit-risk balance” and “must refuse” the application if the result is unfavourable.

The evidence is now convincing that Fipronil and Imidacloprid are currently damaging the environment and the majority of the pollution must originate from the use of flea treatments. This is long-term and potentially irreversible harm to the health of the environment and is jeopardising biodiversity targets, with direct implications for the economy via harm to tourism, fisheries, water quality, sewage treatment costs and Human health. There are many other chemicals authorised for controlling fleas and ticks on Cats and Dogs, and a number of other methods for controlling flea numbers in homes – so the current benefit to animal health from these two chemicals is negated by the rich number of alternative products and control techniques.

In the Britain and Northern Ireland 17 different alternative chemicals are authorised for use on Cats and 18 for use on Dogs (VMD approvals database). Eighteen of these chemicals are currently on the market as flea treatments in the UK – Table 26. In addition there are 13 other chemicals approved as flea treatments elsewhere in Europe ([EMA 2023](#)).

Most of the toxins act by impacting directly on the functionality of the nervous systems of animals, most notably insects. However, Lufenuron is a chitin inhibitor which prevents insects from forming their epidermis and becoming adult, Lufenuron is the sole active ingredient in its authorised products. While (S)-Methoprene and Pyriproxyfen are insect growth hormone mimics that also prevent adult insects emerging. (S)-Methoprene is only incorporated into Fipronil based flea treatment products, Pyriproxyfen is usually mixed with an insecticide such as Fipronil, a pyrethroid or Dinotefuran, while Piperonyl Butoxide makes pyrethroids more toxic so is used mixed with a pyrethroid, rather than on its own.

Other chemicals used to control fleas and ticks on pets include repellents, which do not need to be authorised by VMD as the products do not claim to kill fleas. The active chemicals in the extracts are usually monoterpenes, common products include oils and extracts from:

- Neem Tree (*Azadirachta indica*) - containing the triterpenoid Azadirachtin A;
- Cedarwood (*Cedrus* spp.) - containing Cedrene, Cedrol and Thujopsene (sesquiterpenes);
- Lemongrass (*Cymbopogon citratus*) - containing Citral and Geraniol;
- Citronella (*Cymbopogon nardus*) - containing Citronellal, Geraniol and others;
- Lavender (*Lavandula* spp.) - containing Linalool and Linalyl acetate;
- Peppermint (*Mentha × piperita*) - containing Menthol and Menthone;
- Bitterwood (*Quassia* spp.) – containing the triterpenoid lactone Quassin;
- Rosemary (*Rosmarinus officinalis*) - containing 1,8-Cineole and Camphor (a cyclic terpenoid ketone);
- Clove (*Syzygium aromaticum*) - containing Eugenol;
- Thyme (*Thymus vulgaris*) - containing Thymol and Carvacrol.

Some of these are authorised by HSE as biocides, but despite a number of the chemicals having insecticidal properties and concerns about environmental toxicity (e.g. [Campos et al. 2016](#), [Park et al. 2017](#), [EFSA 2018](#), [Azeem et al. 2022](#), [EFSA 2024](#), [Razzaq et al. 2024](#)), they have not been registered or assessed as flea treatments and hence sit outside the environmental risk assessment regime.

Active Ingredient	Cats	Dogs	PFAS	Neonic	Pyrethroid	Insect Hormone	Macro-cyclic lactones
Fipronil	✓	✓	✓				
Imidacloprid	✓	✓		✓			
(S)-Methoprene	✓	✓				✓	
Afoxolaner	Ⓟ	✓	✓				
Deltamethrin		✓			✓		
Diazinon (Dimpylate)	✓	✓					
Dinotefuran	✓	✓		✓			
Esafoxolaner	Ⓟ		✓				
Flumethrin	✓	✓			✓		
Fluralaner	Ⓟ	Ⓟ	✓				
Lotilaner	✓	✓	✓				
Lufenuron	Ⓟ		✓				
Nitenpyram	✓	✓		✓			
Permethrin		✓			✓		
Piperonyl Butoxide	✓	✓					
Pyrethrins	✓	✓			✓		
Pyrethrum Extract	✓	✓			✓		
Pyriprole		✓	✓				
Pyriproxyfen	✓	✓				✓	
Sarolaner	Ⓟ	Ⓟ	✓				
Selamectin	Ⓟ	Ⓟ					✓
Spinosad	Ⓟ	Ⓟ					✓

Table 26. Current UK authorised active ingredients in flea and tick treatment products and their chemical class. PFAS = poly-fluoroalkyl.

✓=available off the shelves or online (AVM-GSL and NFA-VPS), Ⓟ = prescription only (POM-V and POM-VPS), ✓ = chemical class. (Diazinon (Dimpylate) is an organophosphate and Piperonyl Butoxide is a derivative of benzodioxole)

In addition to insecticidal properties, masking scent, or repellent effects are common modes of action for ‘herbal’ treatments.

A review of essential oil use in ectoparasite control in companion animals ([Bava et al. 2026](#)) concluded that several oils had well established effective insecticidal properties, could reduce reliance on conventional acaricides and had the potential to play a key role in integrated pest management strategies. However there have been limited studies considering pet toxicity or

the environmental risks, which are likely to include aquatic toxicity. As these products cannot easily be patented the product marketers are not able to justify the cost of undertaking such safety tests. If naturally occurring chemicals are to be part of the solution to the current crisis then a state led solution is needed to this problem.

Furthermore, there are other ways to manage fleas and ticks on pets including:

- Electronic and ultrasonic flea and tick repellents;
- Physical traps and immobilisers;
- Flea combs;
- Tick removers;
- Regular vacuuming;
- Hot washing pet's bedding and other fabrics;
- Household flea sprays.

There may be arguable benefits from maximising the number of chemicals available for use as flea treatments this reduces the chances of resistance developing. Resistance may be an issue with some pyrethroid products, and there are growing flea resistance concerns relating to Fipronil, with evidence of just 38% effectiveness on Cats and 65% on Dogs in the UK ([Cooper et al. 2020](#)); only 30.6–65.6% effectiveness, compared with 99.7-100% effectiveness for a Fluralaner based treatment ([Fisara et al. 2019](#)); resistance detected in an American field strain of the Cat Flea (Schenker et al. 2001³); and evidence from France of Fipronil resistant strains of fleas evolving ([Ramon-Portugal et al. 2023](#)). Populations of Fipronil resistant ticks were discovered in Brazil ([Becker et al. 2019](#)) and are commonplace in India ([Gupta et al. 2020](#), [Shakya et al. 2020](#), [Bhagat et al. 2026](#)). There are as yet no resistance concerns for the other approved flea treatment formulations.

Flea treatment products containing Fipronil or Imidacloprid are not the cheapest option, so there is no economic or access benefit to the public from keeping them on the market.

Removing Fipronil and Imidacloprid from the market now would (after perhaps some brief supply chain adaptation) have no impact on the ability of the public to control fleas and ticks on their pets and in their homes, and should resistance develop in all the authorised treatments, so that there is a risk of no treatments being available, then the benefit-risk balance would change and an 'exceptional' authorisation could be considered.

An Environment Agency risk assessment of veterinary medicines in 2002 ([Boxall et al. 2002](#)) did not list Fipronil or Imidacloprid in the top 50 chemicals prioritised for assessment; indeed only two flea treatments, Deltamethrin and Piperonyl butoxide, were included in the study. Deltamethrin was classed as a 'Very High' risk to aquatic environments and a 'High' risk to terrestrial environments, while the classifications for Piperonyl butoxide were 'Unknown'. Data gaps were identified for both chemicals in terms of aquatic and terrestrial toxicity. The report made a number of recommendations, including: filling the many data gaps on aquatic and terrestrial toxicity; the VMD making usage data available annually for all medicines;

³ Schenker R, Humbert-Droz E, Moyses EW, Yerly B. 2001 Efficacy of nitenpyram against a flea strain with resistance to fipronil. Supplement Compendium on Continuing Education for the Practicing Veterinarian, 23:16–19.

rewriting Part 1 of the international VICH risk assessment process due to its technical inability to properly assess environmental risk; and bringing the standard of environmental assessment for veterinary medicines into line with the higher requirements already in place for industrial chemicals, pesticides and biocides. The VICH guidelines were subject to a withering criticism on similar, but more detailed and legalistic grounds, by Montforts and de Knecht ([2002](#)).

A second EA assessment of veterinary medicines ([Boxall et al. 2006](#)) made recommendations for including veterinary medicines in water monitoring, but the study did not assess any flea treatment ingredients.

Despite the recommendations made in 2002, and again in 2017 by Buglife ([Shardlow 2017](#)), there has been little progress in understanding the effects of flea treatments other than Fipronil and Imidacloprid on the environment ([Wells and Collins 2022](#)). The only other flea treatments routinely monitored in the UK environment are Diazinon (Dimpylate), Spinosad, Piperonyl butoxide, pyrethrins, Deltamethrin (not in all circumstances) and Permethrin.

The organophosphate Diazinon (Dimpylate) is also identified as Very Toxic to aquatic life ([EFSA 2006](#)). In 2007 the EU decided not to renew its authorisation as a pesticide. Diazinon is an organophosphate and there are concerns about its [toxicity to Humans](#).

In the England 2014-2024 LCMS dataset Diazinon was recorded in 52.6% of samples and was above the Chronic EQS in 6.9% of samples and above the Acute EQS in 1.5%. Currently rivers in all regions of England are experiencing exceedances of invertebrate mortality endpoints for Diazinon, in 59% to 99% of water samples ([Poyntz-Wright and Tyler 2025](#)). In January 2025 Natural Resources Wales [banned disposal](#) to land of used Sheep dip containing the chemical due to high detections in the River Wye.

The sources of the current Diazinon pollution are not clear, there are no active approved UK agricultural pesticide uses, but there were several up until 2007 ([PAN Europe](#)), and while there are 17 active authorisations for use as a flea treatment, it was a first generation ingredient of flea collars, it appears that no such products are currently on the market. Evidence from Wales indicates that the most significant current input of Diazinon into the environment is via Sheep dipping ([Hadley et al. 2026](#))

A [2023 study](#) by the Rivers Trust and Wildlife and Countryside Link revealed that Permethrin pollution is causing a limited number of exceedances of safe limits “Though there were only a limited number of site detections of Permethrin (four sites in total) all had between three and seven times the safe level as determined by the EUs proposed Environmental Quality Standards. Permethrin has been banned for use on agricultural crops since 2002” ([PAN 2023](#)). But there has been no work to link Permethrin pollution in the environment to its sources.

The PFAS ‘forever chemical’ Fluralaner, is the third commonest domestic pet flea treatment in the UK, with 2,024 kg being sold in the UK in 2019 (VMD data), and 21% of owners using it in 2020 (Table 27), it is used at dose rates 2.5 to 9 times higher than Fipronil and Imidacloprid. It has one other approved use as a treatment for Poultry Red Mites (*Dermanyssus gallinae*) on Chickens (*Gallus gallus domesticus*). Fluralaner can be released into the environment by treated pets, in Dog urine and when swimming, at levels that exceed water quality standards, and contaminates bird’s nests [Diepens et al. 2023](#), but we have no idea if there is any in the wider environment because no one has looked. However, the pathway finding is significant because Fluralaner was administered in tablet form rather than as a pour-on, meaning that we

cannot assume that only externally applied treatments pose a risk to the environment. Dogs do pee when they are in the water ([dogster 2025](#)), as well as shedding hair and skin.

Active Ingredient	% of Cats Treated	% of Dogs Treated	Average
Imidacloprid	34.3	32.3	33.3
Fipronil	31.1	15.8	23.5
Fluralaner	14.7	27.2	21.0
Afoxolaner		16.4	8.2
Selamectin	12.8	2.4	7.6
Sarolaner	0.3	4.5	2.4
Lotilaner	3.1	0.6	1.9
Lufenuron	1.4		0.7
Spinosad	1.1		0.6
Indoxacarb*	0.8		0.4
Dinotefuran	0.6		0.3
Nitenpyram		0.4	0.2
Propoxur*, Flumethrin		0.2	0.1

Table 27. Main flea treatments used by UK Dog and Cat owners in 2020, from survey by Perkins and Goulson ([2023](#)). *Not currently authorised for flea treatment use in UK.

Unusually for a companion animal medicine Fluralaner was subjected to an Environmental Risk Assessment of the swimming Dogs pathway as part of the EU approval process for a Bravecto pour-on ([CVMP 2014](#)), no data or detail is presented supporting the environmental decision, the report just states:

“It was concluded that the topical formulation will dry within the first 24 hours after administration and that after this period, the probability of fluralaner to end up in a watercourse after swimming will be extremely low. The exposure to the aquatic environment is very unlikely when the application site is dry. However, because the probability of exposure of watercourses was not assessed for dogs shortly after treatment when the application site is not dry and since the first time point of the bathing/water-immersion study is only 3 days after application, a warning not to allow the dog to swim in watercourses within 3 days after treatment is required.”

The EU approval of the Chicken mite treatment was accompanied by a reproduction ecotoxicology test on the Large Water Flea (*Daphnia magna*) that calculated a NOEC of 0.047 µg/L, as a result a PNEC for Fluralaner in freshwaters was set at 0.0047 µg/L (EMA/CVMP European Public Assessment Report (EPAR) for Exzolt® [2017](#), [EMA 2023](#)). Studies have also shown very high toxicity to a range of terrestrial insects ([Wells and Collins 2022](#)) and Honeybees (*Apis mellifera*) ([Sheng et al. 2019](#)).

[Diepens et al. 2023](#) also detected the PFAS ‘forever chemical’ flea treatment Afoxolaner in Dog urine, but not in water bodies or birds’ nests.

The potential risk presented by the isoxazoline PFAS flea treatments Fluralaner, Afoxolaner, Esafoxolaner, Lotilaner and Sarolaner in Cat and Dog faeces was assessed by Berny et al. (2026). They detected the chemicals in faeces for up to 204 days after treatment and concluded that “dung-feeding insects could be highly exposed to isoxazoline parasiticides, with fluralaner and lotilaner having the greatest potential impact”.

When a flea treatment chemical has also been used as an agricultural pesticide there is usually some data on toxicity, mobility and persistence from the regulatory pesticide risk assessment. In some cases there are significant aquatic pollution concerns, for instance Spinosad was found to present a High Risk to the aquatic environment (EFSA 2018). As a result the manufacturer withdrew pesticides and flea treatments containing the chemical from EU markets, and failed to resubmit the chemical to renew its authorisation. It is still authorised as a flea treatment in Northern Ireland, but does not appear to be on the market. However, it is currently available in the UK as a domestic and garden insecticide (here and here). In the England LCMS dataset Spinosad was recorded in 1.7% of samples. It mainly occurred associated with watercress beds and salad washing facilities (perhaps imported produce with residues?), sometimes at high levels, on the Rivers Test (2022-24) and Itchen (2019), but was also found in the rivers Lugg and Waveney and in estuaries and the sea, particularly around the Tees and Mersey.

Compared with similar insecticides Spinosad has a shorter half-life than most, with little residual toxicity at 3-7 days post-application (Williams, Valle & Vinuella 2003) and comparatively low toxicity to non-target animals (Lumaret et al. 2012), although the amount of Spinosad in a flea treatment dose is five or ten times greater than the amount of Fipronil in a comparable dose. The Harlequin Fly (*Chironomus riparius*) 25 day NOEC for Spinosad is calculated to be 1.6 µg/L (BPDB: Biopesticides DataBase 2026). EQS standards have not been calculated for Spinosad.

Pyrethroids have been widely used as pesticides and hence their toxicity to wildlife has been studied (Antwi and Reddy 2015). Deltamethrin kills 50% of mayfly larvae at concentrations around 0.01 µg/L (Beketov 2004), while Permethrin contaminated birds' nests have reduced breeding success (Bulgarella et al. 2020). Permethrin was banned from agricultural use in 2003, but has recently been found in UK birds' nests at high concentrations as a result of contaminated pet fur (de Montaigne et al. 2025).

Tank et al. (2026) detected Permethrin in 99% of feather samples examined from British birds in 2020-21. The average level of Permethrin was 9.41 µg/kg and the maximum was 59.4 µg/kg. Deltamethrin was not detected. The authors concluded that it is unlikely that the feather contamination could be explained by arable farmland use, as only an estimated 114 kg of Permethrin was applied between 2000 and 2015. Permethrin applied on livestock and dogs was identified as the most likely source.

Currently 100% of water samples in England are experiencing exceedances of invertebrate mortality endpoints for Deltamethrin (Poyntz-Wright and Tyler 2025). Deltamethrin use on arable crops has declined from 1,600 kg in 2004 to 34 kg in 2024 (PUSstats data), it is unclear the extent to which current pollution is caused by flea treatment use.

Permethrin has been found in Dandelions in public parks at levels higher than those known to harm butterflies (Buijs et al. 2026).

Dinotefuran is a neonicotinoid insecticide that has not been approved for agricultural use in the UK, there are however approvals for use as a flea treatment and a cockroach gel biocide. It is more toxic to bees than Fipronil ([Yasuda et al. 2017](#)) and Imidacloprid, and has also been found in Dandelions in public parks, at potentially harmful levels ([Buijs et al. 2026](#)). It has a breakdown product Dinotefuran-urea which occurred at higher levels than its parent in sewage in a study by Zhang et al. ([2026](#)).

Piperonyl butoxide was recorded in just 0.1% of samples in the England LCMS dataset (Sincil Dyke, Somerhill Stream, Tees, Medway, Ouse and Ancholme, all in 2023). As well as Cat and Dog uses, Piperonyl butoxide is allowed to be used on other small mammals and birds via a small animal (or [Schedule 6](#)) exclusion. It is also a biocide ingredient in a number of cleaning products.

The PFAS 'forever chemical' Lufenuron has high toxicity to aquatic life, It is produced as a tablet or an injection, only injections are listed in the VMD website, but tablets claimed to be authorised in the UK are [on sale](#) here. There is a UK summary of product characteristics ([Defra 2020](#)) suggesting some level of authorisation. In addition Lufenuron is allowed to be used to treat fish lice via a small animal (or [Schedule 6](#)) exclusion. Use as a pesticide was initially deemed to present a low risk to aquatic life due to the nature of the proposed authorisations ([EFSA 2008](#)). However, Lufenuron meets the criteria for substances that are persistent, bioaccumulative and toxic ([German Environment Agency 2017](#)), there are no authorised agricultural uses in the UK and no authorised agricultural uses in the EU since 2019.

A Selamectin pour-on was also subject to an environmental risk assessment that included risk to aquatic life ([CVMP 2002](#)). The assessment appears to have been more detailed than that undertaken for the Fluralaner pour-on, but the public assessment reports, in contravention of the Aarhus Convention, do not present the studies and data on which the environmental decision is taken, but do present some summary findings. Of interest in the Selamectin Phase 2 assessment was a finding that over 42 days treated Dogs excreted 18-20% of the dose in faeces, 1-3% in urine, 19-26% in shed hair, and 15-17% in rinses of the cages and excreta collection pans, which emphasises the fur risk pathway for flea treatments. However the assessment concluded no risk from fur, without appearing to take into account the concentrating effect of bird nest building. After a bathing study the CVMP concluded that two hours after application they expected no more than 5 to 10% of the Selamectin "might be available for wash-off". Using *Daphnia* tests in which half the animals died after 48-hours exposure to 0.24 µg/L of Selamectin they established a Predicted No Effect Concentration (PNEC) of 0.3 µg/L. The report states that "assuming 10% of the dose is washed off into a 100 m³ pond, the Predicted Environmental Concentration (PEC) for the sediment/water system is 0.24 µg/L". Calculating from tests conducted by the applicant they concluded that 91.65% of any Selamectin released into water would lock into sediments and hence not affect water quality, giving a PEC of just 0.02 µg/L. The product was approved on the basis of the PECs being lower than the PNECs.

