Water quality monitoring

Starting points

In 2023/24 the WI organized a national campaign entitled 'Clean rivers for people and wildlife'. The aim was to improve the quality of river water through campaigning for bathing status. The Arnside Parish council were interested in their responsibilities in relation to the quality of the waterfront and we were also aware of an active group in Stavely who are monitoring water quality higher up the river Kent [Clean River Kent Campaign]

We started collecting ideas about this topic from an overview of the issues produced by Arnside & Arnside Knott WI.

The National Federation of Women's Institutes wrote:

> *'Water quality in our rivers is shameful. Legally designated bathing waters must be regularly monitored for pollution. The National Federation of Women's Institutes urges its members, the wider public, local authorities, and Government to make, support and promote applications for officially designated bathing sites on appropriate stretches of rivers in their area. This will be instrumental to the clean-up of rivers as it has been for water quality improvement at coastal beaches '*
>
> *Arnside & Arnside Knott WI investigated the issues locally. We are flanked by a 2-mile stretch of the Kent estuary, as it runs into Morecambe Bay. Arnside is part of The Arnside & Silverdale National Landscape and the whole of Morecambe Bay is a Site of Special Scientific Interest, so we are justly proud of our waterfront and want it to be its best.*
>
> *As the Kent flows past Arnside, it includes not only its own flow of water, but water from numerous other rivers. It has most recently been joined by the Gilpin and Bela rivers. In addition, Leighton Beck, which meanders through the area, irrigating and draining farmland and providing water for grazing cattle, reaches the estuary at Arnside railway station. The Winster joins the Kent from the north shore of the estuary just downstream of Arnside.*
>
> *There are 3 Sewer Storm Overflows in Arnside and we are down-river from the sewage treatment plant near Milnthorpe. The South Cumbria Rivers Trust sewage map shows near real time and annual averages of spillages: https://theriverstrust.org/sewage-map, but we do not know to what extent this adversely affects the quality of our water. This is something that an active campaign would help us to find out.*

We asked does Arnside need or want bathing status? This is not a straightforward question:

On the one hand, the bay has treacherous currents, a fast-incoming tidal bore and unpredictable quicksand. The village has many signs warning visitors about the dangers posed by the estuary area. It is unlikely to be appropriate to actively encourage bathers in Arnside.

On the other hand, being in and around the water is very much part of the enjoyment of many people who live and visit here. Suggesting that no one enters the water is unrealistic.

- *Walkers are on the wet sands and dogs swim in all seasons*
- *People routinely fish on the shores of the estuary*
- *We have a thriving sailing club*
- *Canoeists and sailboarders ride the bore*
- *Children paddle and on warmer days people swim, particularly in the many shallower pools left by the outgoing tide*
- *The famous cross bay walks start from Arnside's promenade and every summer thousands of people wade through the water to Kents Bank and Grange-over-Sands.*

*A quality of water appropriate for bathing would be reassuring for all those who are in contact with the river in Arnside. However, this was deemed not feasible or desirable***.**

Together, Arnside Parish Council, the WI and Sustainable Arnside agreed to collaborate on further investigation.

Getting Expert Advice.

We are finding that as Sustainable Arnside becomes more widely known in the community, there is a wealth of relevant expertise and experience in Arnside. We love to hear from anyone who wants to share their experiences and thoughts on the topic of the environment and of course, global warming.

One such expert, Professor John Quinton, met with us in January 2025
John works at Lancaster Environment Centre, Lancaster University.

We described to him our history of interest in measuring Water quality in Arnside and our realisation that we were clearly need of professional advice, particularly given the challenges of representative sampling in an estuarine environment (see below).

He asked us what is the objective of measuring water quality at Arnside given that it is certainly NOT to encourage bathing?

We are most concerned about levels of organic material (e.g. e-Coli) in the river water, to some degree as a result of monitoring of the Kent by the Staveley WQ group where e-coli contamination has been found to result from sewage overflow.

John noted that meaningful conclusions drawn from organic analyses are problematic.

He confirmed that there is no current evidence of high levels of pollutants in the estuary. Therefore, a water sampling program would start with a clean slate and is not seeking to find the source of an as yet unidentified problem.

We went on to discuss possible sources of pollution in the river Kent at Arnside.

Potential point sources of **organic** pollutants are Milnthorpe and Grange sewage treatment works. Discharge statistics are available on the Environment Agency website. Discharge from Milnthorpe would most affect the estuary at Arnside on an ebb tide, whereas discharge from Grange would affect the estuary at Arnside on a rising tide.

Sources of **inorganic** pollution are fertilizer (nitrogen and phosphorus) run-offs from farmland. We know that the Arnside and Silverdale National Landscape is funding a sampling program in Leighton Beck. John's opinion is that the volume of water entering the estuary from Leighton Beck would be too small to be significant.

The discussion turned to sample collection.

An overriding consideration for sampling is safety. The Sailing Club could be a potential partner if they are interested and it would be interesting to discover whether their members ever get sick from ingestion of estuary water. If they are a willing partner, could they use paddleboards to take samples from the same spot over several months during the sailing season?

In an estuary one can measure concentrations of species but this cannot be normalised to load (volume of flowing water), except in rivers where the Environment Agency gauges monitor the flow.

