



ACTEW working with ActewAGL

Report to SEWPaC: Performance against Fish Management Plan Version 1.

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Delivered by the Bulk Water Alliance



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Executive Summary

The construction and operation of the Enlarged Cotter Dam raises environmental issues relating to the management of five threatened native aquatic species. These are:

- Macquarie Perch (*Macquaria australasica*).
- Trout Cod (*Maccullochella macquariensis*).
- Murray Cod (*Maccullochella peelii*).
- Two-spined Blackfish (*Gadopsis bispinosus*).
- Murray River Crayfish (*Euastacus armatus*).

In order to minimise threats to threatened aquatic species a series of Fish Management Plans will be prepared by ACTEW. To date two versions of the Fish Management Plan have been completed (total of four). The first version of the Fish Management Plan documented projects which would provide information required by ACTEW for the management of threatened aquatic species. The second Version of the Fish Management Plan provides information, from the projects documented in Version 1, to help protect aquatic communities in the Cotter Reservoir and the Cotter River during the construction and operation of the enlarged Cotter Reservoir.

The overarching objective of the Fish Management Plan is to:

- Ensure that the aquatic communities and habitats of the Cotter Reservoir and Cotter River are maintained or rehabilitated to support native fish and crayfish species.

This objective was developed within the context of the *ACT Aquatic Species and Riparian Zone Conservation Strategy* (ACT Government 2007).

The Fish Management Plan will be:

- Designed to prevent or mitigate risks to threatened aquatic fauna and their habitats.
- Scientifically based, using adaptive management.
- Robust in terms of stakeholder involvement, peer review and public transparency.
- Timely and updated on the basis specified in the approval conditions.
- Developed as part of the overall requirements of the Enlarged Cotter Dam.
- Effective in terms of use of resources and expertise whilst at the same time ensuring the protection of threatened species.

This report has been prepared in response to the Department of Sustainability, Environment, Water, Population and Communities' (SEWPaC), formerly Department of Environment, Water, Heritage and the Arts (DEWHA) approval condition:

'The person taking the action must implement the Plan. Every year the person taking the action must submit to the Minister a report covering performance against the Fish Management Plan. The date of the first report must be provided on 19 January 2011, with each subsequent report to be provided 12 months from the date of the previous report.'

The Fish Management Plan Version 1 commitments documented in this report, against which performance has been reported, have been taken from the Fish Management Plan Version 2. This has been endorsed by the Fish Management Program Steering Committee which has representation from SEWPaC, ACT Government, University of Canberra, ACTEW and the Bulk Water Alliance (BWA). ACTEW's performance against commitments in the first version of the Fish Management Plan is documented in Chapter 3 of this report.

1 Background

1.1 Enlarged Cotter Dam project description

The Enlarged Cotter Dam is one in a suite of major projects currently being undertaken by ACTEW Corporation (ACTEW) to secure the future water supply for the Australian Capital Territory (ACT) and region. These projects are being delivered through the Bulk Water Alliance (BWA), a partnership between ACTEW and ActewAGL, GHD, Abigroup and John Holland Group.

1.1.1 Location

The Enlarged Cotter Dam is being constructed approximately 125 metres (m) downstream of the existing Cotter Dam on the Cotter River approximately 18 kilometres (km) due west of Canberra (refer to Figure 1.1). The Enlarged Cotter Dam is located upstream of the confluence of the Cotter, Paddy's and Murrumbidgee Rivers and is in the vicinity of a range of recreational areas including Cotter Avenue, Cotter Campground, Casuarina Sands.

1.1.2 Construction method

The main dam will be constructed from roller compacted concrete and two additional earth rock-fill saddle dams will be constructed adjacent to the right abutment of the main dam. The main dam will be approximately 80 m high with the saddle dams approximately 12 and 16 m in height. At the conclusion of construction, the storage capacity of the reservoir will increase from 4 gigalitres (GL) to approximately 78 GL, raising ACT's overall storage capacity by a third.

The existing Cotter Dam and an additional 232 hectares (ha) of land will be inundated as a direct result of the Enlarged Cotter Dam construction and filling of the enlarged reservoir. In addition, a further 38 ha of land will be cleared to facilitate construction and ancillary works. The land surrounding the Cotter Dam has areas classified as having both "high and low environmental value" with some areas still significantly impacted by previous forestry plantation activities and severe bushfires in 2003.

