

Agricultural Reservoirs Design Guide



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Introduction

The Isle of Wight Area of Outstanding Natural Beauty was designated in 1963 and covers almost half the Island. In 1973, the beauty and historic interest of the Island was again recognised when two, out of the three Heritage Coasts in the South East of England were established on the Island, being the northern Hamstead and southern Tennyson Coasts.

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The Island's water supply, for domestic, industrial and agricultural use, is constrained by the Island's landmass. While other counties may benefit from the water running off mountains or large hills and downland, flowing in rivers that cross many counties for many miles, such as the Thames which flows through Gloucestershire, Wiltshire, Oxford, Buckinghamshire, Berkshire and Surrey before flowing through London; the Island's water catchment area is limited to its own land size. This has resulted in increasing dependence on water being piped under the Solent for domestic use.

Agricultural ponds have been present in the landscape for many hundreds of years. They were usually dug within pastures to give livestock access to drinking water. The importance of irrigation in agriculture is becoming more widely recognised after a series of dry summers. There is also increasing demand for high quality food crops, which require a plentiful supply of water.

This guidance is concerned with agricultural reservoirs and not nature conservation ponds, which are solely for the provision of wildlife habitat. However, the advice within this document could be applied to other agricultural developments such as fish ponds and duck flight ponds. Most modern agricultural water reservoirs hold increasingly larger volumes of water than the traditional farm pond, such as that captured by John Constable in his painting 'The Hay Wain'. The lower limit for which the Environment Agency regulations come into effect starts at reservoirs larger than 10,000m³. Some or all of the engineering works to create the reservoir can be above ground level, or formed out of the topography of the landscape, causing them to stand out as a new man-made feature.

The Department of the Environment and Rural Affairs (DEFRA) produced a UK Climate Change model in 2009 (UKCP09) which indicates that rainfall on the Island could decrease by eight percent during the coming summer periods. Furthermore sudden heavy rain in the winter may run off the land into our rivers and sea, rather than be absorbed into the soil and aquifers to be released over time. In the past, most water required for irrigation was extracted from boreholes, rivers or streams in the summer but this will no longer be sustainable due to reduced flows and drought conditions.

Agricultural reservoirs are going to become a more familiar landscape feature as storing water is becoming increasingly more important for those farms in drier regions of England. Water is vital to fruit, vegetable and cereal farming, to grow crops of yields to be financially viable and to the quality demanded by consumers. Water is also needed for maintaining our golf courses and sports pitches. Creating a reservoir can provide greater water security and certainty in the drier months. It can even add value to the farmholding and water could even be traded as a commodity.

This guide is not intended to be a definitive step-by-step guide, but aims to help anyone looking to design an agricultural reservoir and assist the Local Planning Authority with determining its impact on the protected landscape. It has been written in reflection of the nature of our partnership, in collaboration with the Environment Agency and local stakeholders such as the Hampshire and Isle of Wight Wildlife Trust.

The size and construction methods of modern agricultural reservoirs are highly likely to be considered as operational development and therefore require planning permission. Providing that the requirements of Part 6 of Schedule 2 of the General Permitted Development Order 1995 have been complied with, the farmer can apply for permission from the Local Planning Authority by way of an Agricultural Prior Notification. Where any proposal falls outside of these regulations, then express planning permission will be required from the Local Planning Authority. Permission from the Environment Agency is also likely

to be required in consideration of the water table and water extraction and the disposal of soil on site. Therefore the AONB partnership strongly recommends that anyone thinking of creating an agricultural reservoir, gains pre-application advice from both the Local Planning Authority and the Environment Agency at the earliest opportunity.

While most of the guidance in this publication is voluntary; we hope that land owners on the Island recognise that it is important to maintain a balance between ensuring a sustainable future for the farming of our countryside, with the conservation and enhancement of our nationally designated and protected landscape of the Area of Outstanding Natural Beauty.

Archaeology

The Island's landscape has been shaped by humans for over thousands of years. It has been created by centuries of settlement, agriculture, industry, conflict, religion and ritual from Neolithic and Bronze Age tombs to Roman villas, Saxon settlements, medieval villages and defences from the World Wars. Many monuments survive in visible form. As well as enriching our landscape, they contribute to tourism, education and recreation. On the Isle of Wight, 203 monuments currently have the benefit of legal protection as Scheduled Monuments. It is a criminal offence to damage a scheduled monument. We strongly recommend seeking advice from the Local Authority's County Archaeologist, to identify any possible archaeology interests at the earliest opportunity.

