ECP monthly water quality data report June 2024

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1. Overview

This report provides a synopsis of water quality in the Evenlode catchment for June 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 were used to develop this synopsis. Sonde data is presented for 13 - 18 June, i.e., covering the weekend when citizen science (CS) Freshwater Watch (FWW) surveying was carried out (14 - 17 June). All EA data available for June are presented. Riverfly results reported during June 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	01/06/2024	30/06/2024
Combined Sewage Overflows	Thames Water	01/06/2024	30/06/2024
Nutrients	ECP FWW (citizen science)	14/06/2024	17/06/2024
Nutrients	Environment Agency	10/06/2024	27/06/2024
Biological oxygen demand	ECP Proteus sondes	13/06/2024	18/06/2024
Phosphorous			
Tryptophan			
Turbidity			
Chromophoric dissolved organic matter			
Riverfly	ECP citizen science	June 2024	

3. Rainfall data

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

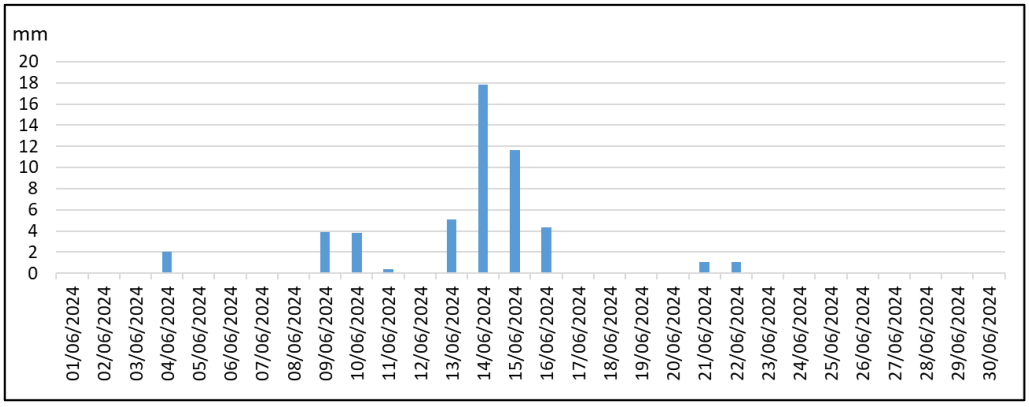

Figure 1: Rainfall at Worsham Mill 01/06/2024 – 30/06/2024

51.2 mm of rainfall was recorded at Worsham Mill for June 2024, mainly over the ECP FWW sampling weekend

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**.

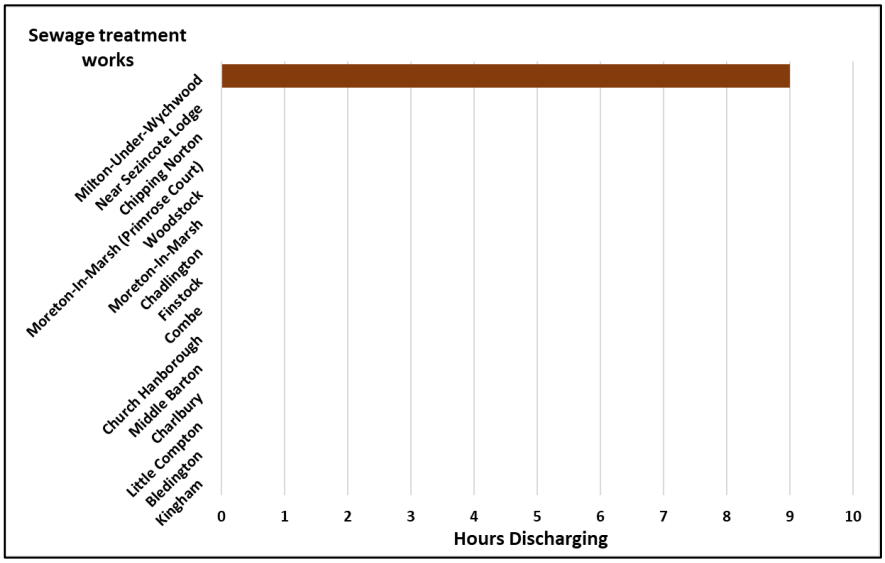

Figure 2: Combined sewage overflows 01/06/2024 – 30/06/2024

CSOs were negligible in June, with only Milton under Wychwood discharging, for a total of nine hours (**Figure 3**).

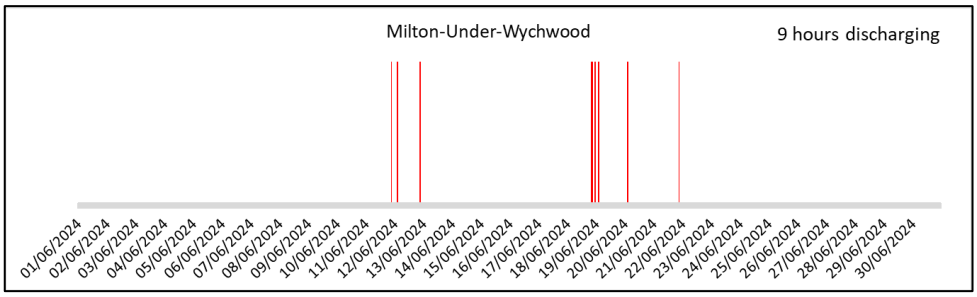

Figure 3: Daily CSOs at Milton under Wychwood in June

5. FWW and EA monitoring

27 FWW surveys were undertaken in June. The water was somewhat turbid, with 56% of samples <14NTU, 22% 17NTU, and the remainder between 19 and 40 NTU, as evidenced by the percentage of observations of brown and green water (**Figure 4**).

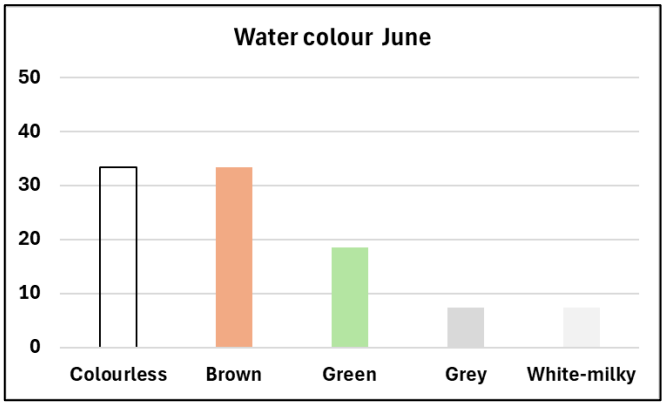

Figure 4: Water colour reported in the Evenlode catchment for June 2024

The rise in temperature during June may be responsible for the increase in observations of green water, although only 5 of the 27 surveys recorded algae.