1.1.3 Approval process

Approval for the construction of the Enlarged Cotter Dam was required under both the Territory *Planning and Development Act 2007* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Territory matters were assessed by the ACT Planning and Land Authority (ACTPLA) through ACTEW's preparation of an Environmental Impact Statement (EIS) and a Development Application (DA). Commonwealth matters were assessed by the former Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) now Department of Sustainability, Environment, Water, Population and Communities' (SEWPaC) through ACTEW's preparation of a Public Environment Report (PER).

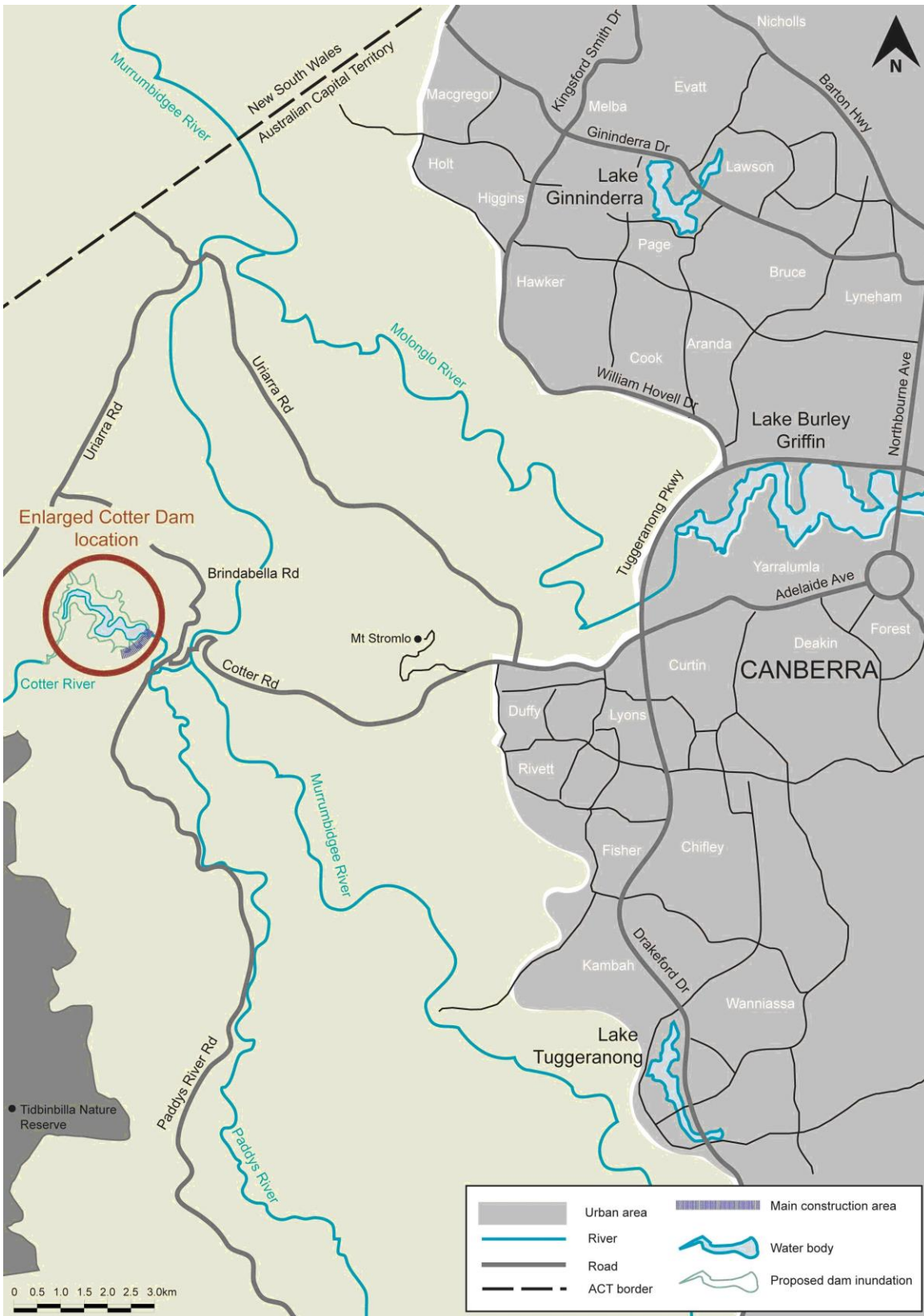
All necessary documentation was prepared and submitted in 2009 with approval of the EIS received in June 2009, the DA in September 2009 and the PER in October 2009. Following the receipt of all major planning approvals, preparatory works officially commenced on Monday 23 November 2009, with construction of the Enlarged Cotter Dam due to commence in December 2010.

