MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

# COVERSHEET

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| **Minister** | Hon Poto Williams | **Portfolio** | Building and Construction |
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| 18 February 2021 | Dam Safety Regulations: Policy Proposals | Office of Hon Poto Williams |
| 24 February 2021 | Dam Safety Regulations: Policy Proposals – Minute of Decision DEV-21-MIN-0008 | Cabinet Office |
| 14 July 2020 | Impact Summary: Regulatory Framework for Dam Safety | Ministry of Business, Innovation and Employment |

**Information redacted** **NO**

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# Impact Summary: Regulatory Framework for Dam Safety

# Section 1: General information

## 1.1 Purpose

The Ministry of Business, Innovation and Employment (MBIE) is solely responsible for the analysis and advice set out in this Regulatory Impact Statement, except as otherwise indicated. This analysis and advice has been produced for the purpose of informing final decisions to proceed with a policy change to be taken by or on behalf of Cabinet.

## 1.2 Key Limitations or Constraints on Analysis

### Quantification of risk

It is difficult to model the likelihood of dam failure using conventional data analytics as the frequency of both dam failures and extreme events leading to dam failures (such as floods and earthquakes) is very low.

However, the impact of a serious dam failure can be extremely high. For example, a poorly maintained dam close to a population centre can represent a significant hazard, but this hazard may not be immediate.

### Quality of data

The information provided by the New Zealand Inventory of Dams, a national dataset about dams, is of variable quality.[1] It is likely that a large number of dam owners have not provided information to the inventory. There are also gaps in the information about the dams in the inventory. In many cases there is a lack of information about dimensions, dam purpose and dam condition.[2] The regulations will help to identify these dams, update the New Zealand Inventory of Dams and provide regional authorities with the necessary information to intervene if deemed necessary to protect people, property and the environment.

There also appears to be systematic undercounting of some types of dams and some groups of owners of dams. The biggest information gaps are likely to be for agricultural dams and flood detention dams.

Public consultation on the proposed regulations has shown that there are many dams in the community that are not regarded as hazards by their owners and that are not actively

[1] It is based on a dataset initially collated by the Government's then-Ministry of Commerce. It was subsequently extended by the Otago Regional Council with assistance from other regional councils and updated in 2018 by the University of Canterbury's Quake Centre following funding from the Ministry for the Environment.

[2] The available dataset lists 3,284 dams varying in size from 0.5m to 118m. Based on this dataset regulations would capture an estimated 900 medium and high impact dams (approximately 27 percent).

managed. MBIE is of the view that previous estimates of the number of dams are significantly understated and that many of these dams may be in poor condition. As New Zealand's dam stock continues to age the level of hazard is likely to increase.

### Cost of remedial and maintenance work

The cost benefit analysis does not include an estimate of the costs owners of dams may face if they identify necessary maintenance or remedial work on their dams. The average cost of maintenance and remedial work is unknown and is highly specific to the dam in question. A case-by-case approach would be necessary to determine the cost of maintenance and remedial work and would therefore be impractical.

Conducting maintenance and remedial work on infrastructure represents responsible asset management practice and should not be seen as a regulatory compliance cost.

### Responsible Manager

Signature: Date:

**Amy Moorhead**

Manager Building Policy

Building System Performance

# Section 2: Problem definition and objectives

## 2.1 What is the policy problem or opportunity?

### Current situation

Dams are important to the New Zealand economy, and investment in dam infrastructure is worth billions of dollars. Dams can be used to store water for municipal water supply, irrigation, hydroelectricity generation, enhancing fisheries, and recreation. Dams can also be used for effluent storage, flood management, and mine tailings.

Dams fail for many reasons, and failures can arise at any stage in a dam's life. Failures can be caused by construction defects, gradual deterioration processes or natural events.

Dam safety requires ongoing active management, inspection and maintenance proportionate to the potential impact of the dam's failure. Inspection and maintenance activities are undertaken voluntarily by some, but not all, owners of dams across New Zealand.

These activities are covered by a number of regulatory schemes, but there is no single comprehensive scheme governing dam safety.

The Building Act 2004 (the Building Act) provides a framework for dam safety management, but regulations are needed to bring this scheme into full effect. The proposed dam safety

regulations are intended to provide a consistent and effective regulatory framework for dam safety.

### Recent regulatory history

In March 2018, the Minister for Building and Construction and the Minister for the Environment jointly decided to return the regulations of dam safety to the Building Act and stop work on a proposed National Environmental Standard for dam safety under the Resource Management Act 1991 (the RMA) [briefing 2266 17-18 refers].

Previous dam safety regulations were intended to come into force under the Building Act 2004 in 2010 but commencement was deferred three times (2010, 2012 and 2014) before they were eventually revoked in 2015 due to concerns about complexity and the potential for regulatory duplication of the RMA. The then-Minister for Building and Housing considered that the regulations were not fit for purpose and sought Cabinet agreement to progress the management of dam safety under the RMA.

MBIE and the Ministry for the Environment share the view that dam safety should be regulated under the Building Act [briefing 2266 17-18 refers]. The objectives of a dam safety scheme align better with the purpose of the Building Act and implementation would be simpler, occur more quickly and have fewer negative impacts on stakeholders.

Managing dam safety under the RMA raises more questions around managing other types of structures under the RMA, possibly creating regulatory overlap. Furthermore, implementation of a dam safety scheme under the RMA could be significantly more complicated than doing so under the Building Act, as a national environmental standard cannot prevail over existing resource consents until the conditions of the resource consent have been reviewed and new conditions to give effect to the national environmental standard are added.

In contrast, timeframes for implementation can be prescribed in regulations developed under the Building Act regardless of any resource consent. This is likely to significantly lessen the costs and uncertainty for regional authorities and owners of dams.

### Regulatory framework

The Building Act, the RMA and the Health and Safety at Work Act 2015 all contain legal responsibilities that affect the construction and ongoing operation of dams.

### The Building Act 2004

All dams are buildings under the Building Act. Dams that have a height of four or more metres and hold 20,000 or more cubic metres volume of water or other fluid require building consent for construction, alteration and/or demolition work. Regional authorities are responsible for managing the Building Act's consent process for new dams.

The information included in a new dam's building consent application may vary regionally, but must contain any information that the building consent authority reasonably requires, including evidence of compliance with the Building Code.[3]

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[3] The Building Code sets clear expectations of the standards buildings should meet. It covers aspects such as structural stability, fire safety, access, moisture control, durability, services and facilities, and energy efficiency. It

The Building Act also provides a framework for the regulation of dams, including post-construction dam safety. Regulations are required to bring this framework into full effect.

This framework has four steps:

1. determine whether the dam meets the size requirements for inclusion in the regulatory system ("classifiable dam");
2. determine the level of hazard that the dam presents to people, property and the environment ("potential impact classification");
3. if the dam has a medium or high potential impact classification, develop a dam safety assurance programme;
4. review the potential impact classification and the dam safety assurance programme at regular intervals.

### Resource Management Act 1991

Section 13 of the RMA places restrictions on certain uses of beds of lakes and rivers, including erecting any structure or part of a structure. Section 14 places restrictions on taking, using, damming and diverting water. The management of these activities is a regional council[4] function.

Under the RMA, regional councils use:

- regional policy statements to provide an overview of the resource management issues of the region and policies and methods to achieve integrated management of the natural and physical resources of the whole region; and
- regional plans to set objectives, policies and rules about managing resources such as soil, fresh water and the coastal environment.

A dam may[5] need resource consent if it is doing any of the following:

- activities in and occupation of the bed of a lake or river,
- taking, using, damming, or diverting water,
- discharging of water into water; or
- discharging of contaminants into water.

Earthworks associated with the construction of a dam are also likely to require resource consent.

Some regional authorities use resource consent conditions as a way to regulate dam safety management for some dams, but this is inconsistent.

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also states how a building must perform in its intended use rather than describing how the building must be designed and constructed.

[4] The Building Act uses the term "regional authorities", while the Resource Management Act uses the term "regional councils". The two terms have the same meaning.

[5] Depending upon the region's permitted activities.

### Health and Safety at Work Act 2015

The Health and Safety at Work Act applies to workplaces. Therefore owners of dams have obligations to identify, assess and manage risks posed by their dams if people are working in, on or nearby the dam. Owners of dams need to ensure risks to people are identified and that steps are taken to mitigate these risks in order to provide a safe working environment.

### New Zealand Dam Safety Guidelines

The New Zealand Dam Safety Guidelines (2015) (the Guidelines)[6] are relevant to any discussion of dam safety because they are current, credible and represent industry good practice amongst dam safety engineers.

The Guidelines represent a body of collaborative work undertaken by dam engineering construction experts, dam safety experts, owners of dams and other stakeholders. The Guidelines are consistent with advice issued by the International Commission on Large Dams, and have been internationally reviewed as representing good practice. Furthermore, insurers have confidence in owners and operators of dams who can demonstrate compliance with the Guidelines.

Use of the guidelines is voluntary meaning that its best practice advice is not legally binding. However, some of the elements of the Guidelines have been reflected in the proposed regulations.

## Why is the current situation a problem?

### There is no single and coherent regulatory framework for dam safety

Unlike most of the Organisation for Economic Co-operation and Development (OECD) countries, New Zealand does not systematically regulate post-construction dam safety. Instead some regional authorities have taken to regulating dam safety through resource consents. Some dam owners follow the Guidelines, but this is voluntary.

Resource consents may contain conditions requiring the on-going management of dam safety, but these conditions are not uniformly found in resource consents and it is not mandatory to have them. This inconsistency can be confusing for owners of more than one dam, other participants in the resource consent process, and authorities who manage these processes.

