

River Yealm Water Quality

Westcountry Rivers Trust Citizen Science Investigation

Report 2*

Findings from July 2022 - April 2025

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This Report is presented on behalf of our local group of volunteer Citizen Scientists, known as the “Yealm Dippers”, the Yealm Estuary to Moor Project and the River Yealm Water Quality Group, in partnership with the Westcountry Rivers Trust.



The work of the Yealm Dippers is kindly supported by funding from the riparian Parish Councils of Wembury, Newton Ferrers, Noss Mayo, Yealmpton, Brixton and Sparkwell, plus one significant anonymous donor, coordinated through the River Yealm Water Quality Group, which is comprised of representatives from each of those councils.

The Yealm Estuary to Moor project supports this CSI through additional funding, and by helping to engage and coordinate local volunteers.

We would also like to thank Nicola Rogers of the Westcountry Rivers Trust for her insights and suggestions towards this report.

* Report 1: [Yealm CSI Report 2022-3 \(Hawkins and Pennington 2024\)](#)

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The Yealm Dippers

The Westcountry River Trust's (WRT) Citizen Science Investigation:

- educates and engage people with the water environment
- helps identify and locate persistent background pollution problems, producing data that can be used to help target remediation
- spots transient pollution events which can then be dealt with as quickly as possible
- creates a network of catchment communities that are invested in their local environment

The Yealm Dippers, a group of over 50 volunteers based throughout the Yealm catchment, use the [methodology specified by WRT](#) to take their water quality readings on the Yealm and its tributaries.

Together we have logged over **600 water quality surveys undertaken** between July 2022 and April 2025 **across 29 sites, including on 12 tributaries**, onto the Cartographer data management platform ([Westcountry Rivers Trust - Case Studies - Cartographer](#)).

Water quality survey sites have been selected based on known and developing challenges within the catchment.

Surveys are recorded on an approximately monthly basis helping to identify and locate persistent background pollution problems throughout the catchment.

Upper Safe Limits (USL) used for each of the water quality readings are:

Temperature - 19.5 °C

Total Dissolved Solids (TDS) – 300ppm

Turbidity – 75 NTU

Phosphate – 100ppb

See Appendix 1 for explanation of each metric and the USLs used.

Summary of Priority Sites

Analysis of CSI data gathered between July 2022 – April 2025 (Table 3) identifies the following sites within the Yealm catchment as our top priorities for water quality improvement.

Table 1. Priority sites

Priority sites	CSI results	Primary inputs
River Yealm		
River Piall – tributary to the River Yealm	• High turbidity and phosphate levels. • Temperatures above levels known to stress brown trout and that have long-term consequences for salmon fry and adults.	• Discharges from clay settlement ponds and/or surface runoff draining from commercial China Clay works. • Cornwood and Lutton STWs, and/or surface runoff.
Lee Mill Stream	• High turbidity and phosphate levels.	• Lee Mill industrial estate, motorway/road runoff, Lee Mill STW and/or surface runoff.
Long Brook Stream	• High phosphate levels.	• Surface runoff.
Puslinch Bridge – below Yealmpton STW	• High phosphate levels. • Temperatures exceeded USLs 3 x during the drought in 2022. • High turbidity.	• Yealmpton STW.
Yealm Estuary		
River Yealm	• High turbidity and phosphate levels.	• China clay works, STWs, industry and land runoff.
Newton Stream	• Extreme phosphate (25 x USL) and high TDS levels (Table 4).	• Newton & Noss STW and/or surface runoff.
Ridgecote Lake Coffin Stream Brusheshill Stream Noss Mayo Stream	• High phosphate levels.	• Surface runoff.

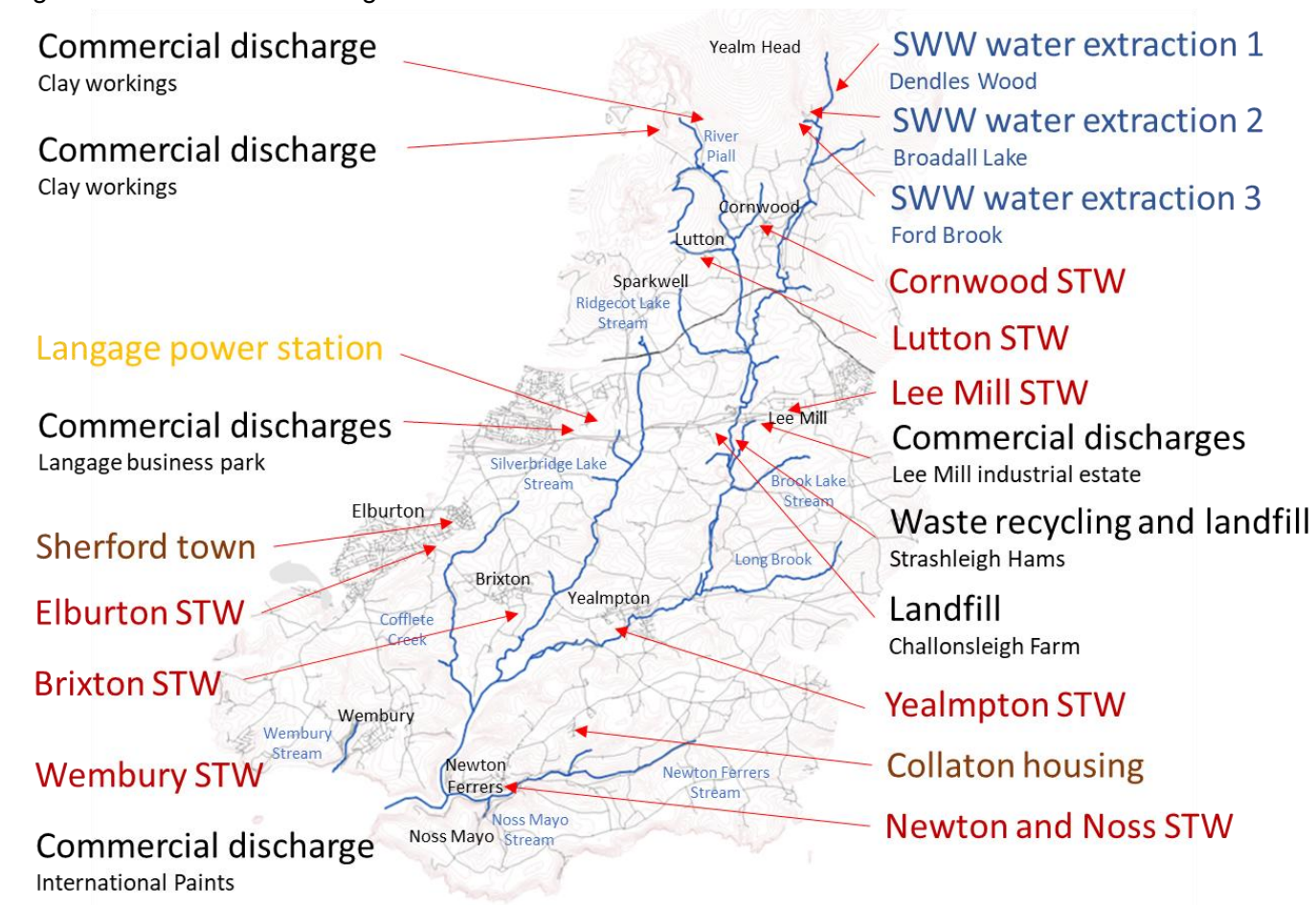
50% of survey sites located on tributaries connecting with the Yealm had average phosphate readings that exceeded the USL of 100ppb. Consequently, elevated phosphate levels, as a marker of associated pollutants, continue to be a primary concern throughout the catchment.

The River Yealm is designated as one of only 42 Principal Salmon Rivers within England with an associated [River Yealm Salmon Action Plan](#). Historic salmon spawning and rearing habitats within the catchment include the River Piall, Ridgecote Lake Stream and the middle to lower reaches in the main channel of the Yealm. Inputs impacting these areas are priorities, shared with the River Yealm Catchment Partnership (RYCP), comprised of representatives from industry, agencies and regulators, towards co-ordinated monitoring and remediation within the context of an agreed 5-10 year plan.

