

Proposed reservoir safety legislation for Northern Ireland

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SYNOPSIS. The 1975 Reservoir Actⁱ does not extend to Northern Ireland and to date no similar legislation has been introduced. This means that there is no regulation for the inspection or maintenance of the 156 reservoirs identified as holding in excess of 10,000m³ of water. In early 2011 Rivers Agency, the flood defence and drainage authority for Northern Ireland, established a bill team to take forward reservoir safety policy development with a view to introducing primary legislation and associated regulations.

INTRODUCTION

The vulnerability of impoundments was dramatically demonstrated by two catastrophic structural failures occurring within a short space of time in Great Britain in 1925. The failure of two dams caused a flood that swamped the village of Dolgarrog in North Wales, killing 16 peopleⁱⁱ, and a dam failure in Skelmorlie, North Ayrshire, Scotland killed 5 peopleⁱⁱⁱ. These failures led to the introduction of the Reservoirs (Safety Provisions) Act in 1930^{iv}. Reservoir incidents involving loss of life across Europe triggered a review of reservoir safety in the Great Britain and the 1975 Reservoirs Act introduced a regulatory framework for large raised reservoirs with a capacity greater than 25,000m³ of water above the natural ground level. The 1975 Act has subsequently been amended by various pieces of legislation but it is still the legislative basis for reservoir safety in England, Scotland and Wales. None of the Great Britain legislation applies in Northern Ireland - indeed Section 30 of the Reservoir Act 1975 is very clear, saying '*this Act shall not extend to Northern Ireland*'^v.

There are two references in the Northern Ireland Statute book to reservoir safety. Firstly, article 33 of the Drainage (Northern Ireland) Order 1973^{vi}. However this legislation can only be used for '*the purpose of preventing or arresting injury to land*' and it cannot be used '*in relation to any dam or sluice which is vested in or controlled by any other government department, any harbour authority, any district council or the Northern Ireland Electricity Service*'^{vii}. The other reference to reservoir safety is in article 297 of the Water and Sewerage Services (Northern Ireland) Order 2006^{viii} which repealed an earlier version of this legislation from 1973. This legislation enables the making of '*regulations with respect to the*

DAMS: ENGINEERING IN A SOCIAL & ENVIRONMENTAL CONTEXT

construction, inspection, maintenance and repair of reservoirs and dams^{ix}, however no such regulations have ever been brought forward. The Health and Safety at Work (Northern Ireland) Order 1978^x may also have a role to play but only for those impoundments which are part of a workplace and there is no explicate reference in this legislation to reservoirs.

There is therefore no regulation of reservoir safety in Northern Ireland which means it is left to the discretion of owners and operators under common law, which was established by the Ryland v Fletcher decision by the House of Lords in 1868 when Justice Blackburn stated: “*We think that the true rule of law is, that the person who for his own purposes brings on his lands and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, is prima facie answerable for all the damage which is a natural consequence of its escape.*”^{xi}

Anecdotal evidence shows that this common law liability is not well understood among reservoir owners or operators as many are choosing not to carry out inspections or maintenance to their structures. This clearly is a gap which cannot be allowed to persist and it was most recently highlighted in September 2008 in the government response to the independent flood management policy review entitled ‘*Living with Rivers and the Sea*’^{xii}. One of the recommendations in this document was that ‘*appropriate legislation will be proposed to provide for regulatory control of reservoir safety in Northern Ireland by Rivers Agency*’. The Northern Ireland Executive subsequently agreed in late 2009 that the Minister for Agriculture and Rural Development should bring forward reservoir safety legislation.

DARD, Rivers Agency is also the competent authority for implementation of the EU Floods Directive^{xiii} and when undertaking the Preliminary Flood Risk Assessment^{xiv} the risk of flooding from reservoirs was identified as a potentially significant source for Northern Ireland. The lack of regulation means that the likelihood of dam failure is impossible to determine as there is no overall view of the condition of the reservoir stock. Rivers Agency therefore undertook some work to start the process of understanding this risk by first quantifying the potential impacts of total dam failure. Figure 1 shows an example of the dam breach inundation mapping produced. It was identified that a total failure of the 156 reservoirs could result in uncontrolled releases of water that could impact upon approximately 66,000 people who reside in reservoir breach inundation areas. While it is accepted that this is a very unlikely situation it was the only way of quantifying the potential hazard as no condition data was available.