Approval of the Enlarged Cotter Dam project has been conditioned by ACTPLA and SEWPaC (formerly DEWHA). Conditions of approval relevant to the Fish Management Plan and the management of threatened native aquatic species are presented the Fish Management Plan Version 2.

This report has been prepared in response to the SEWPaC, formerly (DEWHA) approval condition:

'The person taking the action must implement the Plan. Every year the person taking the action must submit to the Minister a report covering performance against the Fish Management Plan. The date of the first report must be provided on 19 January 2011, with each subsequent report to be provided 12 months from the date of the previous report.'

Figure 1.1 Location of the Enlarged Cotter Dam.



2 Fish Management Plan

2.1 Introduction

The construction and operation of the Enlarged Cotter Dam raises environmental issues relating to the management of five threatened native aquatic species. These are:

- Macquarie Perch (*Macquaria australasica*).
- Trout Cod (*Maccullochella macquariensis*).
- Murray Cod (*Maccullochella peelii*).
- Two-spined Blackfish (*Gadopsis bispinosus*).
- Murray River Crayfish (*Euastacus armatus*).

To date two versions (from a total of four) Fish Management Plans have been completed. The first version of the Fish Management Plan documented projects which would provide information required by ACTEW for the management of threatened aquatic species. The second Version of the Fish Management Plan provides information, from the projects documented in Version 1, to help protect aquatic communities in the Cotter Reservoir and the Cotter River during the construction and operation of the enlarged Cotter Reservoir. Each of the four reports focuses/ will focus on protection of the species during different key program milestones for the Enlarged Cotter Dam as detailed in Table 2.1.

Table 2.1 Updating the Fish Management Plan.

Fish Management Plan Version	Key project milestones	Information sources	Fish Management Program milestones	Due Date
1	EIS Submitted.	Current knowledge.	Identify projects to address knowledge gaps.	Feb 2009
2	Construction period.	<ul style="list-style-type: none"> • Progress reports for Fish Management Program projects. • Reports for Fish Management Program projects were available. • The Aquatic Flora and Fauna Management Plan. • Associated projects by others. • Input from regulators. 	<ul style="list-style-type: none"> • Establish a Fish Management Program Steering Committee. • Implement all projects identified in Fish Management Plan Version 1. • Use information from Project 1 – Constructed homes for threatened fishes to inform design for constructed shelter habitats. • Lodgement of DA for installation of constructed habitats. 	April 2010

Fish Management Plan Version	Key project milestones	Information sources	Fish Management Program milestones	Due Date
3	Filling and operational phase.	<ul style="list-style-type: none"> • Results and recommendations from Fish Management Program projects. • Results from ongoing monitoring. • Input from regulators. • Documented performance against conditions of approval. 	To be determined with Fish Management Program Steering Committee.	Early 2012
4	Two years after Enlarged Cotter Dam construction completion. Operational phase.	<ul style="list-style-type: none"> • Results from ongoing monitoring. • Input from regulators. 	To be determined with Fish Management Program Steering Committee.	Early 2014

The Fish Management Plan reports and their timely delivery form part of both Territory and Commonwealth conditions of approval for the Enlarged Cotter Dam and must be prepared in accordance with legislative requirements.

2.2 Objectives of Fish Management Plan

The overarching objective of the Fish Management Plan is to:

- Ensure that the aquatic communities and habitats of the Cotter Reservoir and Cotter River are maintained or rehabilitated to support native fish and crayfish species.

This objective was developed within the context of the *ACT Aquatic Species and Riparian Zone Conservation Strategy* (ACT Government 2007).

The most recent Fish Management Plan (Version 2) focuses on the protection of threatened aquatic species during the construction phase.

The Fish Management Plan will be:

- Designed to prevent or mitigate risks to threatened aquatic fauna and their habitats.
- Scientifically based, using adaptive management.
- Robust in terms of stakeholder involvement, peer review and public transparency.
- Timely and updated on the basis specified in the approval conditions.
- Developed as part of the overall requirements of the Enlarged Cotter Dam.
- Effective in terms of use of resources and expertise whilst at the same time ensuring the protection of threatened species.

2.3 Fish Management Projects

The nine projects which are being undertaken or have been undertaken as part of the Fish Management Plan are:

- Project 1 – Constructed homes for threatened fishes in the Cotter River Catchment. The main aims of this project are to:
 - Determine if adult Macquarie Perch will use constructed habitat for shelter when emergent macrophytes are not available.
 - Develop capacity to facilitate Two-spined Blackfish recolonising the Enlarged Cotter Dam after construction.
 - Provide guidelines for construction of long-term shelter habitat to sustain threatened fishes.

