



# Guidance for run-of-river hydropower development

December 2013

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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# 1. How to use our guidance

Small-scale hydropower is a reliable and proven technology which converts the power from flowing rivers into electricity.

It's our role to ensure that hydropower development is sustainable. We do this by:

- advising developers
- assessing how schemes might affect the local environment
- ensuring schemes are compliant with environmental legislation
- issuing licences and consents

We make sure that appropriate safeguards are put in place to protect the environment and, if this can't be done, we don't allow schemes to go ahead.

Our guidance will help hydropower developers understand:

- how we license hydropower schemes
- the environmental protection safeguards you will need, such as fish screens and fish passes
- how you can consider the needs of other river users and people with legal rights who may be affected by a hydropower scheme

Our guidance can't cover every eventuality and some sites may require additional or alternative environmental protection safeguards. If your proposal departs from our guidance, we will require you to provide additional information to demonstrate that you can provide and maintain equivalent levels of environmental protection.

## Structure of the guidance

This document explains how we regulate hydropower, the environmental issues to consider, advice on how to design your scheme, and how to apply for the necessary permits and licences. There is a [glossary](#) of technical terms that we use throughout our guidance at the end of this document.

You will need to refer to more detailed technical guidance, which is available on our website<sup>1</sup> as a set of advice notes:

- [Flow and abstraction management](#)
- [Geomorphology \(including weir pools\)](#)
- [Screening requirements](#)
- [Fish passage](#)
- [Water Framework Directive, nature conservation and heritage](#)
- [Flood risk](#)
- [Monitoring](#)
- [Impoundments: the use of weirs](#)
- [Competing hydropower schemes](#)

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<sup>1</sup> You can also request our guidance and forms by calling us on 03708 506 506 or by writing to us at: Environment Agency, 99 Parkway Avenue, Sheffield S9 4WG.

# 2. Getting started

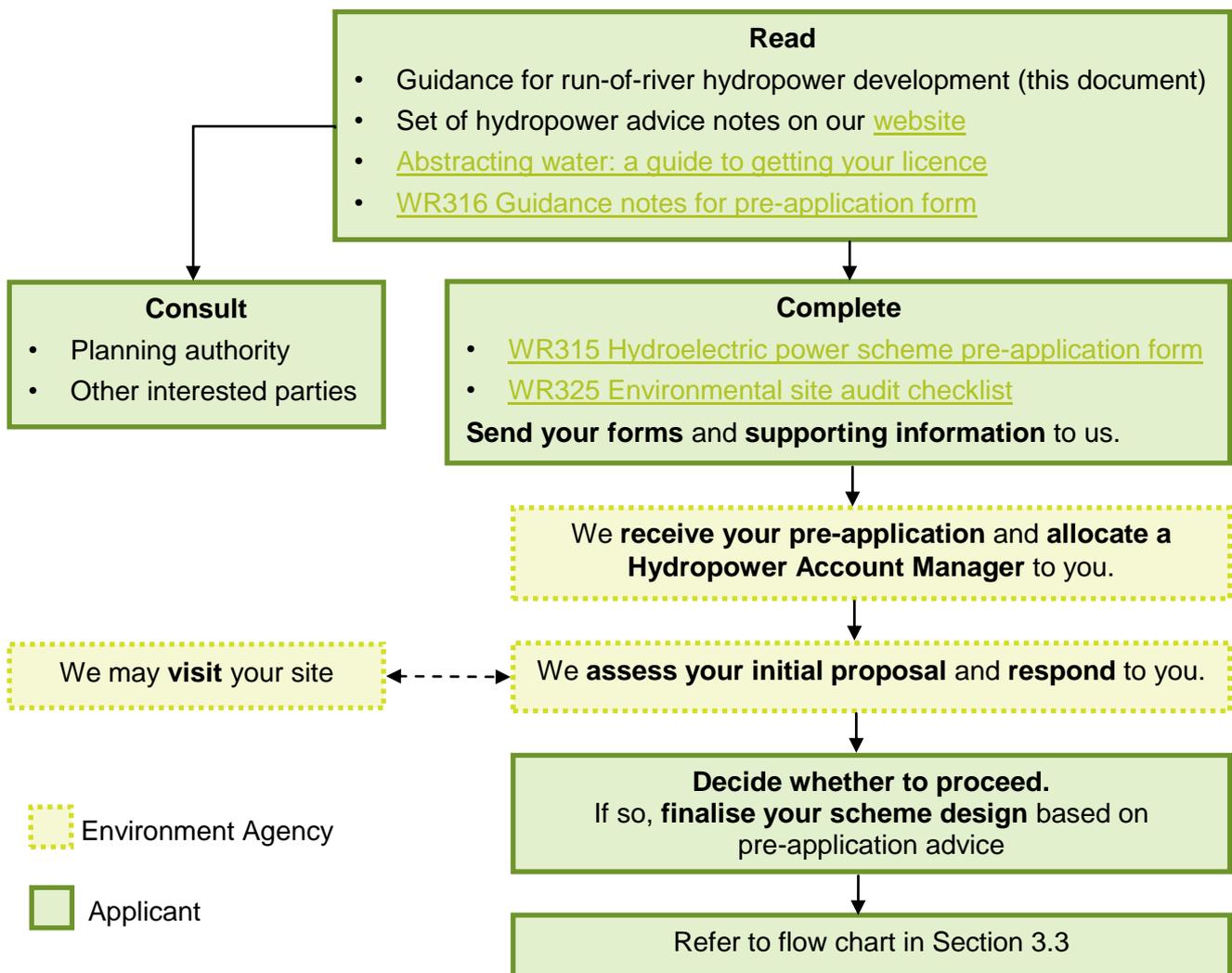
## Key messages for developers:

- choose sites carefully and follow our guidance
- make protecting the environment a priority within your scheme design and budget
- understand that we are less likely to accept proposals in sites of high environmental sensitivity

## 2.1 Pre-application advice

Pre-application gives you an opportunity to discuss your proposal with us before you formally apply for a licence, permit or consent. We recommend that you follow our pre-application advisory process (see Figure 1). We will advise you on any changes you should make to your scheme design to make it more likely that we can issue you a licence. We will confirm the information you need to submit to make a valid application that we can assess. We offer up to 15 hours of free pre-application advice and we may charge for any advice beyond this. If you need advice from us on your planning application, we will give a free preliminary opinion, but will charge for further technical advice.

**Figure 1 The pre-application process**



## 2.2 What you need to do

### Read our guidance

Following the guidance should help to minimise the risks of environmental harm and make the licensing process more straightforward.

- Guidance for run-of-river hydropower development (this document)
- set of advice notes on our [website](#)
- [Abstracting water: a guide to getting your licence](#)

### Complete the pre-application form and Environmental Site Audit (ESA) checklist on our [website](#).

Provide as much information as you can at this stage to help us understand what you are proposing.

- [WR316 Guidance notes for pre-application form](#)
- [WR315 Hydroelectric pre-application form](#)
- [WR325 Environmental site audit checklist](#)

### Consult your planning authority

In almost all cases, you will need planning permission from your local planning authority (LPA) to develop a hydropower scheme.

- Contact your LPA to discuss your plans at an early stage.
- The LPA will tell you which parts of your scheme require planning permission and if you need listed building consent. You can refer to the [Planning Portal](#) for further details.

The LPA will decide on all planning applications for hydropower schemes in accordance with the policies in their development plan unless material considerations indicate otherwise. This plan should be available on their website. They may also need to take account of national planning policy and guidance as well as other material considerations. The LPA will consult with other people who may be affected by the scheme and then the application may be decided by a Planning Committee of elected Councillors.

We encourage you to apply for planning permission and our licences at the same time: this is known as 'parallel tracking'.

Planning permission establishes whether a hydropower scheme is an acceptable use of land (which includes the river), taking into account a wide range of environmental, social and economic considerations. These include potential cumulative effects and issues such as:

- the physical appearance of any buildings
- noise
- ecology
- geomorphology
- landscape
- amenity
- flood risk
- archaeology

A local planning authority may also need to take into account other potential 'material planning considerations' such as water resources, fisheries and biodiversity. However, LPAs work on the assumption that the relevant pollution control regime will be properly applied and enforced, and that they know that our licences will secure adequate controls to protect people and the environment. We have published [guidance](#) on how the planning and permitting systems work together.

For each key planning issue associated with a hydropower scheme, the local planning authority may ask for mitigation measures or compensation measures and impose planning conditions.

- You may need to implement mitigation measures to resolve or address potential problems. You can identify many of these measures during the LPA pre-application consultation process. Measures will address aspects of design and location as well as relate to restrictions on operation.
- A local planning authority may attach planning conditions to permissions for hydropower schemes in order to make otherwise unacceptable developments acceptable.

## Consult other interested parties

Hydropower schemes can affect local communities, other river users and the environment.

Before you submit a formal application, talk with the local people and groups who may potentially be affected, listen to what they have to say and, where appropriate, take steps to address their concerns. You may be able to resolve problems early on, get more support for your scheme and save yourself time, resources and additional work.

Consider consulting with:

- rivers users including representative bodies such as local angling clubs, the Angling Trust, Canal & River Trust, Inland Waterways Association, National Association of Boat Owners, the British Canoe Union and the Ramblers Association
- environmental bodies such as Rivers Trusts, Wildlife Trusts, the RSPB and the Management Units for any Areas of Outstanding Natural Beauty
- Natural England
- local authority officers who deal with environmental health, highways, ecology and archaeology
- neighbours including residents and businesses
- organisations with an interest in the built environment, including English Heritage
- the [District Network Operator \(DNO\)](#)
- the parish council
- neighbouring local planning authorities (if your proposal is on a river which is an LPA boundary)

This list is not exhaustive. Your list will depend on where your site is and the specific local details.

Refer to the relevant local planning authority's Statement of Community Involvement. This will include details on consultation arrangements for planning applications.