Ecology and Biodiversity

The Island has many international, national and local designations for wildlife and geological conservation, including:

- Special Conservation Areas (SAC)
- Special Protection Areas (SPA)
- Locally designated Sites of importance for Nature Conservation (SINCs).
- Ramsar
- Sites of Special Scientific Interest (SSSI), and

These designations seek to protect a range of habitats and ecosystems including the coastline, estuaries, meadows, chalk downland and woodland that provides rich habitat and feeding grounds to protected species of both plants and animals. New reservoirs should seek to avoid direct or indirect impacts upon statutory and non-statutory nature conservation sites. The Isle of Wight Council, in fulfilling its biodiversity duty, will expect to see some biodiversity gain or enhancement in any proposals seeking planning consent.

The AONB is also covered with a large amount of farmland, which not only contributes to its natural beauty in the patchwork of fields, that creates the image of the British countryside, but which also contributes to the rural economy. The countryside is a working landscape of farming and other rural businesses. Farming businesses need water to irrigate crops and while reservoirs can store water, they can also have a high wildlife value. They can support many different types of plants and provide habitat for invertebrates such as insects, molluscs, along with birds and mammals. Creating a reservoir that can help support wildlife is not as time consuming or expensive as you may think.

When considering biodiversity, water depth is one of the most important considerations. Most freshwater aquatic animals live in water less than 15cm deep and marginal plants will not grow in depths much greater than 30cm. Therefore it is valuable to wildlife to construct a marginal shelf or 'scrape' around the perimeter of the agricultural reservoir and to allow marginal vegetation such as rushes and sedges to naturally establish. There is a risk that new planting can introduce non-native species which can be highly invasive. As the water retreats in the spring and summer, the margins of the water and mud warm to provide conditions for invertebrates to look for food and bask in the sun. You could have a 5m or 10m wide buffer zone around the agricultural reservoir with natural vegetation. Animals will naturally populate an area of habitat, so there will be no need to introduce fish or other animals which would not naturally live in the habitat. A log pile or rock pile can provide a place for wildlife to hibernate over the winter. Spoil from the excavation can be placed loosely over such a log pile to help insulate and protect hibernating

animals.

The Pond Conservation website www.pondconservation.org.uk is a good source of information about how to create wildlife-friendly water bodies.

Landscape Assessment

Our countryside is a patchwork of different farming practices over many thousands of years. Reservoirs, as with any human intervention, can either harm the natural environment, or conserve and enhance it. Reservoirs should be located to enhance the natural landscape. A reservoir should avoid breaking the skyline and being constructed with steep slopes; it should blend into the profile of the topography of the landscape.

A Landscape Assessment for the Island was undertaken in 1994 by the former Countryside Commission, now known as Natural England. This assessment has been incorporated into the AONB Management Plan 2009 to 2014. The assessment identifies eleven different landscape character types on the Island:

- Chalk Downs
- Traditional Enclosed Pasture
- Intensive Agricultural Land
- Southern Coastal Farmland
- Sandstone Hills and Gravel Ridges
- Northern Woodland
- Landscape Improvement Zones
- Harbours and Creeks
- The Undercliff
- Osborne Coast
- Northern Coastal Cliffs

While some of these areas are unlikely to have agricultural reservoirs; the characteristics and key landscape features of these areas should be used to guide the design of an agricultural reservoir. For example, one of the key characteristics of Traditional Enclosed Pasture is '*well-preserved dense hedgerows with mature hedgerow oak trees*', indicating that oak trees and dense hedgerows should be incorporated into the design and layout; while one of the key characteristics of Intensive Agricultural Land is that there are '*no hedgerow trees and relict hedges*', indicating an opportunity to maintain and also enhance its character through the use of shrub scrubland rather than trees.

To identify what landscape type the land is in, please contact the AONB Planning Officer.

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Location

The Island's distinctive shape is formed by the ridge of chalk along its length, in the middle of the Island, which separates the clay and gravel deposits of the north of the Island and the sandstone, gravel and Wealden Clays to the south of the Island. The location of the agricultural reservoir will be determined by the local geology and topography of the landscape; being created in locations where water naturally gathers, such as at the bottom of hills, or from ditches and streams that allow water to run off the land.