This does not meet a modern standard of environmental risk assessment, 50% mortality of a notably insensitive aquatic species is an ecologically very bad outcome. Using a PNEC contains no safety margin to account for the toxicity data only measuring quick death, not 'non-lethal' impacts such as reproductive impacts or starvation, or the species tested not being among the most sensitive. Any environmental quality standard based on data from one species would add in a significant assessment factor to protect other species. Removing 91.65% of the pollution from the assessment because it 'would lock into sediments' is an untested theory,

Active Ingredient	Product/s on UK market?	UK aquatic monitoring (detection rate)	Active UK EQS? (% or no. of exceedances)	Aquatic toxicity from previous risk assessments	'Treatment to waterbody' pathway studied?
(S)Methoprene	Yes	No	None	Very Toxic (ECHA)	No
Afoxolaner	Yes	No	None	Very Toxic (ECHA)	Yes
Deltamethrin	Yes	No?	Yes (but marine)	Very High (EA)	No
Diazinon (Dimpylate)	No	Yes -52.6% of samples	Yes -6.9% exceed level	Very Toxic (EFSA)	No
Dinotefuran	Yes	No	None	Very Toxic (ECHA)	No
Esafoxolaner	Yes	No	None	Very Toxic (ECHA)	No
Flumethrin	Yes	No	None	Very Toxic (ECHA)	No
Fluralaner	Yes	No	None	Very Toxic (ECHA)	Yes
Lotilaner	Yes	No	None	Very Toxic (ECHA)	No
Lufenuron	Yes	No	None	Very Toxic (EFSA)	No
Nitenpyram	Yes	No	None	Not assessed	No
Permethrin	Yes	Yes - Rare	Yes - 4 exceed level	Very Toxic (ECHA)	No
Piperonyl butoxide	Yes	Yes - 0.1% of samples	None	Very Toxic (ECHA)	No
Pyrethrins	Yes	No	None	Very Toxic (ECHA)	No
Pyrethrum extract	Yes	No	None	Very Toxic (ECHA)	No
Pyriprole	No	No	None	Harmful (EMA)	No
Pyriproxyfen	Yes	No	No (Italy – Yes))	Very Toxic (ECHA)	No
Sarolaner	Yes	No	None	Very Toxic (ECHA)	No
Selamectin	Yes	No	None	Very Toxic (ECHA)	No
Spinosad	No	Yes - 1.7% of samples	None	Very Toxic (ECHA)	No

Table 28. Alternative UK authorised flea treatment chemicals – aquatic monitoring status and risk to aquatic habitats.

and presents no estimate of timescales. If it takes a week for the chemical to lock into sediments then the damage in the water will have been done. Does that also mean that Selamectin will accumulate in sediments, in which case where is the sediment toxicity

assessment? Furthermore, the assessment did not consider the highly likely scenario that two dogs jump in the pool.

Little and Boxall (2020) calculated that if a large Dog recently treated with Selamectin jumped into a large pond the size of four Olympic swimming pools, 50 per cent of the invertebrates in the pond could be dead within 48 hours.

[Guldemon et al. \(2019\)](#) detected Fluralaner, Permethrin, Piperonyl butoxide and Pyriproxyfen in dead nestling birds; two samples of animal hair were also examined, in which Permethrin and Piperonyl butoxide were detected.

There is very little information available for any of the other approved substances in terms of aquatic toxicity, pathways to the environment and environmental concentrations. So while Afoxolaner, Selamectin, Flumethrin, Lotilaner and Sarolaner all appear to be currently available as authorised flea treatments in the UK with sales of between 100 and 500 kg a year, there is no publicly available evidence about their pollution levels in the UK.

Flumethrin, a pyrethroid insecticide, is sold combined with Imidacloprid as it increases the toxicity of Imidacloprid to fleas and ticks ([Stanneck et al. 2012](#)), the same may be true in relation to toxic impacts in the environment on non-target species. In 2020 366 kg of Flumethrin was sold in Imidacloprid flea treatments.

All approved flea treatment chemicals have been assessed by chemicals authorities (ECHA and EFSA) as being Very Toxic to aquatic life – except Nitenpyram and Pyriprole which have not been assessed by the agencies, the EMA has classified the latter as ‘Harmful’ to aquatic life (Table 28).

Thirteen chemicals currently authorised for use in UK flea treatments are not currently monitored in waterbodies.

While there are currently a large number and variety of chemicals authorised for flea treatment use, there is no guarantee that any of them would be safe to the environment if they were to be used in the volumes at which Fipronil and Imidacloprid are currently being used, or indeed that Fluralaner is not already damaging the environment. The pathway risks for tablets and injections could be lower than for pour-ons and collars, but this has not been demonstrated.

Given that Fipronil flea treatments have polluted the environment extensively at very harmful levels, it is no longer safe to assume that other persistent insecticides used as flea treatments will not cause similar pollution if used in a similar volume. Each chemical has a different set of persistence, solubility and toxicity characteristics that affect its dispersal and impacts. As happens with other categories of toxic chemicals these properties should be established as part of the veterinary medicine approval process. The risk that these chemicals pose cannot now be ignored.

Sufficient data and analysis is required to establish the toxicity levels to a range of vulnerable organisms and to predict environmental pollution concentrations for all flea treatments. This information must be required for all new authorisation applications for flea treatments. Without this information neither the balance test, nor the environment test can be meaningfully applied.

There is a risk that shifting use from one chemical to another will only result in the damage to the environment being shifted from one chemical to another, less well understood, chemical. Or indeed that changes will result in new pesticide cocktail effects in lakes and rivers by mixing a range of toxic chemicals that could have synergistic impacts on life

The benefit-risk balance must be undertaken on the basis that the regulations will be applied to other flea treatment toxins and that their environmental safety will be assured, otherwise the benefit to the environment of taking action to ban Fipronil and Imidacloprid may not be realised in the mid-term.

The flea treatment industry recently funded a paper – Giannelli et al. ([2025](#)) - that aimed to establish the economic benefits to the public of pet parasite control in the UK. The paper claims there are economic benefits of £53 million per year in reduced home flea treatment costs (£32.2 million) and avoided veterinary consultation costs (£20.7 million) due to the current use of parasiticides. However a significant proportion of those alleged savings arise from modelled increases in roundworms (*Toxocara* spp.) and French Heartworm (*Angiostrongylus vasorum*) infections, none of the flea treatment active ingredients discussed in this report have any effect on these parasites. Furthermore the report does not appear to account for the £268.99 million/year currently being spent on parasite treatments in the UK ([Deep Market Insights](#)). If the costs of the current approach were also taken into account then the public would save over £150 million/year by stopping prophylactic use of flea treatments. Of course the costs, and health implications for companion animals, would only arise if none of the alternative authorised flea treatment chemicals were environmentally safe. The report did not take into account the costs that would accrue from removing the chemicals from sewage and trade effluent.

As there are currently 22 effective fleas and tick treatment chemicals authorised for use on companion animals in the UK and another 13 in the EU there is no urgency about retaining any particular chemical for use, others are just as effective. As noted above there is concern about the potential environmental impacts of other flea treatment chemicals, so it is important that the data is quickly gathered to establish the environmental risk these products present. While it is not currently possible to state that any authorised product is more or less of an environmental risk than Fipronil or Imidacloprid, with so many authorised products and with different application methods, modes of toxicity, persistence and dispersal characteristics, there is a good chance that one or more will be found to present a significantly lower environmental risk profile than those that Fipronil and Imidacloprid have realised.

However, as it is not guaranteed that any of the existing products will be environmentally acceptable, and there is a risk of cocktail effects, it is necessary to consider how to reduce overall use of all flea treatments that present a potential risk to aquatic life, and to give serious attention to promoting, developing and encouraging the use of treatments and methods, chemical and non-chemical, that do not rely on extraordinarily potent, persistent, generalist insecticides for their success.

The VMR 2013 allows for the Secretary of State to make an “exceptional” marketing authorisation “if there is no other product with a full marketing authorisation for the indicated condition in the target species”. So if, at some point in the future, there is a risk that there will be no chemical based flea treatments available, and there is clear evidence that non-chemical approaches are unable to provide a sufficient level of health protection, then a temporary

authorisation could be made and kept under annual review until a less harmful option is found.

12.2.2. Unnecessarily, Undesirable Effect on the Environment.

When assessing any application for a marketing authorisation of a flea treatment the Secretary of State must refuse the application if it “will have an unnecessarily undesirable effect on the environment”.

The evidence is clear, the current environmental damage to aquatic life and ecosystem health is both unnecessary and undesirable.

12.2.3. Risks to the Environment Not Sufficiently Addressed.

The Secretary of State must refuse to authorise a veterinary medicine if the risks to public or animal health or to the environment are not sufficiently addressed.

It is always the case that the direct causative evidence linking pollution to environmental harm could be stronger, ‘more research’ is an easy answer, and for some people every box has to be ticked before they act. However, in this case there is not only predictive concerns based on the results of laboratory and mesocosm studies, the evidence is there from the field that ecological harm is occurring in the real world, in line with, or at greater levels than predicted. A decision maker would have to completely set aside the precautionary principle and delay application of the prevention principle to conclude that there is insufficient evidence to act on this issue.

However, this clause is even harder to duck, any doubt remaining in the decision makers mind only serves to underline that the authorisation process has not sufficiently addressed the risks to the environment. Indeed, it is already the established position of the UK Government (VMD) that there is sufficient evidence to justify a significant redrafting of the Environmental Risk Assessment process that is applied to veterinary products “the VMD acknowledge that there are still several evidence gaps remaining we now consider that there are sufficient data to support a review of the internationally agreed Environmental Risk Assessment guidelines”. This would not be necessary if VMD believed that environmental risks for the products had been sufficiently addressed.

12.2.4. Conclusions on Authorisation Tests

There is a clear path for new applications for authorisations for Fipronil and Imidacloprid flea treatments to be refused by the Secretary of State under Schedule 1, Paragraph 24 (2) of the 2013 Act. It appears that they would either not meet the benefit-risk balance, failing that they have an unnecessarily undesirable effect on the environment, or, if there is a lack of certainty with regard to one of the chemicals or in relation to a particular product, then this would be because the assessment report was unable to sufficiently address the environmental risk – in which case the Secretary of State must refuse the application under the third criterion considered here.

Other chemicals in new applications for flea treatment authorisations should also be required to provide data on toxicity and environmental fate, and should be accompanied by a plan to assess the environmental fate and pollution levels in the UK after approval.

If special precautions must be taken in order to avoid a product causing any unnecessary risk to the environment, then if a market authorisation is granted the Secretary of State must categorise a product as for prescription only, or for supply only by vets and pharmacists (Schedule 3, Paragraph 1). It is not clear why 'stopping Dogs swimming' would not fall under the 'special precautions' definition, and hence require all relevant highly toxic flea treatments to be prescription only.

Because there are so many alternative treatments the conditions of Schedule 1, Paragraph 26(1) of the VMR 2013 are not met, so there is no need to consider making an "exceptional" marketing authorisation.

12.3. Assessment Reports

As new information of importance that relates to the environmental safety of Fipronil and Imidacloprid veterinary medicinal products has become available the legislation states that the Secretary of State must update the assessment reports for these products.

"Schedule 1 Paragraph 25 - The Secretary of State must update the assessment report whenever new information that is of importance and relates to the quality, safety or efficacy of the veterinary medicinal product becomes available".

Currently (at least in the publicly available versions) the environmental elements of the assessment reports are brief. Most recent public assessment [reports](#) just say:

"Environmental Safety
The product will only be used in non-food animals and as a result environmental exposure will be low. A Phase 2 ERA was not required."

While the regulators expect assessment reports to contain the information set out in the VICH guidelines, the guidelines and UK legislation allows for the inclusion of whatever information the Secretary of State considers to be relevant.

Indeed there have already been four flea treatments products that have been required to go further than the basic data required by the VICH guidelines, in order to address concerns of regulators about water pollution from flea treatments (Table 29).

There has not been any detailed assessment of Fipronil environmental risks as part of any flea treatment authorisation process. The last assessment of the freshwater risks of Imidacloprid was undertaken in 2009 when little was known about the aquatic risks of Imidacloprid; the Predicted No Effect Concentration they used to assess the risk was 850 µg/l, which we now know would kill most aquatic life. No assessment has considered impacts on mayflies, wild birds, dung fauna or pollinators.

Knowledge about pathways, sewage and water body levels, toxicity and environmental damage has increased rapidly in the last five years, and environmental risks are now clear for mayflies, dragonflies, flies, tits, urban pollinators and ecological communities, and information

relating to these risks must be included in the assessment reports for Fipronil and Imidacloprid, so that their safety can be re-assessed against the full range of environmental risks, not just toxicity to *Daphnia* waterfleas.

Each Fipronil and Imidacloprid assessment report can be updated by the Secretary of State with the new evidence linking the chemical and category of products to environmental damage. VMD should consult with the relevant environmental agencies to set out the information it needs to reach a conclusion on the environmental risk each flea treatment presents. Authorisation holders could be given 2-3 months to respond and provide any relevant toxicology or pharmacovigilance information they have gathered or compiled.

The revised assessment reports would form the basis for taking further regulatory steps to eliminate the environmental harm and risks.

Active Ingredients	Brand	Ecotoxicology Assessment	Additional Information Required in Assessment
Selamectin	Stronghold	CVMP 2002	Solubility and dispersal data. Recovery rates from excreta. Soil contamination from Dog walking estimate. Predicted pollution from Dog swimming. Estimates of wash-off volumes. Tests of toxicity to aquatic animals, earthworms, soil microbes, algae and Trout. Comparison of PEC to PNEC*.
Imidacloprid + Moxidectin	Advocate	CVMP 2009	Environment pathway analysis of excretion and run-off into watercourses. PEC assessment of waterbody pollution. Data on dispersal and persistence on fur. Data on losses from fur during water immersion. Aquatic toxicity data. Comparison of PEC to PNEC*.
Fluralaner	Bravecto	CVMP 2014	Time taken for pour-on to dry. Losses of active ingredients from collar.
Imidacloprid + Flumethrin	Seresto (Foresto) collar	CVMP 2019	Simulated bathing and rain exposure losses. Toxicity studies on water-fleas. Risk assessment for sediment dwelling organisms.

Table 29. Additional, beyond VICH Phase 1 assessment, information required by authorising regulators when assessing flea treatments *Predicted Environmental Concentration and Predicted No Effect Concentration.

In 2023 the European Medicines Agency published a report titled “Reflection paper on the environmental risk assessment of ectoparasiticide veterinary medicinal products used in cats and dogs” ([EMA 2023](#)), in all but name this is an environmental risk assessment for flea treatments.

The EMA concluded that “It cannot be ruled out that VMPs used in pets contribute to fipronil and imidacloprid concentrations measured in urban wastewater effluents”, “The high inherent

toxicity of the example substances imidacloprid, fipronil and fluralaner allows [us?] to anticipate environmental effects in a wide range of free-living arthropods present in aquatic environments where these substances are found in relevant concentrations.” and “On the basis of the available information, it cannot be ruled out that some ectoparasitocidal VMPs used in cats and dogs (at least at higher consumption levels) contribute to the concentrations of ectoparasitocidal substances that pose a risk to the aquatic environment in the vicinity of WWTP [Waste Water Treatment Plant] discharges.”

These conclusions were reached despite the EMA apparently failing to grasp that the Fipronil pollution in the UK can only realistically come from flea treatments as there has been so little agricultural use. Had this been an EFSA risk assessment report on a pesticide then it would have concluded that ‘risks to aquatic life could not be excluded’ which would then trigger regulatory action. The authorisation holder would be asked to supply data to address the failure of the data under consideration and to exclude the risk and would be set a deadline to respond, usually 90 days. If at the end of the period the authorisation holder had not provided information, or if EFSA was not convinced that the information provided enabled them to exclude the risk, then the process of restricting, suspending or revoking the authorisation would be initiated.

It has been nine years since the risk from pet flea treatments to aquatic life were identified, that is ample time for the authorisation holders to have gathered data on the environmental fate of their products. Indeed they should have been reporting the new scientific evidence relating to pollution to the VMD. It fits with the principles of pharmacovigilance and the principle that the polluter pays that responsibility for gathering the data necessary to establish the safety of their products rests with the authorisation holder, not the taxpayer.

12.4. Suspension and Revocation

The tests used to determine if existing products should continue to be used are similar to those applied to new applications for authorisations. However, unlike new authorisations, when reviewing the assessment report, in England, Wales and Scotland (GB) the Secretary of State is enabled, not required, to take action, while in some circumstances in Northern Ireland the Secretary of State must take action.

This is complicated by the fact that in 2024 the legislation was amended so that in GB the regulatory routes to action are subtly different to those in Northern Ireland.

In GB if the Secretary of State believes there is a negative benefit-risk balance then an existing marketing authorisation can be revoked or suspended (Schedule 1, Paragraph 38(1)) or the supply of the product can be prohibited (Paragraph 41). If the Secretary of State believes that urgent action is needed to protect the environment then they can, on a temporary basis, suspend the marketing authorisation, or restrict the supply or use of the product (Paragraph 41A). In addition the marketing authorisation can be revoked or suspended by the Secretary of State if the “pharmacovigilance system in relation to a veterinary medicinal product is inadequate” (Paragraph 38(3)). Authorisation holders have not submitted any of the wealth of available evidence on this environmental safety issue to the VMD ([WildFish 2025](#)). So there appears to be a sound argument that their pharmacovigilance has been inadequate.

In relation to Northern Ireland the Secretary of State must suspend a marketing authorisation if the risk-benefit balance is unfavourable (Paragraph 38(3)). The Secretary of State may suspend a NI marketing authorisation at any time if satisfied it is necessary for the protection of the environment (Paragraph 38). In addition the marketing authorisation can be suspended by the Secretary of State if the “any information required to be supplied to the Secretary of State has not been so supplied” (Paragraph 38(3)). EU Regulations allow Member States to suspend the use of a veterinary medicinal product on its territory where urgent action is essential to protect the environment.

Regardless of the UK country in question, 28 days after being suspended, if there has been no appeal, the Secretary of State can choose to revoke a marketing authorisation.

13. Application of the Water Quality Regulations

The Independent Water Commission identified over 100 pieces of legislation relevant to how water is regulated which apply in England and in Wales and concluded that this was an “overly complex regime” ([Independent Water Commission 2025](#)). When Scotland and Northern Ireland are added to the picture the complexity increases significantly.

In each country there is a national regulator with responsibility for water pollution control.

The England the Environment Agency’s (EA) principle aim as set out in the [Environment Act 1995](#) is “to protect or enhance the environment, taken as a whole, as to make the contribution towards attaining the objective of achieving sustainable development”, and it must exercise its pollution control functions “for the purpose of preventing or minimising, or remedying or mitigating the effects of, pollution of the environment”.

In Wales Natural Resources Wales (NRW) has a statutory purpose established in the [Environment \(Wales\) Act 2016](#) to “(a) pursue sustainable management of natural resources in relation to Wales, and (b) apply the principles of sustainable management of natural resources”, and “must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions”. Under [Environment Act 1995](#) it must exercise its pollution control powers “for the purpose of preventing or minimising, or remedying or mitigating the effects of, pollution of the environment”.

In Scotland the Scottish Environment Protection Agency’s (SEPA) primary purpose as set out in the [Environment Act 1995](#) is “to carry out the functions conferred on it by or under this Act or any other enactment for the purpose of protecting and improving the environment (including managing natural resources in a sustainable way)”.

In Northern Ireland the Northern Ireland Environment Agency (NIEA) has the purpose as defined in policy by the NI Department of Agriculture, Environment and Rural Affairs (DAERA) “to protect and enhance Northern Ireland’s environment, and in doing so, deliver health and well-being benefits and support economic growth” ([DAERA 2024](#)).

In England and Wales the most directly relevant legislation in relation to maintaining water quality is the Environmental Permitting (England and Wales) Regulations 2016 ([EPR 2016](#)). They establish a framework for regulating a defined set of environmentally risky activities

through a unified permitting system. Activities at facilities are covered, including most significantly in this context, water discharge and groundwater activities through which polluting matter is released to surface waters or groundwater. Accordingly, where pollution of receiving waterbodies arises from the operation of a water discharge or groundwater activity, that activity must be properly authorised and controlled under the environmental permitting regime.

Permits may be standard rules or bespoke, and they authorise only the specific activities assessed and granted. Anything outside that scope is unlawful, regardless of whether it is expressly prohibited elsewhere. The EPR provisions create a mandatory legal architecture that has pollution prevention at its core.

Regulation 12 of the EPR 2016 prohibits the operation of water discharge and groundwater activities except in accordance with an environmental permit, and Regulation 38(1) makes it an offence to fail to comply with permit conditions.

Discharges to groundwater are even more strictly controlled by the EPR 2016 than discharges to rivers; the EA and NRW must, in exercising their relevant functions, “take all necessary measures — a) to prevent the input of any hazardous substance to groundwater, and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater”.

In England and Wales, sewage treatment facilities and septic tanks, that do not receive trade waste and that discharge less than or equal to two m³/day to ground water or five m³/day to surface water do not require a permit as long as they comply with General Binding Rules established by the Regulations. These rules include “not causing pollution”. Plants emitting up to 20m³/day of non-trade effluent can operate under a [standard rules permit](#). This English example requires the operator to report any “emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution” to the Environment Agency, however monitoring is limited to weekly visual inspections, which will not detect colourless toxins at parts per billion levels, or the associated loss of invertebrate life. This clear vigilance gap is a condition that is not fit for purpose in a permit that regulates the emission of very highly toxic insecticides. Sewage emissions that include trade effluent or that are greater than 20m³/day are subject to bespoke permits, which will include a variety of conditions, often including set limits on the emission of specified chemicals to avoid pollution occurring.

