ECP monthly water quality data report October 2024

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1. Overview

This report provides a synopsis of water quality in the Evenlode catchment for October 2024. Rainfall data and combined sewage overflows (CSOs) from sewage treatment works (STWs) are considered as the "inputs" or drivers of water quality in terms of contamination and available dilution. No data were available for specific pollution sources other than from STWs, but diffuse pollution for agriculture, road runoff, and outflows from septic tanks and other small sewage treatment facilities at household level also impact water quality in the Evenlode catchment.

Data from citizen science (CS) Freshwater Watch (FWW) surveys, Environment Agency (EA) water sampling, and near-continuous sonde measurements were used to develop this synopsis. Sonde data is presented for 02 October – 05 November to demonstrate the effects of high rainfall and storm overflow discharges on the sonde data. Freshwater Watch (FWW) surveying was carried out over the weekend of 18 - 21 October. All available EA data for October are presented. Riverfly results reported during October are also included. The data sources, determinands, and recording periods are summarised in **Table 1**.

2. Data sources and monitoring period

Table 1: Data types, sources, and monitoring periods

Data type	Data source	Start	End
Rainfall	Environment Agency	01/10/2024	31/10/2024
Combined Sewage Overflows	Thames Water	01/10/2024	31/10/2024
Nutrients	ECP FWW (citizen science)	18/10/2024	21/10/2024
Nutrients	Environment Agency	1/10/2024	31/10/2024
Various	ECP Proteus sondes	02/10/2024	05/11/2024
Riverfly	ECP citizen science	October 2024	

3. Rainfall data

Rainfall for October recorded at Worsham Mill and Chipping Norton is shown in **Figure 1**.

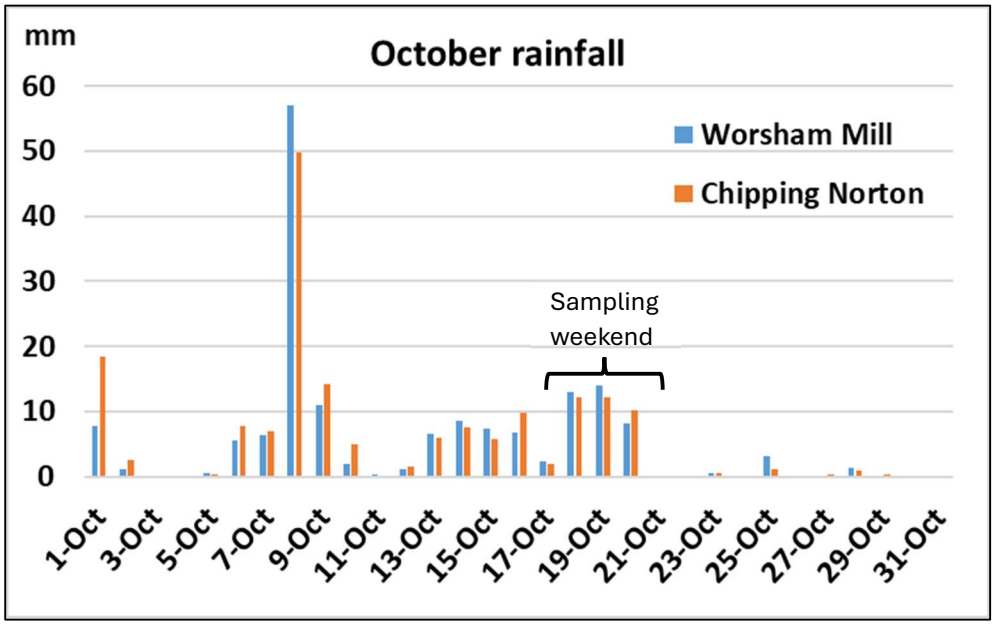

Figure 1: Rainfall at Worsham Mill and Chipping Norton 01/10/2024 –31/10/2024

The Met Office reported that September 2024 was the wettest calendar month that Oxfordshire had ever experienced in a series dating back to 1836. October was much drier, although on 8th October totals of 50 mm and 57 mm were recorded at Worsham Mill and Chipping Norton respectively. 32 mm and 33 mm of rain fell in the week preceding FWW sampling at Worsham Mill and Chipping Norton respectively, with 35 mm recorded at both stations over the sampling weekend. 81 % of citizen scientists reported high flows, while 22% reported average flows.

4. Combined sewage overflow data

The hours that CSOs were discharged from STWs into the River Evenlode and its tributaries are shown in **Figure 2**.