By comparison, the Lower River Yealm is classified as Good on the Department of Environment Food & Rural Affairs (DEFRA) Catchment Data Explorer. Newton Stream is classified as Moderate due to elevated phosphate caused by sewage discharge. Our CSI data determines these sites to be of greater concern.

Environmental Challenges within the Yealm Catchment

Fig 1. Environmental challenges

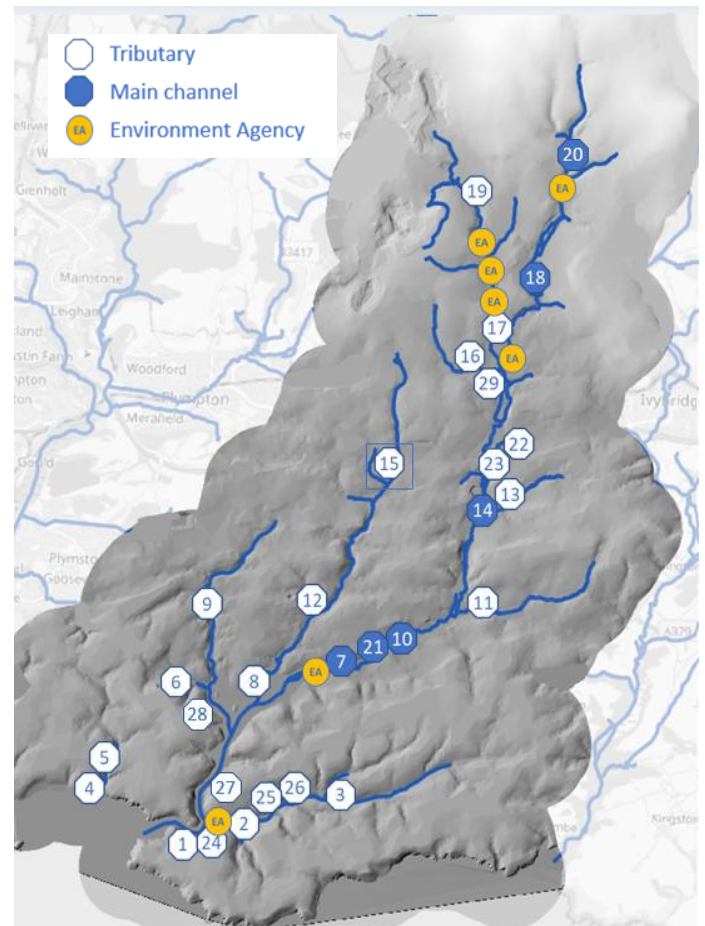


A catchment is a natural ecological unit, all parts being interconnected and influencing each other. We aim for a catchment wide analysis and CSI monitoring sites have been allocated accordingly.

WRT CSI Survey Sites

Fig 2. Survey sites

- 1 Noss Mayo Stream @ Tidal car park
- 2 Newton Stream at Bridgend
- 3 Newton Stream@ Preston
- 4 Wembury Stream @ Wembury beach footbridge
- 5 Wembury Stream @ Mill Meadow footbridge
- 6 Hollacombe Brook @ Traine Wood
- 7 Yealm @ Puslinch Bridge
- 8 Silverbridge lake @ Kitley Lake outflow
- 9 Cofflete Stream @ Combe
- 10 Yealm @ Yealm Bridge
- 11 Long Brook @ Yealm Bridge
- 12 Silverbridge Lake @ Gorlofen
- 13 Brook Lake @ Rubys Wood near Popples Bridge
- 14 Yealm @ Popples Bridge
- 15 Silverbridge Lake @ Barn Park (Smithhaleigh)
- 16 Ridgect Lake @ Three Streams
- 17 Piall @ Marks Bridge
- 18 Yealm @ Cornwood (Slade Mill)
- 19 Piall @ Quick Bridge
- 20 Yealm @ Wisdom Mill Bridge
- 21 Yealm @ The Borough
- 22 Lee Mill Stream @ Lee Mill
- 23 Lee Mill Stream @ New England Nature Reserve
- 24 Coffin Stream @ Bridgend
- 25 Collaton Stream East, Preston
- 26 Collaton Stream West, Preston
- 27 Brusheshill Stream @ Brusheshill Wood
- 28 Trescan Brook @ Wembury Wood
- 29 Piall @ Yondercott Bridge



EA Monitoring Sites

- Newton Stream @ Bridgend
- Yealm @ Puslinch Gauging Station
- Yealm @ Fardel Mill Farm Bridge
- Yealm @ Hele Cross
- Piall @ Marks Bridge
- Piall @ Slade Bridge
- Piall @ Almshouse Bridge

All sewage treatment works (STW) are monitored by the EA in addition to the sites above with the exception of Cornwood STW. The EA monitoring data is available here: [Open WIMS data](#)

Rainfall Trends

The river level is recorded by the Environment agency at [Puslinch Gauging station](#).

- Warning level is 2.08m
- Alert level is 1.71m
- Typical high is 1.36m
- Typical low is 0.21m

Table 2. Rainfall levels

Rainfall Yealm Catchment July 2022 – April 2025		
Dates	No of times > High Alert Level of 1.71m	No of times < Typical Low Level of 0.21m
July 2022 – June 2023	11	59 (official drought 2022, long, dry summer)
July 2023 – June 2024	7	0
July 2023 – April 2025	4	0

Our first Report [Yealm CSI Report 2022-3 \(Hawkins and Pennington 2024\)](#) of findings from 2022 to 2023 demonstrated how, as can be expected, in both the main river and the tributaries of the Yealm, highest levels of temperature, phosphate and total dissolved solids occurred during summer months when water levels were especially low, suggesting inputs from sustained sources, presumably sewage and industry, in the relative absence of land runoff. It is unlikely that consistently high measurements during summer months were also due to sediment resuspension; nor to lack of flushing, given that river flow remained significant at all sampling sites.

Alternatively, highest levels of turbidity occurred during winter and spring when water levels were high.

