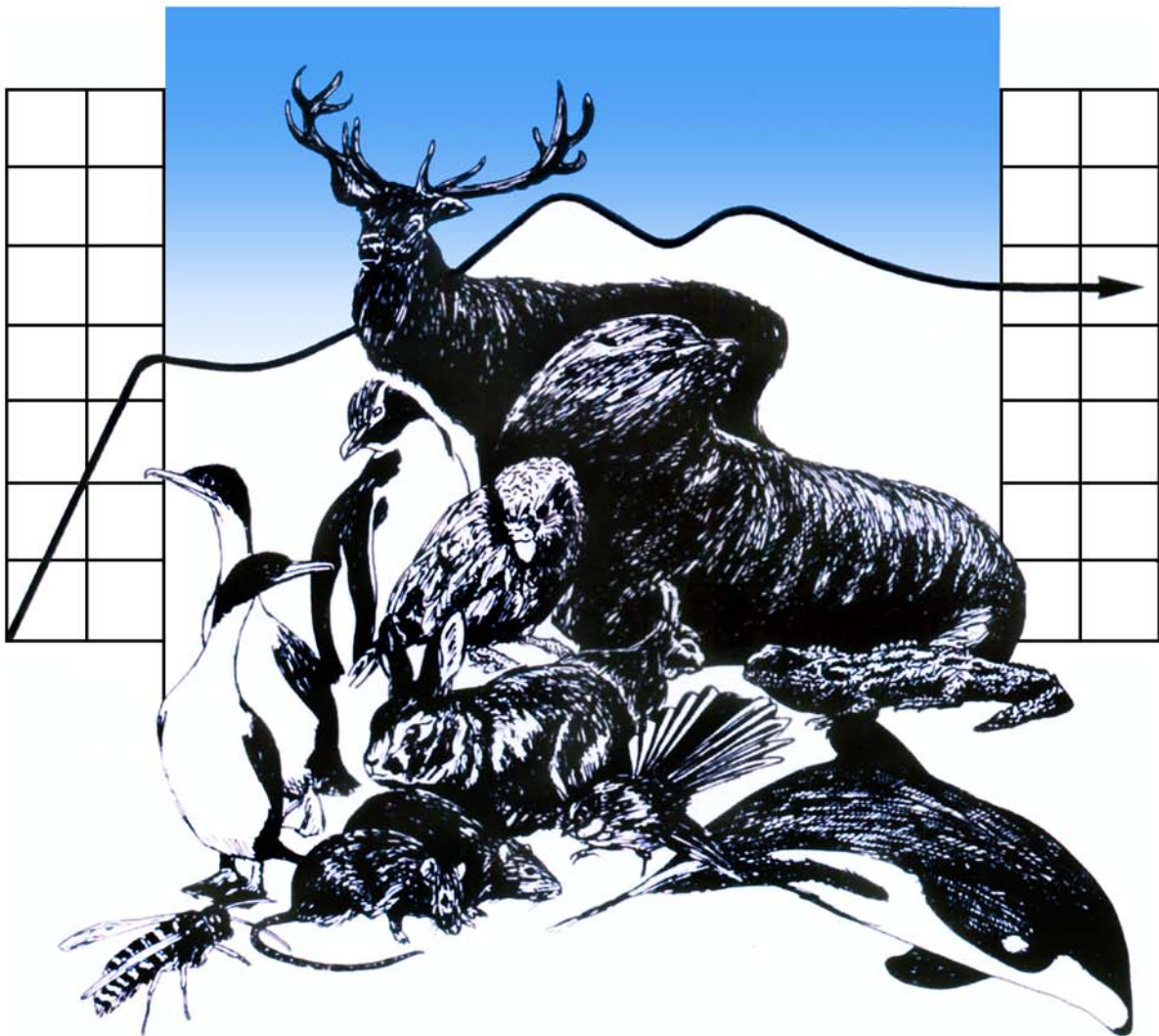


## DEPARTMENT OF ZOOLOGY



## WILDLIFE MANAGEMENT

A REVIEW OF THE NEVIS  
VALLEY AND ITS VALUES:  
In Response to Potential Hydro  
Electric Development

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A report submitted in partial fulfilment of the requirements of the  
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## Executive Summary

The Nevis River carves its way through an intermontane valley within the Central Otago Region of New Zealand. The purpose of this report is to introduce the Nevis Valley, review and discuss the current values of the Valley and as a result demonstrate why the River should be completely protected from any potential hydro electric development.

The Nevis Valley is commonly described as an isolated, open-spaced, golden landscape, scattered with remnants of past mining and farming settlements. These days the valley is utilized by a range of recreational uses such as, fishing, kayaking, four wheeled driving, and picnicking.

More specifically, it is the solidarity and the outstanding back country landscape that anglers, both nationally and internationally have come to value highly. The river also provides the opportunity to see and catch trophy trout. These such values are what Otago Fish and Game Council are seeking to preserve.

In 1997 the Water Conservation (Kawarau) Order (WCO) was created. In regards to the Nevis, the Order seeks to protect the River's wild and scenic characteristics for recreational purposes, in particular fishing and kayaking. However, the WCO fails to completely protect the River from hydro electric development. Recently, there has been increasing interest surrounding hydro development by Pioneer Generation. In addition, the pastoral leases adjacent to the River are currently undergoing Tenure Review. This means there is a possibility of Pioneer Generation gaining Freehold title, which would improve their situation for future development.

As a method to oppose any future damming and to ensure the safety of angler values within the Valley, Otago Fish and Game have recently made an application of amendment to the 1997 WCO. The application is not without conflict and there is some controversy over the position that the Department of Conservation has taken on the amendment. It is anticipated that within the next few months a hearing will be set and such issues will be settled before this time.

This report summarises new evidence of values associated to such recreational and natural features as, landscape, historic, fishing, kayaking, and native flora and fauna. Much of the significant information related to these values were not available at the time of making the original Order and may assist in changing the WCO so that damming is completely prohibited. This will ensure that the values that are appreciated not only by Otago Fish and Game but other associated organisations, are preserved for the future.

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# A REVIEW OF THE NEVIS VALLEY AND ITS VALUES: In Response to Potential Hydro Electric Development

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## 1.0 Introduction

The Nevis Valley is situated within the Central Otago Region and is enclosed by a series of mountains. A central feature of the Valley landscape is the Nevis River, which is utilized by a variety of recreational users such as anglers and kayakers. The Nevis Valley has a fascinating history of mining and farming that dates back as early as the 14<sup>th</sup> Century. These historical remnants are scattered throughout the valley and add value to an already outstanding wild and scenic landscape.

In 1997 the Water Conservation (Kawarau) Order (WCO) was established. This Order protects the Nevis River for its wild and scenic values but fails to completely protect the river from damming. The issue at present has been brought about as a result of the current pastoral leases within the valley undergoing Tenure Review. There are concerns that if Pioneer Development gain Freehold lease title over the land adjacent to the river, they will better their position for potential hydro electric development in the River.

Otago Fish and Game Council have recently submitted an application to amend the 1997 WCO so that hydro electric development is completely prohibited from the Nevis River. Although a hearing is yet to be set, Fish and Game have gathered evidence in preparation for their case. This report will provide an in-depth overview of the past and present situation regarding the Nevis Valley and cover the key values associated with the river. These include but are not limited to landscape, historical, fishery, kayaking, and

native fauna and flora values. The likely impacts of hydro electric development on these values will be described, thus providing evidence on why the Nevis River requires complete protection.

Much of the information discussed in this report, surrounding these values was not available at the time of making the 1997 WCO. Therefore, it is hoped that this new evidence will be used to aid in the process of changing the WCO to ensure that hydro electric development is totally prohibited from the Nevis River.

