

ECP monthly water quality data report May 2024



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Contents

1. Overview	1
2. Data sources and monitoring period	1
3. Rainfall data	1
4. Combined sewage overflow data	2
5. FWW monitoring	2
Nutrient concentrations	3
6. Environment Agency data	6
EA and FWW nitrate and phosphate concentrations.....	8
7. Riverfly data.....	9
8. The Chipping Norton Brook (also known as the Blue Brook).....	9
Combined sewage outflows	9
EA and FWW data	9
Sonde data	9
9. Littlestock Brook.....	13
Combined sewage overflows.....	13
EA and FWW data.....	13
Sonde data	13
10. Summary.....	16

1. Overview

This report provides a synopsis of water quality in the Evenlode catchment for May 2024. Rainfall data and combined sewage overflows (CSOs) from sewage treatment works (STWs) are considered 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, as well as 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 was used to develop this synopsis. Sonde data is presented for 15 – 22 May, i.e., covering the weekend when citizen science (CS) Freshwater Watch (FWW) surveying was carried out (17 - 20 May). All Environment Agency (EA) data available for May are presented. Riverfly results reported during May 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	01/05/2024	31/05/2024
Combined Sewage Overflows	Thames Water	01/05/2024	31/05/2024
Nutrients	ECP FWW (citizen science)	17/05/2024	20/05/2024
Nutrients	Environment Agency	14/05/2024	29/05/2024
Biological oxygen demand	ECP Proteus sondes	15/05/2024	22/05/2024
Phosphorous			
Tryptophan			
Turbidity			
Chromophoric dissolved organic matter			
Riverfly	ECP citizen science	May 2024	

3. Rainfall data

Rainfall for May at Worsham Mill is shown in **Figure 1**.

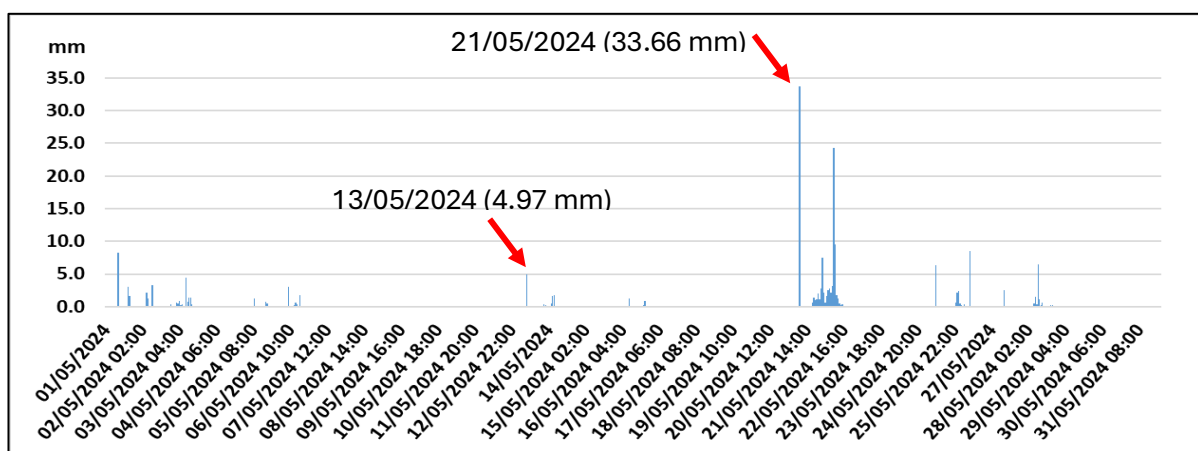


Figure 1: Rainfall at Worsham Mill 01/05/2024 – 31/05/2024

Note that 33.66 mm of rain fell on 21st May, although no significant rainfall had previously occurred since 13/05/2024 (4.97 mm). Although the total rainfall for May was 193 mm, compared with 114 mm in April, it is the dry conditions occurring during the week prior to the FWW sampling weekend that will have influenced those results.

4. Combined sewage overflow data

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

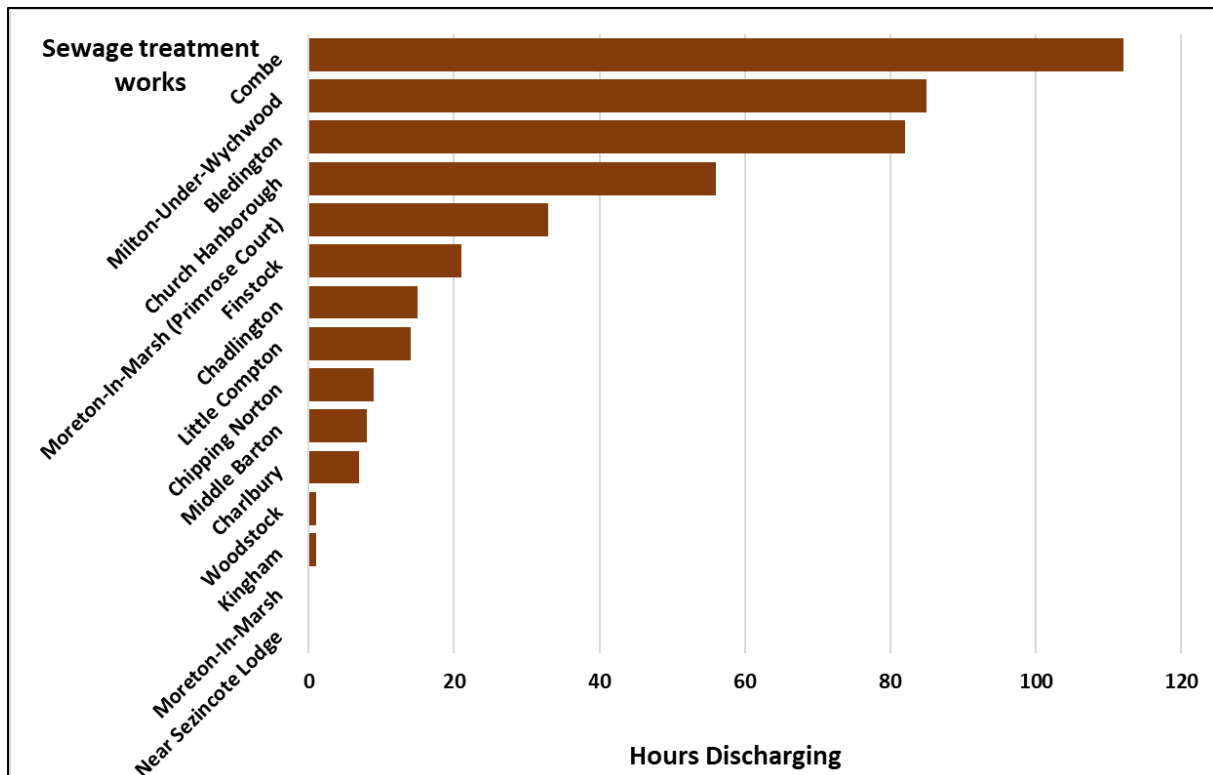


Figure 2: Combined sewage overflows 01/05/2024 – 31/05/2024

Broadly, CSOs in May came to less than half of April’s totals. Coupled with the higher rainfall, this should have resulted in more dilution in the waterbodies, and lower nutrient concentrations. As noted however, CSOs and much of the total rainfall (including the largest single event) occurred *after* the CS FWW sampling weekend (**Figure 1**). Once again, Combe STW “topped the charts” and the downstream effects of this on the Evenlode warrant further investigation.