The most directly relevant regulatory framework in Scotland is the Environmental Authorisations regime under the Environmental Authorisations (Scotland) Regulations 2018 (EAR 2018), which broadly mirrors the EPA 2016. It establishes a system for regulating specified activities that pose environmental risks, including water discharge and groundwater activities through which polluting matter may enter rivers, lochs, or groundwater. Any such activity must be authorised by SEPA, and activities outside the scope of an authorisation are unlawful. SEPA has powers to impose standard conditions or bespoke conditions on authorisations, and it may take enforcement action for any non-compliance. In applying the regulations SEPA must take into account the general aim “that all appropriate measures are taken to prevent or, where that is not practicable, to minimise environmental harm”.

While Northern Ireland does not operate a unified environmental permitting regime equivalent to EPA 2016, the Water (Northern Ireland) Order 1999 provides broad powers to

prohibit polluting discharges, require authorisations, and take enforcement action where pollution occurs or is likely to occur.

UK permitting and authorising conditions are substance-based, while Environmental Quality Standards established under the Water Framework Directive may be used to inform what levels are acceptable in the environment, and hence can be allowed to be emitted in permits, the prevention of pollution is not EQS-dependent – the absence of an EQS cannot be relied upon to delay or negate the need to apply the measures in the EPR 2016 or EAR 2018 so as to prevent pollution. Any emission likely to cause ecological damage must be considered a potential pollution event, triggering regulatory action under the relevant regulations.

For example, Regulation 57 of the EPR 2016 authorises the EA and NRW to take preventative or precautionary action if there is a risk of serious pollution - “If the regulator considers that a risk of serious pollution exists as a result of the operation of a regulated or otherwise authorised activity, it may arrange for steps to be taken to remove that risk”.

Fipronil and Imidacloprid flea treatment emissions have not to date been subject to specific environmental permit conditions or set discharge limits. Their emission from sewage facilities outside permit limits constitutes an unlawful discharge. The authorisation of a flea treatment by the Veterinary Medicines Directorate does not exempt operators from compliance with environmental permits. The water quality regulations operate independently of VMD approvals, and the emission of substances capable of causing pollution remains unlawful if not authorised under the permit/authorisation. Neither does the existence of an authorisation for the use of a chemical by another authority (VMD) provide a legal justification for the relevant environment agency to allow pollution to occur. The permitting and authorising systems do not operate on a “what is not prohibited is permitted” basis. If the discharge is outside the scope of the permit/authorisation, e.g. it is likely to contribute to significant pollution, then its emission has not been lawfully authorised and the affected permits, authorisations and rules would need to be reconsidered and varied or revoked.

Section 93 of the Water Resources Act 1991 (WRA 1991) enables the EA and NRW to designate ‘water protection zones’ and to prohibit or restrict activities, and to impose requirements on people undertaking activities to take steps to help achieve applicable environmental objectives, in such a zone. The purpose has to be to prevent or control “the entry of any poisonous, noxious or polluting matter into controlled waters [rivers, lakes, ponds, coastal waters and groundwater]”.

In addition, Sections 161 and 161ZA of the WRA 1991 enable the EA and NRW to undertake works and operations to prevent any poisonous, noxious or polluting matter or any waste matter from being present in, or likely to enter, any controlled waters or to remedy pollution impacts.

The ‘applicable environmental objectives’ in relation to sections 93, 161 and 161ZA are defined in regulation 13 of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and include preventing deterioration of the status of water bodies, and specific objectives established under the Water Framework Directive, including achieving good ecological and chemical status, and reducing pollution from priority substances. Objectives for groundwater are again stricter and include preventing or limiting the input of pollutants and reversing any significant and sustained upward trend in the concentration of

any pollutant in groundwater. Objectives are further defined for each water body in the River Basin District Management Plans (e.g. Anglian RBMP [objectives](#)).

In Scotland retained sections of the WRA 1991 (exercised under the [Water Environment and Water Services \(Scotland\) Act 2003](#)), confer similar zone related and Water Framework Directive related duties and powers on SEPA, and captures both point and diffuse pollution where it causes environmental harm, especially for substances toxic at extremely low concentrations.

In Northern Ireland, discharges to water are regulated under the Water (Northern Ireland) Order 1999 ([WO 1999](#)), including offences for the entry of poisonous, noxious or polluting matter into controlled waters, and the [Water Environment \(Water Framework Directive\) Regulations \(Northern Ireland\) 2017](#), which establish objectives for ecological and chemical status of waterbodies. The Northern Ireland Environment Agency can take preventative or remedial action to protect water quality and can require authorisations for point-source discharges that pose significant environmental risk. Smaller discharges, such as low-volume domestic sewage or minor trade effluents, may be subject to standard rules or exemptions, similar in effect to the General Binding Rules in England and Wales. However, unlike EPR 2016, Northern Ireland does not have a single consolidated “standard rules permit” regime, and authorisations are more commonly issued for larger discharges that could significantly impact water quality. Despite differences in thresholds, all discharges, regardless of volume, remain subject to the statutory duty to prevent pollution, and any discharge likely to cause ecological harm is unlawful.

Until EQSs are statutorily adopted in the UK in relation to Fipronil and Imidacloprid in waterbodies then they do not constitute a component of the chemical status objectives, but they are very relevant to the achievement of good ecological status. The risk of ecological harm from the input of flea treatments from swimming Dogs and other diffuse sources should also be considered alongside sewage inputs when framing the actions needed to meet the RBMP objectives in all the countries.

The EA, NRW, SEPA and the NIEA are not merely empowered but are statutorily mandated to prevent the entry of polluting matter into controlled waters. To permit the continued, unmonitored discharge of these highly toxic insecticides — capable of significant ecological harm at very low concentrations, as demonstrated in multiple regulatory and scientific assessments — ignores the 'strict liability' nature of water pollution offences. The law requires a precautionary and preventative approach; failure to act to prevent flea treatment pollution constitutes a failure of the regulators' primary purpose to protect the environment for future generations.

14. Application of the Habitats Regulations

14.1. Background

The Habitats Directive 1992 and Birds Directive 2009 require EU Member States to put in place protection measures for Natura 2000 sites and listed species of plants and animals. Since Brexit these provisions are set out in domestic UK law by the [Conservation of Habitats and](#)

[Species Regulations 2017](#) (the Habitats Regulations). Indeed the requirements were extended to also cover Ramsar sites and their features in the [Planning and Infrastructure Act 2025](#).

The Habitats Directive and Regulations, while reasonably complex in its operation, have proved robust to attempts to bypass the protections provided, and case law has largely served to reinforce the strict and simple interpretation of duties and to expand the range of activities that Member States must consider when applying the Directive. In particular, as Habitats Directive tests are of a 'beyond reasonable doubt' type, regulators need to be certain that specified environmental harms will not occur (or, in narrowly defined cases of overriding public interest, are adequately compensated).

14.2. Protection of Natura 2000 and Ramsar sites

In relation to Ramsar and Natura 2000 sites (SACs and SPAs) designated under this legislation the UK must take appropriate steps to avoid the deterioration of natural habitats and the habitats of species. Which means taking action needed to address any existing, or pre-existing, activity that may cause deterioration to a site or prevent its restoration to good condition.

In addition, any new plan or project that may have a significant effect on a Natura 2000 site, on its own, or in combination with other plans or projects, must be subject to an "appropriate assessment" (now more usually referred to as a Habitats Regulations Assessment) of its implications in view of the site's conservation objectives. The Directive does not define 'plan' or 'project' which means the courts take a very wide view on that constitutes a plan or project (only activities that were happening in the same place and in the same way before the legal duties came into force have ever been determined by the courts not to be a 'plan or project'). The plan or project can only be approved or permitted after the competent authority has made certain that it will not adversely affect the integrity of the site/s concerned.

The Natura 2000 protection regime has evolved as a result of case law, the Habitats Regulation Assessment is now a two phase process – firstly a screening report is undertaken by the competent authority, this cannot take into consideration proposed mitigation measures, and must either conclude either, that the regulator is certain there will be no negative impacts on the site/s, or that an Appropriate Assessment is required. The Appropriate Assessment must then thoroughly consider, quantify and analyse all the potential impacts from the plan or project on the protected site/s and the certainty of any proposed mitigation measures.

When the authority cannot be certain that a plan or a project will not have a detrimental impact on a site it cannot allow the plan or project to proceed unless:

1. There is no feasible alternative solution that would be less damaging to the European site and does not have an adverse effect on the integrity of this or any other Natura 2000 or Ramsar site (again 'integrity' is not defined and is given a broad interpretation by the courts), and,
2. The proposal needs to be carried out for imperative reasons of overriding public interest (which for sites supporting 'priority' species and habitats can only be Human health, public safety or important environmental reasons), and,

3. The necessary compensatory measures can be secured (and these either need to be in place or the authority must be certain that they will provide compensation at least equivalent to the harm).

EU Member States and the UK have been slow to apply these site protection measures to some categories of plans and projects, notably to agriculture and forestry activities. But a key case in 2022 has changed that and now Government authorisations that are likely to result in the releases of chemical into the environment are considered to be firmly within the 'plan and project' definition and require a Habitats Regulations Assessment (see "Case Law Relevant to Application of the UK Habitats Regulations" in Appendix 3); hence the increased activity on efforts to reduce nitrate pollution impacting Natura 2000 sites.

14.3. Protection of Habitat Directive Listed Species

In addition to the protection of sites, for the species listed in the Directive (Annex IV) the UK must "take the requisite measures to establish a system of strict protection", including prohibiting deliberate killing and the deliberate or unintentional deterioration or destruction of breeding sites or resting places.

Case law has demonstrated that the functionality of the 'places' must be protected and this extends to surrounding habitats and species. This provision should therefore be understood as aiming to safeguard the ecological functionality of breeding sites and resting places so that they can continue to provide all that is required for a specific animal to rest or to breed successfully. Generally a clear cause and effect needs to be established to show that an activity results in deterioration or destruction. But this does not always have to be established; to show an infringement for a specific project on a species, it is sufficient to establish that there is a probability or risk that that operation might cause disturbance ([case law](#)).

The UK can grant derogations to allow the deliberate killing and deliberate or unintentional deterioration or destruction of breeding sites or resting places, but they must demonstrate that:

- the derogation is for a reasons listed in the Directive (which includes to prevent serious damage to crops, livestock and forests, or for other imperative reasons of overriding public interest, including those of a social or economic nature); and
- there is no satisfactory alternative, and
- the derogation is not detrimental to the maintenance of populations (national and local) at a favourable conservation status (when a population status is classed as unfavourable the derogation must also not prevent its restoration to favourable status).

[Case law](#) has established that UK cannot derogate from the protection of species on the basis that they would otherwise have to change the application of agricultural technologies. Also the mere chance that damage might occur does not suffice; the likelihood that damage will occur must be high, and so must the extent of the damage.

Furthermore the UK must establish a system to monitor the incidental killing of the listed animal species and in the light of the information gathered, must undertake further research

or conservation measures as required to ensure that incidental killing does not have a significant negative impact on the species concerned.

Unlike for Natura 2000 sites there is no prescribed assessment process relating to assessing the impacts of plans and projects on protected species, although [EC guidance](#) says that where species derogations may be needed on a plan or project involving a Natura 2000 site the Appropriate Assessment should cover both aspects.

“The specific provisions and procedures under Article 16 need to be complied also in case of a plan or project, that might affect a EU protected species and is subject to the assessment procedures under Article 6(3) of the Habitats Directive or under the EIA or SEA Directives. In this case, the impact assessment procedures carried out for plans and projects can be used to assess the impact on the requirements under Article 12 and to verify whether the conditions for a derogation under Article 16 are fulfilled.

This would be relevant, for example, when the construction and/or operation of a project is likely to cause the deterioration or destruction of breeding sites or resting places or the disturbance of any species listed in Annex IV(a) and occurring in the project area.

In those circumstances, it is necessary to assess:

- if any of the species listed in Annex IV(a) to the Habitats Directive is present in the project area;
- if any of the breeding sites or resting places of the species listed in Annex IV(a) to the Habitats Directive are present in the project area;
- if any of these species and/or their breeding sites or resting places will be ‘impacted’ (killed, disturbed, damaged, etc.) by the construction and/or operation of the project and, if so;
- if the conditions set out in Article 16 are fulfilled.”

and

“For projects that are not subject to Article 6(3) because they are not likely to have a significant effects on Natura 2000 sites, either individually or in combination with other plans or projects, Member States can adapt existing procedures to meet the requirements of Article 12 and 16. This means that the checks in the list above can be built into the appraisals that form part of the decision-making processes at various levels in a Member State, including land-use planning decisions or environmental assessment procedures for programmes, plans and projects.”

Species protected by the Habitats Regulations which may be impacted by Fipronil and Imidacloprid pollution, and should therefore be part of the Habitats Regulations Assessment, include bats (particularly species feeding in wetland areas), Pool Frog (*Pelophylax lessonae*), Great Crested Newt (*Triturus cristatus*), Natterjack Toad (*Epidalea calamita*), Southern Damselfly (*Coenagrion mercuriale*), White-clawed Crayfish (*Austropotamobius pallipes*) and Little Whirlpool Ram's-horn Snail (*Anisus vorticulus*).

14.4. Protection of Birds Directive Listed Species

The [Birds Directive](#) includes a duty for Member States to establish special conservation measures concerning the habitat (including the breeding, moulting and wintering areas and staging posts of migratory species) of the listed bird species in order to ensure their survival and reproduction in their area of distribution. Also in respect of protected areas, Member States must “take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds”, in so far as these would be significant. Outside protection areas, “Member States shall also strive to avoid pollution or deterioration of habitats”. However, these clauses have not been retained in UK legislation. Never-the-less the UK-EU Comprehensive Trade Agreement states that the UK (and EU):

“shall not weaken or reduce, in a manner affecting trade or investment between the Parties, its environmental levels of protection or its climate level of protection below the levels that are in place at the end of the transition period”

This should be borne in mind when the UK Government takes policy decisions relating to pollution affecting bird’s nests.

The [Wildlife and Countryside Act 1981](#) creates an offence for anyone who “damages” “the nest of any wild bird while that nest is in use or being built”. In England and Wales this damage has to be “intentional” whereas in Scotland the damage can be reckless, which opens a theoretical possibility of a Judicial Review or prosecution of any decision or action that results in damage to birds’ nests.

14.5. Application of the Habitats Regulations in Current Situation

The publically available UK data sheets for flea treatments are very brief. For instance [this](#) recent sheet for a (Krka) worming spot-on contains no information relating to a Habitats Regulations Assessment for the product. Therefore it is not clear how the Veterinary Medicines Directorate are currently undertaking their legal duty as the relevant Competent Authority to establish certainty that the products will not cause harm to Natura 2000 or Ramsar sites.

The first stage of a Habitats Regulations Assessment, which should be completed for all authorisations of releases of chemicals into the environment, is the ‘Screening Assessment’. This is a quick review of possible risks, if the competent authority is unable at that stage to determine whether the authorisation certainly would not result in harm to Natura sites then the assessment proceeds to undertaking an Appropriate Assessment which makes a quantitative assessment of the potential risks identified in the Screening Assessment, enabling the Competent Authority to, in brief:

- determine if impacts will not occur,
- determine if impacts will occur whether they can be negated by mitigation measures,
- approve or refuse the authorisation.

In this case as there is already evidence (particularly [Schweiger et al. 2025](#) and [Hallmann et al. 2014](#)) of Fipronil and Imidacloprid causing environmental harm at levels that occur commonly in UK waters, indeed almost universal levels in the case of Fipronil, then the result of a Screening Assessment for a product containing Fipronil or Imidacloprid would have to be that a full Appropriate Assessment would be required.

If, having completed the Appropriate Assessment, the VMD was still unable to be certain that no impact would occur to Natura 2000 sites, then, unless the Government agrees that the very high hurdle of ‘overriding public interest’ was been met, the authorisation would have to be refused.

Following current guidance, the assessment of the potential impacts of these products on the relevant species listed in the Habitats Regulations should be incorporated into this assessment process.

15. International Agreements and Flea Treatments

The regulation of internationally traded chemicals and products always needs to be considered in light of the UK’s international commitments. Relevant here are both environment and trade related treaties.

15.1. International Conventions

The United Nations Sustainable Development Goals ([UN SDGs](#)) 2015 committed the UK to a list of goals and targets, including:

Goal 6. Ensure availability and sustainable management of water and sanitation for all.

6.3 By 2030, **improve water quality by reducing pollution**, eliminating dumping and **minimizing release of hazardous chemicals** and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

6.6 By 2020, **protect and restore water-related ecosystems**, including mountains, forests, wetlands, rivers, aquifers and lakes.

Goal 12. Ensure sustainable consumption and production patterns.

12.4 By 2020, **achieve the environmentally sound management of chemicals** and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

14.1 By 2025, **prevent and significantly reduce marine pollution of all kinds**, in particular from land-based activities, including marine debris and nutrient pollution.

14.2 By 2020, sustainably manage and **protect marine and coastal ecosystems** to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and **halt and reverse land degradation and halt biodiversity loss.**

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

The [Convention on Biological Diversity 1992](#) commits the UK to:

“Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations”

“Where a significant adverse effect on biological diversity has been determined pursuant to Article 7 [national monitoring data], regulate or manage the relevant processes and categories of activities”

“Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity”

And the subsidiary [Kunming-Montreal Global Biodiversity Framework 2022](#) sets targets for the UK to:

“Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity”.

“Reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: ... (b) by reducing the overall risk from pesticides and highly hazardous chemicals by at least half, including through integrated pest management, based on science, taking into account food security and livelihoods.”

The [Stockholm Convention 2001](#) on Persistent Organic Pollutants commits the UK to:

“take measures to regulate with the aim of preventing the production and use of new pesticides or new industrial chemicals which, taking into consideration the criteria in paragraph 1 of Annex D, exhibit the characteristics of persistent organic pollutants.”

The [Ramsar Convention 1971](#) Convention on Wetlands of International Importance especially as Waterfowl Habitat commits the UK to “designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance” and:

“The Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.

Each Contracting Party shall arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay to the organization or government responsible for the continuing bureau duties specified in Article 8.”

In relation to marine pollution, the [OSPAR Convention 1992](#) requires Contracting Parties to:

“take, individually and jointly, all possible steps to prevent and eliminate pollution from land-based sources”.

Given that Fipronil and Imidacloprid are both highly hazardous, persistent substances (and pesticides) that are polluting rivers, lakes and seas, and are causing damage to biodiversity, there is a clear expectation from the environmental conventions that the UK should take regulatory action to prevent and eliminate the pollution.

The [Aarhus Convention 1998](#) (UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters) is an environmental treaty that grants the public three key rights: access to environmental information, participation in environmental decisions, and access to justice in environmental matters, promoting government accountability and environmental democracy.

The Convention is transposed in the UK via the Environmental Information Regulations ([EIR 2004](#)).

In relation to access to Environmental Information Article 4 (1) of the convention says:

“1. Each Party shall ensure that, subject to the following paragraphs of this article, public authorities, in response to a request for environmental information, make such information available to the public, within the framework of national legislation, including, where requested and subject to subparagraph (b) below, copies of the actual documentation containing or comprising such information:

- Without an interest having to be stated;
- In the form requested unless:

It is reasonable for the public authority to make it available in another form, in which case reasons shall be given for making it available in that form; or
The information is already publicly available in another form.”

There are several caveats that allow a public authority to withhold information. Most do not generally apply to information held by VMD or the environment agencies with regard to flea treatment chemicals. In particular: environmental data provided by an applicant for a veterinary medicine authorisation and the provision of sales, prescription and pharmacovigilance data is required by law and hence the applicant cannot refuse to consent the release of the material; such data held by the VMD is not subject to copyright or

intellectual property rights; and the convention specifically states that information on emissions into the environment cannot be withheld on grounds of commercial confidentiality.

The 'emissions' to the environment provision has been the subject of several EUCJ cases (binding retained case law) that have clarified that the term must be interpreted broadly and authoritatively (one of the cases centred on the authorisation of Imidacloprid as a pesticide). 'Emissions' encompasses foreseeable releases of substances arising from the normal use of products, including diffuse and delayed emissions. It also includes all environmental data and assessments required to evaluate those emissions. As a result, environmental risk assessments and toxicity data submitted in support of veterinary medicine authorisations constitute emissions-related information for the purposes of the Aarhus Convention (and the UK's [EIR 2004](#)), and cannot lawfully be withheld on grounds of commercial confidentiality ([Bayer AG v European Commission](#), [Stichting Greenpeace Nederland and PAN Europe v Commission](#), [ClientEarth v European Commission](#)).

