River life in the Ouseburn valley

Animals & salinity measures

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Summary.

1. This report summarises records of river invertebrates collected by kick sampling in early summer and autumn from the Ouseburn in the valley at three sites: just downstream of the culvert, next to the Farm and by the Boat Club ramp.

2. In addition, measures of salinity were taken on a range of high and low tides to record how far the tidal influence might reach up or down the river.

3. Just downstream of the culvert the animal life is primarily a freshwater mix including mayflies, caddisflies, leeches and flatworms. By the Boat Club ramp the fauna is almost entirely brackish water, including shore crabs, shrimps and ragworms. By the Farm the animals are a degraded remnant of the animals found further up by the culvert. This transition is very typical of brackish tidal habitats.

4. Using the invertebrates to give a water quality score shows that the river is moderate quality by the culvert but poor and very poor at the Farm and Boat Club ramp. This scoring system is for freshwaters so does not capture the brackish water life. In particular, all sites had abundant *Gammarus duebeni*, a brackish water "freshwater shrimp".

5. Several fish were found, notably young European eels by the culvert in spring and autumn, and a juvenile flatfish and goby by the Boat Yard ramp.

6. The measures of salinity during a range of tides in early summer and autumn show the variation in how far the salt-water influence reaches up and down the river in the valley. On high tides with low river flow salt- water influence can be detected as high up as the culvert whilst at low tides and higher flow the water along the length of the channel can be wholly freshwater down to the confluence with the Tyne. This combination of changes with the tides, plus additional variation linked to catchment flows, makes the environment very challenging for many species.

7. The tidal nature of the Ouseburn valley and the resulting mix of freshwater and salt-water life is a distinctive characteristic of the Ouseburn. The alleged unattractiveness of the channel is very typical of such rivers. Rather than worry about it we can show off the tough critters that make their home here.

Introduction.

The Ouseburn river has been the subject of sustained research over recent decades, for example Turnbull (1996) and Zan et al. (2023), both studies demonstrating levels of bacteria linked to sewage pollution higher than acceptable thresholds despite the nearly thirty years between the measures. However the stretch of river in the Ouseburn Valley from the culvert exit down to the confluence with the Tyne has been less researched.

This length of the Ouseburn is distinctly different to the upstream reaches. It is tidal, famously so in the past when wherries could bring resources and goods up and down to the factories and warehouses (Ouseburn Trust, 2024). The river is highly modified, with engineered channel sides, buildings along its length and a closeable barrage just inside the channel before it joins the Tyne. Given the Roman wall crossing point it is likely that channel modifications have been made for at least 2000 years. Effluent outfalls are obvious, primarily large combined sewage overflows but also many pipes or leaks releasing water, often discolouring the river bed with orange, iron rich staining especially by the Farm.

Anecdotal records of wildlife includes breeding birds such as mallard duck, moorhen, dipper and cormorants have been seen catching prey. Occasional seals and otters have been recorded. Adult salmon have been seen on a few occasions, although in poor condition and brown trout can be seen by Crawford's Bridge. The river is evidently not dead. However the general look of the river often attracts negative comment in public events, the river bed being an unattractive mix of bare natural sediment, building debris and, increasingly towards the estuary, thick mud. Sometimes green algae grow but there are no plants except in the artificial bankside rafts. Tidal stretches of small rivers are often like this naturally. For example Willington Gut, on the north bank of the Tyne in Wallsend, has some salt marsh along its length but the actual river channel is still exposed debris and mud much like the Ouseburn. Tidal waters are a tough environment for wildlife because of the very variable salinity.

Salinity impacts on river life.

The aquatic animals and plants of our rivers are adapted to freshwater. Even small increases to salinity are intolerable. Similarly marine wildlife cannot tolerate freshwater. There is a distinct brackish water fauna that is able to cope with the conditions, but is commonly much less species rich than either freshwater river or seaside wildlife (Cognetti & Maltagliati, 2000).

For a tidal system such as the Ouseburn the challenge for aquatic life is made worse because the salinity changes twice a day with the tide. How far the tide reaches will vary if it is a spring or neap tide. Spring tides come higher and go out further, conversely neap tides are not as high nor retreat as low. The tide's reach up the river may also vary depending how much freshwater is coming down the catchment, which will vary with seasons and rainfall.

The purpose of this study.

The surveys described in this report were undertaken to

(1) Characterise changes to salinity from the Ouseburn confluence with the Tyne up to the culvert during varied tidal and flow conditions.
(2) Identify river invertebrates at different points along the river using sampling comparable to the methods typically used up-stream in studies of the Ouseburn.

Methods

Salinity

Salinity was measured using a specialist salinity probe.

In 2024 salinity was measured on three days in springtime, 8th and 30th May and the 24th June, then two days in the autumn (3rd and 17th October). The 8th May, 24th June, 3rd and 17th October were spring tides, so will come up higher and go out further, and the river flow was low. The 30th May was a neap tide and the river flow was higher following rain. Note only low tide measurements were made on 17th October due to a probe malfunction (the days of Litmus paper had their advantages)

The probe recorded salinity as "Practical Salinity Unit", PSU. PSU was adopted in 1978 as a measure to replace the old "parts per thousand ", ppt, PSU representing an improved , more consistent measure. The actual measured outcome in ppt or PSU are very similar. For example, seawater was often quoted as having ~35 ppt, (if you dried out a Litre of seawater you'd be left with 35g of salt) whilst the average for seawater in PSU is 34.7. For both PSU and ppt distilled water should give a measure of 0.0. Freshwater is defined by PSU measures between 0 and 0.5, brackish from 0.5+ to 30.0, with seawater ~35.0.

