Little Faringdon Field Trip Report

A village scale sewerage and water supply system featuring heritage withy wetland sewage treatment

Adam Broadhead

BSc University College London

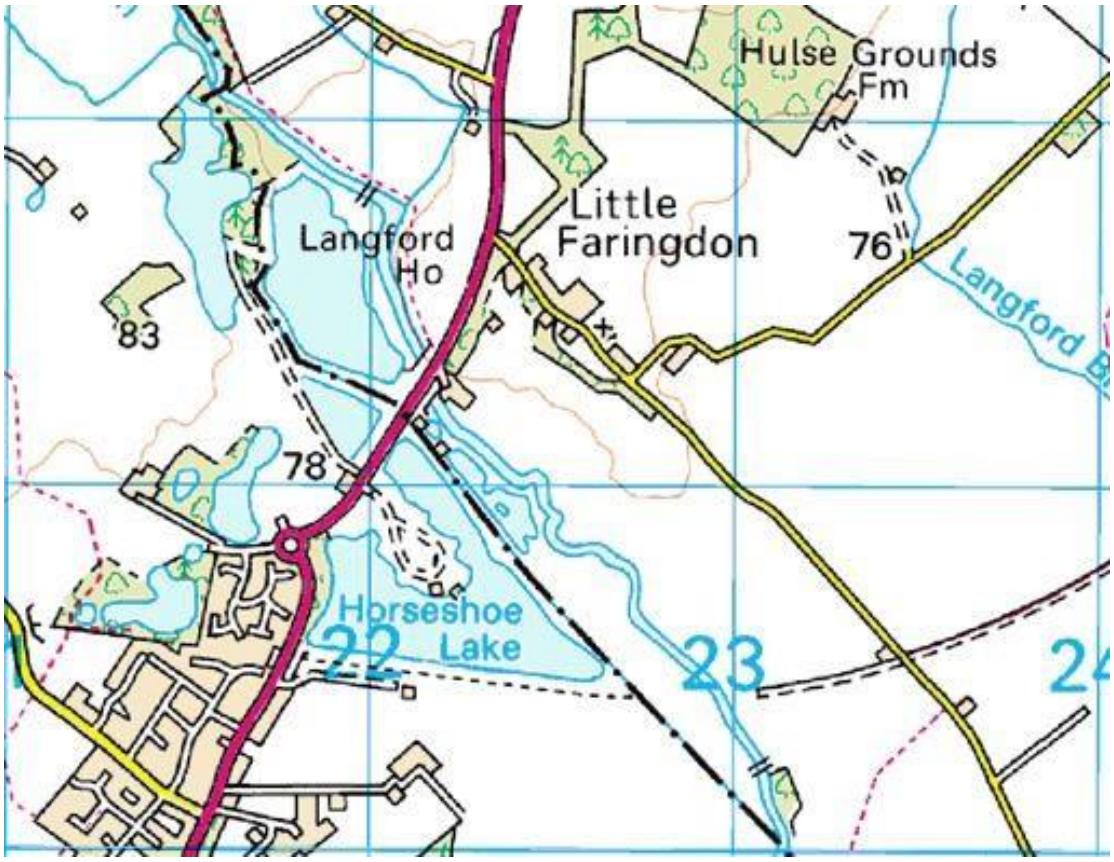
Internship Study

Water treatment

Background

A withy bed is a woodland or grove of trees specifically chosen for their strong but flexible properties suitable for thatching or weaving. It typically consists of various species of willow, but can also include hazels or ash. This is grown and the stems are cultivated. At Little Faringdon, near Lechlade, Oxfordshire, a withy bed is used to treat waste water. This is an unusual system and is not often used in Britain to the author's knowledge.