Building and altering large dams requires a building consent, but the information requirements vary regionally, and the consent does not provide for the regulation of ongoing maintenance and safety management procedures.

A voluntary dam safety framework exists in the Guidelines and many owners of large commercial dams operate using this framework. However, it is not widely used by owners of small to medium dams. The proposed regulations will make on-going safety management of dams mandatory.

The current mesh of regulatory instruments that applies to dams does not provide a coherent approach to regulating dam safety, and instead creates a confusing regulatory environment

[6] Published by the New Zealand Society on Large Dams.

for territorial authorities, regional authorities, owners of dams and those in the dam safety industry. There is no certainty that owners of dams are subject to ongoing safety-related provisions in their resource consents, or what those provisions might be, and it is also difficult for dam owners to ascertain their obligations as there is no single source of 'rules' for them to follow. Moreover, the Guidelines do not ensure a uniform approach to dam safety because they are voluntary.

### There is a risk to people, property and the environment downstream of dams

Dams represent a significant hazard to life, property and the environment. The aim of the proposed regulations is to reduce the risk of dam failure, especially where the consequences of a failure would be serious. Conversely, the potential for dam failure is increased by a lack of monitoring, loose monitoring processes, and/or the deferment of maintenance.

There have been a number of significant dam failures in New Zealand. Since 1960 there have been 25 dam incidents, with at least 14 that could be considered serious.

In 1997 floodwaters caused a breach to Opuha dam near Fairlie, releasing approximately 13 million cubic metres of water into the Opuha Riverbed. A state of emergency was declared and approximately 200 nearby residents of the riverside settlements of Stratheona and Butlers Crossing were evacuated. Fortunately no lives were lost but there were reports of near escapes. The failure resulted in the loss of more than one thousand head of stock, hundreds of thousands of dollars' worth of damage to approximately 25 farms adjacent to the riverbed, half a million dollars' worth of damage to river protection works in the Opuha and Opihi Riverbeds and a major breach of State Highway 79.[7]

More recently, in 2015 the Waihi Dam's sluice gates were damaged by debris during a storm, which subsequently led to the release of silt into the Waiau River, resulting in silt levels approximately 1000 percent higher than normal. This adversely affected water purification processes and the recreational value of the Waiau River, as well as causing many thousands of dollars of damage to irrigation systems.

As evidenced by MBIE's public consultation on dam safety, it is likely that most owners of large dams already use the Guidelines for their dam safety management. Therefore the greatest benefit from the proposed regulations will be to lift the quality of dam safety management of New Zealand's many medium sized dams and consequently reduce the likelihood of failure. Many of these dams are non-commercial in nature, and a high proportion are located in urban areas.

A cost benefit analysis on post-construction dam safety[8] was carried out by consultant engineers and economists MWH (part of Stantec) and New Zealand Institute of Economic Research. It identified five dams to use as case studies that ranged from low to medium to high potential impact. The three medium impact dams' average cost of failure was near $5.8 million each.

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[7] Lees, P. & Thomson, D. (2003) 'Emergency management, Opuha Dam collapse, Waitangi Day 1997', NZ Society on Large Dams (NZSOLD), 2003 Symposium "Dams – Consents and Current Practice", Papers.

[8] National Environmental Standard on Post-Construction Dam Safety (2017), commissioned by MBIE and the Ministry for the Environment.

Based on the current New Zealand Inventory of Dams dataset, medium potential impact dams represent around one-fifth of dams over 3 metres; at least 140 dams across New Zealand. Collectively, this is an estimated total failure cost of more than $800 million.[9] However, it is likely that a large number of owners of dams have not provided information to the inventory. This means that the real number of medium impact dams is likely to be more than 140, and therefore the real total failure cost of medium impact dams is also likely to be higher.

### There is a lack of reporting requirements and information about dams

The Building Act requires regional authorities to keep a register of dams in their region. However, regulations are needed to give effect to the parallel requirement for owners of dams to provide regional authorities with information about their dams. This includes dams' potential impact classifications [10] and dam safety assurance programmes.[11]

Requiring dam owners to provide this information to regional authorities, and requiring regional authorities to maintain a register of dams will help to increase the understanding of the level of hazard and risk dams pose. This is especially warranted as New Zealand's dam stock is ageing, and there is a lack of information about what condition these ageing dams are in.

### There are enforcement challenges and inconsistencies in compliance conditions

It is difficult to enforce dam safety conditions on many dams as there is currently no penalty for poor ongoing dam safety management practices, outside of resource consent requirements.

Dam safety conditions that vary across similar dams, or are loosely specified (e.g. "compliance with the Guidelines") may also be difficult to enforce. Clearly, non-existent conditions cannot be enforced.

Resource consent conditions may differ across dams of the same risk profile and so can be confusing for owners who are responsible for more than one dam, stakeholders participating in resource consent consultation processes, and regional authorities managing the processes.

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[9] $5.8 million * 140 dams.

[10] Owners of dams that meet the size threshold of a 'classifiable dam' will be required to assess the potential impact of their dam(s) if they were to fail. The assessment will result in a potential impact classification which is an estimate of the likely impact a dam failure would have on downstream populations, property and the environment.

[11] If a potential impact classification is assessed as medium or high, owners of dams must develop a dam safety assurance programme to monitor the safety of their dam.

## 2.2 Who is affected and how?

### Identifying impacts and affected parties

The proposed regulations are intended to change the behaviour of owners of dams that do not follow best practice and ensure the safety of their dams. They seek to ensure compliance costs are proportionate to the level of risk posed by the dam to avoid creating onerous dam safety obligations on owners of smaller dams.

The proposed regulations will affect owners of dams, regional authorities, the dam safety industry and people, property and the environment downstream of dams.

During July and August 2019, MBIE publically consulted on the proposed regulations and submissions were received from a wide range of dam sector stakeholders. The submissions were largely in support of the intent of the proposed regulations; however there were a variety of criticisms around particular proposals. The stakeholder submissions are discussed in Section 5.

### Owners of dams

Owners of dams will be responsible for the safety of their dams. Owners of dams range from councils, territorial authorities, irrigation companies and farmers, through to hydroelectric power generators.

The dam safety requirements will apply to all dams that meet the definition of a classifiable dam under the regulations.

All owners of dams will be required to assess whether their dam is classifiable against a classification threshold (height of the dam and volume of the reservoir at its peak operating level).[12] Only owners of classifiable dams will be required to undertake subsequent steps.

For the owner of a small dam, compliance will be limited to considering whether their dam is below the classifiable dam classification threshold. If it is, no further action will be required.

Under the proposed regulations, owners of dams will be responsible for:

- assessing their dams against the classification threshold,
- determining the potential impact classification of their dam,
- submitting the potential impact classification to a 'recognised engineer' for certification,
- providing the potential impact classification to the regional authority,
- preparing dam safety assurance programmes for audit by suitably qualified experts (if the dam receives a medium or high potential impact classification),
- providing certified dam safety assurance programmes to the regional authority; and
- reviewing their dam's classification.

### Regional authorities

[12] Classification thresholds discussed in Annex 1.

Regional authorities already perform the functions of a building consent authority relating to dams (including the issue of building consents) and will carry out the following regulatory functions in relation to dam safety:

- receiving information on classifiable dams related to the size and location of these dams,
- approving or refusing dam classifications,
- approving or refusing dam safety assurance programmes and approving any changes to these,
- receiving annual dam compliance certificates and maintaining a register of dams,
- enforcing compliance with any dam safety regulations using Building Act enforcement powers if necessary; and
- adopting a policy on dangerous dams. This approach must meet the requirements of the Building Act, but the policy itself is to be determined by the individual regional authority.

The Building Act contains provisions for the enforcement of compliance in relation to dam safety. It is an offence for owners of dams who fail to comply with dam safety requirements under the Building Act, such as the requirement to classify a dam and to prepare a dam safety assurance programme for dams classified as medium or high potential impact dams. The penalties for these offences range from fines of $5,000 to $200,000 (Section 134C, 138, 140, 145, 150, and 154).

Sections 13 and 14 of the Act sets out the roles of building consent authorities, territorial authorities, and regional authorities in relation to dam safety. Section 154, 156 and 157 of the Act sets out the powers of regional authorities in respect to dangerous dams and dams that pose an immediate danger to the safety of people, property or the environment. The powers in respect of dangerous dams include giving written notice requiring work to be carried out on the dam, applying to the District Court for an order that authorises the regional authority to carry out work on the dam, and recovering the costs of that work from the dam owner. The powers in respect of a dam that poses an immediate danger include the regional authority (under a warrant from the chief executive of the regional authority) taking any action that is necessary to remove that danger and recovering the costs of that action from the owner.

### Dam safety industry

The proposed regulations will bring into force competency requirements for ‘recognised engineers’. ‘Recognised engineers’ will be responsible for:

- auditing and certifying the classification of a dam,
- auditing and certifying the dam safety assurance programme,
- certifying compliance with the approved dam safety assurance programme,
- certifying reviews of the classification of a dam; and
- certifying reviews of the dam safety assurance programme.

### People, property and the environment downstream of dams

The proposed regulations will help to ensure better risk management processes. This will likely reduce the risk of dam failure, and therefore reduce the potential hazard to people, property and the environment downstream of dams.

## 2.3 Are there constraints on the scope for decision making?

In March 2018, the Minister for Building and Construction and the Minister for the Environment jointly decided to regulate dam safety using the existing provisions in the Building Act and stop work on a proposed National Environmental Standard for dam safety under the RMA. Therefore the choice of which regulatory approach is constrained to the dam safety provisions under the Building Act and the regulation making powers that the Act contains.