If you're aware of other proposals for hydropower schemes at the site you're applying for, you should consult the other applicant(s). For more information, see our advice note on [Competing hydropower schemes](#).

## 2.3 We're here to help you

### **We'll assign an Account Manager to your scheme**

Throughout the pre-application and application processes, your Account Manager will be your single point of contact. Their job is to help you understand our requirements and to highlight any areas of environmental concern.

### **We'll offer advice based on your initial proposal**

Based on the information you have provided, we'll consider the following issues:

- the best use of available water
- possible local and wider environmental effects, such effects may be positive or negative
- the assessment of flood risk and the proposals for mitigating that risk
- the impact on other water users in terms of the effects on the protected rights of existing abstractors, on the existing lawful uses of water by others for agricultural, industrial, public supply or recreational purposes, and on requirements of fisheries, navigation or land drainage
- what licences you will need

We'll look at the best available evidence on how abstraction, impoundment, flow modifications and flow diversions will affect river-based habitats and the associated ecology. We'll also consider effects on the river dynamics (known as geomorphology), such as the passage of sediment, bed and bank stability and physical habitats. We'll use professional expert judgement to interpret this evidence. We may visit your site at this stage.

We recommend that you use our pre-application advice to finalise your scheme design before applying.

### **We'll talk to other regulators**

We'll work with local planning authorities and other organisations that need to be involved, such as Natural England<sup>2</sup>.

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<sup>2</sup> We explain how we take account of environmental considerations in our guidance 'Hydropower developments: Environmental considerations and decision making', which we produced jointly with Natural England and the Countryside Council for Wales (now part of Natural Resources Wales) in 2012. Ask your Account Manager if you would like a copy.

# 3. Applying for licences and consents

## 3.1 What are the licences and consents for hydropower?

You will require licences and consents for your hydropower scheme. We have a duty to ensure that schemes comply with relevant environmental legislation. For instance, we grant water resources licences (abstraction and impoundment) under the Water Resources Act 1991 (WRA).

### Abstraction licences

For most schemes, you need our permission to take water from the river to flow through a hydropower turbine.

We will grant either a full or transfer abstraction licence, depending on how your scheme uses water.

- You will need a full licence to abstract water from a watercourse unless you are transferring it to another watercourse. You will also need a full licence if you want to abstract water from a river via a piped off-take or off-take structure to a turbine. We charge for hydropower abstractions if your scheme has a peak output of more than 5 MW.
- You will need a transfer licence when you are transferring water from, for example, one watercourse to another without using the water for another purpose. For example, a hydropower scheme may move water between channels. There is no annual abstraction charge for a transfer licence.

New abstraction licences are normally time limited to a common end date for the catchment. See our [Catchment Abstraction Management Strategies \(CAMS\)](#) to find out the time limit for your catchment.

For detailed technical guidance, refer to [Flow and abstraction management](#) advice note.

### Impoundment licence

You will need an impoundment licence if you're making changes to structures or works which obstruct, hold or store water, such as weirs and sluices, or if you're building new structures in the watercourse. If you're refurbishing existing unlicensed turbines, or reinstating derelict mill structures/equipment, you may require an impoundment licence.

For detailed technical guidance, refer to [Impoundments: the use of weirs](#) advice note.

### Fish pass approval

We will require you to install a fish pass and appropriate flow management to allow fish to pass safely up and down the river on rivers where your scheme could make upstream or downstream fish passage worse. We will need to approve both the design and installation of your fish pass.

For detailed technical guidance, refer to [Fish passage](#) advice note.

## **Flood defence consent**

You must apply for a flood defence consent when your scheme is sited on a main river. You will also need our consent for any works near a main river or a flood defence. This will include both the construction works and the finished scheme.

If your scheme isn't on a main river you may require an ordinary watercourse consent from your local authority or Internal Drainage Board.

For detailed technical guidance, refer to [Flood risk](#) advice note.