CSI Results

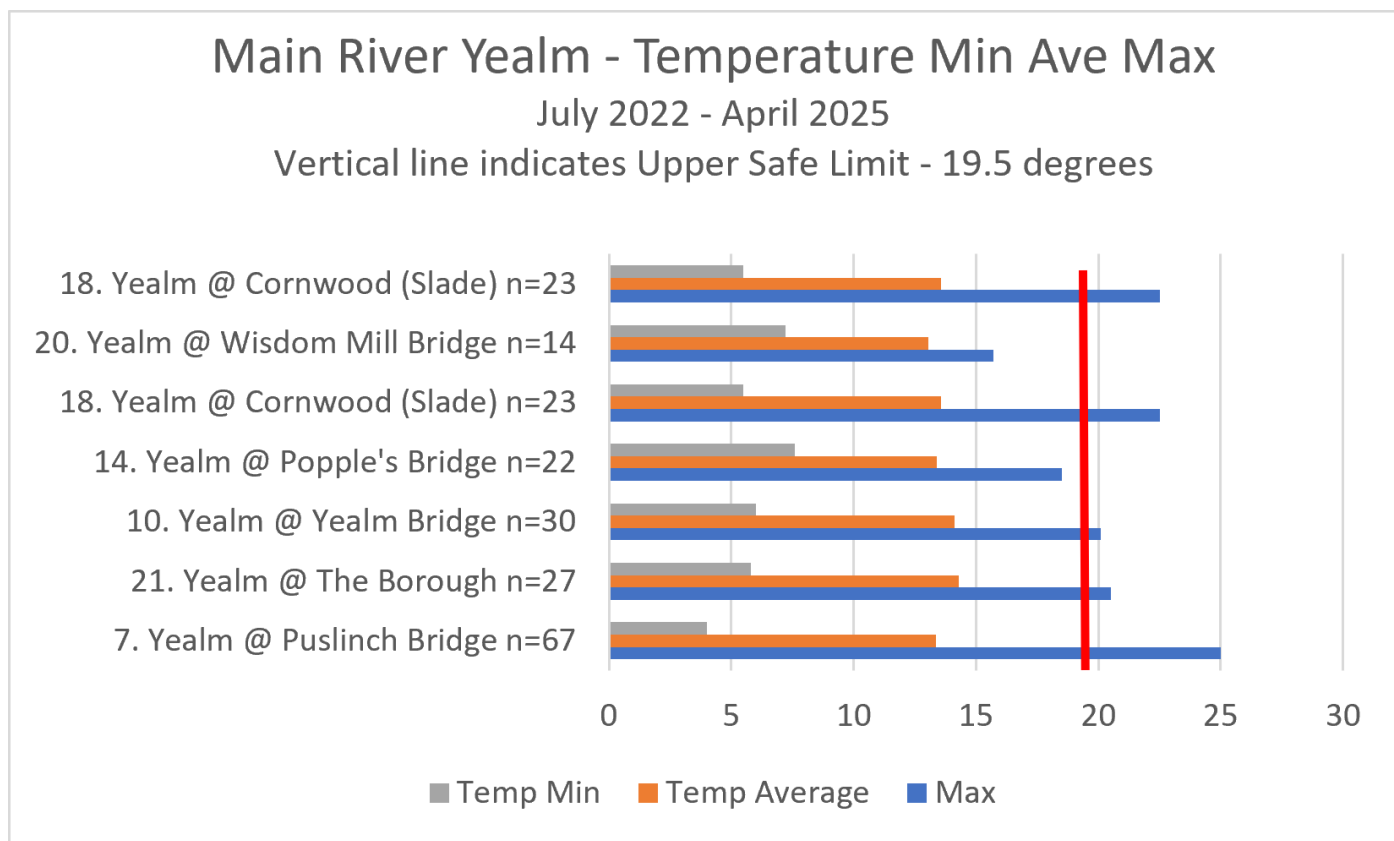
Main channel of River Yealm

- Upper Catchment – Site 20 Wisdom Mill Bridge
- Mid Catchment – Site 14 Popples Bridge
- Lower Catchment – Site 10 Yealm Bridge, Site 21 The Borough and Site 7 Puslinch Bridge

Puslinch Bridge represents the last stretch of fresh water before the river joins the estuary.

Averages presented in all figures below have been calculated as the mean.

Fig 3. Main river – Temperature



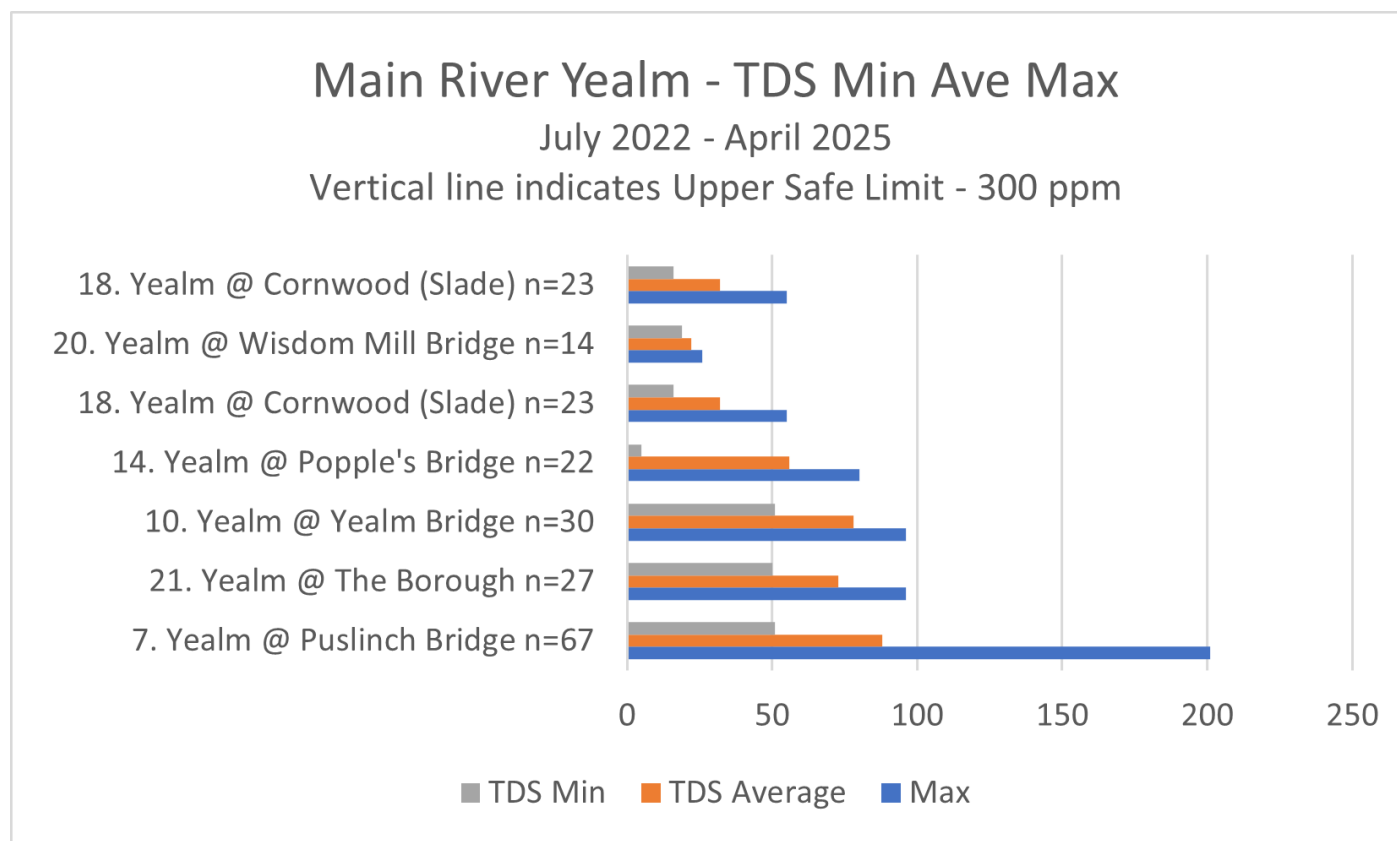
Temperature

The temperature in main channel of River Yealm does not vary hugely, remaining below Upper Safe Limits from the top of the catchment at Wisdom Mill Bridge down to Puslinch Bridge.

However, when the USL for temperature is breached, this is seen to be most significant at **Cornwood (Slade)** and **Puslinch Bridge**, both sites potentially impacted primarily by industry and sewage works. Lack of shade or low depth of water are unlikely to be influencing factors at these sites.

It should be noted that the high temperature readings at both these sites were during the drought of 2022 and such readings have not been observed since.