# Section 3: Options identification

## 3.1 Aims and elements of the proposed dam safety regulations

The dam safety regulations aim to ensure that people, property and the environment are protected from the harmful effects of dam failure. The proposed regulations take a risk-based approach to safety management and place obligations on owners of dams proportionate to the risk their dam or dams are likely to pose. The proposals have been designed to align with elements of existing industry good practice for dam safety and to exclude from regulation small dams, such as those used for stock drinking water or small-scale irrigation. These small dams, in the event of a breach, are unlikely to cause significant damage to life, property or the environment downstream of the dams.

A dam safety scheme will bring New Zealand into line with the majority of OECD countries that already have dam safety schemes in place. The proposed regulations will mean that the number, size, location and ownership of all classifiable dams in New Zealand will be better understood.

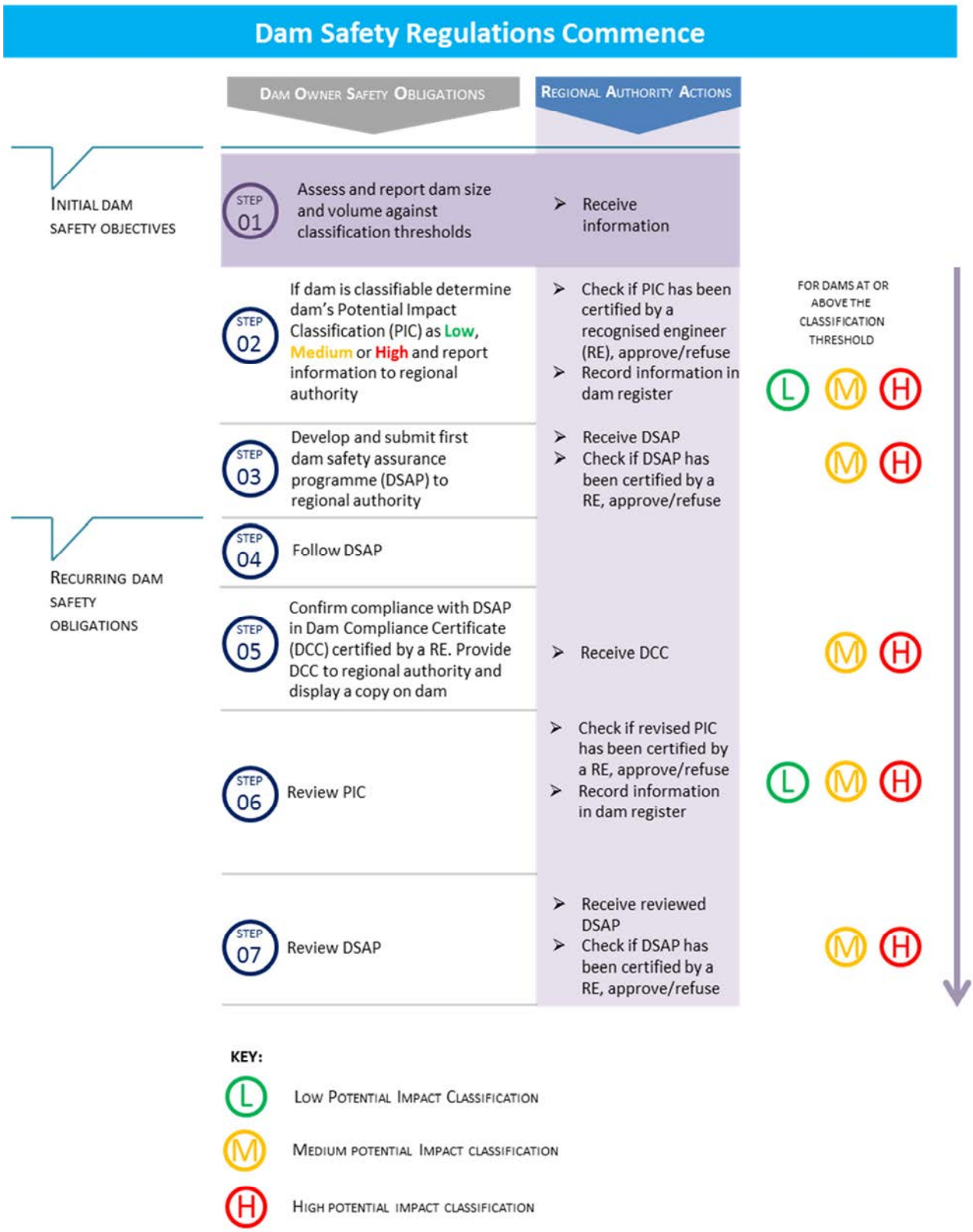
**The proposed regulations will:**

- provide a framework for the classification of dams, according to the potential impact the dam would have on people, property and the environment if it were to fail,
- place responsibilities on the owners of dams to ensure that their dams are maintained to an acceptable level of safety,
- improve the dam safety practices of the owners of dams who are not already following elements of best practice,
- specify criteria and standards to ensure that dams are being managed appropriately proportionate to the potential impact of the dam's failure,
- ensure that there are appropriate procedures in place for the management of dam safety incidents or emergencies; and

- ensure that regulators have better information on the number, size, location and ownership of dams that would have the potential to have a significant impact on people, property and the environment in the event of failure.

Figure 1 illustrates the steps of the proposed dam safety regulations.

**Figure 1: Overview of the key steps in the proposed dam safety regulations**



### The criteria for assessing the proposed dam safety scheme

**Table 1: Assessment criteria for the design of a new dam safety scheme**

| A scheme that is… | … means the regulations will… | To achieve this, the regulations: |
|---|---|---|
| Certain | be transparent and clear: owners of dams and regulatory authorities understand exactly what is expected from them and when. | • clearly specify owners' obligations in regard to monitoring, maintenance and reporting requirements,<br>• clarify that responsibility for compliance rests with the owners of dams; and<br>• provide clarity on the roles and responsibilities of owners of dams and regulators (the regional authorities administering the regulations). |
| Pragmatic | be feasible to implement. | align with existing Building Act requirements, insurance requirements and the New Zealand Dam Safety Guidelines (2015). |
| Efficient | support administrative efficiency and allow owners of dams to act efficiently. | create an effective approach to dam safety without creating unnecessary new red tape for owners of dams or regional authorities. |
| Proportionate | be fair and balanced, without unnecessary costs to owners of dams. | ensure the risks of dam failure – particularly the risks to people – are appropriately balanced against compliance costs to owners of dams and the regulatory authorities. |
| Consistent | require owners of dams and regional authorities across New Zealand to apply and comply with the same standards. | create a nationally consistent framework. |

## 3.2 What options have been considered?

The Minister for Building and Construction and the Minister for the Environment jointly decided that dam regulation was best undertaken under the Building Act, this limits the scope of options under analysis.

Without action, the problems discussed in Section 2.1 will remain; therefore the development of policy options has focussed on the choice to regulate dams through mandatory regulations under the Building Act. Furthermore, the Building Act signals an expectation that the safety of dams is to be regulated, as the provisions for dam safety are already in the Act. Full implementation of the Act will require regulations.

During July and August 2019, MBIE publicly consulted on a proposed regulatory framework for dam safety. Consultation closed on 6 August. The feedback from submitters has been used to confirm some previously proposed elements of a dam safety scheme and also develop new revised elements. Annex 1 provides a detailed comparison between Option 2 and Option 3.

The three options considered for the regulation of dam safety are:

**Option 1 –** Voluntary dam safety management and inconsistent resource consent conditions (status quo).

This option is the equivalent of the status quo discussed in the problem definition and is therefore not preferred (Section 2.1). Without implementing a mandatory dam safety scheme, there will be:

1. no single and coherent regulatory framework for dam safety,
2. an increased risk to people, property and the environment downstream of dams,
3. a lack of reporting requirements and information about dams; and
4. enforcement challenges and inconsistencies in compliance conditions.

**Option 2 –** Mandatory regulation of dam safety management under the Building Act, with all elements that were consulted on during public consultation.

This option is not preferred as it includes some elements that are not the most effective way to achieve the objectives and criteria of a successful dam safety scheme, including:

1. a dam classification threshold that is not entirely clear and unnecessarily captures some low risk dams such as wetland weir and irrigation dams,
2. a potential impact classification assessment that excludes facilities that serve vulnerable populations such as learning centres and hospitals, as well as locations of high cultural and/or historic significance,
3. a definition for a 'recognised engineer' that includes some competencies that are not directly required for the role,
4. a 12 month implementation timeframe that does not provide industry stakeholders adequate preparation time; and
5. some information requirements that are confusing, impractical and inefficient.

**Option 3 –** Mandatory regulation of dam safety management under the Building Act, with revised elements based on stakeholder feedback.

This is the preferred option as it includes elements that were originally consulted on and were deemed fit for purpose, as well as elements that were revised to more effectively achieve the objectives and criteria of a successful dam safety scheme. These include:

1. a dam classification threshold that is clear and captures medium and high risk dams, whilst excluding low risk dams,
2. a potential impact classification assessment that includes facilities that serve vulnerable populations such as learning centres and hospitals, as well as locations of high cultural and/or historic significance,
3. a definition for a 'recognised engineer' that includes competencies that clear and are directly required for the role,
4. a 24 month implementation timeframe that provides industry stakeholders adequate preparation time; and
5. information requirements that are clear, practical and efficient.