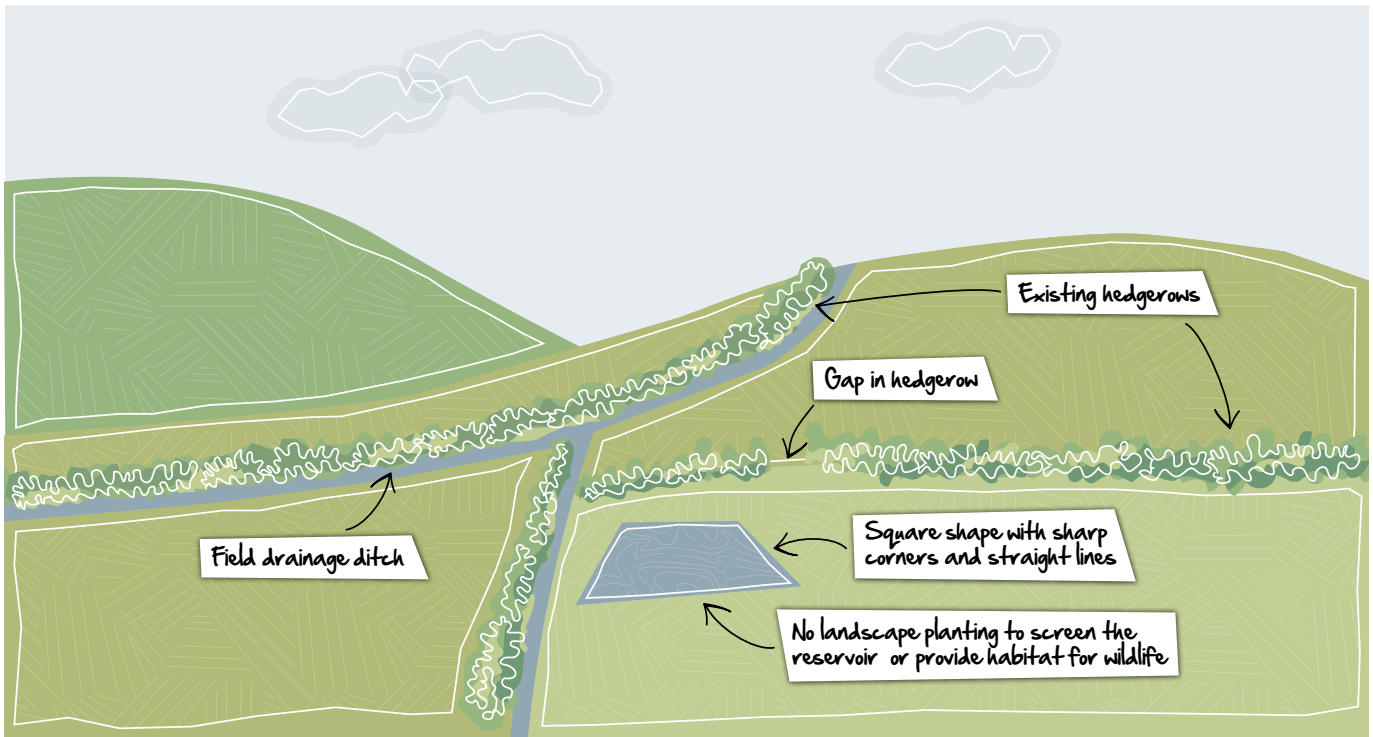
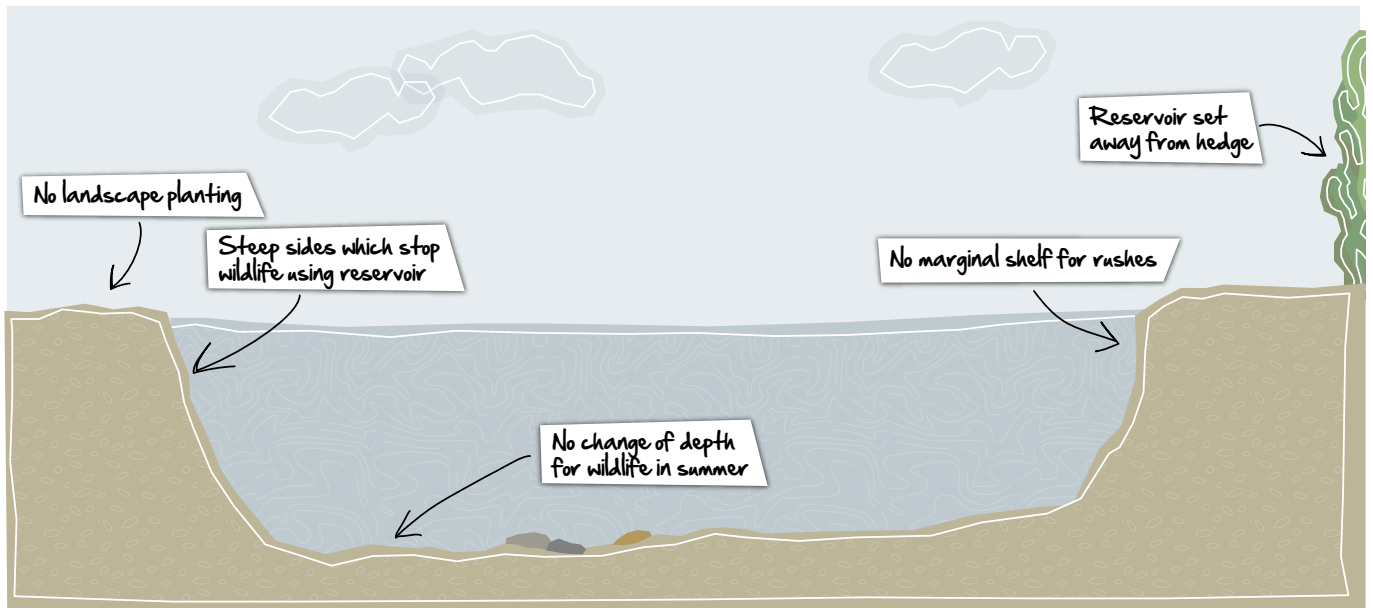
When choosing the location, try and find a position that allows the agricultural reservoir to become a valuable feature to the landscape; this is best achieved by linking it with existing natural features and where possible increase its wildlife value, allowing it to appear to be a natural feature in the landscape.