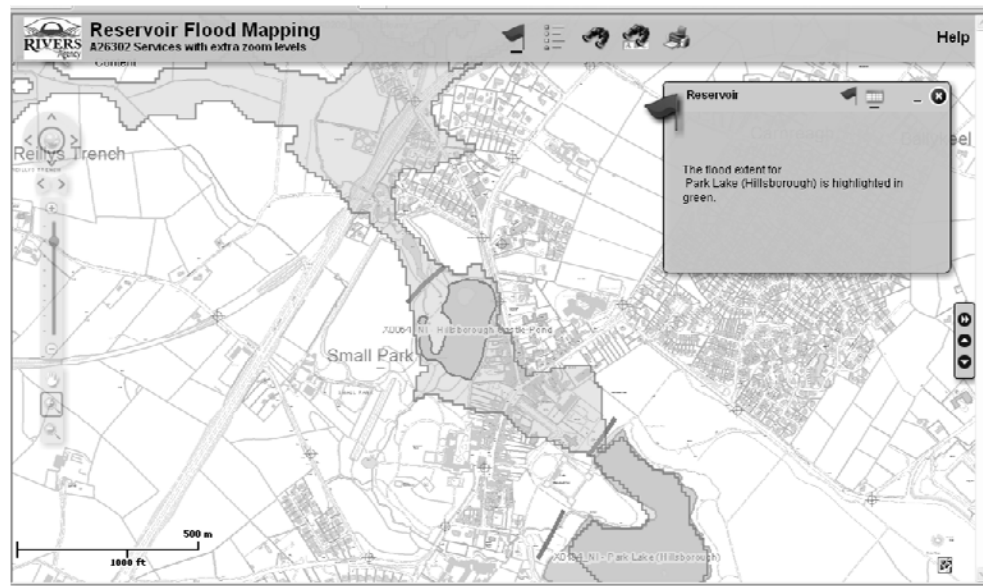


Figure 1. Dam breach inundation map. Crown Copyright

Forty eight of the 156 reservoirs identified are the responsibility of Northern Ireland Water, the body which delivers public water and sewerage services. Although not regulated these structures are generally maintained within the spirit of the 1975 Act. Further detail on the major upgrade programme of these impoundment structures is available in Alan Cooper's 1987 paper^{xv}. Approximately 50 are in the ownership of other public bodies ranging from local Councils to the Forest Service to the National Trust. This leaves about a third of the reservoirs that are either in private ownership or whose ownership is currently unknown.

Thankfully, there have been no dam failures in Northern Ireland which have resulted in the loss of life. There have however been a number of reservoir incidents including a dam burst on the Springfield Road in Belfast in 1902 that discharged into the nearby Blackstaff River causing it to burst its banks. It was reported that due to the uncontrolled release of water a nearby street flooded to a depth in excess of four metres. In the 1980s Church Dam in Hillsborough was overtopped. It was reported that the water from this reservoir caused erosion which exposed old coffins in the adjacent graveyard. The clay core of this structure was subsequently upgraded by sheet piling. Flooding in the Doagh area in 1998 was attributed to the collapse of a spill weir at Tildarg Dam and resulted in a number of houses being flooded.

EMERGING POLICY

Reservoir safety policy proposals have been developed through engagement and communication with key stakeholders. The purpose of the policy is to

DAMS: ENGINEERING IN A SOCIAL & ENVIRONMENTAL CONTEXT

create a legal and administrative framework for regulating reservoir safety and the following are proposed:

- That all reservoirs with a capacity of 10,000m³ or more would be regarded as controlled reservoirs and would be registered with the reservoirs authority;
- DARD Rivers Agency would act as the reservoir authority and would be responsible for enforcing the provisions under the legislation;
- To introduce a risk based approach for all controlled reservoirs. Initially this would be an impact designation based on the consequence of reservoir failure;
- Each reservoir which falls within the scope of a controlled reservoir would be assigned an impact classification according to whether it poses a threat to human life, the environment, cultural heritage and economic activity;
- Each controlled reservoir would be subject to a proportionate supervision and inspection regime depending on its impact classification;
- A requirement that the construction and alteration of controlled reservoirs would be undertaken under the supervision of appropriately experienced and qualified engineers;
- A requirement that independent qualified civil engineers, drawn from a panel appointed by the Minister, would provide technical expertise when undertaking construction, supervision and inspection roles under the framework;
- Provisions for review of designation decision, independent appeal, dispute resolution and enforcement including offences and penalties; and
- A number of miscellaneous provisions including emergency powers and powers of entry.

