Australian Government
National Capital Authority

SCRIVENER DAM DISSIPATOR STRENGTHENING PROJECT

CANBERRA, AUSTRALIAN CAPITAL TERRITORY

Statement of Evidence to the Parliamentary Standing Committee on Public Works

NATIONAL CAPITAL AUTHORITY

2023

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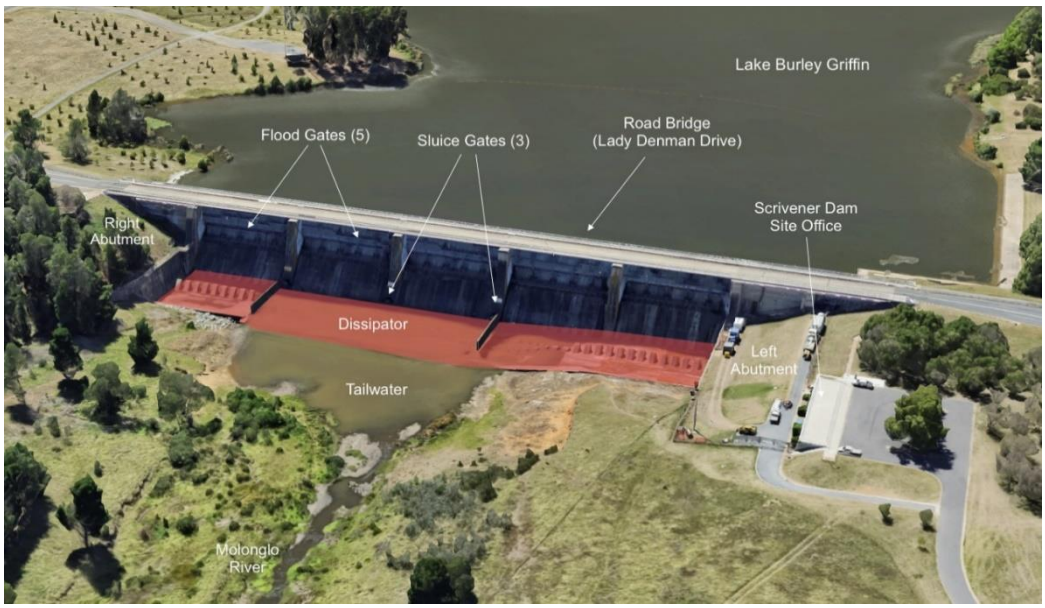
Scrivener Dam Dissipator Strengthening Project

The purpose of this Statement of Evidence is to provide information to the Australian public to comment on, and the Parliamentary Standing Committee on Public Works to enquire into the works proposed under the Scrivener Dam Dissipator Strengthening Project (the Project).

Executive Summary

Scrivener Dam is a concrete gravity dam. The design and mass of the dam retains the water which forms Lake Burly Griffin. The Dam is equipped with five flood gates and three sluice gates, all of which are used to control the water level in Lake Burley Griffin.

The spillway located immediately downstream of the dam includes a dissipator structure. The dissipator is a concrete structure comprising of a horizontal concrete slab, protruding concrete slopes (chute blocks) and vertical concrete blocks (baffle blocks) on either side of the horizontal concrete slab. The dissipator absorbs the energy of the water flowing over the flood gates and prevents potentially damaging erosion in the river channel downstream of the dam—the chute and baffle blocks disperse water and reduce the impact of water pouring over the horizontal concrete slab structure.



The dam is owned and managed by the National Capital Authority (NCA) on behalf of the Commonwealth Government. It is a National Engineering Landmark and is on the Register of National Estate, ranked fifth of 25 dams in Australia with heritage listing. It was built in the 1960s in conjunction with a series of lake walls and bridges that were specifically designed to alter the shape and form of the Molonglo River to create Lake Burley Griffin, the centre piece of the planned capital, Canberra.

The dam plays a critical role in controlling the flow of water and managing the risk of floods by controlling water levels at a consistent rate, that in turn protects the residents of Canberra from flooding and downstream areas from sudden fluctuations in water flows. While Scrivener Dam has had regular maintenance, the structure has not undergone any significant strengthening works since it was first built

Recent studies commissioned by NCA have identified the need to strengthen the Scrivener Dam Dissipator. NCA worked with the University of New South Wales Water Research Laboratory (UNSW WRL), and the Dam Safety Engineers (SMEC) to design, construct and test a scale model of Scrivener Dam. The model and other investigative methods were used to ascertain how the dam and its environs function under a range of operational scenarios.

The modelling and subsequent assessments identified structural concerns with the dissipator:

- The current concrete slabs experience uplifted pressure due to water pressure under the slabs.
- Pressure fluctuations could cause movement between the concrete dissipator slabs.
- Given the age of the existing structure, existing steel anchoring for the concrete slabs are likely in an advanced state of corrosion.

There is the potential for the dissipator to be significantly damaged during a major flood event, which in turn, could lead to the failure and subsequent collapse of Scrivener Dam. In 2022-2023 Budget, the Government provided funding to address this risk.

The current condition of the dam has been reviewed by leading dam experts in Australia and a concept design has been developed to address the structural concerns raised.

The NCA seeks approval from the Public Works Committee to proceed with a project to strengthen the existing Scrivener Dam dissipator by:

- Stabilising the existing horizontal concrete slab of the dissipater by installing approximately 700 new anchor points to natural ground (10 to 20 meters deep).
- Increasing the thickness of the horizontal concrete slab of the dissipator by half a meter.
- Installing new vertical concrete blocks (baffle blocks) to match the increased thickness of the concrete slab.

- Reinforcing the adjacent riverbanks downstream of the dam to minimise soil erosion that could lead to failure of the dissipater structure.

When complete, the dissipater structure (and the dam) will continue to be monitored by the NCA appointed dam safety experts to ensure the dam structure operates safely.

The total funding appropriated for the proposed works is $38.5 million (excluding GST). This includes procurement costs, construction related costs, project management including dam experts, and contingencies against both known and unknown project risks.

A Lump Sum (fixed fee), competitively tendered contract model is proposed. This best aligns with the defined outcomes and nature of the scope of this construction project. A fixed fee contract minimises project delivery risks to the Commonwealth and provides cost certainty on an upfront agreed price.

Delivery of the project will be monitored by the appointed project management team and established project Governance arrangements. All construction works will be in accordance with the relevant legislation, standards, codes and guidelines.

NCA will also inform the Joint Standing Committee on the National Capital and External Territories of project progress.

NCA has engaged proactively with relevant stakeholders, businesses and commercial operators, organisations and ACT Government departments regarding the project and will continue to do so over the course of the project.

Environmental and heritage investigations have been undertaken by third party environmental and heritage experts. The investigations have concluded the Project will not have significant environmental or heritage impacts.

No revenue is expected to be generated by these works. The Project will promote opportunities for Australian businesses through construction trade packages, providing potential employment opportunities.

1. Project Title

1.1 National Capital Authority, Scrivener Dam Dissipator Strengthening Project (the Project).

2. National Capital Authority

2.1 The National Capital Authority (NCA) is a non-corporate Australian Government agency established under the Australian Capital Territory (Planning and Land Management) Act 1988 (the PALM Act) for the delivery of the functions set out in Section 6 of the PALM Act.

2.2 The NCA seeks approval from the Public Works Committee to proceed with the tender and construction for the Project.

3. Context

About Scrivener Dam

3.1 Scrivener Dam is constructed on the Molonglo River and creates Lake Burley Griffin – an ornamental and recreational water body which forms the architectural centrepiece of Walter Burley Griffin and Marion Mahony Griffin's vision for Canberra. Originally named 'Canberra Lake' and 'Canberra Lake Dam', both the lake and dam were later renamed 'Lake Burley Griffin' and 'Scrivener Dam', in recognition respectively of Walter Burley Griffin and Charles Robert Scrivener.

3.2 In 1909 Scrivener recommended to the Australian parliament that Canberra be selected as the site for Australia's capital city and suggested that an artificial lake be created by damming the Molonglo River. In 1912 Griffin won an international competition for the town planning of Canberra and his plan included a chain of ornamental water features along the Molonglo River flood plain.

3.3 The dam was designed in the late 1950's for the National Capital Development Commission (NCDC) by the Commonwealth Department of Works, Major Development Division. The construction of the dam commenced in 1960 and was completed in 1963. The sluice valves were closed on 20 September 1963 by the Honourable Sir Gordon Freeth M.P. to officially commence storing water in the lake. The completion of the Lake was officially commemorated by the Prime Minister of the day, Sir Robert Menzies, on 17 October 1964.

3.4 Lake Burley Griffin was included on the Commonwealth Heritage list in 2022. The listing also extends to adjacent lands including Scrivener Dam.

3.5 The dam is classified as a 'Large' dam in accordance with standards published by the International Commission on Large Dams (ICOLD). This classification has been determined based on the height of the dam and the volume of water stored in the reservoir behind the dam.