5. FWW monitoring

48 citizen scientists uploaded 34 surveys for the weekend of 17 – 20 May. 19 river, 13 stream, and 1 ditch surveys were undertaken. There was no rain reported over the May sampling weekend (See rainfall note, above). Most volunteers noted steady flows, with 60% of reporting average water levels, and the remainder reporting low water levels. Due to the lack of run-off, turbidity was generally low, with 58% of tests showing <14 NTU, and the remainder all between 15 and 30 NTU. Water colour was variable (**Figure 3**).

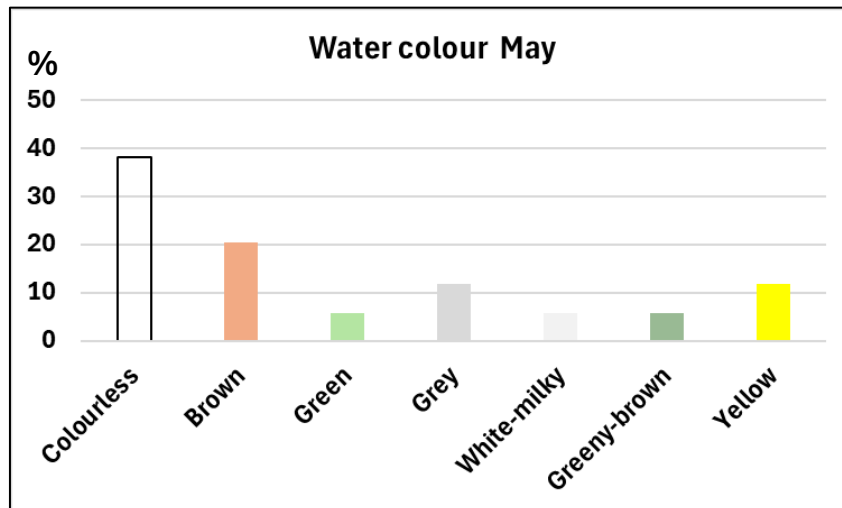


Figure 3: Water colour reported in the Evenlode catchment for May 2024

Nutrient concentrations

Figure 4 shows the distribution of nitrate concentrations throughout the catchment. The highest concentrations (> 10 mg/litre) were mainly found upstream of Lower Oddington. All concentrations were > 0.5 mg/litre, with most surveys reporting nitrate concentrations of > 1.0 mg/litre. The graph in Figure 5 confirms this, showing fewer surveys that recorded that <1.0 mg/litre nitrates compared with April, although there was a shift in May from surveys that recorded > 2.0 mg/litre to those recording 1 – 2 mg/litre. This is a relative improvement, but nevertheless, more than 90% of surveys reported moderate to high nitrate levels.