## **Water Resources Act (WRA) agreement**

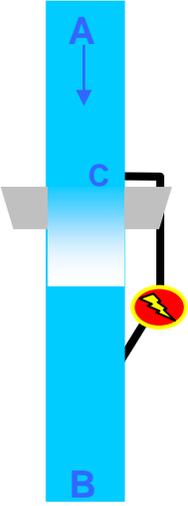
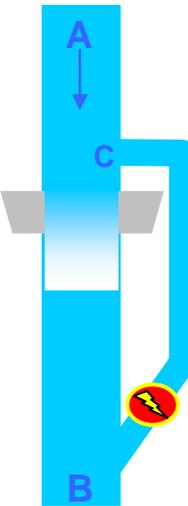
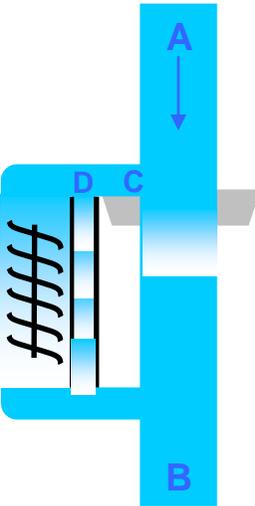
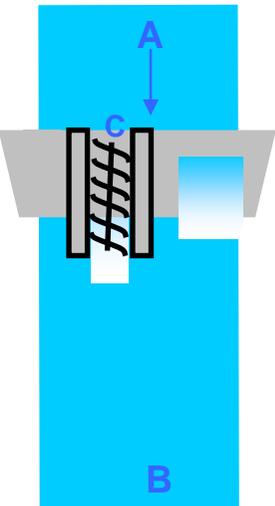
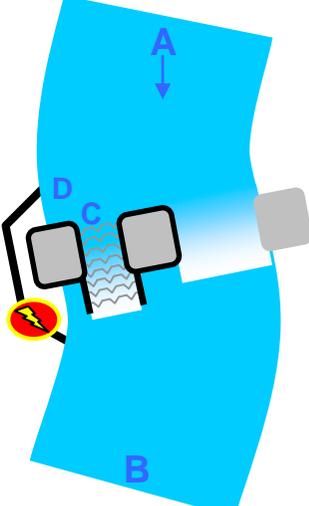
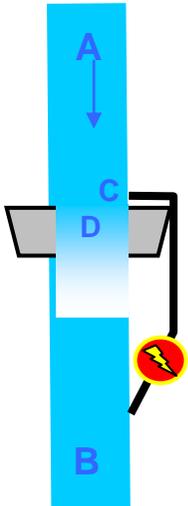
We may also require an agreement with you under Section 158 of the WRA to regulate the way a hydropower scheme is operated. These agreements could cover rights of access, controlling river levels, maintaining the weir and river structures, fisheries and other environmental protection matters.

## **3.2 Which licences apply to your scheme?**

Scheme layouts can be complex and will affect which licences you will need. The scenarios in Figure 2 overleaf illustrate the licences required for some typical scheme arrangements.

Your Account Manager will confirm the licence types that apply to your scheme.

Figure 2 Licences required for some typical scheme arrangements<sup>3</sup>

<p><b>Scenario A (Abstraction only)</b></p>	<p><b>Scenario B (Abstraction only)</b></p>	<p><b>Scenario C (Abstraction only)</b></p>	<p><b>Scenario D (Impounding only)</b></p>	<p><b>Scenario E (Abstraction and impounding)</b></p>	<p><b>Scenario F (Abstraction and impounding)</b></p>
<p>Abstraction around an existing, unchanged in-river structure such as a weir, sluice or lock, via gravity through an intake structure to a penstock pipe at C to a turbine.</p>	<p>Abstraction around an existing, unchanged weir structure, via gravity through an intake structure (C) to an open channel which is considered to be a source of supply. A turbine is located within the open channel.</p>	<p>Abstraction with Archimedean screw turbine (also applies to other types). Water is diverted into turbine forebay from main river at C. New fish pass is proposed at D. There is an existing, unchanged weir across the main river.</p>	<p>In-river impounding works with turbine located within disused wheel-pit structure (C). May or may not be water level control structure across main river. Wheel-pit within curtilage of main river.</p>	<p>Abstraction with the piped turbine off-take (D) located off main river channel. Existing weir structure across main river. New fish pass to be installed at C within existing weir.</p>	<p>Abstraction around new in-river structure. Abstraction via gravity through in-take structure to penstock/pipe.</p>
					
<p>Full licence for abstraction at C.</p>	<p>Transfer licence for abstraction at C. Turbine may need an impounding licence.</p>	<p>Full licence for abstraction at C.</p>	<p>Impoundment licence for altering existing impounding structure at C.</p>	<p>Impoundment licence for modifying existing weir at C. Full licence for abstraction at D.</p>	<p>Full licence for abstraction at C. Impoundment licence for new in-river structure at D.</p>

<sup>3</sup> In all scenarios, the main river flows from A to B.

### 3.3 What you need to do

You should only begin the application process once your pre-application work is complete.

#### Read our guidance

Figure 3 overleaf illustrates what you need to do to apply for the licences and consents that are relevant to your scheme.

For all applications:

- [WR318 Application for hydroelectric-power scheme permissions guidance notes](#)

For particular licences:

- [WR176 Introductory and guidance notes: applying for a full, transfer or impoundment licence](#)
- [FD005 Application for flood defence consent: guidance note \(hydropower\)](#)
- [FP003 Application for fish pass approval: guidance note](#)

#### Complete the relevant application forms

For all applications:

- [WR317 Application for hydroelectric-power scheme permissions](#)

For particular licences:

- [WR174 Application for a full or transfer licence](#)
- [WR175 Application for an impounding licence](#)
- [FD004 Application for a flood defence consent \(hydropower\)](#)
- [FP002 Application for a fish pass approval](#)

#### Send your application to us with supporting information

The law requires that we maintain a sufficient level of environmental protection when we license hydropower schemes. We need to comply with legislation such as the Water Framework Directive and the Habitats and Birds Directive.