On most occasions at least ten points along the length of the river were sampled. This varied a bit depending on accessibility. For most measures a water sample was collected from the river in a jug lowered into the water (se Figure 1), especially at low tide when the reach of the probe wire was insufficient to stretch to the water. Just one sample was taken at each time/spot. Note that the use of the jug may impact the measures because (1) water in tidal rivers can sometimes be separated into distinct fresher or saltier which do not mix well. A single sample will not pick up these subtleties, (2) the jug was mostly used along the river-bank, sometimes from the centre of bridges, so that nay sample may be affected by the precise location.

River invertebrates

The animal life was recorded using kick sampling of shallower, riffle habitats, the same type of habitat as used by the Environment Agency and River Trusts.

Three spots were chosen, primarily for accessibility: (1) twenty metres downstream of the culvert, (2) adjacent to the Farm next to the artificial rafts along the western edge of channel and (3) adjacent to the Boat Club ramp (see Appendix 1 for photos of the sampling sites). Sites further down were not accessible, largely due to increasing muddiness.

At each site five, one minute kick samples were taken moving around over riffle habitat. Each sample was tipped into a white tray and the animals counted and identified. For some invertebrates a few individuals were kept to identify to species level, otherwise the identification was to Family, the level used for routine river water quality monitoring in the UK, using the Biological Monitoring Working Party (BMWP) scoring system. BMWP allocates each taxon found in a sample a score between 1 to 10 depending on its sensitivity to pollution, 10 being highly sensitive, 1 not so. Note that the BMWP this has recently been superseded by the Whalley, Hawkes, Paisley, Trigg (WHPT) system, which is much the same but the precise score for each taxon ("taxon" just means the types of animals regardless of precise level of identification) varies depending on how abundant it is in the sample, using four abundance categories 1, 2, 3 and 4, equivalent to the ranges 1-10, 11-100, 100-1000 and >1000

individuals. For this report references to the BMWP or ASPT scores refer to the revised scores used in the WHPT system.

For any sample an overall score can be obtained by adding up the scores for each taxon found. The higher the score the less polluted the site. However, there is an obvious problem with this; you might get a high score if you have a few high scoring (pollution sensitive) species or lots of low scoring (pollution tolerant) species. Therefore most river quality ratings use the Average Score Per Taxon, ASPT, which is the total score divided by how many taxa contributed to it rather than the overall total score.

The number of each taxon in sample was estimated to allow use of the WHPT scores.

Figure 1. Sampling in progress. Top left shows the salinity probe in a jug of river water. Top right is kick sampling in action, the sample then carried to the bankside for sorting and counting in white trays.

Salinity probe in water sample collection jug.

Kick sampling.

Kick sample in white tray to count.

Tray with kick sample contents.

Results – animal life

The river life in the spring samples is recorded in Table 1, showing the average abundance recorded on the WHPT scale, ranked as 1-4 respectively), at each of the three kick sampling sites. For example in the five kick samples from by the Farm in spring the abundance of shrimp *Gammarus duebeni* was estimated as 11-100, 11-100, 11-100, 101-1000 and 11-100, which translate to WHPT abundance scores of 2, 2, 2, 3 and 2. The average abundance is therefore 11/5 = 2.2.

Table 1. River animal samples, spring season, list of taxa. Taxa shaded brown are brackish water taxa.

	Below culvert	By Farm	By boat club
Polycelis sp., flatworm			
Dendrocoelum lacteum, flatworm			
Naididae worm	1.8	1.6	1.4
Oligochaeta worm, Tubificidae	0.8	1.2	0.2
Oligochaeta worm, Lumbricidae	0.2		
Nereis sp., ragworm			0.2
Erpobdellidae leech		0.2	
Glossiphonidae leech	0.2	0.2	
Pisidium, pea mussel			
Hydrobidae, snail			
Ancylidae, River limpet	0.2		
Hydrachnidia, Water mite	0.6		
Carcinus maenas, shore crab			0.2
Mysidae, Mysid shrimp			
Crangon crangon, brown shrimp			
Gammarus duebeni, shrimp	1.4	2.2	3.0
Asellidae, hoglouse	0.8	0.4	
Ephemerella ignita, mayfly	1.4	0.8	
Baetidae, mayfly	1.0		
*Lepidostomata hirtum, c*ased caddis	0.6	0.8	
Microterna lateralis, cased caddis	0.2		
Cased caddis unidentified.	0.2		
Hydropsyche sp*.,* too small to identify			
*Hydropsyche siltatai, c*aseless caddis	0.6	0.2	
Rhyachophila dorsalis, caseless caddis	0.2		
Chironomidae, non-biting midge larvae	1.8	1.0	0.4
Ceratopogonidae, biting midge larvae	0.2		
Limnius volkmari, Riffle beetle		0.2	
Gobiidae, goby fish			
Anguilla anguilla, European Eel	0.4		
Baby flatfish			0.2

Table 2. River animal samples, autumn season, list of taxa. The presence of taxa is recorded as the average of the WHPT abundance categories (AB1, AB2, AB3 and AB4, ranked as 1-4 respectively), across the five samples from each site. Taxa shaded brown are brackish water taxa.

	Below culvert	By Farm	By boat club
Polycelis sp., flatworm	0.2		
Dendrocoelum lacteum, flatworm	0.2		
Naididae worm	0.6		
Oligochaeta worm, Tubificidae	1.0	0.6	0.2
Oligochaeta worm, Lumbricidae			
Nereis sp., ragworm			0.5
Erpobdellidae leech	0.4	0.2	
Glossiphonidae leech			
Pisidium, pea mussel		0.2	
Hydrobidae, snail	0.6		
Ancylidae, River limpet			
Hydrachnidia, Water mite	0.2		
Carcinus maenas, shore crab			
Mysidae, Mysid shrimp			1.0
Crangon crangon, brown shrimp			1.0
Gammarus duebeni, shrimp	2.0	2.8	2.8
Asellidae, hoglouse	0.4		
Ephemerella ignita, mayfly			
Baetidae, mayfly	1.0		
*Lepidostomata hirtum, c*ased caddis			
Microterna lateralis, cased caddis	0.2		
Cased caddis unid.			
Hydropsyche sp*.,* too small to identify	0.2		
*Hydropsyche siltatai, c*aseless caddis			
Rhyachophila dorsalis, caseless caddis			
Chironomidae, non-biting midge larvae	0.4		
Ceratopogonidae, biting midge larvae			
Limnius volkmari, Riffle beetle			
Gobiidae*, goby fish*			0.4
Anguilla anguilla, European Eel	0.4		
Baby flatfish			