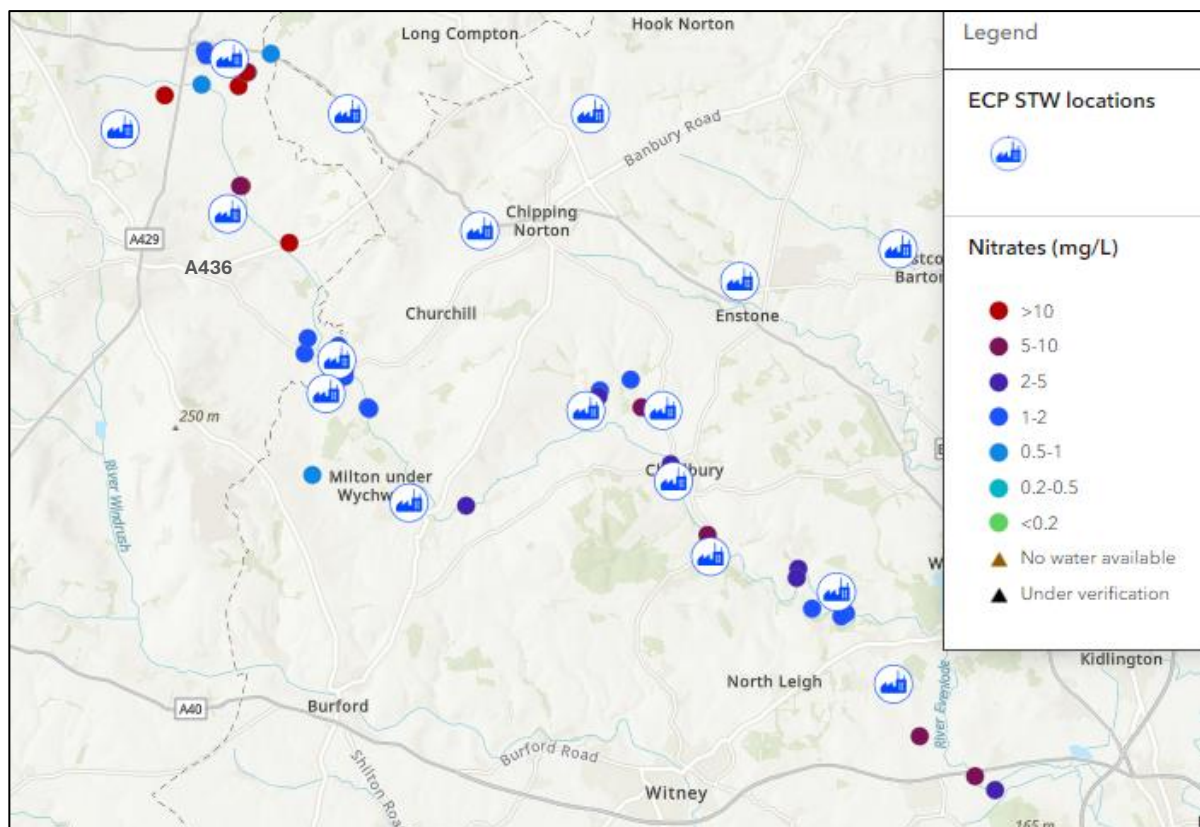


Figure 4: FWW nitrate concentrations 17/05/2024 – 20/05/2024

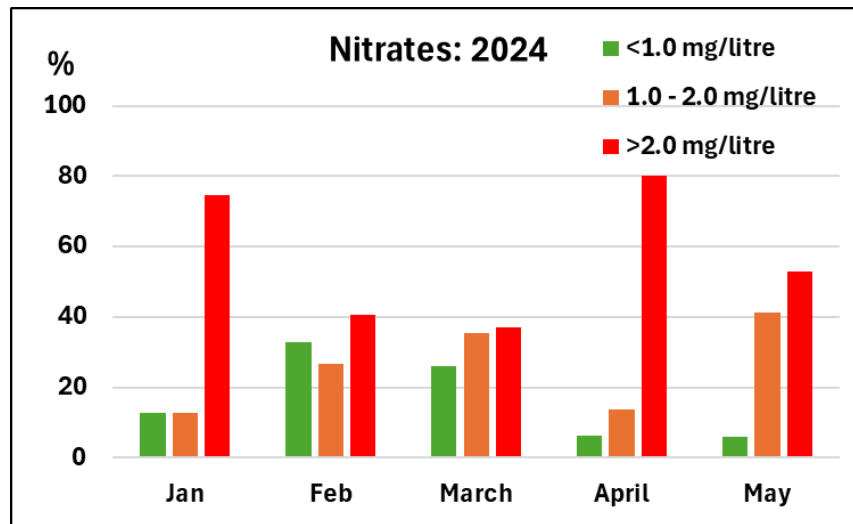


Figure 5: Nitrate concentrations January – May 2024

Figure 6 shows the distribution of phosphate concentrations. The highest concentrations were upstream of lower Oddington, including the only survey that recorded >1 mg/litre phosphate. Most other surveys recorded phosphate concentrations <0.02 mg/litre (limit of detection), with occasional higher concentrations, for example downstream of Kingham, near Churchill. Figure 7 shows that the percentage of surveys recording > 0.2 mg/litre phosphate in May was the highest this year.

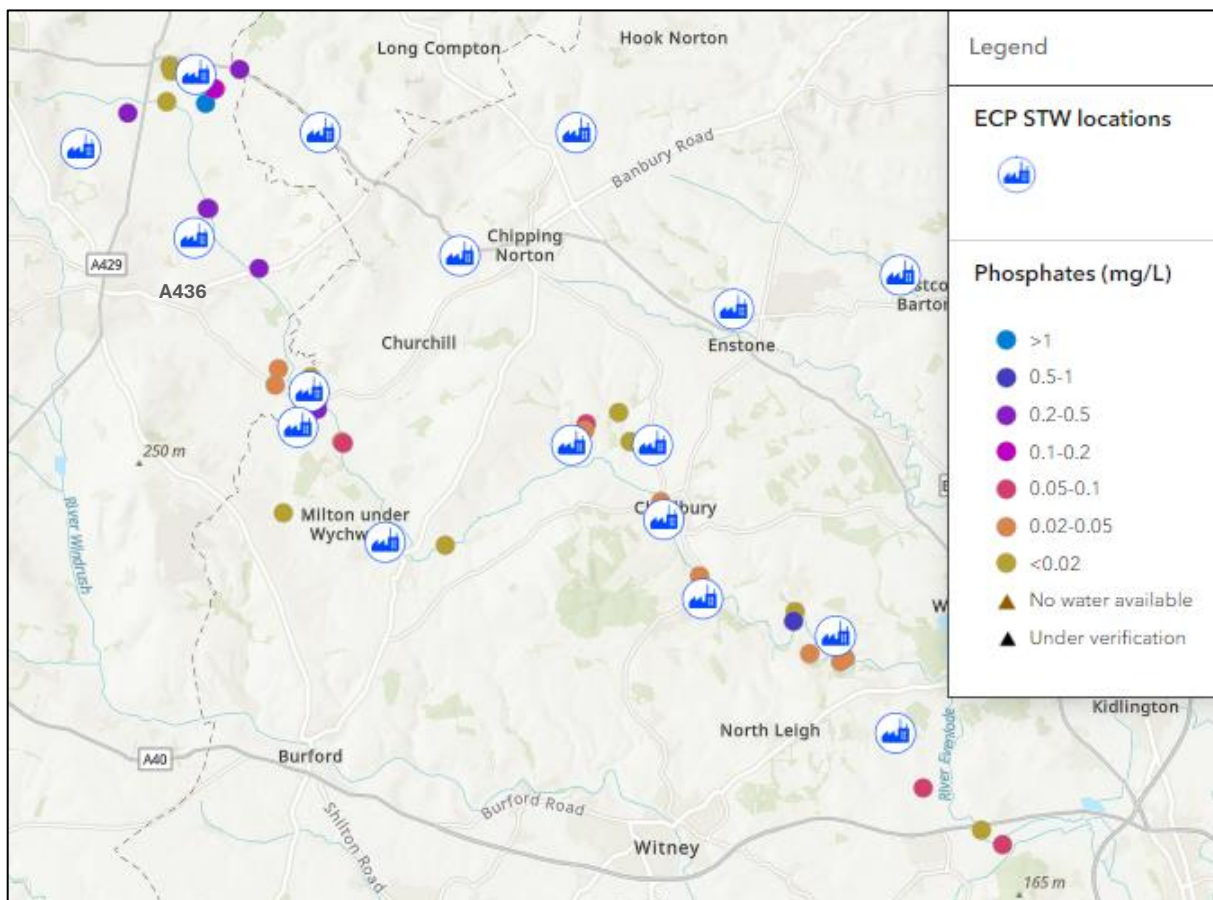


Figure 6: FWW phosphate concentrations 17/05/2024 – 20/05/2024

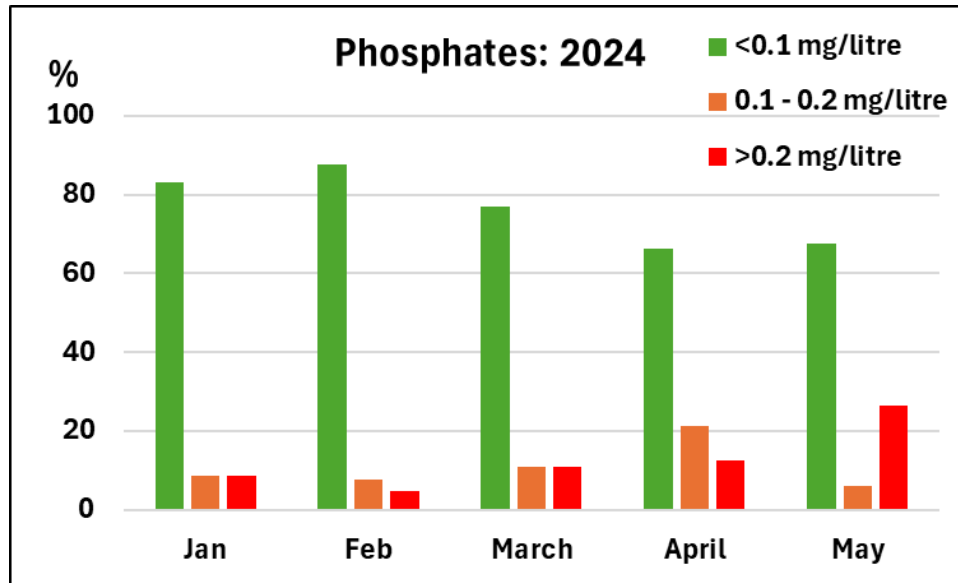


Figure 7: Phosphate concentrations January – May 2024

Figure 8 shows the spatial distribution of FWW surveys that recorded poor, moderate, and good water quality throughout the catchment for May. 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.