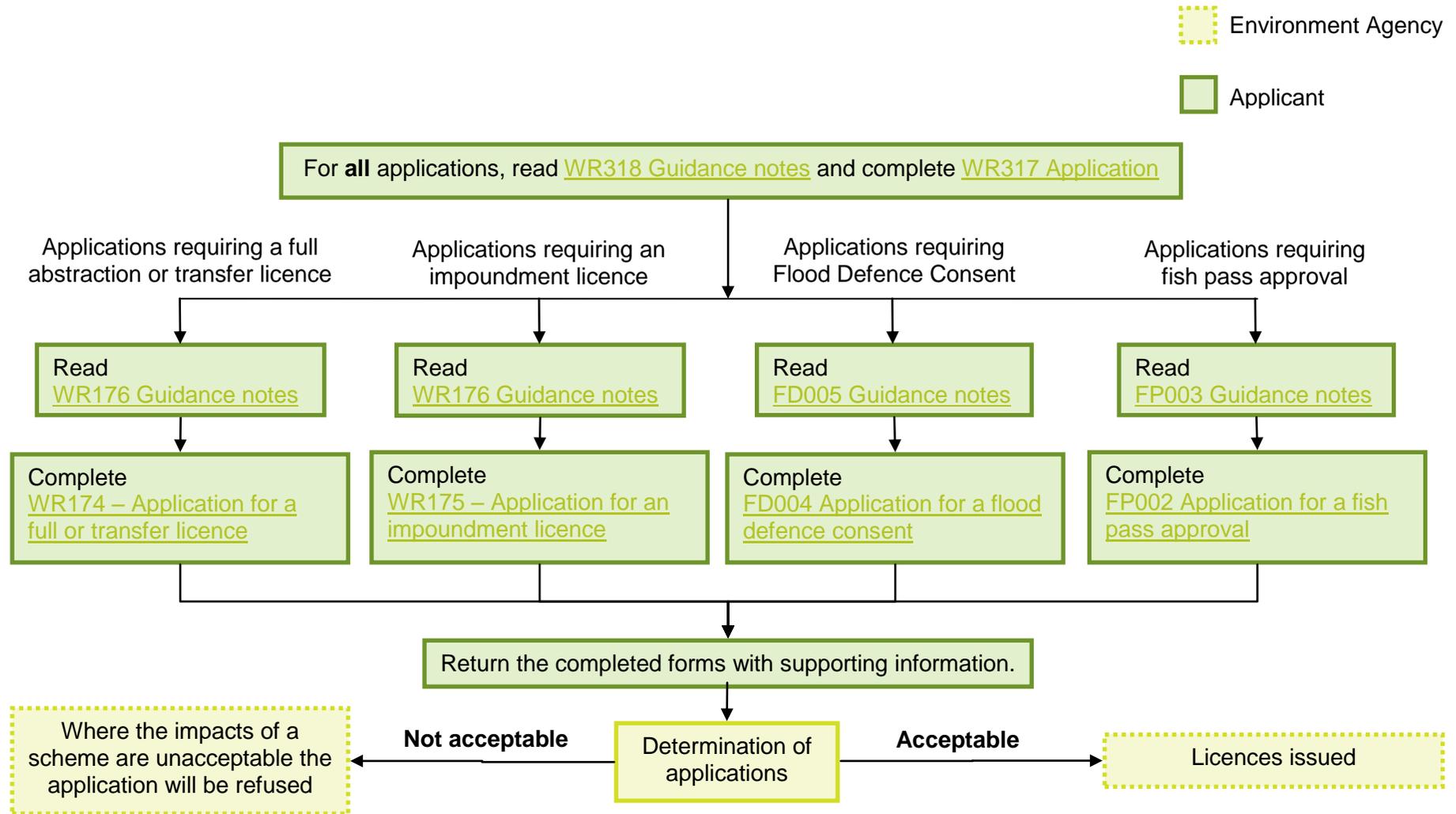
Every hydropower scheme is different. Your design must suit the specific characteristics of the site and provide appropriate levels of environmental protection.

- You should submit an environmental report alongside your application. This should include evidence and supporting information to indicate the potential environmental implications of your scheme and any mitigation measures you will take.
- The type of scheme you are developing and local environmental features will determine exactly what you need to include in your environmental report. Table 1 sets out many types of supporting information that we may ask you to provide. Your Account Manager will advise what is relevant for your scheme.

You may also need to provide some of the supporting information we request as part of your application to the local planning authority (LPA) for planning permission.

**Figure 3 The application process**

You may need to follow more than one of the routes in this flowchart, depending on the licences you need for your scheme.



