

SECTION B

B.1 Background of organisation (250 word limit)

APEM is a science-based aquatic environmental consultancy operating since 1987. We operate throughout the British Isles and beyond, providing a comprehensive, multi-disciplinary approach to the monitoring, assessment and management of aquatic ecosystems. Our scientists are recognised experts in their diverse and specialist fields and we pride ourselves on delivering practical, client-focussed solutions.

The APEM catchment services team offers a unique set of services to provide the science and communication to support the UK Government's commitment to the catchment based approach. APEM's extensive range of monitoring, analysis, reporting and stakeholder engagement services can be tailored to specific requirements, supporting part or all of our customers' catchment management needs. We have developed tools to identify priority issues within a catchment to provide the evidence base for the impact of these sources, and worked with stakeholders to implement solutions to improve the natural environment of the catchment.

APEM has a long history of partnership and collaborative working with Rivers Trusts, Wildlife Trusts, local environmental and community groups, the Environment Agency and conservation agencies throughout England and Wales. We are, therefore, ideally placed to provide collaborative assistance and services to local and strategic projects to deliver environmental improvements that also provide local community, amenity and wider economic benefits. Our multi-disciplinary approach and extensive experience of partnership and collaborative working means we offer a consistent approach across catchments, regions and at a national scale, facilitating delivery of catchment management projects.

B.2 Roles of other parties related to project (250 word limit)

The Severn Rivers Trust provide the primary funding source for APEM's work in the Worfe catchment, via the Catchment Restoration Fund secured in 2012. The Severn Rivers Trust is an independent environmental organisation established to secure the preservation, protection, development and improvement of the rivers, streams, watercourses and water bodies in the Severn catchment, and to advance the education of the public in the management of water and the wider environment.

The Severn Rivers Trust knows that streams and rivers are intimately connected to the landscapes they drain and the valleys through which they flow; a river in poor condition normally reflects a catchment in poor condition. Most problems can be addressed and most can be fixed in a manner that benefits all. The Severn Rivers Trust sought the expert scientific advice of APEM to help them understand the issues facing their catchment, and the possible solutions to improve the catchment.

The Severn Rivers Trust's vision is to have living, working landscapes that deliver employment, food and amenity without impacting on rivers and biodiversity, and without the need for heavy regulation and supervision.

B.3 Summary of Work and Achievements (500 word limit)

APEM was commissioned by Severn Rivers Trust to undertake a series of surveys in the River Worfe catchment, a tributary of the River Severn in Shropshire, England. Particular interest and survey effort was focussed on a sub-catchment of the River Worfe, Wesley Brook which has, historically, been influenced by a wide variety of human activity and where pressures from surrounding land uses and development are causing the watercourse to fail Water Framework Directive (WFD) objectives. The brook was selected as a priority catchment which has significant capacity for improvement using funds made available to SRT via the Catchment Restoration Funding initiative.

In 2012/13 APEM undertook a walkover survey of the entire Worfe catchment to assess the current condition of the river and the pressures imposed on the watercourse by surrounding land practices. APEM undertook a walkover survey mapping fish habitat and diffuse pollution sources throughout the entire catchment. These surveys allow accurate and informed interpretation of the sources and pathways of contaminants entering the river system with subsequent mitigation measures aimed at source inhibition. Validation of suspected diffuse pollution sources were also subsequently determined by a series of wet weather sampling events in winter 2013 / 14.

In addition, a variety of ecological surveys using both ground and remote sensing applications have been undertaken in order to establish a baseline in the most sensitive and impacted sub-catchments. As part of these surveys barriers to fish migration in the catchment have been mapped and subsequent site visits have been performed looking at potential fish passageway measures at each. In addition protected species surveys have been established, notably looking at the population status of white clawed crayfish in the catchment.

It was intended that these surveys would inform mitigation work to facilitate a potential move towards good ecological status in the catchment, as required by the WFD. Prior to the implementation of any improvement measures, it was essential to acquire a comprehensive understanding of the current pressures on the catchment. This understanding enabled measures to be targeted to the specific issues impacting the water body and, as a result, provide the most ecological and cost effective mitigation strategy.

This work has led to the initiation of a riverine restoration plan on Wesley Brook. In 2013 APEM presented the findings of the catchment surveys to the East Shropshire National Farmers Union in Telford. Subsequently, APEM have undertaken 20 farm visits in the Worfe catchment to discuss high priority issues. The contribution of the land owners and farmers in the area to date has been excellent and a number of proposals have been put forward to the SRT and the Environment Agency which aim to mitigate future diffuse pollution issues on Wesley Brook, of which a significant number have been implemented.