Schedule 1 paragraph 9 of the Veterinary Medicines Regulations 2013 provides protection to commercial data as the VMD may only use data submitted in support of a marketing authorisation when assessing an application for another marketing authorisation with the permission of the authorisation holder. Paragraph 11 also prevents generic Cat or Dog flea treatments being placed on the market for 10 years after the original authorisation of the formulation. However, when data is made public via an EIR request it can no longer be considered to be a trade secret ([Trade Secrets \(Enforcement, etc.\) Regulations 2018](#)).

Under the VMR 2013, there is no statutory prohibition preventing the VMD from publishing the environmental data and reports submitted in support of a marketing authorisation, or subsequent pharmacovigilance. Schedule 1 paragraph 25 requires publication of the assessment report, with confidential material removed, but does not restrict disclosure of the underlying studies themselves, or data received after authorisation.

Data submitted by applicants may qualify as a trade secret under the Trade Secrets (Enforcement, etc.) Regulations 2018. These regulations prohibit unlawful acquisition, use, or disclosure of trade secrets. However, the VMD may disclose such environmental data where this is in the public interest, particularly for environmental protection, which overrides commercial confidentiality claims.

Regulation 4 of the EIR 2004 sets out that:

“a public authority shall in respect of environmental information that it holds— progressively make the information available to the public by electronic means which are easily accessible; and take reasonable steps to organize the information relevant to its functions with a view to the active and systematic dissemination to the public of the information.”

The VMD should therefore proactively publish all environmental data, study reports, associated with veterinary medicine authorisation, sale data and pharmacovigilance data for all medicines where there is a risk of emissions to the environment, neither the applicant/holder's consent nor an EIR request are required to release environmental data of public interest. The VMD already proactively publishes sales data for antimicrobials.

Redactions would be limited to narrowly defined genuine trade secrets or confidential commercial information, and only where disclosure cannot be justified as being in the public interest for environmental protection.

Article 6 of the Aarhus Convention requires signatories to notify the public of any upcoming decision that “may have a significant effect on the environment”, and to enable their informed participation in the decision making process.

At the moment the UK public are not informed about the authorisation of veterinary medicine products that may impact the environment until after the event and there is no opportunity provided to participate in the decision making.

15.2. Trade Agreements

The most significant international trade agreement of relevance is the [Agreement on Technical Barriers to Trade](#) (TBT).

The TBT includes a number of environmental reassurances about how global trade should function, for example it states that “no country should be prevented from taking measures necessary to ensure the protection of the environment” if those measures are “otherwise in accordance with the provisions of this Agreement”. Although regulatory measures taken to protect the environment “shall not be more trade-restrictive than necessary” and “available scientific and technical information” should be considered in the decision.

A directly relevant TBT section is 2.4:

“2.4 Where technical regulations are required and relevant international standards exist or their completion is imminent, Members shall use them, or the relevant parts of them, as a basis for their technical regulations except when such international standards or relevant parts would be an ineffective or inappropriate means for the fulfilment of the legitimate objectives pursued, for instance because of fundamental climatic or geographical factors or fundamental technological problems.”

The TBT requires members (including the UK) to “play a full part, within the limits of their resources, in the preparation by appropriate international standardizing bodies of international standards for products for which they either have adopted, or expect to adopt, technical regulations”.

The TBT also requires members “Whenever a relevant international standard does not exist or the.....proposed technical regulation is not in accordance with the technical content of relevant international standards, and...[the regulatory action].....may have a significant effect on trade” then the member shall “publish a notice”, “notify other Members” and “allow....Members to make comments”. In urgent cases the member can act first and talk later.

Internationally recognised standards are set by a small number of international bodies including the International Telecommunication Union, the Codex Alimentarius, and the

International Plant Protection Convention (IPPC) – there is no WTO recognised international body for setting standards for the authorisation of veterinary medicines. In addition national and regional bodies can submit themselves to the TBT Committee's Code of Good Practice, which is the official mechanism for a standardising body to signal its recognition under the TBT Agreement, such bodies are [listed](#) by the International Organisation for Standardisation (ISO).

The UK currently applies standards to veterinary medicines that have been developed by VICH (International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products). VICH has not registered with TBT/ISO, and does not fit with the WTO 'Principles for the Development of International Standards, Guides and Recommendations' ([WTO 2000](#)) as its membership is not "open on a non-discriminatory basis to relevant bodies of at least all WTO Members" and it does "give privilege to, or favour the interests of, a particular supplier/s, country/ies or region/s". Therefore the standards and guidance that VICH produces do not form part of the canon of standards that the World Trade Organisation would take into account when considering if the UK was able to set its own environmental standards and take regulatory action to protect the environment from flea treatments. In addition as the [VMD](#) "now consider that there are sufficient data to support a review of the internationally agreed Environmental Risk Assessment guidelines" and have acknowledged that the current [VICH guideline](#) 'Environmental Impact Assessment (EIAs) For Veterinary Medicinal Products Part 1' is inadequate as it filters all products aimed at companion pets out on a categorical rather than risk basis and therefore excludes them from requiring any actual assessment of real world risk. All the actual tests and contemplation of risk is in [Part 2](#) of the VICH EIA guidelines, in truth one might argue that Part 1 of the guidelines is not part of any sensible risk assessment process, but instead acts as a robust filter to prevent products having to have an environmental risk assessment.

As well as not being WTO registered or compliant, it is clear that the VMD consider that the VICH EIA guidelines are "an ineffective or inappropriate means for the fulfilment of the legitimate objectives pursued", in which case the UK is in no way compelled by being party to the TBT to adhere to them in the current urgent situation (and would not be so compelled even if they were TBT approved standards).

Trade and cooperation agreements with other countries or blocs are also pertinent. At the moment there are six relevant trade agreements:

- Trade and Cooperation Agreement between the United Kingdom and the European Union ([TCA](#))
- Free Trade Agreement between Iceland, Liechtenstein and Norway and the United Kingdom ([ILNU FTA](#))
- Comprehensive and Progressive Agreement for Trans-Pacific Partnership texts ([CPTPP](#))
- Free Trade Agreement between the United Kingdom and Australia ([UKA FTA](#))
- Free Trade Agreement between the United Kingdom and New Zealand ([UKNZ FTA](#))
- UK/Japan: Agreement for a Comprehensive Economic Partnership ([UKJ ACEP](#))

These agreements also contain clauses recognising the UK's right to determine its approach to good regulatory practices and to define or regulate its own levels of environmental protection (sometimes with direct reference to [Article XX](#) of GATT 1994) and not to delay addressing the threats to environmental protection because of the respective treaty. In addition compliance

with these agreements requires the UK to fulfil several environmental commitments, including:

- To uphold, ensure and strive to increase high levels of environmental protection (EU, ILN, CPTPP, A, NZ, J).
- To regulate in accordance with the Environmental Principles (EU, ILN, CPTPP).
- To effectively implement multilateral environmental agreements (ILN, CPTPP, A, J).
- Not to use the lack of full scientific certainty as a reason for postponing cost-effective measures to prevent degradation where there are threats of serious or irreversible environmental damage (EU, ILN)/ to take account of the precautionary approach (J).
- To take account, when managing risks, of relevant and available scientific, technical and other information (EU, ILN, A, J)/ review of relevant scientific or technical information, and the consideration of alternatives (CPTPP).
- To take appropriate measures to protect and conserve wild fauna and flora identified to be at risk, including measures to conserve the ecological integrity of protected natural areas, for example wetlands (CPTPP, A).
- To promote the conservation of marine ecosystems and species (ILN).
- To have regard to applying the precautionary approach to fisheries management (EU).
- To take measures to conserve biological diversity when it is subject to pressures linked to trade (EU, ILN).
- To cooperate on preventing and controlling pollution, including pollution of a transboundary nature (ILN).
- To undertake Environmental Impact Assessments (EU).
- Not to waive, fail to enforce or otherwise derogate from its environmental law, in order to encourage trade (ILN, CPTPP, A, NZ, J)/, or in a manner affecting trade (A).

The Trade Agreements will often set out some clauses relating to the regulation of products and the setting of related standards, in some cases these relate directly to general pharmaceuticals or specifically to veterinary medicines.

On applying international standards to regulation of products the Trade Treaty commitments vary from the rather non-committal “seek to apply relevant scientific guidance documents that are developed through international collaborative efforts with respect to inspection of pharmaceuticals” in the CPTPP, through “shall take account of available scientific and technical information, and where appropriate, relevant international standards, guidelines or recommendations” in the Japan treaty, and “shall take account of ... relevant international standards, guidelines and recommendations” in the ILN treaty, to more specific text in the NZ and EU treaties.

The New Zealand treaty says that:

“The Parties shall seek to collaborate, where appropriate, on matters such as improving their respective regulations and regulatory activities for medicinal products and resolving issues relating to the medicines supply chain and its security, through relevant international initiatives such as for medicinal products for veterinary use, the International Cooperation on Harmonization of Technical Requirements for Registration of Veterinary Medicinal Products (VICH).”

The EU treaty says with regard to regulating veterinary products the objective is:

“to promote public health by safeguarding patient safety and animal health and welfare, as well as to protect high levels of consumer and environmental protection, where relevant, by promoting regulatory approaches in line with the relevant international standards.”

And stipulates that:

“The relevant standards for[Veterinary Medicines] shall ensure a high level of protection of public health in line with standards, practices and guidelines developed by the International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products (VICH).”

And that parties:

“shall endeavour to cooperate with a view to strengthening, developing and promoting the adoption and implementation of internationally agreed scientific or technical guidelines including, where feasible, through the presentation of joint initiatives, proposals and approaches.”

And:

“shall encourage national bodies to participate in the preparation of international standards by relevant international standardising bodies; to use relevant international standards as a basis for the standards they develop, except where such international standards would be ineffective or inappropriate, for example because of an insufficient level of protection.”

By attending the VICH as an observer, co-operating with the EU on their submission of a proposal to revise the guidelines and seeking to collaborate with New Zealand on preparing new guidelines we have fulfilled the UK’s Treaty obligations. The EU treaty is most considered in its detail, and it is clear that when, as in this case, the Member believes that the international standards are “ineffective or inappropriate” they do not need to be applied. There is no requirement in any of the treaties that would mean that the UK has to wait for the VICH guidelines to be rewritten before taking regulatory action to address environmental damage.

In any case, the current VICH Phase 1 guidelines say that in exceptional circumstances “Some VMPs that might otherwise stop in Phase 1 may require additional environmental information to address particular concerns associated with their activity and use.” There is no doubt that the widespread pollution the UK is facing from flea treatments is an ‘exceptional’ situation, this was not foreseen, it is the first such calamity as a result of a companion animal medicine, and the UK is in an exceptional position due to having one of the densest Cat and Dog populations in the world.

However, adding environmental data that goes beyond the Phase 1 guidelines to the assessment process for a flea treatment would not be exceptional as this has been done in the past for four flea treatments, two of which contain Imidacloprid ([CVMP 2002](#), [CVMP 2009](#), [CVMP 2014](#), [CVMP 2019](#)).

Rather than having to wait until the guidelines are revised, the VMD just needs to define the scope of environmental information needed, with assistance from the Environment Agency, SEPA, NRW and others, gather that information and assess it. If the data that VMD would like to have to assess the environmental risk of these products “are inadequate” then under regulation 24 of the Veterinary Medicines Regulations the Secretary of State (VMD) must refuse to grant it. Doing so would be perfectly in line with the current VICH guidelines.

The preamble of the EU agreement talks of the “benefits of a predictable commercial environment” while the Japan treaty says that “each Party shall provide for a transparent regulatory environment, which is effective and predictable for persons including economic operators”.

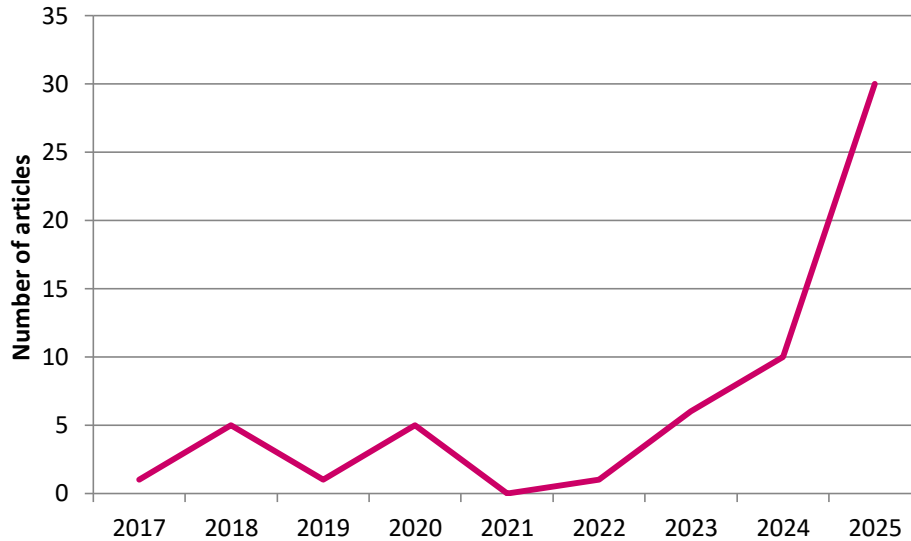
While the objective of a “predictable” regulatory environment is admirable, in reality environmental issues often hit regulatory processes from the side, leaving regulators in a position where improvisation is required. The concept that authorisation holders should be able to rely on legal certainty once their product has been authorised, and that the regulator cannot then retract the authorisation on the basis of criteria not included in the authorisation tests, has been tested in law and found not to carry weight.

Pesticide regulation follows a broadly similar environmental risk system to that of Veterinary Medicines, indeed the internationally agreed pesticide risk assessment standards are considerably more formally engaged by the relevant legislation and regulatory processes, the law includes the international standards as being “uniform principles for evaluation”. When the EU banned neonicotinoid seed treatments and Fipronil from use on flowering crops in 2013 Bayer and Syngenta challenged the decision in relation to Imidacloprid, Clothianidin and Thiamethoxam, claiming, in part, that the decision breached their rights to enjoy the “principles of legal certainty”, “protection of legitimate expectation”, their “property” and their “freedom to conduct a business”. The ECJ [judgement](#) established “that notifiers do not have a general right, arising from the principle of legal certainty, to expect the risk assessment and risk management criteria in respect of an active substance to remain fixed” and that “it was sufficiently foreseeable, for the producers of the active substances approved under Regulation No 1107/2009, that the approvals of those substances might be reviewed in the light of scientific and technical knowledge” (the judgement was upheld on [appeal](#) in 2021).

Indeed, the more apt definition of a predictable regulatory process is that it should be predictable that when a serious and urgent, but unforeseen, environmental harm arises the regulator will act according to national and international law and will not “fail to enforce or otherwise derogate from its environmental law, in order to encourage trade”, or fail to “take measures to conserve biological diversity when it is subject to pressures linked to trade”.

16. Parliamentary Debate

The issue of environmental damage from flea treatments has been widely reported in the media with at least 35 articles or pieces in the national media, in every instance raising concerns about the environmental harm (see Appendix 4: Media Coverage).



Graph 37. Number of flea treatment pollution related news articles per year 2017-2025.

On the 25 March 2025 there was a [Parliamentary debate](#) titled “Veterinary Products in Waterways”.

In response to a lively discussion the Minister, Emma Hardy, stated that **“This Government will not turn the other way or continue to allow our rivers, lakes and seas to be polluted.”**

On 9 March 2026 an [Early Day Motion](#) was tabled by Rachael Maskell MP:

“That this House expresses grave concern that fipronil and imidacloprid, pesticides banned for outdoor agricultural use, are still being widely used in domestic veterinary treatments for ticks and fleas in cats and dogs; recognises that the widespread use of these substances contributes significantly to freshwater pollution; highlights that these chemicals are among many available to pet owners, and that limiting their application would not impede effective pet parasite control; and therefore, calls upon the Government to urgently implement stricter regulations on veterinary medicines to effectively reduce the concentrations of these harmful pesticides in order to protect beneficial invertebrates and ecosystems for future generations.”

17. Government Roadmap

On 22 July 2025 the Government published a plan to address the presence of chemicals from pet flea and tick treatments in UK waterways ([Press Release](#), [Roadmap](#)).

“Cross-government Pharmaceuticals in the Environment Group Roadmap

Communication and Education
Immediate

- The Veterinary Medicines Directorate (VMD) will collaborate with veterinary professionals and industry to enhance and promote consistent messaging to users on the appropriate use of cat and dog topical parasiticides, aiming to reduce potential environmental impacts

Evidence Gathering

Medium Term

- The Environment Agency, the Scottish Environmental Protection Agency, Natural Resources Wales and the Northern Ireland Environment Agency will harmonise approaches and determine overall trends for the levels of Fipronil and Imidacloprid across the UK to support assessment of progress.
- The Group will engage with academia to identify and prioritise research needs relating to cat and dog topical parasiticides and improve collaboration opportunities.
- The Group will investigate all potential sources of Fipronil and Imidacloprid, such as biocides (HSE), imported fabrics (EA), imported produce (HSE), manufacturing, use of historical agricultural products, off label and illegal use.
- The VMD and Defra will collaborate with veterinary professionals to assess how changes in product usage might impact animal welfare, animal health and public health.
- The Group will encourage veterinary professionals and organisations to generate and use evidence to determine the optimal use of cat and dog topical parasiticides.
- The Group will use this evidence to improve understanding of any issues relating to cat and dog topical parasiticides and inform future policy activities.

Regulatory Actions

Long term

- The four environment agencies will establish and agree on Environmental Quality Standard (EQS) values for Fipronil and Imidacloprid.
- The VMD will utilise the data collected to support a review of the VICH Environmental Risk Assessment guidelines
- Review subject to acceptance by VICH. (What is VICH)
- The VMD will consider the environmental risk assessment process for pet parasiticides working within the international regulatory framework.
- The VMD will use the evidence gathered in the medium term to consider any future regulatory actions.”

17.1. Reactions to the Roadmap

Richard Benwell, chief executive of Wildlife and Countryside Link, welcomed the Roadmap but queried the timeline.

"It's good to have a roadmap to address the widespread, unnecessary pollution of rivers by over-the-counter tick and flea treatments. The question is how quickly will regulators travel the road?"

"A quick information campaign is a useful idea to help vets understand the alternatives and pet owners understand what they can do, but the government

should set clear timescales so that regulations to deal with these potent ingredients in the toxic cocktail in UK rivers are brought forward without delay."

Josie Cohen, interim director of Pesticide Action Network UK, said that Fipronil and Imidacloprid pose a "major risk" to aquatic ecosystems.

"While it is good to see the government publish its roadmap, their proposals fall far short of the action needed given the biodiversity crisis facing the UK,"

"It simply makes no sense to allow chemicals blocked for use in agriculture due to the harms they cause to be routinely applied by millions of pet owners every month. Where alternatives exist, which they absolutely do in the case of pet medicines, chemicals that are known to be harming wildlife should be taken off the market."

Andrea Kelly, of the Broads Authority, which manages the wetland National Park in Norfolk and Suffolk, said it welcomed the government's new "road map" to address the pollution.

Susan Morgan, Chief Executive of SongBird Survival, said:

"It is a positive step by the Government to support a proposed review into how they assess the safety of flea and tick treatments for pets, humans and wildlife. The pesticide Fipronil found in these treatments is polluting rivers and is now linked to increased chick deaths in bird nests. We now need a clear timeframe for when this review will happen."

Dr Cannelle Tassin de Montaigu, Research Fellow at the University of Sussex and lead author of the research on pesticides and bird nests said:

"Our research recommended a more comprehensive review of the environmental safety assessment for veterinary drugs, after we found insecticides in 100% of tested blue tit and great tit nests. Veterinary flea and tick treatments are the most likely source of contamination."

Professor Dave Goulson at the University of Sussex added:

"The environmental impacts of drugs used on pets have been overlooked for too long. There is an urgent need to evaluate the pros and cons of alternatives so that pet owners can be advised as to the most sustainable option."

The Progressive Veterinary Association argued the roadmap should have gone much further:

"The toxicity problem is already here and action needs to be taken now. It is commendable that the PiE roadmap sets out the severity of its concerns, but its proposed actions would be too little, too late. Mere discussion of a plan to make a plan at some point in the future as the roadmap sets out, without taking any action now, would demonstrate complacency as well as complicity."