Results have shown that fish have a preference for rock reefs over other constructed habitats. This project is due for completion in December 2010.

- Project 2 – Predicted passage of native and alien freshwater fish based on swimming speed performance. This project assessed the swimming capacity of native fish and the results will be applied in the design of fish passages (to enable native fish to reach their spawning grounds). This project was completed in June 2009.
- Project 3 – Crayfish ecology. This project examined the ecology of Murray River Crayfish in the Cotter River system and possible avenues for improving their habitat. This project was completed in July 2010.
- Project 4 – Epizootic Haematopoietic Necrosis (EHN) virus occurrence. This project indicated that the EHN virus was not present in sampled fish. This project was completed in August 2008.
- Project 5 – Research into the establishment of new populations of Macquarie Perch, Trout Cod and Two-spined Blackfish through translocation. This project will look at establishing other populations of Macquarie Perch, Trout Cod and Two spined Blackfish, to supplement populations in the Cotter River. This project is due for completion in August 2011.
- Project 6 – Management program for alien fish species. It is expected that alien fish populations will increase in the enlarged Cotter Reservoir and they may impact on threatened native fish. This project will investigate management options for alien fish and is due for completion by the end of 2011.
- Project 7 – Food sources for Macquarie Perch and drawdown effects. This project is examining the food sources available to Macquarie Perch and the impact of fluctuating reservoir levels on these food levels. This project is due for completion in early to mid 2011.
- Project 8 – Investigation of techniques for mapping instream barriers. This project complements research undertaken in Project 2 - Predicted passage of native and alien freshwater fish based on swimming speed performance. This project is due for completion in early 2011.
- Project 9 – Enlarged Cotter Dam fish monitoring. This project will provide monitoring information to answer specific questions on the impacts of the Enlarged Cotter Dam on threatened aquatic species. The monitoring program will extend beyond the completion of the Enlarged Cotter Dam's construction.

The implementation of these projects and the reporting of findings and recommendations relevant to the protection of threatened aquatic species form part of the Australian Capital Territory (ACT) and Commonwealth conditions of the approval for the Enlarged Cotter Dam project. Accordingly, information on each of these projects, as well as discussion of a range of associated projects and supplementary information sources is presented in Fish Management Plan Version 2.

2.4 Process for update

The Fish Management Plan is designed to be an iterative document which reflects a growing body of knowledge on threatened aquatic species and appropriate measures to minimise the potential impact which the construction and operation of the Enlarged Cotter Dam might have on these species and their habitats.

Version 1 of the Fish Management Plan was prepared by ActewAGL on behalf of ACTEW during the design phase of the Enlarged Cotter Dam. Version 1 established a basis for the nine research projects by identifying key knowledge gaps. Version 1 of the Fish Management Plan was included as an appendix to the ACT EIS and the Commonwealth referral documentation prepared for the Enlarged Cotter Dam project.

Following the formation of the BWA the responsibility for the management of aquatic species, including preparation of Version 2 of the Fish Management Plan, was passed wholly from ActewAGL to the BWA. Version 2 of the Plan provides an update on research projects providing information to assist in the management of threatened aquatic species. Version 2 includes findings or recommendations that have been provided since Version 1 was produced in February 2009. Version 2 was completed in September 2010 (final draft submitted to agencies in May 2010) following an extension of time permitted by ACTPLA to bring the date of submission in line with Commonwealth conditions of approval.

The responsibility for the preparation of subsequent versions of the Fish Management Plan (Versions 3 and 4) will revert to ACTEW at the completion of construction (expected late 2011).

3 Fish Management Plan Version 1 Commitments

The following table presents, as taken from Fish Management Plan Version 2, the commitments in the first version of the Fish Management Plan (February 2009).

