IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the hearing of applications by **ASHBURTON COMMUNITY WATER TRUST** to Canterbury Regional Council and Ashburton District Council for resource consents in respect of the Rakaia Terrace Hydro Scheme

STATEMENT OF EVIDENCE OF IAN ALEXANDER LEES

1. INTRODUCTION

1.1 My name is Ian Alexander Lees.

1.2 I am employed by TrustPower Limited as Production Manager. In this position I have overall asset management and production responsibility for TrustPower's hydro and wind power assets throughout New Zealand, which include the:

(a) Branch and Waihopai Schemes in the Marlborough region;

(b) Kaniere Forks, McKays Creek, Arnold, Wahapo and Dillmans Schemes in the West Coast region;

(c) Cobb Scheme in the Tasman region;

(d) Coleridge Scheme and the Highbank and Montalto Scheme in Canterbury;

(e) Waipori, Deep Stream, Paerau and Patearoa Schemes in Otago;

(f) Matahina, Kaimai, Wheao and Hinemaia Schemes in the Bay of Plenty region;

(g) Mangorei, Motukawa and Patea Schemes in the Taranaki region; and

(h) Tararua wind farm in the Manawatu region.

1.3 My background is in general mechanical and marine engineering and I hold qualifications in these disciplines. For the past 32 years I have worked within the energy production industry, initially within power boards and latterly within power companies. My focus has been to build on the good work undertaken by the early

developers of hydro schemes, by further developing, modernising and enhancing efficiency and environmental compliance at the existing schemes and being closely involved in the development of new schemes.

1.4 I currently hold the position of Chairman of Directors of the Rangitata Diversion Race Management Limited (RDRML) and have held this position since 2002. My role as Chairman has included active involvement in the hearing and Court proceedings relating to the Rangitata River Water Conservation Order, resource consenting for the Rangitata River and associated diversions and the renewal of consents for the Ashburton River diversion.

1.5 The Highbank Hydroelectric Power Scheme is one of the schemes within my area of responsibility. The team that operates and maintains this facility is under my direct management control and as such I provide direct technical, resource consenting, human resources, commercial and managerial support to this team. My involvement extends to civil works asset management, which in turn includes civil safety management, contractual arrangements, silt control, structures, river protection, penstock and conveyance canal maintenance and monitoring. My role also involves me in higher level stakeholder discussions.

1.6 In relation to this application I have participated in pre-hearing discussions with the Ashburton Community Water Trust (ACWT) and some of its representatives and consultants. It is also relevant that I note my involvement in the recent consenting of Electricity Ashburton's hydro generation scheme which, as the ACWT consent application states, is essentially the first stage of the ACWT proposal. The Electricity Ashburton consent process, for which I presented evidence at the hearing, ultimately resulted in a suite of consent conditions being developed which adequately address TrustPower's significant concerns with that proposal.

1.7 As Ms Burkhardt has already stated in her submission, TrustPower has been able to reach agreement with ACWT over the consent conditions which, if imposed, would also adequately address TrustPower's concerns with ACWT's proposal. Those conditions are attached to the statement of Mr Dunning on behalf of ACWT and are more fully highlighted and explained in Mr Bonis' evidence.

2. SCOPE OF EVIDENCE

2.1 The purpose of this evidence is to assist this Hearing Panel, who did not hear my evidence regarding the Electricity Ashburton scheme, by outlining the reasons for TrustPower's submission that the ACWT proposal has direct and potentially significant

adverse effects on TrustPower's Highbank Power Station. In my evidence I will provide:

(a) A brief description of TrustPower's Environmental Policies and Performance;

(b) An overview of the operation of the Highbank Power Station; and

(c) A summary of TrustPower's concerns relating to the impacts of the application on the salmon barrier, tailrace and diversion bypass; the impacts of the widening of the tailrace; the potential effects of additional flows in the tailrace; and the effect on TrustPower's access to Highbank.