Nutrient concentrations

Figure 5 shows the distribution of FWW and EA nitrate concentrations throughout the catchment. Nutrient concentrations in the Moreton in Marsh decreased from May, but with fewer samples taken month-to-month comparisons are difficult. The EA monitored 17 sites in the Evenlode catchment in June. 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 Blue and Littlestock Brooks. Note that EA sampling took place 10 – 27 June whereas FWW data are restricted to the ECP sampling weekend of 14 – 17 June.

As in May, the highest concentrations (> 10 mg/litre) were found upstream of Oddington, although some concentrations of between 2 and 10 mg/litre are found throughout the catchment. The graph in **Figure 6** illustrates the overall improvement in nitrate concentrations, although only 22% of surveys recorded concentrations of < 1.0 mg/litre – a low percentage of a small overall number of surveys.

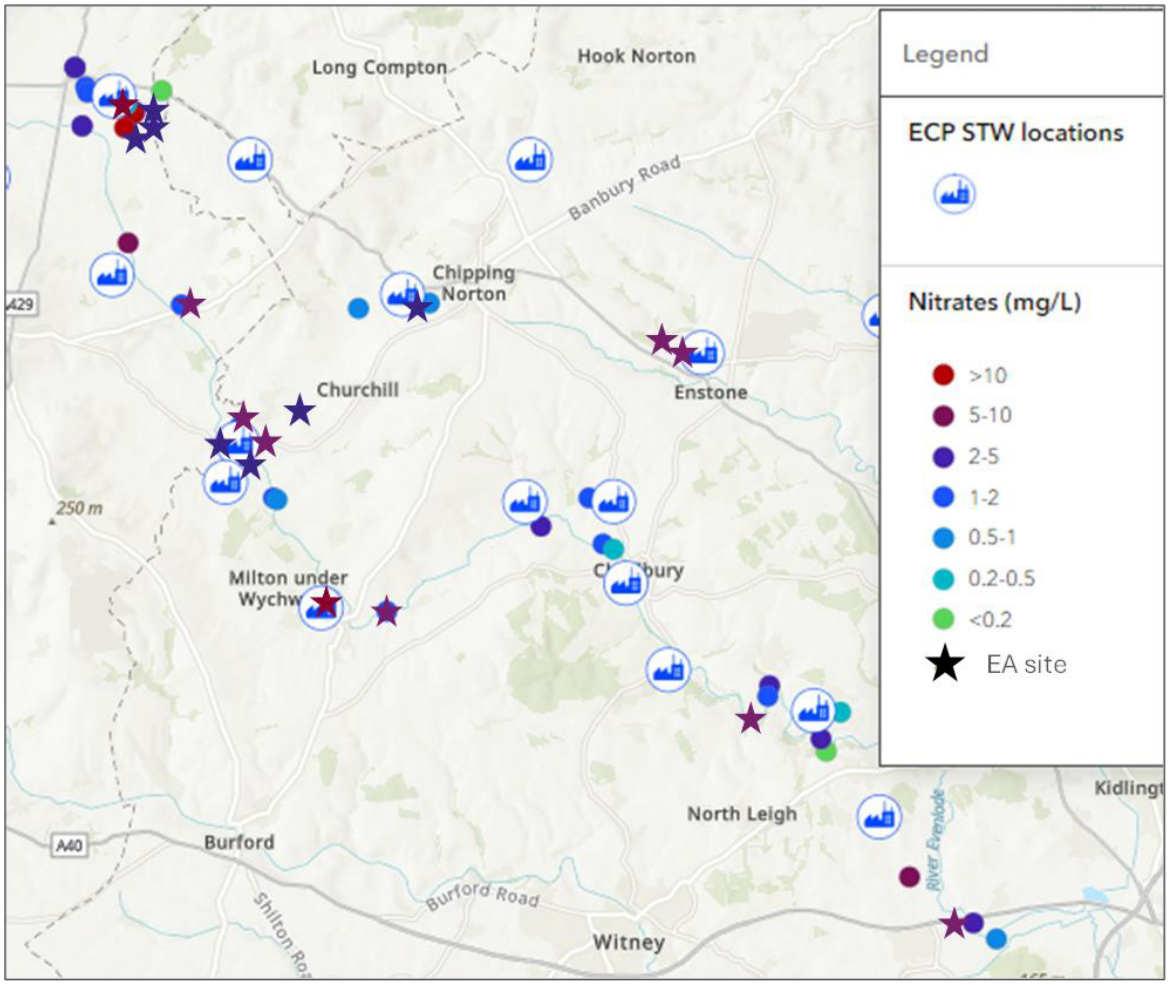

Figure 5: FWW (14 – 17 June) and EA (10 – 27 June) nitrate concentrations

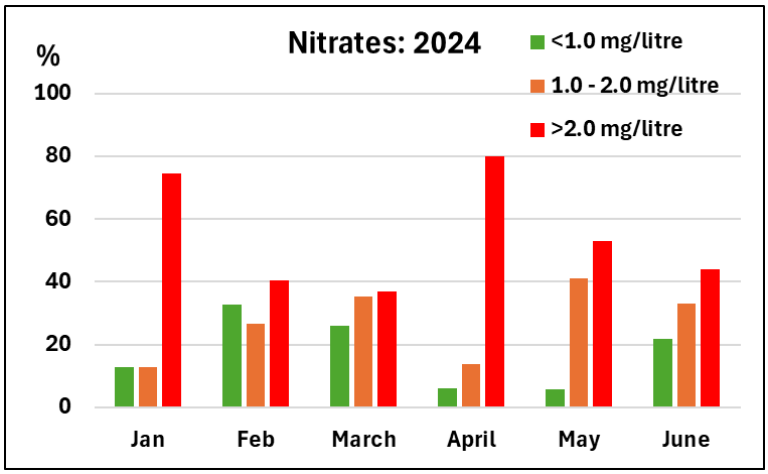

Figure 6: FWW nitrate concentrations January – June 2024

Figure 7 shows the distribution of phosphate concentrations. Although the highest concentrations were upstream of Oddington, there and throughout the catchment the majority of concentrations reported were <0.02 mg/litre. **Figure 8** shows that the percentage of surveys recording <0.1mg/litre has remained stable for the past three months, with fewer surveys recording > 0.2 mg/litre phosphates in June than in May.

