

## Environment agency report on water quality

Samples taken 19<sup>th</sup> June 2001

	stream	moat	My comments (WEJ)
<b>PH</b>	<b>8.0</b>	<b>7.9</b>	Due to water from Arden sandstone (calcareous) 7 = neutral
<b>Conductivity</b> uS/cm	<b>863</b>	<b>767</b>	Quite high – not a problem
<b>Alkalinity</b> mg/l	<b>364</b>	<b>407</b>	Quite high - Arden sandstone Not a problem
<b>BOD</b> (biochemical oxygen demand) mg/l	<b>&lt;1.43</b>	<b>2.09</b>	Up to 2.5 classed as very good water quality, class A
<b>Ammonia as N</b> mg/l	<b>0.241</b>	<b>3.07</b>	Up to 0.25 – very good, class A <b>2.5 – 9.0 – poor, class E</b>
<b>Nitrogen total oxidised as N</b> mg/l	<b>16.0</b>	<b>&lt;0.2</b>	<b>Moat value very low</b>
<b>Solids suspended</b> mg/l	<b>&lt;3,0</b>	<b>8.0</b>	Both values low - good
<b>Chloride ion as Cl</b> mg/l	<b>43.6</b>	<b>24.1</b>	Quite low – no problem
<b>Oxygen dissolved instrumental</b> as % saturation	<b>101</b>	<b>101</b>	Over 80 very good, class A <i>But is this reliable?</i>

### Our own water quality tests with fish pond testing kit

Samples taken a few weeks before the above ones – May?

### Three sites around moat , pond 1 and pond 2

	pH	Total hardness	Carbonate hardness	Nitrite NO2	Nitrate NO3
<b>M 1</b>	<b>7.6</b>	<b>21</b>	<b>20</b>	<b>0</b>	<b>0</b>
<b>M 2</b>	<b>7.6</b>	<b>19</b>	<b>20</b>	<b>0</b>	<b>0</b>
<b>M 3</b>	<b>7.6</b>	<b>21</b>	<b>20</b>	<b>0</b>	<b>0</b>
<b>P1</b>	<b>7.5</b>	<b>20</b>	<b>20</b>	<b>0</b>	<b>0</b>
<b>P2</b>	<b>7.3</b>	<b>19</b>	<b>20</b>	<b>0.1</b>	<b>1.0</b>

### The results for Ponds and all Moat sites are very similar

pH – as expected; slightly alkaline

total hardness and carbonate hardness very high on the scale given but not a problem for plant growth. Probably due to water coming from calcareous Arden Sandstone.

Nitrite and nitrate very low! – possible that the test strips were too old?

( Env. Agency results may confirm these results at least for the moat, but why do plants grow well in ponds and not moat?) Nitrate is a nutrient needed for plant growth and the lack of it could be the limiting factor in the moat.

### Environment Agency advice – (contact Gary Mason, conservation and recreation)

In the letter which was sent with the results the stream was reported as having water of good quality with no signs of pollution at that time. The high ammonia levels in the moat were pointed out and put down to the presence of water fowl (but around 10 ducks for a few weeks and a couple of moorhens are not likely to cause this result)

The Environment Agency now agree that ammonia may be coming from decaying leaves etc in bottom of moat if ducks are not as numerous as they thought. Dredging the moat would

help to solve the problem but we can't do this. They suggest removing overhanging branches to let more light in to the water. This can help to improve quality. It would also reduce the number of leaves falling in. More light may also help to get some of the oxygenating plants growing. Those put in so far have not prospered and it does not seem that the problem is lack of oxygen according to Env. Agency results. They also suggest that the introduction of reeds (Phragmites) might help with purification of the system.

**Further analysis** carried out using equipment borrowed from Worcestershire Wildlife Trust on 28<sup>th</sup> October

Water samples were collected from **the Moat** from about a foot below the surface.

pH                    between 7.5 and 8.0  
Hardness            over 25 (approx. 400ppm)  
Nitrate                none detectable

These 3 results obtained using simple methods confirm the earlier findings

#### **Phosphate      4ppm**

This is a surprisingly **high value** (my pond gave 0) and could come from water fowl or decaying vegetation (or sewage pollution which is not likely).

The test scale runs from 0 to 5 and the method used here was a more sophisticated colorimetric one. **It has since been discovered that the sewage from the old vicarage once ran into the moat!**

#### **Dissolved oxygen      1.7ppm**

This result is a **very low value**.

The test scale runs from 0 to 10 and the method used was a field kit version of the Winkler titration. The test was repeated and compared to my pond which gave 6.1 for water from a similar depth. (The presence of certain organic compounds, nitrite, iron salts and some forms of sulphur can interfere with the accuracy of this test but it is usually a good indication of the amount of dissolved oxygen.)

It is at variance with the Environment Agency meter reading (but oxygen probes are notoriously unreliable and no in situ reading was taken). Their sample may have come from the surface layers and/or oxygen may have been entrained during collection. As I understand it the sample was tested immediately on site.

If this low result is correct it confirms what we suspected in the first place that there is a lack of oxygen in the water body as a whole and the introduction of oxygenating plants is the right thing to do providing we can get them to grow. It may be that the lack of nitrate is the limiting factor though this would apply to the ponds as well and in pond 1 at least the hornwort has thrived.

On 29<sup>th</sup> Oct. similar phosphate and dissolved oxygen tests were done on the two ponds along with a dissolved oxygen test on water from the moat surface. The results were:

**Dissolved oxygen in the moat** surface water **2.0ppm** – still a very low value.

**Samples from the ponds** were taken from about 6-8ins. down

	<b>Pond 1</b>	<b>Pond 2</b>
Dissolved oxygen	2.5ppm	2.5ppm
Phosphate	1ppm	2ppm

Although the dissolved oxygen values are higher than in the moat they are still low. Phosphate values are more reasonable.

On 28<sup>th</sup> and 29<sup>th</sup> Oct. 'swarms' of daphnia were present in the moat along the south (road) and east (stream) sides. Similar 'swarms' were observed on a couple of occasions earlier in the year.

**W E Johnson**