The village is not connected with the water board. Thames Water occasionally suggests the village to get connected, but with a fee reaching six figures. There are no plans to connect. The major local landowner provides 18 households with free spring water from two extractions, and treats all waste. There is a large settling tank to separate the solids from the liquids. This is then piped to a withy bed, which lies approximately 200 m from the nearest household. The water is then allowed to recharge, runoff, or infiltrate 40 metres downhill to a newly dug pond and into the River Leach. The system is not monitored by the Environment Agency for quality of output of water discharge. This is because it does not discharge directly into the stream, but infiltrates into the underlying gravel beds. It is monitored generally by the landowner and left to nature.



Water 21 was called to view the site as an item of interest, and to offer some suggestions for a problem identified by the landowner.

The withy bed

The withy bed measures approximately 45 m by 65 m, with the inflow pipe entering on longer side. The area is enclosed by a wooden fence and barbed wire to keep out animals and people. It consists of a series of broadly parallel trenches and ridges, 6 ft wide and up to 2 ft deep. This is a narrower pattern than in the surrounding fields, which appear to exhibit the remains of regulated flood meadow. The willow species of tree are grown along the ridge crests at regular intervals. The withy bed has remained largely untouched since its construction 80 years ago. It acts in a similar way to reed bed or constructed wetland treatment systems. The water is allowed to flow into the soil at one end, and the plant species (typically reeds, but in this case willow) promote growth of bacteria on the roots. The denitrification and nitrification of pollutants and absorption of chemicals allows for a high quality of water cleansing for outflow into water courses. For effective removal of pollutants the withy bed must be constructed correctly, with careful thought to the species, soil type, hydrology and positioning of the system. The ridges and trenches and a gentle 1:200 downhill gradient aid the movement of water through the system, cleaned by bacteria in the plant roots and soil, before it is discharged across the south edge and allowed to infiltrate or run off to the water course.


The problem

The landowner was concerned that the withy bed was no longer treating the effluent to a good standard, indicated by a smell, and concerns of contamination in the 3 year old pond between the bed and river.

On inspection, it was clear that the withy bed had become overgrown with elder bushes and nettle. These have a high tolerance to pollution and are often found colonising refuse tips. The west side of the withy bed had no smells, and the ground was not damp. However, on the north eastern corner of the site, where the inflow pipe is located, there was a strong smell of decaying organic matter. The pollutant removal by bacteria had gone anaerobic. There were several pools of contaminated standing water, each just a metre across in the trenches. Overgrowth and mud had filled in many trenches, so that some were no longer visible from the ridges. The soil was wetter and blacker on this side than the western side.

The solution

The problem was being caused by a lack of maintenance. Over time, the channels had become filled in, which prevented the distribution of wastewater through the withy bed. Water had become blocked at the top corner. Overgrowth and lack of maintenance of controlling the flows or recutting the trenches is to blame for the problem. It was recommended that the overgrowth be removed and the willows replanted where necessary. Trenches must be dug out. It would also be advisable to check to blockages in the pipe inlet to the bed. To facilitate a better distribution of waste water, a secondary pipe could take a proportion of the flow to spread it across the top edge of the bed.

Despite this, there were no obvious signs of pollution in the vicinity, and the smell and pooling was contained in a small part of the bed. It stands to reason that the bed has sufficient capacity to treat many more homes, as water is currently being treated in a small corner of the bed. However, the capacity of the pipes should be checked as water consumption has greatly increased since the construction of the withy bed.

Any concerns for nutrient enrichment in the pond were suggested to be minimal, and that ponds take many years to balance and develop. The lack of plants other than

weeds and algae were likely just an indicator of its youth. However, a small reed bed system in between the withy bed and the pond and stream would “polish” the water quality. Water quality tests could also be used to investigate the extent of groundwater and soil contamination near the withy bed.

Implications

This withy bed has provided many decades of adequate water quality treatment. The landowner could reasonably issue a fee for water supply and wastewater treatment to cover maintenance. The withy bed has had no major maintenance since its construction, and any maintenance required now is largely manual labour and non-technical. If the issues can be resolved easily, then it is an example of a far more cost-efficient way of treating water in remote areas than connecting with the water boards. Land is usually not in short supply, and the size of the treatment bed required to serve the population is relatively small. The landowner does not use this area of land for intensive farming, rather occasional grazing of sheep. For intensively farmed land, space may be of greater importance.