17.2. Analysis of Roadmap Communication and Education Actions

“The Veterinary Medicines Directorate (VMD) will collaborate with veterinary professionals and industry to enhance and promote consistent messaging to users on the appropriate use of cat and dog topical parasiticides, aiming to reduce potential environmental impacts”

The current [VMD guidance](#) on its website about protecting the environment from flea treatments says:

“Pet owners are encouraged to read the package leaflet and ensure that they are administering the product correctly and adhering to the specific advice concerning environmental risks, such as keeping treated animals out of water courses for a limited time after treatment.

If the product literature has been misplaced, this information can be accessed via the VMD’s Product Information Database by searching for the product in question.

Used pipettes should not be rinsed and should instead be disposed of via household waste.”

It is not clear that this represents any change from previous advice, and as discussed above none of these measures can be expected to produce anything like the necessary c.98% reduction in Fipronil and c.84% reduction in Imidacloprid from current pollution levels. However, the main tool that the VMD uses to influence user behaviour is the labels that accompany the products. A number of these have been updated since the Roadmap was published, these are long documents and the relevant sections for three example product labels are set out below.

Frontline Spot on Dog 10% w/v spot on solution [label](#) (Fipronil) - revised October 2025

- Do not treat your dog more frequently than every 4 weeks.
- Avoid the product coming into contact with the fingers. If this occurs, wash hands with soap and water. After accidental contact with eyes, rinse carefully with clean water.
- Wash hands after use.
- Treated animals should not be handled until the application site is dry, and children should not be allowed to play with treated animals until the application site is dry. It is recommended that recently treated animals are not allowed to sleep with owners, especially children.
- Fipronil may harm fish and other water creatures. Do not contaminate ponds, waterways or ditches with the product or empty containers.
- Bathing/immersion in water within 2 days after application of the product and more frequent bathing than once a week should be avoided.
- Do not allow dogs to swim in ponds or other waterways for 2 days after treatment.
- Can be used monthly (where required) throughout the year for continuous flea and tick protection.
- Make sure all cats and dogs in your home are treated regularly.
- Dispose of empty packaging and any remaining product in the household rubbish. [not on all the labels!]

Advantage 250 mg spot-on solution [label](#) (Imidacloprid) – Updated August 2025

- The veterinary medicinal product remains effective if the animal becomes wet, for example after swimming or exposure to heavy rain. However, in cases of frequent swimming or bathing re-treatment may become necessary, depending on the presence of fleas in the environment. In these cases do not treat more frequently than once weekly.
- Wash off any skin contamination with soap and water.
- After application, do not stroke or groom animals until application site is dry.
- Wash hands thoroughly after use.
- Imidacloprid is toxic to aquatic organisms. To avoid adverse effects on aquatic organisms, treated dogs should not be allowed to enter surface water for 48 hours after treatment. See also section 'Special precautions for disposal'
- Medicines should not be disposed of via wastewater.
- This veterinary medicinal product should not enter water courses as Imidacloprid may be dangerous for fish and other aquatic organisms.
- Use take-back schemes for the disposal of any unused veterinary medicinal product or waste materials derived thereof in accordance with local requirements and with any applicable national collection systems. These measures should help to protect the environment.
- Ask your veterinary surgeon or pharmacist how to dispose of medicines no longer required.

As can be seen from these two labels the VMD is still promoting actions that will contribute significantly to aquatic pollution, including:

- Treating pets weekly with Imidacloprid and monthly with Fipronil.
- Treating all Cats and Dogs regularly.
- Washing hands after use – despite this being the largest confirmed pathway from pets into rivers ([Perkins et al. 2024](#)).
- Allowing Dogs to swim in the environment or for animals to be bathed 48 hrs after application - despite evidence that they still cause pollution incidents for more than 28 days.
- Allowing stroking of animals after when treatment appears to be dry, despite evidence that this continues to be a significant pollution pathway weeks or months after treatment.

It is not clear if there is anything new in these labels as a result of the Roadmap. If applied universally by users of the products (which is highly unlikely) these measures would do almost nothing significant to reduce the household emissions. The only pathway that would thereby stop being significant would be the disposal of the chemicals and packaging, although the advised measures are inconsistent between labels and are not included on all relevant labels. While undoubtedly waste product does occasionally get flushed into the sewage system and some people may wash used containers, this pathway, although acute, is likely to be small in overall volume when compared to washing pet bedding, washing hands and washing clothes, none of which are addressed on the labels or by any other VMD guidance.

In addition the labels state that Fipronil and Imidacloprid “may” cause harm to aquatic life, when the evidence is unequivocal that they do cause harm – this is misleading.

VMD is continuing to authorise new products containing these chemicals. In July 2025 it authorised a new collar, Prevexto, containing Imidacloprid, the product was authorised for

public sale, not veterinary prescription. The [product summary](#) states that the Imidacloprid will “spread from the site of direct contact over the entire skin surface” but then offers no caution about allowing Dogs to swim after the collar is removed “Dogs wearing the collar should not be allowed to swim in water courses”. It also advises users to “wash hands with cold water after fitting the collar”.

Other than inconsequentially amending the labels there is no evidence that the VMD has ‘immediately’ undertaken any other actions to educate or communicate to the public the severity of the issue and the actions they should take to reduce pollution levels. Even if the timid and misleading label advice was universally followed by users the resulting reduction in pollution would probably be negligible.

It is also important to note that the communication and education actions all relate only to topical –externally applied - flea treatments – hence tablet based treatments are excluded. Given the evidence that tablet based treatments are capable of polluting rivers and birds’ nests these actions only address part of the flea treatment pollution issue.

17.3. Analysis of Roadmap Evidence Gathering Actions

“The Environment Agency, the Scottish Environmental Protection Agency, Natural Resources Wales and the Northern Ireland Environment Agency will harmonise approaches and determine overall trends for the levels of Fipronil and Imidacloprid across the UK to support assessment of progress.”

This is a good aim, the best way to achieve it would undoubtedly be to include the two chemicals in the routine Water Framework Directive monitoring programmes. Of course this is not a prerequisite for starting to take action to reduce pollution levels.

“The Group will engage with academia to identify and prioritise research needs relating to cat and dog topical parasiticides and improve collaboration opportunities”.

Engaging with academia is to be encouraged, too often chemical regulation ignores scientific evidence that is not generated by those they are regulating. The Roadmap does not identify any specific issues requiring further research so it is unclear what research they plan to identify and prioritise. However, as this review sets out, the evidence base is already more than strong enough to justify urgent action.

“The Group will investigate all potential sources of Fipronil and Imidacloprid, such as biocides (HSE), imported fabrics (EA), imported produce (HSE), manufacturing, use of historical agricultural products, off label and illegal use”.

As shown above, other than leaching of the persistent (and now banned) Imidacloprid seed treatment and its breakdown products from agricultural areas, it is fairly straight forward to demonstrate that none of these routes are likely to be significant contributors to the current level of loading of rivers with Fipronil and Imidacloprid.

These are premium products, so off label and illegal use is unlikely to be common, and are in any case is likely to be very hard to quantify.

“The VMD and Defra will collaborate with veterinary professionals to assess how changes in product usage might impact animal welfare, animal health and public health.”

This action is a perfectly reasonable proposal but is not a prerequisite for action to stop the current pollution.

Alternative treatments are already available. While environmental regulation of veterinary medicines has been vanishingly weak, the better developed principles associated with agricultural pesticide regulation are very clear – the protection of the environment should not be trumped by other considerations. The relevant agricultural [pesticide legislation](#) says pesticides “shall not have any unacceptable effect on the environment”.

“The Group will encourage veterinary professionals and organisations to generate and use evidence to determine the optimal use of cat and dog topical parasiticides.”

Again a perfectly reasonable research priority, but unless Cats and Dogs are being overdosed with these chemicals by a wide margin, which is very unlikely, the conclusions are unlikely to significantly assist with reducing pollution to acceptable levels.

“The Group will use this evidence to improve understanding of any issues relating to cat and dog topical parasiticides and inform future policy activities.”

It is unclear what this might mean in practice.

It is also important to note that the evidence gathering actions all relate only to topical – externally applied - flea treatments – hence tablet based treatments are excluded. It is essential that pollution from ingested flea treatments is also addressed; no reason is given for excluding ingested treatments from the research.

17.4. Analysis of Roadmap Regulatory Actions

“The four environment agencies will establish and agree on Environmental Quality Standard (EQS) values for Fipronil and Imidacloprid.”

Environmental Quality Standard (EQS) values are a tool for use in implementing the Water Framework Directive. They are calculated using standardised data on toxic effects and established formulae (see Appendix 1 ‘Environmental Standards Explained’ for more on this).

The Water Framework Directive contains a list of ‘priority substances’ that are all toxic pollutants. If the concentration of one of the priority substances in a waterbody exceeds one of the EQSs then the waterbody cannot be classified as being in good condition.

Since the UK left the EU the Water Framework Directive has been carried into UK legislation. The UK has a target of achieving 75% of waterbodies in 'Good' condition by 2027. The UK legislation allows for additional chemicals to be listed for monitoring and the determination of 'Good', or otherwise, status of waterbodies; chemicals can also be listed with EQSs for monitoring purposes only.

Despite the fact that neither Fipronil nor Imidacloprid are Priority Substances, Acute and Chronic EQSs have already been calculated for both chemicals in freshwater habitats (see Appendix 1) and the resulting standards are being widely used. Of course when there are significant changes in the evidence then the EQSs should be recalculated, which generally results in the limits where we believe chronic or acute effects will occur reducing over time as evidence of greater impacts than were previously calculated becomes available. Conversely it is possible to increase the calculated EQS levels by excluding specific, and perhaps inconvenient, evidence that might be from a published journal and expert academic but which does not follow certain methodological parameters.

It is also possible to set EQSs for other types of samples such as saline water, sediments and biota, the only current non-freshwater derived standard for these substances is a saline water Chronic EQS for Imidacloprid.

In 2023 the Office for Environmental Protection's Water Quality Stocktake identified Fipronil as a Very High Risk and recommended regulatory action to reduce pollution levels ([Atkins et al. 2023](#)).

The EU has recently reached a [political agreement](#) to update the list of Priority Substances and the new list will include Imidacloprid, but not Fipronil. The resulting list and associated EQSs will be directly applicable to Northern Ireland.

Since leaving the EU there have been no updates to the list of Priority Substances in the UK. The devolution agreement means that Northern Ireland, Scotland and Wales have power over environmental legislation in their countries, and England and Wales, Scotland and NI each have their own WFD regulations that would need to be amended by statutory instrument. Work at the UK Water Framework Directive Technical Advisory Group ([UKTAG](#)), that provides technical advice to the four Governments on WFD implementation, has halted due to a lack of resources ([Atkins et al. 2023](#)). So it is unclear how national reviews would be initiated, or how England and Wales would act together - there may currently be regulatory paralysis.

The Water Framework 'Watch List' of substances that Member States are expected to monitor in water, to enable the trialling of monitoring methodologies and the gathering of some initial data to inform a decision about adding the substance to the Priority Substance List, has not been retained in any of the UK regulations. However, the relevant agencies maintain lists of 'emerging contaminants' and adding substances to their monitoring programmes can be done without new legislation.

While the Water Framework Directive in the UK remains the key driver of water quality improvements, it may also be a stranded asset that is unable to protect the UK environment from newly identified environmental pollutants. Certainly to date there has been no publicly visible efforts to update the UK Priority Substance list.

In 2022 the Chief Scientists Group at the Environment Agency commissioned a Fipronil EQS calculation from the consultancy [WCA](#). This calculation has not been made public, but may be the basis for discussions between country agencies.

Recalculating the EQSs for Fipronil and Imidacloprid will only have a significant regulatory driver effect if the two chemicals are added to the Priority Substance lists in the UK, at the moment there is no proven mechanism for adding new substances. Until this happens recalculating and agreeing new EQS figures for the two pollutants risks being an academic action.

“The VMD will utilise the data collected to support a review of the VICH Environmental Risk Assessment guidelines

Review subject to acceptance by VICH. (What is VICH)

The VMD will consider the environmental risk assessment process for pet parasiticides working within the international regulatory framework.”

The International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) is a trilateral (EU-Japan-USA) programme aimed at harmonising technical requirements for veterinary product registration. The UK is not a Founding Member, but is a Standing Member. Standing Members are observers and do not take part in any formal decision on topics or guidelines and do not sign-off any draft/final guideline. Decisions on guidelines have to be unanimous and are taken by the 12 [Founding Members](#) 50% of the Founding Members represent the producers of veterinary medicines and there are six representatives from veterinary medicine regulators, two from each of the EU, US and Japan. In addition 50% of Standing Members (observers) are industry representatives and 50% are regulators from third party countries (including one representative from the UK - VMD). There are no Founding or Standing Members representing the environment.

VMD [claim](#) that pharmaceuticals for companion animals pass Part 1 of the environmental risk assessment because “VICH guidelines stipulate that environmental exposure from use of these types of products will be negligible”. The [VICH guidelines](#) state that “Approval of VMP's for use in non-food animals is likely to be associated with fewer environmental concerns than approval of VMP's in food-producing animals simply because there is less total amount of product used”. But then the decision tree indicates that, if the answer to the question “Will the VMP be used only in non-food animals?” is ‘yes’, then no further environmental impact assessment is required for the product! Indeed even if these chemicals progressed beyond this point they would still not require any aquatic toxicity testing as the decision tree assumes that treatments for terrestrial animals cannot cause aquatic pollution. Even if Dogs were treated as aquatic animals⁴ the VICH guidelines then assume that if the level in the water is below 1 µg/L then there will be no environmental impact (despite this concentration being over 10,000 times higher than the Acceptable Field Concentration of Fipronil).

Although there are three blocks to an environmental impact assessment being undertaken in the guidelines, they also state that “Some VMPs that might otherwise stop in Phase 1 may

⁴ Which has happened on rare occasions and explains why the small number of Phase 2 assessments for flea treatments have largely focussed on the wash off from swimming Dogs CVMP ([CVMP 2002](#), [CVMP 2009](#), [CVMP 2014](#)).

require additional environmental information to address particular concerns associated with their activity and use.” the guidelines do not prevent the UK taking further risk assessment and regulatory action.

Twenty-four years ago the Environment Agency ([Boxall et al. 2002](#)) recommended that Part 1 of the VICH guidelines needed to be rewritten because it was inadequate and failed to meet basic environmental risk assessment standards, such as those currently applied to other categories of chemicals. There appears to have been no progress on this in a quarter of a century.

A [draft proposal](#) to initiate a review of the relevant VICH environmental impact assessment guidance was tabled by the EU in 2024. It proposed bringing forward to an expert committee amendments to the VICH guidance on environmental risk assessment processes, to take into account the harm being caused by pet flea treatments. VICH steering committee member and funder the industry lobby group the Japan Veterinary Products Association “expressed reservations about revising the guideline and also requested additional time to review how the revisions may align with existing laws and their practical implementation possibility” and the US Food and Drug Administration has said they “will need more time” ([VICH SC minutes Nov 2024](#)).

In November 2025 the VICH Steering Committee confirmed that the ecotoxicology guidelines would not be reviewed ([VICH SC minutes Nov 2025](#)), minuting that:

“The EU acknowledged with disappointment that the comments received from the SC members showed that there is no consensus within the SC to revise VICH GL 6.
Several SC members confirmed their unwillingness to reopen this GL at this point in time.
The EU will therefore not pursue further the drafting of a CP but will develop guidance for use at EU level. The resulting EU guidance will not be in conflict with VICH GL6, as the VICH guideline includes a certain amount of flexibility (the “however clause”).”

There were 15 VICH Steering Committee members and coordinators present at the decision, of which nine were industry representatives. The veterinary medicines industry funds the meetings and associated entertaining costs of VICH.

VICH is a voluntary harmonisation initiative, not a formal intergovernmental standards body. Its guidelines are developed through consensus among three regulatory authorities (EU, Japan, USA) and the veterinary medicines industry and are not a legally binding set of rules in themselves.

VICH has not been formally recognised as a standards authority under the World Trade Organisation's (WTO) Technical Barriers to Trade (TBT) Agreement in the same way as bodies like the International Organisation for Standardisation (ISO). However, the WTO's TBT framework encourages members to use international standards where they exist, and VICH guidelines are widely adopted and influential in shaping national regulations, and enabling products meeting the standards to be traded. Never-the-less, the distinction is important because it changes how VICH's guidelines function within the global trade system, VICH is not a formal TBT standards body, and its restricted membership and high level of trade

representation means it does not comply with WTO principles for international standards bodies.

The UK Pharmaceuticals in the Environment Group [is of the view](#) that “any regulatory drivers would require international agreement and is therefore a long-term action to help reduce the levels of Fipronil and Imidacloprid”, but, now that VICH has decided to not to develop guidelines to address the situation, the only place left for us to develop international agreement on domestic veterinary medicine regulation measures would be in a bilateral partnership with the EU.

Northern Ireland faces additional challenges in relation to protecting the environment from veterinary medicines as it has full access to the Single Market and the public could thereby access veterinary medicines even if their use is banned in the UK. It is not clear how this would play out as the [recent guidance](#) on the topic makes no mention of the environment, instead it states that “The Government will always do whatever is necessary to protect public health and food security, ensure the health and welfare of animals, and safeguard the livelihoods of farmers while meeting our obligations under the Windsor Framework” and appears to be based on the premise that maintaining the use of veterinary medicines in NI is, in this context, the main UK Government priority.

“The VMD will use the evidence gathered in the medium term to consider any future regulatory actions.”

VMD have a ‘long-term’ action to consider future action; the long grass was to have led us into the longer grass of VICH deliberations. However, VICH has stubbornly and quickly refused to revise the guidelines. The refusal was an entirely predictable outcome, the only surprise being that VICH did not drag out the process of taking no action for a few more years. The chances that the industry led VICH committee would ever have produced guidance that might have increased the likelihood of regulators banning their most profitable products were always next to non-existent. This leaves us all with a question mark about the decision to make VICH corporate responsibility a cornerstone of the UK Government’s flea treatment roadmap – incompetent or deliberately dilatory.

As ingested flea treatments are excluded from the Roadmap’s evidence and education actions there is unlikely to be any new information generated to assess the environmental risk non-topical products pose, or to enable the regulation of that risk.

On 16 April 2026 VMD and Defra launched a call for evidence on pet flea and tick treatments in UK waterways ([VMD and Defra 2026](#)). The evidence call is limited to Fipronil and Imidacloprid, and while focused on river pollution because “the Environment Agency has found concentrations in surface water that frequently exceed toxicity thresholds for aquatic insects”, it also recognises that “Residues have also been found in river sediments, fish tissue, wild bird nests and coastal waters, suggesting multiple pathways by which contamination may occur”.

The context of the evidence call is set out as:

“given the increasing evidence of environmental contamination, the VMD is now considering changing how these medications are sold. This would mean these

medicines would only be available from vets, pharmacists, or Suitably Qualified Persons (SQPs), ensuring that trained professionals can give point of sale advice to pet owners on correct use and disposal”.

Five years ago vets called for Fipronil and Imidacloprid to be made prescription only (British Veterinary Association, British Small Animals Veterinary Association and British Veterinary Zoological Society [2021](#)), the VMD proposal would not achieve that, let alone the full ban called for more recently by the Progressive Veterinary Association, Veterinary Poisons Information Service, and others ([PAN 2023](#)). People would still be able to buy them over pharmacist counters and online without a prescription.

The call makes it clear that “A full ban on sale is not being considered” no legal or scientific justification for this decision is provided, but the context of the statement suggests that it is because “Animal welfare remains paramount” – whether this includes the welfare of mayflies, Blue Tits and butterflies is unclear.

The announcement also states that “These medications play an essential role in protecting both animal and human health against fleas and ticks and the diseases they may carry” which appears to relate to Fipronil and Imidacloprid specifically, rather than the treatment of ectoparasites generally, as this review has set out there are many effective alternatives to these two chemicals, so there is no grounds for considering either of them to be ‘essential’.

A very long timescale of 12 months is set before any action is likely to be taken as a result of the evidence call.

The evidence call also states that the Government will be “using this evidence to support an international review of environmental risk assessment guidelines” despite the fact that VICH has decided months ago that there will be no review of the only existing international risk assessment guidelines, so it is unclear to what this statement now refers.

The consultation [document](#) provides a legal context for the evidence call, but only mentions the benefit-risk balancing test:

“As the UK authority responsible for deciding how veterinary medicines can be supplied, the VMD must balance animal health and welfare, public health, environmental protection and continued access to veterinary medicines.”