3. TRUSTPOWER'S ENVIRONMENTAL POLICIES AND ENVIRONMENTAL MANAGEMENT SYSTEM

3.1 While having an obvious need to achieve financial and commercial objectives, TrustPower prides itself on being an environmentally responsible good corporate citizen. TrustPower's commitment to this stance is evidenced by its Environmental Policies which originated at the request of the Company's Board of Directors. Developed by TrustPower's Environmental Management personnel, to industry best practice, the policies were subject to internal review by staff and management before being adopted and implemented.

3.2 The Hearings Panel will note that the Environmental Policies commit TrustPower to, amongst other things:

(a) complying with all of its legal and statutory obligations;

(b) enhancing the awareness of its staff to the significance and sensitivity of the environment in which they operate;

(c) promoting the efficient use of the significant physical resources under its control; and

(d) operating the significant physical resources under its control in a manner which minimises all potential adverse effects and maximises all potential positive effects.

3.3 To assist with the achievement of TrustPower's Environmental Policies, an Environmental Management System (or EMS) has been implemented. The EMS is significant, as it establishes the specific undertakings given by TrustPower to ensure that it operates in accordance with the Company's Environmental Policies. The EMS

also assigns managerial responsibility and establishes 'Environmental Performance Indicators', against which TrustPower's environmental performance is measured and reported. The undertakings given and the actions to be taken are extensive and involve a significant commitment of TrustPower's time and resources.

3.4 The Policies and EMS are referenced here, as they to some extent underpin the need to identify and address the environmental impacts likely to arise from the ACWT proposal.

4. TRUSTPOWER'S HIGHBANK POWER STATION

4.1 TrustPower is the owner and operator of the Highbank and Montalto Power Schemes, which utilise water diverted from the Rangitata and Ashburton Rivers via the Rangitata Diversion Race. This water is finally discharged via the Highbank Power Station to the Rakaia River. The location and general configuration of the Highbank and Montalto Scheme is shown in **Annexure 1.**

4.2 The Highbank Scheme was commissioned on June 8th 1945. The station is located at the end of the 67 kilometre long Rangitata Diversion Race, which supplies three irrigation schemes. The Rangitata Diversion Race concept of winter generation and summer irrigation is well thought out and engineered and the original concepts and objectives remain valid in the current commercial climate with significant downstream benefits to the local economy from both generation and irrigation. The traditional operating periods and those reflected in agreements are:

(a) For generation – from 9 May through to 10 September; and

(b) For irrigation – from 10 September to 9 May.

It is important to note that during the irrigation season, water diverted and not utilised for irrigation is conveyed down the race to Highbank and used for generation. This approach has provided an inherent economic and water utilisation efficiency to the whole scheme.

4.3 As a result of the Electricity Industry reforms, TrustPower purchased the Highbank and Montalto Scheme during 1999. The Highbank machinery, head works, control systems and switchyard were in very poor condition at the time of purchase and TrustPower set about rectifying these issues to ensure the plant had the reliability expected of a strategic asset. Investment in the asset was heavy with new transformers, high and low voltage switchgear, cabling, DC and AC local service systems, oil containment equipment, emergency diesel, turbine inlet valve, remote control and SCADA and

turbine overhaul all being included. One of the benefits to consumers arising from the electrical upgrade is the embedding of the Highbank generator into the Electricity Ashburton electrical network. Previously Highbank was connected to the Transpower electrical grid. Embedding the energy produced by Highbank in the Electricity Ashburton network places the energy at the source of greatest consumer demand thereby reducing transmission losses. My role in the Highbank Scheme upgrade was to manage the planning, procurement, supply, and installation of equipment and provide technical solutions for turbine refurbishment and silt control. The work was successful and the commercial, efficiency and reliability objectives were achieved. As a result the station now contributes reliably and cost effectively to the electricity market with market dispatch being undertaken from our Tauranga Control Centre.