## 2.0 General Background Information regarding

### 2.1 Location/description

The Nevis River is located in the South Island of New Zealand within the Central Otago region (Figure 1). The Nevis Valley is enclosed by a sequence of mountains (Hector, Remarkables, Garvies Mountains) and high rangelands (Old Women, Carrick Ranges) (Petrie, 2006). The source of the river is near the southern end of the Hector and Garvie Ranges. From there the river flows in a nor-northeasterly direction for approximately 50 kilometres (km) where it converges with the Kawarau River (Otago Fish and Game, 2007; Petrie, 2006). As described by Petrie (2006), the characteristics of the Nevis River vary with locality. The upper reach of the Nevis River flows in an open but steep-sided valley (Figure 2), that then becomes briefly confined by a gorge which opens out to a broader valley beneath the Nevis Township (Figure 3). Further downstream, past the Nevis Crossing the Nevis River becomes more rugged and embedded. The river again drops into a steeply chiselled gorge, where it flows for a considerable distance before converging with the Kawarau River (Figure 4) (Otago Fish and Game, 2007; Petrie, 2006).

Figure 1: Location map of the Nevis Catchment

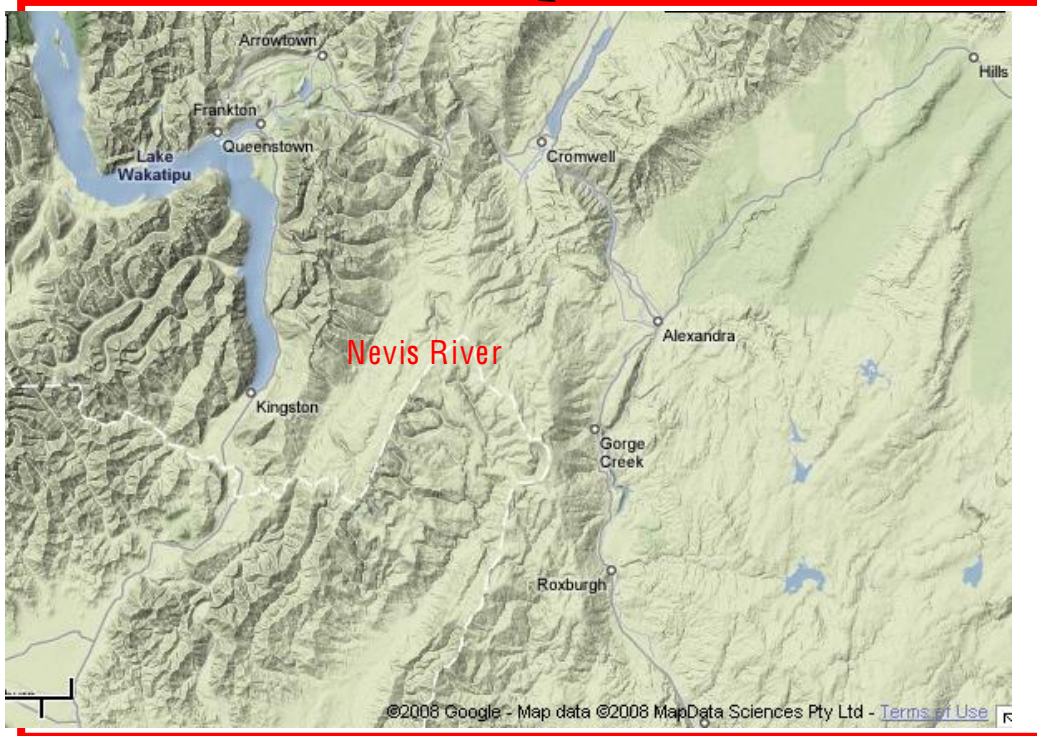
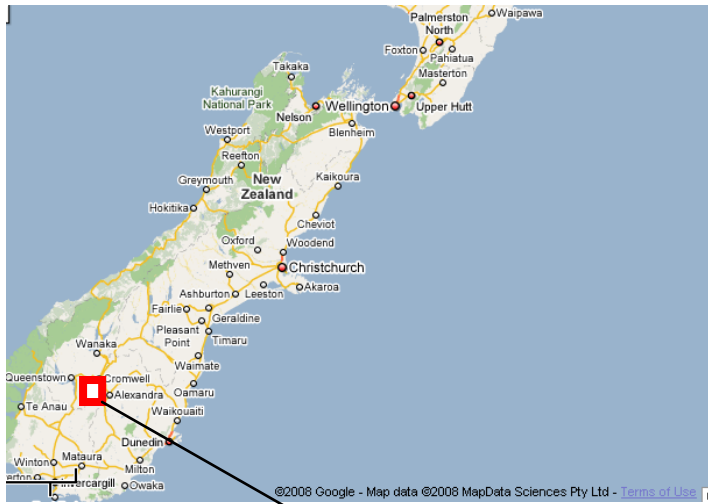


Figure 2: The Upper reach, further south looking upstream of the Nevis Valley. The Nevis River contained within a deep v-shaped valley (Petrie, 2006).



Figure 3: Looking north towards the Nevis Crossing (Petrie, 2006).



Figure 4: Looking from the south towards the confluence between Nevis and Kawarau rivers (Petrie, 2006).





The Nevis Valley is often described as an open-spaced and isolated landscape, enclosed by its surrounding mountain ranges. This is reinforced by the harsh climate and isolation during winter snow falls (LINZ, 2004). The dominant vegetation cover is tussock, which gives the appearance of a ‘tawny gold’ texture on the hill slopes. Flats, gorges, terraces, tor-lined gullies and slopes all contribute to the spectacular nature and diversity of the landforms found in the Nevis Valley (LINZ, 2004).

The Valley also portrays a cultural character as a result of historical mining activity. There is evidence that suggests human occupation dates back to the 14<sup>th</sup> Century (Hamel, 1994). As a consequence, the remnants of old mining sites and settlements throughout the valley are considered to add an unobtrusive cultural and historical aspect to the valley landscape. There is also past and present evidence of pastoral settlement, with old sheep stations retained. The current catchment land use consists of relatively low summer sheep grazing and conservation estate with some pasture development in the lower Nevis Valley (Hamel, 1996).

## 2.2 History (As described by Hamel, 1994; 1996)

### 2.2.1 Maori

There are no records of any significant Maori historical sites within the Upper Nevis. However records from local historian Philip George, in 1917 discuss the remains of a

historical moa-hunting site at the mouth of Schoolhouse Creek in the Lower Nevis. George describes how when he came across the site he found grassy circular depressions, with rings of stones around them which were filled with charcoal and ashes. George was informed that before mining began the site was covered with ovens and moa bones were abundant.

George also found the only other known Maori site approximately 3km away from the School House Creek. He discovered several heavy moa bones, along with crop stones. Because of the absence of any remnants of ovens or fires, it was believed this might have been a Moa butchery site, where moa were slaughtered and the meat stripped before carrying the meat back to the School House Creek site. If the description that the miners gave to George was correct, then the Schoolhouse Creek site may have been one of the larger moa hunting sites in Otago.

Currently, the Schoolhouse Creek site can be easily relocated but there are no surface remnants of the moa hunting site. This is due to mining and naturally occurring erosion. George deposited the Maori artefacts that he found into the Otago Museum. The butchery site has never been relocated; it is not even known which side of the valley it lay on.

### 2.2.2 Mining

The lower Nevis is scattered with remnants of all types of workings of all the major periods of historic gold working in Otago from 1863 to the 1930's. It was known there was gold in the Nevis back in 1862 by Vincent Pyke. The first miners worked a tributary (Potters No 1, Figure 5) running in the lower gorge, moving down during the winter in 1863 to the coal pits near what was to become the Nevis Crossing. The winter months usually drove miners out because of the harsh conditions and the frozen rivers that impeded water and power supply.

The first workings in the valley had been paddocking and cradling close to the river. Ground sluicing began in 1864; it was slow to develop because of the difficulty getting pipes in over Duffers Saddle. Past dredging is thought to have destroyed many of these earlier workings in the riverbed.