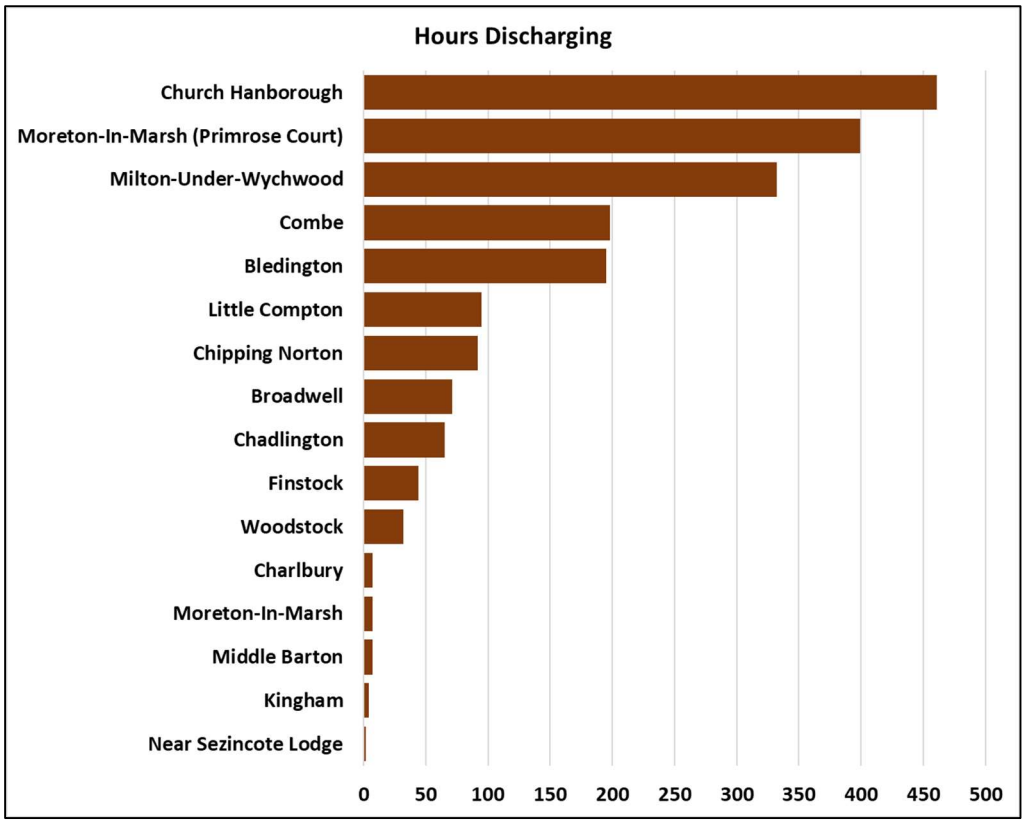

Figure 2: Combined sewage overflows 01/10/2024 – 31/10/2024

The nine STWs at the top of the table had all been discharging since the heavy rainfall on the 22nd September, indicating a prolonged impact on their receiving watercourses even though the high relatively high flows offered dilution. Note that there are 720 hours in October, meaning that the top five STWs in **Figure 2** were discharging approximately a third to half of the available time.

5. FWW and EA monitoring

38 FWW surveys were taken by 59 participants in October. The EA monitored 17 sites in the Evenlode catchment between 1 - 31 October. Nitrate as N, and orthophosphate reactive as P analysed by the EA are comparable with the N and P concentrations measured by citizen scientists using the FWW test kits, and with P monitored by the four Proteus sondes installed in the Blue/Chipping Norton, Littlestock, and Four Shires Brooks.

Figure 3 shows the spatial distribution of FWW surveys that recorded poor (46%), moderate (35%), and good (19%) water quality throughout the catchment for October, with the percentage

of each represented by the inset pie chart. Water quality is derived from a combination of nitrate, phosphate, and turbidity values, as well as other observations, including of algae and of sewage fungus.