**Table 2: Multi-criteria analysis of the three options for new dam safety scheme**

| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Certain | 0 | +<br><br>It is clear that the responsibility for compliance rests with owners of dams.<br><br>Not all elements are transparent and clear, including the dam classification threshold, 'recognised engineer' competencies and some information requirements.<br><br>Owners' obligations in regard to information reporting requirements are specified but there is not adequate clarity.<br><br>Not all roles and responsibilities of owners of dams and regulators are clear and certain. | ++<br><br>It is clear that the responsibility for compliance rests with owners of dams.<br><br>Elements are transparent and clear; overlap of information requirements and unnecessary and unclear 'recognised engineer' competencies are eliminated.<br><br>The dam classification threshold is easier to interpret for regulators and owners'.<br><br>The roles and responsibilities of owners of dams and regulators are clear and certain. |
| Pragmatic | 0 | +<br><br>Creates a pragmatic scheme that aligns with existing Building Act requirements, insurance requirements and the New Zealand Dam Safety Guidelines. However, some information requirements are not feasible to implement and the 12 month timeframe does not provide enough time for stakeholders to prepare. | ++<br><br>Creates a pragmatic scheme that aligns with existing Building Act requirements, insurance requirements and the New Zealand Dam Safety Guidelines. Requirements on regulators and owners are feasible to implement and follow. The 24 month timeframe provides adequate time for stakeholders to prepare. |
| Efficient | 0 | +<br><br>Creates a reasonably efficient system where excessive administrative requirements and 'red tape' are minimised. Some information requirements and 'recognised engineer' competencies are confusing and unnecessary. | ++<br><br>Creates a reasonably efficient system where excessive administrative requirements and 'red tape' are minimised. Information requirements and 'recognised engineer' competencies are more refined and better suited to their purpose. |
| Proportionate | 0 | +<br><br>The risks of dam failure, particularly the risks to people, are reasonably balanced against compliance costs to owners of dams and the regulatory authorities. Some low impact dams will be captured by the dam classification threshold, creating unnecessary compliance costs. | ++<br><br>The risks of dam failure, particularly the risks to people, are well-balanced against compliance costs to owners of dams and the regulatory authorities. The classification threshold further minimises compliance costs by capturing less low impact dams.<br><br>The potential impact of a dam failure is better accounted for as facilities that serve vulnerable populations such as learning centres and hospitals, as well as locations of high cultural and/or historic significance are included in the potential impact assessment requirements. |

| | | | |
|---|---|---|---|
| | | | The addition of locations of cultural significance helps to align with the Crown's Treaty of Waitangi obligations. |
| Consistent | 0 | ++<br>Requires owners of dams and regional authorities across New Zealand to apply and comply with the same standards and creates a nationally consistent framework. | ++<br>Requires owners of dams and regional authorities across New Zealand to apply and comply with the same standards and creates a nationally consistent framework. |

Key:

++ much better than doing nothing/the status quo

+ better than doing nothing/the status quo

0 about the same as doing nothing/the status quo

- worse than doing nothing/the status quo

- - much worse than doing nothing/the status quo

## 3.3 Which of these options is the proposed approach?

MBIE's preferred approach is Option 3 – Mandatory regulation of dam safety management under the Building Act, with revised elements based on stakeholder feedback.

The preferred approach best meets the criteria outlined in Table 1 (certain, pragmatic, efficient, proportionate and consistent) and mitigates the issues discussed in the problem definition.

Option 3 includes the benefits of Option 2, whilst minimising the drawbacks of some of Option 2's elements. It provides a more refined and targeted approach to dam safety regulation, is informed by public feedback and has been redesigned with the input of key industry stakeholders.

Option 3 provides a single and coherent regulatory framework for dam safety; reduces the risk to people, property and the environment downstream of dams; provides clear reporting and information requirements about dams; and allows for consistent compliance conditions and more effective enforcement of them.

The proposed approach clearly specifies owners of dams' obligations in regard to monitoring, maintenance and reporting requirements; clarifies that responsibility for compliance rests with the owners of dams; provides clarity on the roles and responsibilities of owners of dams and regulators; aligns with existing Building Act requirements, insurance requirements and key elements of the New Zealand Dam Safety Guidelines (2015); creates an effective approach to dam safety without creating unnecessary new red tape for owners of dams or regional authorities; ensures the risks of dam failure – particularly the risks to people – are appropriately balanced against compliance costs to owners of dams and the regulatory authorities; and creates a nationally consistent framework.

### Government's 'expectations for the design of regulatory systems'

The proposed approach has clear objectives and seeks to achieve those objectives through the least cost way, and with the least adverse impact on market competition, property rights, and individual autonomy and responsibility. It is focussed on dams that present the greatest risk and seeks to minimise regulatory burden on dams that present a low risk.

The proposed approach has processes that produce predictable and consistent outcomes for regulated parties across time and place and is proportionate, fair and equitable in the way it treats regulated parties. It is consistent with relevant international standards and practices and aligns with other OECD countries' dam safety regulatory frameworks. It is well-aligned with existing requirements in related or supporting regulatory systems through minimising unintended gaps or overlaps and inconsistent or duplicative requirements.

The proposed approach conforms to established legal and constitutional principles and supports compliance with New Zealand's international and Treaty of Waitangi obligations. It will set out legal obligations and regulator expectations and practices in ways that are easy to find, easy to navigate, and clear and easy to understand. The preferred approach generally has scope to evolve in response to changing circumstances or new information on the regulatory system's performance.

# Section 4: Impact Analysis (Proposed approach)

## 4.1 Summary table of costs and benefits

Compared to the status quo, the proposed dam safety regulations' benefits are expected to outweigh the costs.

**Table 3: Additional costs of proposed approach, compared to taking no action**

| Affected parties | Comment | Impact |
|---|---|---|
| Regulated parties (Owners of dams) | Many owners of dams already voluntarily comply with the Guidelines, meaning that compliance with the dam safety provisions in the Building Act will not be onerous.<br><br>Owners of dams not already following the Guidelines may face costs to comply with the provisions in the Building Act.<br><br>While many owners of high potential impact dams that are already observing the Guidelines are likely to have good systems in place, it is likely that some urban flood detention dams have not been classified and have no dam safety management systems. Many of these may have a high potential impact classification because of their risk to people, property and the environment downstream.<br><br>The Building Act excludes all owners of low potential impact classification (usually smaller sized) dams from dam safety assurance programme-related requirements.<br><br>There may be significant compliance cost implications for territorial local authorities, who own many small to medium | Medium |

| | | |
|---|---|---|
| | dams. Territorial local authorities will face compliance costs to implement dam safety management systems.<br><br>Owners of dams that require remedial work to comply with the regulations will face costs. However, these costs are no different to other costs associated with the management of other types of infrastructure such as bridges, network utilities and water infrastructure, and these activities reflect responsible asset management practices. As such, these are not compliance costs. | |
| Regulators (Regional authorities) | Regional authorities will face the administrative and staffing cost of setting up systems for the activities specified under the Building Act and carrying them out, namely approving or refusing dam classifications, approving or refusing dam safety assurance programmes, registering information, monitoring and enforcement activities.[13] | Low |
| Other parties (Downstream communities and wider society) | Some councils have stated that they may struggle to pay for compliance and enforcement activities. These costs may need to be recouped through targeted levies or fees on owners of dams, or through rates.[14] | Low |
| Total monetised cost | See Section 4.2 and Section 4.3. | Medium |
| Non-monetised costs | | N/A |

### Affordability of compliance costs

Owners of dams in New Zealand are largely fall in to one of the following categories: large commercial operators, irrigators and farmers, and central and local government.

### Large commercial operators

Most power generators, owners of large commercial irrigation dams, mine tailings dams and larger water supply operators such as Watercare Auckland follow the New Zealand Dam Safety Guidelines and have the asset management and information management systems in place to be able to comply with the proposed regulations. During public consultation these owners expressed support for the need to regulate dams and were largely unconcerned about compliance costs.

### Irrigators and farmers

Farmers with irrigation dams were initially concerned about the compliance costs associated with the proposed regulations and expressed the view that these costs may cause their small and low impact dams to become uneconomic to construct or to operate. However, changes made to the policy settings in response to stakeholder feedback have been

[13] Section 243 and 281A of the Building Act authorise regional authorities to charge fees for the performance of a function or service under the Building Act. Regional authorities could therefore charge fees to owners of dams for the cost of approving or refusing dam classifications, approving or refusing dam safety assurance programmes, and registering information.

[14] The cost of compliance, review and administration activities have been factored into the cost benefit analysis discussed in Section 4.3.

designed to exclude low impact and small dams, especially irrigation dams, from the dam safety management procedures and/or the potential impact classification requirements respectively. Therefore farmers and irrigators will largely face minimal to no compliance costs.

### Central and local government

City and district councils are significant owners of dams; these dams include water supply dams, sewage treatment dams, flood detention dams and recreational dams in parks and reserves. Some councils do not follow the New Zealand Dam Safety Guidelines and do not have adequate dam safety management practices and procedures for all of their dams. These dams may not be appropriately managed, and may represent a significant risk to people, property and the environment downstream of them.

Councils will face costs to comply with the proposed regulations and appropriately manage their dams. These costs may be significant in some instances but will be necessary to reduce the risk and hazard to people, property and the environment downstream of these dams. During public consultation, most councils agreed with the intent of the proposed regulations and agreed that owners of dams should be following the New Zealand Dam Safety Guidelines.

Flood detention dams are often used to protect transport infrastructure such as roads and railways, and may represent a significant proportion of central and local government dams that are in need of maintenance and safety management activities. The cost to remediate or maintain these to meet the requirements of the proposed regulations may be recouped through internalising the cost to the transport system.