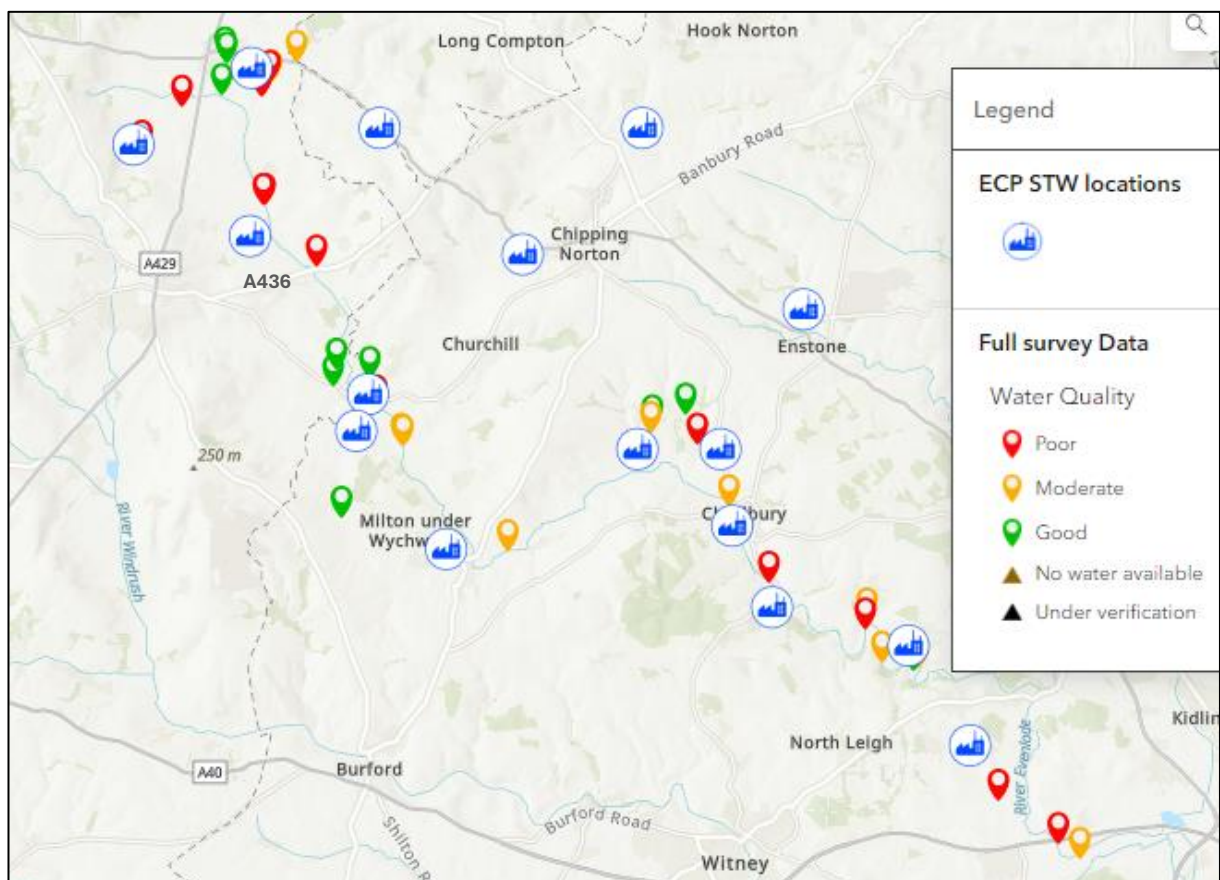


Figure 8: FWW full survey data for May 2024

There was no clear upstream-downstream trend for water quality. Many of the red pins that signify poor water quality are above Lower Oddington, although good water quality was nevertheless recorded for some streams around Moreton in Marsh. Surveys taken along the stretch of the Evenlode downstream of Lower Oddington and upstream of Charlbury generally recorded good water quality with some moderate results recorded. Downstream of Charlbury, however, water quality was moderate or poor.

6. Environment Agency data

The Environment Agency (EA) monitored seven sites in the Evenlode catchment between 14 – 29 May. Nitrate as N, and orthophosphate reactive as P measured by the EA data 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 Chipping Norton Brook and Littlestock Brook. The EA site details and associated nutrient concentrations are summarised in **Table 2**. The colours in **Table 2** correspond to those used to indicate the nitrate and phosphate ranges in **Figure 9** and **Figure 10**.

Table 2: Environment Agency Evenlode sampling site details for May 2024

ID	Site	Latitude	Longitude	Date	Nitrate as N (mg/l)	FWW range (mg/l)	Ortho-phosphate reactive as P (mg/l)	FWW range (mg/l)
TH-PEVR0052	Fire College Stream 150 M Below A44	51.987946	-1.679156	22 May	0.54	0.5 - 1	0.11	0.1 – 0.2
TH-RSN1250	D/S Heath End Bridge	51.972343	-1.677753	14 May	4.3	2 - 5	0.089	0.05 – 0.1
TH-SSN0207	D/S Station Road - Kingham Stream	51.905748	-1.625945	20 May	3.1	2 - 5	0.044	0.02 – 0.05
TH-PEVR0081	Evenlode d/s of Westcote Brook tributary	51.897387	-1.626247	24 May	5.1	5 - 10	0.15	0.1 – 0.2
TH-RSN0626	Heythrop Park	51.927167	-1.458003	14 May	9.4	5 - 10	<0.01	<0.02
TH-PEVR0013	Evenlode below Ashford Bridge	51.836954	-1.441177	29 May	5.8	5 - 10	0.14	0.1 – 0.2
TH-PEVR0006	Evenlode at T B4449, Cassington	51.788664	-1.351885	22 May	6.2	5 - 10	0.15	0.1 – 0.2

EA and FWW nitrate and phosphate concentrations

The EA nitrate concentrations are colour-coded to align with the FWW categories, and are shown together with the FWW concentrations in **Figure 9**, whilst EA and FWW phosphate concentrations are shown together in **Figure 10**. The data from EA and FWW are closely comparable.