Fig 4. Main river - Total dissolved solids



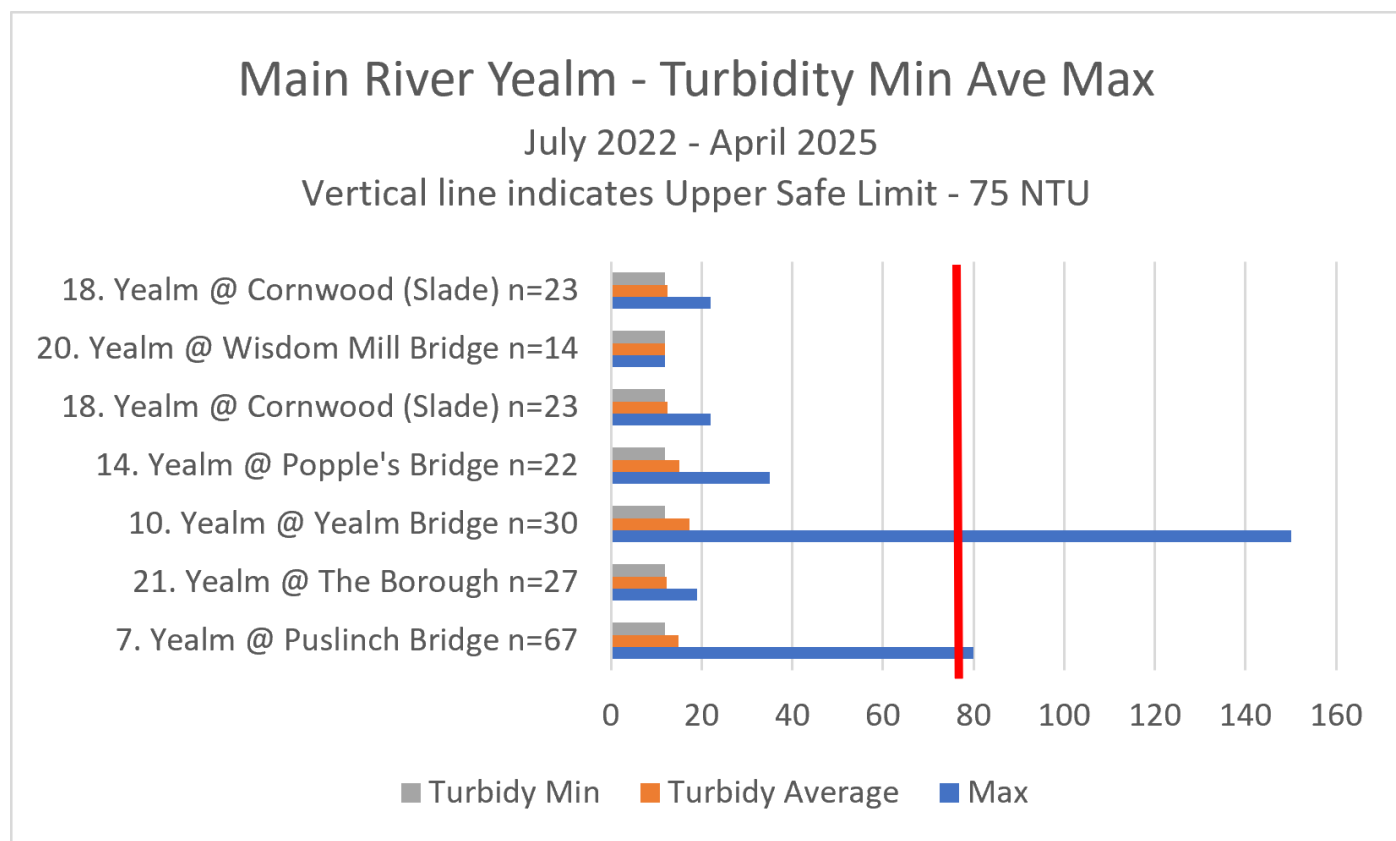
Total Dissolved Solids

The average readings for total dissolved solids (TDS) are seen to increase from the Upper Catchment at Wisdom Mill down to the Lower Catchment at Puslinch Bridge.

No sites have breached the Upper Safe Limits for TDS over the time surveyed.

The site with the highest readings is **Puslinch Bridge**.

Fig 5. Main river – Turbidity

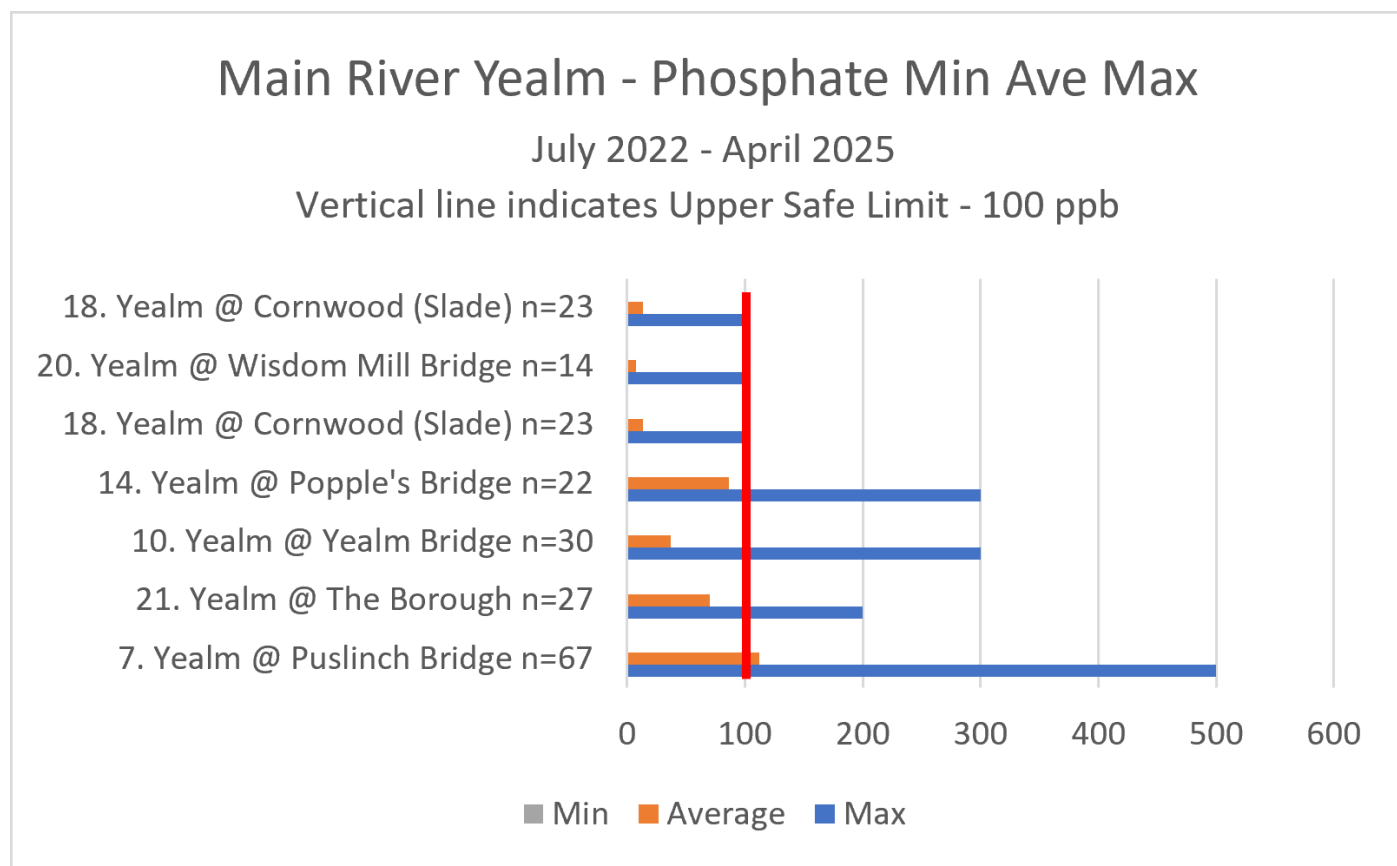


Turbidity

The average turbidity readings on the main river were consistently below the USL of 75 NTU.

The sites on the main river where the highest turbidity has been observed are **Yealm Bridge and Puslinch Bridge, the highest levels being recorded at Yealm Bridge.**