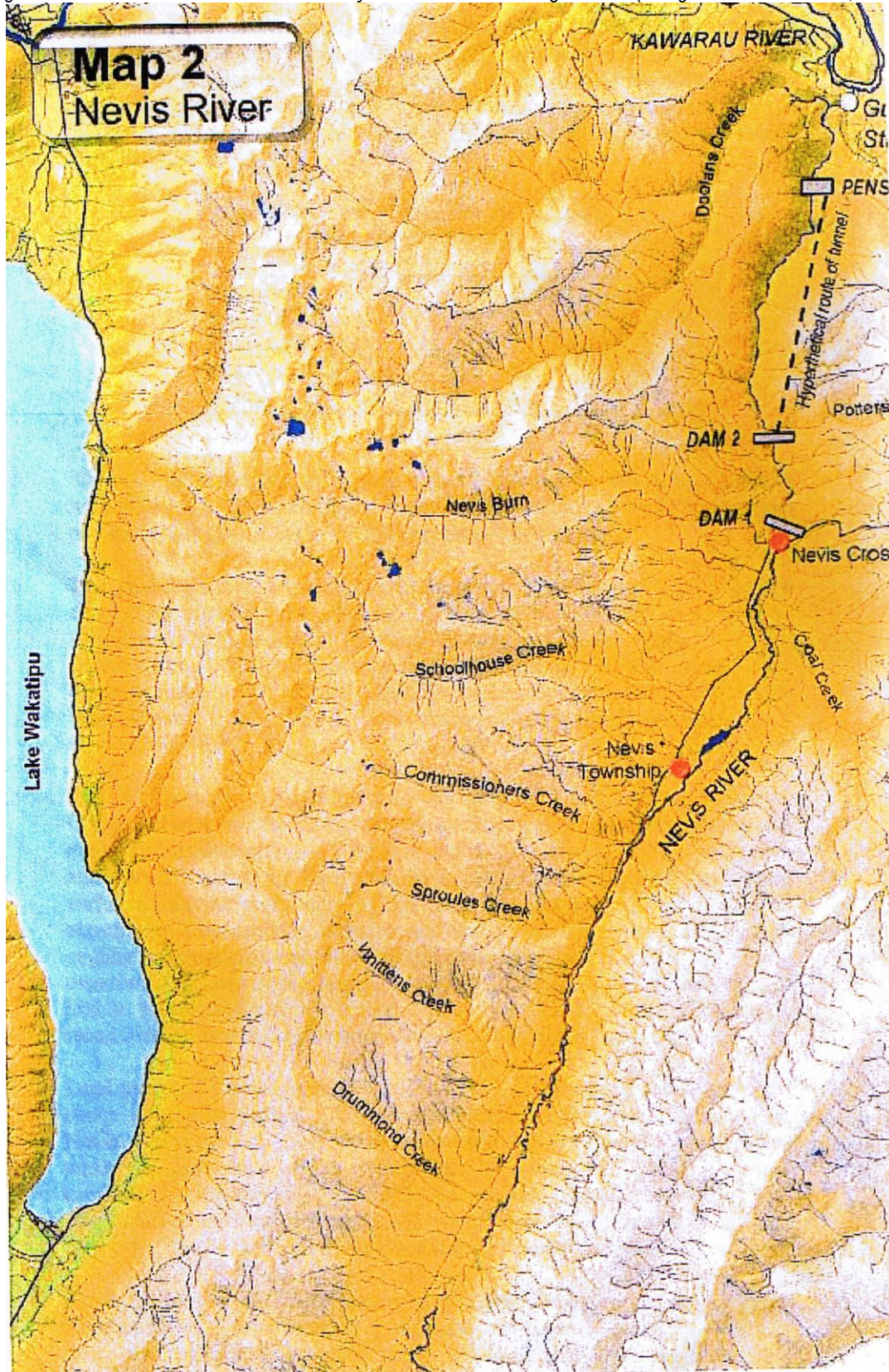
The 1890's brought a change in both people and the pattern of mining as hydraulic elevating began and continued for over 50 years. In the lower river bed flats the varying mining techniques succeeded one another with dredging predominating during the 1900's. There are ponds and large heaps of tailings, left by elevating and dredging still visible that

stretch along the river flats from the Nevis Crossing to the Nevis Township. There are remains of what is thought to be the Nevis Crossing Dredge that lie south of the Schoolhouse Creek confluence. This dredge was likely to be the longest operating dredge in Otago and Southland, running from 1902 to 1939.

A major group of sluice faces lie behind and south of the Nevis Township. These were mostly worked by the Masters and Adie families and the Robertsons at the turn of the Century. Some efforts were made to work the deposits from shafts and adits, but these were not successful. The most southern group of faces were worked by Robertson from 1891, using the lowest races from Commissioners Creek. In addition one of the highest races of Otago, an 11km race built in 1883 from the head of Coal Creek on the Garvie Range along the 1400m contour, was used. Robertson dropped water down a gully to carry out hydraulic sluicing on his claim west of Nevis Township (Figure 5). Masters sluicings were fed by the middle two races from Commissioners Creek (Figure 5). Adies sluicings were worked by the highest race from Commissioners Creek and smaller races from Schoolhouse Creek. Adie's high race was built in approximately 1891, and they, together with the McLean's, continued working behind the Township up until the 1950's (Figure 5).

The lower Nevis was mined for coal since 1863. There are three or four coal pits in the Nevis Burn and near the Crossing. These supplied coal for household fuel for the miners and were intensely worked in the 1900's to supply dredges and other stationary engines.

Figure 5: Closer view of the Nevis Valley and its contributing waters (Otago Fish and Game, 2007).



### 2.2.3 Farming

Currently, there are two farmsteads in the Nevis Valley, one of which is the Ben Nevis. The design of the Ben Nevis farmstead is typical of the early runs and obeys the two basic principles of placing the living quarters upwind of the yards and the woolshed closest to the road entrance. Evidence suggests that the farmstead was established in the early 1860's. The other early farmer in the Nevis was William Masters. Masters is said to have farmed in the upper valley, which was wiped out by bad weather forcing Master's to shift to the lower valley and become a miner.

#### 2.2.4 Settlement

The Nevis has a long history of human occupation beginning in the 14<sup>th</sup> Century and continuing till this day. During the peak of mining the Nevis Valley had a population greater than 600.

There were two small townships established in the Valley during the mining period. There was a store near the Crossing and the more important Nevis Township, which is located in the upper end of the valley (Figure 5). The Township historically spread out for approximately 2km along the Nevis road on both sides of the river. There are few scattered small freehold sections, buildings and foundations still visible, along with two cemetery reserves that mark the site of the Nevis Township.

More recently two cribs have been built, and there is a current resident population of less than 5 people.

### 3.0 1997 Water Conservation (Kawarau) Order (WCO)

#### 3.1 History of the WCO

According to the Resource Management ACT 1991 (RMA), the purpose of a water conservation order is to recognise and sustain “*outstanding amenity or intrinsic values*”. The order may provide the protection of characteristics which any water body has or contributes to, and which are considered outstanding. This includes, for fauna habitat, as a fishery, for wild, scenic or other natural characteristics, and for recreational, historical, spiritual or cultural purposes.

On the 23<sup>rd</sup> of October 1990, an original application was made by the Minister of Conservation for a water conservation order to be created for the Kawarau River. This application included Lake Wakatipu, its inflowing streams and rivers and all the tributaries

of the Kawarau, including the Nevis River. The application was made in response to representatives from the NZ Canoeing Association, and was then quickly supported by other organisations such as Forest and Bird, Otago Conservation Board, NZ Canoe Association, NZ Fish and Game Council and the Otago Department of Conservation (DoC).

The original application was made under the Water and Soil Act 1967 until the RMA came into force on 1 October 1991. With accordance of Part 205 of the RMA, applications and submissions were then considered by a Special Tribunal. Submissions of support were prepared by the organisations mentioned above and several individual anglers and recreational users. The Otago Central Electric Power Board (OCEPB) alongside several other individuals presented some of the opposing submissions to the application. Following the hearing of the WCO application, the Special Tribunal made a report for the Minister of the Environment in December 1993. There were a few appeals lodged, however these did not concern the Nevis River. The Planning Tribunal then presented its report and recommendations to the Minister for the Environment on 13 June 1996 and the Order was gazetted in March 1997.