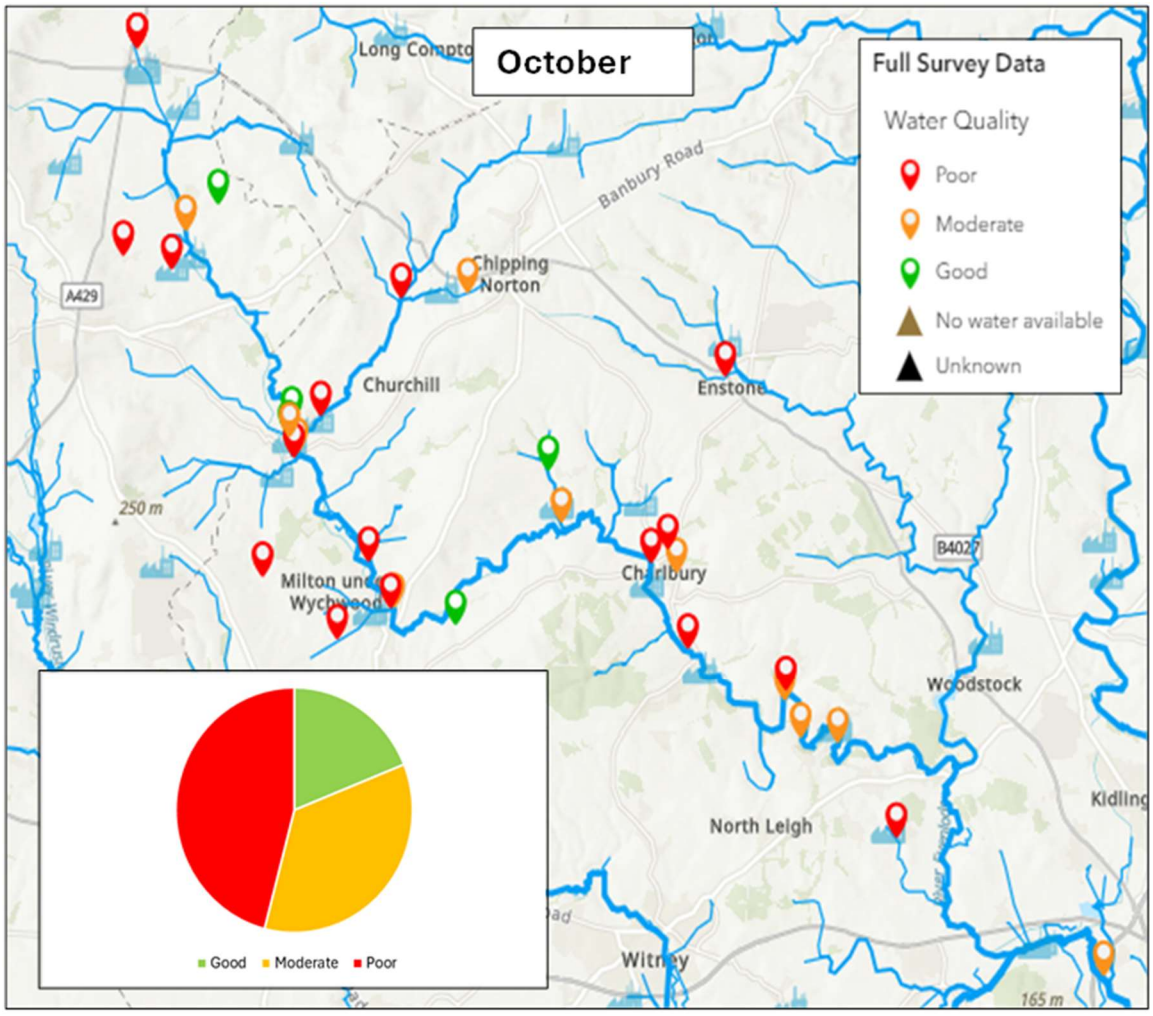

Figure 3: FWW full survey data (18 – 21 October)

Nutrient concentrations

Figure 4 shows the distribution of FWW and EA nitrate concentrations throughout the catchment. The inset pie chart indicates the percentage of FWW surveys that showed good (32%), moderate (34%) and poor (34%) nitrate concentrations. Together with the graph in **Figure 5** this shows that the percentage of samples with N> 2.0 mg/L fell from September levels, whilst approximately one third of samples showed acceptable nitrate concentrations. This indicates an overall improvement in nitrate concentrations, perhaps due to dilution from high rainfall.