Locate them where then can be fed naturally by clean water, but do not dig up existing wetlands. Instead, if you already have low-lying wetlands, such as seasonal grazing, create an agricultural reservoir next to them to compliment them, but do not link them, as two habitats are better than one.

Shape

Reservoirs are often square or rectangular with sharp angular corners, or circular and regular in shape. But a reservoir can be shaped to soften its corners and give a more irregular, informal and natural appearance without taking up to much extra land or time and cost to construct.

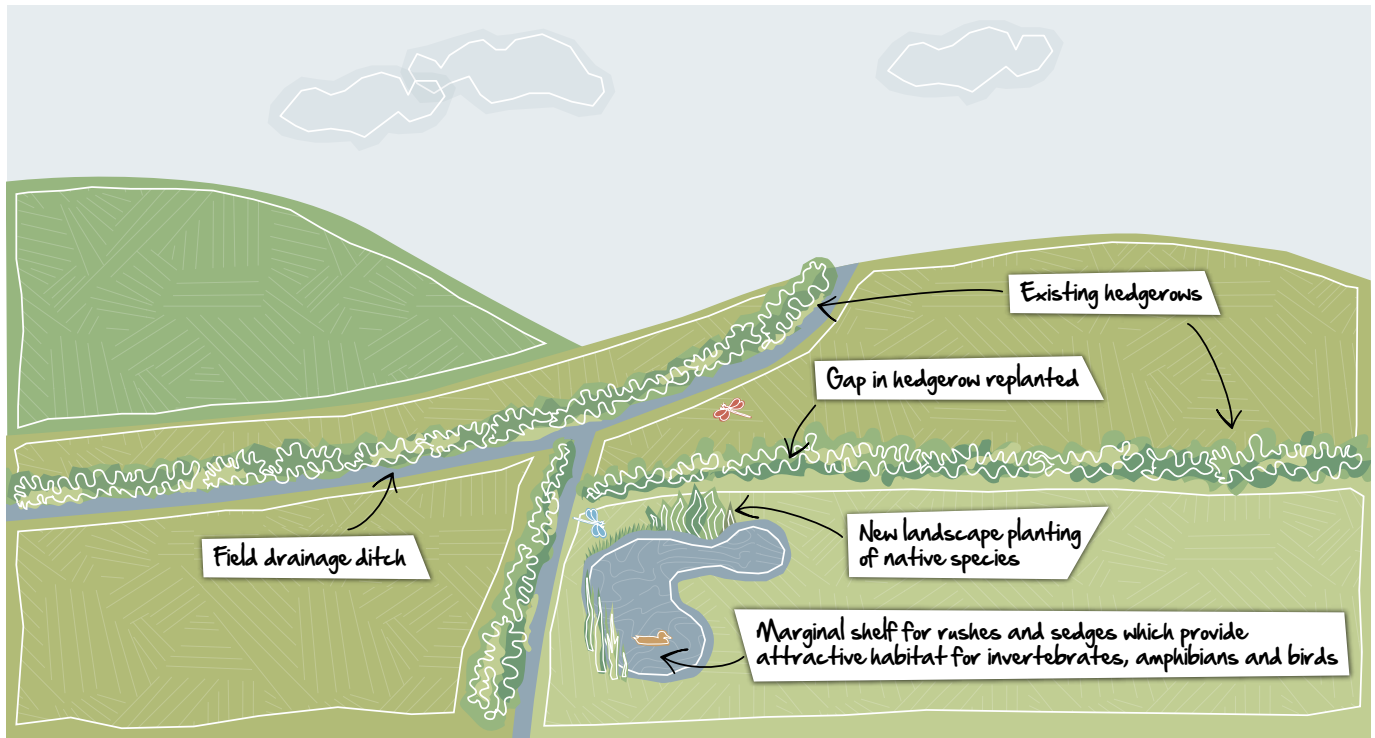
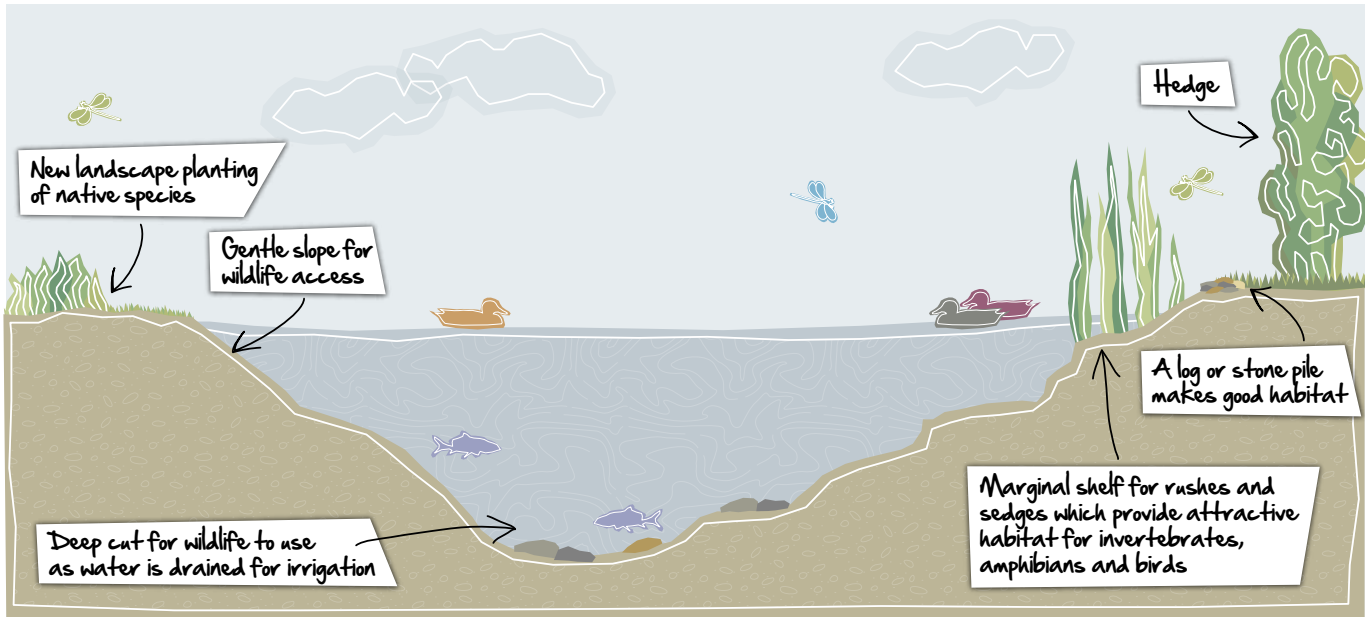
Reservoir 1



This reservoir has not been placed tight against the hedgerow and is out into the field in an open and exposed location, it is a square shape with sharp edges which obviously appears to be a man made feature. No new planting has taken place to screen the reservoir or provide wildlife habitat.