WHICH RESERVOIRS?

The proposal is to regulate 'controlled reservoirs' that is any structure or area which is capable of holding 10,000m³ or more of water above the natural level of any part of the surrounding land. This will include any structure designed or used for collecting and storing water as well as a lake or other area capable of storing water which was created or enlarged by artificial means. The term controlled reservoir will encompass the reservoir basin and all apparatus including its spillway, valves, value towers, pumping stations, pipes and sluices or any other thing that affects the functioning and operation of the reservoir. Service reservoirs and other

similar structures or areas that meet the minimum volume threshold are within the scope of the proposed legislation. Whilst these structures and areas are not impoundments and do not include a dam the proposals aim to reduce the risk of flooding resulting from structural failure.

It is also proposed that structures or areas that individually do not meet the volume threshold but where water does or can flow between them, and where there could be an uncontrolled release of 10,000m³ or more of water as a result of the combined capacity, will be treated as a controlled reservoir. This is to ensure that cascades or reservoirs that are, or could become interlinked in a breach situation, and have the potential to cause a similar impact as individual larger reservoirs are subject to control. It is proposed that structures or areas are to be excluded from regulation if these are already subject to other legislation - for example ash, sludge, power station and mining lagoons as these are regulated by the Mines Act (Northern Ireland) 1969^{xvi} as amended and Quarries (Northern Ireland) Order 1983^{xvii}.

The Department proposes to take the power to be able to treat any structure or area or combination of any structures or areas that do not meet the criteria of a controlled reservoir but that is assessed by the Department as posing a potential significant risk to human health, the environment, cultural heritage and economic activity as a controlled reservoir. This power is being taken so that should a need arise in the future the primary legislation does not need to be amended; however, there is no plan to implement this power at the early stages of commencement.

WHO WILL BE RESPONSIBLE FOR RESERVOIR SAFETY?

It is proposed that persons or organisations that manage or operate the controlled reservoir will be the responsible for reservoir safety and that the following principles apply:-

- Where the whole of a controlled reservoir is managed or operated by a water undertaker then the water undertaker is the responsible person. Where the water undertaker manages or operates part of the controlled reservoir the water undertaker is responsible for that part.
- Any other person(s) or business (for example hydro electric power company) that manages or operates a controlled reservoir in whole or in part will be the responsible person for the whole or part of the reservoir that they manage or operate.
- Where all or part of the controlled reservoir is not managed or operated by a water undertaker or other person(s) or business(es) then the owner(s) of the controlled reservoir will be the responsible person for the whole or part of the reservoir that is not managed or operated.

DAMS: ENGINEERING IN A SOCIAL & ENVIRONMENTAL CONTEXT

- Recreational users of controlled reservoirs, e.g. fishing or sailing clubs, will not be responsible for reservoir safety unless they are the owner(s) of the controlled reservoir.

It is proposed that the policy will place a duty on the reservoir operators to co-operate where more than one person or organisation is identified as being responsible for a controlled reservoir.

IMPLEMENTATION OPTIONS

The type of implementation option that is adopted will determine the key features of the overarching regulatory framework and three options were considered during the policy development:

Option 1: Do Nothing, Self Regulation

Option 2: Reservoir Licensing Scheme

Option 3: Panel Engineer System

Implementation Option 1: do nothing, self regulation

Under this option reservoir safety would continue to be left to the discretion of reservoir owners and operators. The legal basis for the safety of reservoirs under this self regulation option would remain common law or the Health and Safety at Work (Northern Ireland) Order 1978 when it applies.

While this option may be perceived as delivering a reduced administrative and cost burden on the owners, managers and government it provides extremely limited assurance that reservoir safety is being appropriately managed as it relies on self-regulation. There would be no legal requirement for regular inspections of reservoirs to be undertaken and evidence shows that many reservoir owners are not carrying out any inspections or maintenance. This situation will worsen as time passes as the risk of reservoir failure increases with age and neglect.

Implementation Option 2: reservoir licensing system

Under the licensing option all reservoirs would be registered, usually for a fee; an inspection would be undertaken by the licensing authority and then a formal licence agreement that sets out the conditions would be provided. Licences are usually issued for a fixed period of time and need to be renewed or periodically reviewed to update the conditions to reflect legal and policy changes. All impounding structures are currently licensed by the Northern Ireland Environment Agency (NIEA) acting on behalf of the Department of Environment under the Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006^{xviii}. These Regulations set out a control regime for regulating the abstraction of water from underground strata or waterways and the construction, alteration or

operation of impounding works, referred to in the Regulations as “*controlled activities*”. So under this option a one-stop shop licence application system for both NIEA abstraction and impoundment purposes and reservoir safety regulation could be developed with Rivers Agency, undertaking the enforcement role for reservoirs. Under this approach the reservoirs authority would engage a panel engineer to carry out the inspection of the reservoir, with the cost being passed to the owner/operator as part of the license fee.