Table 3.1 Fish Management Plan Version 1 commitments

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
Executive Summary, page vi	ACTEW will provide sufficient information (documented in the Fish Management Plan and associated management plans) on how it proposes to protect the threatened fish species during the construction, filling and operational phases of the Enlarged Cotter Dam.	ACTEW has been working closely with the University of Canberra, to ensure protection of threatened fish species. Measures to protect fish during the construction phase are documented in Version 2 of the Fish Management Plan. Protection measures during filling and operational phases will be documented in subsequent versions of the Fish Management Plan.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Following incorporation of stakeholder comments the Plan was finalised in September 2010. Versions three and four will be submitted in early 2012 and early 2014 respectively.
Section 1.3, page 3	Version 2 of the Fish Management Plan will be produced at the start of construction and will incorporate: <ul style="list-style-type: none"> • Results from a range of projects (currently being completed), designed to fill knowledge gaps. • Changes needed if the range of projects is unable to provide suitable results for the management of threatened fish species in the Enlarged Cotter Dam. • Results of ongoing monitoring (by ACTEW, ActewAGL, Ecovise Environmental, TAMS, University of Canberra and a number of other organisations). 	Version 2 of the Fish Management Plan was submitted in line with conditions of approval in consultation with the Fish Management Program Steering Committee and covers the Enlarged Cotter Dam construction period (from late 2009 to late 2011).	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Following incorporation of stakeholder comments the Plan was finalised in September 2010.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	<ul style="list-style-type: none"> Input on Version 1 from regulators and stakeholders. 		
Section 1.3, page 3	<p>Version 3 of the Fish Management Plan will be produced at the commencement of filling and operational phases and will incorporate:</p> <ul style="list-style-type: none"> Results from a range of projects (currently being completed), designed to fill knowledge gaps. Changes needed if the range of projects is unable to provide suitable results for the adaptive management of threatened fish species in the Enlarged Cotter Dam. Results of ongoing monitoring (by ACTEW, ActewAGL, Ecowise Environmental, TAMS, University of Canberra and a number of other organisations). Input on Version 2 from regulators and stakeholders. 	Version 3 of the Fish Management Plan will be submitted in accordance with conditions of approval.	Version Three will be submitted in early 2012.
Section 1.3, page 3	<p>Version 4 of the Fish Management Plan will be produced two years into the filling and operations phases and will incorporate:</p> <ul style="list-style-type: none"> Results of ongoing monitoring (by ACTEW, ActewAGL, Ecowise Environmental, TAMS, University of Canberra and a number of other organisations). Input on Version 3 from regulators and stakeholders. 	Version 4 of the Fish Management Plan will be submitted in accordance with conditions of approval.	Version Four will be submitted in early 2014.
Table 2, Section 3.3, pages 19-28	The projects detailed in the Fish Management Program will address those knowledge gaps directly related to the construction of the Enlarged Cotter Dam.	Knowledge gaps related to the construction of the Enlarged Cotter Dam will be addressed by the projects identified in the Fish Management Program.	Nine research projects were identified in FMP V1 and these are underway (as identified in FMP V2). These projects are filling knowledge gaps which will

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
			be addressed on an ongoing basis.
Section 3.3, page 28	On most projects, consultation and collaboration will be undertaken with the ACT Research and Planning Unit of PCL.	ACTEW maintains communication with ACT Research and Planning Unit of PCL via the Fish Management Program Steering Committee.	Consultation with the Fish Management Program Steering Committee will be ongoing.
Section 4.1.4, page 44	Actions detailed in the Fish Management Plan are to be in accordance with National Recovery Plans for Trout Cod and Macquarie Perch (when available).	ACTEW will work with their Fish Advisor and the Fish Management Program Steering Committee to meet these commitments.	Consultation with the Fish Advisor and Fish Management Program Steering Committee will be ongoing.
Section 4.2.1, page 47	Actions detailed in the Fish Management Plan are to be in accordance with <i>The Aquatic Species and Riparian Zone Conservation Strategy: Action Plan 29</i> .		
Section 4.2.2, page 47	Actions detailed in the Fish Management Plan are to be in accordance with the fish management plan prepared by the ACT Conservator under the ACT <i>Fisheries Act 2000</i> .		
Section 5.3, page 51	Provision of artificial shelter habitat for adult fish whilst the reservoir fills and the reedbeds establish.	Constructed shelter habitat will be provided. Habitat has been designed by the Fish Management Program team in consultation with ACTEW and the University of Canberra. Fish habitat will be provided in the form of constructed rock reef habitat and insitu structural wood. Habitat provision has been endorsed by the FMP Steering Committee.	Constructed shelter habitat (rocks reefs) will be installed by the Bulk Water Alliance prior to the completion of the construction phase.
Section 5.3, page 51	Provision of artificial shelter habitat for adult fish suitable when the reservoir is drawn down greater than 1.5 m (from FSL).	Constructed shelter habitat will be provided. Habitat has been designed by the Fish Management Program team in consultation	Constructed shelter habitat (rocks reefs) will be installed by the Bulk Water Alliance