3.6 Scrivener Dam has been assessed as a 'High C' Hazard Category dam in accordance with the guidelines issued by the Australian National Committee on Large Dams (ANCOLD). The hazard category rating for a dam is determined primarily based on the population at risk and potential loss of life resulting from a failure of the dam.

3.7 The Dam is specifically designed to maintain the level of Lake Burley Griffin at a constant level of 555.93 metres above sea level (+/- 150mm).

Management and Governance

3.8 The NCA has established ae Dam Safety Management Plan (DSMP) which encompasses the dam safety code, dam safety policy, and individual task assignments to ensure that NCA manages Scrivener Dam in accordance with relevant codes and standards, including the ACT Dam Safety Code.

3.9 The NCA's Dam Safety Team (DST) includes the Manager, Lake and Dam, the Operations and Maintenance Contractor and the Dam Safety Engineer. The DST is responsible for operational decision making for the dam.

3.10 The Dam Safety Engineer is engaged to provide independent specialist advice on dam safety matters.

3.11 The management and governance framework for Scrivener Dam is outlined in Figure 1 below.

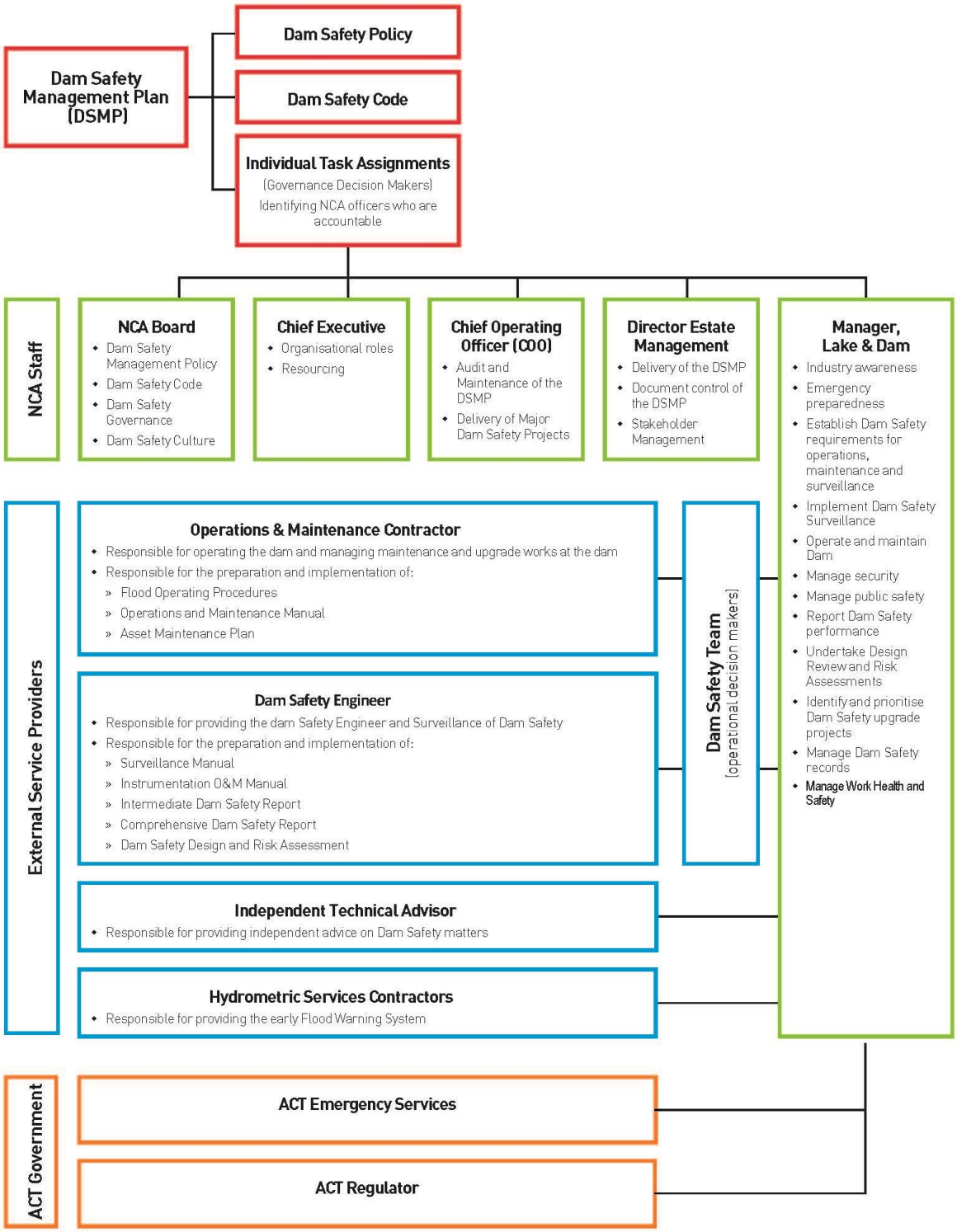
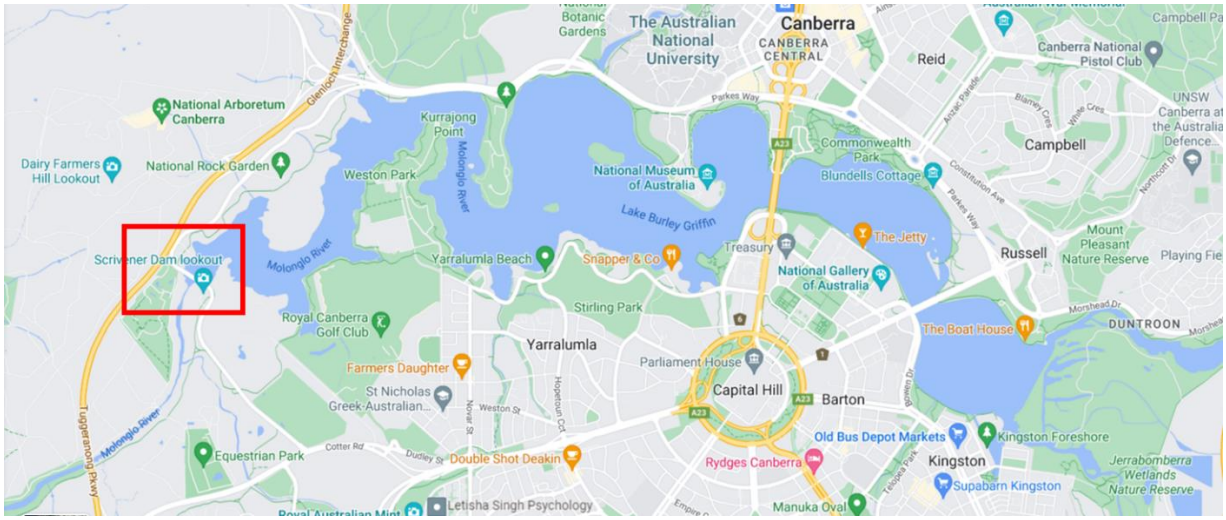
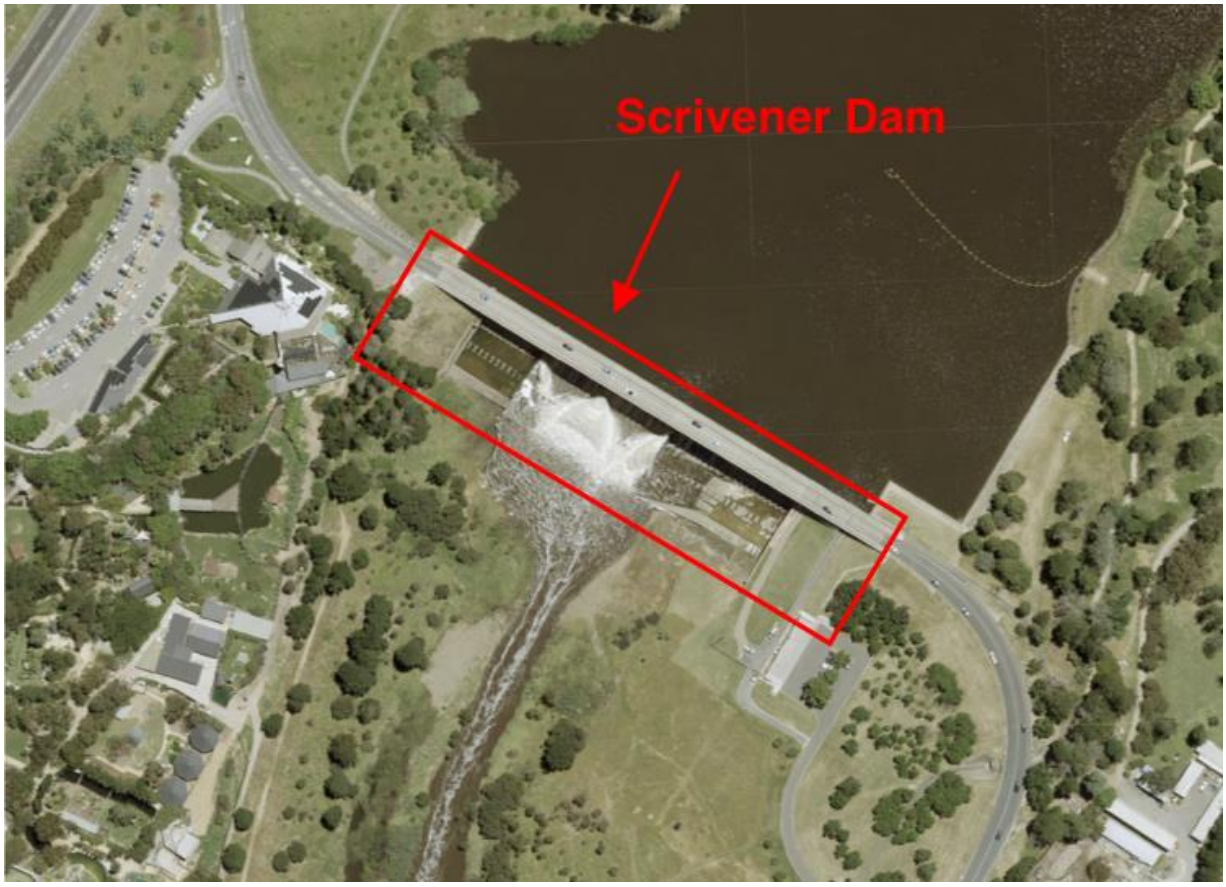