### 3.2 Relevance to the Nevis River

During the development of the WCO, requests were made by the Minister of Conservation and Otago Fish and Game Council to the specific prohibition on damming of the Nevis for their respective obligatory reasons. The 1997 WCO gave protection to the Nevis River's wild and scenic characteristics for recreational purposes, in particular fishing and kayaking, however the Tribunal was not persuaded to completely prohibit damming. "*The Tribunal recognised the potential loss of value but decided the protection of the recreational characteristics, while having regard to the community needs, to be the best decision*" (Special Tribunal, pg 18). Incidentally, the final Order failed to completely protect the Nevis River from hydro electric development. Any damming of the Nevis River is subject to several restrictions that are aimed to prevent any significant damage to the values of the River. According to the WCO damming is only acceptable if it (see Appendix 1):

- i) *...makes provision for river flows to be provided at sufficient levels to enable kayaking to be undertaken in the gorge at times stated in the plan or permit and the extent of any impounded water is not beyond S143:836485 (Approximately 6km upstream of the Nevis Crossing)*

ii) *ensures fish passages are maintained*

In 1997 when the order was implemented, any hydro electric development was seen as quoted by J.R. Waugh and J.S. Holloway (see Appendix 3) ‘... *such a distant possibility that it is not likely to be of great weight...*’ and that any damming proposals would have to undergo the stringent approval of Otago Regional Council land and water permits before any development should get underway.

## 4.0 Otago Fish and Game Application for Amendment of the WCO

### 4.1 The Application for Amendment (As described by Otago Fish and Game, 2007)

In 2007, Otago Fish and Game Council submitted an application to amend the 1997 Water Conservation (Kawarau) Order, specifically in respect of the Nevis River, with accordance of Part 216 of the RMA. According to the application the amendment ‘*seeks to protect the outstanding fishery, in-stream habitat, wild, scenic, recreational and natural characteristics of the Nevis River by adding prohibition on* (for full list of proposed amendments see Appendix 2):

- i) *damming on the Nevis*
- ii) *diverting the flow of the Nevis River*
- iii) *taking water from the Nevis River or imposing a minimum flow*’

The proposed amendments would prevent any hydro electric development activity in the Nevis River. The Minister for the Environment has agreed to appoint a Special Tribunal to hear and report on the application and Fish and Game are now waiting for a date to be set for the hearing. Otago Fish and Game are currently gathering submissions of support and evidence as a preparatory step to the hearing.

## 4.2 Incentive for Amendment

### 4.2.1 Otago Fish and Game Obligations

Fish and Game New Zealand is a Crown Entity, established under the Conservation Act 1987. The organisation has a statutory responsibility for the sports of freshwater fishing and game bird hunting (Fish and Game NZ, 2008). In regards to the amendment

application Fish and Game, under section 26Q of the Conservation Act, obligations are as follows:

*(l) The functions of each Fish and Game Council shall be to manage maintain and enhance the sports Fish and Game resource in the recreational interests of anglers and hunter and in particular...*

*e) In relation to planning, -*

*(i) To represent the interests and aspirations of anglers and hunters in the statutory planning process; and*

*vii) To advocate the interests of the council, including its interests in habitats*

Hydro electric development in the Nevis Valley would directly affect the values of recreational anglers and the surrounding habitat. Therefore, it is in the best interests of users of the River that Otago Fish and Game ensure the Nevis River, its contributing waters and its unique trout fishery, are protected against damming.

Although there are no specific policies regarding any of the Nevis Valley properties, the Regional Policy Statement does provide the following guidelines regarding natural values:

*“To maintain where practicable enhance the diversity of Otago’s significant indigenous vegetation and significant habitats of indigenous fauna, trout and salmon”*

*“To recognise and provide for the protection of Otago’s outstanding natural features and landscapes”*

The application to amend the WCO reveals new values that recognise the Nevis River (upper and lower) as part of an outstanding landscape. This and the significant indigenous fauna and trout habitat the river provides should be significant reasons for Otago Regional Council to be against any development that would threaten these values.

#### 4.2.2 OCEPB/Pioneer Generation

Pioneer Generation was formed out of Central Electric Ltd after the sale of the Network and Energy Marketing operations of the company in April 1999. This was to comply with the requirements of the Electricity Industry Reform Act 1998. The company is located in the Central Otago Region. The industry is based upon hydro electricity generation, specialising in the operation, maintenance, and development of small hydro electric power stations (Dowling, 2000). Pioneer Generation is completely owned by OCEPB. The shares are currently held in the trust for the benefit of beneficiaries who are customers of Central



Electric Ltd and are residents of Central Otago (Dowling, 2000). The company is required to operate as an efficient business, however their main objective is to ensure the sustainable development and growth of the region (Dowling, 2000).

During the making of the WCO, OCEPB was concerned with the inclusion of the Nevis River, Staircase Creek, Moke Creek and Doolan's Creek. There was interest in the potential hydro generating opportunities in these waterways that would be affected by the WCO. OCEPB saw their role as having stewardship with regard to power generating resources on behalf of their consumers. When presenting their case to allow potential hydro development in the Nevis River they promoted themselves as a low-cost energy producer and supplier with an aim to be an efficient operator (report of meeting with OCEPB 2/7/91). OCEPB submissions stated that they were '*anxious to reduce impacts and among other things said that the river between the dam and the intake could retain its existing average flow, that they would build the dam in a single summer, that the existing tracks nearby to the power station site were already available and that they would put freshes into the gorge for canoeists*'. OCEPB also implied that with the Nevis Valley having a small resident population and small visitation numbers that such development would affect only a minimal amount of people. There has been recent evidence that suggests Pioneer Generation is increasing their investigations and is preparing to submit a proposal for hydro development.

There is a general rule within the Otago Regional Council Water Plan which describes damming as a discretionary activity (see Appendix 4). However there is no specific rule against hydro electric development. This may mean that the consent process for Pioneer Generation is going to be a rather simple process especially if they gain freehold title over the surrounding land.

#### 4.2.3 Proposed Hydro Electric Development in the Nevis River

Pioneer Generation justify hydro development in the Nevis River as a necessity to meet increasing demands for power supply to ensure continual economic growth, especially in regards to tourism, but also for farmers (Dowling, 2000). In addition, the company believes that their dam would be the least environmentally destructive option and would not directly affect many people as the area is isolated and human occupancy and tourism is minimal (OCEPB WCO Submission).

The proposed development on the Nevis River would consist of two dams; the upper dam would be an arch dam situated at the Nevis Crossing and would contain the

storage lake (Figure 6) (EHMS, 2004). The lower intake dam (also a concrete arch construction) would be approximately 2km downstream of the Nevis Crossing; it would include the additional flow of the Nevis Burn Stream and would divert the water into the 6.5km tunnel (Figure 6) (EHMS, 2004). The average flow estimated here is  $10.5\text{m}^3/\text{s}$  and the area drained is approximately  $510\text{ km}^2$ . Presently, it is planned that a 8km long concrete lined tunnel would be driven, parallel to the river, to just above the power station and a steel penstock installed to carry the water to the power station (Figure) (EHMS, 2004). It is estimated that the scheme would produce 45 MW, however with the WCO flow restrictions this value may be considerably lower. The minimum and maximum potential footprints of the reservoirs formed by such developments are shown in Figure 7 (Olsen and Hayes, 2006).

Figure 6: Map of the Nevis River showing possible hydro electric development (Olsen and Hayes 2006)