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
		with ACTEW and the University of Canberra. Fish habitat will be provided in the form of constructed rock reef habitat and insitu structural wood. Habitat provision has been endorsed by the FMP Steering Committee.	prior to the completion of the construction phase.
Section 5.3, page 51	Survey of potential fish habitat structures at a range of depth transects before the reservoir fills to identify the need for artificial habitats across the full drawdown range.	Survey has been undertaken by Fish Management Program team in consultation with Biosis and the University of Canberra.	Survey completed and presented to FMP Steering Committee. The survey documents the insitu woody shelter habitat.
Section 5.3, page 52	Investigate measures to provide shelter, or to mitigate cormorant predation including potential management solutions prior to the reservoir filling.	Habitat has been designed by the BWA in consultation with ACTEW and the University of Canberra. Measures to monitor changes in the distribution and abundance of cormorants are included in the scope for Project 9 – Enlarged Cotter Dam fish monitoring.	Constructed shelter habitat (rocks reefs) will be installed prior to the completion of the construction phase. Monitoring of cormorants will be ongoing.
Section 5.3, page 52	Investigate the impacts of the Enlarged Cotter Dam on Two-spined Blackfish breeding.	Spawning habitat enhancements and recruitment of Two-spined Blackfish within Bendora Reservoir are being investigated as part of Project 1 - Constructed homes for threatened fishes. Monitoring of potential Enlarged Cotter Dam impacts are included in scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Project 1 will be completed in December 2010. Monitoring of Two-spined Blackfish recruitment will be ongoing.
Table 4, Section 6.6, page 69			
Monitoring	Continue monitoring water quantity and quality in Cotter Reservoir and provide this information on a regular basis to ACTEW, TAMS and ActewAGL.	Monitoring will be in accordance with ACTEW’s Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue to monitor nutrient concentrations	Monitoring will be in accordance with	Monitoring will be ongoing

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	and algal numbers in Cotter Reservoir and provide this information on a regular basis to ACTEW and ActewAGL.	ACTEW's Licence To Take Water.	as required by regulators.
	Continue monitoring the recovery of the catchment and provide this information on a regular basis to TAMS, ACTEW and ActewAGL.	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue to monitor fish numbers in Cotter Reservoir and the Cotter River upstream of the reservoir and provide this information to TAMS.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Occasionally monitor storm events to estimate sediment transport.	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue to monitor the presence of Macquarie Perch and reproductive success upstream of Vanity's Crossing.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor annual recruitment or spawning in the Macquarie Perch population.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor potential adverse water-quality changes (DO and pH) in the water trapped between the two dam walls (if overlapping construction and filling phases).	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Monitor fishing use of the Cotter River between Bendora and Cotter Reservoir.	The responsibility for this commitment will be discussed with the ACT Government.	Discussions ongoing.
	Regularly monitor food resources available to fish.	ACTEW will undertake monitoring in accordance with recommendations of Project 7 – Food sources for Macquarie Perch and drawdown effects.	Monitoring to be as recommended. Project 7 due for completion early 2011.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Continue to monitor adult Macquarie Perch in wet-well.	The design of the intake structure for the enlarged Cotter Reservoir will prohibit the entrainment of adult Macquarie Perch, therefore monitoring of the wet well is not required.	No further action.
	Monitor alien fish numbers in reservoir and river immediately upstream.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor cormorant activity during spawning events.	Monitoring will be conducted by the University of Canberra as part of the associated project Cormorant predation of Macquarie Perch and ongoing monitoring of cormorant activity in spring, during spawning events. Long-term monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	The cormorant predation study will be completed in February 2011. Monitoring conducted as part of Project 9 and will be ongoing as required.
Operating Regime	Continue to use the ACT Environmental Flows Technical Advisory Group to determine the quantity and temperature of releases from Bendora Reservoir, including flushing flows.	ACTEW will operate the enlarged reservoir in accordance with their operating licence, including the provision of stipulated environmental flows and drawdown limits. The quantity and quality of environmental flows required in the Cotter River Catchment will continue to be determined by the ACT EPA.	Appropriate management of water resources will be ongoing and in accordance with Licence conditions.
	Ensure that releases from Bendora Reservoir have a temperature similar to that of river water during the Macquarie Perch spawning season (mid-October to mid-November).		
	Minimise drawdown during Macquarie Perch spawning season (Oct-Dec).		