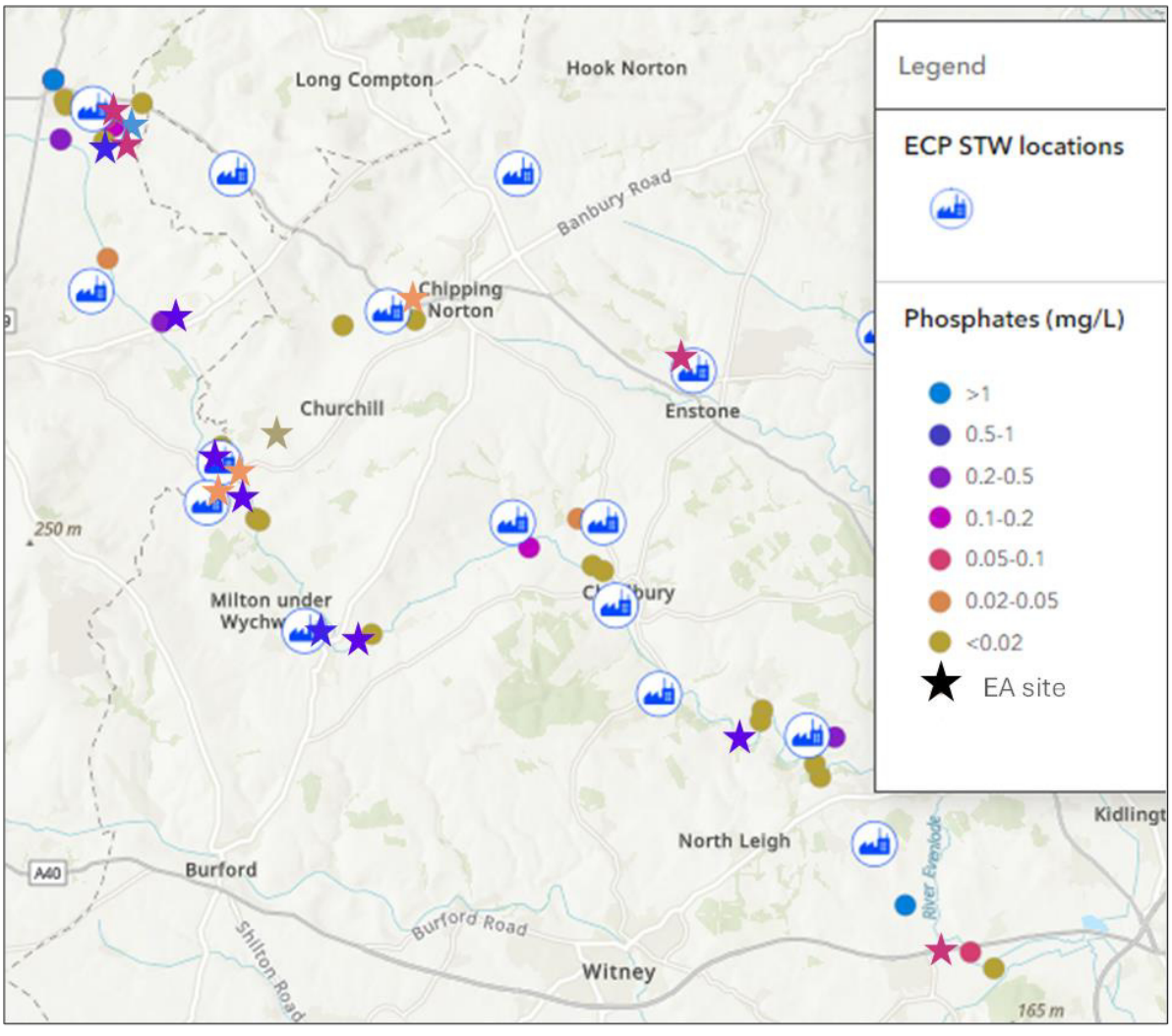

Figure 7: FWW (14 – 17 June) and EA (10 – 27 June) phosphate concentrations

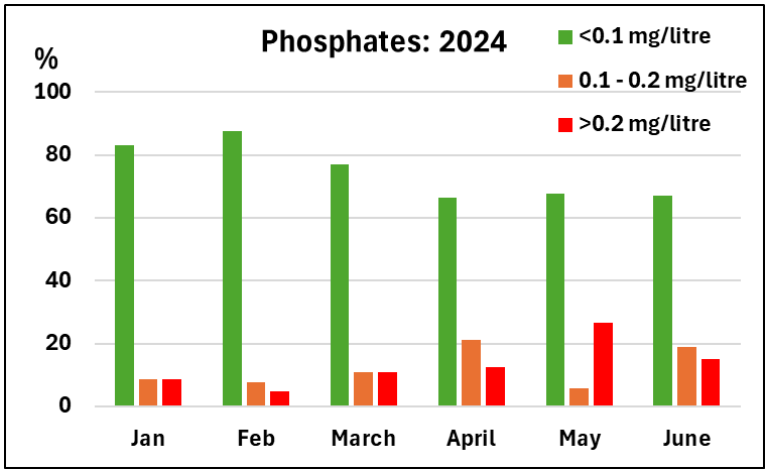

Figure 8: FWW phosphate concentrations January – June 2024

Figure 9 shows the spatial distribution of FWW surveys that recorded poor, moderate, and good water quality throughout the catchment for June. 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.