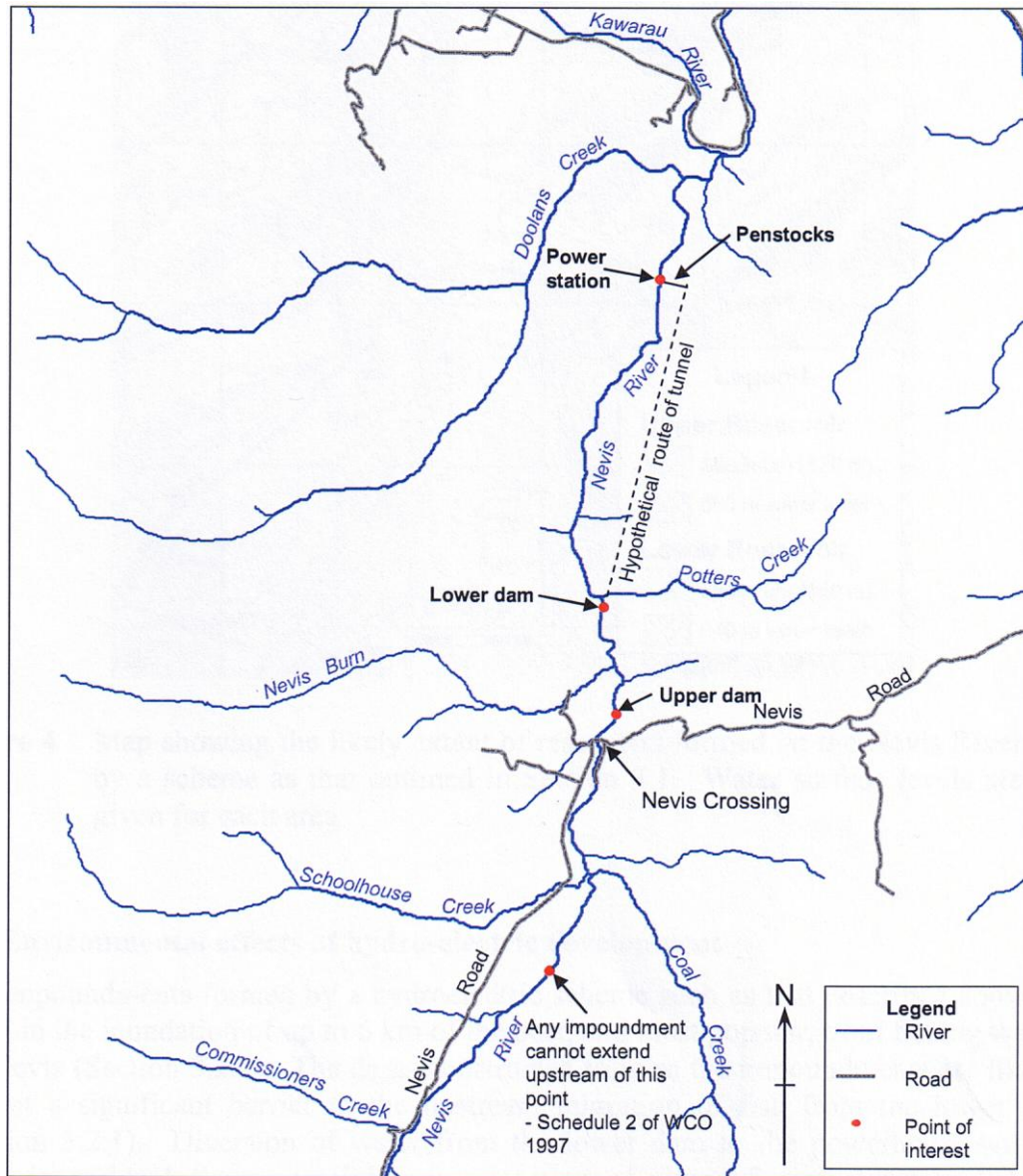
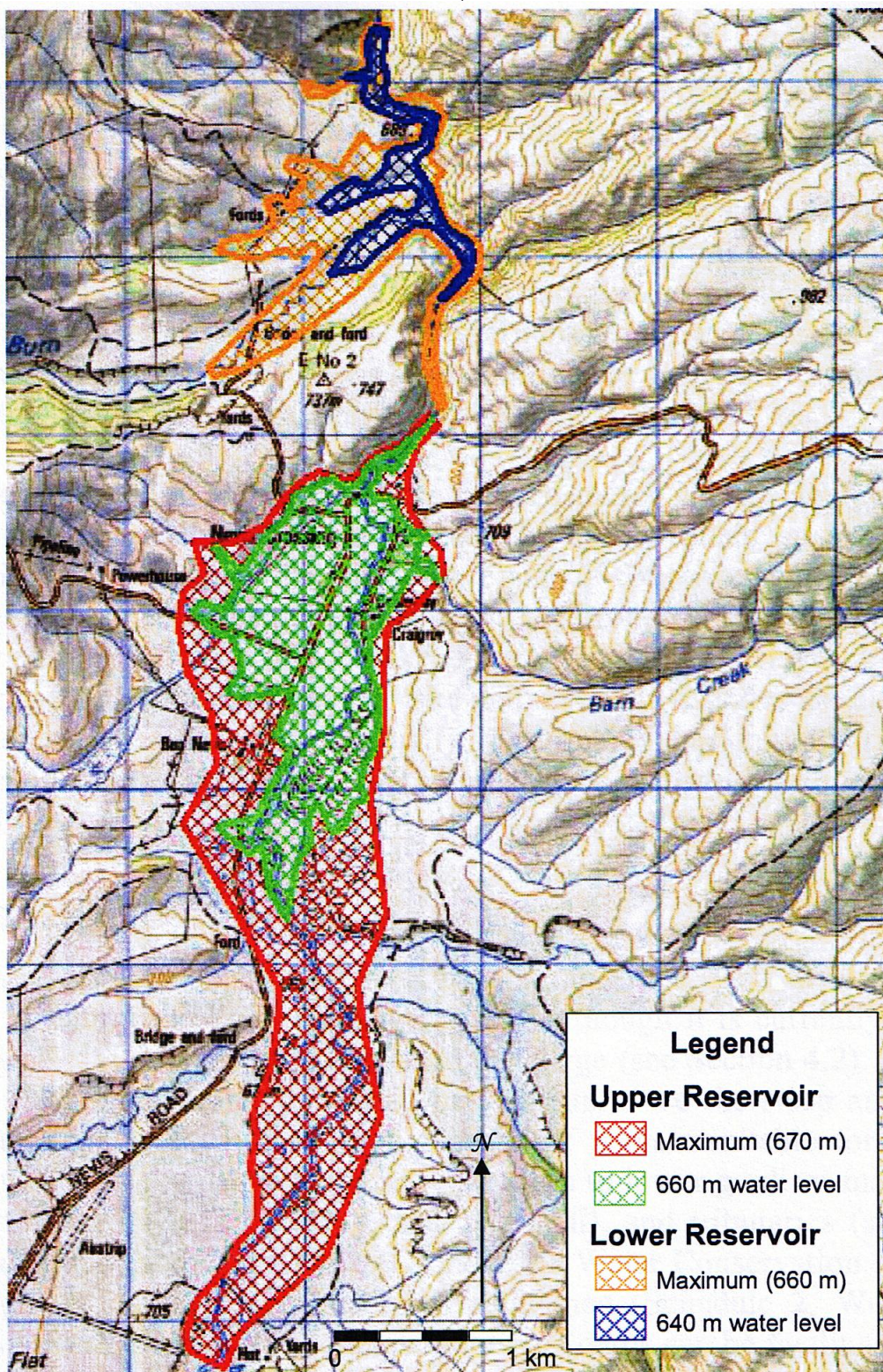


Figure 7: Map showing the possible extent of reservoirs formed on the Nevis River (Olsen and Hayes, 2006).



### 4.3 Tenure Review Pastoral Lease

Tenure Review involves the identification of significant inherent values of the pastoral lease land, the establishment of Crown reserves where inherent values are high and the offering of freehold title over areas with predominantly farming values (Otago Fish and Game, 2007; LINZ, 2008). The Nevis Valley has three pastoral leases, the Ben Nevis, Craigory, and Carrick Station. All of these leases are currently in the process of Tenure Review and are in the stages of information gathering and consultation with the lessee for the preliminary proposal.

Pioneer Generation is currently a stakeholder in the leases that concern the Nevis River (LINZ, 2008). Concerns have been raised that Pioneer Generation are in a good position to gain freehold title over these leases which will subsequently improve their chances of gaining approval for hydro electric development in the Nevis River.

It is of relevance that LINZ (2004), advises that the landscape within the valley is vulnerable to changes such as hydroelectric development. In addition, the Otago Conservation Management Strategy (CMS) indicates that the Nevis Bridge site should be retained and managed by DoC and also proposed that the parcels of unalienated Crown Land should be included in Tenure Review because of inherent ecological and historic values. One of these parcels is located by the Nevis River. It is also of interest that DoC has proposed that the hydro-dam footprint be freeholded as a trade-off for high altitude land to be retained by the Crown.

## 5.0 Nevis Valley Values (*Evidence in Support of an Amendment*)

### 5.1 Historical

Much of the historical information mentioned in Section 2.2, described by Hamel (1996) and LINZ (2004) was not available at the time the WCO was created. These reports have described in detail the many historical sites that are found in the Nevis Valley in relation to gold mining, pastoral farming and Maori occupation.