There is no reference made to the other two relevant legal tests that, if met, would allow the Secretary of State to amend or suspend the product authorisations:

“38. 3(f) the pharmacovigilance system in relation to a veterinary medicinal product is inadequate” (E, W, S).

Or

“41A. Where urgent action is necessary for protecting human or animal health or the environment” (E, W, S).

And in relation to Northern Ireland:

“38. 3(f) any information required to be supplied to the Secretary of State has not been so supplied” (NI).

Or

“38. 1(a) this is necessary for the protection of animal or public health or the environment”. (NI). ([VMR 2013](#)).

No reference is made to the legal requirement under Regulation 25 of the VMR 2013 for the Secretary of State to update the Assessment Reports for the products, despite the further acknowledgement of new evidence relevant to the environmental safety of the products.

Schedule 3, Paragraph 1(5) of the regulations states that “When granting the marketing authorisation the Secretary of State must classify the following as POM-V or POM-VPS..... (b) products in respect of which special precautions must be taken in order to avoid any unnecessary risk to (iii) the environment”. While the precautions included on flea treatment labels are minimal and inadequate they do stipulate special precautions, including preventing Dogs from swimming in water bodies. It would seem to follow that all flea treatment products that require such special precautions, not just those containing Fipronil or Imidacloprid, should already be prescription only (POM-V or POM-VPS).

As set out in this evidence review, it is highly improbable that even changing the prescribing status of Fipronil or Imidacloprid to prescription-only will achieve the respective 98% and 84% reductions in pollution levels; putting them behind the counter may make a small change to the volumes sold, but it is unlikely to affect pollution levels significantly.

17.5. Conclusion on the Roadmap

We are facing one of the most significant pollution events in recent history, most UK waterbodies are being polluted at levels that we know will be damaging ecosystem health, reducing populations of mayflies, caddisflies and dragonflies, and risking further ecosystem collapse, with serious ramifications for the health of the environment and its ability to support us and our economy.

The pollution from these flea treatments is pervasive; our rivers, our most protected wildlife sites, and our globally renowned landscapes, like the Wye Valley, River Test and the Broads National Park, may already be irreversibly damaged.

This may not be a problem that was predicted, let alone wanted, but it is here and demands urgent action to reduce pollution levels. To fail to act would not only make us complicit in allowing unacceptable ecological harm, it would break many earnestly made international commitments in conventions and trade agreements.

The existence of the Roadmap is in itself confirmation that the Government acknowledges that new and alarming evidence exists of high levels of harmful pollution from two flea treatment chemicals in the sewage effluent and the environment. This awareness triggers the duty under the VMR 2013 to consider whether those authorisations remain appropriate. It is not clear, given this awareness, why the first step was not to review the product authorisations.

The communication and education actions in the Roadmap are feeble and cannot, even with 100% compliance, make a significant contribution to the necessary reduction in pollution. In

any case voluntary approaches that require significant behavioural change have a strong record of being ineffective in these situations.

In 2023 twenty-four environmental and veterinary organisations, including the Progressive Veterinary Association, Veterinary Poisons Information Service, Rivers Trust, WildFish, RSPB, Wildlife and Countryside Link and Wildlife Trusts, wrote an open letter calling on the UK Government to ban five flea treatment chemicals – Dinotefuran, Fipronil, Imidacloprid, Nitenpyram and Permethrin - on the basis that they were banned as pesticides due to environmental damage, or were too environmentally toxic to be approved for use as pesticides ([PAN 2023](#)).

It is disappointing that the Roadmap contains no commitments to address the lack of environmental information relating to other flea treatment chemicals. We understand the toxicity and prevalence of Fipronil and Imidacloprid only because they were agricultural chemicals, but some chemicals used as flea treatments have undergone no aquatic toxicity testing. The Roadmap could have committed to undertake or require aquatic toxicity testing, environmental monitoring and full environmental risk assessments for all products authorised as flea treatments.

Most roadmaps are drawn up because there is a destination in mind, in this case the Roadmap has no clear aim – where is it going, what is it trying to achieve, when will we get there? Not only is it lacking a destination and timeline, now that VICH has opted out of its key role in the plan there is no longer a road to travel along. The UK could delay action further by waiting for the EU to develop its approach to the flea treatment crisis. But developing a new EU framework is likely to take years, when a solution is needed now, and could be delivered now within existing frameworks, and enabled by existing legislation. Urgent action is required to halt potentially irreversible damage and to achieve the “high level of protection” expected by the public.

It is unclear why all the actions that are likely to actually reduce flea treatment pollution are put in the ‘long term’ category – although this is not defined in the Roadmap one gets the impression this means ‘many years’. EQSs exist already and should be provisionally adopted, and we do not need to wait for new guidelines to take urgent regulatory action now. A 2026 Buglife report concluded that Fipronil and Imidacloprid pollution from flea treatments demands the “urgent attention of the industry and policy makers to reduce use and impact on the environment” ([Bourne-Taylor 2026](#)).

The domestic legislation and evidence is adequate to enable the VMD to undertake bespoke risk assessments for the chemicals. Indeed it must do this as the evidence presented here constitutes important new safety information as per Schedule 1, Paragraph 25 of the Veterinary Medicines Regulations 2013, its existence requires the Secretary of State to update the Assessment Reports. The current authorisations for Fipronil and Imidacloprid should be reviewed as soon as the Assessment Reports have been updated.

In addition, and now in parallel, domestic water quality legislation requires that action is taken to reduce pollution to surface waters and ground water. In the absence of regulatory action relating to the control of the substances at source the implementation of pollution control measures becomes a pressing legal requirement.

Governments may choose which approach to take to prevent flea treatment pollution, but they must select an approach that does not result in an unreasonable delay in effective regulatory action. The delay in taking action to reduce pollution is so long that it constitutes and unreasonable frustration of the statutory purposes of the EPA 1991, EIA 1988, WFA 1991 and the WMA 2013. The environmental damage will have been done before action is taken. A long-term policy document does not remove pre-existing statutory duties.

When the UK was part of the EU it may have been possible for UK authorities to please those being regulated by prioritising domesticated animal welfare and low levels of business regulation, while leaving the difficult environmental protection decisions to the European Medicines Agency (EMA) and its Committee for Medicinal Products for Veterinary Use (CVMP), with final legal authority resting with the European Commission. However, now the UK has to make its own decisions on the domestic standards of environmental protection that it needs and how to fulfil its international commitments, so as to achieve a high level of environmental protection.

The inaction and obfuscation of the Roadmap were an inadequate response to the crisis, with VICH stepping out of the plan it is now redundant.

There is nowhere left to hide, we cannot turn the other way and continue to allow our rivers, lakes and seas to be polluted, difficult environmental decisions need to be urgently taken to make our water bodies safe for life, to protect our most important wildlife sites and landscapes, and to safeguard the health of the UK people and its economy.

18. Is the environmental regulation of veterinary medicines fit for purpose?

Inevitably the question arises 'How did we get to this point?' - Why did it take 23 years for Fipronil, and 20 years for Imidacloprid, flea treatment pollution of freshwaters to be detected and why has there been no significant regulatory action to reduce pollution levels in the subsequent nine years?

Allocating blame is always awkward, but it is in answering that question and then addressing the conclusions where we will find the solutions that will prevent any future reoccurrence of the widespread environmental harm as a result of the authorisation of a veterinary medicine.

The EA, NRW, SEPA and NIEA are primarily responsible for protecting the UK public from pollution and environmental damage caused by the emission of chemicals, while the VMD is responsible for protecting us from environmental harm caused by veterinary medicines. Prior to 2020 the VMD shared this responsibility with regulators in other EU member states and particularly with the European Medicines Agency's Committee for Veterinary Medicinal Products (CVMP) and the European Commission. As the focus of this review is the situation in the UK and the EU mechanisms for regulating veterinary medicines are currently not operating in the UK, other than in Northern Ireland, in answering this question I will in the main only address the functioning of the UK based regulators.

In the first place there was a failure of the VMD to identify the environmental risk when products were first authorised, the water pollution should have been foreseeable, as should the contamination of flowers, even the pollution of birds' nests might have been identified as a risk by an ornithologist. Indeed it appears that the VMD has never required a detailed (Phase 2) environmental risk assessment for a companion animal product.

Of course, as the Environment Agency identified in its 2002 review, the basic VICH EIA guidelines are inadequate and the VMD may have had to require bespoke risk assessments to adequately identify and assess the risk. The VMD has not managed to update the risk assessment process in the intervening 24 years.

It also appears that the VMD may not be undertaking its statutory 'competent authority' role in relation to assessing risk to protected sites and species, which if undertaken may have flagged an unresolved risk.

Following on from the initial failure, the VMD also failed to require pharmacovigilance data to be gathered by the authorisation holders on the presence of these chemicals in the environment.

While the VMR 2013 appears to have the ability to stop environmental damage if properly applied, WildFish ([2026](#)), in a detailed review of the environmental regulation of veterinary medicines, considered the regulations to be insufficiently protective of the environment. The failure of the VMR to adequately protect the environment was highlighted by a comparison with regulations overseeing pesticide authorisation. WildFish drafted a series of amendments to improve the VMR so that adequate environmental pharmacovigilance is required, adequate risk assessments are undertaken and made public, and there is a duty to act to protect the environment from already authorised veterinary medicines.

The Environment Agency has been gathering data on the presence of Fipronil and Imidacloprid in waterbodies since at least 2014. Widespread recent agricultural use of Imidacloprid would have masked its potential flea treatment source, high level detections in urban only catchments were first detected in 2016. However, the finding of widespread Fipronil pollution at an average level of 0.0043 µg/L (higher than the Acute EQS) in 2014, combined with evidence of harm to aquatic life at comparable levels in scientific studies published in 2014 should have triggered concern and regulatory action to understand the source. This could have identified the aquatic risk presented by flea treatments.

Similarly pharmacovigilance cases of honeybees being impacted by Fipronil flea treatments in 2014-16 should have triggered further regulatory action by the VMD.

Data on Fipronil and Imidacloprid in waterbodies was also gathered in Scotland, Wales and Northern Ireland, but perhaps not until 2016, and with fewer samples and a lower pet density identifying the risk would have been more challenging outside England.

It was not until 2017 that a UK NGO managed to acquire UK water monitoring data from the European Commission, having been unable to acquire it in the UK, and identified pollution of Imidacloprid in streams, rivers and lochs with no agricultural inputs, at which point the alarm was raised about risks to aquatic life from flea treatments. This is not, as it was characterised at the time by EA staff, a success for open data and public involvement in environmental surveillance, but was an abject failure of the environmental regulators to adequately consider

the implications of the data they were gathering and hence to identify and investigate a serious environmental risk.

Furthermore the four environment agencies have failed to add any of the other commonly used flea treatment chemicals to their monitoring or horizon scanning programmes, despite clear evidence that they present a pollution risk to the environment. They have also failed to adopt or establish and apply EQSs for Fipronil and Imidacloprid in a timely manner. Meanwhile monitoring frequency of invertebrates and chemicals in waterbodies has declined making it harder to discern recent trends.

The Environment Agency's core funding for environmental protection has fallen from £152 m in 2010–11 to £130 m in 2024-25, a 43% reduction in real terms, and real-terms funding for SEPA has fallen by roughly 26% between 2010–11 and 2023–24, based on independent budget analysis ([The Ferret 2023](#)). Given these large reductions to the biggest environment agencies it is unsurprising that UK environmental vigilance has declined.

Following the identification of flea treatment pollution in waterbodies the VMD commissioned independent scientific research in 2019. This research confirmed and further illuminated the scale and pathways of Fipronil and Imidacloprid flea treatment pollution in the UK. The VMD were closely informed of progress with the studies, and were aware of the draft findings, the first paper from the research was published in 2021 and confirmed the widespread presence of very high levels of Imidacloprid and Fipronil in UK waterbodies and recommended a regulatory “re-evaluation of the environmental risks associated with the use of companion animal parasiticide products” but VMD chose to wait until after the last paper from the research was published in April 2025 before announcing the next steps (the July 2025 Roadmap), which only commit to a long-term contemplation of a possible regulatory review of the risks.

There has been:

- no significant changes to restrictions on product labels,
- no requirement of additional environmental information to assess new applications for flea treatment authorisations,
- no review of the authorisation reports,
- no revocation or suspension of products,
- no change to prescription status of the products.

Beyond the specific case of Fipronil and Imidacloprid, other critical examples of VMD operations that raise significant environmental concerns include:

1. Sheep dips and pour-ons

Issue: Chemicals used in Sheep dips that are known to be highly toxic to aquatic life and soil invertebrates. Cypermethrin Sheep dip chemicals, approved in 1999, caused around one third of all freshwater Environmental Quality Standards (EQS) failures between 2000 and 2003, causing ecological destruction in over 1,000 miles of river ([Buglife](#)). One of the main pathways for Cypermethrin to pollute water courses is the washing of raw wool and woollen clothing.

Concerns:

- Although the VMD suspended Sheep dip use in 2006 on ministerial instruction the authorisations were not revoked and eventually in 2010 the manufacturers withdrew the products, although action was too late for the Small Grey Sedge caddisfly (*Glossosoma intermedium*) a species of Principle Importance which occurred in Lake District National Park streams until impacted by sheep dip and is now nationally extinct ([Wallace 2011](#)). However, the VMD did not review authorisations for the use of Cypermethrin sheep pour-ons and in 2017 over 13,000 kg were still being used ([EA 2019](#)). In 2016 10% of freshwater sites and 50% of saline sites were failing their chronic Cypermethrin EQSs, some by 12-16 times the EQS. Cypermethrin use in UK arable farming has sharply declined—from 24,000kg in 2016 to 4,180 kg in 2022, but levels in rivers increased between 2021 and 2024 and pour-ons pose the highest risk to the environment ([EA 2025](#)). Seventeen Cypermethrin veterinary products remain authorised in 2026, but since 2017 the VMD have kept sales secret.
- In 2014 the VMD included a Phase 2 environmental risk assessment for the Cypermethrin product 'Fly Off 12.5 mg/ml Pour-on Solution for Sheep' ([VMD 2015](#)). The risk assessment considered the impact of a single use on Large Water Fleas (*Daphnia magna*) and dung fauna. The assessment used PNECs, although in this case with protective assessment factors included for the *Daphnia* data. The predicted water concentration was at the level where 50% of the waterfleas would be killed. Despite reducing predicted environmental levels by 54% (I think on the basis that only 46% of the product was found to be excreted by the animals), averaging the pollution over 7 days and modelling the pollution in a range of scenarios, the assessment still predicted harm to streams. The amount in dung was forecast to be 1,143 times higher than the level that would kill 50% of dung beetles. In addition, the assessment predicted groundwater pollution of 0.007 µg/L. The VMD approved the product with the recommendation for the following advice to be put on the label "Cypermethrin is extremely toxic to aquatic and dung organisms. As a precautionary measure sheep must be kept away from watercourses for at least 12 hours following treatment." and "Given the risks to the environment the use of the product should be limited to one treatment per year per pasture". This provides no protection to dung organisms which will be seriously impacted by a single use (and limited protection for aquatic life as Cypermethrin on sheep can cause river pollution events at least four weeks after treatment ([Ramwell et al. 2009](#))). It does not appear that the VMD has required any monitoring of use to establish if the 'precautionary' measures are being applied or to measure environmental residues, and no studies to detect if the harm predicted in the risk assessment is occurring. The product remains on the market despite real world data showing that Cypermethrin in pour-ons is polluting watercourses. Currently rivers in all regions of England except the Thames region are experiencing exceedances of invertebrate mortality endpoints for Cypermethrin, Anglian, Midland and North-east are most polluted with exceedances in 38%, 50% and 44% of water samples respectively ([Poyntz-Wright and Tyler 2025](#)).
- VMD still authorises Diazinon (Dimpylate) Sheep dips, despite it being banned as an agricultural pesticide and evidence that its use as a flea treatment can poison birds of prey ([VMD 2018](#)). In 2025 the NRW had to ban the disposal of Sheep dip to land due to high levels of detection in the Wye, this looks like a failure to prevent pollution at source. Currently rivers in all regions of England are experiencing exceedances of invertebrate mortality endpoints for Diazinon, in 59% to 99% of water samples ([Poyntz-Wright and Tyler 2025](#)).

2. Anthelmintics (wormers)

Issue: For decades it has been known that chemicals used in wormers are highly toxic to invertebrate life, soil fauna, and dung inhabitants. They have been associated with devastating impacts on wildlife including reducing beetle populations ([Verdu et al. 2018](#), [Finch et al. 2020](#)) fly populations ([Boxall et al. 2007](#)) and with causing the decline of dung fauna feeding bird species such as the Chough (*Pyrrhocorax pyrrhocorax*) ([Jonsson et al. 2020](#)). Wormers, and in particular Ivermectin are implicated in widespread declines in insect populations that scientists predict will have profound implications for life on earth ([Cardoso et al. 2020](#)). Ivermectin has been identified as a significant risk to aquatic ecosystems ([Lorente et al. 2023](#)). Nature conservation charities have banned or restricted use of some or all anthelmintics on their land for 30 years ([Gilbert et al. 2019](#), [BBC 1999](#)) (although in practice livestock movement often makes these measures less than fully effective).

Concerns:

- Despite the publication of many scientific papers identifying environmental damage from wormers and their existence being raised with VMD there appears to have been no regulatory action to reduce environmental pollution, even the most heavily implicated chemical, Ivermectin, still has dozens of approved veterinary medicine products.
- There have been environmental risk assessments undertaken, such as this [2022](#) assessment of Maximec 5mg/ml Pour-On Solution for Cattle. The risk assessment included a dung fauna study that only lasted 28 days at the end of which levels in the dung were still 160 times higher than the predicted no effect level for flies and 6 times higher for beetles. Despite the study failing to determine how long it would take for residues to decline to safe levels, the risk assessment concluded that there would be probable impacts on dung fauna for circa one month. The VMD approved the product using the 'logic' that "surrounding fields will help maintain population levels". Which does not appear to take into account the fact that insects do not spontaneously generate, if there are treated cow pats in the other fields they will not be re-supplying the dung fauna. Furthermore many dung inhabiting species are only active as adults for a short period, so a month out of the calendar has the potential to cause cumulative year on year population reductions and to result in local extinctions. Indeed the assumption in chemical pollution regulation that depleted populations of invertebrates can be replenished from surrounding reservoirs has been questioned by the European Academies Science Advisory Council who pointed out that "This may be a false assumption - not only because such reservoirs simply do not exist for many intensive agricultural landscapes, but because the decline in arthropods has been shown to be widespread and extending to protected areas" ([EASAC 2025](#)). Nor does the risk assessment consider knock on environmental impacts for birds, bats, or soil health.
- In this case rather than relying on long-term scientific studies and published papers the VMD commissioned a short-term study and then found some highly dubious reasoning to enable an environmentally damaging product to be authorised. This represents a profound failure of environmental regulation.

3. Post-marketing surveillance (pharmacovigilance)

Issue: The VMD's primary tool for monitoring a medicine after it is authorised is "pharmacovigilance," which relies on people reporting adverse effects. The failure of the market authorisation holders to submit any of the data available on the environmental harm caused by flea treatments ([WildFish 2025](#)) illustrates how badly the current system is failing.

Concerns:

- This system is designed for human and animal health, not for the environment. A river's invertebrate population cannot "report" an adverse event to the VMD. Environment events reported to the VMD in 2014-16 were disclosed ([VMD 2016](#), [VMD 2017](#), [VMD 2018](#)). However, there were no reports of high levels of medicines in water, soil, air or other environmental locations, and no reports of ecosystem damage. All 'environmental' reports in those years were associated with impacts on mammals, birds, or Honeybees, and mostly domestic animals rather than wild animals. Even when poisoning of wild birds and Honeybees by veterinary medicines is reported there does not appear to be any VMD follow up action.
- Despite the clear failure of the pharmacovigilance to produce environmental data, the VMD does not commission its own independent, long-term environmental monitoring, instead relying on the environment agencies to "identify and act upon any emerging issues" ([VMD 2025](#)) after the damage has already occurred, rather than requiring such data from authorisation holders.
- Unlike other environmental regulators, the VMD has no statutory requirement for routine surveillance of drug residues in the environment. The VMD's residues surveillance programme, only covers residues in animal products, not in the environment. This creates a "blind spot" where the VMD claims a lack of evidence for environmental harm while simultaneously failing to look for it.
- In 2025, the online reporting portal for medicine concerns was out of action for many months. This hindered the ability of the public and professionals to flag safety or environmental issues during a critical period of regulatory debate to the concern of professionals in the sector ([Loeb 2025](#)).