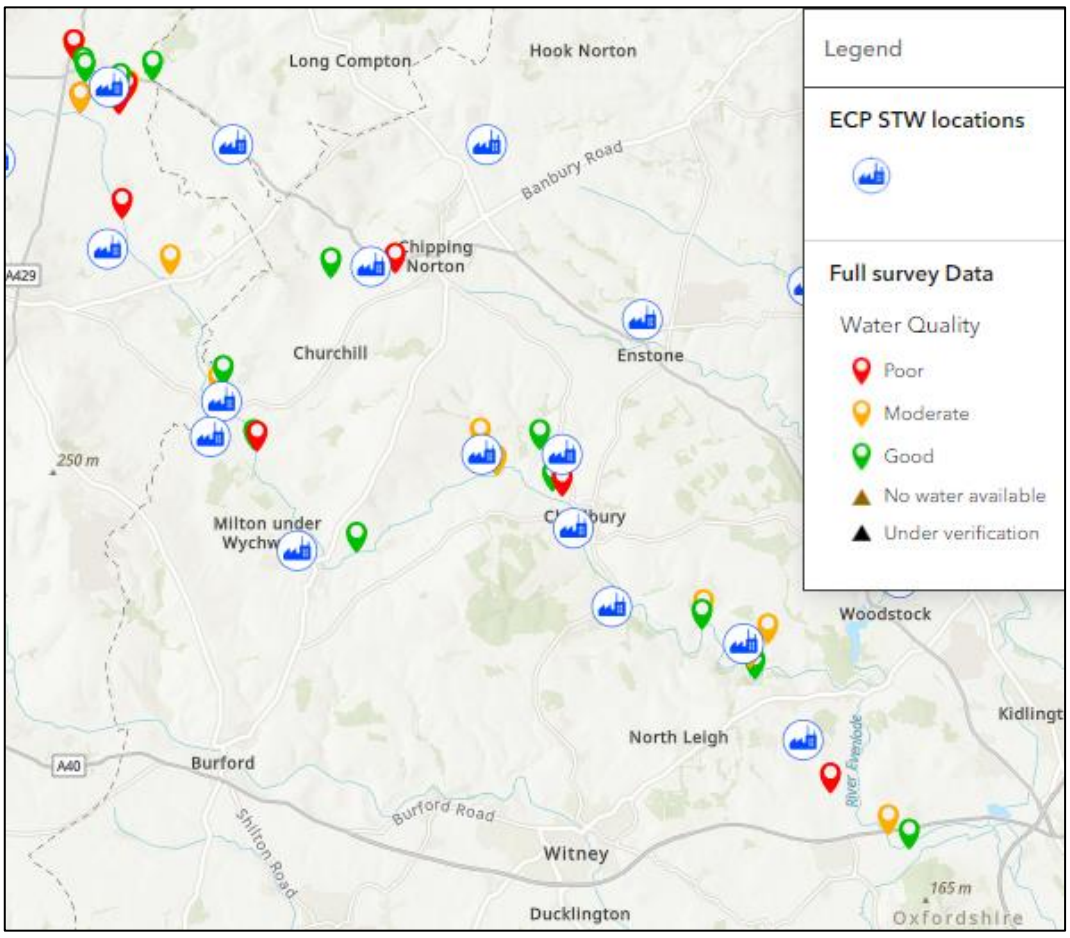

Figure 9: FWW full survey data 14 – 17 June

Water quality reported by citizen scientist using FWW test kits throughout the Evenlode in June was mainly good or moderate, with poor water quality typically associated with STWs.

6. Riverfly data

Six Riverfly sites were surveyed in June, three on the Evenlode and three on the Dorn. No trigger level breaches were reported (**Figure 10**).