There are gold mining sites within the Nevis that are considered some of the most intact landscapes in Otago. Since the 19<sup>th</sup> Century, there has been minimal modification to the gold mining sites with only minor effects from cultivation around the crossing. In addition, the wide open landscape and lack of forest and shrub-land makes these sites highly visible and therefore easier for visitors to appreciate. Lastly, the sites are easily

accessible. These factors, combined with the high heritage values, make the area one of national importance (LINZ, 2004).

### Maori

Under the Historic Places Act the Schoolhouse Creek moa hunter site is now protected. There are also new claims from Ngai tahu (South Island Maori Tribe) that suggest that the Nevis Valley was historically used as a corridor for travelling groups. Ngai tahu have expressed their interest and are likely to submit evidence in support for the application of amendment.

### Potential Impact of Hydro Development on Historic Values

The proposed damming and subsequent reservoir will flood a substantial amount of the Valley (Figure 7). The main historical sites of the Nevis Valley are concentrated between the Nevis Township and the Crossing, all of these will be submerged by the storage lake if damming should go ahead. The loss of these sites would significantly damage if not completely ruin the historical values of the Nevis Valley. It is expected that the Historic Places Trust will submit evidence in support for the amendment in their own right.

## 5.2 Landscape

The Nevis River is one of the key physical features running through the valley. It provides an important linkage through the diverse natural and historic/cultural characteristics of the landscape (DoC, undated). The river is also considered to be one of the last free-flowing examples in Central Otago. It runs its total length in its natural state without adverse effects of damming, channel modification, flow regulation/fluctuation, major abstraction or discharge (Otago Fish and Game, 2007). There is little evidence left of any impacts of historic mining activities apart from the river side tailings. Geomorphological processes are thought to have restored any significant damage that occurred in the past (Otago Fish and Game, 2007).

LINZ (2004) and Petrie (2006) have both produced reports that describe the important open-spaced characteristics of the Nevis Valley and both caution that the landscape would be threatened by hydroelectric development amongst other things. The 1997 WCO seeks to protect the outstanding wild and scenic landscape in the Nevis Valley, however new evidence reveals that the Lower Nevis Valley has outstanding values not recognised by the Order. During the making of the WCO the special tribunal determined that the upper Nevis (above the Nevis Crossing) had outstanding scenic characteristics and that the lower Nevis had outstanding wild characteristics down through the gorge section.

New evidence has emerged to suggest that this distinction is questionable; the evidence suggests that the lower river also has outstanding scenic characteristics. DoC's submission during the making of the WCO also argued that both the upper and lower Nevis should have both values labelled to both upper and lower regions instead of being separate amenities. Otago Fish and Game in their application seek to change the WCO so that the values to be protected should be defined as scenic in the upper river and wild *and scenic* in the river below the Crossing (Otago Fish and Game, 2007; see Appendix 2).

Petrie (2006) carried out a landscape and amenity values assessment of the Nevis Valley. He admitted that it is the river itself or the contribution it makes to the wild and scenic values that WCO's consider, but claimed that the Nevis River especially with the lower gorge, is inextricably linked with its landscape setting. The RMA defines values as "*those natural or physical qualities that contribute to people's appreciation of its pleasantness, aesthetic coherence and cultural and recreational attributes*". Therefore, as suggested by Petrie (2006), what determines a river as being outstanding is a combination between the river, its setting and how the river and its environment are valued within the community (Petrie, 2006).

#### Potential Impact of Hydro Electric Development on Landscape Values (as described by Petrie, 2006)

The Nevis Valley is relatively unmodified in recent history with the exception of cattle and sheep farming and its associated farm buildings. The remnants of past disturbance is minimal and only a few historic mine workings/habitation and the graveyard remain. These remains are considered to enhance the landscape value for recreational users. Any type of development in such a scenically valued landscape would be both visually intrusive and incompatible with the surrounding natural environment.

##### *Storage pond*

The overall experience of entering a dry-upland basin would severely be reduced with the creation of a man-made impoundment. Visitors to the valley would not expect a large lake, unless of course it had been created for hydro development or irrigation purposes, thus defeating the purpose of a natural experience.

##### *Diversion dam/intake structure*

The actual height of the structure is unknown; however it can be assumed that the dam will be substantial and visually imposing. It will present a "built" element in an area which is relatively empty of man-made structures.

##### *Headrace*

Similar to the dam effects, the introduction of a steel pipe within the gorge would compromise the gorges untamed and unexploited characteristics. Although the tunnel will be visually unobtrusive, the spoils from the tunnel will be stockpiled and re-contoured in a small space. Potential earthworks associated with the tunnel may also have negative effects on the character of the gorge.

#### *Surge chamber, penstocks and powerhouse*

Depending on the location, the presence of these components in the landscape will be visually intrusive.

#### Landforms, geology and soils

The Nevis Valley is a relatively unmodified intermontane basin. There is a diverse array of landforms including incised channels, gravel braids, flood plains, terraces and fans of different ages. The exposed Nevis Fault at Schoolhouse Creek is the only feature actually recognised as of regional scientific, educational and aesthetic importance (Hayward and Kenny, 1998).

The soils associated with a variety of these landforms are some of the least modified of the eastern rain-shadow regions (LINZ, 2004). Unfortunately due to the open landscape and lack of plants, these soils are very vulnerable to erosion if disturbed (LINZ, 2004). As with landscape values, hydro development would have detrimental effects on the visual aspect of the landforms and geology of the Valley. It will also have considerable physical impacts which may ultimately change the entire dynamics and therefore the Nevis Valley will no longer be considered as an unmodified system. The soils may be disturbed by earthworks involved with the construction of a dam. This may runoff into the river causing sediment overloading, disturbing or destroying river habitats.

### 5.3 Fishery

The Nevis River is an outstanding back country fishery and fishery habitat, highly regarded for its relatively unmodified natural features and scenery. The River is open for angling from the 1<sup>st</sup> October until the 30<sup>th</sup> day of April (Fish and Game NZ, 2008). Only fly fishing is permitted with a bag limit of one fish per person per day (Fish and Game NZ, 2008). The natural environment and outstanding scenery as a backdrop, is a major factor attracting both international and national anglers to the Nevis Valley. It is classified as a nationally important backcountry trout fishery in the Sports Fish and Game Management Plan for Otago (Otago Fish and Game, 2003).



Brown trout are the primary sports fish found in the Nevis and are found throughout the main stem, with juveniles in many of the tributaries (Otago Fish and Game, 2007). Rainbow trout are caught in the lower gorge close to the confluence with the Kawarau. The Nevis has a reputation for producing trophy sized trout, being ranked 3<sup>rd</sup> out of 256 New Zealand rivers (Walrond and Hayes, 1999). There are approximately 12km of prime fishable waters in the Nevis, which represents almost 5% of the total length on fishable backcountry rivers in Otago (Walrond and Hayes, 1999). The Nevis River supports an estimated 250 angler days per year with peak usage in December – January. This ranks the Nevis River as the 10<sup>th</sup> most fished river of 15 back country rivers in Otago (Walrond and Hayes, 1999).

The key aspects of the Nevis fishery that are valued by anglers include (Otago Fish and Game, 2007):

- Remoteness from centres of population
- Not easily accessible
- Low angler density
- Catch rate relatively high
- Large size of fish
- Largely unmodified catchment
- Highly scenic setting

A survey conducted by Trotter (2005), revealed that the natural environment and scenery was essential to an anglers fishing experience. They also valued peace, solitude and the opportunity to spot and catch a trophy sized trout. The research conducted in the last decade has been significant in providing a context for managing a spectrum of fishing opportunities. One end of this spectrum represents highly valued backcountry fishing opportunities. The main objective of back country fisheries management is to protect key characteristics, whether that be controlling angler densities or advocating to protect the settings that are valued by anglers (Otago Fish and Game, 2007).

Recent evidence has shown that the Nevis provides an outstanding habitat for trout. It sustains a headwater of a trophy brown trout fishery based on resident fish that have an average size greater than most brown trout fisheries in Otago (Olsen and Hayes, 2006; Trotter, 2004; Trotter, 2006). Studies have suggested that the important areas for spawning habitat exist in the main stem of the Nevis, upstream of the Crossing and in the tributaries. The river downstream from the Nevis Crossing poses barriers to upstream trout

migration for the Kawarau River (Olsen and Hayes, 2006), therefore the lower river is dependent on downstream migration of juveniles or trout reared in tributary streams.