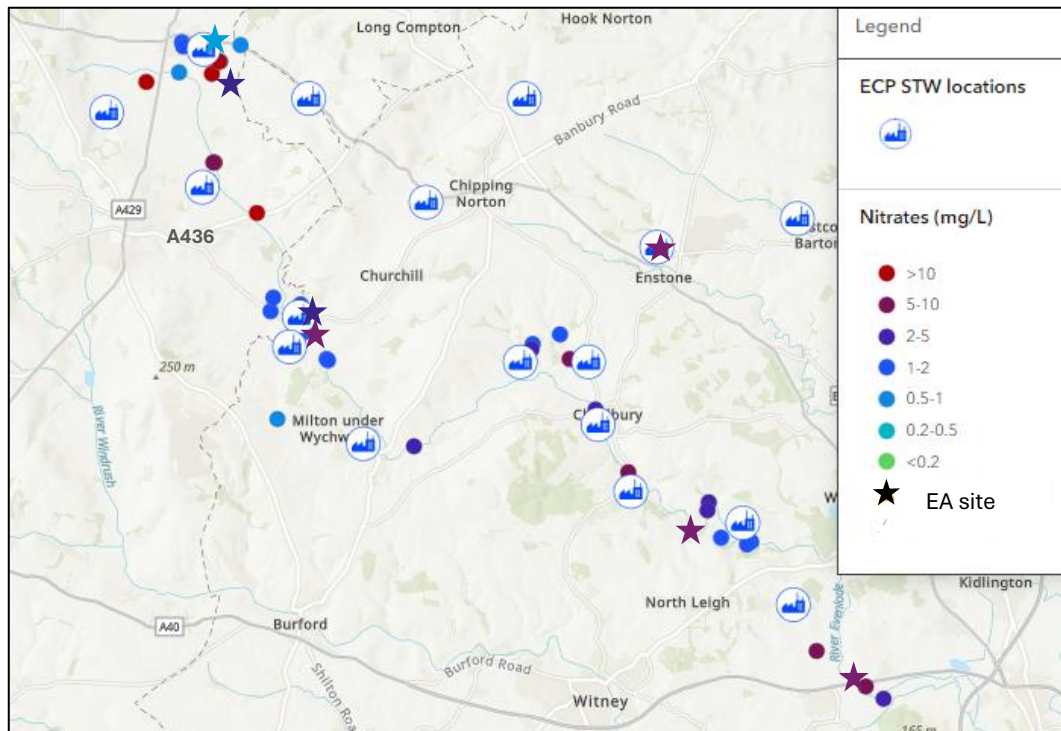


Figure 9: FWW and EA nitrate concentrations

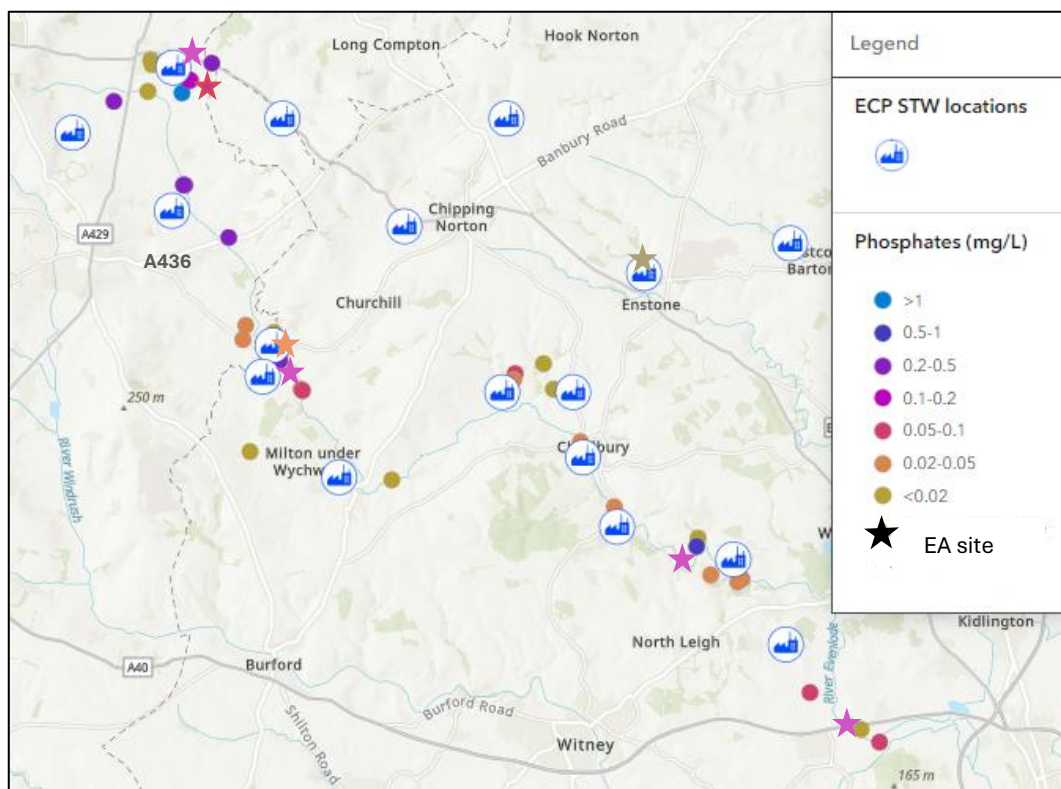


Figure 10: FWW and EA phosphate concentrations

7. Riverfly data

Three Riverfly sites were sampled in the Evenlode catchment in May 2024. No trigger level breaches were reported.