Seventeen freshwater invertebrates were recorded at the upstream site including classic freshwater animals such as mayflies and caddisflies. This fell to eleven taxa by the Farm and, by the Boat Club ramp, only six taxa but that includes two brackish water types, the shore crab and ragworm. Two species of fish were found; two young eels up by the culvert and a very small juvenile flatfish by the Boat Club. In autumn thirteen invertebrates taxa were found up toward the culvert, only four by the Farm and five by the Boat Club, the latter nearly all brackish water species. Eels were found by the culvert again and a goby down by the Boat Club. Figure 2 shows some of the brackish water animals found.

These results suggest a very steep gradient of salinity impacts on the animal life.

Tables 3 and 4 summarise the results for the numbers of taxa and the BMWP scores for the spring and autumn animals respectively, to get a measure of water quality. The BMWP and ASPT scores for the culvert and Farm site are markedly higher than for the Boat Club spot.

BMWP and ASPT scores in isolation are hard to use to characterise water quality because rivers will vary naturally. The Environment Agency and allied bodies use the WHPT system by comparing scores in samples to predictions of the score for a river based on characteristics such as where in the country (National Grid reference), channel width and alkalinity of the water (WFDUK, 2024). Published thresholds for BMWP and ASPT ratings vary. BMWP are typically <10 very poor, 11-40 Poor, 41-70 moderate, 71-100 good and >100 very good, and for ASPT the equivalents are <3.9, 4.0-4.9, 5.0-5.9, 6.0-6.9 and >6.9.

Table 3. Summary data on taxa richness and BMWP/ASPT scores for the spring samples.

	Below culvert	**By Farm**	**By boat club**
Total taxa recorded at each site	18	11	7
Average number of taxa across the 5 samples at each site, ± 1 standard deviation	9.6 ± 1.5	6.8 ± 0.8	3.0 ± 1.0
BMWP for the site using total taxa list	68.5	49.3	9.4
ASPT for the site using total taxa list	5.30	4.93	3.13
Average BMWP across the 5 samples at each site, ± 1 standard deviation	38.2 ± 12.1	28.0 ± 4.9	8.2 ± 0.9
Average ASPT across the 5 samples at each site, ± 1 standard deviation	4.81 ± 0.78	4.89 ± 0.43	3.50 ± 0.61

Table 4. Summary data on taxa richness and BMWP/ASPT scores for the autumn samples.

	Below culvert	**By Farm**	**By boat club**
Total taxa recorded at site	14	4	6
Average number of taxa across 5 samples at each site, ± 1 standard deviation	6.6 ± 2.7	2.0 ± 01.0	3.6 ± 0.9
BMWP for the site using total taxa list	47.6	16.1	8.2
ASPT for the site using total taxa list	3.96	4.02	4.1
Average BMWP across the 5 samples at each site, ± 1 standard deviation	22.5 ± 8.3	8.3 ± 3.8	5.3 ± 1.6
Average ASPT across the 5 samples site, ± 1 standard deviation	3.7 ± 0.2	4.2 ± 0.3	4.5 ± 0.2

Using the BMWP and ASPT scores from the total list of taxa recorded at each site (an optimistic approach which counts everything including taxa that might just turn up in one sample out of the five at each site) the culvert site in spring shows moderate quality, by the Farm is poor and at the Boat Club very poor. In autumn the culvert site shows moderate quality, whilst the river by the Farm is poor and at the Boat Club very poor.

Figure 2. Examples of animals found during the kick sampling.

European eel, found by the culvert in spring and autumn

Goby, probably sand goby, found by Boat Club in autumn.

Mysid shrimps, found by Boat Club in autumn.

Brown shrimp, by Boat Club in autumn.

Shore crab, by Boat Club in spring.

Green patches at low tide could be diatoms that move up to surface when tide is out.

Results - Salinity

The following maps and tables show the salinity measures, plus oxygen and temperature, at sites from the Ouseburn estuary up to the culvert. Where the PSU reading is >0.5, i.e. greater than the threshold for fresh water, the table is shaded in pale brown. For each day the data are shown in the order of the tides, high or low, which ever was first.

Also note that on the 24th June the Cycle Hub Quayside readings were off the scale, although the probe was checked after the field work in the lab and Orchard pond and gave the following results which suggest that the calibration was fine.

Low tide. Tap water prior to field work 0.55, after field work 0.52, distilled water after field work 0.00, meadow pond 1.53.

High tide. Tap water after field work 0.56, distilled water after field work 0.00, meadow pond 1.0.

Presenting the salinity data

For each date on which salinity was measured the data are shown for the high and low tide, in the order they occurred, in tables alongside a map of the Ouseburn in valley to point out the sample sites. The data pages are then followed by some example photographs from the date.

For example, the first set of data is titled **"8th May, 2024, Spring tide, river flow low",** indicating date, type of tide and general river flow from inland

The table with the first set of data is then headed **"Low tide, 2024 5 8, 10.30 am, 0.63m".** This shows that the low tide came first during the day at 10.30 am. The 0.63m refers to the height of the tide above datum that the tide.