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
Construction Environmental Management	Require all consultants undertaking activities in catchment to have EMPs for their activities.	All consultants will undertake activities in accordance with BWA environmental management requirements.	Ongoing for the duration of the construction phase.
	Require all consultants to have necessary approvals (such as a waterways permit) in place.	All consultants will have necessary approvals and permits in place.	Ongoing for the duration of the construction phase.
	Require all consultants to notify the BWA of their activities in the catchment. Also require that key personnel are trained in mitigation measures to reduce the chance of introducing contaminants into Cotter Reservoir.	All consultants will undertake activities in accordance with BWA environmental management requirements.	Ongoing for the duration of the construction phase.
	Ensure that no water from below the existing dam wall is used for construction purposes, and ensure that the space between the old and the new dams is thoroughly dried out prior to commissioning the new dam.	Procedures for the management of the area between the new and existing dam walls and onsite water use, to minimise the risk of the EHN virus entering the existing or enlarged Cotter Reservoir, are documented in the CEMP and Aquatic Flora and Fauna Management Plan.	Ongoing for the duration of the construction phase.
	Ensure that appropriate measures are employed to eliminate the possibility of transferring biological material from the river section between the old and the new walls in the new reservoir. This will require fish eradication techniques (e.g. drying, poisoning, netting etc).	Procedures for the management of the area between the new and existing dam walls, to minimise the risk of the EHN virus entering the enlarged Cotter Reservoir, are documented in the CEMP and Aquatic Flora and Fauna Management Plan.	Ongoing for the duration of the construction phase.
Shelter Habitat	Use the findings of Project 1 to provide additional information specifically on the suitability of some form of artificial habitat as a replacement for the current macrophyte beds.	Suitable constructed habitats (rock reefs) have been identified with the use of information from Project 1 – Constructed homes for threatened fishes.	Constructed shelter habitat (rocks reefs) will be installed prior to the completion of the construction phase.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Survey Enlarged Cotter Dam basin to determine whether suitable shelter habitats, especially boulder, cobble and rock areas, and timber, will be submerged down to maximum operating level.	Survey has been undertaken by Biosis in consultation with the Fish Management Program team and the University of Canberra.	Survey was completed in September 2010 and presented to the FMP Steering Committee.
	Examine the possibility of providing additional edge-boulder habitat (for juvenile and sub-adult Macquarie Perch), within the new dam.	Treatment of final quarry and surfaces of saddle dams and provision of rock reefs will provide suitable juvenile and sub-adult Macquarie Perch habitat.	Treatment will be undertaken prior to completion of construction phase.
	Examine the possibility of providing additional boulder habitat (for juvenile, sub-adult and adult Macquarie Perch), within the quarry site for the Enlarged Cotter Dam (which will be within the flooded area of the Enlarged Cotter Dam).	Treatment of final quarry to provide suitable fish habitat.	Treatment will be undertaken prior to completion of construction phase.
	Seek to maximise amounts of submerged timber at all depths.	Timber within the inundation zone will be left in situ unless it poses a risk to water quality.	Water quality assessment underway. Steering Committee aware of issue and being kept informed.
Fish Passage	Use the findings of Project 2 to provide additional information specifically on improving the passage of fish (particularly Macquarie Perch) along the Cotter River upstream of the Enlarged Cotter Dam.	Project 2 - Predicted passage of native and alien freshwater fish based on swimming speed performance recommends that existing pipe culverts at Pipeline Road Crossing and Bourke's Creek Crossing be modified to reduce flow velocity and allow passage by Macquarie Perch. Repairs to Vanity's Crossing are also proposed.	Remediation will be undertaken prior to the completion of the construction phase.
	Use the findings of Project 8 to reduce or eliminate remaining instream barriers (if any).	Project 8 – Investigation of techniques for mapping instream barriers is currently underway.	Project 8 will be completed by early 2011.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Provide uninterrupted passage at any problem barriers, either by modifying stream bed structure or building fishways.	Project 2 - Predicted passage of native and alien freshwater fish based on swimming speed performance recommends that existing pipe culverts at Pipeline Road Crossing and Bourke's Creek Crossing be modified to reduce flow velocity and allow passage by Macquarie Perch. Repairs to Vanity's Crossing are also proposed.	Remediation will be undertaken prior to the completion of the construction phase.
Crayfish	Use the findings of Project 3 to provide additional information specifically on improving of the Cotter River downstream of the Enlarged Cotter Dam for crayfish.	Project 3 - Crayfish ecology recommends that flows be investigated to improve the quality and availability of Murray River Crayfish habitat.	The investigation and modification of environmental flows will be ongoing. ACTEW will provide flows in accordance with Licence conditions.
Design	Investigate screening to prevent fish access or entrainment in intake structure.	The design of the intake structure has mitigated this risk.	No further action.