However, it is not sure how effective the withy bed actually is, and whether this would meet current discharge quality standards. A reed bed could also be constructed reasonably cheaply to improve the water quality. Simple testing could be carried out to identify any other issues. A part of the reason for mainstream resistance to reed bed water treatment is the belief that they do not reliably treat effluent to high standards. There are many examples to the contrary, but it is clearly important to construct the system carefully and quickly resolve issues such as those identified here. A regularly managed withy bed would not expect to ever fail in normal circumstances, thus making it a very attractive option for rural areas.

Pond and River Leach

The landowner constructed a pond at the bottom of his field between the withy bed and River Leach. This an unlined pond, dug out of the shallow gravel beds beneath. Here, the water table is at the surface and provides sufficient depth all year round. The pond serves no practical function, as the land is not used intensively; it is aesthetic. It was constructed about three years ago, and few plants or fish live in the pond. It has a few reeds in clusters around the perimeter, and algal blooms on the surface. There is a build up of fine sediment on the bottom of the pond, and there is believed to be a nutrient enrichment, likely caused by the withy bed just uphill releasing treated effluent. The withy bed has for some time needed maintenance and it is likely to be the major source of pollution in the pond.

The landowner would like to reinstate a small underflow water wheel at the weir on the River Leach, at the bend in the water course at the south-east corner of the pond. This will be ornamental, but could potentially be used to pump water into the pond to flush it through and dilute any pollutants. The water wheel is a refurbished 150 year old metal framework with new paddles. The sluices at the weir no longer function, and require refurbishment. It would also require Environment Agency liaison due to

legislation on water abstractions, which would bring attention to the withy bed treatment. Although the withy bed is legal, the landowner would like to keep it discrete.

Water meadows

Flood meadows are areas of riverside grassland allowed to naturally flood. Water meadows are artificially controlled and regulated to keep them wet but not flooded. Historically, the warming effect on the ground brought the advantage of an early crop of water-meadow hay. Its quality was not as high as summer hay, but was valued for its quantity and early production. Water meadows generally became less popular with industrialisation, and few existed by the second half of the 20th century in Britain.

Typical water meadows featured a system of sluices and gates on the river or stream, which could be controlled manually to alter flow. The top gate could be blocked to force some of the water along a constructed channel into the fields. This would then dissipate along sub-channels back into the river.

The ground would be carefully maintained with a gradient to prevent blocking of water. A functioning water meadow would have no standing water, as all flows would be controlled to allow damping of all the meadow, but not inundation. A series of wide parallel ridges and trenches would help to channel the flows slowly back into the stream, and these would be dug every year to maintain them. Gently undulating land is visible along the course of the River Leach in the landowner's fields. Old stonework indicates the positions of former sluice gates. The land is still flat, but clearly not used as regulated flood meadows, for this is labour intensive and no benefit would be derived for the local farmers.

The River Leach has changed course. The old channel, which is perhaps the original, is now dry, and the water flows through a northern channel. This is perhaps remnants of changes for water meadows.


Leach
Leach
/ © 2007 Intermap / © 2008 IGN
100 yards
Terms of use

Old sluices remain but are no longer operated

Wetland

The final feature at this site is an area at the bottom of the last field downstream belonging to the landowner. This land has been allowed to flood and form wetland. The maximum estimated area is 10 acres, and average depth of 18 inches. Approximate maximum storage is therefore 16000 m^2. This was requested by Defra for ecological habitat restoration, and the landowner was offered a one-off token payment of £150 for constricting some flow of the River Leach to inundate the end of the field. The landowner was happy to do this to encourage snipe for game shooting, and had little use for the land otherwise. It is about 3 years old, and the inundation has promoted growth of grass in the surrounding field.

Water21 Limited is a not-for-profit company limited by guarantee

Registered Office
135 Aztec West
Bristol BS32 4UB
Registered No. 9098337 in England & Wales

http://www.water21.org.uk/contact