### Potential Impact of Hydro Electric Development on Fishery Values

#### *Inundation of Existing Habitat*

The primary effect will be the flooding and creation of a reservoir downstream of the Nevis Crossing, along with an impoundment from below the Nevis Burn confluence. These reservoirs will have some fishery values but the quality of such fisheries is uncertain, for this will rely heavily on the stability of the water levels. Fluctuating lake levels affect the productivity of the littoral zone which as a result, will affect the productivity of any lake fishery (Hayes, 1995). Lake fisheries are common throughout Otago, whereas river fisheries especially backcountry river fisheries, are uncommon in comparison with other regions (Walrond and Hayes, 1999).

#### *Fish Passage*

The proposed construction of the dams will prevent any upstream migration of adult trout from the lower gorge that is thought to occur (Olsen and Hayes, 2006). Although it is a requirement under the WCO for fish passages to be maintained, there has been mixed success with fish passage structures in the past, and there are no guarantees.

#### *Flow Requirements*

A study (Instream Flow Incremental Methodology (IFIM)) conducted by Jowett (2004) in the Nevis River found that a flow of approximately  $5\text{m}^3\text{s}^{-1}$  at the Nevis Crossing provided maximum habitat for brown trout. The peak aquatic invertebrate food producing habitats occurred at a flow of approximately  $6.2\text{m}^3\text{s}^{-1}$ . The amount of habitat available for juvenile trout and spawning declined dramatically as flow fell below  $1\text{m}^3\text{s}^{-1}$ . This suggests that any water takes that reduces the flow below the current mean annual flow will result in a reduction of habitat for brown trout (estimated 20% reduction) and aquatic invertebrates (estimated 25% reduction).

#### *Construction Activities*

During construction of the dam the creation of the necessary roads, the maintenance of the proposed schemes and the increased traffic on the roads will lead to increased sediment inputs into the Nevis River. As a result, the habitat for fish and macro-invertebrates in low gradient sections will likely become significantly degraded (Olsen and Hayes, 2006).

#### *Loss of fishery values*

Outstanding angling opportunities will be lost following dam construction. An example is the loss of the more challenging wilderness fishing experience that Nevis River provides. Also, the outstanding scenic backdrop will be interrupted by the intrusion of man made structures. The loss of having a challenging fishing experience with a sense of open-spaced remoteness, will impact the general attractiveness of the Nevis as backcountry fishery (Olsen and Hayes, 2006; Otago Fish and Game, 2007).

## 5.4 Kayaking

The Nevis River has been recognised for its outstanding kayaking values downstream of the Nevis Crossing. It is unique for its sustained steepness and intensity of the whitewater challenge that it offers to experienced local, national and international users. New Zealand Whitewater identified that “...nowhere else in New Zealand does a river drop this fast for so long” (Revised Edition, 2002, Graham Charles). Because there are parts of the Nevis River that provide a high level of difficulty, some sections of the river are considered a Grade 6 river challenge. During the making of the 1997 WCO, the New Zealand Recreational Canoeing Association (NZRCA) and other kayaking organisations described the river as a nationally significant wild and scenic River that is appreciated both nationally and internationally (NZRCA WCO Submission). The NZRCA has expressed their support of the application to amend the WCO. NZRCA believes the outstanding values that they recognise are simply not compatible with any damming and diversion of river flow (Otago Fish and Game, 2007, Appendix 5)

## 5.5 Other Recreational Users

The Nevis Valley is a popular area used for other recreational activities such as recreational driving, four wheeled driving, mountain bikers, and picnickers. The Valley is considered to be a ‘remote’ experience with a sense of isolation from human interaction or activity. The naturalness of the setting had been described as providing a sense of tranquillity, solitude, self reliance and spiritual growth (Otago Fish and Game, 2007; Petrie, 2006). As described in Section 5.2, the current landscape of the Valley presents an outstanding setting for recreational users, which would be jeopardised if hydro development should occur.

## 5.6 Native Fauna

A variety of fauna species has been documented to be found in the Nevis Valley. Data on population sizes and distribution is relatively poorly documented on the majority of these species and so it is difficult to determine the population status and protection requirements (LINZ, 2004).

The valley is inhabited by several moth species such as *Orocrambus sophistes*, *Carex muelleri*, *Asaphodes oraria*, *Asaphodes nephelias*, *Notoeras* n.sp., *Eurythecta zelaea* and *Lycaena boldenarum* (LINZ, 2004). In addition there is also an abundance of grasshoppers, weevils and beetles (LINZ, 2004). A range of aquatic caddisflies (*Hydrobioisis* n.sp., *Tiphobioisis montana*) and stoneflies (*Holcoperla magna*, *Spaniocercooides howesi*, *Zelandobiu mariaë*) have been found throughout the Valley all of which a rare western species. Many are also considered distinctive and of national importance (LINZ, 2004).

The Nevis Valley was surveyed in 1986 by Whittaker in search of the large Otago endemic skinks, none of which were found. However, a small cryptic species was discovered near the Township. Further research is needed to confirm its presence. Several species of bird have been recorded throughout the Nevis Valley of which include, the occasional Kea, the New Zealand Falcon, tams, pied oyster catchers, terns and white faced herons (LINZ, 2004). Three species of fish have been recorded in the Nevis, two exotic species of brown trout (*Salmo trutta*) and brook char (*Salvelinus fontinalis*) and the native Gollum galaxias (Otago Fish and Game, 2007).

#### Orocrambus sophistes

Orocrambus sophistes is a grey-winged nocturnal grassmoth that is found in inland areas of Otago and South Canterbury (Patrick, 2004). Although still locally common, the moth is threatened because of the ongoing degradation and elimination of its mountain dryland grassland habitat (Patrick, 2004). The species is also very vulnerable to local extinction because of the flightlessness of its short-winged female which reduces dispersal (Patrick, 2004). Some of its few remaining habitats are found in the Nevis Valley (Patrick, 2004). The possible effects of hydro electric development on the moth are unknown but should be considered when considering the WCO amendment as a species that requires protection from local extinction.

#### Gollum galaxias

Gollum galaxias are a non-migratory species, their distribution is heavily dependent on their predatory species - trout species and the brook char (Figure 8). Galaxiad species in general have become increasingly restricted in their range and their populations have

become fragmented due to introduced fish species (McDowall, 2006). With little data to base upon, the species was initially classified as not threatened, however in 2005 they were classified as a threatened species with a ranking of gradual decline (DoC, 2007).

The *galaxias gollumoides* are spread throughout the Nevis Valley including its tributaries. The current distribution of *galaxias gollumoides* within the valley is due to the impacts of brown trout. Usually the larger populations of galaxiads are found upstream of barriers that would prevent trout migration. The sites that contain *galaxias gollumoides* have been found to be of significantly higher elevation than any other Gollum galaxias sites (Allibone, 2008). The increased elevation and cooler climate would have several implications for the life history of the fish and therefore makes the species found within the Nevis as unique and warrants further research.

Figure 8: Gollum galaxias from the Nevis River (Allibone, 2008).



According to the research carried out by Allibone (2008), the population of *galaxias gollumoides* found in the Nevis Valley is genetically distant from all other populations of Gollum galaxias. There is also evidence that suggests the population to be a unique lineage isolated by geological events from southland populations. This is based on the high level of divergence the Nevis populations have from other populations of Gollum Galaxias. Although further research is need to confirm Allibone's findings, he concludes that the Nevis populations represent a distinct ESU (Evolutionary Significant Unit), which may qualify for a *key population* status for the Non-Migratory Galaxiid Recovery Plan (DoC, 2004).

There are several possible impacts hydro electric development may have on Gollum galaxias populations in the Nevis Valley (Allibone, 2008):

- (i) It is unknown how much migration occurs within streams but construction of a dam and reservoir will hinder any movement that does occur.
- (ii) The construction of the dam will lead to some loss of habitat for the species.
- (iii) There will be a loss of key fish barriers that prevent trout access to tributaries and will therefore put increased pressure on an already threatened species.
- (iv) Other predatory species that are not already found within the river may be able to become established. For an example, the Koaro, which needs a lake for the larval stage of its life cycle

During the original hearings for the WCO, the presence and status of the Nevis Valley populations of Gollum galaxias were unknown. For this reason there are currently no provisions that protect the Nevis populations. With new evidence of their biodiversity value the Nevis population can now be considered as significant evidence to amend the WCO.