Reservoirs should be created in consideration of the location and designed to compliment the surrounding landscape and natural topography.

Reservoir 2



This reservoir has been dug next to hedgerows and shaped to follow the corner of the field with soft round edges. A shallow 'scrape' or marginal shelf has been created around the edge of the agricultural reservoir to provide habitats to dragonflies, water voles, amphibians and birds. The nearby hedgerow has been replanted and the gaps filled in, while around the majority of the agricultural reservoir new landscape planting has been done with non-invasive native plants to provide wildlife habitat.

Reservoirs should incorporate some gentle slopes that have marginal shelves as wildlife habitat, to support native plants and wildlife, which will make a valuable contribution to biodiversity.

Banks

Reservoirs are often dug with steep or vertical banks. For natural clay-lined reservoirs, this prevents plants from becoming established on the water's edge and wildlife finds it difficult to get in and out of the water. This can equally apply to livestock and people, which creates a safety issue. Unfortunately reservoirs which are constructed with man-made liners are too slippery for plant life to establish, but marginal habitat can still be created around it.

The marginal shelf can have various features, from shallow to scooped, planted rolls, a wood or stone edging. Such shelves can help prevent wave erosion, especially to those facing prevailing westerly winds. This is particularly useful for clay reservoirs.

Where an embankment is needed, spoil can be used to contour the site, reducing slope angles and making it appear a natural feature in the landscape. Areas like this are also good for wildlife and they can also allow the reservoir to appear natural by softening the edges. But some vegetation will only survive if it can stay wet; this can be achieved by 'bleeding off' water, either manually or automatically.

Depth of water

One of the difficulties in making reservoirs suitable as wildlife habitats is the fact that the water level can fall rapidly during the irrigation period and then can stay low for many months until the water levels are replenished. The difference between the natural winter and summer water levels is called the 'draw down zone' and is one of the most ecologically rich areas of the reservoir. In order to support wildlife, it would be advantageous to create pockets of water on one side of the reservoir would help to support local wildlife. This can be created quite easily when the digger is on site, but care must be taken not to intercept the ground water strata.

Floating Islands

A large reservoir can often stand out on the landscape, one way of breaking this up is to create an Island; however this may look unsightly when the water levels drop, resulting in the agricultural reservoir looking like a 'Mexican hat' and can reduce the volume of water the reservoir stores. One solution to this is to create a floating Island using wooden rafts, which has the benefit of always being at the same height as the water. These rafts can be planted with marginal vegetation and encourage nesting birds as a safe haven from predators.

Tree and Shrub Planting

Generally, tree planting on the banks of a reservoir is unwise due to potential root damage. However shrub and hedgerow planting can be established, together with grassland and wildflowers. Away from the edges of the reservoir itself, tree planting can help to screen or soften the appearance of the reservoir and any pump houses that may be needed. Trees and shrubs can provide a link between areas of habitat as well as create new habitat. Native species, reflective of those found in the area, should be chosen. Around the reservoir and on its embankments, you can seed the areas seed with a traditional wild grass and meadow flower seed mix.

To identify local plants the following website can identify local plants found within your postcode:

<http://www.nhm.ac.uk/nature-online/life/plants-fungi/postcode-plants/>

Surrounding Land

Digging the reservoir will create surplus spoil. Rather than disposing of the spoil off site, where possible this should be used on site and spread by the digger on the surrounding land, to match and harmonise the contours of the existing landscape, soften new man made slopes and banks, or where appropriate create undulating landform with sheltered areas and increased diversity. You should, however avoid covering nearby areas of existing wildlife value. It is important to maintain an appropriate soil profile to allow the reservoir to fit into the topography of the surrounding landscape. Furthermore disposing of the soil on site is more environmentally-friendly than transporting it off site; although impact on flood plain and watercourses should always be discussed with the Environment Agency.

How much water will you use?

If you already irrigate your land, you may have a good idea of how much water you currently use and what you may need to meet your future demand including the types of crops you might grow, cropping intensity and yield. However, you will need to quantify the volume of water you will need. It would also be better to round up, or reserve slightly more than you think you will need. For example; if you use about two thousand cubic meters of water a year, then create a reservoir that can hold two thousand five hundred cubic meters of water. A larger reservoir provides security for protection against climate change; longer hotter summers and water can be stored from one year to the next.