This approach could be perceived as reducing the number of authorisations by advocating a more joined-up approach by government bodies with responsibility for abstraction from, and flood management for impoundments. This approach would also facilitate the allocation of a risk designation for all impounding structures, including those reservoirs with a capacity of less than 10,000m³. However, the inclusion of an inspection as part of the licensing process adds an additional requirement which is likely to make this option more expensive. This option could be perceived as over-regulation by owners and operators of impoundments having a capacity of less than 10,000m³ and could be considered as creating unnecessary bureaucracy and thereby falling outside best practice for Better Regulation. This option places an increased burden on the licensor to undertake on-site inspections and to check for compliance and given that these skills are not currently available in-house would necessitate recruitment of additional staff or bought in expertise to undertake initial site inspections, set site specific licence conditions, monitor and inspect compliance with the license conditions. The licence option would be more complicated to implement effectively, particularly where there are multiple operators and owners, and it could be argued that it, in some part, removes the risk from reservoir owners.

Implementation Option 3: panel engineer system

Under the Panel Engineer System the person with responsibility for reservoir safety is required to implement a management framework that relates to the assigned impact designation for the reservoir, either high or low impact. Under this option qualified engineers have a key role in ensuring public safety of reservoirs. Qualified engineers are to undertake inspections, specify the appropriate management regime, report on the reservoir’s condition, designing, supervising and certifying the completion of construction works.

This option could be perceived as imposing a new financial burden on the operators of controlled reservoir, certainly by those that previously choose not to undertake regular inspections or carry out maintenance. It could also be argued that this option places an unnecessary regulatory burden on reservoir owners as there has been no loss of life due to a reservoir breach in

DAMS: ENGINEERING IN A SOCIAL & ENVIRONMENTAL CONTEXT

Northern Ireland and independent panel engineers are likely to adopt a precautionary approach to the risk of failure of the dam structure.

This option, however, does provide assurance that reservoirs are being managed in the interests of public safety. It also provides a consistent approach across Northern Ireland which is similar to the system operating in England, Wales and Scotland. Under this option the frequency of inspection by a panel engineer is related to the impact designation and the condition of the reservoir. This approach is therefore a risk based as it takes into account the reservoir condition and therefore the likelihood of failure. Implementation of this option would establish a framework which would be considered to be a reasonable approach to management of controlled reservoirs.

DESIGNATION

Risk is a function of impact of a given hazard or threat and the likelihood that it will occur. The likelihood of a reservoir breach will be determined by factors including age, construction materials used and the condition of structure or dam. The likelihood of dam failure is generally considered to be low and is difficult to reliably predict. The initial strategic assessment of each reservoir will be based on the impact of a reservoir breach considering the four indicators within the Floods Directive of human health, the economy, the environment and cultural heritage. It should be clear from this table that controlled reservoirs designated as high impact will be subject to higher levels of regulation than those designated as low impact. Figure 2 shows a flow chart of the designation process including reviews and appeals, the inspection regime and the 10-yearly reassessment of designation. Figure 3 summarises the designation criteria and also outlines the responsibilities and minimum inspection standards for both high and low impact reservoirs. By adopting this approach the likelihood of failure is being controlled by the legislation in a proportionate manner taking into account the condition of the structure.

The proposed policy is being brought forward based on this risk-based approach that accounts for both the consequence or impact of failure and the likelihood or probability of failure. If, however, a more rigorous methodology to assess the likelihood of reservoir failure is developed, this can be adopted at a later stage of the implementation. It should be noted that the options considered for implementation do not fully follow the same process as England, Wales and Scotland.