Data are given as:

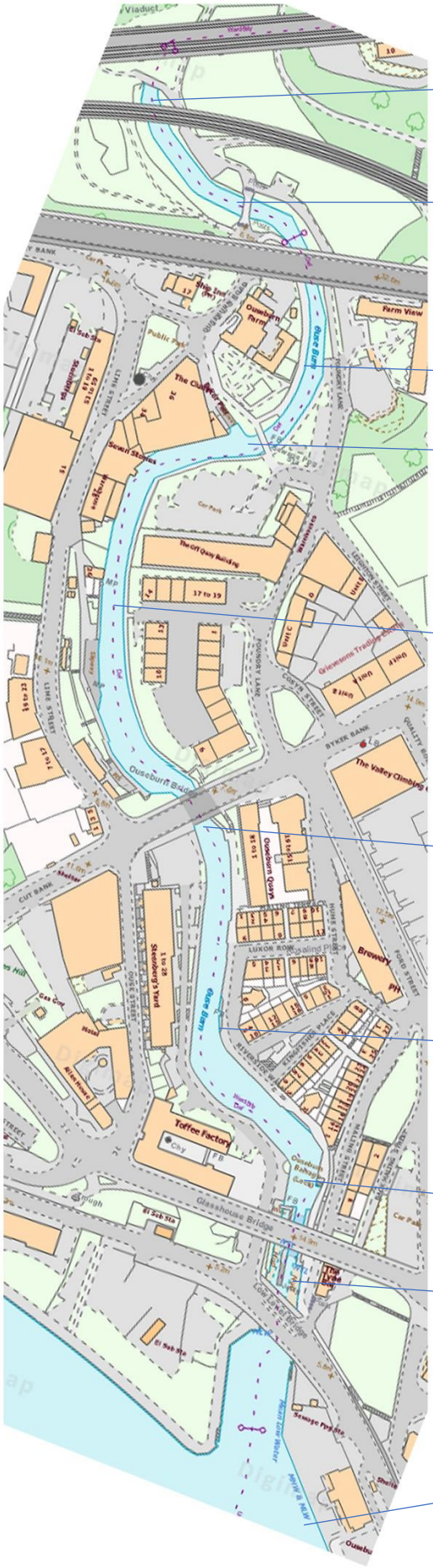
1. Water temperature, °C, degrees centigrade.
2. Oxygen, %, % saturation. The amount of oxygen in water depends on the water temperature. The % measure will be 100% if the water has the exact amount of oxygen appropriate for the temperature. The % can vary due to other influences such as pollution.
3. Oxygen, O_2 mgl^{-1}, milligrams per Litre.
4. Salinity, PSU, Practical Salinity Units.

Data recorded as -- show where the water could not be accessed during some low tides, even with the jug.

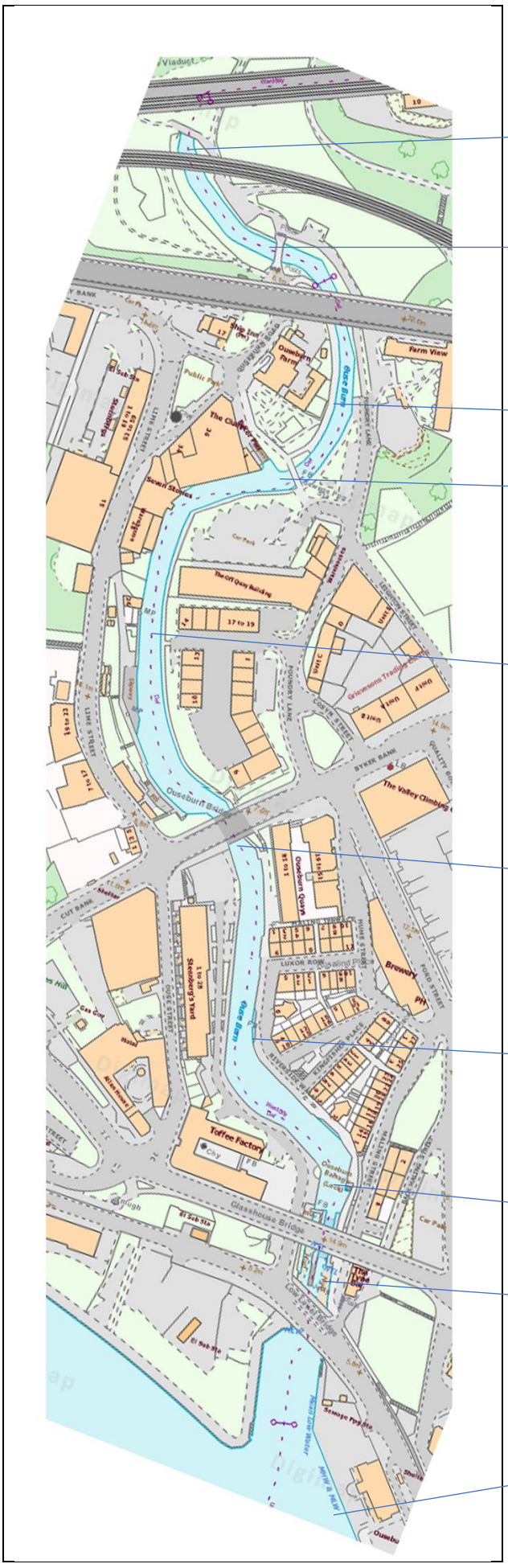
PSU data above the threshold of 0.5 for freshwater are highlighted by the **light brown colour**.

Note on 24th June the high tide reading at the cycle Hub quayside was off the scale, show by ??