**Table 1 Supporting information you may need to send us**

Supporting information	Description	Environment Agency	LPA	Advice notes
<b>Scheme details</b>	Describe the proposal, including: <ul style="list-style-type: none"> <li>its location (with photographs)</li> <li>turbine type</li> <li>details of grid connection works, including transformer and transmission lines</li> </ul>	✓	✓	
<b>Plans</b>	Include maps and diagrams such as: <ul style="list-style-type: none"> <li>location plan of your site (scale of 1:1250)</li> <li>site plan showing the location of, for example, the intake forebay, pipeline, turbine, tailrace, bywash, fish and trash screens, fish pass and other elements of the scheme that affect its physical appearance (scale of 1:500)</li> <li>existing and proposed elevations (scale of 1:50 or 1:500)</li> <li>existing and proposed floor and roof plans for your turbine house (scale of 1:50 or 1:500)</li> <li>land ownership/permissions and access</li> </ul>	✓	✓	
<b>Details of power and efficiency</b>	Provide details of the predicted power from the installation (in kW and kW/hrs/year) and the scheme efficiency parameters, as well as what the energy will be used for (if applicable).	✓	✓	
<b>Details of site management measures during construction</b>	Can help avoid or minimise the effects of construction by ensuring it is undertaken sensitively and at the appropriate times of year. It may also highlight whether you will require additional permissions during the course of the works.	✓	✓	
<b>Details of vehicular access and movements</b>	Include the means of vehicular access and the number and frequency of vehicle movements during both the construction and operation of a scheme.		✓	

Supporting information	Description	Environment Agency	LPA	Advice notes
<b>Environmental Impact Assessment (EIA)</b>	<p>If your scheme is likely to have a significant effect on the environment, or is situated in a sensitive area.</p> <p>Ask your LPA for a 'screening' opinion to assess if an EIA is necessary and a 'scoping opinion' to set out the information that you will be expected to cover in your assessment.</p> <p>An EIA is more likely for a hydropower scheme above 0.5MW.</p>		✓	
<b>Environmental Statement</b>	<p>Where a proposed development is the subject of an Environmental Impact Assessment, you will be required to prepare an Environmental Statement. This is likely to draw together much of the information outlined in this table in order to assess likely significant environmental effects of a proposal.</p>		✓	
<b>Hydrology assessment</b>	<p>Analysis of how the proposed scheme will affect the volume of water flow, or water level, within all present or proposed channels and over any structures in the river, such as a weir or fish pass.</p> <p>The assessment will include:</p> <ul style="list-style-type: none"> <li>• Flow Duration Curve (FDC) statistics including the mean flow value</li> <li>• details of how these flow estimates have been derived and validated</li> <li>• Base Flow Index</li> <li>• details of the proposed abstraction regime</li> <li>• hydrographs showing impact of the scheme on river flows</li> </ul>	✓		<u><a href="#">Flow and abstraction management</a></u>
<b>Flood Risk Assessment</b>	<p>Needed for most applications for hydropower schemes.</p>	✓	✓	<u><a href="#">Flood risk</a></u>
<b>Details of provision for fish passes</b>	<p>To highlight the measures incorporated to enable fish to pass safely downstream and upstream through the site.</p>	✓		<u><a href="#">Fish passage</a></u>

Supporting information	Description	Environment Agency	LPA	Advice notes
<b>Details of the bywash channel</b>	Where required, the design of a bywash channel is critical to the performance of any fish screen placed within a channel. State whether the bywash is a separate channel, whether the fish pass forms part of the bywash channel, and the dimensions.	✓		<a href="#"><u>Screening requirements</u></a>
<b>Details of fish screening measures</b>	<p>To highlight the measures incorporated to prevent fish from entering the turbine, including:</p> <ul style="list-style-type: none"> <li>• the type of fish screen such as mesh screens, vertical or inclined bar racks, coanda-effect screens (wedge-wire spillway screens)</li> <li>• mesh size of the intake screen, in millimetres (mm)</li> <li>• dimensions (width x height) of the screen in millimetres (mm)</li> <li>• angle of the intake screen (in degrees) in relation to the main flow path (this should be adequate to guide fish effectively to the bypass channel)</li> <li>• the approach velocity, for the intake screen only, in metres per second</li> <li>• 10-figure National Grid Reference of intake screen</li> </ul>	✓		<a href="#"><u>Screening requirements</u></a>
<b>Alternative screening methods</b>	Alternative screening methods such as behavioural fish barriers may be used where similar levels of protection can be provided. Behavioural fish barriers include acoustic deterrents and strobe lighting.	✓		<a href="#"><u>Screening requirements</u></a>
<b>Water Framework Directive (WFD) assessment</b>	Schemes will be assessed to determine whether they will prevent the achievement of WFD objectives. This may include an assessment of cumulative and in-combination effects.	✓		<a href="#"><u>WFD, nature conservation and heritage</u></a>
<b>Ecological survey</b>	To understand the environment and species at the site and to assess the impacts on both the aquatic and terrestrial habitats and species.	✓	✓	<a href="#"><u>Monitoring</u></a>