There are other options for central and local government to generate funding to pay for costs associated with dam safety management activities; among these are the options to increase rates, implement targeted user charges and metering (e.g. for municipal water supply) and decommissioning.

Some dams owned by central or local government may be in poor condition and/or defunct; this is especially true for heritage dams. Some authorities may determine that the cost of safely managing these dams outweighs the benefit that they provide and may decide to decommission them. This will still meet the intent of the proposed regulations as the hazard to people, property and environment downstream of these dams will be reduced.

**Table 4: Expected benefits of proposed approach, compared to taking no action**

| Affected parties | Comment | Impact |
|---|---|---|
| Regulated parties (Owners of dams) | Avoiding dam repair costs, ability to get insurance, protecting reputation and maintaining the confidence of affected communities. The avoided costs of repair are similar to other stewardship responsibilities to maintain network utilities or infrastructure.<br>Owners of dams' assets are better protected as dam failures are also costly for owners of dams. | Medium |
| Regulators (Regional authorities) | Lower likelihood that regional authorities will need to intervene regarding dangerous dams.<br>Better information on the number, size, location and | Medium |

| | | |
|---|---|---|
| | ownership of classifiable dams.<br>Knowing that dams meet appropriate dam safety criteria will help ensure that the risks of development in potential dam break inundation zones is acceptable. | |
| Other parties (Downstream communities and wider society) | Brings New Zealand into line with the majority of OECD countries that already have dam safety schemes in place.<br>Assurance to the public that dams are managed appropriately.<br>Over time, the increased application of effective dam safety management practices may reduce the overall risk of dam failure.<br>Savings of not incurring damage to downstream life, property and the environment.<br>For every dam failure that is avoided as a result of the proposed regulations, the benefits (avoided loss of life or damage) may include the preservation of infrastructure, agriculture, horticulture and/or a range of values such as heritage values, recreation values and cultural and iwi values. | High |
| Total monetised benefit | See Section 4.3. | High |
| Non-monetised benefits | Cultural and iwi values counted as existence values e.g. preservation of freshwater values. | High |

## 4.2 Monetised compliance costs

### Costs of determining the Potential Impact Classification (PIC)

**Table 5** provides indicative costs for a PIC assessment, depending on the anticipated level of dam failure consequences. PIC's would require periodic reassessment, but reassessment costs would be significantly lower than initial costs.

A dam's PIC is informed by a dam-break flood hazard and consequence assessment, which will be done at either an initial, intermediate or comprehensive level depending on the anticipated level of consequence. There are three levels of assessment, as in some cases the dam failure consequences may be obvious and only a simple (i.e. an initial) assessment is required to determine the PIC. In other cases, the dam failure consequences may be complicated or difficult to define and a more detailed (i.e. intermediate or comprehensive) assessment would be appropriate. This is influenced primarily by the population exposed to the potential dam failure, the amount of downstream development, and the severity of the anticipated inundation.

There is potential for reasonable cost savings if multiple dams in a given area are assessed at the same time. Generally, an increasing level of practitioner experience is required as the assessment level increases.

**Table 5: Indicative costs for a PIC assessment**

| Level of assessment | Indicative range of cost to conduct assessment | Notes |
|---|---|---|
| Initial | $3,000 to $7,000 | Topographic survey not normally required for an initial assessment and not included in the cost range. |
| Intermediate | $10,000 to $20,000 | Topographic survey may be required, and this is reflected in the cost range.<br>Cost includes production of flood maps suitable for use in an emergency action plan. |
| Comprehensive | $25,000 to $50,000+ | Topographic survey may be required, and this is reflected in the cost range.<br>Cost includes production of flood maps suitable for use in an emergency action plan.<br>Detailed hydraulic modelling is usually required. |

### Costs of dam safety assurance programme preparation (DSAP) and audit (annual Dam Compliance Certificate)

**Table 6** provides indicative costs for preparing a DSAP and annual Dam Compliance Certificate. It is less costly to prepare a DSAP for a dam that already has dam safety procedures in place. If safety procedures are already in place, the DSAP preparation is more about summarising and referencing those procedures to tie them together.

Preparing a DSAP for a dam that has no dam safety procedures in place will be more costly because the procedures need to be written as part of the DSAP preparation.

A DSAP can generally be prepared more efficiently for an owner of a dam who has multiple dams with common procedures. Generally, an increasing level of practitioner experience is required as the PIC increases.

These indicative costs do not include the ongoing cost to owners of implementing the DSAP content, such as maintaining and monitoring a dam. These costs are likely to vary depending on the extent of existing dam safety practices and if any existing dam safety programmes meet the principles of the Guidelines.

**Table 6: Indicative costs for a DSAP and Dam Compliance Certificate**

| Dam PIC | Prepare DSAP (dam safety procedures exist) | Prepare DSAP (no dam safety procedures exist) | Audit DSAP (annual Dam Compliance Certificate) |
|---|---|---|---|
| Medium | $8,000 to $10,000 | $15,000 to $20,000 | $4,000 to $5,000 |
| High | $10,000 to $15,000 | $20,000 to $30,000 | $5,000 to $6,000 |

## 4.3 Cost benefit analysis (CBA) case studies

As part of the development of an RMA-based National Environmental Standard for Dam Safety, a case study CBA was carried out by consultant engineers and economists MWH (part of Stantec) and New Zealand Institute of Economic Research. The CBA identified the

potential impact, over 35 years, of the proposed National Environmental Standard on five specific dams. The characteristics of the case study dams are provided in Annex 2.

MBIE and consultant design safety experts agree that the CBA is generally fit for purpose to be used for a Building Act-based regulatory framework for dam safety. This is because the main regulatory obligations of the previously proposed National Environmental Standard will still be reflected under the Building Act framework. These obligations include the implementation of a dam safety assurance programme, the classification of dams, and regular reviews of the potential impact classification and dam safety assurance programmes for medium and high impact dams. The cost and benefit outcomes for people, property and the environment will be similar to a Building Act based framework, and the benefits will still greatly outweigh the associated costs, however, as stated in Section 1.2, maintenance and remedial work are not factored into the CBA because they are not regulatory compliance costs.

The implementation costs of the CBA were adjusted to reflect a new requirement within the dam safety assurance programme requirements that deals with the cost of establishing, implementing, auditing and reviewing of the dam and reservoir operations and maintenance procedures. Following consultation with experts, MBIE assumes that this new cost impact will be approximately 1/6$^{th}$ of the total implementation costs to owners of dams previously used in the CBA. This adjustment has been detailed in an addendum to the CBA.

While they are not fully representative of all dams in New Zealand, the five dams were selected to provide a range across the following criteria:

- Potential impact classification.
- Dam purpose (water supply, irrigation scheme, farm water supply, hydro-electricity).
- Current dam safety practice.
- Regional / unitary council.

The CBA found that the compliance costs of implementing the proposed dam safety scheme would mainly affect owners of dams that are not currently operating safety activities consistent with the Guidelines. MBIE expects that the most affected dams will be those that attract a medium potential impact classification, as most dams that do, or would, attract a high potential impact classification will already have robust safety systems in place. Based on the current New Zealand Inventory of Dams dataset, medium potential impact dams represent approximately one-fifth of dams over 3 metres.

Assuming that the proposed regulations do result in a potential dam break being avoided (best case scenario), the benefits relative to the costs[15] are:

- **Dam A** - Medium potential impact (PIC), council water supply dam: 42:1
- **Dam B** - Low PIC, Farm irrigation: 323:1
- **Dam C** - Medium PIC, council water supply dam: 104:1
- **Dam D** - Medium PIC, irrigation scheme dam: 298:1

[15] The cost benefit analysis does not include an estimate of the costs owners of dams may face if they are required to undertake maintenance or remedial work on their dams.

- **Dam E** - High PIC, hydro dam: 90,822:1

As benefits are uncertain, a range of potential benefits are given (which are the costs of a dam break being avoided), that vary with a probability the dam safety regulations reduces the likelihood of a dam break. The purpose of Table 7 is to show that if the regulations were to only contribute a minute amount (0.1% – 2.5%) to a dam break being avoided, then the benefits still outweigh the costs (excluding the cost of remedial work and maintenance).

The blue lines on the table illustrate a level of influence on the likelihood of a dam breach that the dam safety regulations would have, where the benefits outweigh the compliance costs.

For example, if the dam safety regulations only contribute 2.5% to avoiding a dam break for Dam A, then the benefits ($227,145) still outweigh the costs ($216,049). If the dam safety regulations contribute only 1% to avoiding a dam break for Dams B – E, then the benefits still outweigh the costs. The dam safety regulations will not totally eliminate the risk of a dam break, but it is expected to have some influence over the risk. The extent of the benefit will vary from dam to dam and is expected to be relative to the level of improvement in dam safety practice (which is uncertain).

For dams that already adhere to the dam safety practices that would be required by the dam safety regulations, the level of benefit would be smaller. For those dams where dam safety practice is currently not best practice, the extent of the benefit (i.e. avoided dam break cost) is expected to be the highest.