SECTION C

C.1 Demonstrate your achievements in restoring the natural state and functioning of the river system. (500 word limit)

The Worfe catchment comprises nine water bodies, of which eight are in poor or moderate condition and only one water body is currently classed as Good status, but this is at risk of failing Good status. The reasons for failure to reach Good status include Phosphate, Fish, Nitrate, Diatoms, Macroinvertebrates, BOD, Flow, Macrophytes, Dissolved Oxygen and Sedimentation.

Using a standardised approach, walkover surveys were undertaken in 2012/13 allowing us to identify the areas where pollution inputs were most likely to be occurring. Impacts were graded on a scale of Grade 1 to Grade 3; Grade 1 being the most severe. In total, 190 sources were identified, with 17 of these recognised as high priority 'Grade 1' sources. This standardised categorisation facilitated subsequent analysis, enabling key issues to be identified. Photographs and/ or video footage were taken at each location, depending on the severity of the issues identified along with comments to provide specific details of the observations made. Furthermore, the location of each source was recorded in the field using a GPS, enabling subsequent GIS analysis of the spatial distribution of sources to be undertaken.

Using the data recorded during the walkover surveys, a wet weather sampling plan was established to ascertain the area's most susceptible to pollutant inputs and to quantify the relative inputs. Under the appropriate wet weather conditions a team of field scientists from APEM were mobilised to the Worfe catchment and samples were taken at each of the pre-determined locations. During the wet weather sampling on the ground, high resolution imagery was also recorded from an aircraft to further identify sources of pollution and runoff pathways.

The combined data provided from the initial walkover survey and subsequent wet weather sampling allowed a more targeted approach in the areas of the catchment most likely to be having a negative impact on water quality. Agricultural visits were arranged in these high priority areas, providing targeted farm advice on controlling diffuse pollution in meetings with landowners. Farm information packs and action plans were produced to notify landowners of issues relevant to their business and implement practical solutions for diffuse pollution remediation. By taking this approach we have been able to implement solutions to reduce pollution and improve quality in the catchment.

C.2 Demonstrate the added value of working in partnership (500 word limit)

Through working in a partnership the efficiency of the work has been improved, reducing the potential for efforts to be duplicated and ensuring that funds are targeted where they are most needed. The work undertaken on the Worfe catchment has followed a natural progression to ensure that in the early phases of the project a holistic view of the catchment was taken into consideration, and allowed a strategic approach to be taken in decision

making. As the project progressed a more targeted view was established in the order to remediate the diffuse pollution issues in the high priority areas. These progressive stages were made much easier by working in a partnership, as decisions were made much quicker. Quick decision making was vital to the ongoing success of the project, as although the walkover surveys have proved an effective method of determining pollution inputs, they only provide a snap shot in time and are more effective if they are followed up with wet weather sampling and visits with landowners.

The benefits of the partnership between APEM and The Severn Rivers Trust were also evident when it came to compiling the data as the 'one-stop-shop' approach meant that all of the data was in one place and could be easily brought together as and when required. Over the course of the project there have been several data sets for walkover surveys, wet weather sampling, agricultural visits and ecological analysis and APEM Ltd were able to compile the relevant information with relative ease.

Due to their active involvement within the catchment, The Severn Rivers Trust were able to support APEM with the communication of their findings, by arranging meetings with relevant stakeholders and landowners to ensure that remediation could be focused in the appropriate areas as efficiently as possible. The Worfe Catchment Partnership brings together the stakeholders, including: landowners; angling clubs; Environment Agency; Severn Trent Water; Natural England and the National Farmer's Union. APEM has presented updates to the project at each of the quarterly meetings and has successfully sought actions from stakeholders to support the rapid progress of practical measures to improve the catchment.

C.3 Demonstrate the different benefits arising from your work (500 word limit)

Around half of the WFD's Reasons for Failure in the River Worfe catchment are as a result of diffuse pollution sources. Therefore, there are many benefits arising from the work undertaken within the Worfe catchment, with the potential for similar projects to be undertaken throughout the country.

Firstly, the initial walkover surveys acted as an effective tool in determining the locations of sources and pathways of potential diffuse and point source pollutants. Using the Worfe catchment walkover survey as an example, there were 190 sources recorded in 140km, and each of these sources were graded to determine their priority for remediation. The data recorded during the walkover survey was digitised using GIS software, which gave a precise visual representation of where the pollution sources are located within the catchment and each point has relevant photographs and comments associated with it. Once the walkover data was digitised clusters of previously 'low priority' sites proved to be as significant, if not more so than individual 'high priority' sites.

The walkover survey allowed a more targeted sampling approach to be undertaken, and ensured that only areas directly affecting water quality were sampled, thereby reducing sampling costs. The sampling delivered further evidence of pollution issues within the catchment, providing physical values of the water quality parameters, which quantify the scale of the pollution.

Once all of the data had been collated, decisions on appropriate remediation could be made much more easily, using the GIS map as a visual aid to target specific problem areas within the catchment. In the Worfe catchment, such remediation measures included the installation of stock-proof fences along with channel clearance in areas prone to livestock poaching.