Figure 1: Scrivener Dam Management and Governance Structure

Location

3.12 Scrivener Dam is located on the Molonglo River Corridor in the Canberra suburb of Yarralumla. The dam is bridged by Lady Denman Drive and located adjacent to Government House and the National Zoo and Aquarium.





Land Custodianship

3.13 Scrivener Dam and Lake Burley Griffin are owned and managed by the National Capital Authority (NCA) on behalf of the Commonwealth Government. The areas surrounding the Dam are under the custodianship of several landowners as indicated in Figure 2 below:

Figure 2: Land Custodian Boundaries

Scrivener Dam Structure and Operation

3.14 Scrivener Dam is a concrete gravity dam constructed from roughly 55,000 cubic metres of concrete. The dam is 25m in height with a crest length of 235m. The outlet works of the dam consist of three sluice valves located in the central part of the spillway, and five fish-belly flap gates/flood gates located along the top of the spillway. The piers separating the spillway bays support a two-lane road bridge for Lady Denman Drive.

A pictorial overview of Scrivener Dam is shown in Figure 3 below.

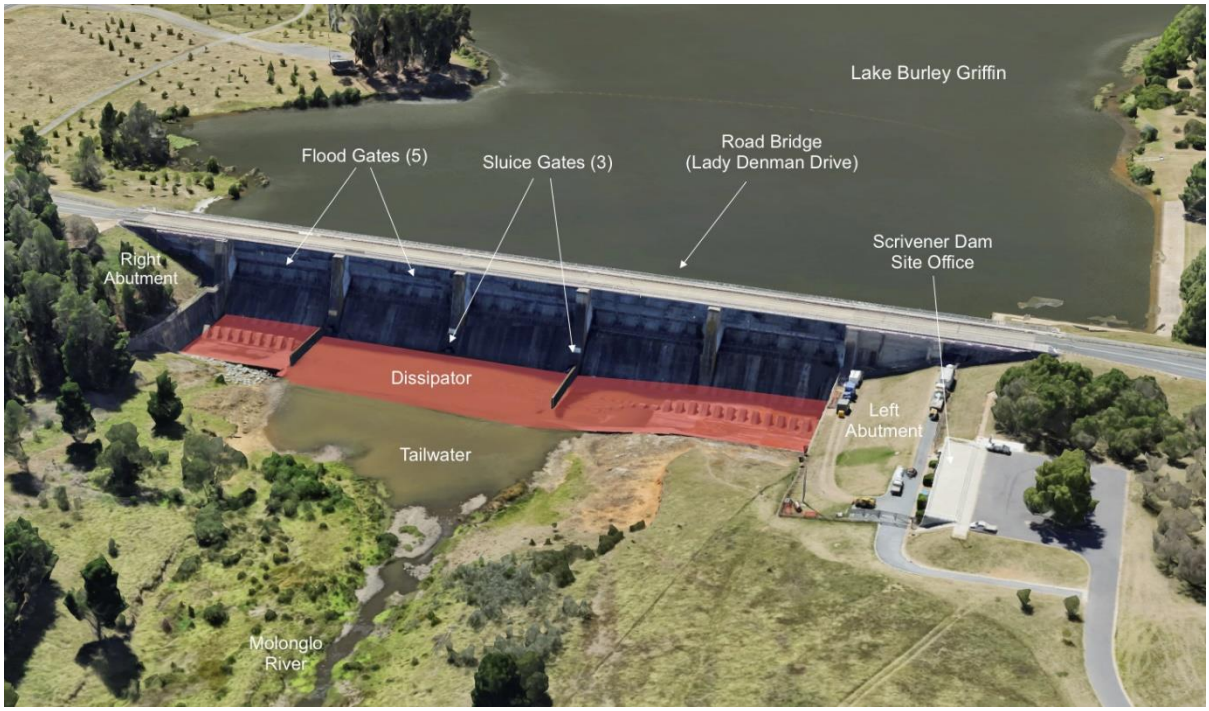


Figure 3: Scrivener Dam Structure

3.15 The dam is operated to maintain the level of the Lake within a narrow tolerance. The water levels are maintained at full supply level through use of two independent water release systems.

Sluice Gates – Water is released using the three low level sluice gates for day-to-day water releases of up to 56 cubic metres of water per second (cumecs). Each sluice gate can release roughly 19 cumecs when fully open.

Flood Gates – During significant weather events, water is released using flood gates along the top of the spillway. The flood gates are hydraulically controlled to allow water to spill over the top of the flood gates into the dissipator structure below. In the fully open position, all five flood gates can release up to 9,600 cumecs.

3.16 The water released through the sluice gates and flood gates possesses tremendous kinetic energy. If uncontrolled, the water has the potential to significantly erode unprotected areas downstream of the dam. Such erosion, in turn, could undermine the foundations and cause failure of the dam. Accordingly, the dam has been constructed with an energy dissipator structure located immediately downstream to protect against this erosion and damage.

Scrivener Dam Dissipator

3.17 The existing dissipator of Scrivener Dam consists of the following components:

- A 900mm thick reinforced concrete slab and anchors
- Chute blocks design to direct the flow of water flowing over the flood gates towards the baffle blocks.
- Baffle blocks to dissipate the kinetic energy of water plunging into the dissipator.
- End sill to increase the depth of water in the dissipator basin
- Drainage System to allow drainage of water under the dissipator slab and reduce uplift pressure.

3.18 Together, the chute blocks, baffle blocks and end sill effectively reduce the kinetic energy of water releases and minimise potentially damaging erosion downstream of the dam. A pictorial overview of the Dissipator components is show on Figure 4.

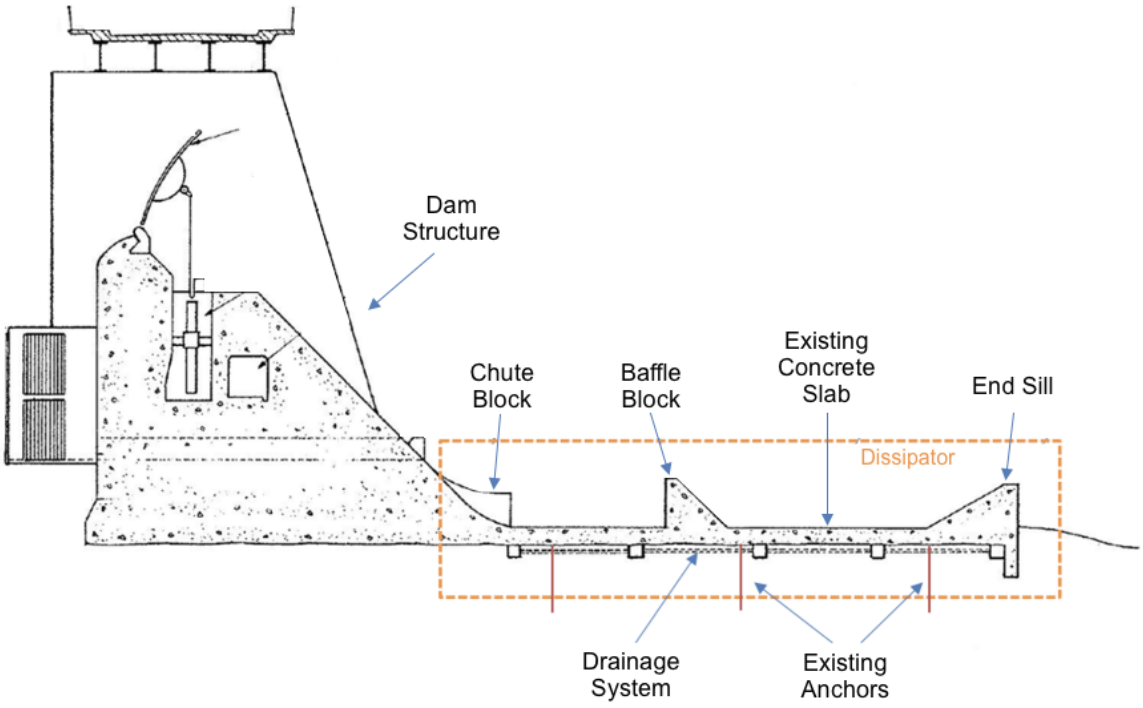


Figure 4: Scrivener Dam Dissipator

4. Need for the Works

Project Background

4.1 A detailed design review of Scrivener Dam was undertaken by the Dam Safety Engineer in 2014 and was again reviewed in 2016. The review identified several risks associated with the stability of the dissipator structure under flood conditions. The review noted that if the drainage system does not function as intended and significant uplift pressures develop, the dissipator slabs could lift – which could ultimately lead to the failure of the dam.