8th May, 2024, Spring tide, river flow low



Low tide, 2024 5 8, 10.30 am, 0.63m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Culvert exit	12.3	103	11.4	0.3
Crawford Bridge	13.1	104	11.0	0.31
By missing raft	12.2	102	10.8	0.54
Footbridge	12.3	101	11.0	0.4
Boatyard ramp	13.7	107	11.3	0.48
Just south of bridge	12.9	109	11.7	0.41
By Northern Rye	-	-	-	-
Di Meo's Steps	13.4	113	12.0	0.49
Tyne pub	13.4	113.6	12.0	0.82
Cycle Hub quayside	13.6	85.2	8.58	11.79

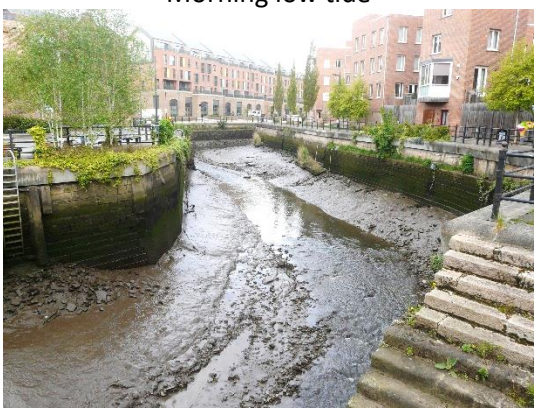


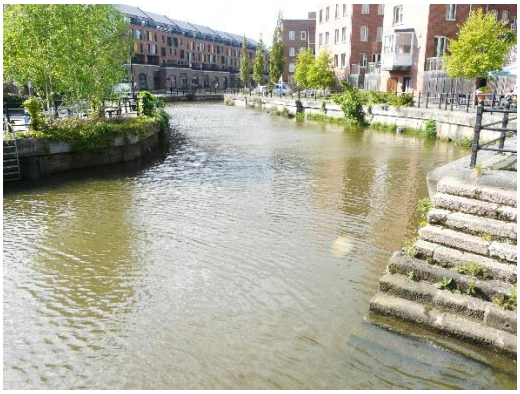
High tide, 2024 5 8, 4.30 pm, 5.26m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Culvert exit	13.6	103.9	10.9	0.32
Crawford Bridge	13.7	105.9	11.1	0.56
By missing raft	13.1	104.7	11.1	0.81
Footbridge	13.2	105.5	11.2	0.6
Boatyard ramp	13.4	106	11.2	1.05
Just south of bridge	13.6	106.7	11.2	1.7
By Northern Rye	14.2	113.7	11.8	1.35
Di Meo's Steps	14.4	117.7	12.1	1.64
Tyne pub	13.3	95.0	9.5	10.6
Cycle Hub quayside	11.8	78.3	7.8	25.9

8th May 2024 tides comparison photos.

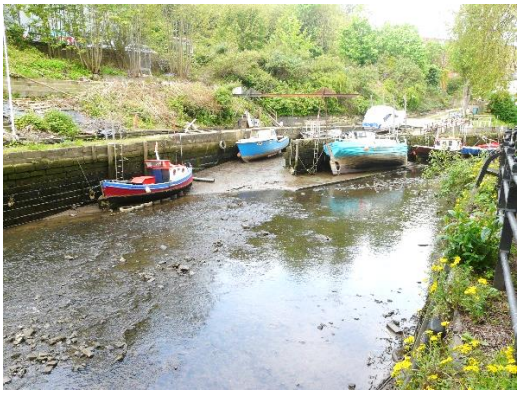
Morning low tide

Afternoon high tide





Steps near Di Meo's, looking upstream.

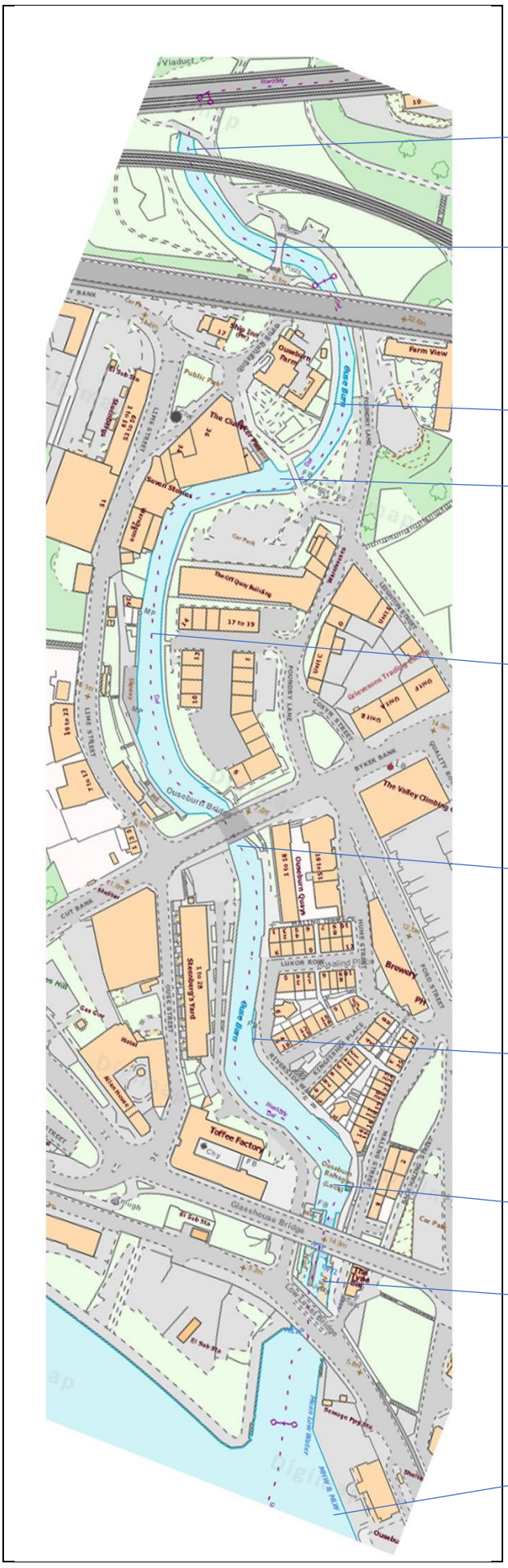


Boatyard ramp, looking upstream.