**Table 7:** Comparison of uncertain benefits and certain costs across the sample dams (net present value over 35 years)[16]

| **% contribution of regulations to avoiding a dam break** | **Level of benefit (avoided dam break costs)** | | | | |
|---|---|---|---|---|---|
| | **Dam A** Medium PIC, council Water supply dam | **Dam B** Low PIC, Farm irrigation | **Dam C** Medium PIC, council Water supply | **Dam D** Medium PIC, irrigation scheme dam | **Dam E** High PIC, hydro dam |
| 0.1% | $9,086 | $2,916 | $4,357 | $3,930 | $1,039,882 |
| 1% | $90,858 | $29,161 | $43,574 | $39,302 | $10,398,816 |
| 2.5% | $227,145 | $72,903 | $108,936 | $98,255 | $25,997,040 |
| 10% | $908,578 | $291,613 | $435,744 | $393,020 | $103,988,162 |
| 20% | $1,817,156 | $583,226 | $871,489 | $786,039 | $207,976,323 |
| 50% | $4,542,890 | $1,458,065 | $2,178,722 | $1,965,098 | $519,940,808 |
| 100% | $9,085,780 | $2,916,130 | $4,357,444 | $3,930,197 | $1,039,881,616 |
| **Total Implementation costs** | **$216,049** | **$9,018** | **$41,897** | **$13,178** | **$11,450** |

[16]MWH. 2017. National Environmental Standard on Post-Construction Dam Safety.

| | | | | | |
|---|---|---|---|---|---|
| Regional authority administration costs included in total[17] | $8,108 | $384 | $5,457 | $1,399 | $903 |
| Administration costs as percentage of total | 4% | 4% | 13% | 11% | 8% |

### Regional authority administration costs

The Building Act authorises regional authorities to charge fees for the performance of a function or service under the Building Act. Regional authorities could therefore charge fees to owners of dams for the cost of approving or refusing dam potential impact classifications (PIC), approving or refusing dam safety assurance programmes (DSAP) and registering information. Although, it is not certain whether these costs will be passed on directly to owners of dams; the extent of the costs and whether they will be passed on to owners is subject to the regional authority in question. These administration costs will only occur in regard to classifiable dams that meet the volume and size thresholds.

### Low PIC

Initial dam safety obligations:

1. Report to regional authority ($185)[18]
2. Check if PIC has been certified by a recognised engineer, and either approve or refuse PIC ($68)

Recurring dam safety obligations

3. Check if reviewed PIC has been certified by a recognised engineer, and either approve or refuse PIC ($131).

### Medium and high PIC

Initial dam safety obligations:

1. Report to regional authority ($93 - $185)
2. Check if PIC has been certified by a recognised engineer, and either approve or refuse PIC ($681 – $1,361)
3. Check if DSAP has been certified by a recognised engineer, and either approve or refuse DSAP ($171 - $5,442)

Recurring dam safety obligations (every five years):

4. Check if reviewed PIC has been certified by a recognised engineer, and either approve or refuse PIC ($547 - $1,306)
5. Check if reviewed DSAP has been certified by a recognised engineer, and either approve or refuse DSAP ($573).

[17] Administration costs include a combination of reporting to regional authority, checking PIC, checking DSAP, checking reviewed PIC and checking reviewed DSAP.

[18] Costings based on CBA case studies.

## 4.4 What other impacts is this approach likely to have?

The impact of the dam safety regulations on levels of risk will depend to a large extent on the response of the dam industry to the regulations and on how effective regional authorities are at monitoring and enforcing compliance.

Evidence provided from stakeholders during public consultation suggests that New Zealand may have a significant number of poorly managed dams. If the hazard that these dams represent is to be reduced, behaviours and asset management practices will need to change. The proposed regulations aim to change dam owner behaviour and create a regulatory environment that regularise sound asset management practices.

# Section 5: Stakeholder views

## 5.1 What do stakeholders think about the problem and the proposed solution?

A Technical Working Group was formed to aid the development and review of the proposed regulations. The group comprised of these key industry stakeholders:

- Otago Regional Council
- Waikato Regional Council
- The New Zealand Society on Large Dams
- Dam Safety Intelligence Ltd
- Irrigation New Zealand
- Meridian Energy
- Federated Farmers of New Zealand
- Ministry for the Environment
- Environment Canterbury
- University of Canterbury
- Dam Watch Ltd

The Technical Working Group is supportive of the intent of the proposed regulations and MBIE has sought its feedback from multiple engagements. The feedback has been used to ensure the proposed regulations are fit for purpose and was instrumental in developing the revised approach to regulating dam safety (Section 3.2 – Option 3).

During July and August 2019, MBIE publicly consulted on the proposed regulatory framework for dam safety. Consultation closed on 6 August, 2019.

In total 106 submissions were received from a range of dam sector stakeholders. These included farmers, local government, engineers, the irrigation and energy industry, individual submitters and iwi groups.

The majority of submitters were either dam owners or were involved in dam construction, maintenance and regulation. The largest number of submissions came from the rural sector, with owners and operators of irrigation dams making up most of these.

### A breakdown of submissions received

**Table 8: Breakdown of submitters by category (number)**

| Submitter category | Number |
|---|---|
| Farmers or farmer representative bodies | 36 |
| Local government | 22 |

| | |
|---|---|
| Engineers (individuals and companies) | 14 |
| Irrigation industry (non-farmers) | 11 |
| Dam owners (including representative bodies, but not including local government, farmers or irrigators) | 8 |
| Individual submitters (non-farmer and non-engineer) | 8 |
| Other interest groups | 4 |
| Iwi organisations | 3 |
| **Total** | **106** |

### Overview of submissions

The overview of submissions provides a summary of stakeholder feedback on the initial elements of the proposed dam safety regulations. Elements of the proposed approach have been modified as a result of stakeholder feedback, as discussed in Section 3.2 and Annex 1. Nearly all submitters were supportive of the intent of the proposed regulations.

### Dams that are included in the regulations

There was considerable comment received on the height and volume thresholds for inclusion in the dam safety regulatory system. The greatest disagreement related to the proposed 30,000 cubic metre volume threshold, which had no minimum height.

Many owners of small to medium dams considered that the proposed regulations represent a heavy-handed approach to the risks their dams pose. They suggested increases to the thresholds that had the effect of excluding their dams from the regulatory system.

Irrigation dams are frequently constructed using a “turkey nest” design. Excavated material from the centre of the reservoir is used to construct a dam around the circumference of the reservoir. This forms a water storage reservoir that is partially below ground level. Questions were raised by the owners of these dams as to how their volume should be measured.

Other small to medium dams include water supply dams, sewage treatment dams and flood detention dams. Flood detention dams are empty of water for the majority of the time. A number of the local authority owners of these dams were concerned about their inclusion and sought partial or full exclusion from the regulatory framework.

Response: MBIE has engaged with the Technical Working Group and its technical advisor to reassess the threshold for dam classification. Consequently, a new threshold has been created that includes clarification on how volume should be measured for irrigation ponds and adds a larger volume threshold with a minimum height (1 metre minimum height and 40,000 cubic metres) (Annex 1 refers). This means that fewer low risk dams will be captured and the regulations will be clearer. MBIE does not agree that flood detention dams should be exempted from the regulations as they still pose a large hazard to people, property and the environment when they contain water.

### Compliance costs

A variety of views were expressed about regulatory compliance costs. In general, dam owners who are already following the New Zealand Dam Safety Guidelines were less concerned about compliance costs. Other dam owners expressed stronger concerns.

Most large commercial dam owners follow the New Zealand Dam Safety Guidelines and have the asset management and information management systems in place to be able to comply with the proposed regulations. These dam owners were supportive of the need to regulate dam safety and were largely unconcerned about compliance costs.

Territorial authorities are significant dam owners. These dams include water supply dams, sewage treatment dams and flood detention dams. With some exceptions, councils do not follow the New Zealand Dam Safety Guidelines. Submissions from city and district councils raised concerns about the scale of the compliance costs to implement dam safety management systems for their dams. Many also commented that investment may be required to raise the resilience of their dams if the proposed regulations are brought into force.

Owners of irrigation dams (largely farmers) were concerned about regulatory compliance costs and stated that the proposed regulations have the potential to make irrigation dams uneconomic to construct or to operate.

Response: The proposed regulations are intended to ensure compliance costs are proportionate to the potential impact of the dam. Compliance costs will mainly affect owners that are not managing their assets to minimise the consequences of dam failure on people, property or the environment.

Many local authorities face funding pressures associated with aging infrastructure that needs to be renewed. This problem is more acute for smaller local authorities, many of which have small and declining rating bases. MBIE does not consider that this constitutes an argument for not regulating dam safety. The purpose of the dam safety regulations is to identify and manage risk. Some of the dams in question represent a significant risk to people, property and the environment downstream of them.

### 'Recognised engineer'

The majority of submitters thought that the list of engineering competencies in the discussion document lacked sufficient detail. Others suggested that the identified competencies were focussed on the wrong skills. It was recommended by most submitters that MBIE and Engineering New Zealand work together to refine the competencies.

Concern was expressed by many submitters that a lack of suitably trained and qualified engineers has the potential to be a bottleneck for implementation of the regulations. For many submitters this was a reason for adopting a longer implementation timeframe than the one proposed in the discussion document.

Response: MBIE has engaged with the Technical Working Group and its technical advisor to reassess the competencies required for a 'recognised engineer'. Subsequently, a new clearer set of engineering competencies are proposed that are more directly linked to the role being performed. Furthermore, a longer implementation timeframe has been proposed (Annex 1 refers).

### Understanding and assessing risk

A number of submitters thought that the approach to risk described in the discussion document was too narrow. An Iwi submitter commented on the need for cultural values to form part of a dam failure impact assessment.

Other submitters commented on the need for the inclusion of social well-being measures such as the presence of vulnerable populations within a dam's inundation zone.

Civil defence and emergency management (CDEM) organisations emphasised the need for emergency sector and wider community engagement when developing dam emergency response plans and asked whether more detail about emergency preparedness could be included in the regulations.