4.4 During the opening legal submissions presented on behalf of ACWT on Monday 19th September 2008, I note that a reference was made to TrustPower's rights or otherwise to the water within the scheme that is not used for irrigation. This reference arose during discussion on the potential use of this water by the Barhill Chertsey Irrigation proposal. I address this matter in my evidence to ensure that the Hearings Panel is clear about the historical use of this water and how shareholders, by agreement, have optimised the use of this water. In this regard the RDRML shareholders use water under Water Agreements held between the particular Shareholder group (Irrigation, Generation and Stock water) and the RDRML. The agreements are based on historical use, recognised both during the re-consenting and Rangitata River Water Conservation Order process. The Highbank assets were sold to TrustPower on the basis of this historical water balance and it is material to the earnings and hence value of the Highbank assets. It is a stretch to claim that TrustPower has no rights to this water. This is a matter that can only be addressed between RDRML shareholders and/or in the event that there is a new entrant, being in this case Barhill Chertsey Irrigation Limited, and it is my view that any effects must be compensated via some form of commercial agreement.

4.5 TrustPower is a major shareholder in the RDRML along with Valletta, Mayfield Hynds and Ashburton Lyndhurst Schemes and the Ashburton District Council and as such has a substantial interest in the consents. In terms of Shareholding and voting rights each entity has 30,000 shares (with a total of 150,000 shares) with Ashburton District Council holding an additional 50,000 deferred shares with no ordinary voting rights on these shares. Board representation is by one Director each for Valletta, Mayfield Hynds, Ashburton Lyndhurst and Ashburton District Council and two Directors representing TrustPower.

4.6 ACWT's legal submissions also refer to the Highbank installation as being outdated technology. While the plant was designed and installed during 1945 this statement does not recognise the criticality of Highbank to supporting energy demand, especially during high demand and energy shortage periods, nor does it recognise technological advances available for designing and retrofitting new componentry should economic drivers signal this initiative should be taken.

4.7 The Highbank and Montalto Schemes are subject to a number of resource consents and associated conditions which require monitoring and result in consent compliance responsibilities which I discuss further below.

4.8 The Highbank and Montalto Schemes are a significant resource in Canterbury and hence contribute significantly to the social and economic wellbeing of the region. The combined installed capacity of Highbank and Montalto is as outlined in Table 1 below:

Table 1: Key Statistics

	Highbank Power Station	Montalto Power Station
Maximum Capacity	28MW	1.9MW
Rated Capacity	25.2 MW	1.8MW
5 yr/Average Annual Output (03-07)	98.22 GWh	
Peak Efficiency Output	23MW	NA
Plant Rated Efficiency	86.67% @ 25MW (Actual)	NA
Water Conversion at Peak Efficiency	1.17 cumecs/MW	NA
Water Consumption at Peak Efficiency	27 cumecs	NA

The combined energy output of the Highbank and Montalto Schemes provide energy requirements approximately 12,250 typical New Zealand households.

5. OVERVIEW OF TRUSTPOWER'S CONCERNS

5.1 As with the Electricity Ashburton scheme, TrustPower is not opposed to the ACWT application per se. TrustPower has actively sought to work with ACWT over many months to attempt to address the impacts of the ACWT proposal on TrustPower's facilities. Given that TrustPower reached a satisfactory outcome with the Electricity Ashburton scheme, the focus of these discussions has been on those aspects of the ACWT scheme which differ from the previously consented Electricity Ashburton scheme.

Salmon Barrier, Tailrace and Diversion Bypass

5.2 Condition 2 of consent CRC011249[1], which authorises discharges from the Highbank Power Station into the Rakaia River, requires:

(a) the construction of a salmon barrier to ensure that adult salmon are excluded from entering the formed section of the Highbank tailrace; and

(b) the maintenance of a channel to ensure that the salmon attracted to the barrier are able to return to a main flowing channel of the Rakaia River. A separate consent (CRC011251) is also held to authorise the works necessary to maintain the channel and, in particular, its interconnection with the main flow of the river.

A copy of the consents referred to are attached to my evidence as **Annexure 2**.

5.3 The salmon barrier was erected in late 2006 following detailed discussions with Fish & Game and Canterbury Regional Council and in response to the requirement in condition 2 to install the screen. It should be noted that when TrustPower purchased the Highbank assets the issue of salmon entrainment within the tailrace had been an issue for many years. TrustPower recognised this at the outset of the Rangitata Diversion Race re-consenting process and proactively sought a solution in conjunction with North Canterbury Fish and Game Council. Various options were investigated during 2001 and 2002 and a firm proposal was able to be put to Fish and Game during January 2003. Consent was granted commencing 12th February 2005 and full design was undertaken tendered, constructed and commissioned during 2006.