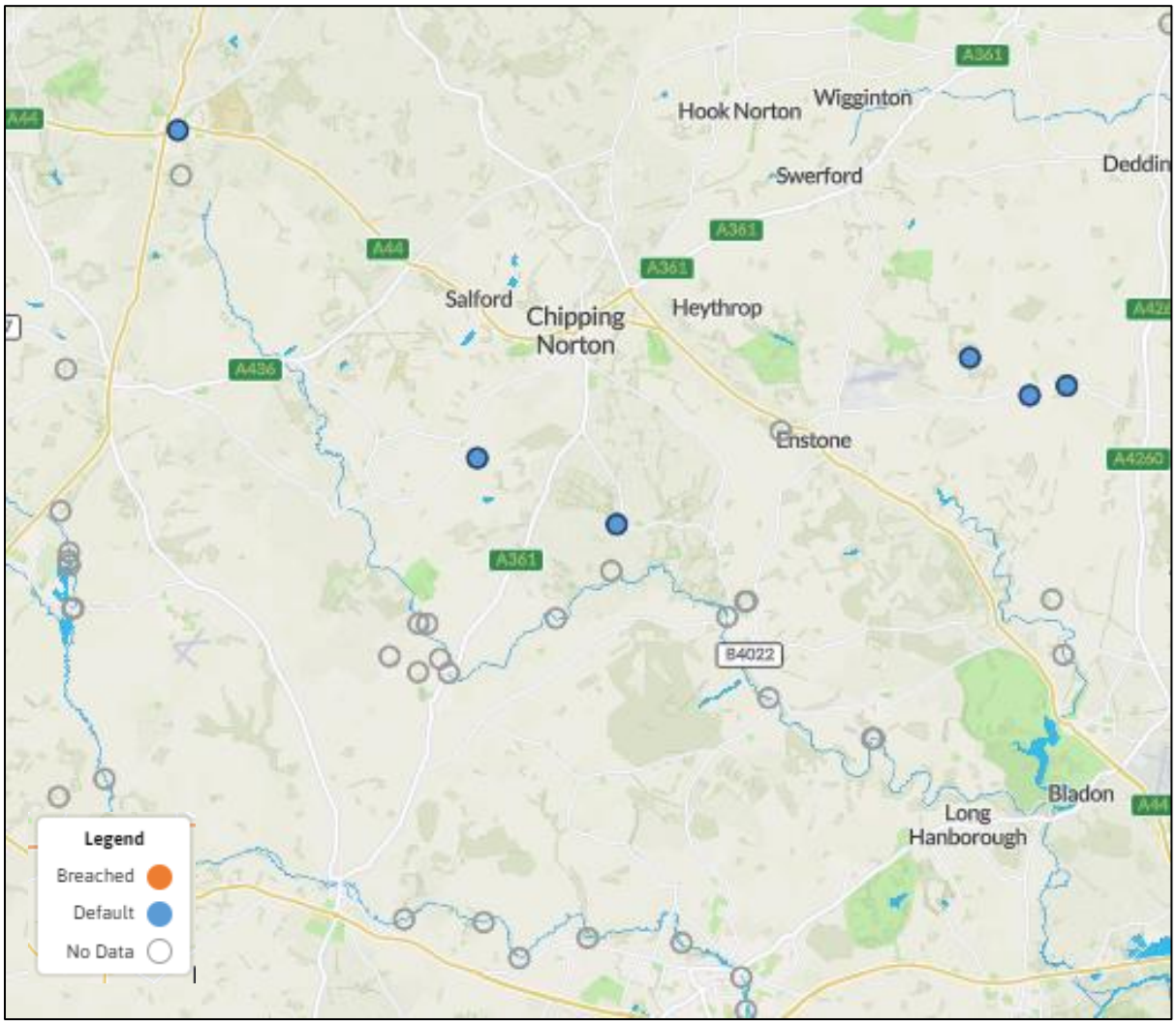

Figure 10: Riverfly surveys in the Evenlode catchment in June 2024

7. The Blue Brook

Combined sewage outflows

No Storm Discharges were released from Chipping Norton STW in June.

EA and FWW data

EA and FWW nitrate and phosphate data collected for the Blue Brook in June are shown in **Figure 11** and **Figure 12**.

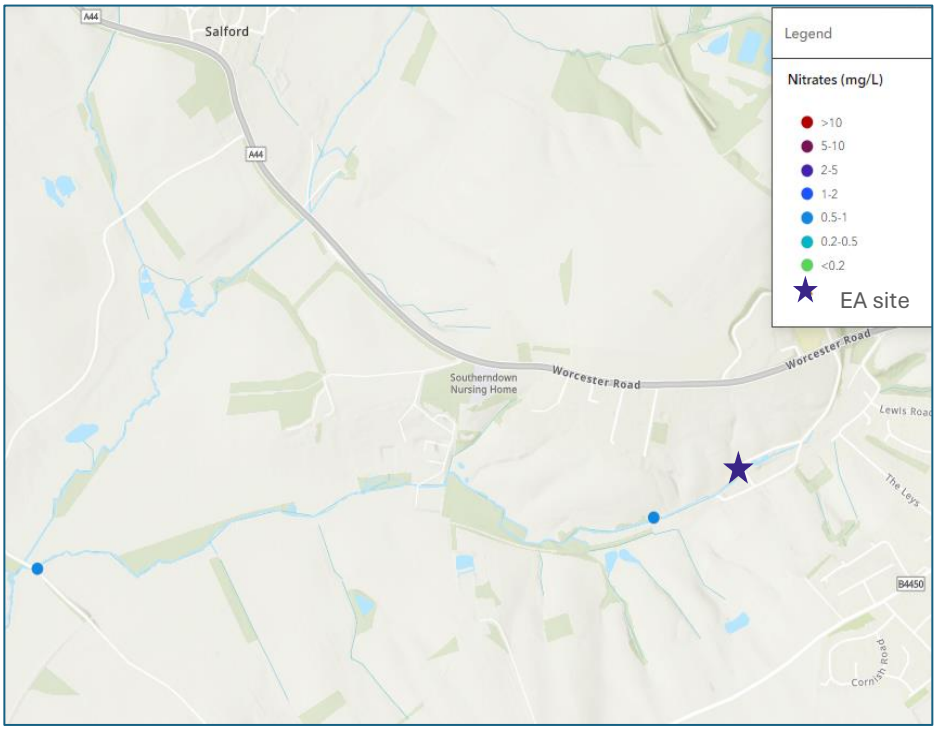

Figure 11: EA and FWW nitrate data for the Blue Brook in June

Note that the EA sample was taken on 19th June, at least two days later than the FWW samples, which may account for the higher concentration of nitrates recorded by the EA.

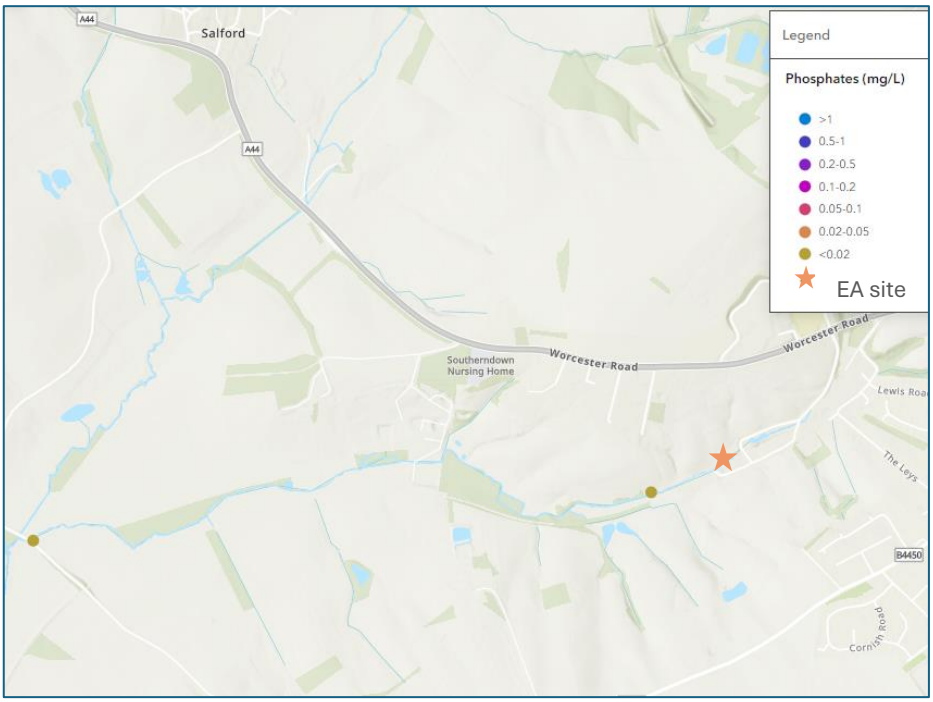

Figure 12: EA and FWW phosphate data for the Blue Brook in June

As with nitrates, the EA phosphate concentrations are slightly higher than the FWW concentrations.

Sonde data

Two Proteus sondes are installed on the Blue 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 during the reporting period.