## 5.7 Native Flora

The Otago CMS lists the lower Nevis as one of the most intact known indigenous valley floor for short Tussock grasslands in Central Otago (LINZ, 2004). The upper margins of the lower fan of the Schoolhouse Flat support nationally rare species such as *Tetrachondra hamiltonii*, *Euchiton ensifer*, *Carex uncifolia* and *Ranunculus ternatifolius* (LINZ, 2004). The small hummocky pavements of the gravel below the road are inhabited by *Raoulia* spp., *Scleranthus uniflorus*, *Poa maniototo* and *Poa Lindsayi* (LINZ, 2004). More recently a *Galium* sp. has been recognised and occurs on the un-mined alluvial terraces south of Schoolhouse Flat (LINZ, 2004).

The species of plants which are most likely to be significantly impacted by the hydro electric footprint are the *Leptinella* and *Myosotis pymaea*. *Leptinella* is a tiny native button daisy which is classified as nationally critical and found on the gravel pavements of the Nevis Valley below the road. *Myosotis pymaea* is a forget-me-not, classified as nationally threatened, found on the slope of lower Schoolhouse Flat flanking the River (DoC, 2007). Because of the lack of data available on both species characteristics and distribution, the extent of the impact is unknown.

## 6.0 Conflict with the amendment

The Otago Fish and Game Council are committed to their application to amend the 1997 WCO. In preparation for a potential hearing being set in the near future, Fish and Game have already compiled a list of likely witnesses to supply evidence in support of the amendment. In addition, it is expected that the Historic Places Trust, Ngai Tahu and NZ Recreational Canoe Association will provide supporting submission in their own right. It was initially assumed that DoC (Otago Conservancy) would do the same. However, there is evidence that DoC has some form of unwritten agreement with Pioneer Generation to not oppose any hydro development on the Nevis River. It is believed that this agreement was arranged as the 1997 Kawarau WCO was being finalised, in spite of the opposing protests to damming being allowed. This agreement is thought to apparently bind DoC beyond the Provisions of RMA to the point that the Otago conservancy cannot take part in the application for amendment on the damming of the Nevis, even with the accumulation of new evidence of significant values in the Valley.

Fish and Game also have had reason to believe that their stance on the amendment is misrepresenting their reports and recommendations that they have made through the Tenure Review process. This is substantiated by DoC proposing the hydro-dam footprint be freeholded as a trade-off for land in the High Altitude areas to be retained by the Crown. This land will undoubtedly be used to form or add to the Remarkables Park being proposed at the expense of the Nevis River. These concerns are currently being investigated and will hopefully be resolved before the hearing.

## 7.0 Summary

In summary, the Nevis River is an essential feature of an outstanding open-spaced landscape within the Otago region. Situated in amongst remnants of historical mining and farming, it sets a breathtaking backdrop for users such as anglers, kayakers, four wheeled drivers, and other recreational activities. The failure for the 1997 Water Conservation (Kawarau) Order to protect the River from hydro electric development is presently unjustified, with the emergence of new significant values in need of protection.

Otago Fish and Game and other associated organisations are clearly validated in their concerns over the Rivers future. Pioneer Generations hydro development proposal

along with the pastoral leases undergoing Tenure Review generates an increasing possibility that damming of the Nevis may be approved in the near future.

Fish and Games amendment application reveals new values that were not available at the time of making the Order. The new evidence discussed in this report may be enough to make changes to the 1997 WCO and ultimately completely prohibit damming from the Nevis River, therefore protecting the River and these new values.

The assumption is that the Minister for the Environment will set a hearing for the Amendment to present its evidence within the next few months. It is desired that any controversy that Fish and Game have with the Conservancy Department Otago is resolved or at least offered assurances that assessments presented by DoC are unbiased.

## 8.0 Recommendations

After consideration of all the current evidence that is in support for the Nevis Valley, I believe that Fish and Game have assembled a good case. Hydro electric development is one of the most destructive forms of harnessing power, even if the project is at a smaller scale. Having a wildlife management background, I am admittedly biased against damming of the River; the environmental effects would without a doubt have significant impacts on the surrounding environment, completely altering ecosystems and habitats.

If power generation could be proven to be significantly more important than any of these values then damming should be considered. However, it is imperative that alternative options be explored first. Pioneer Generations argument regarding to the low population and visitors to the valley as a reason for hydro development to occur because of the minimal impact it would have on people, is poorly justified. It is important to remember that solitude and minimal human encounter rate is one of the key values that is appreciated in the Valley and should not be an excuse for development approval. It is such environments as these that are becoming rare and should be protected for their wild and isolated characteristics.

The possibility that the populations of Gollum galaxiads within the Nevis River being a distinct new species provide the foundations for a strong case in preventing hydro development. The species is endemic and threatened so would require protection from decline. The consequences of this requirement would be considerable as this will oblige DoC to fulfil their statutory obligation as set out by the Conservation Act where they must



preserve indigenous freshwater fisheries (so far as is practicable). Even if DoC is opposing the amendment application, DoC will indirectly support the WCO amendment due to their responsibility to the Galaxiid Threatened Species Recovery Plan (DoC, 2004).

Fish and Game have raised a variety of new values. This means that most people will be in some way affected if one or more of these values were to be affected by damming. As has been discussed in this report, all of these values will be impacted by hydro electric development to some extent, whether it be altering the landscape visually, destroying habitats and historical sites or impacting prized fishery and kayaking waters. Given the opportunity to be presented with all the evidence from opposing sides regarding development in the Nevis Valley, it is the users, the locals and the general public who have the power to determine the fate of the Nevis River.

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1. Water Conservation (Kawarau) Order 1997
2. Proposed Amendments to Water Conservtaion (Kawarau River) Order 1997
3. Response letter from the Otago Conservancy Department
4. Otago Regional Plan: Water
5. NZRCA support letter

**Appendix 1.**  
**Proposed Amendments to Water Conservation (Kawarau River) Order 1997**

**WATERS TO BE PROTECTED**

Waters	Outstanding characteristics	Restrictions and Prohibitions
Nevis River mainstem gorge from Nevis Crossing to Kawarau River confluence (S133:877677 to S133:847538)	<p>(c) <u>wild and scenic</u> characteristics;</p> <p>(c) recreational purposes, in particular fishing and kayaking.</p> <p><u>backcountry</u> <u>trout fishery</u></p>	<p>(i) <del>no damming allowed unless a rule in a plan or condition in any water permit granted makes provision for river flows to be provided at sufficient levels to enable kayaking to be undertaken in the gorge at times stated in the plan or permit, and the extent of any impounded water is not beyond S143:836485;</del></p> <p>(ii) <del>fish passage to be maintained;</del></p> <p><u>(i) no damming or diversion allowed.</u></p> <p><u>(ii) (iii) water quality to be managed to Class CR, Class F, and Class FS standards.</u></p>

[(c) natural



<u>particular fishing.</u>	<u>river flows to be provided at sufficient levels to enable kayaking to be undertaken in the gorge at times stated in the plan or permit, and the extent of any impounded water is not beyond S143:836485;</u>
<u>Back country trout fishery</u>	
<u>Trout spawning habitat</u>	
<u>Adult trout Habitat - trophy Trout</u>	<u>(ii) fish passage to be maintained;</u>
<u>Native fishery habitat (Non migratory Galaxiids,</u>	
<u>Scientific – biogeographic River capture</u>	<u>(i) no damming or diversion allowed.</u>
	<u>(ii) (iii) water quality to be managed to Class F and Class FS standards.</u>
<u>[(c) natural Characteristics – In particular outstanding natural landform</u>	
<u>Historic and cultural characteristics</u>	minimum flow or flow share

**ADDRESS FOR SERVICE**

The address for service for the Applicant is C/o Anderson Lloyd Caudwell, Barristers & Solicitors, Ground Floor, Otago House, Moray Place/Princes Street Corner, Dunedin.

Documents for service on the abovenamed Applicant may be left at the address for service or may be:-

(a) Posted to Private Bag 1959, Dunedin; or  
(b) Transmitted by facsimile to (03) 477-3184.

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