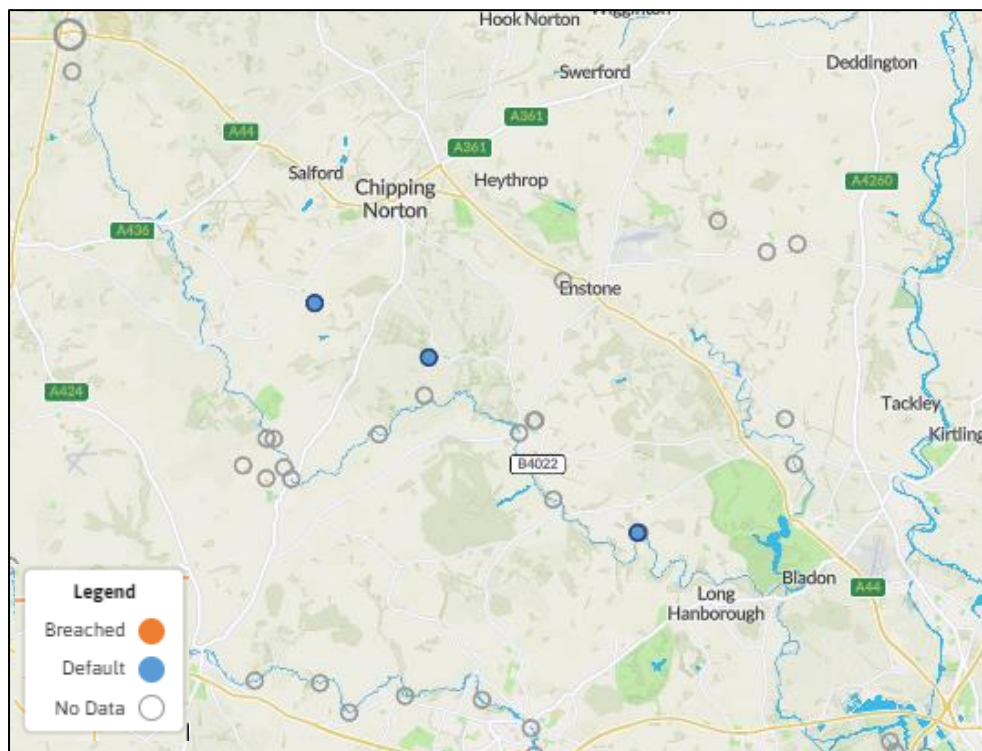


Figure 11: Riverfly surveys in the Evenlode catchment in May 2024

8. The Chipping Norton Brook (also known as the Blue Brook)

Combined sewage outflows

Chipping Norton STW released raw sewage into the Chipping Norton Brook for 9 hours on 22nd May. i.e. during the high rainfall event (+30 mm) that occurred after the FWW sampling weekend.

EA and FWW data

No EA or FWW data were collected for the Chipping Norton Brook in May.

Sonde data

Two Proteus sondes are installed on the Chipping Norton Brook, one downstream of the Chipping Norton STW, and one further downstream below a constructed natural flood management intervention (wetland). They measure and derive several determinands including Biological Oxygen Demand (BOD), phosphorus, tryptophan, turbidity and chromophoric dissolved organic matter (CDOM). The sonde downstream of the Cornwell wetland was non-functional from the 16th to the 20th May, apparently due to a loss of signal.

BOD indicates the impact that decaying matter would have on dissolved oxygen levels in the water course. High BOD indicates pollution from an organic load.

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, surface water and soil run-off, or to algae.

Chromophoric dissolved organic matter (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.

The graphs in **Figure 12** and **Figure 13** show the BOD, phosphorus, tryptophan, turbidity and CDOM data recorded by the sondes downstream of Chipping Norton STW, and downstream of the Cornwell wetland, respectively. The axes and line colours are the same for both graphs.

Table 3 summarises the average values from the two sondes for the period when both were working, i.e., 15 – 16 May, and 20 – 22 May

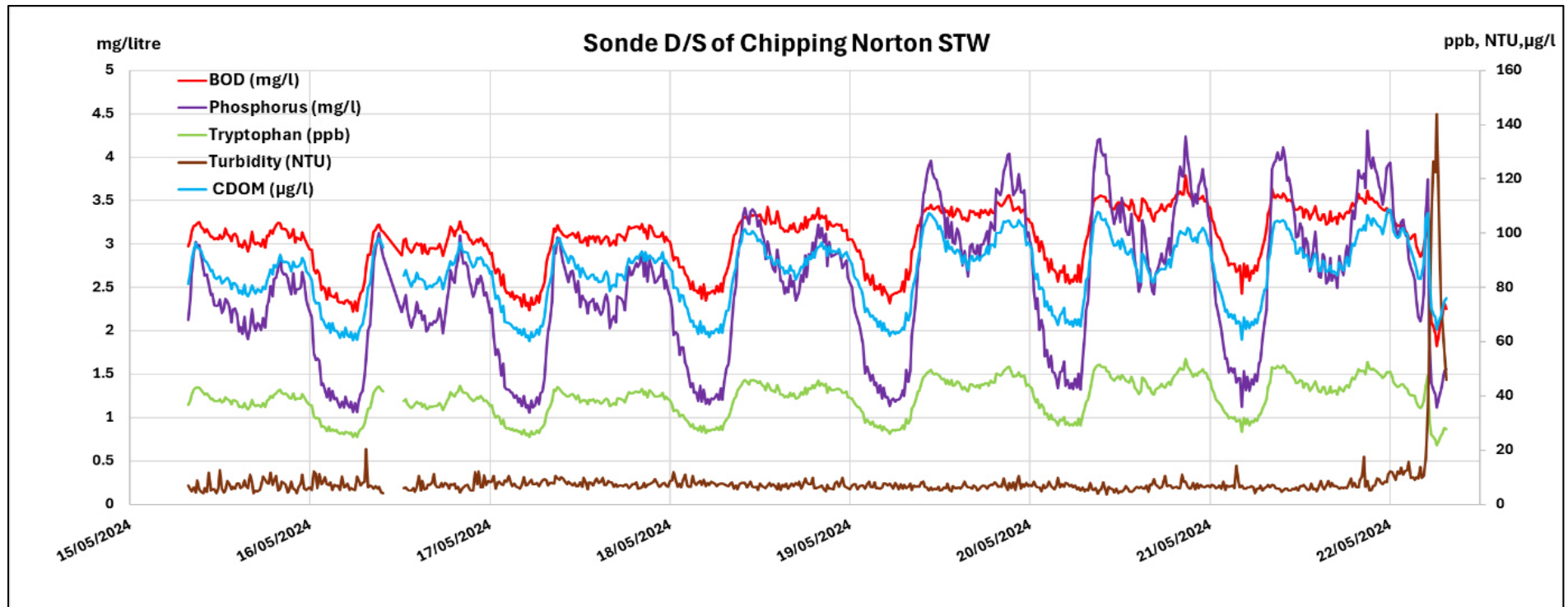


Figure 12: BOD, phosphorus, tryptophan, turbidity and CDOM downstream of Chipping Norton STW 15 – 22 May 2024