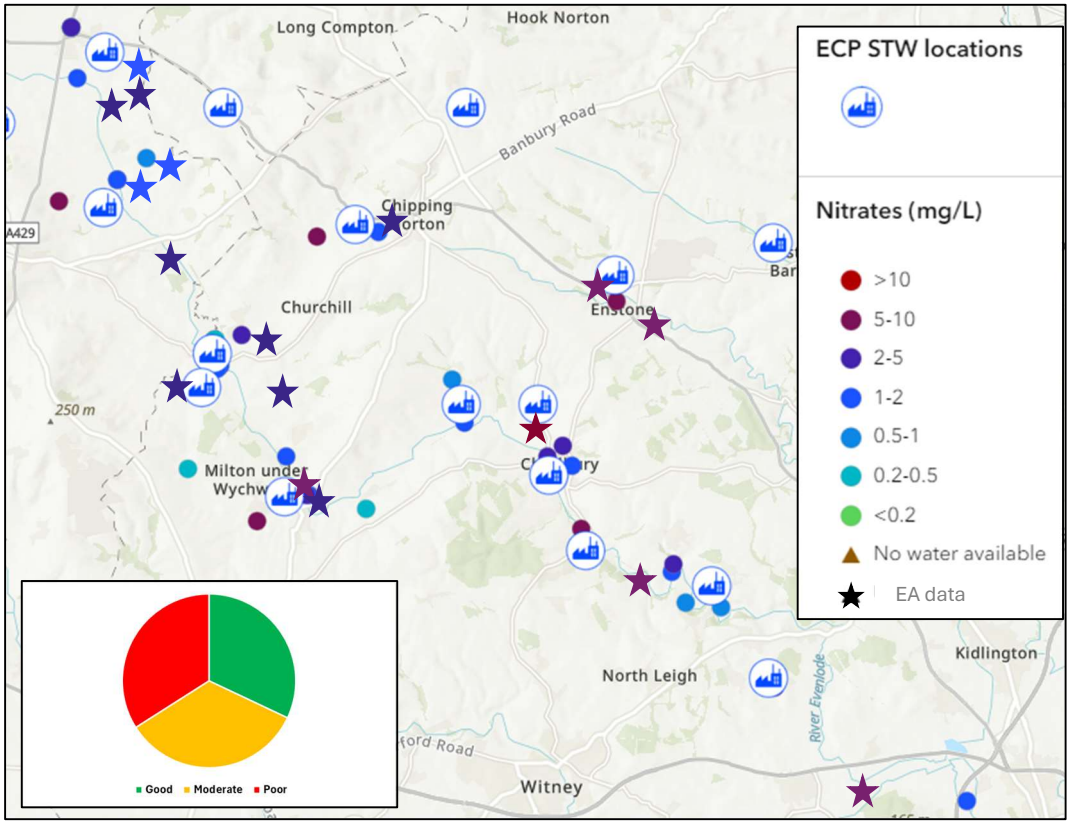

Figure 4: FWW (18 – 21 October) and EA (01 – 31 October) nitrate concentrations

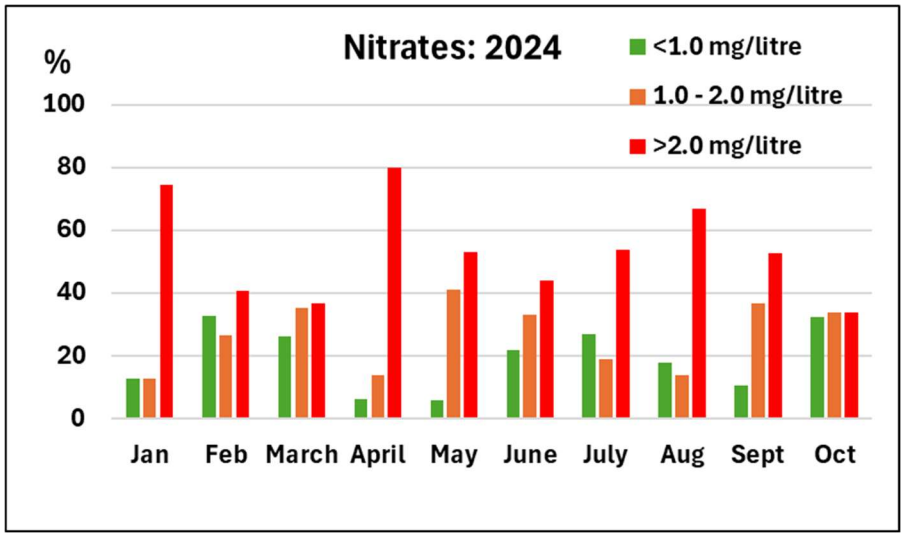

Figure 5: FWW nitrate concentrations January – October 2024

Figure 6 shows the distribution of FWW and EA phosphate concentrations. The inset pie chart indicates the percentage of FWW samples that showed low (87%), moderate (8%) and high (5%) P concentrations, which together with the graph in **Figure 7** shows that, like nitrates, phosphate concentrations decreased markedly in October. It is likely that dilution, due to the preceding period of high rainfall, is responsible for this improvement, given the high number of hours that STWs such as Church Hanborough, Primrose Court and Milton-under-Wychwood overflowed during this period. There is good agreement between the FWW and EA P concentrations.

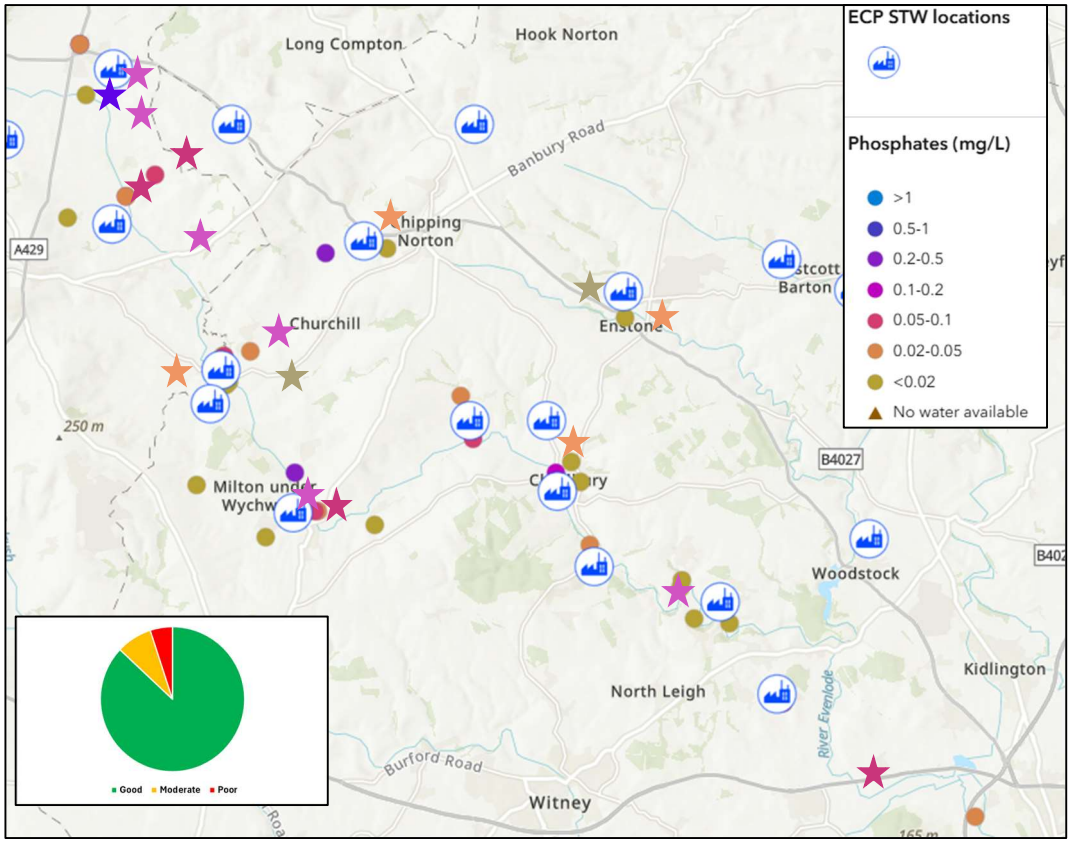

Figure 6: FWW (17 – 21 October) and EA (01 – 31 October) phosphate concentrations

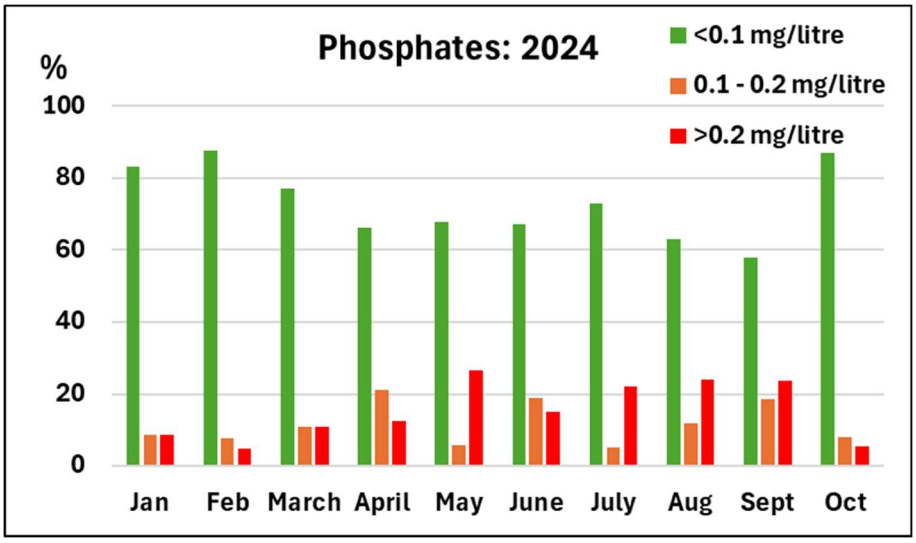

Figure 7: FWW phosphate concentrations January – October 2024

6. Riverfly data

Twelve Riverfly sites were surveyed in October (seven in the Evenlode catchment, three on the Dorn and one on the Glyme. No trigger levels were breached (**Figure 8**).