4.2 During routine inspections of the dam in 2015, gaseous bubbles were observed to be coming through the dissipator slab joints. This highlighted the fact that none of the concrete slab joints were constructed with water stops. This could allow water to move through the joints in the slab, creating voids and uplift pressures on the underside of the dissipator. These pressures could in turn cause damage or destruction of the dissipator.

Some images of the bubbles travelling through the slab are shown on Figures 5 and 6.

Figure 5: Bubbling between the Dissipator slab joints

Figure 6: Close up bubbling between the dissipator slab joints

Scrivener Dam 1:40 Physical Hydraulic Model

4.3 In order to better understand the differential and transient pressures generated in the dissipator, the NCA commissioned the UNSW Water Research Laboratory (WRL) to build and study a 1:40 physical hydraulic model of Scrivener Dam. The model was used to understand how the dam functioned under a range of different operational scenarios.

Figures 7, 8 and 9 show a few perspectives of the Scale Model.

Figure 7: Physical Hydraulic Model view from upstream

Figure 8: Physical Hydraulic Model view from downstream

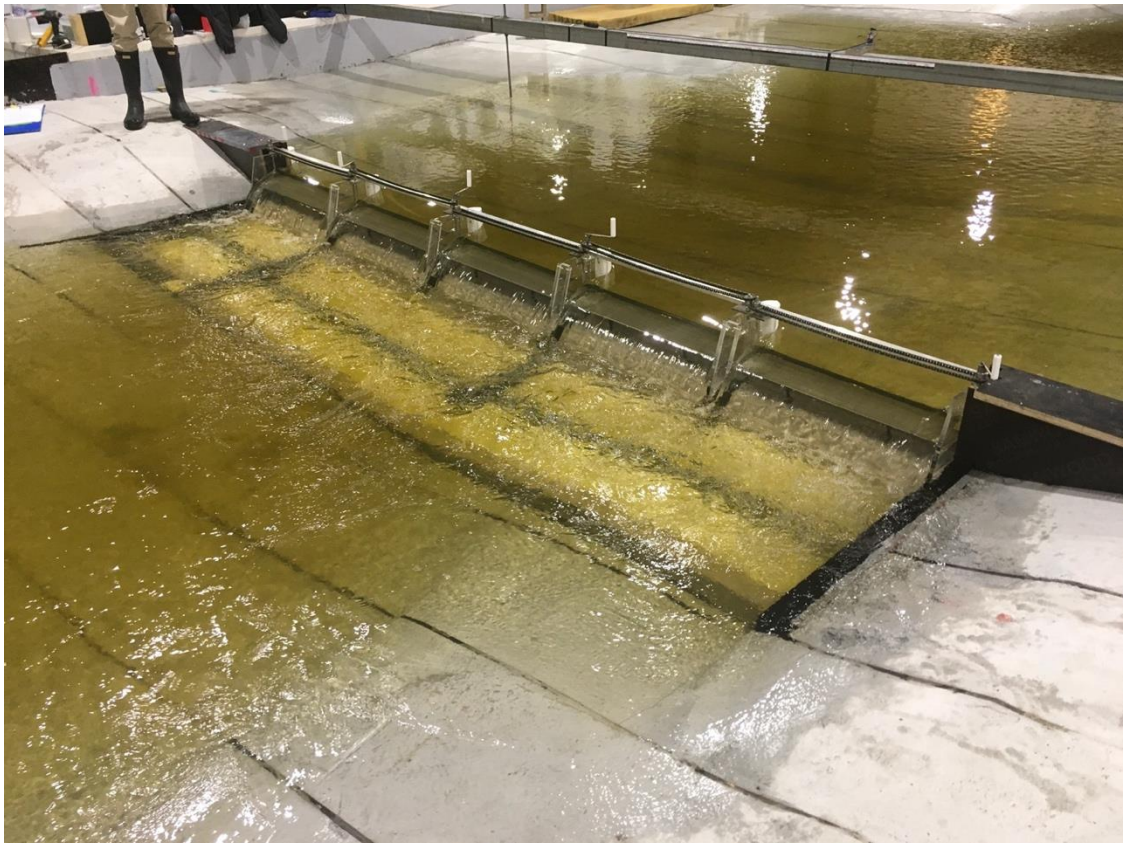


Figure 9: Physical Hydraulic Model view of the dam

4.4 The modelling project found that the uplift pressures and transient pressures developed in the dissipator were of such magnitude and frequency that the dissipator could fail under certain operational conditions.

4.5 Furthermore, the study identified very strong recirculation in the river downstream of the dam which could cause damaging erosion to the downstream abutments of the dam in the extreme flood conditions.

4.6 Following review by the Dam Safety Engineer, it was recommended that a project be undertaken to strengthen the dissipator of the dam to minimise risk to the safety of the dam during flood operations.

Purpose of the Works

4.7 The purpose of the proposed works is to strengthen the Scrivener Dam dissipator to rectify known structural deficiencies and to ensure ongoing safe operation of the dam for the next 100 years.

4.8 The key objectives of the works are as follows:

- Anchor the dissipator slab to prevent damage and uplift of the structure during flood operations.
- Strengthen the dissipator slab to prevent damage from transient pressures during flood operations.
- Install new erosion protection on the downstream abutments of the dam to minimise risk of erosion of these areas during flood operations.

Options Assessment

4.9 In 2021, The NCA engaged an engineering consultant to undertake an options assessment to identify possible remedial options to strengthen the dissipator.

4.10 The concept design consultant identified 11 potential options to strengthen the dam. The potential options were as follows:

- Option 1 – Do nothing
- Option 2 – Concrete overlay slab with no additional anchors
- Option 3 a, b and c – Overlay slab with new anchors (varying thickness of overlay slab)
- Option 4 – Retrofit anchors and no new concrete overlay slab
- Option 5 – Lengthen the stilling basin
- Option 6 – New tailwater control weir downstream of dissipator
- Option 7 – Change flood gate operating rules (no other changes)
- Option 8 – Deepen stilling basin in bays 1, 4 and 5
- Option 9 – Partial demolition of existing slab, new anchors and reconstruct slab

4.11 NCA, together with the concept design consultant, Dam Safety Engineer and independent peer reviewer, considered all options presented. Following review, three options were shortlisted for further development, as follows:

- Option 3 – Overlay slab with new anchors
- Option 4 – Retrofit anchors with no new overlay slab

- Option 9 – Partial demolition of existing slab, new anchors and reconstruct slab

4.12 Each of the preferred options were developed further for consideration. A Multi Criteria Analysis was undertaken to assess the preferred options against the following:

- Technical merit and ability to meet project requirements
- Constructability
- Cost
- Operation and maintenance requirements
- Other aspects, including impact to operations of the dam during construction.

4.13 Following the assessment, and associated discussions, Option 3 – Overlay slab with new anchors, was determined to be the preferred method to address the requirements of the project.

4.14 The Scrivener Dam Dissipator Strengthening Options Report is included at Appendix A: Design Options Report, which contains the information and details relating to the options considered and the selection process.

Concept Design

4.15 Following the options assessment, the concept design consultant developed the preferred option to concept stage. The concept design included:

- Anchors - installation of approximately 700 new anchors into the foundation rock beneath the dissipator.
- Topping Slab – construction of a new 500mm thick reinforced topping slab over the existing dissipator including water stops at each of the construction joints.
- Reconstruction of the chute blocks – the chute blocks will be reconstructed to maintain the geometry of the dissipator.
- Reconstruction of the baffle blocks – the baffle blocks will be reconstructed to maintain the geometry of the dissipator.
- Training wall extensions – extension of the piers and training walls to mitigate water impact behind the training walls and on the abutments.
- Abutment erosion protection– erosion protection of the abutments downstream to protect against erosion in the event of significant flood events.