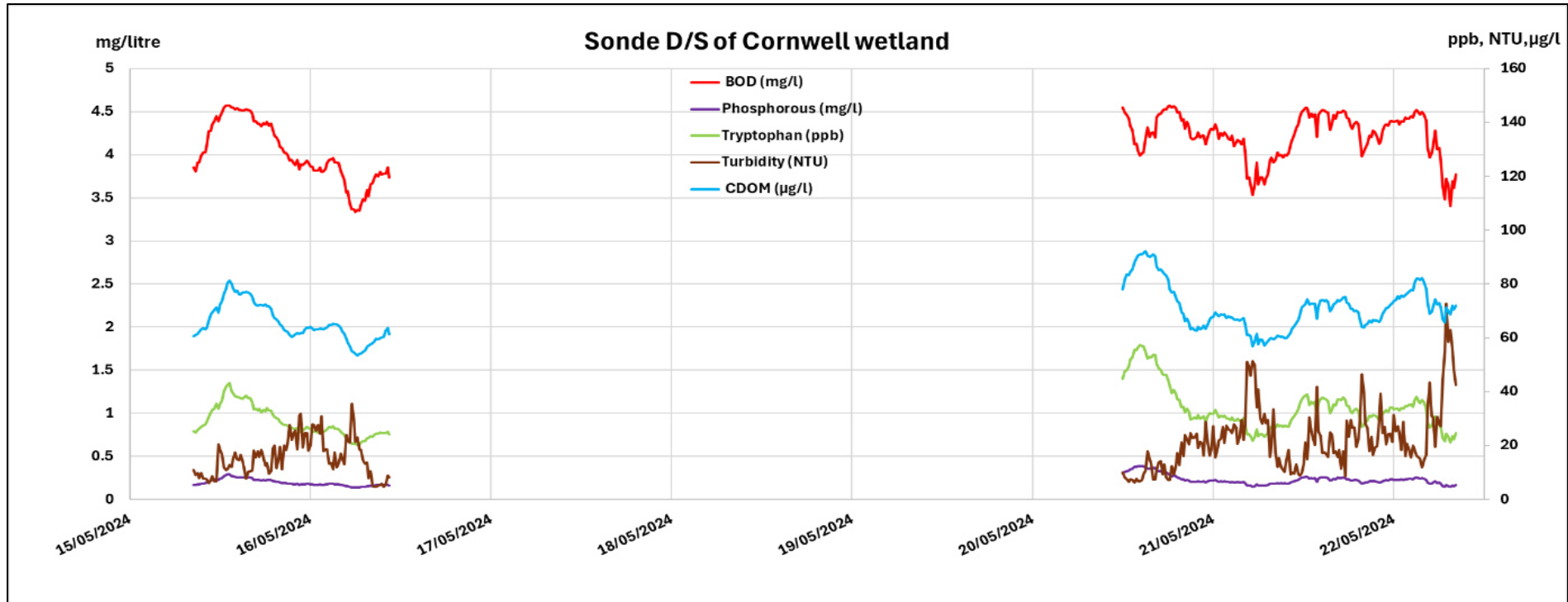


Figure 13: BOD, phosphorus, tryptophan, turbidity and CDOM downstream of Cornwell wetland 15 – 22 May 2024

Table 3: Average values for the Chipping Norton Brook downstream of the STW and the wetland

Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
D/S STW (n=281)	3.11	2.59	39.95	10.31	86.22
D/S wetland (n=284)	4.15	0.22	32.14	19.83	69.22

At Chipping Norton Brook it was expected that the wetland would mitigate the effects of the STW, and that this would be reflected in the sonde data. The trace clearly showed the daily patterns expected from a sewage treatment works discharge. The pattern follows the typical domestic routine of toilet flushing/showing/washing, where there is an ~8.00am peak associated with the morning flush, followed by a slight dip during the day, rising to the evening peak ~8.00pm, before dipping overnight as the population sleeps. The traces were far smoother in **Figure 13**. However, **Table 3** confirms that BOD, tryptophan, and CDOM values were *higher* downstream of the wetland than downstream of the STW, although the reasons for this are unclear.

More in line with expectations, the wetland reduced the high phosphate levels downstream of the STW by more than 90%, although 0.21 mg/litre was still a high concentration that indicated the presence of pollution sources. Suspended matter (measured as turbidity) was also largely removed by the wetland, with the widening of the channel and slowing of the flow probably playing a significant role in sediment deposition as vegetation was not yet well established. The constant turbidity values recorded downstream of the STW were however replaced by an erratic pattern downstream of the wetland, possibly due to bed disturbance by wildlife and aquatic organisms (including invasive crayfish that actively burrow into the banks below the waterline). The effect on all determinands of the rainfall event and concurrent CSO on 22nd May was clearly visible downstream of the STW (**Figure 12**) but much less so downstream of the wetland, (**Figure 13**) perhaps partly due to the extra time needed for the flow to reach the second sonde.

9. Littlestock Brook

Combined sewage overflows

Milton under Wychwood STW released raw sewage into the Littlestock Brook for 85 hours during May (**Figure 1**), mainly during the first week of the month, and from the 22nd May in response to the rainfall on that day.

EA and FWW data

No EA or FWW data were collected for the Littlestock Brook in May.

Sonde data

Two Proteus sondes are installed on the Littlestock Brook, up- and downstream of the Milton under Wychwood STW. The sonde upstream of the STW was non-functional from 16th May. **Figure 14** and **Figure 15** show the BOD, phosphorus, tryptophan, turbidity and CDOM data from the sondes up- and downstream of the STW.

Note that the left-hand vertical axis (mg/litre) is the same in both graphs, *and* in the graphs for the Chipping Norton Brook, but that the maximum values for the right-hand axes of these graphs are half (i.e. **80** ppb, NTU, and µg/l) of the Chipping Norton Brook maxima (i.e. **160** ppb, NTU, and µg/l). The line colours are consistent between all four graphs. **Table 4** summarises the average values from the two sondes for the period when both were working, i.e., 15 – 16 May.