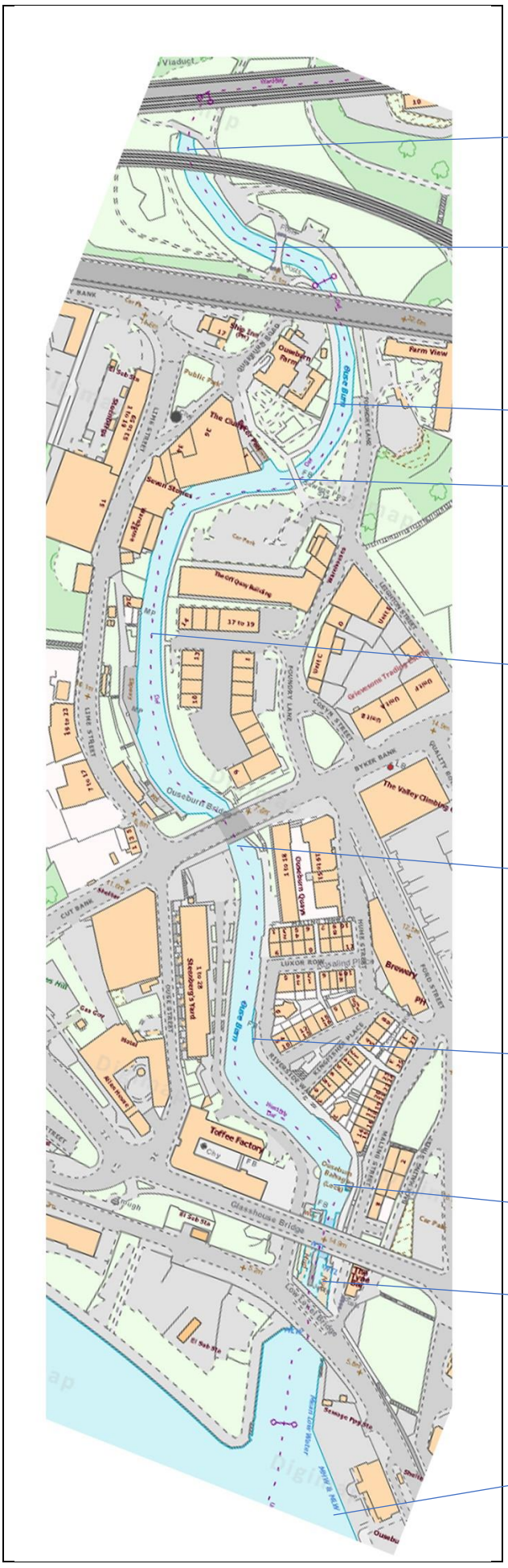
Next to Farm, looking upstream.

Crawford's Bridge, looking upstream.

30th May 2024, neap tide, river flow slightly higher due to rainfall



High tide, 2024 5 30, 9.00 am, 4.66m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Culvert exit	14.8	101	10.1	0.11
Crawford Bridge	13.8	102	10.5	0.11
By missing raft	13.4	100	10.3	0.14
Footbridge	13.5	102	10.6	0.12
Boatyard ramp	13.5	101	10.5	0.12
Just south of bridge	13.3	102	10.6	0.12
By Northern Rye	13.3	100	10.4	0.13
Di Meo's Steps	13.4	101	10.5	0.14
Tyne pub	13.3	101	10.4	1.36
Cycle Hub quayside	13.23	99	10.1	5.81



Low tide, 2024 5 30, 3.55 pm, 1.31m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Culvert exit	13.2	102	10.7	0.13
Crawford Bridge	13.2	102	10.7	0.13
By missing raft	13.5	101	10.5	0.14
Footbridge	13.1	102	10.7	0.14
Boatyard ramp	13.2	102	10.7	0.14
Just south of bridge	13.2	101	10.7	0.14
By Northern Rye	13.0	103	10.8	0.14
Di Meo's Steps	13.3	101	10.6	0.15
Tyne pub	13.1	102	10.7	0.23
Cycle Hub quayside	14.2	97	9.7	3.1

30th May 2024 tides comparison photos.

Morning high tide.

Afternoon Low tide.

Cycle Hub quayside, looking west along Tyne.

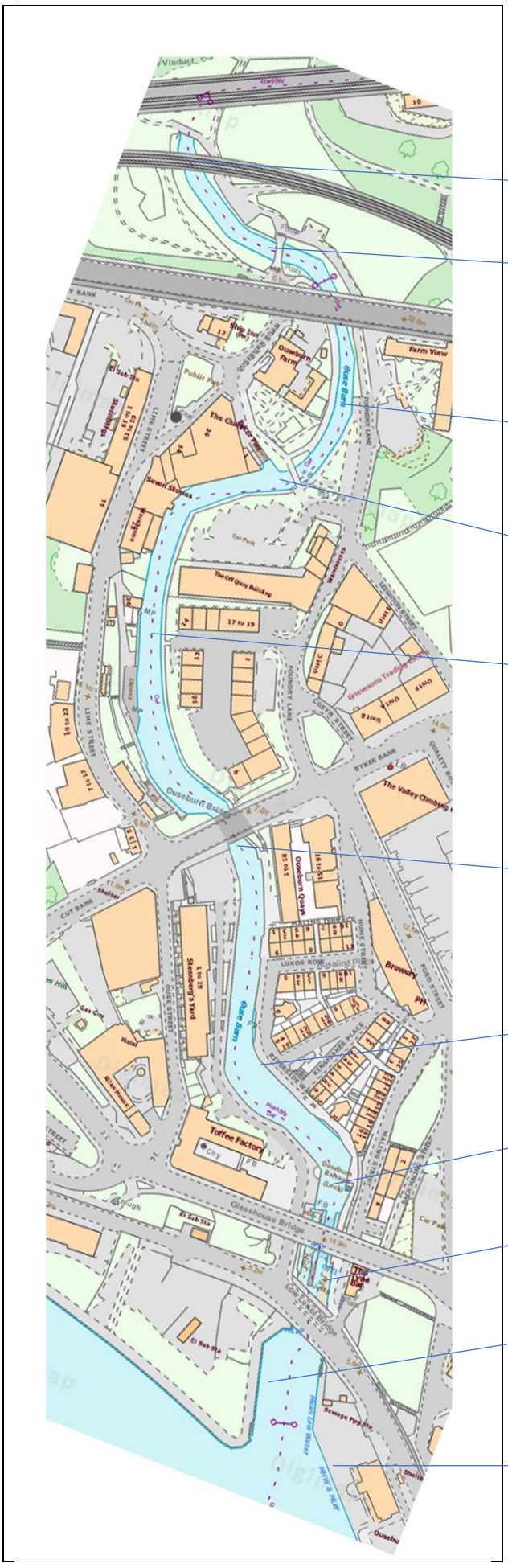
Tyne pub, looking downstream.