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.

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 graph in **Figure 13** shows the BOD, phosphorus, tryptophan, turbidity and CDOM data recorded by the sondes downstream of Chipping Norton STW. The sonde downstream of the Cornwell wetland was not functioning at this time. **Table 2** summarises the average values from the sonde.

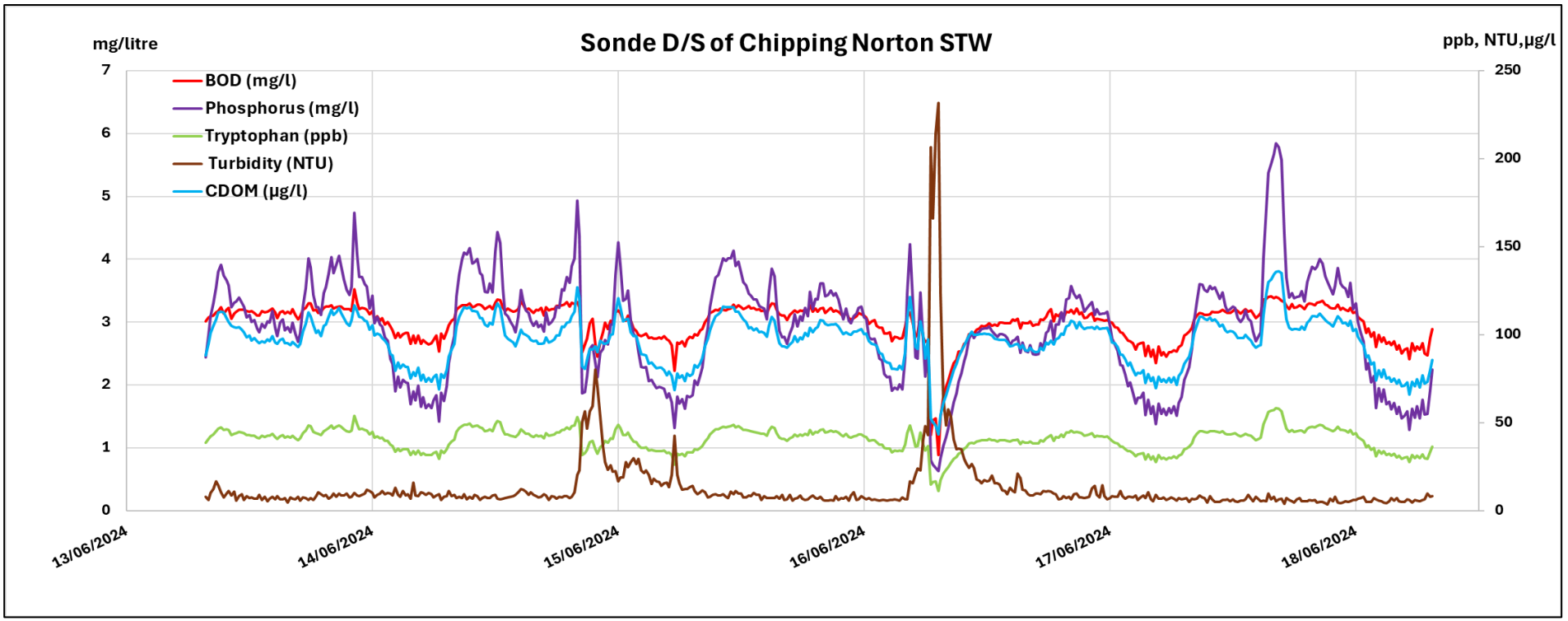

Figure 13: BOD, phosphorus, tryptophan, turbidity and CDOM for the Blue Brook downstream of Chipping Norton STW 13 - 18 June 2024

Table 2: Average values for the Blue Brook downstream of the STW 13 – 18 June

Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
D/S STW (n=480)	2.99	2.89	40.50	12.94	96.20

The expected twice daily pattern of peaks and troughs is present, but somewhat disrupted in **Figure 13**, probably due to the rain that fell from the 13th to 16th June (**Figure 1**).

No rainfall was reported for 17th June, and no Storm Overflow Discharges were recorded for this STW during the month, yet there was a simultaneous increase in BOD, phosphorus, tryptophan and CDOM values (to their highest levels for the month) during the afternoon/evening of 17th June, with no related rise in turbidity. Unfortunately, no other information is available to provide insight into this anomaly.

8. Littlestock Brook

Combined sewage overflows

Milton under Wychwood STW released raw sewage into the Littlestock Brook for nine hours during June (**Figure 2**).

EA and FWW data

No FWW data were collected for the Littlestock Brook in June, although a site was surveyed for the Evenlode downstream of the confluence. The EA and FWW nitrate and phosphate data are shown in **Figure 14** and **Figure 15**.