4. Environmental priorities obscured by "unnecessary burden" concerns

Issue: Effective environmental regulation requires a long-term view, and the expert consideration of a wide range of complex and technical ecological, toxicological, and physiochemical factors. There will be cases where proper assessment of environmental risks will require long-term studies, additional data requests and review by experts.

Concerns:

- An over focus of regulatory process and speed of turn-around of applications risks incomplete risk assessments and decisions.
- The VMD reports monthly against a set of standards derived from its priorities ([VMD 2024](#)). None of the standards relate to environmental outcomes, the standards are almost exclusively focussed of ensuring the fast turn-around of authorisation applications and other services to the producers and suppliers of veterinary medicines. This focus on process rather than outcomes risks sacrificing the protection of the public and the environment to provide a service to industry,

particularly when the VMD is struggling to meet some of the process targets ([VMD 2024](#)) and VMD staff report a “lack of time to complete routine work” ([VMD board minutes 2024](#)). While the VMD can ‘stop the clock’ on its authorisation process targets to request additional information, or to refer an issue to experts, do staff have the time and clear direction that supports them in doing so?

- In September 2025, the VMD called for evidence relating to the regulation of veterinary medicines under the Medicines and Medical Devices Act 2021 and VMR 2013 ([VMD 2025](#)). The primary focus of this review is "whether the current legislation effectively protects animal and public health while avoiding unnecessary regulatory burden". From an environmental law perspective, reducing regulatory burden conflicts with the Precautionary Principle and the Habitats Regulations, which require rigorous evidence before a chemical can be deemed safe for use. Environmental protection was not mentioned in the press release and environmental experts and bodies were not identified in the stakeholder list.

5. Unnecessary Secrecy and Transparency Issues

Issue: Environmental regulatory decisions must be open and participatory because; it is legally required by the EIR (2004); it is necessary to comply with the Aarhus Convention (1998); it enables the engagement and scrutiny of a wide range of experts, improving scientific accuracy; it guards against regulatory capture and institutional bias; it respects the public’s stake in shared environmental goods; it produces more resilient and defensible decisions; and it is often the only way to prevent irreversible harm.

Concern:

- The VMD operates with a level of opacity that hinders public engagement and regulatory accountability.
- Papers considered by the VMD’s Veterinary Products Committee ([VPC](#)) meetings are all confidential and the minutes are thin in relation to regulatory decisions, with product and active ingredient names routinely excluded.
- The public is not notified when VMD receives a product authorisation application, or when a regulatory change is being considered, and is only notified after final decisions have been taken.
- Significant portions of the reports on new authorisation applications and environmental studies are not made publicly available. Summaries of the environmental impact assessment in the report are often cursory and cannot be cross examined. This prevents external ecological experts from verifying the environmental data and rationale used to underpin authorisation decisions.
- Although the VMD routinely makes product sales data available for antimicrobials, due to human health concerns, it makes no sales data available on substances that present an environmental risk. This means that scientists, NGOs and the public do not know which substances are being commonly used and are unable to make links between observed environmental concentrations or impacts and the potential source of the problem. Even when EIR requests are made the VMD has failed to make flea treatment sales information available for environmental purposes because it is ‘incomplete’ ([Brown et al. 2025](#)) – Elanco should be commended for making their Imidacloprid sales data available voluntarily. In 2025 Wild Fish has reported the VMD to the Information Commissioner for failing to provide data in response to an EIA request ([WildFish 2025](#)).

- Environmental regulators, including Defra, EA, NE, SEPA and NRW, publish their responses to FoI/EIR information requests online and maintain them for many years (over 20 years in the case of SEPA), in stark contrast the VMD appears to only publish responses for six months, after which point they are removed and replaced by list of the titles and numbers of each request. Environmental information disclosed in response to public requests can form an important part of the environmental information needed for public participation in decision making. They can become referenced documents and an important part of the environmental regulation history. It is not clear why the VMD quickly sweeps information requests under the carpet, but this makes it harder to access environmental information and results in the VMD having to deal with repeated requests for the same information and requests for previous responses to be released again!
- Furthermore, adverse environmental events reported to VMD through their pharmacovigilance programme used to be summarised in an annual report ([VMD 2016](#), [VMD 2017](#), [VMD 2018](#)), but no information on the environmental events reported appears to have been made available relating to the last decade ([VMD](#)). This contributes to ensuring that independent experts and the public are kept in the dark about any emerging environmental risks relating to veterinary medicines.
- The VMD remains silent on the steps it takes to deliver its competent authority duty under the Habitats Regulations.
- The Competition and Markets Authority is currently undertaking a market investigation into veterinary services ([CMA 2024](#)), this was prompted primarily by concerns that consumers may not be given enough information to enable them to choose the right treatment for their needs. The public has a strong appetite for information about the comparative environmental risks of different flea treatments, 98% of vets are concerned about the impact of flea treatments on wildlife ([BVA 2021](#)) and 94% of Dog owners say that protecting nature would be an important consideration when selecting flea treatment products ([Yoder et al. 2024](#)); but the lack of information available to them frustrates their efforts to protect their own environment.
- It does not appear that over the last 22 years VMD has made significant progress to comply with its EIR duty to progressively make available information relevant to environmental emissions.

6. Perceived Closeness to the Regulated Industry

Issue: In situations where a regulator and the industry they regulate share a restricted pool of Human expertise, where the number of regulatory staff and the resources available to them are small compared to the number of industry employees and their resources, and where they work closely together on regulatory processes that are out of the public eye, there is a high risk that the relationship becomes unhealthy close. Without sufficient distance between the regulator and the regulated, shared priorities can dominate and external influence on ethical positions and decisions can be side-lined. In environmental regulation cultural capture is usually more prevalent than material capture ([Chen and Xu 2025](#)), and the interpretation of scientific evidence is probably the area with greatest vulnerability ([Saltelli et al. 2022](#)).

Experts whose careers, research funding and professional networks, are closely tied to pharmaceutical development may—consciously or unconsciously—be more inclined to;

accept standard regulatory assumptions, treat environmental harm as “acceptable risk”, and focus on mitigation rather than exclusion or non-authorisation. This requires no bad faith — it is a structural bias issue, well recognised in regulatory science. The EU pesticide regulator EFSA has strict rules that exclude anyone with a conflict of interest from appointment to any of its expert committees.

Concerns:

- The VMD does not appear to have taken any steps to mitigate the risk of regulatory capture, beyond the standard application of the Nolan Principles of Public Life and the Government’s Code of Practice for Scientific Advisory Committees. Nor are there any measures in place to stop the revolving door whereby regulators become the regulated.
- Under the Veterinary Medicines (Amendment) Regulations 2024, the VMD removed the requirement for Marketing Authorisations to be renewed every five years. They are now valid indefinitely, which significantly reduces the opportunities for the regulator to reassess older chemicals (like Fipronil) against modern, more stringent environmental standards.
- VMD’s approach to the regulation of Zinc oxide on Pigs appears to be focussed only on maintaining, and now restoring, use, not on stopping ecologically harmful water pollution levels (see detail in ‘Application of the Veterinary Medicines Regulations 2013’).
- There is concern among independent veterinary experts that the profession is "in the grip of the pharmaceutical industry" ([Tarr 2025](#)). Furthermore there is concern that the VMD is particularly vulnerable to industry influence due to its funding model ([Sustainable Food Trust 2013](#)). In 2024/5 the VMD received £12.75 million from the pharmaceutical industry in fees and charges; 38% of the VMD’s income ([VMD 2025](#)). This is exceptionally high for an environmental regulator, most only receive 5-10% of their income from those they are regulating.
- It is also exceptional for a national environmental regulator to attempt to completely delegate the shaping of its regulatory assessments to a committee managed and financially supported by the industry they are regulating.
- There is no record of the VMD ever refusing an application for, or revoking, the marketing approval of, a flea treatment, insecticidal pour-on or dip, or antihelmethic product.
- The VMD’s Veterinary Products Committee has 18 members half of whom are vets, the remainder are all members of associated industries (e.g. farming, parasite control, disease control and pharmaceuticals) there is one toxicologist and one environmental scientist, but they both have declared links to the veterinary medicine industry ([WildFish 2026](#)).
- The VMD's structure and recent policy statements suggest a "regulatory capture" where the interests of veterinary practices, livestock producers and pharmaceutical companies are prioritised over the public and environmental protection.

These six examples depict VMD as a regulator that is strongly inclined to facilitate the veterinary medicine market, that takes Human health and domesticated animal welfare seriously, but that routinely fails to protect the environment. As a result veterinary medicines are a source of systemic environmental risk, and are contributing to widespread biodiversity damage, including the 59% decline in flying insect numbers observed in the UK between 2021 and 2025 ([KWT and Buglife 2025](#)).

While outside the remit of this review to consider the regulation of other veterinary medicines in detail, it appears that the failure of the VMD to produce an appropriate regulatory response to the flea treatment pollution crisis is not an isolated incident. Instead, it reflects a broader pattern of regulatory inertia and a failure to integrate modern environmental values, standards and knowledge into the veterinary medicine decision-making framework.

The VMD received a government grant-in-aid of £11.8m in 2010–11 and £17.6m in 2023–24, representing a real terms increase in funding of 8%. However, in 2010 a significant burden of veterinary medicine regulation was carried by the European Medicines Agency which has an annual budget of £575m to regulate Human and animal medicines. Since Brexit the VMD has had to take on a significant proportion of the work previously undertaken by the EMA, although there is a question as to whether the same quality of regulation has been maintained. The consequential increase in application volumes and complexity of work related to parallel submissions and aligned labelling in NI resulted in VMD performance figures falling below minimum standards in 2024/25 ([VMD 2024](#), [VMD 2025](#)).

It is not possible to exclude concerns that environmental regulation of veterinary medicines is unfit for purpose, but it is beyond the reach of an independent review to conclude if this failure is due to cultural/institutional bias, a lack of competency, a lack of resources, or a combination of all three (which seems likely). There may also be shortcomings in the regulatory measures available to the VMD, but, as it does not appear to be using currently available environmental regulations, this seems less likely to be the primary problem.

Due to the growing number of unresolved environmental impacts from veterinary medicines and grave questions about the competency and commitment of the regulator to take environmental risks seriously, there is a need to review the environmental regulation activity of the VMD. This could be undertaken by the Office for Environmental Protection with support from the Environmental Standards Scotland and Future Generations Commissioner.

Options for reform, restructure and resources should be considered, this might range from improved resources and reporting for the VMD, to transferring authority on the assessment and management of environmental risk of veterinary medicines to agencies that have greater ecological competence and resources (which with regard to water quality issues might sit well with the recommendations of the Independent Water Commission: review of the water sector ([2025](#))).

APPENDICES

Appendix 1: Environmental Standards Explained

A confusing array of statistics are applied in different contexts and using different data to set levels of environmental concentrations of chemicals that may be acceptable or unacceptable. Here is a little explainer of the main statistics used in relation to Fipronil and Imidacloprid in water.

In this review I have, wherever possible, converted all the units of measurement to micrograms per litre ($\mu\text{g/L}$) or micrograms per kilogram ($\mu\text{g/kg}$) to enable easy comparison of data. A microgram is one thousandth of a milligram, and a milligram is one thousandth of a gram. Another way of expressing $1 \mu\text{g/L}$ or $1 \mu\text{g/kg}$ would be 1 part per billion (ppb).

EQS standards – these standards are calculated from data gathered in studies. They are integral to the delivery of the Water Framework Directive, which includes a list of priority substances. Countries must monitor priority substance levels in surface waters. The Environmental Quality Standards Directive (EQSD) sets out how EQSs are established and these must be met to achieve good surface water chemical status in accordance with Water Framework Directive. The UK has retained pre-existing EQSs, but has not updated the list of priority substances since Brexit.

There are several different types of EQS. The Acute and Chronic EQSs are the most universally applied and relate to concentrations in the water. For bioaccumulating substances an EQS_{biota} can be developed for concentrations in living organisms and an EQS_{sediments} can be developed if the chemical concentrates in sediments in water bodies.

The acute or Maximum Allowable Concentration EQS (**MAC-EQS**) is intended to provide protection against short-term exposure peaks, that may last hours of a few days. Peaks over this level normally result in a Water Framework Directive fail for the waterbody. Sometimes QS is used rather than EQS and the term is followed by subscript descriptors, for example MAC-QS_{sw,eco} is a Maximum Allowable Concentration Quality Standard for saline waters that protects ecology. Also sometimes neither QS or EQS are used, to indicate that the figure is not yet statutorily accepted.

Chronic or Average Annual EQSs (**AA-EQS**) are intended to provide protection against prolonged exposure, weeks or months. If the annual average level in a waterbody is over this level it results in a Water Framework Directive fail for the waterbody.

There are three routes to determining an EQS. Firstly, the assessment factor (AF) method is based on laboratory studies on the effects of the chemical on three or more test species. Secondly, the species sensitivity distribution (SSD) method, which models the sensitivity of species and is based on at least 10 studies of different species. Thirdly, the effect concentration (EC) method which is based on studies on micro- and mesocosm studies (model ecosystems) – the latter is the best approach but is expensive and there is rarely suitable data available.

Once the initial calculations have been done to determine the levels at which damage may occur a buffer factor called an Assessment Factor is applied. The calculated level is divided by the Assessment Factor (AF) to provide the EQS, this creates a safety margin for the environment based on the probability that the environmental sensitivity may be higher than that calculated from limited data (for instance some species are likely to be more sensitive than those studied). Depending on levels of certainty and taxa used the factor for an Acute EQS can be 10, 50, 100, or 1000, lower factors can be applied when the SSD or mesocosm methods are used. For chronic EQS the default AF is 100, but this can be reduced to ten in certain circumstances. More on EQSs [here](#).

Predicted No Effect Concentration (PNEC) - is a value used in risk assessments under REACH (general chemical regulation) and Biocidal Products Regulation to represent a concentration below which an effect on the environment is not expected. Despite different terminology, PNECs are derived according to the same methods and principles as EQSs. A PNEC should be comparable to a Chronic EQSs (AA-EQS) and a PNEC_{intermittent} comparable to an Acute EQS (MAC-EQS), although in practice there can be a difference between the figures. PNECs can be calculated for different circumstances, such as freshwater, marine, soil and sediment. However, care is needed when interpreting results that use PNEC levels, as in some cases the PNEC may relate to a specific effect and/or species, rather than all effects for all species studied.

Regulatory Acceptable Concentrations (RAC) – these are a tool for use in pesticide regulation, by setting an RAC the regulator can assess if particular pesticide uses are likely to result in a predicted environmental concentration (PEC) that would exceed environmental limits, below which no unacceptable adverse effects on aquatic organisms are expected. The methodology for calculation is similar to an EQS, but RACs allow for greater harm to be caused to algae and invertebrates because of a belief that temporary damage to populations is acceptable. RACs can allow for 50% damage to populations of affected species, while EQSs draw the line at 10%.

EQS, PNEC and RAC are the three main regulatory standards applied in the EU/UK. These different standards answer different regulatory questions. EQSs ask whether water bodies are protected for ecosystem health; RACs ask whether a particular use of a product is ‘acceptable’; PNECs ask whether a specific risk can be excluded under defined assumptions. Confusion arises when standards designed for one purpose are used to justify decisions in another and using a RAC or PNEC to judge water-body protection can substantially underestimate ecological risk.

Field-Based Acceptable Concentration – (AC_{field}) this is a new method for calculating the level of a chemical that causes harm to aquatic invertebrate populations in the field. Calculating it requires a lot of field data and this has only been done for 22 chemicals, derived on the basis of field observations by [Liess et al. \(2021\)](#). This threshold aims for 95% of streams to support largely intact invertebrate communities in terms of the invertebrate-based indicator SPEAR_{pesticides} (see below). In contrast to the EQS or RAC, this threshold incorporates other environmental stresses present in the field that interact with pesticide toxicity. This measure is used in academic papers but has not yet been adopted by regulators. It is more protective of invertebrate ecology than EQSs or RACs ([Vormeier 2023](#)).

There are other standards that may be referred to in studies. These are based on alternative calculations that represent environmental sensitivities, but unlike the three regulatory

standards these levels usually contain no safety margin – the effects observed have occurred at the specified concentration.

Protection Concentration 95% (PC₉₅) this is a standard water quality parameter in Australia and New Zealand. It is based on the Species Sensitivity Distribution model that is also used in the calculation of some EQSs. It models the point at which 95% of the species in an ecosystem are unaffected by a pollutant, this is referred to as **HC₅**, sometimes the **PC₉₅** is the **HC₅**. Because 5% of species can be impacted, some potentially seriously, this is one of the least protective standards. Regulators may therefore apply additional safety factors before adopting a final standard. **PC_{99s}**, which protect 99% of species and other values also exist. The PCxx relevant in a particular situation is adopted as the default guideline value (**DGV**) for the waterbody. More [here](#).

Lowest Observed Effect Concentration (LOEC) – as it suggests this is the lowest concentration of a chemical which produced an effect significantly different from a control. While it sounds as if this level might be safe, it is only as good as the data used, if based on mortality rates it tells you nothing about reproduction effects for instance. The size of the samples and the level of effect tested are not pre-set, low sample sizes and big effect steps can result in significant underestimations of the risk, or unclear consequences if the risk is realised. LOECs are not used as environmental standards, but can be used to inform them.

No Observable Effect Concentration (NOEC) – this is the highest concentration of a chemical which did not produce an effect that was significantly different from a control. This has most of the same risks of statistical and effect magnitude crudeness as a set out under LOEC. In practice the magnitude of the studied biological effect that chemicals at the NOEC typically cause is 10 to 30% ([Warne and van Dam 2008](#)), i.e. there are usually significant effects at the NOEC! Despite the bad reputation of NOEC figures they are still widely used in chemical regulation and can be the only ecological data available.

Chronic Invertebrate Benchmark (CIB) is a regulatory guideline threshold in the USA. The U.S. EPA usually calculates this using the lowest **NOAEC** (No Observed Adverse Effects Concentration) or an EC₅₀ from a life-cycle test, and sometimes a location-specific assessment factor (LOC) of 1, to set the benchmark, essentially making the benchmark equal to that lowest NOAEC. SSD methods can also be applied to calculate a CIB.

Lethal Dose 50% (LD₅₀) this is the dose at which 50% of the group of organisms ingesting the chemical would be expected to die. It is statistically derived from an experimental study. Similarly **LD₁₀** is the lethal dose predicted to kill 10% of the organism. This statistic is less common in this context as it is generally used for vertebrates that can be fed chemicals (not easy with fish or mayflies!). As with the metrics covered below this is a statistic to inform environmental standards, rather than an environmental standard in itself.

Lethal Concentration 50% (LC₅₀) this is the dose at which 50% of the group of organisms exposed to the chemical would be expected to die. It is a statistically calculated from experimental studies that are usually done over four or fewer days, so this does not measure long term mortality caused by effects that do not cause death in a short time frame. In some cases very small sample numbers are used which means the results are likely to miss effects, this is particularly an issue when calculating lower effect levels such as **LC₁₀**. Water concentrations (and hence LC_{50s}) are the usual way to test the short-term sensitivity of aquatic organisms.

Effective dose 50% (ED₅₀) or effective concentration 50% (EC₅₀) these terms can be used for measuring any effect, including non-lethal effects, for instance the concentration at which 50% of shrimps stop swimming. There are also a plethora of other similar terms that are used to specify the particular effect – for example Lethal Time **LT₅₀** = time taken for 50% to die, and Knock Down **KD₅₀** = dose required to make 50% of organisms become motionless.

In addition there are a number of metrics specifically developed to appraise pesticide toxicity to life.

Species at Risk – Pesticides (SPEAR_{pesticides}) – this is a metric based on the presence or absence in a water body of species and families of invertebrate that are sensitive to pesticide pollution. It is not a statutory metric, but is widely accepted and used, including as a tool to use alongside Water Framework Directive ecological monitoring and can be used to establish if a water body meets the required ‘good’ status. More on this [here](#).

Maximum Toxicity Units (TU_{max}) – is used to identify which chemical dominates toxicity when there is a mixture of chemicals in the water. Pesticide Toxicity Index (PTI) scores for each chemical in a system are used to calculate Toxicity Units, the pesticide that makes the single largest (maximum) contribution is called TU_{max} ([Liess et al. \(2021\)](#))

Likely Effect Benchmarks (LEB) define a pesticide concentration in whole sediment above which there is a high probability of adverse effects on benthic invertebrates, while Threshold Effect Benchmarks (**TEB**) define a concentration below which adverse effects are unlikely.

Calculated Environmental Standards for Fipronils and Imidacloprid

[Tierbach et al. 2021](#) and [here](#)

Swiss Fipronil EQS 2021

Chronic CQC (AA-EQS): 0.00077 µg/L

Acute AQC (MAC-EQS): 0.0032 µg/L

[EU 2025](#)

Water Framework Directive EQS for inland freshwaters, draft revised list of priority substances.