Fig 6. Main river – Phosphate



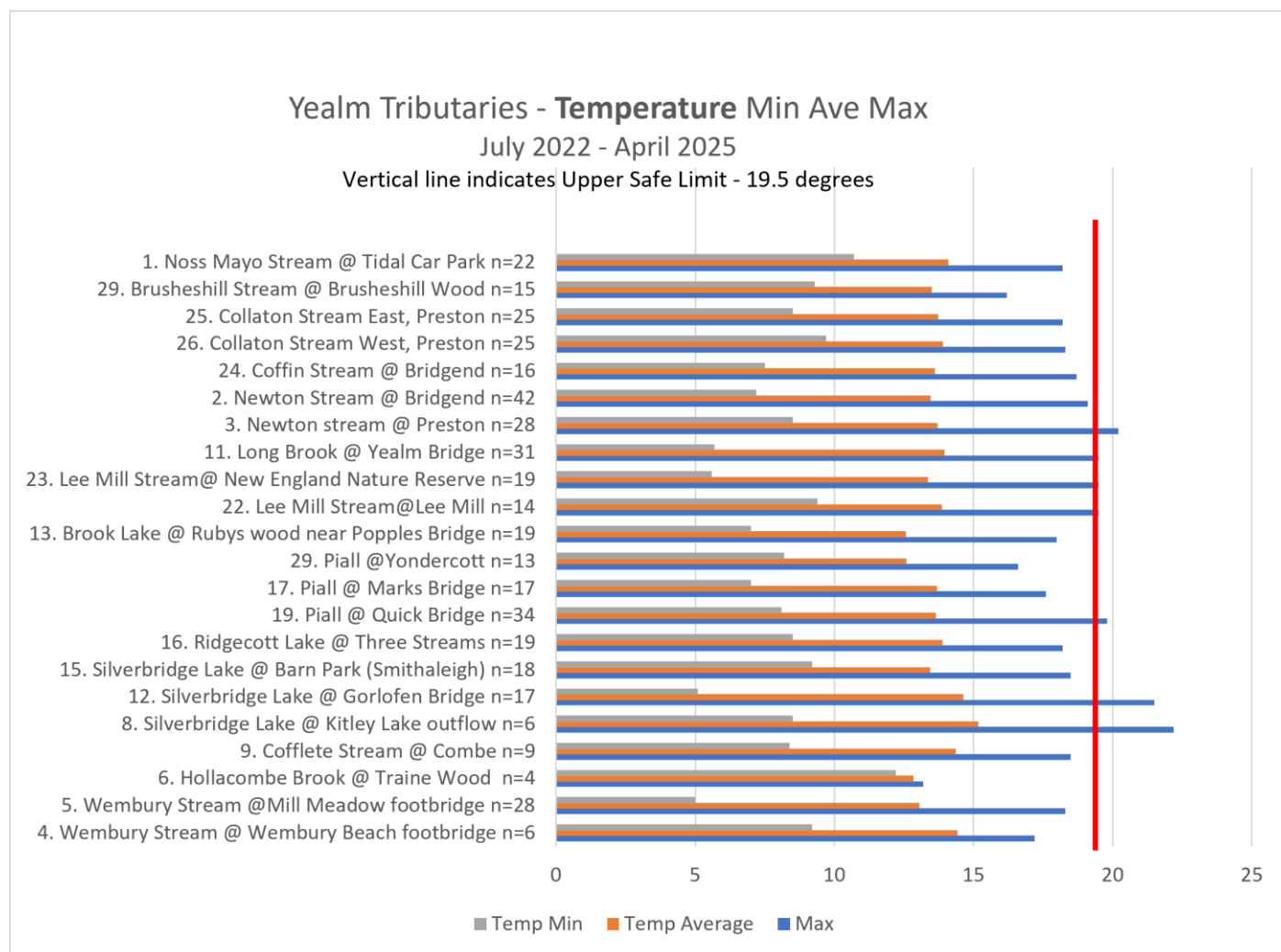
Phosphate

Average phosphate levels increased very significantly in the Mid Catchment at Popples Bridge, immediately below input from Lee Mill Stream, and again at **Puslinch Bridge**, immediately below Yealmpton Sewage Works.

Phosphate levels exceeded the USL at **Popples Bridge**, and then at all sites further downstream, including **Yealm Bridge**, **The Borough** and particularly **Puslinch Bridge** where the average phosphate level reading exceeds the USL.

Tributaries to both the River Yealm and Yealm Estuary

Fig 7. Tributaries – Temperature



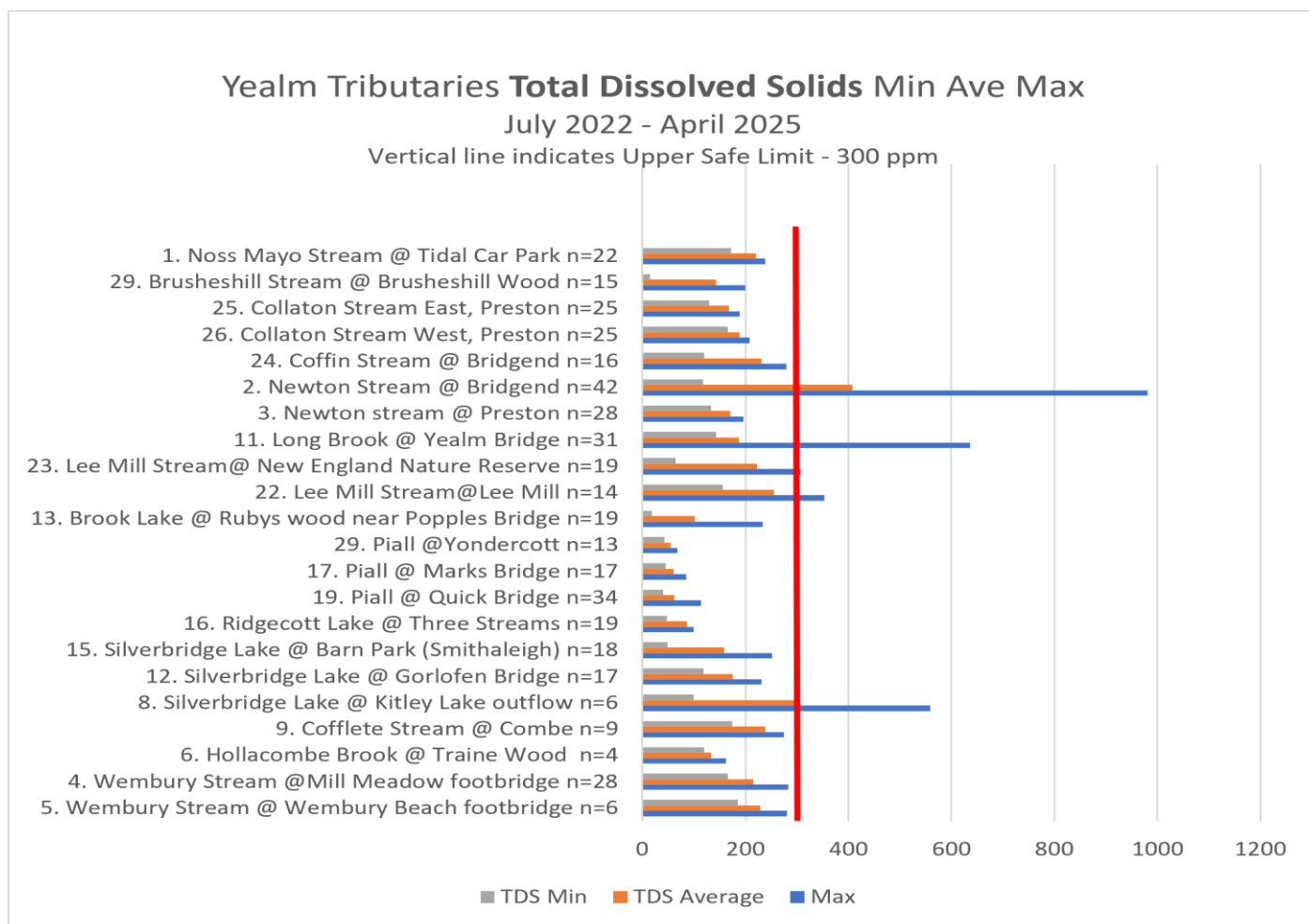
Temperature

Average temperature readings across all tributary sites within the catchment are consistently below the USL. All averages are very similar and most, with the exception of Silverbridge Lake, are below 15 degrees.

Sites where higher temperatures have been observed to exceed the USL include **Silverbridge Lake** sites, **Piall @ Quick Bridge**, **Lee Mill Stream** sites, **Long Brook @ Yealm Bridge** and **Newton Stream @ Preston**. These readings were mainly observed during the drought of 2022.

Care should be taken when interpreting results from Silverbridge Lake @ Kitley Lake outflow as there have only been 6 water quality readings taken. However, it is indicative that there is problem and that further CSI monitoring is necessary.