4.16 A pictorial representation of the dissipator strengthening concept is in Figure 10: Concept Design below.

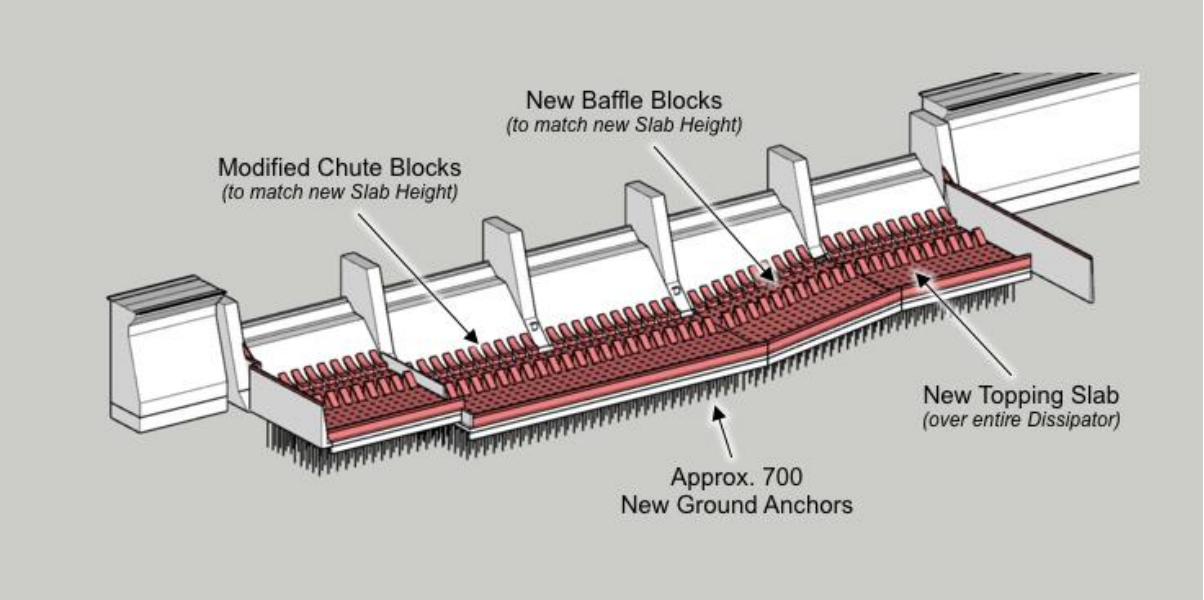


Figure 10: Concept Design

4.17 The Concept Design Report is attached as Appendix B: Concept Design Report.

Concept Design Costing

4.18 The concept design consultant used cost modelling to develop estimated costs for the project. Costs were also verified by an independent construction specialist. Estimated costs were used in preparation of the budget funding applications for the project.

Functional Requirements

4.19 The functional requirements of the project are as follows:

- The dissipator must demonstrate resilience to all flood scenarios up to and including the maximum design Flood – 1:100,000 AEP Flood Event.
- The dissipator must be able to withstand all imposed loadings, in accordance with relevant guidelines, such as guidelines published by the United States Bureau of Reclamations (USBR) and United States Army Corps of Engineers (USACE).
- The dissipator must be able to withstand all pressure loads identified as part of the Physical and Computation Fluid Dynamics (CFD) modelling.
- The upgraded energy dissipation characteristics of the Dissipator need to achieve equal or better hydraulic performance (and exit velocities) than the existing Stilling Basin
- The works must be designed for the site geotechnical conditions.
- The design must be in accordance with relevant codes and guidelines, including:
    - Australian National Committee on Lager Dams (ANCOLD), 2019, Guidelines on Design of Dams and Appurtenant Structures for Earthquakes, ANCOLD.

- Australian National Committee on Lager Dams (ANCOLD), 2013, Guidelines on Design Criteria for Concrete Gravity Dams
- United States Army Corps of Engineers (USACE), 2005, EM 1110-2-2100 Stability Analysis of Concrete Structures, USACE, Washington, DC.
- United States Army Corps of Engineers (USACE), 2016, EM 1110-2-2104 Strength Design for Reinforced Concrete Hydraulic Structures, USACE, Washington, DC.
- US Department of the Interior, Bureau of Reclamations (USBR) 2007, Uplift and Crack Flow Resulting from High Velocity Discharges Over Open Offset Joints (Report DSO-07-07)
- British Standard Code of Practice for Ground Anchorages, BS 8081:1989
- Australian Standards, AS/NZS 1170.0, Structural Design Actions – General Principles
- Australian Standards, AS/NZS 1170.1, Structural Design Actions – Permanent, imposed and other actions
- Australian Standards, AS 3600, Concrete Structures

- The design must minimise the need for ongoing maintenance and operational intervention.
- The works must not compromise Scrivener Dam.

Detailed Design

4.20 Following the concept design and funding approval, NCA engaged a detailed design consultant to develop the concept design to construction stage. The detailed design addresses all functional requirements of the project.

4.21 The detailed design included the following:

- Review of the concept design, shortlisted options and the preferred option to ensure it is the most suitable option for the project. It was confirmed to be the preferred option.
- Review of the project functional requirements and design criteria to ensure the detailed design will be fit-for-purpose on completion, and that the new dissipator will achieve all performance requirements.
- A full documentation review to identify available documentation and information and to determine
- Documentation of additional geotechnical and geophysical investigation works required to determine the strength of the foundation rock beneath the dam.
- A hydrology study to understand the expected flows during construction and to determine required controls to manage construction risk while working downstream of the dam.

- Computational Fluid Dynamic (CFD) modelling to confirm results obtained during the physical hydraulic modelling project and to inform the design of the new dissipator.
- Detailed design development including several workshops involving both the Independent Peer Review team and the NCA.
- Cost development to accurately forecast the project delivery cost for submission as part of the PWC Statement of Evidence.
- Documentation preparation including design drawings and specifications.

4.22 A P80 cost estimate was prepared as part of the detailed design. Further information on the detailed design cost estimate is included in Cost-effectiveness and public value.

5. Other Investigations and Issues

Acoustic and Vibration Investigation

5.1 In 2022, separate from the detailed design, NCA engaged a specialist acoustic consultant to undertake investigations and studies to better understand the potential acoustic and vibration impacts of the project during construction.

5.2 The objective of this engagement was to characterise the likely disruptive noise and vibration from the project, model propagation over surrounding areas, understand the impacts of the project and establish mitigation strategies to minimise impact if required.

5.3 The National Zoo and Aquarium and Government House are located on either side of Scrivener Dam. These facilities have been identified as the most likely to be impact by noise and vibration from the project.

5.4 The acoustic consultant characterised and calibrated the expected noise levels of the proposed drilling rigs for use in the acoustic model. The consultant then developed a detailed noise and vibration model to visually represent propagation around the dam and adjacent facilities.

5.5 The NCA and the acoustic consultant also attended the Zoo to investigate potential impacts to Zoo animals and guests due to the noise and vibration created as part of the project.

5.6 The key findings of the investigations were as follows:

- The noise levels modelled at adjacent areas in the Zoo and Government House were below ACT thresholds for construction activity in residential areas.
- The construction noise could be a minor nuisance to guests at the Jamala Lodge at the National Zoo and Aquarium.
- The construction noise was found to have little or no adverse impact on the Zoo animals.
- Sound at vibration levels at Government house and surrounding suburbs were well below minimum thresholds.

5.7 Further details can be found in the Acoustic Investigations Report in Appendix D: Acoustic and Vibration Report.

Heritage Impact Assessment

5.8 In 2022, separate from the Detailed Design effort, NCA engaged a heritage consultant undertake a Heritage Impact Assessment (HIA).

5.9 The HIA included investigation and review of the dam's Commonwealth Heritage Values. This included a review of historical processes involved during the construction, rarity of the structure, research potential, characteristic values, technical achievement, social value and significance to significant people and groups.

5.10 The key findings of the Heritage Impact Assessment were as follows:

- The project will have minor impact on several values, given proposed changes to the original dissipator as a component of the dam.
- There will be minor impacts to heritage values relating to historical processes and technical achievement. Works undertaken as part of the Project will cover the existing dissipator slab and baffle blocks. As such, the original construction of the dissipator will be hidden from view. However, the original form of the dissipator will be sympathetically reflected in the modifications.
- There will be no impacts on a range of other values including structural rarity, research accessibility, characteristic values, social value and significant people.
- The works will be consistent with several conservation policies and strategies as part of the heritage management plan for the dam. These include maintaining the structural and design integrity of the dam and maintaining the ability to continually monitor the dam and undertake preventative actions to minimise degradation of the structure.

5.11 Further details can be found in the Heritage Impact Assessment in Appendix F: Heritage Impact Assessment.

Cultural Heritage Impact Assessment

5.12 In addition to the Heritage Impact Assessment, NCA engaged a heritage consultant to undertake a Cultural Heritage Impact Assessment.