Boat club ramp, looking upstream.

Next to Farm, looking upstream.

24th June 2024, spring tide, river flow low, little rain in preceding days

Low tide, 2024 6 24, 12.15 pm, 0.89m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Meadow pond	22.3	109	9.5	1.58
Culvert exit	15.4	98.0	9.6	1.53
Crawford Bridge	15.8	95.8	9.4	1.58
By missing raft	15.4	92.3	9.2	2.26
Footbridge	15.8	91.8	8.96	2.34
Boatyard ramp	16.9	108.8	10.4	3.11
Just south of bridge	17.2	110.5	10.5	3.02
By Northern Rye	--	--	--	--
Di Meo's Steps	--	--	--	--
Tyne pub	--	--	--	--
Western quayside	18.6	108	9.6	11.75
Cycle Hub quayside	19.0	94.5	7.3	48.5



High tide, 2024 6 24, 18.15 pm, 5.09m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Meadow pond	20.7	71.0	6.4	1.70
Culvert exit	16.7	99.5	9.6	1.68
Crawford Bridge	16.9	96.2	9.0	7.58
By missing raft	16.9	97.1	89.1	7.36
Footbridge	17.0	93.5	8.8	6.02
Boatyard ramp	16.9	95.2	8.8	8.59
Just south of bridge	18.0	98.4	9.0	8.20
By Northern Rye	18.5	108	9.9	6.40
Di Meo's Steps	19.2	110	9.6	12.16
Tyne pub	18.8	103	8.3	38.10
Western quayside	19.0	106	8.8	28.45
Cycle Hub quayside	17.5	94.4	6.4	??

24th June 2024 tides comparison photos.

Morning low tide

Afternoon high tide

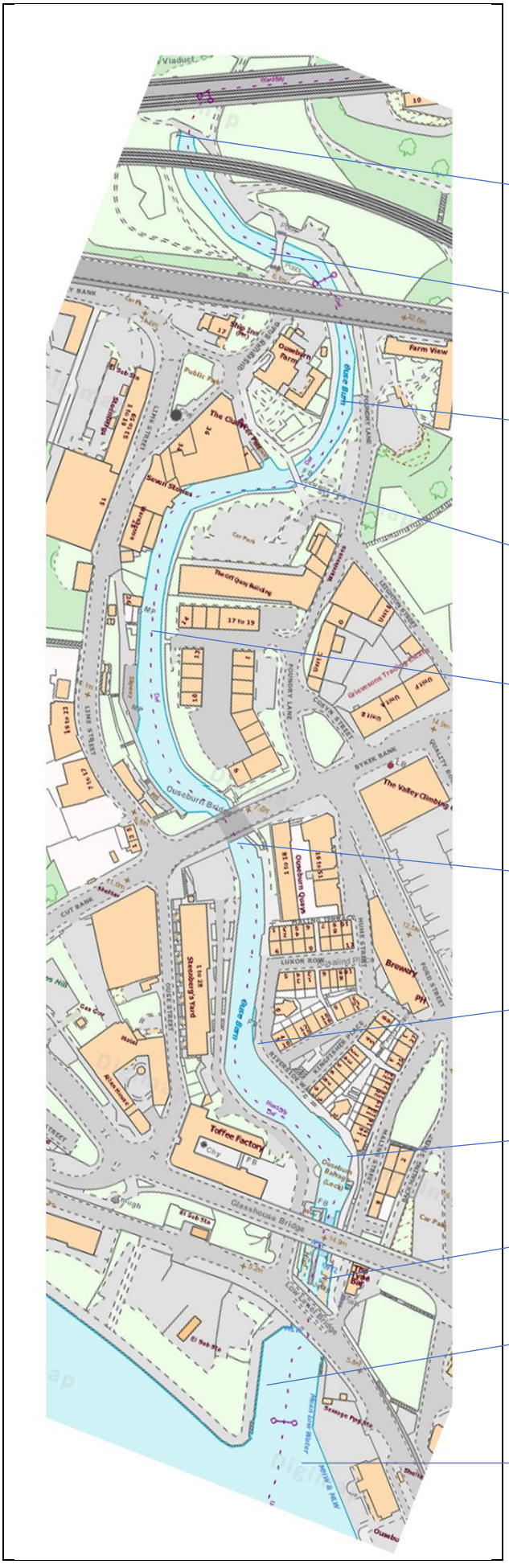
Western quayside, looking into mouth of Ouseburn.

Boat club ramp, looking downstream.

Next to Farm, looking upstream.

Crawford Bridge, looking upstream.