Stakeholder Management	<p>Require close consultation between ACT government agencies, ACTEW and ActewAGL, to recognise additional risks due to lack of sufficient information.</p> <p>Ensure frequent meetings between fish management personnel and design/construction team members to discuss fish management requirements.</p> <p>Have regular stakeholder assessments of management requirements.</p> <p>Liaise with ACT Government to promote a program of public education about the various</p>	<p>The Fish Management Program Steering Committee will meet regularly to guide the provision of mitigation strategies for the protection of threatened native aquatic species.</p> <p>Represented organisations include SEWPaC (formerly DEWHA), the ACT Government, the ACT EPA, the University of Canberra, ACTEW and the BWA.</p> <p>The Community Engagement and Stakeholder Management Team will keep</p>	Consultation with the Fish Management Program Steering Committee will be ongoing.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	risks.	the ACT community informed of fish management activities.	
	Involve relevant stakeholders including ACTEW, ActewAGL, the ACT Government and the ACT community.		
	Compile protocol(s) for recovery and release of any fish which become trapped in intake infrastructure. This is to be undertaken jointly by TAMS, ACTEW and ActewAGL.		
Translocation	Continue to translocate Macquarie Perch, Trout Cod and Two-spined Blackfish to other potentially suitable habitats and monitor populations(s) in new habitat(s).	Project 5 - Research into the establishment of new populations of Macquarie Perch, Trout Cod and Two-spined Blackfish through translocation is currently underway.	Project 5 will be completed in August 2011.
Fish Management Plan and adaptive management	Review Fish Management Plan on a regular basis; for example, at end of design phase, at end of construction phase and then at intervals of once every two years for the filling and operational phases.	Update of the Fish Management Plan has been developed in accordance with Territory and Commonwealth conditions of approval. This process will be overseen by the Fish Management Program Steering Committee.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Versions three and four will be submitted in early 2012 and early 2014 respectively.
	Require peer reviews of information collection and monitoring.	Peer reviews will be conducted as required.	Peer review will be ongoing.
	Ensure substantial areas of suitable spawning habitats are available at all storage levels.	The remediation of Pipeline Road Crossing and Burke's Creek Crossing, will allow Macquarie Perch to access a further 13 km of suitable spawning habitat in the Cotter River upstream of the enlarged inundation zone.	Remediation will be implemented prior to the completion of the construction phase.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Use findings of each of the Fish Management Plan projects to inform actions.	The results of the Fish Management Program and associated projects will be used to inform the adaptive management approach and will be guided by the Fish Management Program Steering Committee.	Adoption of recommendations will be undertaken in ongoing consultation with the Fish Management Program Steering Committee.
	Audit, review and update Fish Management Plan	The audit, review and update of the Fish Management Plan will be in accordance with Territory and Commonwealth conditions of approval and will be overseen by the Fish Management Program Steering Committee.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Versions three and four will be submitted in early 2012 and early 2014 respectively. Consultation with the Fish Management Program Steering Committee will be ongoing.
Predation	Investigate levels of Trout predation and what life stages of threatened fish are most affected.	Included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Investigate control techniques to reduce impacts of predation (barriers, trapping etc).	The design and siting of the alien fish management structure (fish trap) will be finalised as part of the scope of Project 6 – Alien fish management.	Project 6 is expected to be completed by the end of 2011.
	Investigate temporary and permanent provision of artificial cover during spawning events.	Project 9 - Enlarged Cotter Dam fish monitoring will determine the need for artificial cover based on Macquarie Perch and cormorant behaviours.	Monitoring from Project 9 will be ongoing as required. Results from monitoring to determine need for action.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Investigate temporary bird management options to mitigate predation during spawning events.	This will be investigated by the University of Canberra as part of the proposed project research into the potential predation by cormorants of Macquarie Perch in the Cotter Reservoir which is planned to commence in late 2010 and culminate in early 2011.	The cormorant predation study will be completed in February 2011.
Spawning Habitat	Investigate whether Two-spined Blackfish will breed in reservoir habitats.	The spawning behaviour of Two-spined Blackfish in Bendora Reservoir is included in the scope of Project 1 - Constructed homes for threatened fishes.	Project 1 will be completed in December 2010.
	Investigate provision of artificial spawning habitats for Two-spined Blackfish.	The spawning habitat requirements for Two-spined Blackfish, including their use of spawning tubes is included in the scope of Project 1 - Constructed homes for threatened fishes.	Project 1 will be completed in December 2010.

4 References

ACT Government 2007, *Ribbons of Life: ACT Aquatic Species and Riparian Zone Conservation Strategy*, Action Plan No. 29 Department of Territory and Municipal Services, Canberra.

ACTEW Corporation [ACTEW] 2010, *Enlarged Cotter Dam Fish Management Plan – Version 2*.

ActewAGL 2009, *Enlarged Cotter Dam Fish Management Plan*, report to ACTEW Corporation Ltd, Canberra.