John recommended sampling at high and low tide on one day per lunar month. Best to do it in the summer months only because

- Fluvial load will be at its lowest (lowest rainfall).
- Recreational usage, and therefore exposure to potential pollutants, will be at its highest.
- Sampling will be at its easiest and safest (if the Sailing Club were to be involved).

We asked if it would it be feasible to sample sediment rather than water for organic pollutants. John's view was that the high level of naturally occurring organics in

estuarine sediments would mean that identification of an external pollutant would be impossible.
We moved on to a discussion of methods and costs of sampling. The options are different for **inorganic** and **organic** pollution.

John explained that there are different types and quality of analysis for i**norganic** species. For example, to detect levels of nitrogen or phosphorous, semi quantitative measurement can be made using paper indicator strips. These could be used for exploratory measurements.

Salinity, dissolved oxygen and perhaps turbidity (how cloudy or hazy the sample is) can be measured using meters and other methods after their collection without the need for a laboratory analysis. John may be able to provide temporary loan equipment for us to do this. However results obtained by these methods are not accurate enough to be used in a discussion with, say, the Environment Agency, which would require fully quantitative laboratory analyses. More accurate electrochemical probes to measure salinity and dissolved oxygen would cost ~£1000-2000.

Analysis of **organic** species (such as e-coli) must be performed in a lab. As already known through contacts with the Staveley group, samples must reach the lab within a certain time, either by courier or by car: The nearest lab is in Preston. The Staveley group quote a cost of £50/sample.

Although conclusions on potential organic pollution are probably of most interest to residents and visitors, drawing conclusions from organic analyses in an estuary is difficult. The sediments are teeming with life and so a high organic content is expected. A single sample may be influenced very much by local conditions. One might take a sample close to where a seabird has just defecated! Dissemination of results based on too small a dataset would be dangerous and misleading. A proper organic sampling program would need to be carried out over a very long period at considerable expense.

Summary of issues and possible ways forward

- First of all, the specific purpose of monitoring river water quality needs to be better defined. Since Arnside does not want to encourage sea bathing, this could not be used as a justification. Other justifiably interested parties, such as dogwalkers concerned for the health of the pets, Crossbay walkers, etc are probably weaker lobbies.
- Sample collection in an estuary poses both technical and health and safety challenges. It is hard to produce reliable measurements given the extent of rising and falling tides
- There are many different fluid inputs into the estuary some of which are only relevant on a rising or falling tide e.g. input from the Grange side which would deliver material to Arnside on the rising tide only.
- It is hard to distinguish between human-induced and natural organic signals: the estuary is rich in invertebrates and bird life which all add their own 'pollution'.

- It would be difficult to devise a sampling and testing program robust enough to form the basis of a conversation with any responsible authorities.

Despite the difficulties identified above there are some possible ways forward if there is enough concern in the village and enthusiasm to take practical action. We could

- Hold a 'Water Day' during the summer to raise awareness and provide information (note that this would be held before any sampling program or run alongside it). We could involve the Coastguard, South Cumbria Rivers Trust, National Landscape, Sailing Club etc
- Do some exploratory semi-quantitative sampling for inorganic pollutants using lo-tech equipment.
- Encourage people to use existing online resources, such as the interactive maps that show recent outflows of sewage.
- Encourage people to think about what they can do to improve water quality. For example, thinking about what they wash down drains e.g. bleach and oils, also encouraging folk to look after their septic systems (if they have them), avoiding paving their drives and gardens. John mentioned some nice examples where fish have been stencilled onto drain covers to make the point that the drains are connected to the river. Is this something that the school could get involved in designing? Or perhaps posters?
- Lead a 'water walk' - a loop round the village, incorporating some of the historic and current water features & noting where the storm drains flow into the estuary. It would be good to include something aimed at school children.
- Hold an evening meeting and invite speakers from United Utilities, the Sailing Club or Coast Guard on safety on the sands etc.

River Kent monitoring - information and Resources

The people who created these resources have done some of the work we have been talking about. Maybe we can mine this for baseline data - or at least use it as a starting point? We encourage anyone who is interested in water quality in the Kent to look at these websites and maps for information.

Clean River Kent Campaign – our vision - SENS - Sustainability and Energy Network in Staveley

https://www.sewagemap.co.uk/?asset_id=UUG2167&company=United+Utilities

https://theriverstrust.org/sewage-map

https://theriverstrust.maps.arcgis.com/apps/dashboards/9bda000262544ab3aba957490a5ed73e

Surfers Against sewage https://www.sas.org.uk/updates/data-hq-tool-exposes-shocking-stats-on-uk-water-quality/

This Greenpeace report gives details of how to test for plastics in rivers GRL-TR-04-2019-plastics-in-UK-rivers.pdf

https://top-of-the-poops.org/now

https://riveractionuk.com/

Events | FreshWater Watch *Twice yearly 'citizens survey' of inorganic river pollution*

What's the foam you sometimes see along Britain's coastlines? – Creating a better place *Without seeing and smelling it is hard to be sure, but foams that form on estuaries and the sea can often be natural, although might be related to sewerage spill (they will smell if they are). This blog gives a good overview*