Fig 8. Tributaries – Total dissolved solids

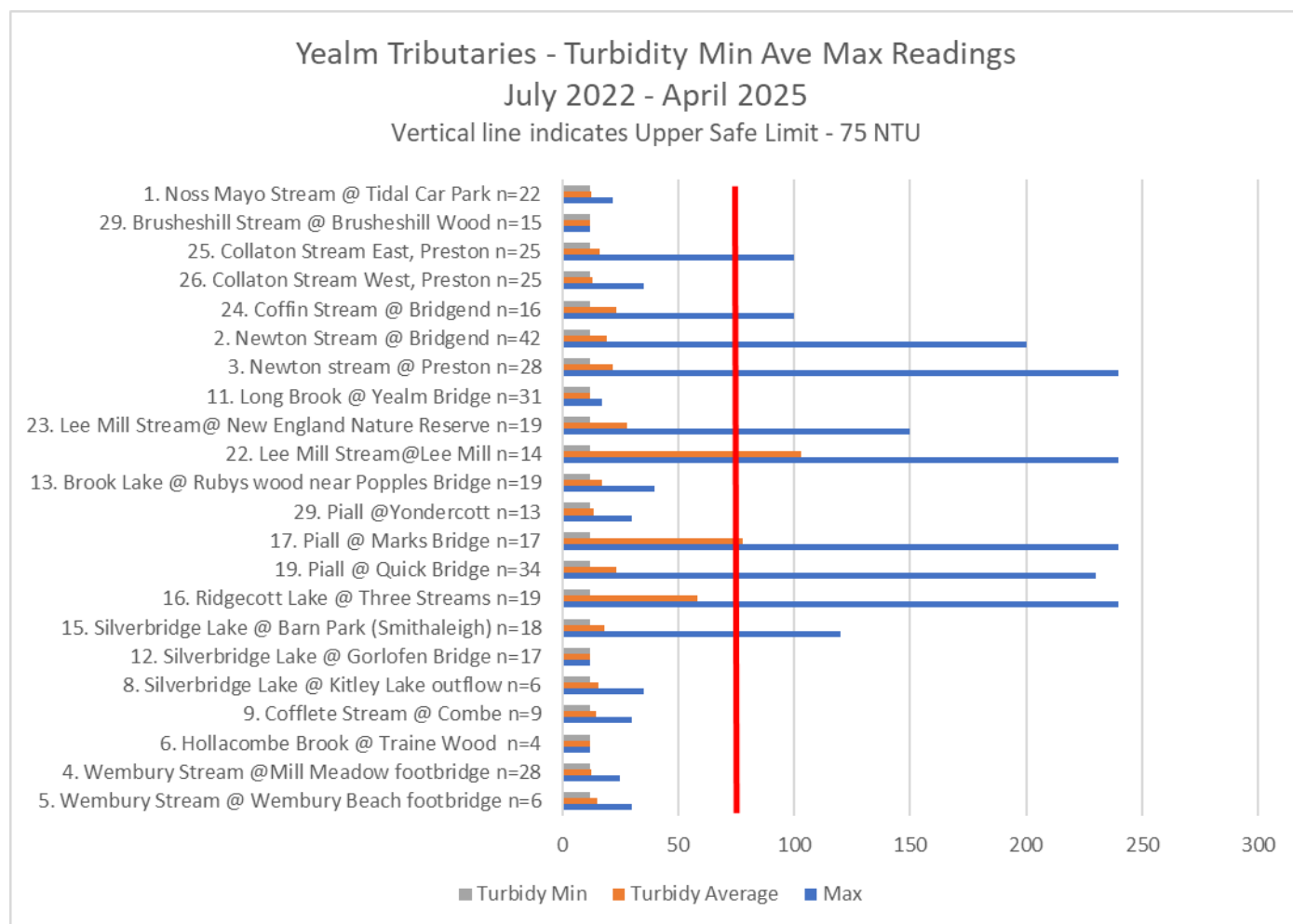


Total Dissolved Solids

Average TDS readings across the catchment are consistently below the USL apart from in **Newton Stream @ Bridgend** where TDS consistently exceeded the USL with highest reading of > 900ppm.

Other sites where TDS has been observed to exceed the USL include **Long Brook @ Yealm Bridge**, **Silverbridge Lake @ Kitley Lake Outflow** and **Lee Mill Stream @ Lee Mill**.

Fig 9. Tributaries – Turbidity

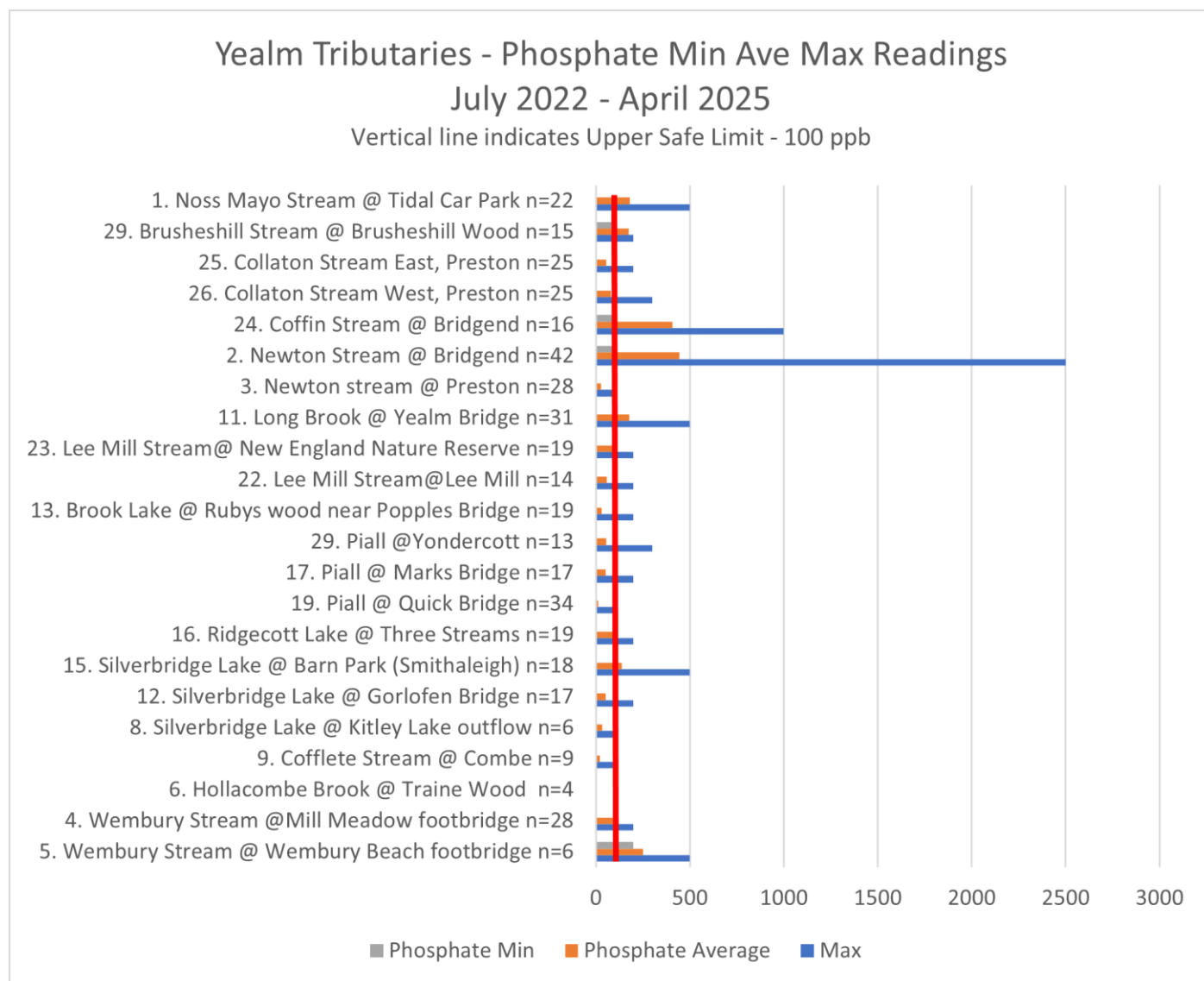


Turbidity

Average turbidity readings are consistently below the USL throughout the catchment apart from in **Lee Mill Stream @ Lee Mill** and the **Piall @ Marks Bridge** where turbidity consistently exceeded the USL.

The sites turbidity has been observed to exceed the USL, have included **Piall** sites, **Ridgect Lake @ Three Streams**, **Newton Stream @ Preston**, **Collaton Stream** at East Preston, **Coffin Stream @ Bridgend**, **Lee Mill Stream @ New England Nature Reserve** and **Silverbridge Lake @ Barn Park (Smithaleigh)**.