5.13 As part of this engagement the consultant undertook stakeholder engagement and consulted with ACT Heritage. The consultant also considered the impacts of previous works at the dam, and in particular, the construction of the dam in 1963.

5.14 The heritage consultant also facilitated a site inspection by Representative Aboriginal Organisations (RAO) to identify any artifacts or areas which have cultural heritage value.

5.15 The assessment found that the area where works will be undertaken as part of this project was significantly impacted during the construction stage of Scrivener Dam, and as such, it is highly unlikely that any cultural items or areas of interest would remain.

5.16 Following the site inspection, no items of interest or areas having cultural heritage value were found.

5.17 Based on these investigations it was determined that the project will not cause damage to areas or artifacts that have cultural heritage value.

5.18 Further details can be found in the Heritage Impact Assessment in Appendix G: Cultural Heritage Impact Assessment.

Environmental Impact Assessment

5.19 In 2023, and separate from the detailed design, an environmental consultant was engaged to undertake an Environmental Impact Assessment (EIA) for the project.

5.20 The following items were assessed as part of the EIA:

- Biodiversity – including investigating environmental conditions and value, vegetation and flora, terrestrial fauna, and aquatic fauna
- Hydrology and flooding
- Water quality
- Soil erosion and contamination
- Traffic impacts – including road traffic, active transport, and parking
- Noise and vibration studies (undertaken during a separate engagement)
- Heritage studies undertaken (undertaken during a separate engagement)
- Visual amenity
- Air quality
- Commercial and recreational impacts
- Construction waste
- Hazards
- Utilities

5.21 The following departments and organisations were engaged with as part of the EIA:

- Environment, Planning and Sustainable Development Directorate (EPSDD)
- ACT Parks and Conservation Services (EPD)
- ACT Environmental Protection Authority (EPA)
- Transport Canberra and City Services (TCCS) – Roads, City Presentation and Infrastructure branches
- ACT Heritage Council
- ACT Conservator of Flora and Fauna

5.22 Generally, the assessment has found that the project will have minimal environmental impact. Very few permanent changes that would have significant environmental impact are planned to occur as part of the project.

5.23 The main potential environmental impacts are temporary in nature and are related to activities during construction for the Project, including:

- Erosion and sedimentation
- Vegetation removal
- Commercial and recreational impacts (related to lowering the level of Lake Burley Griffin)

5.24 The EIA has provided risk mitigation strategies which will be implemented during the construction stage of the project.

5.25 The Environmental Impact Assessment report is included in Appendix E: Environmental Impact Assessment.

Community Engagement

5.26 The National Capital Authority's (NCA) 'Commitment to Community Engagement' details how the NCA conducts consultation. For the NCA, community engagement involves proactive approaches to the broad Australian community to:

- Keep people informed about decisions which have already been made or will be made and/or
- Offer people opportunities for input to the NCA's thinking and decision-making processes.

5.27 Endeavouring to inform and consult with impacted stakeholders, the NCA has proactively engaged with relevant stakeholders, businesses and commercial operators, organisations and ACT Government departments regarding the project. The NCA has been undertaking consultation via various forums including:

- Lake User Group (LUG) meetings - LUG meetings are held quarterly and are open to any members of the Lake User Group. Attendees have been briefed on the project and the NCA will continue to do this leading up to and throughout the proposed construction stage of the project.
- Dissipator Strengthening Project user group sessions – The NCA held two formal Lake User Group consultation sessions to specifically discuss the project with interested stakeholders and to better understand the concerns of recreational and commercial lake users. Two meetings were held on 30 November 2022 and 8 December 2022. As part of the consultation, the NCA provided further details about the project and stakeholders were given the opportunity to provide comment. Following these user group sessions, the NCA sought to understand how the Project may impact entities and what possible mitigation strategies exist.
- NCA Website - the NCA maintains a webpage on the NCA website which provides details about the project for interested individuals.
- Noise and Vibration Investigations – the NCA engaged an acoustic consultant to undertake a noise and vibration study for the project. Consultation was undertaken with the National Zoo and Aquarium and Government House as part of this project.
- Environmental Investigations – the NCA engaged an environmental consultant to complete an Environmental Impact Assessment Investigations. The consultant contacted multiple government organisations to better understand the impact to them and to understand potentially what approvals are required for the project.
- Media releases and social media
- Monthly email updates to members of the community who wish to sign up the to the project newsletter.
- Informal consultation, including on-site visits with impacted stakeholders – completed as required and as questions are raised during the project.

5.28 The following stakeholders have been directly consulted with as part of the project:

Sporting and recreational users:

- ANU Sailing Club
- ANU Boat Club
- YMCA Sailing Club
- Capital Lakes Rowing Club
- Canberra Yacht Club
- Rowing ACT
- Canberra Grammar School
- Pedal Power ACT
- The Molonglo River User Group (via EPA)

Commercial Operators:

- Canberra Cruises and Parties (commercial vessel)
- Go Boat Canberra (commercial operator)
- Capital Paddle (commercial operator)
- Southern Cross Club – MV Southern Cross (commercial vessel)
- Lake Burley Griffin Cruises (commercial vessel)
- SupCbr (commercial operator)

Other Organisations and Stakeholders

- Friends of the Grasslands
- The Canberra Ornithologists Group
- Abstractors
- Yarralumla Nursery

Adjacent Organisations

- The National Zoo and Aquarium
- Government House

Other Organisations and Government Organisations

- The Australian National Botanic Gardens
- Environment, Planning and Sustainable Development Directorate - Parks and Conservation
- Environment Protection Authority
- Jerrabomberra Wetlands
- City Renewal Authority
- Transport Canberra and City Services
- ACT Property Group
- Major Projects Canberra
- The National Arboretum
- The Royal Canberra Golf Course

Public Consultation - Next Steps

5.29 The NCA will continue to engage with stakeholders and the broader ACT community as the project progresses through update to the website and media releases.

5.30 Information on the detailed design for the project will be available for public comment during the NCA Works Approval process.

Lowering the level of Lake Burley Griffin

5.31 The works will be undertaken in the spillway of the dam. The construction works will be staged to allow operation of the dam to continue around construction activities. In order to adequately manage construction risk while working in the dissipator, and to minimise the risk of inundation of the construction site, the NCA will lower the level of Lake Burley Griffin by a maximum of 500mm below normal lake level.

5.32 During Lake User Group consultation sessions, the NCA sought to understand how lowering the lake will impact lake users. This information has been used, together with information form the hydrology study undertaken as part of the detailed design, to determine the maximum drawdown level during the project.

5.33 The maximum drawdown level has been selected to minimise impact to lake users, to allow a buffer in the lake to accommodate rain events and increased inflows while minimising risk to construction and inundation of the site.

5.34 The maximum drawdown level will be reduced as much as possible during the project and NCA will work closely with lake users to mitigate impacts to use of the lake.

Security Measures

5.35 As part of operation and maintenance of Scrivener Dam, the operators of the dam have developed a security plan. The plan includes details of physical and electronic security at the dam require to ensure ongoing safety of the dam. Prior to commencement of works on site, the security plan will be updated to include construction activities.

5.36 Additional security provisions will be implemented to ensure ongoing safety of the dam.

5.37 Prior to any works commencing, barriers and fencing will be installed to control unauthorised access to the construction site and the dam compound.

Fire Protection

5.38 All construction and fire protection requirements will, as a minimum, be in accordance with the provisions of applicable codes and standards.

Occupational Health and Safety

5.39 The Project will comply with the Work Health and Safety Act 2011 (WHS) (Cth), Federal Safety Commissioner Act 2022, and Work Health and Safety Regulations.

5.40 The detailed design consultant has employed Safety in Design approach and documented safety measures to be adopted in construction. The construction contractor will be required to develop and adhere to a safety management plan for the construction phase, which incorporates Safety in Design mitigations as well as other relevant risk mitigations.

5.41 Project safety and work health and safety specialists will undertake work health and safety assessments to ensure all impacts are identified and correctly managed during the works.

6. Scope of Works

Scope overview

6.1 The Dissipator Strengthening Project will involve the following works:

- Project approvals
- Procurement activities
- Site enabling works and traffic management
- Installation of new dissipator ground anchors
- Construction of a new dissipator topping slab
- Reconstruct the dissipator baffle blocks
- Abutment armouring, training wall works, and erosion protection works
- Site remediation

Project Approvals

6.2 Several approvals are required prior to the project works occurring. Some of these include the following:

- Parliamentary Works Committee (PWC) approval
- NCA Works Approval
- Environmental Approvals
- EPA Waterways Works Licence

Procurement Activities

6.3 Multiple procurement activities will be undertaken to engage contractors and consultants for the construction stage of the project. One of these procurements will be for the construction head contractor. Other procurements will include legal support, designer involvement, project management support services and other ancillary roles.