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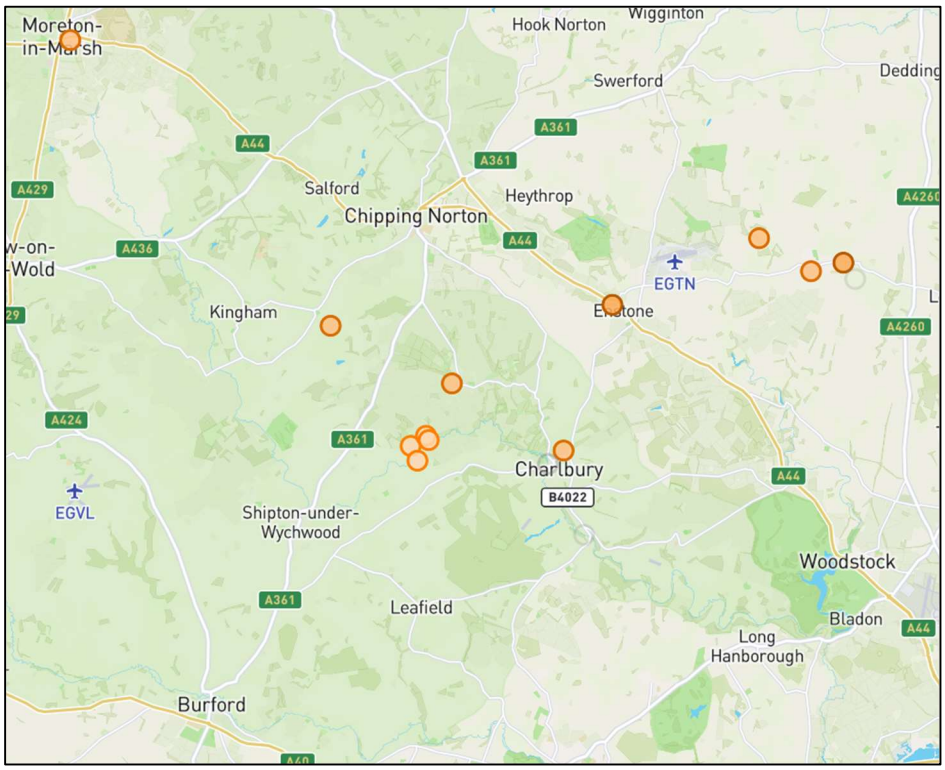

Figure 8: Riverfly surveys in the Evenlode catchment in October 2024

7. The Chipping Norton Brook (Also known as the Blue Brook)

Combined sewage outflows

Chipping Norton STW released Storm Overflow Discharges for 92 hours in October (Figure 2), mainly before the sampling weekend, adding to the 173 hours associated with the rainfall event that began on September 22nd.

FWW data

FWW data was collected for the Blue Brook between 13 - 16 October.:

- U/S of the Chipping Norton STW:
  - N = 1 – 2 mg/L, moderate,
  - P = < 0.02 mg/ L, low/good
- D/S of the Chipping Norton STW
  - N = 5 – 10 mg/ L, high/poor
  - P = 0.2 – 0.5 mg/L, high/poor

As shown in **Figure 3**, in combination these nutrient concentrations indicated moderate and poor water quality, respectively.

EA data

The EA sampled the Blue Brook above Chipping Norton STW:

- N = 2-5 mg/L (high/poor)
- P = 0.02 – 0.05 (low/good)

In combination these nutrient concentrations indicated poor water quality upstream of the Chipping Norton STW.

Sonde data

One Proteus sondes is installed on the Blue Brook, downstream of the Chipping Norton STW. It malfunctioned and went offline on 15/10/2024. The sonde formerly located downstream of the wetland was moved to the Four Shires Brook downstream of Morton-in-Marsh STW in August.

P recorded by the Proteus sonde installed D/S of the STW for the period 01 - 15 October averaged 1.00 mg/L, i.e., 0.5 - 1 mg/L, high/poor, which was higher than the concentration recorded by FWW.

8. Littlestock Brook

Combined sewage overflows

Milton-under-Wychwood STW released raw sewage into the Littlestock Brook for 332 hours in October, i.e., in addition to the 188 hours that it discharged in late September. The discharges occurred almost continuously, apart form a gap between the 3rd and the 8th October.

FWW and EA N data

Table 2 summarises the N and P concentrations and classifications, and the resulting water quality classes for samples taken from watercourses up-and downstream of the Milton-under-Wychwood STW..

Table 2: FWW and EA Nand P sampling results around Milton-under-Wychwood STW

Data source	Location	N (mg/L)	Class
FWW	Evenlode U/S of confluence	1-2	Moderate
FWW	The Liffs U/S of STW,	5-10	High/poor
FWW	Littlestock Brook D/S of STW	2-5	High/poor
EA (04/10/2024)	Littlestock Brook D/S of STW	5-10	High/poor
EA (02/10/2024)	Evenlode D/S of confluence	2-5	High/poor

Moderate to high N concentrations were found at all the sites summarised in **Table 2**, whilst P concentrations were low to moderate. This may be due to inflow of N from surrounding agricultural land during the high antecedent rainfall events.

Sonde data

Two Proteus sondes are installed on the Littlestock Brook.