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Health and Safety

It may be prudent to erect a fence for the safety of farm animals and the general public. This should be an agricultural fence to reflect the rural landscape; such as a wire stock fence with wooden posts. This could be combined with landscape planting to provide a further barrier and contribute to safety.

Lined reservoirs with steep sides can be very difficult to climb out of as they are very slippery. Escape routes should be provided for humans, these can also be used by some animals. These can be made of old tyres, roped together to provide a way of climbing out.

The Environment Agency provides a special guide on reservoir safety called 'Creating a Better Place – The owners guide to reservoir safety', which is available for free on the Environment Agency web site: <http://publications.environment-agency.gov.uk/pdf/GEHO0210BRRU-e-e.pdf>

Permissions and Licences

Abstraction Licence

Most water abstractions that take more than twenty cubic metres (20m³) of water a day will require an abstraction licence from the Environment Agency. In sensitive locations you may be asked to provide information on the impact of your proposed abstraction on the sensitivity of that area.

Planning Permission

The type of planning permission required will depend on the size of the farm, the site and location, including proximity to dwellings. A reservoir may only require an agricultural prior notification application; as set out under Part 6 of Schedule 2 of the 1995 General Permitted Development Order. However, if the requirements for this under the order are not met, then full planning permission may be required. Obtaining planning permission can be expensive and take many months. Many studies may need to be undertaken, such as archaeological or ecological and these may also take time; for example a bird study may require a full year of observations. Pre-application discussions will be vital in identifying what the Local Planning Authority will require in order to determine a planning application.

Planning and construction

Allow for a minimum of two years from idea to completion.

First Year

- Make sure you have a reliable and adequate water source. If you have any ditches or streams to feed the agricultural reservoir, start collecting flow data through the winter and spring to support your application. A simple gauge board may provide baseline data, but an acoustic Doppler meter would provide more detailed and accurate information. You will also have to select a suitable site for metering and extraction and the Environment Agency will be able to help you. If the water source is a substantial stream or river, or a groundwater aquifer, it may already have been studied by the Environment Agency who may be able to provide you with existing flow rate information.
- Find a reservoir engineer or a 'design and build' engineer, or similar professional to undertake the works. Word of mouth is often the best way of finding a good engineering firm.
- Have initial discussions with the Local Planning Authority and the Environment Agency.
- Identify any additional studies which may be needed, such as archaeology, ecology or landscape and visual impact assessments.

Second Year

- With the benefit of any studies that pre-application consultation had identified as being required, proceed to apply for planning permission from the Local Authority.
- Apply for an abstraction licence from the Environment Agency. Summer is the best time of year for construction, ready for winter rain.

Summary

Reservoirs should be created in consideration of the location and designed to compliment the surrounding landscape and natural topography. They should incorporate some gentle slopes that have marginal shelves as wildlife habitat, to support native plants and wildlife, which will make a valuable contribution to biodiversity.

Checklist

The following checklist is a list of general considerations for anyone thinking of creating an agricultural reservoir within a protected landscape. It is not an exhaustive list of considerations, but designed to be a useful tool when first considering creating an agricultural reservoir.

An agricultural reservoir may be considered to have an acceptable impact on the protected landscape in principle, if it is in compliance with the following criteria:

Proposed site of agricultural reservoir is low grade agricultural land?	✓
Located and designed to provide wildlife habitat?	✓
Good access to construction traffic?	✓
Has had early consultation with the Local Planning Authority?	✓
It has been establish if an Environmental Impact Assessment (EIA) is required?	✓

An agricultural reservoir **may not** be considered acceptable in principle within the protected landscape if it would have a negative impact on the following criteria:

On a site of archaeological interest?	✓
Sites of Special Scientific Interest (SSSI)?	✓
Sites of Importance for Nature Conservations (SINC)?	✓
Near utilities, such as overhead power lines or gas pipes?	✓

Other useful publications

- *Illustrated Guide to Ponds and Scrapes*, Natural England, 2010
- *Thinking about an irrigation reservoir? A guide to planning, designing, constructing and commissioning a water storage reservoir*, The Environment Agency
- *Creating a better place: the owner's guide to reservoir safety*, The Environment Agency, 2010

Useful Contacts

Natural England

2nd Floor
Cromwell House
15 Andover Road
Winchester
Hampshire
SO23 7BT

Tel: 0300 060 2514

enquiries@naturalengland.org.uk

Environment Agency

Solent and South Downs Office
Colvedene Court
Wessex Business Park
Wessex Way
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