Due to the primarily arable land use within the Worfe catchment, APEM carried out consultation visits to a number of arable farms to discuss methods of remediation with landowners. It has also proved very beneficial for APEM to liaise directly with landowners during the advisory visits. The field team at APEM was able to offer a first-hand experience of the watercourses surveyed during the walkover phase and discuss relevant pollution sources with confidence, offering a personal touch that the landowners seemed to appreciate. Each of the agricultural visits was tailored to the individual farm's needs, discussing the data that had been collected to date and the appropriate guidance towards remediation was supplied.

The Worfe catchment will benefit from the work undertaken, as the pollution sources identified in the initial walkover can be dealt with through communication with landowners and providing them with the advice required for remediation. This in turn benefits the landowners, as the loss of soil and applied nutrients are minimised, increasing yield and profits. The increased soil and nutrient retention on land benefits the aquatic ecology and reduces the potential for flooding further downstream.

D.1 Describe how your works fit in to a larger catchment approach. (300 word limit)

Catchment walkover approaches are increasingly being used to understand the issues facing a catchment from diffuse pollution source to in-stream barriers to habitat assessment. We have developed a standardised approach that has been identified as best practice by the Environment Agencies and adopted by Natural England and Rivers Trusts amongst others.

Identifying the issues is only the start. We are helping to provide the evidence base to address the issues. Ultimately knowing the problem is only the start and we are developing tools to provide solutions and make real changes. The catchment-based approach is not only about understanding a catchment but making the changes to improve it.

The SRT has wider catchment restoration visions for the entirety of the River Severn watershed – notably in other high-priority failing watercourses. The contribution of the Worfe restoration work to this vision is vital and the project aims to result in improvements to at least 27 WFD elements and the status of all nine water bodies in the catchment by 2015. In addition, the improvement in water quality in the Worfe catchment will have wide-ranging implications for the WFD categorisation of the River Severn as a whole and will contribute to measures actioned in the Midlands Catchment Flood Management Plans.

D.2 Provide evidence of success, including any monitoring results, anecdotal, media, etc. (500 word limit)

A key success of the Worfe catchment restoration project is the widespread engagement of land practitioners in the area which has been pivotal in achieving intervention measures. The involvement of the National Farmers Union has been key to this engagement and has facilitated a long term relationship with farmers and key stakeholders in the catchment.

The ecological survey results from 2014 will give further evidence of catchment solutions, however, APEM have already identified fish populations at sites where stock-proofing has been erected to prevent cattle poaching. APEM have erected nearly 2km of fencing at high priority sites identified during the walkover survey. At these locations significant habitat degradation and sedimentation of substrate had previously prevented successful fish populations. It is anticipated that these fish will reseed tributaries which are currently devoid of life as a result of previous poaching.

D.3 Describe your long-term vision. (300 word limit)

The long term vision is to establish a tool kit for implementing practical measures to support the catchment based approach that starts with identifying the issue, gathering credible evidence of impacts, engaging with stakeholders and providing cost effective solutions. We now have an established best practice method of recording diffuse pollution sources and pathways within a catchment. We are developing the tools to ensure that the data collected are used to directly reduce the impacts these sources have on the surrounding watercourse.

For the tool kit to be adopted and used and to ensure reliability throughout the initial walkover stages, relevant training and calibration is required for the surveyors in the standardised techniques. Ideally, then the same surveyors that carried out the initial walkover would then proceed with the wet weather sampling in that area and are further involved at the remediation stage.

D.4 What have been your challenges and lessons learned? (300 word limit)

The most challenging aspect of the project has been the logistics. In order to survey such a large area in a relatively short space of time, good preparation is vital. To ensure successful capture of all potential sources at the walkover stage, the entire catchment must be surveyed. GIS software is used along with detailed maps at the preparation stage to ensure that all of the watercourses within the catchment are covered, before leaving the office. Once out in the field, APEM adopts a 'leap-frogging' approach, whereby individuals walked along the river to a predefined location where a vehicle had been left by a team member who had walked upstream from that point. This approach enabled large areas to be covered systematically and efficiently. There were also logistical challenges at the sampling stage of the process, as not only was a large team required to sample 51 individual sites throughout the catchment in the space of a few hours, but also the weather conditions had to be favourable.

Gaining the trust of stakeholders and land owners to make changes was key. It took time to build trust with them and this only occurred when we had credible evidence, presented in an

understandable way which demonstrated clear improvements. Understanding the business of arable farming in the Worfe catchment and the practical challenges was key to gaining the trust and respect of stakeholders. High resolution digital imagery from APEM's aerial surveys of the entire Worfe catchment proved to be a very effective tool for engaging interest and understanding among stakeholders. We also spent time developing an ongoing relationship with stakeholders using a continuity of people in contact with them.