

Guidance Note

Hydropower Guidance Note: HGN15 Weir Pools

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This Guidance Note has been prepared by Natural Resources Wales (NRW) to provide applicants for abstraction and impoundments licences for the purpose of hydropower schemes with information on weir pools. Its contents may be updated periodically and developers should ensure they read the most recent version, which is available on the NRW website.

What is a weir pool?

A weir pool is an area of water below a weir (or similar impounding structure). The energy of the water entering a weir pool is what creates and maintains the shape and features of a weir pool. This flow is often variable, depending in part on natural fluctuations in water flows within river systems, but also the management regimes associated with the impounding, or other control structures – for example flood defences.

What are the issues and concerns?

In lowland rivers where multiple impounding structures alter large portions of habitat, weir pools can provide important habitats for plants, invertebrates and fish. The habitat features associated with weir pools, such as areas of gravel used for spawning, are often otherwise missing in heavily managed rivers. In such cases weir pools provide otherwise rare habitat between impounding structures. Whilst such situations are rare in Wales, if hydropower development is proposed in such areas, considering weir pool ecology may be appropriate.

When the flow is changed, as it may be through the introduction of a hydropower scheme, the nature of the weir pool may change. Changes in flow may reduce, enhance or cause

no change to the key features of weir pools. It is changes to flow and energy patterns that are of concern.

What is our position?

When you are planning a hydropower scheme, you should consider the possibility that the weir could be removed in the future, for example if it fails structurally and is not re-built, or if the requirements of the Water Framework Directive require it to be removed. For weirs that cannot be removed, it is important not to cause changes to a weir pool that might adversely affect compliance with the relevant environmental legislation or the rights of existing users. An adverse change is defined as:

- a deterioration in the Water Framework Directive ('WFD') status of the associated water body, and/or
- prevention of that water body from achieving its environmental objectives under the WFD, and/or
- a harmful change for existing users of the river, including riverside ('riparian') use such as a fishery, rights of navigation and legitimate amenity use.

Assessment of weir pools

The importance of weir pools must be assessed in relation to the relevant environmental legislation. For each weir pool, there are two elements to consider:

- its ecological value
- its contribution to the status of the water body or fishery where it is found.

Ecological value

The substrate is often the most important habitat feature for fish and wildlife found in weir pools. This substrate can contain gravels, which are used by fish for spawning. The presence and distribution of these gravels are maintained by the flows through the weir pools. Large flows can significantly alter their distribution, while low flows can result in fine sediments being deposited over these areas, reducing their function as spawning habitat. Medium flows help maintain spawning gravels by keeping them clean and well

oxygenated. Gravels are typically found at the tail of the weir pool. Not all fish found in weir pools spawn on gravel substrates, but many do – for example, trout, barbel, chub, dace, bleak and lamprey.

Weir pools often provide deep water refuges for many species of fish.

To understand the ecological value of a weir pool, it is necessary to understand both the type of habitat associated with the weir pool and the species that use it. In relation to the WFD, where a weir pool contributes to the ecological status of a water body, we need to consider any potential changes to the flow within it. Specifically, changes leading to a deterioration in the status of that water body or preventing it from achieving its WFD objectives should be avoided or mitigated.

If these changes cannot be avoided or fully mitigated a scheme is unlikely to be approved unless, in accordance with Article 4(7) of the WFD:

- the adverse impacts are mitigated as far as practicable;
- the changes are reported in the River Basin Management Plan;
- the benefits of improved WFD status are outweighed by the benefits of the hydropower scheme;
- the benefits cannot be achieved by other means, technically or only at disproportionate cost and
- there is no significantly better environmental option.

Weir pools often contribute significantly to the ecological status of a water body in which it is found. We must take this into account when any changes are proposed that might affect weir pool structure and function.

To address this point, we need to know:

- which ecologically important features are contained within the weir pool;
- the contribution these features make to the status of the water body in which the weir is located or with which it is associated.

Typically the assessment of the contribution made by the weir pool will need to include its contribution to the river reach to the next impoundment, if any, downstream within the river. Where similar habitat features are prevalent throughout the stretch of river, the contribution from the weir pool may be relatively small. In these cases, changes to a weir pool are less likely to affect the ecology of the river section as a whole and would be unlikely to cause further deterioration in the status of the water body in which it is found or within which it is associated. However, removal of flow may affect the potential for fish to migrate upstream past the weir, and we will need to be assured that this potential is maintained or enhanced.

In heavily impounded lowland rivers, the important habitat associated with the weir pool may not be prevalent in the rest of the reach. In these situations, the weir pool habitat may be more important. Changes that would damage that habitat may be more likely to affect compliance with WFD requirements. It should be noted that not all changes have the potential to cause an ecological impact, some may be beneficial.

How can weir pool habitat be assessed?

Before you undertake detailed ecological and hydro-morphological surveys, try to establish what is already known about the nature of the weir pool. Consider:

- the number of weirs and weir pools in the river system and their size
- the existing fish migration status of the weir and future requirements
- the nature of the substrate within the pool
- which fish species are known to be present in the pool
- whether there are other biodiversity interests associated with the pool
- whether there is ecologically important habitat in the pool, and if so, whether similar habitat exist downstream
- whether there are lawful uses of the weir pool, such as a fishery

Where possible, we will consider the effects of a hydropower scheme on a weir pool and associated uses on the basis of existing data, information and expert knowledge. Where this is not possible, we may require you to carry out surveys to provide the necessary information. These will need to focus on answering the points highlighted above.

What do you need to do?

When you are designing a hydropower scheme, it is important to consider any weir pool associated with the scheme and to understand how it affects the local ecology. Factors that could affect a weir pool include:

- the proposed residual flow into the weir pool
- the location of the turbine tailrace
- the management of flows across the scheme – turbine flow, flow over the weir, fish pass flow, and the co-location of turbine and fish pass flows which is required to maximise fish pass effectiveness

You will also need to consider the value of the weir pool in relation to:

- its contribution to the Water Framework Directive status of associated water bodies
- its value as, or contribution to, a recreational amenity

How can you do this?

The flow chart below shows the process for determining how the design of a hydropower scheme should take account of the presence of an associated weir pool.

Decision tree to support weir pool assessment