Fig 10. Tributaries – Phosphate



Phosphate

50% of survey sites on tributaries to the main channel of River Yealm have average phosphate readings that exceed the USL of 100ppb.

The sites where the highest phosphate readings have been observed include:

- **Newton Stream @ Bridgend** with its highest readings of 2500ppb, 25 times higher than the USL
- **Coffin Stream @ Bridgend**
- **Noss Mayo Stream @ Tidal Car Park**
- **Brusheshill Stream @ Brusheshill Wood**
- **Long Brook @ Yealm Bridge**
- **Silverbridge Lake @ Barn Park (Smithhaleigh)**
- **Ridgecott Lake @ Three Streams**
- **Piall @ Marks Bridge**
- **Lee Mill @ New England Nature Reserve**
- **Wembury Stream @ Wembury Beach Footbridge and @ Mill Meadow Footbridge**

CSI surveys exceeding upper safe limits

Table 3. Surveys exceeding upper safe limits

Sites Surveyed (July 2022 - April 2025)	No of Surveys	No of times water quality indicator exceeded USL				Total x USLs exceeded	Ave no of x the USL has been exceeded per no of surveys	Potential influences
		Temperature 19.5 degrees	Total dissolved solids 300 ppm	Turbidity 75 NTU	Phosphate 100ppb			
Main channel								
20. Yealm @ Wisdom Mill Bridge	14	0	0	0	0	0	0.00	
18. Yealm @ Cornwood (Slade)	23	1	0	0	1	2	0.09	Industry, sewage works and surface runoff
14. Yealm @ Popple's Bridge	22	0	0	0	6	6	0.27	
10. Yealm @ Yealm Bridge	30	1	0	1	3	5	0.17	
21. Yealm @ The Borough	27	1	0	0	1	2	0.07	
7. Yealm @ Puslinch Bridge	67	3	0	2	16	21	0.31	
Tributaries								
22. Lee Mill Stream@Lee Mill	14	1	1	6	1	9	0.64	Industry, sewage works and surface runoff
23. Lee Mill Stream@ New England Nature Reserve	19	1	2	2	7	12	0.63	
15. Silverbridge Lake @ Barn Park (Smithhaleigh)	18	0	0	1	7	8	0.44	
12. Silverbridge Lake @ Gorlofen Bridge	17	2	0	0	1	3	0.18	
8. Silverbridge Lake @ Kitley Lake outflow	6	2	1	0	0	3	0.50*	
2. Newton Stream @ Bridgend	42	0	23	1	29	53	1.26	Sewage works and surface runoff
3. Newton stream @ Preston	28	1	1	0	0	2	0.07	
26. Collaton Stream West, Preston	25	0	0	0	4	4	0.16	
25. Collaton Stream East, Preston	25	0	0	1	1	2	0.08	
19. Piall @ Quick Bridge	34	2	0	2	0	4	0.12	
17. Piall @ Marks Bridge	17	0	0	7	1	8	0.47	Surface runoff
29. Piall@ Yondercott	13	0	0	0	1	1	0.08	
5. Wembury Stream @Mill Meadow footbridge	28	0	0	0	7	7	0.25	
4. Wembury Stream @ Wembury beach footbridge	6	0	0	0	5	5	0.83*	
9. Cofflete Stream @ Combe	9	0	0	0	0	0	0.00	
16. Ridgecott Lake @ Three Streams	19	0	0	7	4	11	0.58	
13. Brook Lake @ Rubys wood near Popples Bridge	19	0	0	0	3	3	0.16	
11. Long Brook @ Yealm Bridge	31	1	1	0	17	19	0.61	
24. Coffin Stream @ Bridgend	16	0	0	1	15	16	1.00	
27. Brusheshill Stream, Brusheshill Wood	15	0	0	0	11	11	0.73	
1. Noss Mayo Stream @ Tidal Car Park	22	0	0	0	12	12	0.55	

NB: * Indicates where results are preliminary, with only a low number of surveys to date.

Red highlights indicate sites with the highest average number of times upper safe limits have been exceeded per number of surveys. These sites are seen to be the most polluted within the Yealm Catchment and serve to form our priorities for further action.

The highest extent to which USLs were exceeded at each site, with tributaries grouped according to potential influences

Table 4. Multiples by which the highest measures exceeded the upper safe limit at each site

Sites Surveyed (July 2022 - April 2025)	No of Surveys	Maximum water quality measure exceeded USL by x multiples				Potential influences
		Temperature 19.5 degrees	Total dissolved solids 300 ppm	Turbidity 75 NTU	Phosphate 100ppb	
Main channel						
20. Yealm @ Wisdom Mill Bridge	14					Dartmoor
18. Yealm @ Cornwood (Slade)	23	✓				Industry, sewage works and surface runoff
14. Yealm @ Popple's Bridge	22				✓✓✓	
10. Yealm @ Yealm Bridge	30	✓		✓✓	✓✓✓	
21. Yealm @ The Borough	27	✓			✓✓	
7. Yealm @ Puslinch Bridge	67	✓		✓	✓✓✓✓✓	
Tributaries						
22. Lee Mill Stream@Lee Mill	14	✓		✓✓✓	✓✓	Industry, sewage works and surface runoff
23. Lee Mill Stream@ New England Nature Reserve	19	✓		✓✓	✓	
15. Silverbridge Lake @ Barn Park (Smithhaleigh)	18			✓	✓✓✓✓✓	
12. Silverbridge Lake @ Gorlofen Bridge	17	✓			✓✓	
8. Silverbridge Lake @ Kitley Lake outflow	6	✓	✓			
2. Newton Stream @ Bridgend	42		✓✓✓	✓✓	✓✓✓✓✓✓✓✓✓✓✓✓ ✓✓✓✓✓✓✓✓✓✓✓✓ ✓✓✓	Sewage works and surface runoff
3. Newton Stream @ Preston	28	✓		✓✓✓		
26. Collaton Stream West, Preston	25				✓✓✓	
25. Collaton Stream East, Preston	25			✓	✓✓	
19. Piall @ Quick Bridge	34	✓		✓✓✓		
17. Piall @ Marks Bridge	17			✓✓✓	✓✓	
29. Piall @ Yondercott	13				✓✓✓	
5. Wembury Stream @Mill Meadow footbridge	28				✓✓	
4. Wembury Stream @ Wembury beach footbridge	6				✓✓✓✓	Surface runoff
9. Cofflete Stream @ Combe	9					
16. Ridgescott Lake @ Three Streams	19			✓✓✓	✓✓	
13. Brook Lake @ Rubys wood near Popples Bridge	19				✓✓	
11. Long Brook @ Yealm Bridge	31	✓	✓✓		✓✓✓✓✓	
24. Coffin Stream @ Bridgend	16			✓	✓✓✓✓✓✓✓✓✓✓	
27. Brusheshill Stream, Brusheshill Wood	15				✓✓	
1. Noss Mayo Stream @ Tidal Car Park	22				✓✓✓✓✓	

Observing the extent to which upper safe limits have been breached at each site helps to prioritise the sites for remedial work and indicate the magnitude of the pollution event that caused the highest of the breaches.

Incidents Reported to the Environment Agency

Nov 24, Jan, May and Aug 2025, Collaton Stream West - soil run off events continue despite engineered solution (settlement basins with silt fences, Floccmats and extra bunds) to mitigate put in place by Collaton Development. Video evidence of soil run-off from the site has been recorded and shared with the PC/Collaton Liaison Meeting.

July 2025, Mudbank in Brixton - very slippery concrete apron, possibly a sewage leak or spring water, slurry from the nearby cow field, or water flowing from Kitley Lake. Currently a hazard to users and needs cleaning.

July 2025, River Yealm - cloudy from below Luton STW down to Puslinch. Incident was reported 3 times to the EA by Yealm Responders. Luton STW is known to have been under repair.

May 25, River Piall - saw a significant input of China clay-like material in the absence of previous rainfall.

March 24 – Piall - meeting held with EA, YEG, RYWQG, YEM and Snowbee International. We were advised that recent incidents on the Piall have been within limits for discharge licences held by China clay workings. We are in regular contact with the EA regarding the serious incident in December 2022 who have regularly assured us that the associated investigation is ongoing. The EA welcomes our help with more detailed monitoring of the Piall.