Response: MBIE has engaged with the Technical Working Group and its technical advisor to reassess the potential impact classification assessment (PIC). As a result, the revised PIC assessment includes schools, hospitals, aged care facilities and locations of high cultural and/or historic significance as factors that must be considered (Annex 1 refers).

Furthermore, the proposed dam safety assurance programme includes a requirement for an emergency preparedness plan and therefore MBIE considers the addition of more details to be unnecessary. A more appropriate approach would be to add material on best practice in emergency preparedness to the guidance material that will support the regulations. This guidance material could be developed in consultation with the Ministry of Civil Defence and Emergency Management.

### New Zealand Dam Safety Guidelines

A key concern voiced by large dam owners was overlap and duplication between the proposed regulations and the New Zealand Dam Safety Guidelines. These dam owners had considerable investment in dam safety management systems and wanted reassurance that being compliant with the Guidelines would mean that they were also compliant with the regulations.

Electricity generators manage their dams within the context of whole power schemes. These may include multiple dams linked by canals. The New Zealand Dam Safety Guidelines provide for dam safety management systems that are scheme wide. Some of these dam owners expressed concerns that the proposed regulatory framework has been designed for single dams and does not provide for scheme-wide safety systems.

Response: The dam safety assurance programme requirements have been designed to be applicable to a wide range of dams and owners, and to allow for scheme-wide dam safety management systems. The requirements set a minimum standard, but they are consistent with the Guidelines. MBIE will develop guidance material to assist owners of dams and engineers to develop their dam safety assurance programmes.

### Earthquake prone, flood prone and dangerous dams

Some submitters expressed concerns that the proposed thresholds for earthquake prone, flood prone and dangerous dams are less stringent than the thresholds in the Guidelines.

Owners of large dams were concerned about the potential to undermine the Guidelines over time, where the proposed regulations set safety standards that differ from the Guidelines.

A number of technical comments were made about how the thresholds are measured. The earthquake thresholds attracted the most comments, with requests for alignment between the dam safety earthquake thresholds and those in the Building Code.

Response: The definitions are based on New Zealand Structural Design Standard 1170 and will be used largely by engineers. They are technical in nature and are supported by the dam

engineering professional community. They are intended to provide a threshold for intervention, not a best practice performance standard. Owners of large dams will be able to set higher performance standards for their dams.

Guidance material will also be provided to assist owners of dams and regional authorities to understand and apply the definitions.

### Compliance systems and processes

A number of comments were made about the information requirements for the proposed regulations. These included unnecessary duplication of information between forms and review frequencies being too high. An important concern for many dam owners was the requirement to display a copy of the dam's annual compliance certificate on the dam itself. Most dams do not have an enclosed space or structure on which to fix a certificate and many owners found this requirement excessively bureaucratic.

Response: MBIE has engaged with the Technical Working Group and its technical advisor to reassess the information requirements for the proposed regulations. The forms have been amended to reduce duplication of information and to make them less onerous to use.
MBIE also proposes to seek an amendment to the Building Act requirement to a display an annual compliance certificate on a dam (Annex 1 refers).

# Section 6: Implementation and operation

## 6.1 How will the new arrangements be given effect?

The proposed regulations will be drafted and given effect through an Order in Council.

Proposed changes will be communicated through public communications (e.g. Ministerial press release) and targeted communications to the industry and stakeholders.

Guidance material will be produced for local authorities to assist implementation. Guidance material for dam owners is also proposed, to improve their understanding of the requirements.

### Engineering sector capacity

Regional authorities will be responsible for the ongoing operation and enforcement of the regulations. Regional authorities and other stakeholders have expressed concern that engineering capacity constraints have the potential to delay compliance with the regulations. MBIE has worked with industry bodies, including Engineering New Zealand, and developed a revised set of competency requirements for the definition of a 'recognised engineer' to help foster and clarify engineering capacity. The capacity of the dam engineering sector will also grow over time.

### Timeframe for implementation

MBIE has determined that a 24 month implementation period will be feasible for dam owners and regulators to comply with and prepare for.

### Overlap with the Resource Management Act

Regional authorities have attached dam safety conditions to some resource consents and regulations made under the Building Act may duplicate some of these conditions.

Owners of dams have the ability under section 127 of the Resource Management Act (RMA) to apply for a change or cancellation of a consent condition. Additionally, in a small sample of resource consents for dams processed between 2005 and 2015, most consents provided for a council-initiated review of conditions under section 128 of the RMA. Any council-led review could result in the removal of conditions relating to dam safety that are covered by the regulations under the Building Act.

# Section 7: Monitoring, evaluation and review

## 7.1 How will the impact of the new arrangements be monitored?

Regional authorities are required to collect information from owners of 'classifiable' dams based on prescribed criteria and standards, and maintain regional dam registers. MBIE will use these data to monitor change in the sector and compliance with the regulations. As data are collected, MBIE will develop a better understanding of the conditions, locations, ownership arrangements and the general states of unsafe dams, and how they are changing.

## 7.2 When and how will the new arrangements be reviewed?

In order to assess the efficacy of amendments to the dam safety regulations, a formal post-implementation review is planned for two years after implementation. A review would likely include:

- compliance rates,
- the reported practicality and compliance costs of the dam owner obligations as reported by dam owners,
- the reported practicality and compliance costs of the regional council actions as reported by regional councils,
- a comparison of the condition of dams pre- and post-implementation of regulations; and
- the number of "known dams" captured by the proposed regulations.

As part of the proposed regulations' reporting requirements, owners of dam will be required to supply information about their dams to regional authorities. This information can be used to update the New Zealand Inventory of Dams and will subsequently allow a more accurate assessment of the number of "known dams" captured by the proposed regulations.

The earthquake and flood standards are derived from the NZS Building Standards (1170.5). There will be an opportunity to review definitions used in these standards when 1170.5 is reviewed by MBIE at a later date.

# Annex 1: Comparison of Option 2 and Option 3

**Option 2 –** Mandatory regulation of dam safety management under the Building Act, with all elements that were consulted on during public consultation.

**Option 3 –** Mandatory regulation of dam safety management under the Building Act, with revised elements based on stakeholder feedback.

## A dam classification threshold

All owners of dams will be required to assess whether their dam is classifiable against a classification threshold (height of the dam and volume of the reservoir at its peak operating level).

If a dam meets the classification threshold, owners are required to notify the local regional authority of the size and location of the dam. If the dam does not meet the threshold, no further action will be required. The purpose of the size threshold is to exclude owners of smaller dams from further obligations, and thus minimise compliance costs.

Most submitters supported the consultation document proposal (Option 2a) that dams exceeding 4 metres in height and 20,000 cubic metres in volume should be classifiable. However, many submitters did not agree with an additional proposal to include a 30,000 cubic metre volume threshold without a minimum height and expressed the view that it will capture a number of low risk structures such as wetland weirs and irrigation dams (Option 2b).

Based on analysis of the New Zealand Inventory of Dams, a classification threshold of at or above 4 metres in height and 20,000 or more cubic metres volume of water or other fluid, or 1 metre in height but at or more than 40,000 or more cubic metres volume of water or other fluid, would capture approximately 900 dams (Option 3). This would represent approximately 27 percent of the 3,284 known dams including all high potential impact dams, but would exclude many low risk structures such as wetland weirs and irrigation dams.

Owners of irrigation ponds commented that their dams are built by excavation and that they are partly below ground, therefore it is necessary to include clarification on how volume should be measured for irrigation ponds (Option 3c).

| Option 2 | Option 3 (preferred) |
|---|---|
| a classifiable dam meets or exceeds the following classification thresholds:<br>a) 4 metres minimum dam height and 20,000 cubic metres volume of water or other fluid; OR<br>b) a height of less than 4 metres and 30,000 cubic metres volume of water or other fluid. | a classifiable dam meets or exceeds the following classification thresholds:<br>a) 4 metres minimum dam height and 20,000 cubic metres volume of water or other fluid; OR<br>b) 1 metre minimum dam height and 40,000 cubic metres volume of water or other fluid; AND<br>c) Stored water that is lower than natural ground level at the downstream (or outside) toe of the dam structure at its maximum height shall not form part of the volume |

| | |
|---|---|
| | calculation. |

## A potential impact classification assessment

Owners of classifiable dams will be required to assess the impact of a hypothetical dam failure. The assessment will result in a potential impact classification, which is an estimate of the likely impact a dam failure would have on populations, property and the environment downstream of the dam. Dams would receive an impact classification of either low, medium or high.

This assessment must be certified by a 'recognised engineer' who states that the classification of the dam meets the prescribed criteria and standards for dam safety. A dam's impact classification is critical information for owners of dams and for dam regulators, as it forms the basis for ongoing operational safety and maintenance requirements.

As part of the procedure of assessing a dam's potential impact classification, a 'recognised engineer' must determine the damage a dam failure may cause. The assessed damage level is not necessarily directly proportionate to the potential impact classification, but rather it is used in conjunction with the determination of the size of given nearby populations at risk and the likelihood that they will be harmed; this is represented in a different table (Annex 3). Together these determinations will guide the potential impact classification.