5.4 The salmon barrier takes the form of a concrete plinth with vertical columns supporting 7 removable screens. The structure is positioned across the outlet from the formed tailrace section. The formed section of the tailrace discharges into an unformed section of tailrace which in turn meanders downstream for approximately 1 kilometre where it meets the Rakaia River. Adult salmon entering the unformed tailrace section at the confluence of the outlet of this channel and the Rakaia River approaching the barrier are unable to pass through the screen bars (60mm between centres with 6mm bar thickness) and hence follow the purpose built return channel back to the Rakaia River.

5.5 Discussions on the practicality of operating these screens in a sometimes challenging physical environment were held during 2003 with Fish and Game who accepted that

100% diversion of fish was not practicable. It was recognised at that time that freshes in the Rakaia River had the potential to block the exit channel, and that small numbers of fish may access the formed section of the Highbank tailrace during the screen cleaning process.

5.6 In normal hydropower practice, debris screens are upstream of the power station and debris is cleaned from the screens before entering the machines. The tailrace barrier is essentially a debris screen designed to stop salmon above approximately 50 mm in width. They are therefore subject to blockage from the debris carried in the power station discharge flows to the tailrace. This debris tends to be grasses and straw blown off the plains into the Rangitata Diversion Race and cannot be avoided. The effect of accumulation of this debris is the requirement to clean the screens on a frequent basis and occasional blow out or "popping" of one or more screens. When a screen pops the Highbank machine must be shut down and the screen recovered and replaced. It should be noted the screen is designed to pop otherwise the stresses on the individual screen panels will cause buckling and potentially put the whole structure at risk.

5.7 To ensure the potential for fish to pass upstream of the barrier and into the tailrace during the screen cleaning process is minimised the screens have been designed to lift out individually. TrustPower has invested significantly in water blasting, lifting and power equipment to expedite the cleaning of screens at any required intervention.

5.8 TrustPower has also as a goodwill measure, after listening to Fish and Game's concerns of possible fish stranding in pools in the unformed section of the tailrace on recession of flow when the power station shuts down, gained consent and undertaken grading of the invert of the unformed section of the tailrace.

5.9 In terms of normal day to day operation, the screens are placed for the period January through August in any given year. If TrustPower personnel observe that the run is late then the barrier is left active for a longer period. TrustPower personnel or contractors check the barrier as a minimum once per week. In reality it is checked more frequently due to blockages and when personnel or contractors are working around the site. Staff observe and note weather conditions, presence of fish (upstream and downstream of screens) and clean screens by lifting one panel at a time and using the water jet process referred to above. If more than 50 adult salmon are noted upstream of the barrier then Fish and Game would be notified and

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[1] This consent is held in the name of Rangitata Diversion Race Management Limited on behalf of its shareholder, TrustPower Limited.

discussions take place on the potential or need for recovery and transfer back to the Rakaia. In terms of the recovery and transfer operation, discussions with Fish and Game have been held so that TrustPower can gain permission and training to undertake this work where practicable. We are currently working with Fish and Game on the next steps in this process.

5.10 In the event of freshes in the river and the return channel is damage or blocked, TrustPower personnel note this and arrange earthmoving contractors to reinstate the channel as soon as the river recedes sufficiently so that this operation can be conducted safely and effectively. TrustPower is proactive in this matter and the work is undertaken promptly and normally within hours of the fresh receding.

5.11 Monitoring of the screen's operation last year clearly shows that the screen is operating efficiently with there being only 2 or 3 occasions where adult salmon were seen to be present in the tailrace. On these occasions salmon numbers were very low (ie between 5 and 7 with 7 being the total for the period). A copy of the Inspection and Monitoring Log is attached as **Appendix 3**.