The sondes measure and derive several determinands including Biological Oxygen Demand (BOD), phosphorus, tryptophan, turbidity, chromophoric dissolved organic matter (CDOM), conductivity, and dissolved oxygen (DO).

BOD indicates the impact that decaying matter would have on dissolved oxygen levels in the water course. High BOD may indicate eutrophication, due to excess nutrients.

Phosphorus is comparable with the EA and FWW data, with a strong correlation to sewage discharges at the sonde locations.

Tryptophan is an amino acid, indicative of organic contamination and microbial activity. Sewage discharge is the dominant source at these locations.

Turbidity indicates the total suspended solids present, which may be linked to rainfall and river flow, or to the introduction of solid matter, or to algae.

CDOM is the light-absorbing part of organic matter. It does not specifically measure sewage, but at the sonde locations, there is a strong correlation between CDOM and the sewage discharges.

Conductivity indicates the amount of dissolved solids and inorganic content present. These are present naturally in freshwater bodies, due to the subsurface movement of water through rocks and soils. However, high levels of dissolved solids are indicative of pollution sources such as discharge from STWs.

Dissolved Oxygen (DO) is present in freshwater from atmospheric absorption and as a byproduct of photosynthesis. Low DO is (i.e. < 4 mg/L) can be lethal to fish, and is negatively impacted elevated water temperature and decaying organic matter which may be elevated downstream of STWs.

BOD, CDOM, phosphorus, tryptophan, conductivity and DO data from the sondes up- and downstream of the Milton under Wychwood STW are shown in **Figure 9** and **Figure 10** respectively. The axes values and line colours are the same for both graphs.

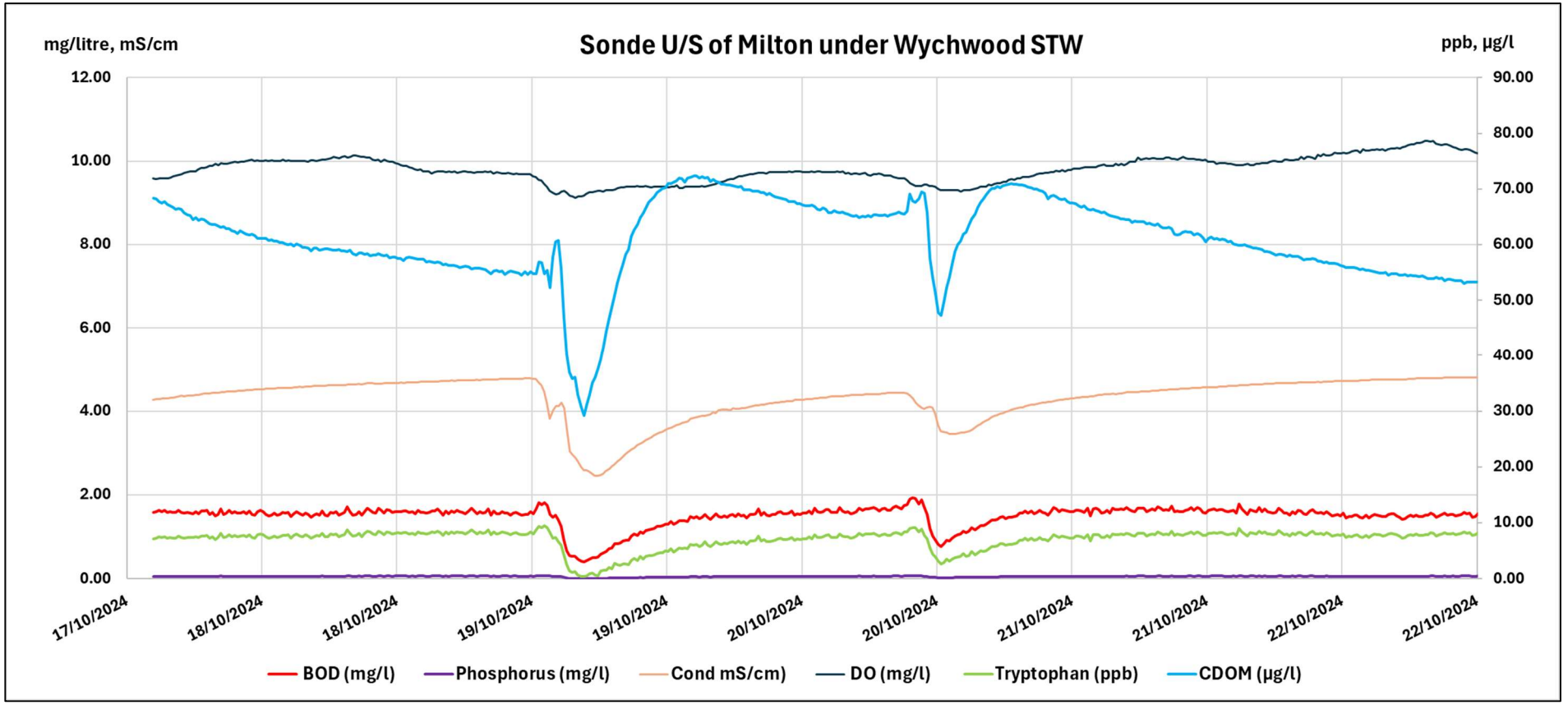

Figure 9: BOD, phosphorus, conductivity, DO, tryptophan, and CDOM for the Littlestock Brook at Heath Farm, upstream of Milton-under-Wychwood STW 17 – 22 October