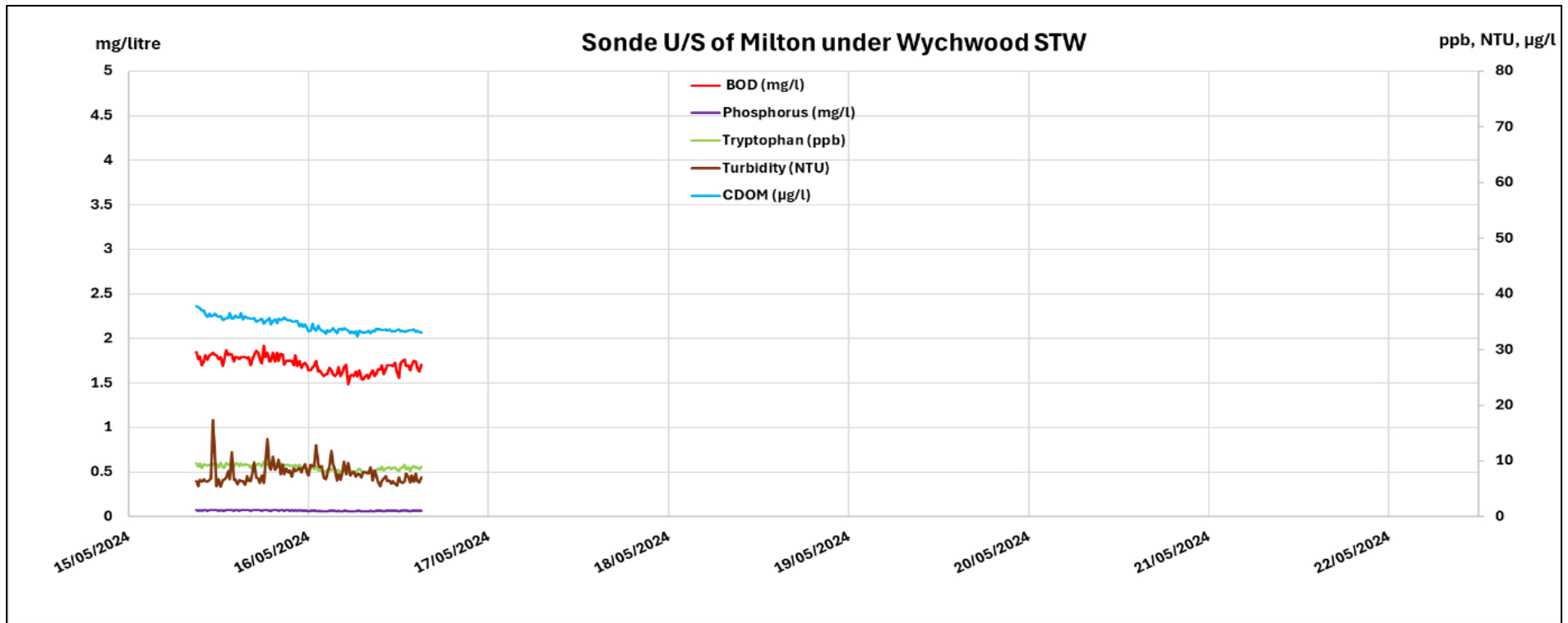


Figure 14: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Heath Farm

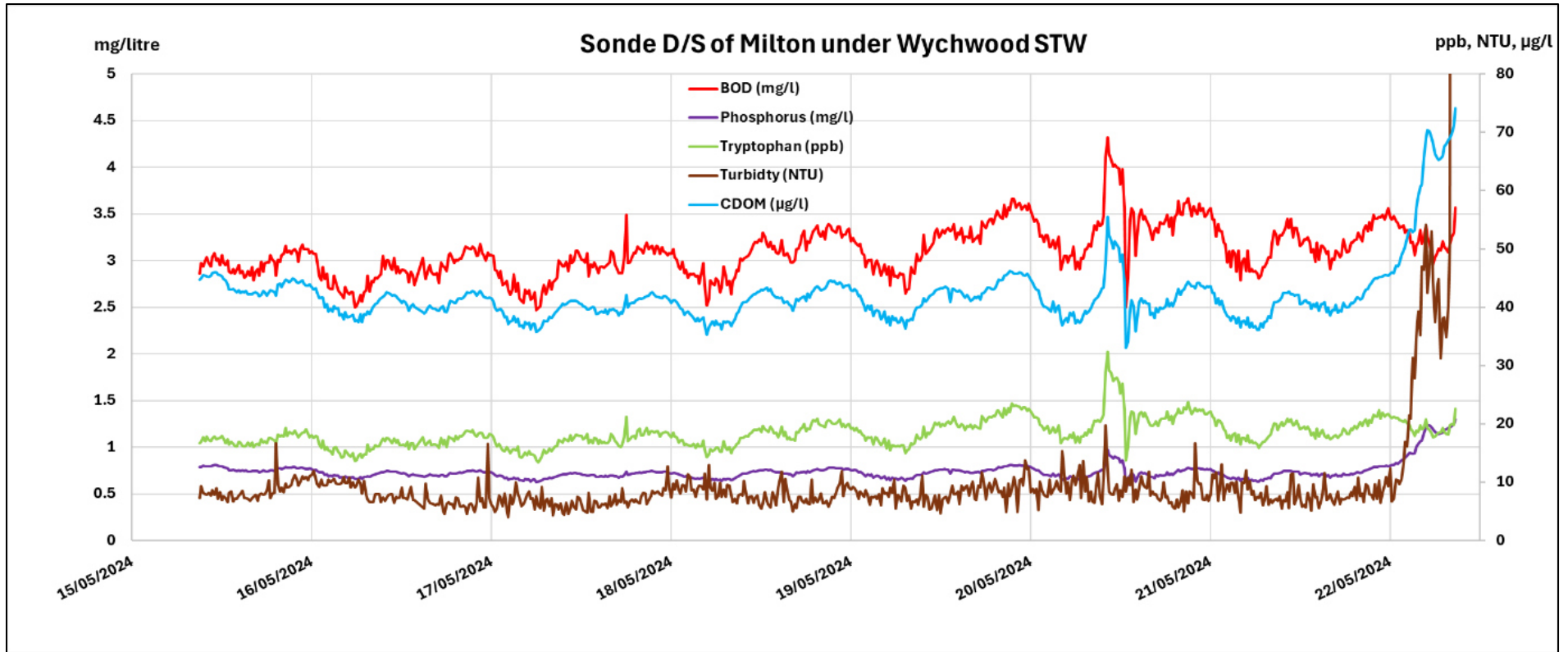


Figure 15: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Littlestock House

At Littlestock Brook, it was expected that the impact of STW discharges would be apparent from the downstream data, and although there is little upstream data available for comparison, the familiar twice daily effluent discharge pattern is seen in **Figure 15**, though less pronounced and at lower values than for the Chipping Norton Brook. Similar to Chipping Norton Brook, values of all the determinands recorded for the Littlestock below the STW show a gradual upward trend throughout the monitoring period. As expected, **Table 4** shows an increase in the average values of all determinants downstream of the STW.

Table 4: Average values for the Littlestock Brook up- and downstream of the Milton under Wychwood STW

Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
U/S STW (n=281)	1.71	0.07	8.86	7.71	34.51
D/S STW (n=284)	2.90	0.74	16.71	8.63	42.05

It is interesting to note that despite the STWs releasing CSOs for 85 hours into the Littlestock Brook compared with nine hours for the Chipping Norton Brook, the graphs and tables above do not reveal a related degree of impact on the Littlestock Brook. This highlights the issue with reporting CSOs in terms of hours instead of volumes, which provides no insight into the impact on the receiving watercourse.

10. Summary

The results of EA and FWW nutrient testing in May were similar, showing that the waterbodies above Lower Oddington had high nutrient concentrations and poor water quality. Water quality generally improved downstream with lower nutrient concentrations until Charlbury, downstream of which water quality declined as nutrient concentrations generally rose. However, this was not uniform with local pollution sources resulting in poor water quality and high nutrient concentrations at discrete points throughout the catchment.

Despite outages, the sonde data showed that even at an early stage of establishment, the Cornwell wetland mitigated the impact of the sewage outflows from Chipping Norton STW on the Chipping Norton Brook. Water quality declined markedly downstream of the Milton under Wychwood STW outflow to the Littlestock Brook.

It is recommended that the downstream impacts of the consistently high CSOs from Combe STW on the Evenlode be investigated further.