6.4 All procurement activities will be undertaken in accordance with the Commonwealth Procurement Rules (CPR's) and the NCA Accountable Authority Instructions (AAI's).

Site Enabling Works

6.5 Prior to construction works commencing on the dissipator, multiple enabling works need to occur including:

- Installation of site fencing.
- Installation of traffic management and safety measures.

- Establishment of the site compound including access from existing roads, parking areas, site offices, equipment storage and laydown areas, assembly and handling areas and facilities.
- Construction of vehicle access roadways into the dissipator worksite.
- Construction of a coffer dam to separate work areas from water being released from the dam. The coffer dam configuration will be reconfigured during the project to enable works to occur in different locations.
- Installation of dewatering equipment to drain the work area and enable safe and dry access to the worksites.
- Installation of silt fencing and other environmental controls as required.

6.6 Figure 11 below shows and indicative layout of the construction site.

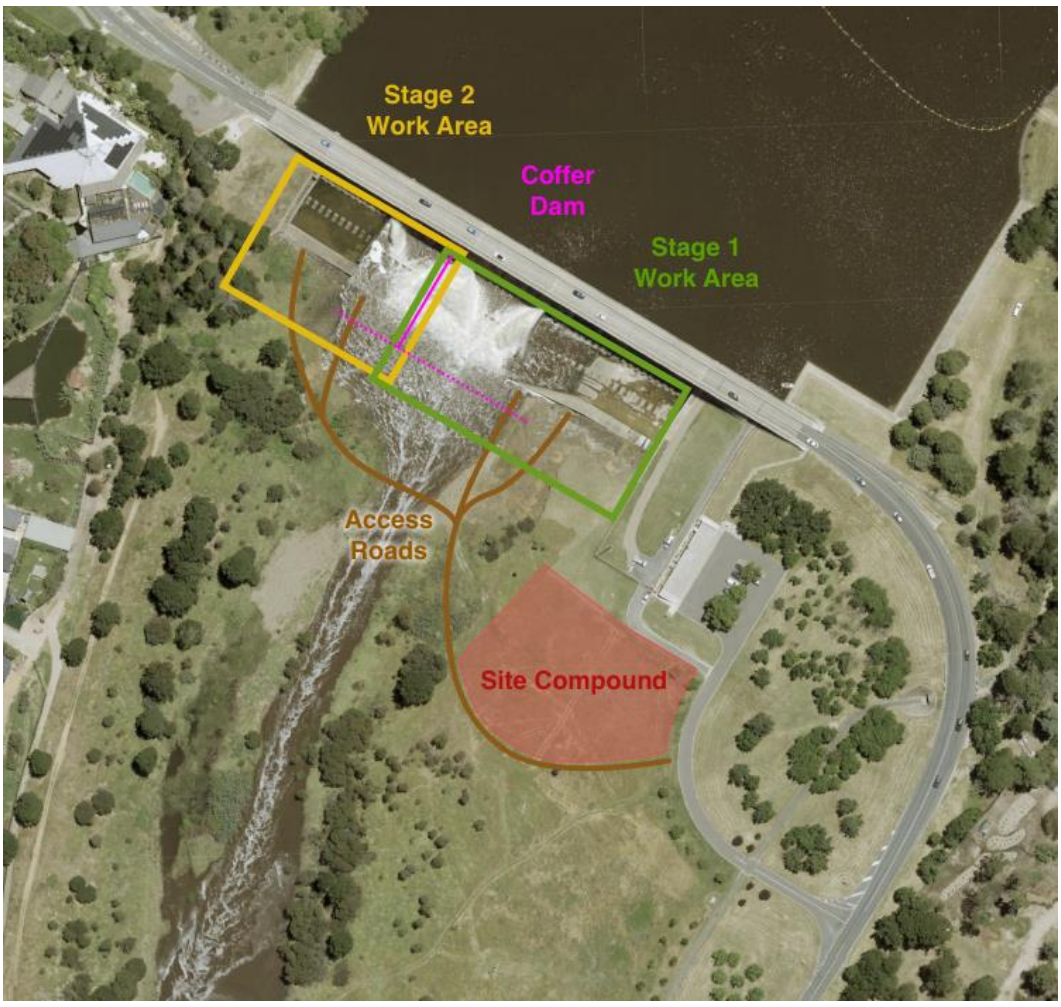


Figure 11: Indicative Site Layout and associated Enabling Works

6.7 Construction will commence following completion of the site enabling works

6.8 Access to the site is primarily via Lady Denman Drive from Cotter Road. During the project, it is anticipated that there will be up to 60 workers on site and 10 heavy vehicles accessing the site per day. Generally, there will be minimal impact to traffic volumes

generates as part of the Project. Traffic management will be implemented ed across the active travel path adjacent to site to ensure safety for users.

Dissipator Ground Anchors

6.9 A major works package as part of the Project is the installation of 700 new ground anchors.

6.10 These anchors are 57mm thick steel rods that are grouted into holes drilled into the foundation rock of the dissipator. The top of the anchors are cast into the new dissipator topping slab concrete.

6.11 The depth of the anchors varies between 8.5m and 11.5m into the foundation rock. The depth has been determined based on geotechnical investigations undertaken as part of the detailed design.

6.12 Figure 12 shows an indicative typical anchor detail.

6.13 The ground anchor drawing set, which provides indicative details of the ground anchors, is in Appendix C: Detailed Design Drawing Package.

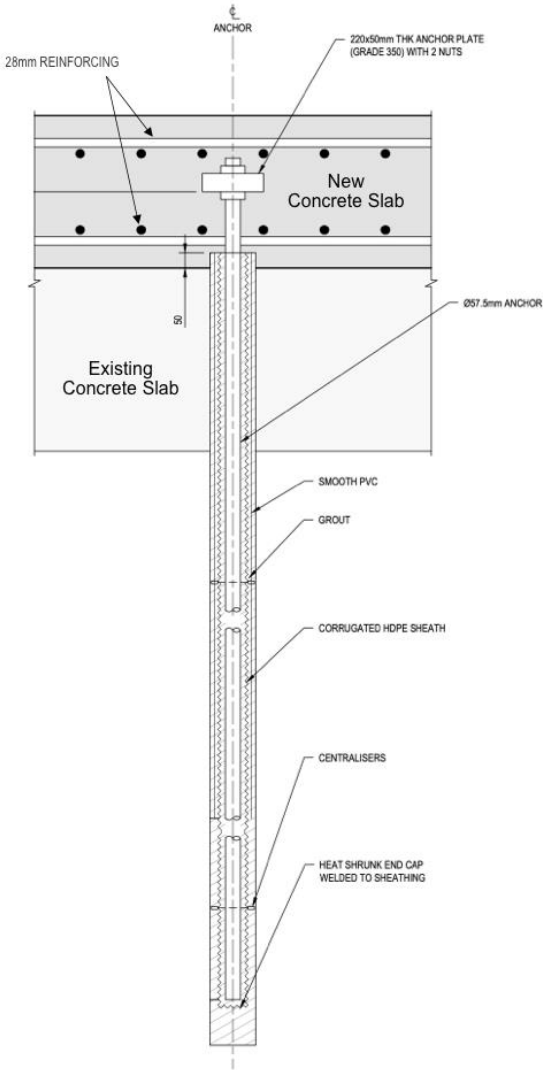


Figure 12: Typical anchor detail

Dissipator Topping Slab

6.14 A new 500mm thick reinforced concrete topping slab will be constructed on top of the existing dissipator slab. This concrete topping slab will increase the strength of the dissipator and will be held down by the 700 new ground anchors.

6.15 The topping slab includes a mesh of 28mm thick steel reinforcement bars, installed at the top and bottom, that are encased in concrete.

6.16 Figure 13 shows the new reinforced concrete topping slab on top of the existing slab. It also shows and new and old anchors.

6.17 The topping slab drawing set, which provides details of the works is shown at Appendix C: Detailed Design Drawing Package.