Effects on salmon barrier and tailrace

5.12 As outlined by Mr Woods in his second statement of evidence for ACWT (para 4.11) the combined flows in the Highbank tailrace will be split so that up to $40m^3/s$ enters the Terrace Canal and the remainder is discharged to the Rakaia River via the unformed section of the Highbank tailrace. Based on my review of the material, the combined flows referred to will comprise that currently consented for the Highbank Power Station discharge (being up to $40m^3/s$) and the Electricity Ashburton discharge (being up to $17m^3/s$) and that proposed by ACWT (being up to $40m^3/s$ but not exceeding that even when combined with the Electricity Ashburton discharge). Therefore the maximum combined consented discharge from the Highbank tailrace to the Rakaia River will be up to 80 m^3/s if the ACWT proposal is consented.

5.13 In relation to the Electricity Ashburton proposal, the increase in discharges through the Highbank tailrace has the effect of increasing the attraction of migrating salmon to the tailrace. Also, the additional discharge will result in further debris being caught in the screens resulting in the screens "popping" with increased frequency and then being needed to be reset. As such, Electricity Ashburton accepted that the fish screen would be widened. I had understood from meeting with ACWT in May this year (and in subsequent correspondence) that it accepts the need for this requirement to also apply to the development of its proposal should the situation arise where ACWT develops the first stage of the scheme (rather than Electricity Ashburton). From

TrustPower's perspective it is imperative that whoever develops the scheme ensures that the Highbank tailrace is of sufficient capacity (that is the width of the tailrace and salmon barrier) to accommodate a reasonable worst case flow scenario.

5.14 In relation to the fully developed ACWT scheme, I generally accept that under normal operating conditions (when water is flowing to the Terrace Canal) the flow through the salmon barrier will not raise any serious concerns. To address those events (albeit rare) where the Terrace Canal is not operating and the inflows to the tailrace are not able to be controlled, an auxiliary spillway is proposed. As I understand, the flows in the spillway will bypass the barrier at rates above $57m^3/s$ (being the combined TrustPower/Electricity Ashburton discharge) and consent conditions are proposed to provide appropriate remedial measures to address the effects of such events. These are discussed by Mr Allibone and Mr Bonis.

Effects on the salmon diversion bypass

5.15 Turning briefly to the potential for effects of the ACWT headworks on the salmon diversion bypass, TrustPower engaged a hydraulics engineer, Mr Graham Levy of Beca, to provide technical comment on this issue. A copy of that advice is attached in **Annexure 4**.

5.16 The Hearing Panel may recall that Mr Levy was also engaged by TrustPower in relation to the Central Plains Water Trust proposal and assisted in the development of proposed consent conditions to address the possibility of the Central Plains' intake construction and management affecting the position of river braids near the Highbank tailrace. As with the Central Plains proposal, the particular risk with the ACWT headworks (including the sediment disposal area) is associated with the need to maintain a bypass flow from the Rakaia River past the Highbank tailrace salmon barrier. As I mentioned earlier this is a requirement of TrustPower's consents, and is particularly needed during the salmon migration season of December through May.

5.17 To address the potential for effects in relation to this issue, consent conditions have been developed and agreed with ACWT as explained by Mr Bonis.

Widening of the Tailrace

5.18 The ACWT response (dated 12 March 2008) to the Ashburton District Council's further information request states that the Highbank tailrace needs to be widened to accommodate the combined flow of the Highbank Power Station and the Rakaia Terrace Hydro Scheme and that this may be by up to 15m depending on final design and survey (para 13). The extent of widening to the **formed section** of the

TrustPower tailrace is therefore greater than the 10m required for the Electricity Ashburton proposal (both of which involve the clearance of exotic grasses, scrub and plantation pines).

5.19 In relation to the **unformed section** of the tailrace, ACWT have advised TrustPower (in a letter dated 30 June 2008) that under its proposal a similar widening to the Electricity Ashburton proposal (that is 5m) will be required, in addition to realignment of much of the existing channel (by approximately 40m east) to avoid clashing with the new Terrace Canal.

5.20 The works to the tailrace have the potential to give rise to the following effects:

(a) Salmon stranding in the invert;

(b) Destabilisation of the river bank; and

(c) Disruption to TrustPower's existing operations.