July 2024, River Piall and Yealm - Rebecca Smith MP was engaged to follow up the incidents with the EA. Response indicated that the discolouration was due to the compliant discharges from 2 quarry sites upstream of Luton.

Jan 25, Cofflete Stream - ran white, possibly coming from Sherford.

Sept 2024, Brixton - sewage sludge and lime spread on the fields to the east of Brixton. CSI readings showed TDS to be very high at 894ppm. This was after heavy rain. Foam also observed.

August 2024, Bridgend Creek - high levels of algae were observed at Bridgend Creek. Newton stream had a significant soil runoff event in early September.

Fig 11. River Yealm July 24



Fig 12. River Piall July 25



Fig 13. Yealm at Yondercott July 25



Photo credits: Charles Weston-Baker and Julia Bertram

Additional Measures at Wembury

Wembury bathing water has deteriorated from Excellent to Good based on classification by the Environment Agency (EA) in 2024. The EA is conducting detailed investigations to find the causes, working with landowners/relevant authorities to try and rectify any issues. These investigations will primarily be concentrating on faecal indicators but may also include other determinants such as phosphate.

Our CSI sampling is also supporting the EA's investigation at Wembury. Measuring sites now include Church Road Stream, Wembury Stream above the confluence of Church Road Stream and Wembury Stream at the beach, with monthly results being reported both to the EA and WRT's CSI.

In addition to the EA actions to improve the water quality at Wembury, the National Trust continues to develop nature friendly solutions at [New Barton Farm, Wembury](#). Some of the planned solutions will help mitigate the runoff into Wembury Stream.

Further Actions

River Yealm Catchment Partnership (RYCP)

Priorities identified within this report are being shared with the RYCP to give direction for future action.

The RYCCP is hosted by the EA and YEM, with representation from organisations active in the catchment including RYWQG, WRT, South Devon National Landscapes, Yealm Estuary Management Group, Dartmoor National Park, Natural England Catchment Sensitive Farming, South West Water, ParkLife South West and Devon Wildlife Trust, plus expert advice from 5 Farming, the University of Plymouth and Plymouth Marine Laboratory.

The RYCP enables YEM and WRT to share evidence for areas of concern with industry, agencies and regulators, aiming to achieve synergy, drawing upon each member's separate programs and working towards co-ordinated monitoring and remediation within the context of an agreed 5-10 year plan.

South Hams District Council (SHDC) trial of new sensors

The Piall has been selected for inclusion in the SHDC all catchment trial of a new Teledyne continuous water monitor set up to help monitor water pollution, [BBC article](#). The Piall is a major tributary of the River Yealm that is notoriously subject to discharges of both China clay and sewage, incidents of which are regularly reported by the Yealm Dippers to the Environment Agency. Data from this new monitor will complement and help to interpret our existing continuous water monitor, the "Yealm Sonde", located in the bottom reaches.

Yealm Estuary to Moor

The Yealm Dippers water quality monitoring results help inform the working priorities of Yealm Estuary to Moor who undertake remedial and preventative nature-based solutions such as tree and hedge planting, pond creation and wildflower meadow creation.

Appendix 1

Explanation of Upper Safe Limits used

Temperature

Temperature is a vital parameter within the river ecosystem. It controls many of the aquatic species life cycles. Temperature fluctuates with the seasons; however, you do get variation within that, particularly in small rivers and streams. Another important reason to measure temperature is to track the impact of our warming climate on our waterbodies.

Survival in, and passage through, estuaries and rivers by returning adult salmon are influenced by temperature, especially where other water quality parameters are critical. Studies indicate that brown trout and Atlantic salmon are stressed, with long-term consequences for the population, at temperatures above 19.5 °C and 22.5° C, respectively ([Brown trout and salmon \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/612221/Brown-trout-and-salmon.pdf)).

We use 19.5°C as the upper safe limit (USL) for temperature.

Total Dissolved Solids

Total dissolved solids (TDS) is directly related to the conductivity of the water. The more minerals, salts and metals that are dissolved in the water the more conductive it gets. Geology will influence the normal level of conductivity in a watercourse. Low levels of dissolved solids in waters such as those on Dartmoor near to the source of the river are a result of very low levels of input from the surrounding landscape. As the river runs down to the sea it collects material from many different inputs, some natural and some man-made such as farms, sewage plants, factories and residential areas. This typically increases the amount of solids dissolved in the water leading to a higher reading. Harmful pollution from things like sewage, slurry and factory discharge will usually elevate TDS. However, some pollutants such as oil can lower conductivity. Therefore, whilst continuous or regular monitoring of TDS may allow the detection of pollution events, TDS should be used as a general indicator of water quality, rather than a specific measure of toxicity.

The U.S. Environmental Protection Agency (EPA) Secondary Regulations advise a maximum contamination level of 500mg/L (500 ppm) for total dissolved solids (TDS). When TDS levels exceed 1000mg/L it is considered unfit for human consumption. Most commonly, high levels of TDS are caused by the presence of potassium, chlorides and sodium. Changes in the amount of dissolved solids determines the flow of water in and out of an organism's cell, thereby affecting growth or causing death. A level of 400ppm = 400 mg/l is recommended for most freshwater fish.

Given the above, and that TDS levels vary between catchments according to natural geology etc, whilst we are still getting to know our river -

we use 300 ppm = 300 mg/l as the upper safe limit (USL) for total dissolved solids

Turbidity

Turbidity is a measure of the optical clarity of the water. The more suspended particles in the water the lower the clarity and the higher the turbidity. You will often find your waterbody gets more turbid after heavy rainfall due to soil running off the fields and sediment being mixed into the water column. This loss of topsoil is both a problem for farmer and river. It can often contain chemicals from the fertiliser and pesticides used on the land. An increase in sediment level on the substrate of the river can cause smothering of habitat by removing light and oxygen. Aquatic wildlife such as the less mobile invertebrates and fish eggs struggle to survive in low oxygen conditions and without light, plants are unable to grow. It is

a good idea to sample your river after different weather conditions to understand how it responds to rainfall or drought.

Turbidity is recorded in Nephelometric Turbidity Units (NTU). The relationship between NTU and suspended solids is as follows: 1 mg/l (ppm) is equivalent to 3 NTU. Therefore, 300 mg/l (ppm) of suspended solids is 900 NTU.

A review of literature indicates that NTU values of ≥ 100 are unsafe for most aquatic life.

The European Union (EU) Freshwater Fish Directive's Guideline Standard is an annual mean of 25 mg/l, and which guideline standard is used by the U.K. Environment Agency to help set controls on discharges of inorganic material from quarries, open cast coal sites, and mines. This EU standard of 25 mg/l = 75 NTU annual mean.

We use 75 NTU = 25 mg/l as the upper safe limit (USL) for turbidity

Phosphate

Phosphate occurs naturally within the river ecosystem, but in very low levels under 0.05 mg/l. Higher levels may indicate anthropogenic input. Phosphate is found in animal and human waste, cleaning chemicals, industrial runoff and fertiliser so this can be a good indicator of pollution. Having raised levels of phosphate can lead to increases in plant growth within the watercourse. This leads to a depletion of oxygen due to the plant's aerobic respiration during the night. Without oxygen aquatic species cannot survive and the river ecosystem collapses. It is important to note that phosphate is taken up by plants. You may get a low reading but high plant growth, indicating eutrophication.

In 1986, the U.S. Environmental Protection Agency (EPA) recommended phosphate levels of no more than 0.1 mg/l (100 ppb) for streams that do not empty into reservoirs; no more than 0.05 mg/l (50 ppb) for streams discharging into reservoirs; and no more than 0.024 mg/l (24 ppb) for reservoirs.

The above recommendations are consistent with the ranges on the diagnostic colour chart for WRT's CSI test kit as follows:

0 – 100 ppb: OK
200 – 300 ppb: HIGH
500 – 2500 ppb: TOO HIGH

We use 100 ppb = 0.1 mg/l as our upper safe limit (USL) for phosphate.