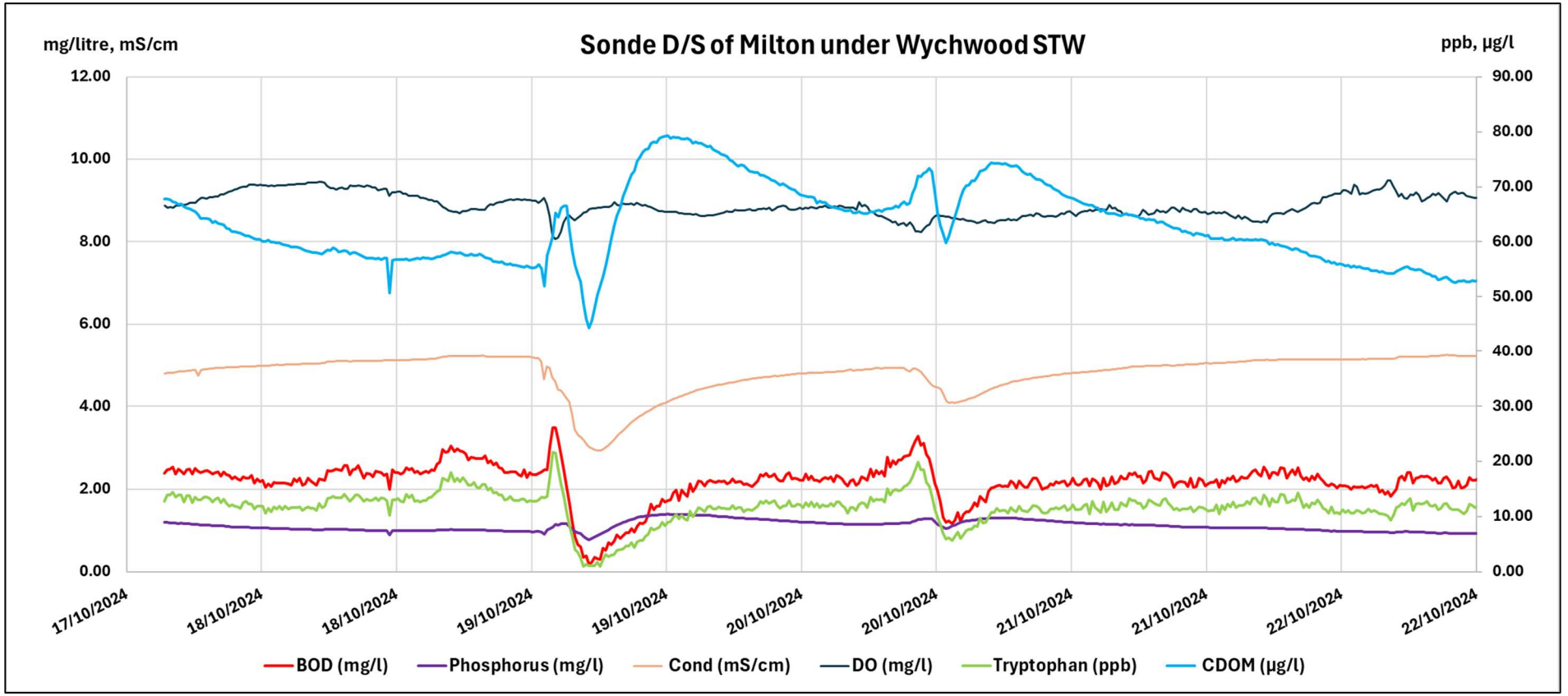

Figure 10: BOD, phosphorus, conductivity, DO, tryptophan, and CDOM for the Littlestock Brook at Littlestock House, 17 – 22 October

The two graphs are remarkably similar with little influence from the STW seen in the downstream pattern, perhaps due to the high water levels at this time. However, as seen in **Table 3**, all values except DO are elevated.

Table 3: Average sonde data values for the Littlestock Brook up- and downstream of the Milton under Wychwood STW for 18 - 23 October

Site	BOD (mg/l)	P (mg/l)	CDOM (µg/l)	Tryptophan (ppb)	Conductivity (mS/cm)	DO (mg/l)
U/S STW	1.50	0.05	60.88	7.10	4.32	9.80
D/S STW	2.17	1.11	62.91	11.71	4.81	8.88

Table 4 compares P concentrations up- and downstream of Milton-under-Wychwood STW from all available sources. The results from different sources seem quite consistent except for the ECP sonde downstream of the STW which recorded a much higher average concentration for the period 17 – 22 October than the spot samples taken by FWW and EA.

Table 4: P concentrations U/S and D/S of Milton-under-Wychwood STW

Data source	Location	P (mg/L)	Class	Water quality
FWW	Evenlode U/S of confluence	0.02-0.05	Low/good	Moderate*
FWW	The Liffs U/S of STW	<0.02	Low/good	Poor*
ECP sonde	U/S of STW	0.05-1	Low/good	Good
FWW	Littlestock Brook D/S of STW	0.05-0.1	Low/good	Poor*
ECP sonde	D/S of STW	> 1.0	High/poor	Poor
EA (04/10/2024)	Littlestock Brook D/S of STW	0.1–0.2	Moderate	Poor*
EA (02/10/2024)	Evenlode D/S of confluence	0.05-0.1	Low/good	Poor*

* In combination with N concentrations

9. The Four Shires Brook

The sonde previously located downstream of the Cornwell wetland on the Blue Brook was relocated to the Four Shires Brook downstream of the outlet of the Moreton-in-Marsh STW in mid-August.

Combined sewage overflows

Moreton-in-Marsh STW discharged untreated sewage for only 7 hours, on the 19th October.

FWW and EA data

Table 5 summarises the N and P concentrations and classifications, and the resulting water quality classes for samples taken from watercourses up-and downstream of the Moreton-in-Marsh STW.

