

Discontinuance of Small Reservoirs

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SYNOPSIS Any reservoir can outlive its original purpose or design life and it can be more economical to discontinue it than to carry out works for reservoir safety. Generally this is easier to achieve for smaller reservoirs than for larger ones.

Changing the minimum volume of statutory large raised reservoirs from 25,000m³ to 10,000m³ will bring many more small reservoirs under the Act. Increased awareness of the Act by private owners has prompted requests for discontinuance to be considered as an alternative to repairs, even before the change in volume has come into effect.

The paper discusses the reasons for discontinuance and describes methods of achieving this.

Eight reservoirs that have been discontinued in the last four years or are in the process of discontinuance are described. The owners' reasons for discontinuance are outlined. The principal design decisions are discussed.

INTRODUCTION

Any reservoir can outlive its original purpose or design and it can be more economical to discontinue it than to carry out works for reservoir safety. This requires reducing the volume that can be impounded to less than 25,000m³. If the proposed changes to the Reservoirs Act 1975 are implemented this volume will reduce to 10,000m³.

DEFINITIONS AND STANDARDS

Volume.

The volume is calculated from the top water level (defined as the overflow crest level) to the lowest level of natural ground. If there is no overflow it is calculated to the dam crest level. It is not necessary to include the flood rise in the calculation.

It is sometimes helpful to survey the reservoir to derive an accurate volume. Hydrometric surveys can measure the depth of water and also the depth of silt, which has to be included in the volume calculation.

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Design flood for discontinued reservoirs.

There is no standard for the design flood for small reservoirs. It is a matter of judgement, depending on the hazard. A return period of 150 years is typical.

APPROVALS

Approval is not needed to remove the water as such, as it belongs to the owner and he can make use of it.

However, approval may be needed for:

- Discharge of water to a watercourse
- Fish removal
- Tree removal

Planning permission may be needed for change of use and this brings into the equation other requirements at the discretion of the planning authority such as a flood risk assessment and an environmental impact assessment. The engineering is often the easy part of discontinuance.

REASONS FOR DISCONTINUANCE

Discontinuance is usually carried out because the original reason for the construction of the reservoir no longer exists and it is not economic to repair for other uses.

Some owners want to develop the site and the existence of a reservoir that is a hazard requiring supervision is an impediment. This is the case for two of the reservoirs in Table 1 where the owners are trying to obtain approval for a supermarket and a housing development respectively.

The owner of farm reservoir number 1 in Table 1 wanted to avoid enforcement action by the Environment Agency. It had been built without an overflow so the volume was calculated to the dam crest level and it was inspected under Section 8 of the Act. An overflow was recommended and it was decided to construct one that would reduce the volume to 23,000m³. The overflow can be raised later, which will probably be done when the reservoir has to be registered if the qualifying volume is reduced to 10,000m³.

Two of the fishing lakes will continue with the same use but the owners have avoided more expensive immediate repairs.

MEANS OF DISCONTINUANCE

It would theoretically be possible to fill a reservoir with rocks or concrete that would not wash out if it breached, thereby reducing the volume, but the author has not yet come across this solution.

The usual means is to lower the top water level by:

- Lowering the existing overflow.
- Building a new overflow, which can be
 - Open channel
 - Pipe

The piped solution has to be large enough to pass the design flood and not prone to blocking.

There can be environmental concerns with dealing with silt if all the water is removed, so it is usually preferable to retain some water.

Table 1. Reservoirs discontinued between 2008 and 2012.

No	Description	Volume m ³		Method	Comments
		Before	After		
1	Farm reservoir with no overflow	37,000	23,000	New piped overflow	Designed for raising.
2	Redundant industrial reservoir	32,000	8,000	Lower existing overflow	For supermarket development.
3	Redundant water supply	35,000	7,000	Notch in embankment	For recreation.
4	Abandoned, original purpose unclear	39,000	9,000	New piped overflow	No future use. Some water retained to avoid silt release.
5	Fishing lake	30,000	22,000	Lower existing overflow	For fishing. Temporary situation that will be reconsidered on next inspection.
6	Fishing lake	35,000	9,000	Lower existing overflow	For fishing/visual appearance.
7	Redundant industrial reservoir	12,000		In planning	For housing development.
8	Redundant industrial reservoir	59,000	13,000	New piped overflow	For fishing. Further reduction below 10,000 m ³ may be needed.

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All of the reservoirs in Table 1 are embankments, except for number 2 which is reinforced concrete.

EXAMPLES

Reservoir number 3 – redundant water supply reservoir.



Figure 1. Concrete weir in centre of embankment of reservoir number 3.

The reservoir had been built for water supply but was redundant and used for fish breeding when the water authorities were formed in 1974. It was therefore transferred to the National Rivers Authority and then inherited by the Environment Agency. It was discontinued to reduce ongoing liabilities. The reduced water area is now used by the Scouts.

The original overflow went round the right bank in an open channel. The new overflow at lower level is formed in open cut with a concrete weir on the centreline of the embankment. The weir is the same width as the original and the channel was designed for a 150 year return period flood. Planning consent was needed and a flood risk assessment was carried out.

Reservoir number 2 – redundant industrial reservoir. Reinforced concrete.

The top water level was reduced by cutting an opening in the side of the existing overflow shaft. There was concern that the pipe at the bottom of the shaft could block so another opening was made in the main wall of the dam at slightly higher level, but still below the 10,000m³ level.



Figure 2. Overflow shaft of reservoir number 2.



Figure 3. Reservoir number 2 drawn down.

The owner carried out an environmental impact assessment and a fish rescue. The local authority decided it did not need planning consent because a full application for change of use to a supermarket is planned.

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Reservoir number 8 – redundant industrial reservoir used as fishing lake

There were serious problems with this reservoir found during a Section 10 inspection. The owner started the remedial works but then decided to discontinue the reservoir as it was cheaper. He used his own excavator and laid a 1.2m diameter pipe 90m long as a new overflow at a low level to reduce the volume to about 13,000m³. The pipe is large enough to pass the 50 year flood.

The reservoir was certified discontinued in 2008 before the proposed reduced volume was mooted and will have to be registered again if the change is implemented. The situation will be considered again then – a possible course of action might be to partially fill it with concrete waste from demolition to reduce the volume.



Figure 4. Pipe at reservoir number 8

ACTIONS AFTER DISCONTINUANCE

Certificate

A certificate under Section 13(2) of the Act is issued to the owner and copied to the Environment Agency so it can be removed from the register.

Supervising Engineer

A Supervising Engineer is no longer required.

The Enforcement Authority

The Environment Agency invariably writes to the owner saying they will keep information about the reservoir on a database and they advise him to retain the services of a Supervising Engineer. This advice is usually ignored.

Advice to the owner

The author has adopted the practice of writing to the owner with any advice appropriate to the situation. This includes a reminder that the owner would still be liable for damage caused by escapes of water and recommendations for operation and maintenance.