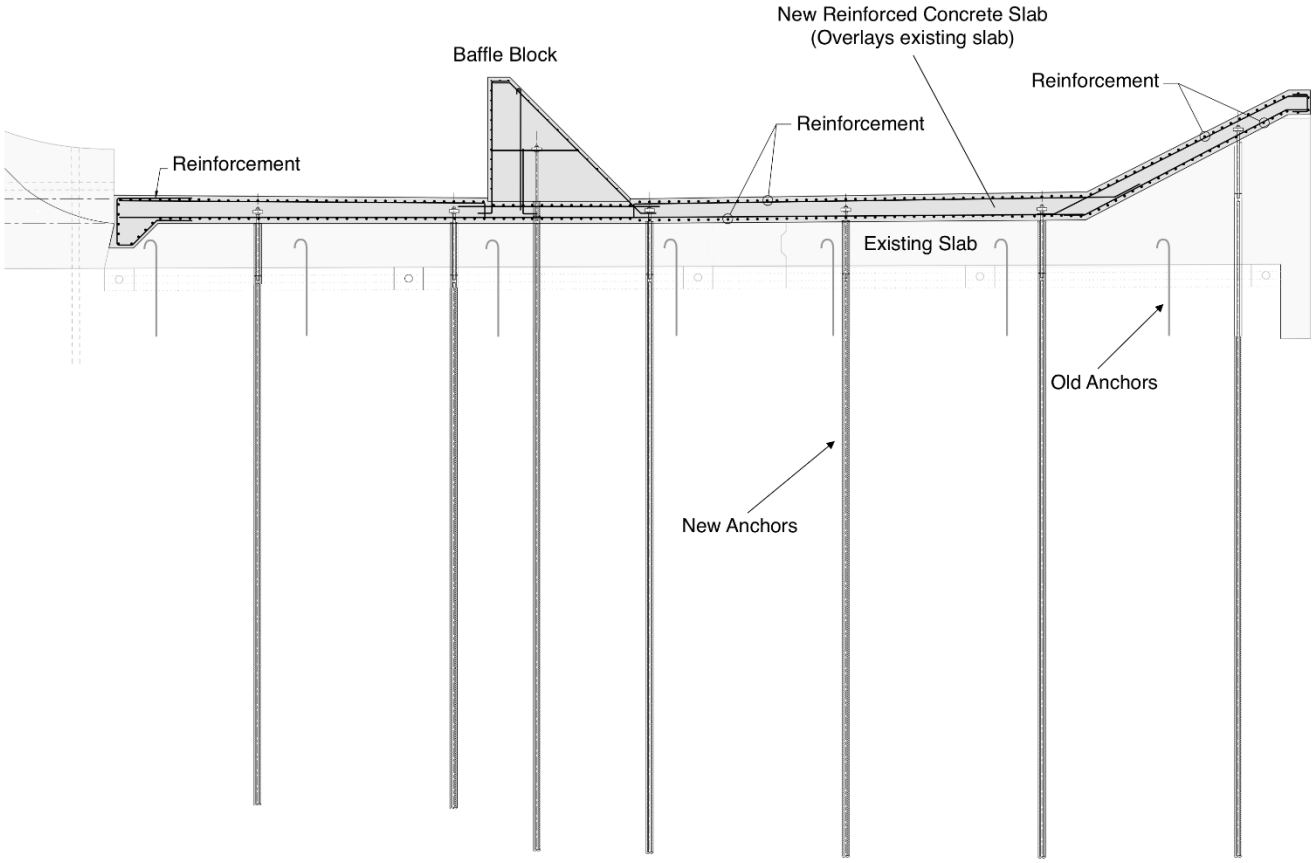


Figure 13: New reinforced concrete topping slab over the existing slab

Reconstructed Baffle Blocks

6.18 Due to the change in thickness of the Dissipator slab, the existing baffle blocks will be demolished and reconstructed on top of the new topping slab.

6.19 The new baffle blocks will be reconstructed to the same dimensions and in the same location to ensure the geometry of the new dissipator structure is the same as the existing structure.

6.20 Figure 14 below shows the new baffle block in relation to the new slab.

6.21 The baffle block drawing set, which provides details of the works is included in Appendix C: Detailed Design Drawing Package.

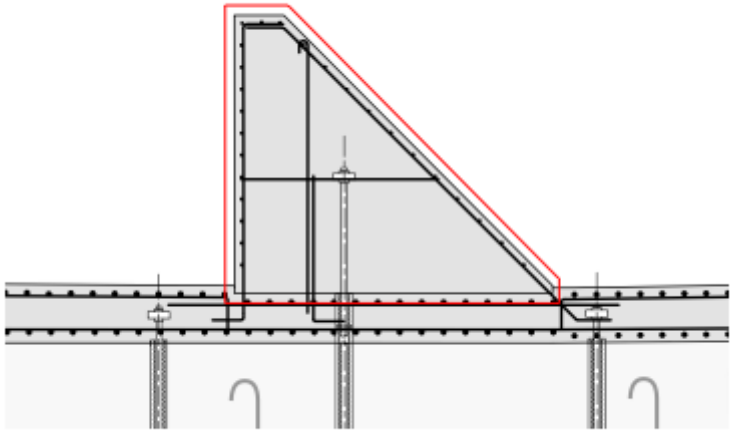


Figure 14: Reconstructed Baffle Blocks

Abutment Erosion Protection

6.22 As identified in previous studies and investigations, erosion on the abutments of the dam caused by fast flowing water could undermine the structure of the dam during flood operations.

6.23 To protect against damaging erosion, the top layer of soil will be removed on the abutments and an erosion protection matting will be laid down. This matting will then be filled with soil and reseeded with grass. The result will be a grassed slope similar to current site conditions. This armouring will minimise erosion during a major flood event, whilst be invisible to visitors to the dam.

6.24 Backfill material behind the training (side) walls of the spillway will be improved with free draining material, and the walls will be strengthened to ensure the walls are structurally adequate to protect against high flows.

6.25 Figure 15 shows an indicative anti-erosion matting.

6.26 The abutment armouring drawing set, which provides details of the works is included in Appendix C: Detailed Design Drawing Package.

Figure 15: Indicative erosion protection matting to be placed on abutments and grassed over. (Image from Varsity Inc.)

Site Remediation

6.27 Site remediation activities will occur following completion of all of the works packages on site. Site remediation will include removal of all temporary works including roads, culverts and coffer dams, and remediation of all disturbed areas.

7. Cost-effectiveness and public value

Project Cost

7.1 The estimated project cost for the proposed works is $39.8 million (excluding GST). The estimated project cost includes all costs required for the delivery of the project including project management and design fees, construction costs, contingencies and escalation provisions. Any additional cost will be met from within existing resources.

Finance phasings

7.2 Subject to approval by the Committee, it is anticipated that construction works will commence early 2024. The project duration is 18 months with completion scheduled for Financial Year 2024/2025. The project funds will be used within these timeframes.

Whole of life costs

7.3 The works involve installation of embedded anchors and construction of a reinforced concrete topping slab. There is no significant maintenance burden introduced by the Project and no significant whole of life costs associated with the Project.

Financial Risk

7.4 Several items present financial risk to the project, as follows:

- Inflation
- Resource and material availability
- Flood and wet weather - the project is located in the spillway of Scrivener Dam. rain and adverse weather have the potential to impact project time and costing.

7.5 The NCA has sought to minimise project risk by proactive management of the design and construction stage planning. In addition, the project cost forecast has contingencies included for such events.

Revenue

7.6 There will be no revenue derived from the Project.

Public value

7.7 Scrivener Dam is a critical component of Canberra's architecture and urban design. The dam creates Lake Burley Griffin which forms the centrepiece of Canberra and an important resource for recreation, commercial activities, and tourism. The Lake is enjoyed by lake users, community groups, the wider ACT Community, and visitors to Canberra. The project will ensure that the dam can maintain this important public amenity.

7.8 Furthermore, the dam allows for safe release of water in normal operation and during significant weather events. The project will ensure ongoing safe operation of the dam into the future.

7.9 The project will also generate short-term employment within the construction sector and will provide employment opportunities in several areas.

8. Project Delivery Methodology

8.1 The NCA, with the assistance of engaged contractors and consultants, has undertaken investigations, full design and documentation of the works to be undertaken as part of the Project.

8.2 Being fully designed, the NCA intends to procure the services of an experienced head contractor to lead, manage and deliver the construction component of the project. The head contractor will engage and manage all required sub-contractors and sub-consultants.

8.3 The NCA will also engage several consultants to assist with design related matters, quality assurance, and to manage risk during the construction phase. This will likely include a design consultant, a superintendent and other specialist as required.

Head Contractor Procurement

8.4 It is proposed that the head contractor will be procured using a two-stage procurement methodology.

8.5 The first stage will be an Expression of Interest (EOI). The EOI will be prepared and released to the open market via AusTender. Responses to the EOI will be assessed and organisations that are deemed to be potentially suitable to undertake the construction related work will be shortlisted.

8.6 The second stage will be a Request for Tender (RFT). The RFT will be issued only to the shortlisted organisations. The submitted tenders will be assessed based on technical merit, cost, risk and others. The NCA will select the organisation that best value for money and lowest risk for the Commonwealth.

Construction Stage Indicative Schedule

8.7 The actual construction stage methodology employed by the contractor will likely be as per the nominated Contractor's RFT and tailored for their methodologies and experience.

8.8 An indicative project schedule is provided in Appendix H. Pending approval by the Committee, it is anticipated that construction works will commence early 2024. The project duration is 18 months with completion scheduled for Financial Year 2024/2025.

Appendix A: Design Options Report

Appendix B: Concept Design Report

Appendix C: Detailed Design Drawing Package

Appendix D: Acoustic and Vibration Report

Appendix E: Environmental Impact Assessment

Appendix F: Heritage Impact Assessment

Appendix G: Cultural Heritage Impact Assessment

Appendix H: Indicative Project Program