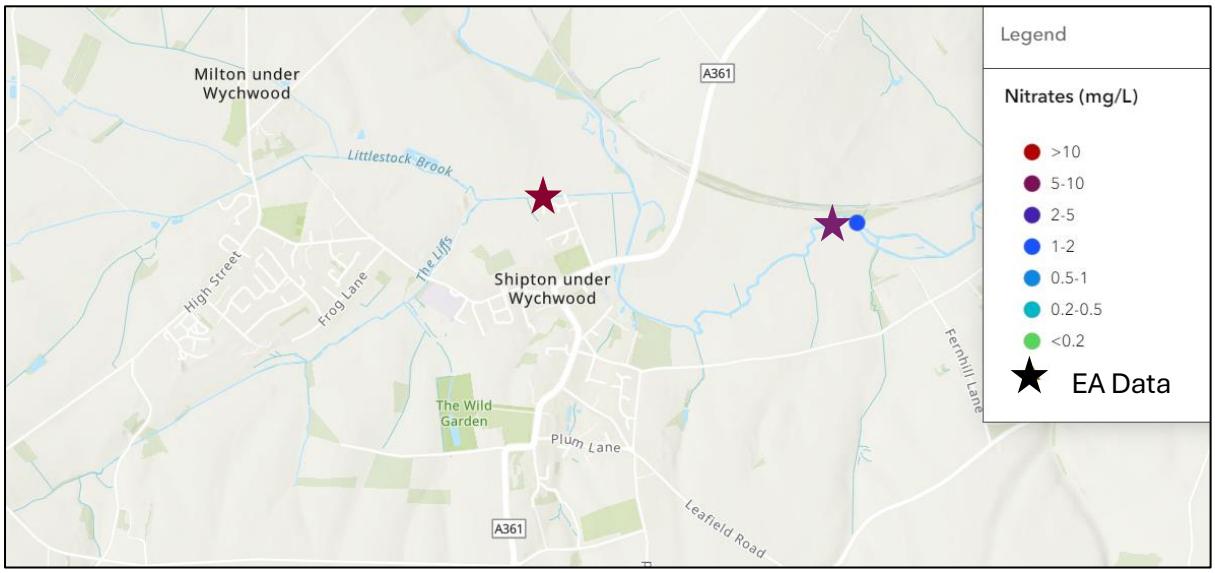

Figure 14: EA and FWW nitrate data for Littlestock Brook in June 2024

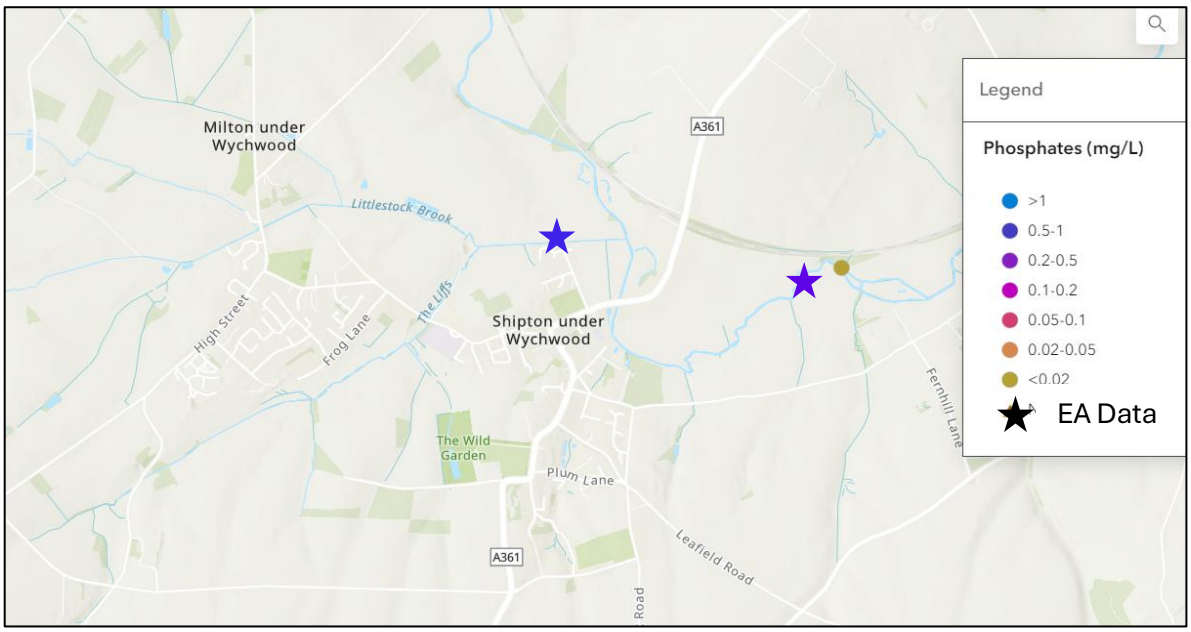

Figure 15: EA and FWW phosphate data for Littlestock Brook in June 2024

Sonde data

Two Proteus sondes are installed on the Littlestock Brook, up- and downstream of the Milton under Wychwood STW. **Figure 16** and **Figure 17** show the BOD, phosphorus, tryptophan, turbidity and CDOM data from the sondes up- and downstream of the STW.

Note that the vertical axes (mg/litre) are the same in both graphs (0- 5 mg/litre) but are less than in the graph for the Blue Brook (0-7 mg/litre). The right-hand axes of all graphs are the same (0 – 140 ppb, NTU, and µg/l). This cuts off the highest turbidity peak in **Figure 16** (562 NTU, 15/06/202). The line colours are consistent between all graphs.