Imidacloprid - inland waters Chronic (AA-EQS): 0.0068 µg/L

Imidacloprid - inland waters Acute (MAC-EQS): 0.057 µg/L

[Liess et al. 2021](#)

AC_{field} Values

Fipronil 0.000097 µg/L

Imidacloprid 0.0035 µg/L

EU Commission 2000

Water Framework Directive EQS for inland freshwaters.

Imidacloprid AA-EQS 0.007 µg/L MAC-EQS 0.057 µg/L

[JRC 2018](#)

Imidacloprid proposed PNEC – 0.009 µg/L updated PNEC – 0.0083 µg/L

[SCHEER 2021](#)

Recommended EQSs for Imidacloprid.

From a deterministic procedure using Coquette Flat-headed Mayfly (*Epeorus longimanus*). toxicity data

MAC-QS_{fw,eco} = 0.065 µg L⁻¹,

MAC-QS_{sw,eco} = 0.0065 µg L⁻¹.

From a deterministic procedure using Angler's Curse mayfly (*Caenis horaria*) toxicity data

AA-QS_{fw,eco} = 0.0024 µg L⁻¹,

AA-QS_{sw,eco} = 0.00024 µg L⁻¹

From a probabilistic procedure using an aquatic insect SSD curve

MAC_{fw,eco} = 0.057 µg L⁻¹,

MAC_{sw,eco} = 0.0057 µg L⁻¹.

AA_{fw,eco} = 0.0068 µg L⁻¹,

AA_{sw,eco} = 0.00068 µg L⁻¹,

[Queensland 2018](#)

Proposed 95% species protection level for Imidacloprid 0.11 µg/L

[Tennekes 2018](#)

An environmental quality standard (EQS) for Fipronil in Dutch surface water has been set at 0.0007 µg/L.

Bower and Tjeerdema 2017

Fipronil metabolite EQSs

Fipronil sulphone

Acute toxicity EQS 0.0013 µg/L

Chronic toxicity EQS 0.00017 µg/L

Fipronil sulphide

Acute toxicity EQS 0.00062 µg/L

Chronic toxicity EQS 0.00014 µg/L

Bower, J. C. and Tjeerdema, R. S. (2017) Water and Sediment Quality Criteria Report for Fipronil. Final Report. Report prepared by the University of California Davis for the Central Valley Regional Water Quality Control Board.

[Nowell et al.2016](#)

Development and application of freshwater sediment-toxicity benchmarks for currently used pesticides.

Fipronil	0.1 LEB 0 µg/L	0.01 TEB 0 µg/L
Fipronil desulphinyl	17 LEB 0 µg/L	1.7 TEB 0 µg/L
Fipronil sulphide	0.92 LEB 0 µg/L	0.06 TEB 0 µg/L
Fipronil sulphone	0.26 LEB 0 µg/L	0.026 TEB 0 µg/L

[Perkins et al. 2024](#)

PNECs of 0.0121 µg/L for Fipronil and 0.0048 µg/L for Imidacloprid (ECHA, 2011; ECHA, 2015), blue lines indicate PNECs of 0.00077 µg/L for Fipronil and 0.013 µg/L for Imidacloprid (NORMAN, 2023)

[Australian Government 2023](#)

Toxicant default guideline values for aquatic ecosystem protection - Fipronil in freshwater
Australian Government Technical brief July 2023

The default guideline values (DGVs) for 99, 95, 90 and 80% species protection are 0.013 µg/L, **0.018 µg/L**, 0.022 µg/L and 0.029 µg/L, respectively. The 95% species protection level for Fipronil is recommended for adoption in the assessment of slightly-to-moderately disturbed ecosystems.

[Schmidt et al 2022](#)

Calculated new HC5 value of 0.017 µg/L for Imidacloprid

[Moeris et al. 2021](#)

Calculated EQSs for **saline water**. Acute toxicity testing revealed that immobilization is a more sensitive endpoint than mortality, with a 96-h median effect concentration (EC50) value of 25 µg/L for Imidacloprid. In addition, the larval development tests resulted in a 7-d no-observed-effect concentration (NOECs) of 4.2 µg/L for Imidacloprid. The derived saltwater **annual average (AA-)EQS was 0.002 µg/L for Imidacloprid.**

[Liu et al. 2023](#)

Recommended short-term water quality criterion (SWQC) and long-term criterion (LWQC) in 21 **seawater** were derived as **0.8 µg/L and 0.056 µg/L, for Imidacloprid.**

Appendix 2: VMD Data on Flea Treatment Sales

[REDACTED]

From: [REDACTED]
Sent: 18 July 2022 11:20
To: [REDACTED]
Subject: Official Sensitive: Response to Freedom of Information Request AT10802

Dear [REDACTED]

Thank you for your e-mail of 29 June 2022.

We are dealing with it under the Freedom of Information Act (FOIA) 2000.

Your request

The available annual sales data for fipronil, imidacloprid, fluralaner, selamectin, flumethrin, afoxolaner and spinosad used in companion animals since 1994 in the UK.

Our reply

Please find below the available UK sales data for products containing fipronil, imidacloprid, fluralaner, selamectin, flumethrin, afoxolaner and spinosad. Sales data from highlighted years are not complete due to differences in the companies reporting schedule for the Periodic Safety Update Reports from where sales figures are obtained. The figures are derived from data which are not subject to independent verification and the VMD does not guarantee their accuracy.

Fipronil sales in kg:

Year	Pipettes (kg)	sprays (kg)
1995		129.55
1996		277.34
1997	225.85	340.24
1998	696.80	308.48
1999	795.01	155.37
2000	825.80	155.37
2001	949.30	155.37
2002	1231.48	155.37
2003	1235.26	155.37
2004	1152.14	134.86
2005	1338.84	91.87
2006	1207.78	80.02
2007	1335.06	66.80
2008	1305.28	56.37
2009	1398.16	51.81
2010	1412.71	42.80
2011	1705.13	38.75
2012	2051.22	36.00
2013	1850.14	34.29
2014	1651.49	30.08
2015	1541.77	25.69

2016	1633.36	22.34
2017	1563.80	20.16
2018	1243.89	19.27
2019	1025.65	13.25
2020	775.17	13.83
2021	31.86	

Imidacloprid sales in kg:

Year	pipettes (kg)	collars (kg)
1997	103.03	
1998	429.07	
1999	481.06	
2000	501.54	
2001	180.39	
2002	539.46	
2003	588.55	
2004	89.32	
2005	130.28	
2006	279.36	
2007	453.10	
2008	563.10	
2009	1045.35	
2010	1291.39	
2011	1598.70	
2012	2017.25	162.60
2013	2299.55	211.41
2014	2893.56	344.24
2015	3433.98	510.02
2016	3660.65	582.62
2017	3408.76	761.05
2018	2821.79	872.27
2019	1479.63	8.73
2020	730.63	
2021	606.59	

Fluralaner sales in kg of active substance:

Year	tablets	pipettes
2014	194.43	
2015	551.16	
2016	820.24	37.26
2017	1399.01	132.13
2018	1287.61	227.44
2019	1666.80	357.29

2020	198.46	94.56
------	--------	-------

Selamectin sales in kg of active substance:

Year	pipettes (kg)
2007	200.31
2008	185.77
2009	16.40
2010	15.42
2011	105.91
2012	22.23
2013	19.33
2014	27.28
2015	90.73
2016	252.13
2017	186.05
2018	222.47
2019	247.08
2020	187.30
2021	86.83

Spinosad sales in kg of active substance:

Year	Dogs and cats - tablets
2011	138.95
2012	277.21
2013	465.57
2014	606.44
2015	456.64
2016	280.99
2017	278.21
2018	176.52
2019	78.61
2020	16.19

Afoxolaner sales in kg of active substance:

Year	Dogs - tablets
2014	45.74
2015	100.75
2016	239.64
2017	237.79
2018	205.18
2019	167.42
2020	41.41
2021	40.03
2022	0.32

Flumethrin sales in kg of active substance:

Year	Dogs and cats - collars
2012	75.30
2013	93.04
2014	154.93
2015	229.55
2016	262.22
2017	342.53
2018	392.58
2019	304.61
2020	366.97
2021	310.26
2022	16.71

Information releasable to the public

In keeping with the spirit and effect of the FOIA and the government's Transparency Agenda, we may place this request on GOV.UK, in due course. We will not place information identifying you on the GOV.UK website.

Copyright

The information supplied to you continues to be protected by copyright. You are free to use it for your own purposes, including for private study and non-commercial research, and for any other purpose authorised by an exception in current copyright law. Documents (except photographs) can be also used in the UK without requiring permission for the purposes of news reporting. Any other re-use, for example commercial publication, would require the permission of the copyright holder.

Most documents produced by Defra will be protected by Crown Copyright. Most Crown copyright information can be re-used under the Open Government Licence. For information about the OGL and about re-using Crown Copyright information please see The National Archives website.

Copyright in other documents may rest with a third party. For information about obtaining permission from a third party see the Intellectual Property Office's website.

Our Service

If you are unhappy with the service you have received in relation to your request and wish to make a complaint, you may request an internal review within two calendar months of the date of this e-mail. If you would like to request an internal review, please write to Mike Griffiths at the VMD via postmaster@vmd.gov.uk. If you are not content with the outcome of the internal review you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at:

Information Commissioner's Office
 Wycliffe House
 Water Lane
 Wilmslow
 Cheshire
 SK9 5AF

Kind regards,




 Veterinary
 Medicines
 Directorate



Appendix 3: Case Law Relevant to Application of the UK Habitats Regulations

Assessment of Nitrogen Use as Plan or Project in the Netherlands

EUCJ joined cases C-293/17 and C-294/17.
[Preliminary judgment](#) of 7 November 2018

While about nitrogen use rather than veterinary medicines, this case clearly established that diffuse pollution inputs, that are likely to cause ecological harm to Natura 2000 sites and that change over time and space, must be treated by the authorities as plans/projects and must be assessed against the strict protection required by the Habitats Directive. The EUCJ provided responses to questions posed by three councils following challenges to their agricultural permitting decisions by a number of NGOs.

The case has started to transform how member states (and the UK) approach the issue of nitrogen pollution on Natura 2000 sites, with a much more rigorous approach to protecting sites starting to prevail.

The following quotes from the judgement are self-explanatory, and below is the conclusion of a published scientific paper that considered the implications of the judgment, including with regard to pesticide regulation.

“162 Natura 2000 sites in the Netherlands, face a problem of excessive nitrogen deposition, for which the principal national source of emissions is agriculture.”

“the decisive criterion for establishing whether a new project requires an appropriate assessment of its implications to be carried out is whether there is a possibility that that project will have a significant effect on a protected site.”

“where there is no continuity and, inter alia, the location and the conditions in which it carried out are not the same, the recurring activity of applying fertilisers on the surface of land or below its surface cannot be classified as one and the same project for the purposes of Article 6(3) of the Habitats Directive.”

“an activity complies with Article 6(2) of the Habitats Directive only if it is guaranteed that it will not cause any disturbance likely significantly to affect the objectives of that directive, particularly its conservation objectives. The very existence of a probability or risk that an activity on a protected site might cause significant disturbances is capable of constituting an infringement of that provision”

A programmatic Appropriate Assessment only fulfils the HD requirements “only in so far as a thorough and in-depth examination of the scientific soundness of that assessment makes it possible to ensure that there is no reasonable scientific doubt as to the absence of adverse effects of each plan or project on the integrity of the site concerned, which it is for the national court to ascertain.”

“The Court has held that, where a Member State introduces an authorisation scheme, under which there is no provision for a risk assessment depending inter

alia on the characteristics and specific environmental conditions of the site concerned, that Member State must show that the provisions which it has adopted enable it to be excluded, on the basis of objective information, that any plan or project subject to that authorisation scheme will have a significant effect on a Natura 2000 site, whether individually or in combination with other plans or projects.”

“The option of generally exempting certain activities, in accordance with the rules in force, from the need for an assessment of their implications for the site concerned is not such as to guarantee that those activities do not adversely affect the integrity of the protected site. Thus, Article 6(3) of the Habitats Directive does not authorise a Member State to enact national legislation which allows the environmental impact assessment obligation for certain types of plans or projects to benefit from a general waiver”

“the Habitats Directive must be interpreted as precluding national programmatic legislation, such as that at issue in the main proceedings, which allows a certain category of projects, in the present case the application of fertilisers on the surface of land or below its surface and the grazing of cattle, to be implemented without being subject to a permit requirement and, accordingly, to an individualised appropriate assessment of its implications for the sites concerned, unless the objective circumstances make it possible to rule out with certainty any possibility that those projects, individually or in combination with other projects, may significantly affect those sites, which it is for the referring court to ascertain.”

[Möckel \(2022\)](#) concluded the following implications for pesticide regulation as a result of this and previous cases:

“The ECJ decision of 7 November 2018 has far-reaching legal and practical implications for agricultural and forestry land-use in the EU. In practice, a large number of agricultural and forestry land-uses and management measures within and in the vicinity of Natura 2000-sites require an official screening and, if necessary, a full appropriate assessment under Article 6(3) HD and are only permitted if significant effects can be excluded. All agricultural and forestry measures in and in the vicinity of Natura 2000-sites are subject to the reservation of examination and prohibition, if their application has changed since 1992 or is being implemented for the first time and, according to general experience, is likely to prejudice the conservation objectives of the Habitats Directive (e.g. by dint of the use of fertilisers and plant protection products, the conversion of permanent pastures and other near-natural or extensive areas, drainage measures).”

Assessment of Pesticide Use as Plan or Project in Germany

EUCJ case C-98/03,
[Judgment](#) of 10 January 2006

In 2006 Germany lost a case brought by the Commission against national legislation that excluded pesticides from assessment under the Habitats Directive. The court said:

“Since, under Paragraph 36 of the BNatSchG 2002, the authorisation of installations [equivalent term in domestic legislation to plan or project] causing emissions is refused only where they appear likely to affect a protected site situated in the area of impact particularly of those installations, installations whose emissions affect a protected site situated outside such an area may be authorised without taking account of the effects of those emissions on such a site.

In that connection, it must be held that the system established by German law, so far as it covers emissions within an area of impact, as defined in technical circulars in accordance with general criteria on installations, do not appear to be capable of ensuring compliance with Article 6(3) and (4) of the Directive.

In the absence of established scientific criteria, which have not been mentioned by the German Government, which would a priori rule out emissions affecting a protected site situated outside the area of impact of the installation concerned having a significant effect on that site, the system put in place by national law in the field in question is not, in any event, capable of ensuring that the projects or plans relating to installations causing emissions which affect protected sites situated outside their area of impact do not adversely affect the integrity of those sites, within the meaning of Article 6(3) of the Directive.

Accordingly, it must be held that Article 6(3) of the Directive has not been properly transposed”.

Appendix 4: Media Coverage

Dec 2017 [Guardian](#) English rivers polluted by powerful insecticides, first tests reveal.

January 2018 [Telegraph](#) - Pet flea treatment chemicals polluting Britain's streams and rivers.

January 2018 [Times](#) - Flea treatments are polluting rivers.

January 2018 [Environment Times](#) - British aquatic insects suffering from neonicotinoid insecticides too.

January 2018 [KentOnline](#) - Somerhill Stream near Tonbridge third most polluted in Environment Agency sampling.

Oct 2018 [BBC Countryfile Autumn Diaries](#) - some chemicals in flea treatments are polluting our rivers and affecting our wildlife.

Feb 2019 [Environment Analyst](#) - Banned insect killer in UK waterways.

Sept 2020 [Vet Record](#) – Are pet parasite products harming the environment more than we think?

Nov 2020 [Guardian](#) - Pet flea treatments poisoning rivers across England, scientists find.

Nov 2020 [Daily Mail](#) - Toxic pesticides used to treat cats and dogs for FLEAS are contaminating English rivers and harming aquatic life, study warns.

Nov 2020 [Science Daily](#) - Pesticides commonly used as flea treatments for pets are contaminating English rivers.

Nov 2020 [Times](#) - Flea treatments for pets 'harm river life' .

Feb 2022 [4-Legs-Good](#) - Worms Fleas and their treatments in the environment – it's worse than I thought

March 2023 [Times](#) - Pet flea treatments are polluting rivers, scientists warn.

March 2023 [Times](#) – Toxic Flea remedy – Letter.

April 2023 [VetHelpDirect](#) - Tick treatment and environmental contamination – what's the best way forwards?

Nov 2023 [ENDS](#) - Pet medicines polluting rivers with toxic insecticides.

Nov 2023 [VetTimes](#) - Pesticide cut 'not working', warns action campaign.

Nov 2023 [Independent](#) - Pet medicine chemicals banned in agriculture found in English rivers.

Feb 2024 [BBC](#) - New Forest warning over dog-flea chemicals in ponds.

Feb 2024 [Veterinary Ireland](#) - Cat and dog parasiticides and the environment.

Feb 2024 [Guardian](#) - Vets urged to cut pesticide flea treatments amid river pollution fears.

Feb 2024 [MRCVSONline](#) - Handwashing biggest contributor to pesticide pollution, study finds.

April 2024 [Newsweek](#) - Cat and Dog Flea Treatments Are Polluting Rivers.

May 2024 **The Garden** – Insecticides in pet fur.

Aug 2024 [Guardian](#) - Are some of your household products killing insects and wildlife?

Oct 2024 [ITV](#) - Hampstead Heath's aquatic wildlife at risk after flea treatment.

Oct 2024 [Times](#) - Dogs splashing on Hampstead Heath pollute ponds with flea drops.

Dec 2024 [Evening Standard](#) - Bee-killing pesticides found in 85% of English rivers – analysis.

Jan 2025 [Guardian](#) - Songbirds being killed by pesticides found in pet fur flea treatments.

Jan 2025 [Daily Express](#) - Owners of dogs and cats warned they may be killing garden birds.

Jan 2025 [Guardian](#) - Vets urged to cut back on flea treatments amid UK biodiversity fears.

Feb 2025 [Guardian](#) - Flea treatments are turning our pets into an environmental hazard – there has to be a better way.

Feb 2025 [Guardian](#) - How can you treat your pet for fleas without harming nature?

Feb 2025 **The Tablet** – A little spot of bother.

Feb 2025 [TheDirt](#) - Pet Flea Treatments Increasing Bird Mortality Rates.

Feb 2025 [Brighton Argus](#) - Toxic flea treatments found in nests of British songbirds.

Spring 2025 [Science in Parliament](#) - Tick and flea treatments A hidden chemical threat in our waterways.

March 2025 [Guardian](#) - Call for pets' toxic flea treatments to be tightly restricted in UK.

March 2025 [Manchester Evening News](#) - 'Avoid' warning issued to anyone with a cat or dog.

March 2025 [Forbes](#) - Pet Flea Treatments Are Poisoning Wild Birds, New Study Finds.

March 2025 [BBC](#) - MP raises pollution concerns over use of flea killer.

April 2025 [Independent](#) - Concern for wildlife as 100-fold increase in chemicals found in harbours.

April 2025 [BBC](#) - More than 100 chemicals polluting harbours – study.

April 2025 [C4](#) - Scientists discover pet flea toxic chemicals in every birds' nest they tested.

April 2025 [Times](#) - Flea treatments for pets found in more than half of water samples.

June 2025 [New Scientist](#) - Dogs pollute water with pesticides even weeks after flea treatment.

June 2025 [Guardian](#) – Wensum and Tone found to have high concentrations of chemicals that are toxic to aquatic life.

June 2025 [Fakenham and Wells Times](#) - Toxic anti-flea chemical found in river Wensum in Norwich.

July 2025 [EDP](#) - Broads Authority warns pet owners of harmful flea treatments.

July 2025 [Daily Express](#) - Busy pet owners claim free [Fipronil] flea treatment for dogs and cats as infestation number rises [!].

July 2025 [Radio Norfolk](#) – long piece about flea treatments and the Broads

July 2025 [West Australian](#) - Should we be worried about the impact of pet tick and flea treatments on wildlife.

Aug 2025 [BBC](#) - Broads warns of potential impact of flea treatments.

Aug 2025 [EDP](#) - Pollution warnings over dogs swimming in Norfolk rivers.

Aug 2025 [VetTimes](#) - IVC chief calls for parasiticide reform as working group launches.

Sept 2025 [Saga Magazine](#) - Save Our Songbirds

October 2025 [Apple News](#) - Scientists raise alarm over common yet 'deeply concerning' practice for pet owners: 'That doesn't sound healthy to me'

Nov 2025 [River Action](#) - Flea treatment – The silent river killer