Supporting information	Description	Environment Agency	LPA	Advice notes
<b>Habitats Regulations Assessment (HRA)</b>	The competent authority will assess schemes that have likely significant effects on interest features of European sites. This will include an assessment of cumulative and in-combination effects. You should provide the competent authority with all the necessary information to enable it to undertake the HRA. You can include this within your environmental report.	✓	✓	<a href="#"><u>WFD, nature conservation and heritage</u></a>
<b>Geomorphology/weir pool assessment</b>	A geomorphology/weir pool assessment is an integral component of a WFD assessment, where applicable.	✓		<a href="#"><u>Geomorphology (including weir pools)</u></a>
<b>Design and Access Statement</b>	For major developments or if your site is in a conservation area or is a UNESCO 'World Heritage Site'. Provide details of the extent, layout, scale, landscaping and appearance of the proposal.		✓	
<b>Photomontages</b>	To demonstrate the landscape/visual impact.		✓	
<b>Land contamination</b>	Conduct a preliminary risk assessment to identify the existing and previous uses of the site and possibility of contamination. Complete a land contamination study if a proposed site is known or suspected to be affected by land contamination (for example has previously been used for industrial purposes or is a landfill site). Examine the likelihood of the presence of land contamination, its nature and potential risk to the proposed development, and what further measures are required to ensure the site is suitable for use.	✓	✓	

## Other regulatory requirements

You may need to comply with other regulatory requirements, depending on the impacts of your scheme. You'll need to satisfy these requirements separately in accordance with relevant legislation and in addition to the permissions referred to in this guidance.

We can review and comment on planning applications for hydropower development and help ensure that the planning and permitting processes complement but do not overlap each other.

### Further information:

- Natural England [www.naturalengland.org.uk/](http://www.naturalengland.org.uk/)
- Planning Portal, the UK government's online planning resource [www.planningportal.gov.uk/](http://www.planningportal.gov.uk/)
- English Heritage [www.english-heritage.org.uk/](http://www.english-heritage.org.uk/)
- Marine Management Organisation [www.marinemanagement.org.uk/](http://www.marinemanagement.org.uk/)

# Glossary

<b>Abstraction</b>	The removal of water from a watercourse.
<b>Abstraction Sensitivity Bands (ASBs)</b>	There are three abstraction sensitivity bands assigned to each water body in England and Wales: ASB1 low sensitivity; ASB2 moderate sensitivity and ASB3 high sensitivity.
<b>Account Manager</b>	Throughout the pre-application and application processes, your Account Manager will be your single point of contact. They will help you understand our requirements and provide initial advice.
<b>Approach velocity</b>	The speed at which the water flowing towards an intake hits the fish screen. Also known as 'escape velocity'.
<b>Base flow</b>	The component of stream flow that originates from storage within the catchment, for example, groundwater, and supports stream flows during long periods with no rainfall.
<b>Base flow index</b>	The ratio of annual baseflow in the river to the total annual runoff.
<b>Biota</b>	Animals and plants.
<b>Bywash</b>	The arrangement of flow that is needed to prevent fish from becoming trapped by, or caught up in, the screening at a hydropower scheme.
<b>Catchment</b>	An area with several, often interconnected, water bodies (rivers, lakes, groundwater and coastal waters). There are 93 catchments in England, six of which cross borders with Wales.
<b>Catchment Abstraction Management Strategies (CAMS)</b>	A framework to assess resource availability to produce a licensing strategy on a catchment scale.
<b>Coarse fish</b>	A freshwater fish that isn't a member of the salmon family.
<b>Cofferdam</b>	Watertight enclosure across a watercourse.
<b>Competent Authority</b>	The public body (such as the Environment Agency) which has responsibility for assessing the potential impact of a development on water bodies or protected nature conservation sites.
<b>Depleted reach</b>	This is the section of a watercourse between the point where water is taken out of the river and the point at which it's returned.
<b>Designated site</b>	These include Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas and Ramsar sites. These sites have designated features which have various degrees of legal protection.

<b>Ecological connectivity</b>	Refers to the connected system of open space throughout an ecosystem and adjacent ecosystem. For example, the ability for fish to move within river systems to complete their life cycle.
<b>Ecological potential</b>	The Water Framework Directive classifies all Heavily Modified or Artificial Water Bodies in terms of their ecological potential.
<b>Ecological status</b>	The Water Framework Directive classifies water bodies in terms of their ecological status.
<b>Ecosystem</b>	The interactions of a community of living organisms with their environment.
<b>Environmental Flow Indicators (EFI)</b>	Identifies where abstraction pressure may start to cause an undesirable effect on river habitats and species.
<b>Environmental report</b>	Report that presents various types of supporting information, submitted with the formal application form.
<b>Environmental statement</b>	Where a proposed development is the subject of an Environmental Impact Assessment, you will be required to prepare an Environmental Statement. This is likely to present information in order to assess the likely environmental effects of your proposal.
<b>Escape velocity</b>	The speed at which the water flowing towards an intake hits the fish screen. Also known as 'approach velocity'.
<b>Expert judgement</b>	Our staff use their professional knowledge and expertise to interpret available evidence.
<b>Fish pass</b>	A structure that allows fish to move upstream or downstream of a barrier. There are many types of fish pass. For more information, see our <a href="#">website</a> .
<b>Fish passage</b>	To allow free movement of fish and eels
<b>Flashy flow</b>	Frequent, heavy flows of short duration in a river or watercourse.
<b>Flow Duration Curve (FDC)</b>	The statistical availability of any given flow, based on the best available information.
<b>Forebay</b>	A pond/pool where water is diverted before entering the turbine.
<b>Geomorphology</b>	The form and processes which make up the physical structure and habitat of the river channel. This defines its ability to allow migration of aquatic organisms and maintain natural sediment transport, and physical features of the channel. (See also Hydrogeomorphology).
<b>Hands off flow (HOF)</b>	This is the minimum flow that needs to flow over the weir and down the depleted reach when abstraction and/or impoundment is taking place.