3rd October 2024, spring tide, river flow low, little rain in preceding days



Low tide, 2024 10 3, 11.00 am, 0.92m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Meadow pond	--	--	--	--
Culvert exit	11.2	99.1	11.0	0.28
Crawford Bridge	11.5	99.2	10.9	0.29
By missing raft	11.4	95.4	10.5	0.39
Footbridge	11.5	96.6	10.6	0.49
Boatyard ramp	11.9	101.8	11.1	0.61
Just south of bridge	12.0	102.5	11.1	0.58
By Northern Rye	--	--	--	--
Di Meo's Steps	--	--	--	--
Tyne pub	--	--	--	--
Western quayside	11.7	97.2	10.6	1.02
Cycle Hub quayside	12.5	95.0	10.0	5.25

High tide, 2024 10 3, 16.52 pm, 5.18m				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Meadow pond	--	--	--	--
Culvert exit	11.3	101.0	11.14	0.29
Crawford Bridge	11.2	99.1	10.9	0.35
By missing raft	11.3	98.6	10.8	0.54
Footbridge	11.5	98.8	10.8	0.58
Boatyard ramp	11.5	93.1	10.2	1.05
Just south of bridge	11.5	93.5	10.1	1.59
By Northern Rye	12.2	103.6	11.1	1.63
Di Meo's Steps	12.4	103.2	11.1	1.63
Tyne pub	12.6	99.9	10.4	8.43
Western quayside	12.4	101.2	10.7	6.17
Cycle Hub quayside	13.4	93.5	9.2	16.3

3rd October 2024 tides comparison photos

Morning low tide

Afternoon high tide

By Di Meo's, looking upstream.

Byker Bank bridge, looking downstream.

Footbridge by Cluny, looking downstream.

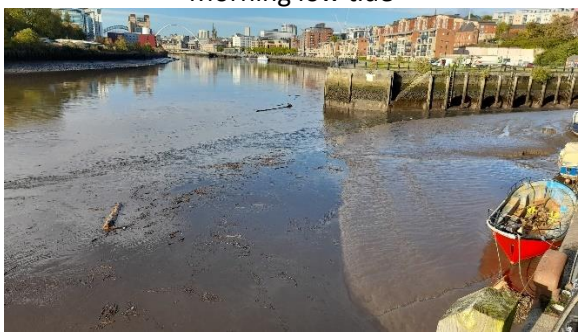
Across from Farm, looking downstream.

17th October 2024, super moon spring tide, river flow high overnight rain

Low tide, 2024 10 17, 10.30, 0.39				
	T °C	O_2, %	O_2, mgl^{-1}	PSU
Meadow pond	12.2	90.4	9.7	0.24
Culvert exit	12.7	95.5	10.0	0.07
Crawford Bridge	12.7	96.4	10.1	0.08
By missing raft	12.8	95.3	9.96	0.08
Footbridge	12.7	95.2	10.0	0.08
Boatyard ramp	12.8	94.4	9.88	0.09
Just south of bridge	13.0	95.1	9.93	0.09
By Northern Rye	--	--	--	--
Di Meo's Steps	13.3	93.3	9.6	0.11
Tyne pub	--	--	--	--
Western quayside	12.9	91.1	9.5	0.11
Cycle Hub quayside	14.2	62.0	6.11	0.08

17th October 2024 tides comparison photos.

Morning low tide



Afternoon high tide

Confluence with Tyne.

Byker Bank bridge, looking downstream.

East bank by Farm looking downstream.

Upstream of Crawford's Bridge.

Discussion.

The salinity measures show how the salinity varies with the tide cycle, whether it is a spring versus neap tide and the river flow from upstream.

During spring high tides some brackish influence can reach as far up river as beyond Crawford's Bridge (for example 24th May) but on a neap tide might not extend into the river beyond the Tyne (30th May). During a low tide with higher river flow the water can be entirely freshwater as far down as the confluence with the Tyne (17th October). During most sampling days the salinity reduced markedly immediately upstream of the Tyne Pub, so that the gradient is not a simple, gradual trend. Perhaps the structures associated with the barrage create a pinch point.

The animals show the effects of the salt-water influence.

Up by the culvert the animal life is entirely freshwater except that the *Gammarus* shrimp is *G. duebeni*, a brackish water species, compared to *G. pulex*, the freshwater shrimp found further upstream in the Ouseburn. Other species include caddisflies, mayflies and riffle beetles, freshwater invertebrates typical of the Ouseburn further upstream. This is also where the eels were found in both spring and autumn.

Down by the Boat Club ramp the animal life is distinctly brackish water: shore crab, brown shrimp, mysid shrimps, ragworms. The distance from the culvert sample sites is only ~330 metres but the variations in salinity are enough to drive a major change to the animal life.

The impacts of other pollution is hard to pick out from the dominant effect of salinity. The fauna up by the culvert does not score very highly using the water quality BMWP/ASPT scores, but this might just be the natural state of a small river down towards its estuary. The low pollution index scores are partly the nature of the brackish water habitat as freshwater species that count in the scoring system are lost. Nonetheless the freshwater communities up towards the culvert are limited in diversity. This is likely to result from a mix of pressures including the general pollution of the Ouseburn, the culvert restricting opportunities to recolonising from the upstream freshwater reaches and occasional slat water impacts reaching this high

The variety of life in the river channel was a welcome surprise, in particular the brackish water and marine species, which had not been recorded before. Birds such as cormorant have been seen fishing successfully in the Ouseburn on high tides, suggesting food is available. The well-known kingfisher is also indicative of fish prey which tend to be more visible up around the Farm in the clearer freshwater.

References

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Appendix 1. Stretches of the river used to kick sample the animals.

Below culvert, just upstream of the fallen tree. The riffle is a mix of stones and boulder, with no mud. Fallen branches and smaller woody debris are common-place. The river is overhung with tress with vegetated side bar along the east side of the river.

Adjacent to the Farm. The riffle is a mix of stones and boulders with a small amount of building debris. Note the iron staining on the left-hand side, typical of this stretch of the river where many small effluent outfalls occur. Green algae and mosses are also evident and there are rafts with riparian plants immediately alongside the riffle.

The riffle next to the boat club ramp is a mix of cobbles, boulder and building debris such as bricks and concrete. There is a coating of slippery mud over many of the stones in the shallower parts. No algae or other vegetation are visible in the river nor are there any bankside rafts