**Option 2 –** Determination of assessed damage level *excluding* schools, hospitals, aged care facilities and locations of high cultural and/or historic significance

| **Damage Level** | **Specified categories** | | | | |
|---|---|---|---|---|---|
| | Residential houses | Critical or major infrastructure | | Natural environment | Community recovery time |
| | | Damage | Time to restore to operation | | |
| Catastrophic | More than 50 houses destroyed | Extensive and widespread destruction of and damage to several major infrastructure components | More than 1 year | Extensive and widespread damage | Many years |
| Major | 4 to 49 houses destroyed and a number of houses damaged | Extensive destruction of and damage to more than 1 major infrastructure component | Up to 12 months | Heavy damage and costly restoration | Years |
| Moderate | 1 to 3 houses destroyed and some damaged | Significant damage to at least 1 major infrastructure component | Up to 3 months | Significant but recoverable damage | Months |
| Minimal | Minor damage | Minor damage to major infrastructure components | Up to 1 week | Short-term damage | Days to weeks |

**Option 3 (preferred) –** Determination of assessed damage level *including* schools, hospitals, aged care facilities and locations of high cultural and/or historic significance

| Damage Level | Specified categories | | | | | |
|---|---|---|---|---|---|---|
| | Community | Cultural | Critical or major infrastructure | | Natural environment | Community recovery time |
| | | | Damage | Time to restore to operation | | |
| Catastrophic | More than 50 houses destroyed<br>Destruction of a school, hospital or rest home with loss of life | Destruction of one or more sites of major (national) historical or cultural significance | Extensive and widespread destruction of and damage to several major infrastructure components | More than 1 year | Extensive and widespread damage | Many years |
| Major | 4 to 49 houses destroyed serious damage to a school, hospital or rest home | Destruction or serious damage to one or more sites of local or regional historical or cultural significance | Extensive destruction of and damage to more than 1 major infrastructure component | Up to 12 months | Heavy damage and costly restoration | Years |
| Moderate | 1 to 3 houses destroyed and some damaged<br>A school, hospital or rest home needs to be evacuated | Serious damage to a historic or cultural site of importance to a local community | Significant damage to at least 1 major infrastructure component | Up to 3 months | Significant but recoverable damage | Months |
| Minimal | Minor damage | Minor damage | Minor damage to major infrastructure components | Up to 1 week | Short-term damage | Days to weeks |

## A definition for a 'recognised engineer'

The Building Act requires that a potential impact classification and a dam safety assurance plan must be signed off by a 'recognised engineer'. The dam owner's compliance with a dam safety assurance plan must also be verified annually and signed off by a 'recognised engineer'.

The Building Act requires that a 'recognised engineer' is registered under the Chartered Professional Engineers of New Zealand Act 2002 and has prescribed qualifications and competencies related to dam construction and safety management and planning.

The ‘recognised engineer’ competencies attracted the greatest number of comments from submitters during the public consultation. Concerns included that the engineering competencies were not well enough specified and that they were not consistent with the engineering tasks being performed.

MBIE has undertaken further work on the competency requirements for ‘recognised engineers’ in partnership with Engineering New Zealand and the New Zealand Society of Large Dams.

The different options for a definition of a ‘recognised engineer’ involve the competencies that a ‘recognised engineer’ must possess.

The engineering competencies as proposed in Option 3 are more directly linked to the regulatory role that is being performed. ‘Recognised engineers’ will not be required to demonstrate competencies that do not relate directly to auditing and certification of dam safety management systems.

| **Option 2** | **Option 3 (preferred)** |
|---|---|
| A ‘recognised engineer’ is an engineer that is required to have the following competencies:<br>• geotechnical principles<br>• design principles including structural, geotechnical, seismic, hydrologic and hydraulic principles<br>• dam construction techniques<br>• operation and maintenance of dams<br>• surveillance processes<br>• response to dam safety issues<br>• emergency planning and emergency response<br>• resolution of potential dam safety deficiencies<br>• dam safety critical plant systems. | A ‘recognised engineer’ is an engineer that is required to have the following competencies:<br>1. Preparation and review of potential impact classifications, including:<br>• Dam classification system<br>• Dam break flood hazard assessment<br>• Consequence assessment.<br>2. Preparation, implementation and review of dam safety assurance programmes, including:<br>• Dam and reservoir operation and maintenance<br>• Surveillance<br>• Appurtenant structures and gate and valve systems<br>• Intermediate dam safety reviews<br>• Comprehensive dam safety reviews<br>• Emergency preparedness<br>• Identifying and managing dam safety issues.<br>3. Audit of dam safety management systems and dam owners’ compliance with dam safety assurance programmes. |

## Implementation timeframe

The majority of submitters disagreed with the 12 month implementation timeframe proposed in the discussion document (Option 2). The most common concern raised was that the industry does not have the capacity to complete the required potential impact classifications and dam safety assurance programmes within this timeframe.

MBIE proposes that the timeframe between gazetting of the regulations and their coming into force be 24 months (Option 3). The exact implementation date will be determined during 2020 as regulations are being drafted.

| Option 2 | Option 3 (preferred) |
|---|---|
| The proposed date for regulations to come into force is 12 months from the date that they are gazetted. | The proposed date for regulations to come into force is 24 months from the date that they are gazetted. |

# Information requirements

## Forms

The consultation document contained proposed forms for supporting compliance with the regulations. Some submitters identified duplication of information and unnecessary detail in the proposed forms. These forms included a dam classification certificate, dam safety assurance programme and an annual dam compliance certificate.

MBIE proposes to revise the initial information requirements to reduce duplication and detail (Option 3).

| Option 2 | Option 3 (preferred) |
|---|---|
| Retain information requirements in forms as presented in discussion document. | Alter information requirements in forms to reduce duplication and detail. |

## Displaying a dam compliance certificate

The Building Act requires a dam owner to display an annual compliance certificate on the dam itself. Dam owners commented that in most cases this is impractical. They also commented that because there is no public access to most dams, the requirement is purposeless.

The requirement to display an annual compliance certificate on the dam is a Building Act requirement, which cannot be amended by regulations. An owner who fails to comply with this requirement may be fined up to $5,000.

Removing the requirement to display an annual compliance certificate on the dam would resolve a concern of many dam owners while having a negligible impact on regulatory compliance. MBIE proposes to seek an amendment to this requirement as part of current reforms to the Act.

| Option 2 | Option 3 (preferred) |
|---|---|
| Retain requirement to display annual compliance certificate on dam. | Remove the requirement to display annual compliance certificate on dam. |

# Annex 2: Characteristics of case study dams

## Dam A – Medium potential impact (PIC), council water supply dam

Dam A comprises two reservoirs which provide water supply to a township. The total storage capacity is 917,000 $m^3$. The height of both dams is approximately 12 metres.

The dam has a resource consent for taking water, which is due to expire in 2032. There is currently no water permit for the damming of water.

The downstream catchment of the dam largely contains rural land uses. This is predominantly sheep and beef, with some dairy and horticulture. A town is located approximately 5 km downstream of the dam.

## Dam B – Low PIC, farm irrigator

Dam B comprises two storage dams used for farm irrigation. The dams have embankment heights of 11 and 14 metres and store approximately 320,000 $m^3$. The potential impact classification (PIC) of the dams has been determined as low.

The dams have various resource consents relating to it. The land use consent which provides for the construction of the dam contains conditions which require continual observation of the New Zealand Society on Large Dams Guidelines (the Guidelines) on Inspecting Small Dams. The water permit to dam the water behind the dam does not contain conditions.

The immediate downstream catchment is rural and contains agricultural land uses.

## Dam C – Medium PIC, council water supply dam

Dam C is a municipal water supply dam. The embankment dam is 3 metres high and 200 metres long which retains a reservoir of over 200,000 $m^3$. The dam is old and has been through various modifications in its lifetime.

The age of the dam means it was not consented under the Building Act 2004. The dam is the subject of a resource consent (water permit) under the RMA which contains conditions relating to:

- completion of a PIC (which is required to be made available to the regional council)
- a dam safety assurance programme and provision of surveillance and review documentation to the regional council every 5 years
- the regional council's ability to review the conditions of the resource consent every 5 years.

The resource consent expires in 2039.

The immediate downstream catchment contains dwellings in a semi-rural environment and beyond this industrial land uses and a residential area.

## Dam D – Medium PIC, irrigation scheme dam

Dam D is a proposed storage dam for an irrigation scheme. The pond will store a large volume of water and the embankment height will be up to 10 metres. As part of the resource consent requirements for this dam, the PIC has been determined to be medium.

The immediate downstream catchment is rural.

## Dam E – High PIC, hydro dam

Dam E is a hydro dam, which is approximately 70 metres high. The PIC of this dam has been determined to be high. The dam is operated in a manner compliant with the Guidelines.

The dam's construction pre-dated the Building Act and the RMA. However its current resource consents include conditions relating to dam safety requirements. In particular these conditions require:

- That safety shall be managed in accordance with the principles of the Dam Safety Guidelines issued by the New Zealand Society on Large Dams.
- Annual certification of the safety of the dam.
- The completion of independent safety assessments every five years.

# Annex 3: Table used to determine potential impact classification

**Table 9: Determination of potential impact classification**

| Assessed damage level | Population at risk (the number of people likely to be affected by inundation) | | | |
|---|---|---|---|---|
| | **0** | **1 to 10** | **11 to 100** | **More than 100** |
| Catastrophic | High potential impact | High | High | High |
| Major | Medium potential impact | Medium/High (see note 4) | High | High |
| Moderate | Low potential impact | Low/Medium/High (see notes 3, and 4) | Medium/High (see note 4) | Medium/High (see notes 2 and 4) |
| Minimal | Low potential impact | Low/Medium/High (see notes 1, 3, and 4) | Low/Medium/High (see notes 1, 3, and 4) | Low/Medium/High (see notes 1, 3, and 4) |

**Notes:**

1. With the population at risk at 5 or more people, it is unlikely that the potential impact will be Low.

2. With the population at risk at more than 100 people, it is unlikely that the potential impact will be Medium.

3. Use a Medium classification if it is highly likely that a life will be lost.

4. Use a High classification if it is highly likely that 2 or more lives will be lost.