<b>Hydrograph</b>	A graph showing changes in river flow over a period of time.
<b>Hydromorphology</b>	The form and processes which make up the physical structure and habitat of the river channel. This defines its ability to allow migration of aquatic organisms and maintain natural sediment transport, and physical features of the channel. Hydromorphology and geomorphology can be interchangeable terms, although the former includes a greater emphasis on flow. Hydromorphological quality elements are important for assessing compliance with Water Framework Directive objectives.
<b>Impoundment</b>	Where water is obstructed, held or stored behind a structure or works, such as a weir, dam or sluice.
<b>Intake</b>	The point at which water is diverted from the river towards the hydropower turbine.
<b>Integrity (of a designated site)</b>	Legal term for maintaining the ecological conditions within a designated site.
<b>Invertebrates</b>	Animal species that don't develop a spinal column.
<b>Leat</b>	A man-made water channel.
<b>Main river</b>	A main river is a watercourse that is shown on a main river map and includes any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. Refer to our <a href="#">flood map</a> to find out if a watercourse is a main river.
<b>Material considerations</b>	Impacts that planning authorities must consider as they assess planning applications.
<b>Mitigation measures</b>	The measures taken to reduce or remove the risk of activity causing damage.
<b>Morphology</b>	The form and function or physical structure of the river channel. This defines its ability to allow migration of aquatic organisms and maintain natural sediment transport, and physical features of the channel. Morphology puts a greater emphasis on the form of the channel rather than the processes operating within the channel. (See also Geomorphology and Hydrogeomorphology).
<b>No deterioration</b>	The Water Framework Directive requires that water bodies must not deteriorate from one status class to a lower one.
<b>Ordinary watercourse</b>	Any watercourse that doesn't form part of a main river.
<b>Pre-application</b>	Pre-application gives you an opportunity to discuss your proposal with us before you formally apply. We recommend that you follow our pre-application advisory procedure.

<b>Qn</b>	The natural river flow that is exceeded for a percentage (shown by n) of the year. For example, Q95 is the natural river flow you would expect to be exceeded for 95% of the year.
<b>Qmean</b>	The mean flow of a river. It is usually calculated from the daily mean flows for a given period.
<b>Reach</b>	A continuous stretch of river.
<b>River Basin Management Plan</b>	River Basin Management Plans set out measures to improve water in rivers, estuaries, coasts and aquifers under the Water Framework Directive. They are produced every six years.
<b>River dynamics</b>	(see Morphology)
<b>Riverine/riparian habitats</b>	The ecology found along the banks of rivers.
<b>Run-of-river</b>	Hydropower in rivers, where there is little or no storage of water,
<b>Salmonid</b>	A fish of the salmon or trout family.
<b>Screen</b>	Fish screens can be physical barriers that block fish passage or behavioural screens that steer fish away from danger.
<b>Sediment transport</b>	Movement of solid particles such as sand and mud in rivers.
<b>Special Area of Conservation</b>	Special Areas of Conservation (SACs) are strictly protected sites designated under the EC Habitats Directive.
<b>Turbine</b>	Converts the energy from flowing water into electricity, Many different types of turbine are used in hydropower schemes.
<b>Water body</b>	The division of aquatic habitats into manageable areas.
<b>Water Framework Directive (WFD)</b>	This EU legislation requires member states to plan and act to protect and improve the water environment. It has significant implications for hydropower schemes.
<b>WFD objectives</b>	The principal aims of the Water Framework Directive are to: <ul style="list-style-type: none"> <li>• achieve good status or potential in inland and coastal waters and groundwater</li> <li>• prevent deterioration in the status or potential of water bodies</li> <li>• achieve compliance with standards and objectives set for designated sites – these are listed in the <a href="#">Register of Protected Areas</a> under the Water Framework Directive and include all Natura 2000 Protected Areas designated for water-dependent species or habitats</li> </ul>
<b>Weir pool</b>	An area of water below a weir (or similar impounding structure).

# Acknowledgements

This guidance has been produced by the Environment Agency with input from the Hydropower Working Group. This group brought together key representatives from industry and interest groups and partners to consider hydropower and its potential impacts on the environment.

## Feedback

If you have questions or comments about this guidance or its associated advice notes, or suggestions about how we could improve it. Please email us at [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk), phone us on 03708 506 506 or write to us at:

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