Table 5: FWW and EA Nand P sampling results around Moreton-in-Marsh STW

Data source	Location	N (mg/L)	Class	P (mg/L)	Class	Water quality
EA (15/10/2024)	Fire College stream, U/S	1-2	Moderate	0.1-0.2	Moderate	Moderate
FWW (22/10/2024)	4 Shires Brook2, D/S	2-5	Moderate	<0.02	Low/good	Moderate
EA (17/10/2024)	4 Shires Brook, D/S	2-5	High/poor	0.2-0.5	High/poor	Poor

Sonde data

Figure 11 shows BOD, phosphorus, conductivity, DO, turbidity, tryptophan, and CDOM data from the sonde downstream of the Moreton-in-Marsh STW.

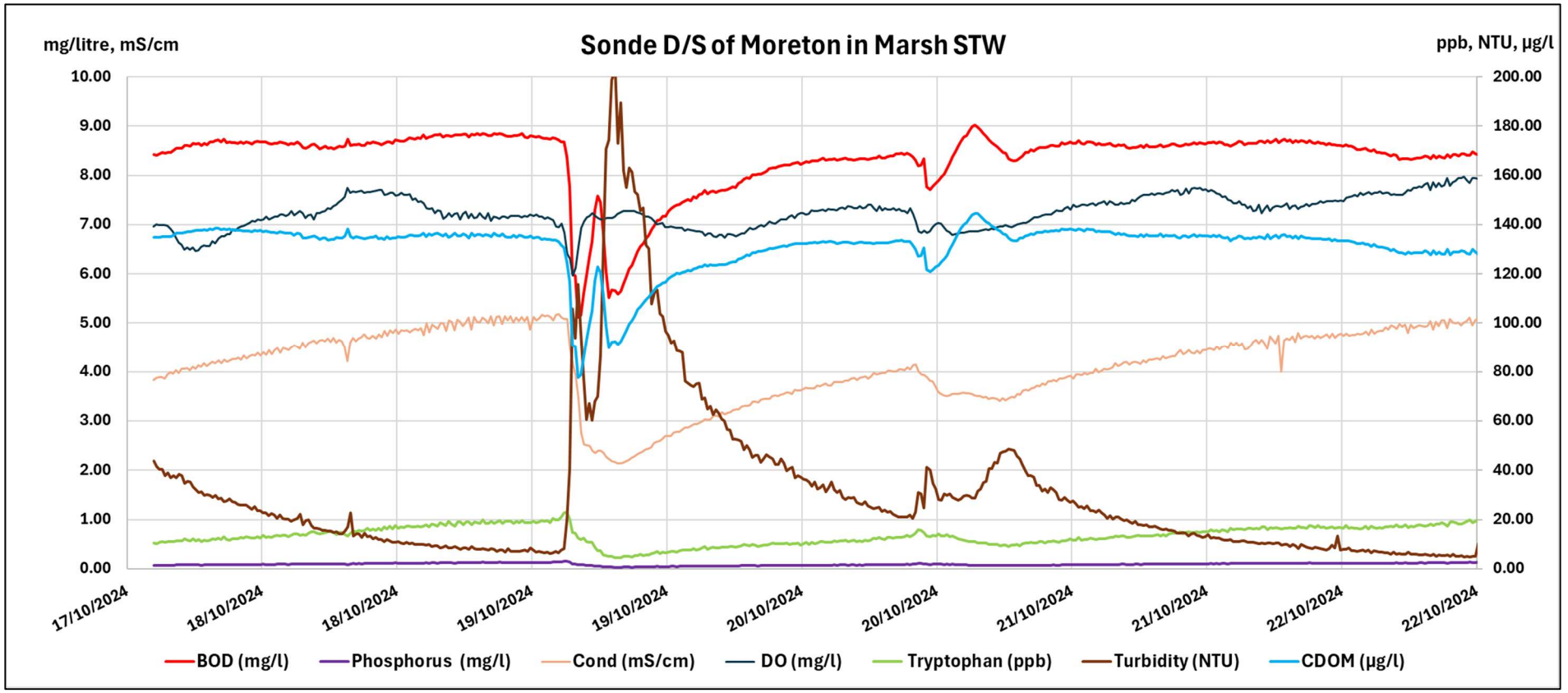

Figure 11: BOD, phosphorus, conductivity, DO, tryptophan, turbidity, and CDOM for the Four Shires Brook downstream of Moreton-in-Marsh STW 17 - 22 October 2024

As with Milton-under-Wychwood, the typical twice daily signature normally associated with data recorded downstream of a STW is absent in this graph, perhaps due to high water levels following the high rainfall of the preceding 6 weeks. It is interesting to note, however, that BOD and CDOM values are far higher for Four Shires Brook than for the Littlestock Brook. These two determinands are indicative of the organic matter typically associated with sewage. The averages are compared in **Table 6**.

Table 6: Comparison of average values from U/S and D/S Milton-under-Wychwood STW, and D/S Moreton in Marsh STW

Site	BOD (mg/l)	P (mg/l)	CDOM (µg/l)	Tryptophan (ppb)	Conductivity (mS/cm)	DO (mg/l)
U/S MuW STW	1.50	0.05	60.88	7.10	4.32	9.80
D/S MuW STW	2.17	1.11	62.91	11.71	4.81	8.88
D/S MiM	8.34	0.09	131.23	13.66	4.16	7.26

10. Summary

Water quality in the Evenlode catchment improved in October, with nutrient concentrations recorded by FWW and supported by EA data the lowest so far in 2024. **However, there was no reduction in the supply of nutrients to watercourses in the Evenlode catchment**, with some STWs discharging raw sewage for a third to half of the month. The lower concentrations were not due to any beneficial change in STW operating procedures or to improvements/upgrades to SWT infrastructure, but were the result of dilution because of the catchment experiencing the wettest September/October since Met Office records began.