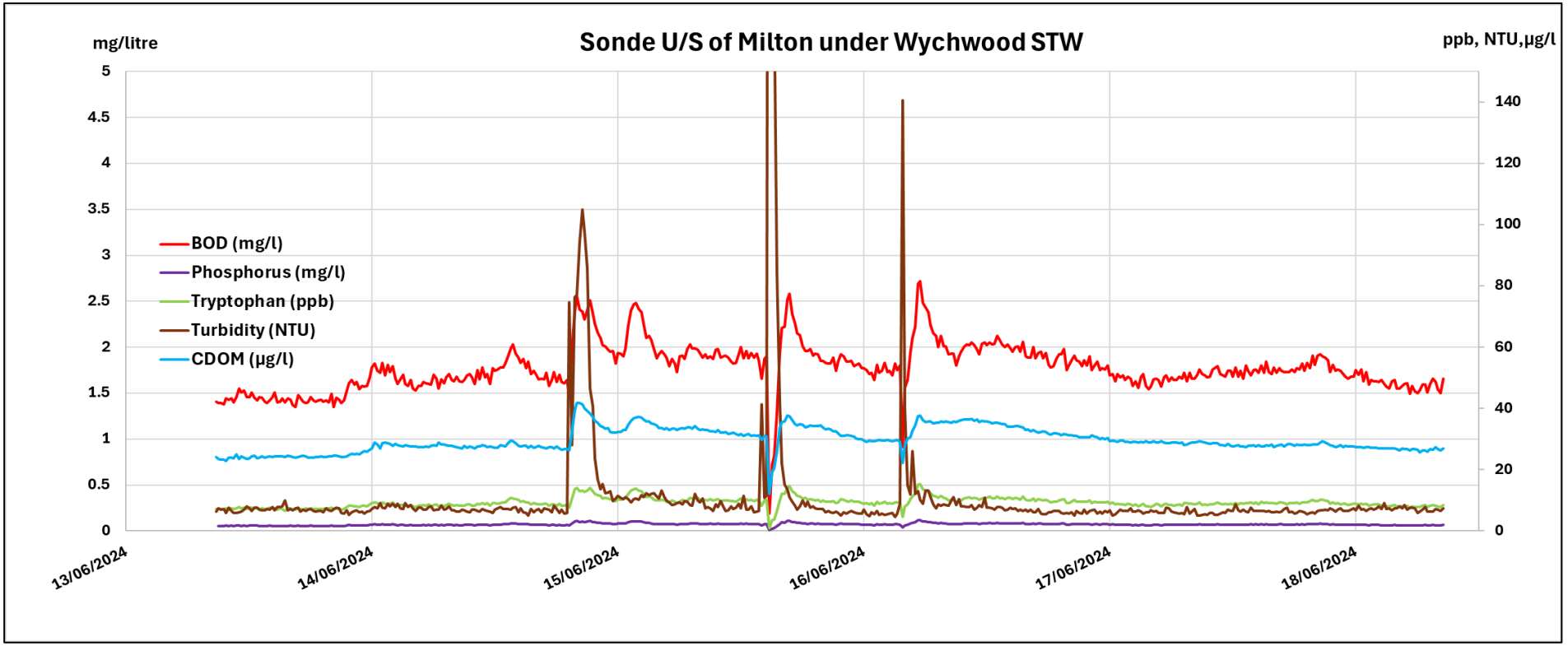

Figure 16: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Heath Farm, 13 – 18 June

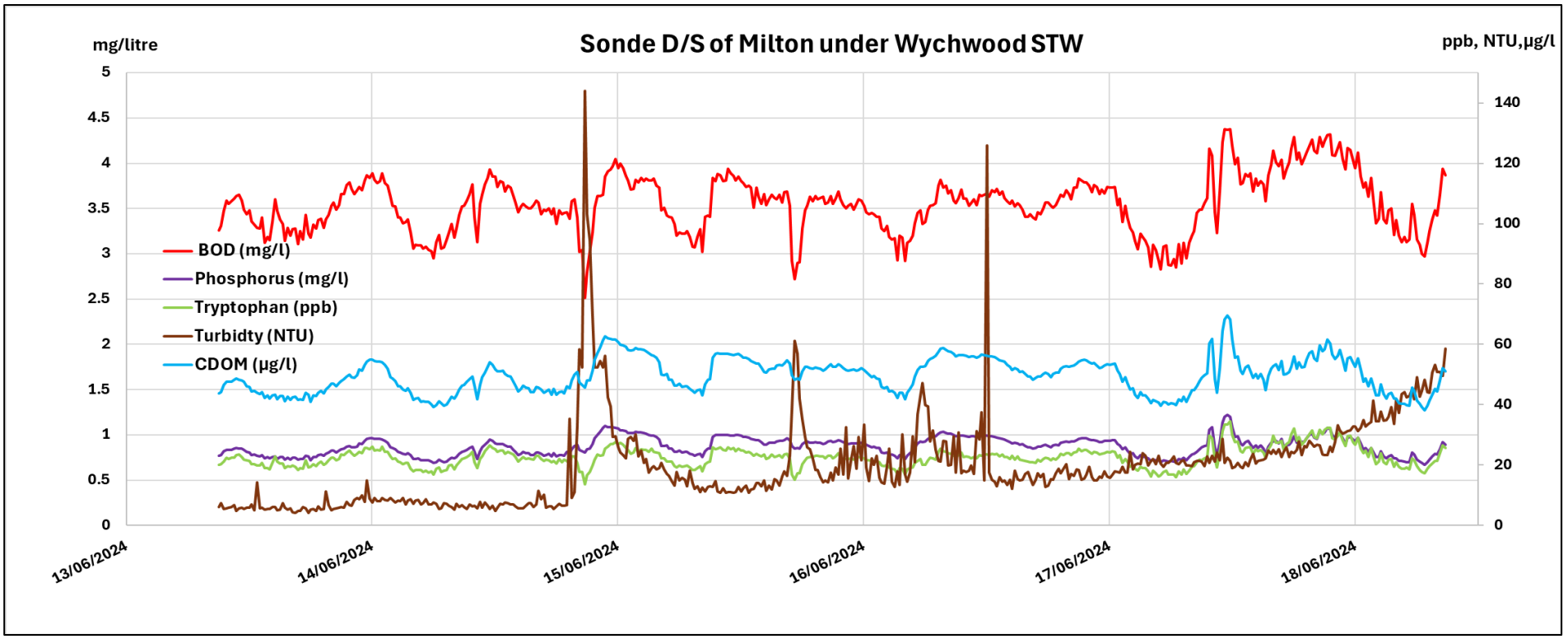

Figure 17: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Littlestock House, 13 – 18 June

The effect of the rainfall between 13th to 16th June (**Figure 1**) was evident both upstream (**Figure** 16) and downstream (**Figure 17**) of the STW. The decrease in BOD, phosphorus, tryptophan and CDOM values due to dilution was most noticeable upstream, as was the increase in turbidity. BOD, phosphorus, tryptophan and CDOM downstream of the STW responded clearly to the twice daily peaks in sewage effluent due to daily domestic cycles. All determinands trended slightly upwards over the course of the reporting period, indictive of falling river levels. As expected, **Table** 3 shows an increase in the average values of all determinants downstream of the STW.

Table 3: Average values for the Littlestock Brook up- and downstream of the Milton under Wychwood STW for 13 – 18 June

Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
U/S STW (n=@@)	1.75	0.07	9.10	7.03	28.81
D/S STW (n=@@)	3.55	0.88	22.41	17.21	49.86

9. Summary

The FWW nitrate and phosphate concentrations improved compared with May, but with less data available a month-to-month comparison was difficult. Up- and downstream comparisons were not possible at Chipping Norton STW due to the downstream sonde malfunctioning. The negative influence of the STW on water quality was apparent at Milton under Wychwood, whilst the beneficial influence of rainfall as a dilutant of BOD, phosphorus, tryptophan and CDOM was apparent at both STWs. However, the data showed different responses to different rainfall events and was dependant on antecedent rainfall conditions.

The FWW data provides good spatial coverage, but it is vital that all sites are surveyed regularly to maintain this coverage over time and to allow valid month on month comparisons, as well as to expand monitoring to include previously unsurveyed tributaries. The “Cream Teas and Cartography” meetings being held with the CSs by Sam Frith are successfully identifying and remedying gaps in the sampling coverage and greatly helping to achieve this aim.