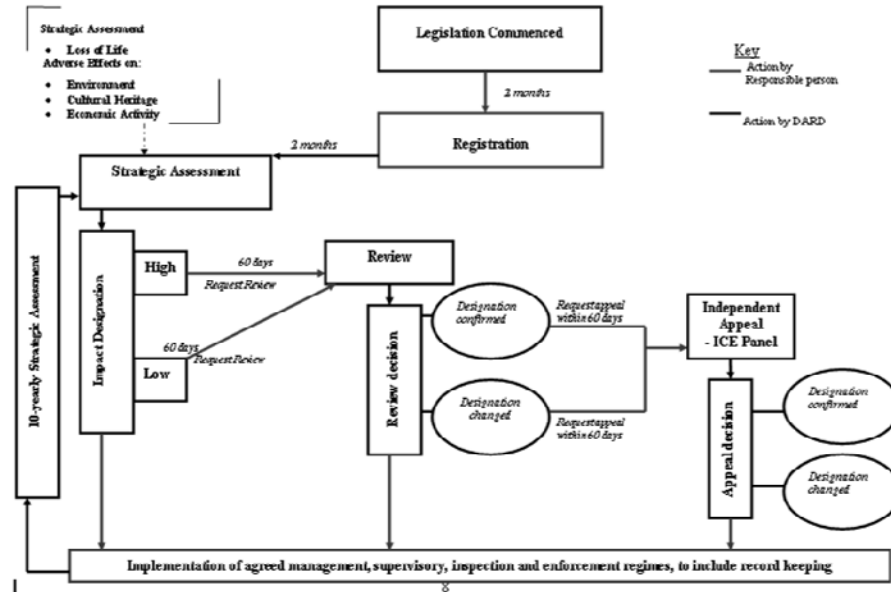


Figure 2. Flow chart of the designation process

Impact Category	Criteria description	Registration	Management and Supervision	Inspection	Record keeping
HIGH	Where a breach could i)endanger 1 or more lives, or ii)could result in extensive damage to economy, cultural heritage, or the environment	Yes – within 2 months of legislation being introduced, or 28 days after the day on which the first certificate is given in relation to new or altered reservoirs that fall within the scope of the legislation.	2 visits per year by a supervisory engineer. Provide annual written statement on steps taken to monitor reservoir safety or measures undertaken by reservoir operator. Monthly health and safety checks by reservoir operator or other trained staff. Routine maintenance as agreed with the supervisory engineer.	Every 10 years, or at any time recommended by the supervising engineer, or if recommended in an earlier inspection report.	Retain and provide the Department with copies of all safety reports, inspection reports, directions or notices issued to reservoir operator. Maintain management information records Water levels, leakages, repairs etc, Details of any incidents occurring which may impact reservoir safety. On-site Flood plans Emergency response information Provide appropriate facilities for supervisory and panel engineers Provide access and information to the Department, as required Safe access information
LOW	Special cases where no loss of life can be reasonably foreseen as a result of a breach and very limited additional flood damage would be caused.	Yes – within 2 months of legislation being introduced or 28 days after the day on which the first certificate is given in relation new or altered reservoirs which fall within the scope of the legislation.	Not required – reservoir manager expected to undertake visual checks to monitor reservoir safety.	Not required	Maintain management information records Water levels, leakages, repairs etc, Details of any incidents occurring which may impact reservoir safety. Basic On-site Flood plans Emergency response information Provide access and information to the Department, as required Safe access information

Figure 3. Designation criteria and minimum inspection standards

CONCLUSION

The necessity of a robust reservoir safety regime is beginning to be understood amongst those that own or operate these structures and the proposed legislation will enable assurance to be provided to the wider community that this risk is being properly managed. It is surprising that until now no concerted effort had been put into closing this legislative gap and it is fortunate that there have been no serious reservoir failures which caused fatalities.

DAMS: ENGINEERING IN A SOCIAL & ENVIRONMENTAL CONTEXT

The tried and tested approach of independent qualified engineers to inspect and oversee the maintenance of reservoirs is emerging as the preferred option for implementation in Northern Ireland. The approach to risk is, however, different from that adopted or proposed in other regions of the United Kingdom.

At present reservoir safety is the responsibility of the owners or operators/managers of reservoirs under common law. These proposals seek to clarify roles and responsibilities and to introduce a suitable management regime that should control or limit liability in the event of an uncontrolled release of water. It will enable assurance to be provided to citizens that this risk is being addressed in a proactive manner.

ACKNOWLEDGEMENTS

The work described in this paper is the result of close cooperation between officials of DARD Rivers Agency and the Institution of Civil Engineers (ICE) Northern Ireland Branch reservoir safety advisory panel. From Rivers Agency I would like to thank Averil Gaw, Mary McKeown and David Henderson for their input. The ICE panel consisted of William Gowdy, Alan Cooper, David McKillen, Stephen Orr, Donal Ryan and Richard Kirk.

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