Salmon stranding in the invert

5.21 TrustPower is concerned that the tailrace works could result in the creation of pools and hollows which could strand salmon. As indicated in paragraph 5.9 above during early 2006 TrustPower invested significant resources into work on the invert to even out its surface to ensure that fish stranding does not occur when flows drop. Conditions are proposed to ensure that any works on the invert do not result in fish stranding.

Destabilisation of the riverbank

5.22 The widening of the tailrace raises obvious issues about the potential impacts of excavations on surrounding land and in particular on TrustPower's Highbank Power Station and the Rakaia River bed protection works. The current river course, protection and river training works has been very stable for a long period exceeding 15 years. Conditions are proposed to require a full assessment of current protection by a qualified rivers engineer in light of the proposed works interference with current protection works and protection lost due to willow, scrub and grass removal, and prompt implementation of any recommendations arising from the assessment.

5.23 Even greater concern is held for the protection of the river bank reach running parallel to the power station and upper section of the formed tailrace where most or all of the willows, birch and pine trees will be removed. Existing rock protection is also highly likely to be impacted during construction rendering the power house and tailrace

embankments at risk from river flood damage. Again this area is very stable and well armoured and vegetated and hence any change to this stable condition will increase the risk of flood damage to TrustPower's Highbank assets. As with the formed tailrace, conditions are proposed that require ACWT to commission a rivers engineer to undertake an assessment of how to best maintain river protection to no less than current standards during and post construction activities.

Disruption to TrustPower's operations

5.24 The effects of construction (particularly vibration and dust) have the potential to disrupt the operation of the Highbank Power Station. Dusty environments, especially when in high volume and without regular rainfall, has real potential to cause generator fouling leading to overheating, contamination of oil systems and effects on switchgear and sensitive electronics. While we take steps to deal with "normal" dust generated through everyday weather patterns, construction dust with the high fine glacial silt and sand found in this area is almost certainly going to be a significant issue for TrustPower's equipment unless dust mitigation measures are implemented.

5.25 In terms of vibration, although the machinery weighs in excess of 100Tonnes, the shaft is accurately aligned in a vertical plane relative to the generator stator (outside casing) and is relatively easily displaced from the operational alignment. This alignment is critical to the safe and reliable functioning of the oil lubricated thrust and guide bearings that allow the machine to rotate freely within bearing design limitations. Any settling of power house foundations will significantly effect the machine alignment and balance. In the event balance is unduly affected and the peak to peak resonance exceeds the guide bearing clearances, the shaft will break through the hydrodynamic film and pick up and destroy the white metal bearing which will, in turn, damage the shaft and render the plant unserviceable.

5.26 The same issue applies to the thrust bearing pads where any tilting of the machine will destroy the hydrodynamic wedge between the bearing pad and thrust face and overheat and eventually destroy the bearing and worse still, the thrust collar that takes the whole axial load of the machine. While we can undertake vibration checks before and after the construction activities, if we find the machine has been affected reinstatement to full operating condition will be protracted and very expensive. It is absolutely critical that appropriate conditions are imposed to ensure vibration is controlled, in particular that imparted from roller compactors and heavy earthmoving vehicles when working within the TrustPower land and in particular within 50 metres of the power house.

5.27 ACWT have therefore agreed to the imposition of conditions, to undertake pre, during and post construction vibration checks and powerhouse structure deformation surveys to monitor and report any effects on structures or generation machinery on a regular basis and immediately cease work should any changes from datum measurements occur. A monitoring and technical review procedure will be developed in conjunction with engineering specialists and in discussion with TrustPower prior to commencement of any works. In addition, under no circumstances will ACWT construction activities be allowed to operate high frequency vibration or heavy duty earthmoving machinery within 15 metres of any part of the powerhouse structures.

5.28 Mr Bonis outlines in his evidence the proposed conditions of consent to ensure that construction activities do not adversely affect TrustPower's operations and these are.

Effects of Additional Flows

5.29 Hydro power turbines are invariably site specific in terms of position of the centreline of the turbine runner (water wheel) to the head water and tail water. The turbine setting is optimised for these two levels to maximise power, efficiency and cavitation performance.

5.30 When tail water and head water levels vary to the extent that they move outside of the design range (either higher or lower) the turbine performance is affected. When the head water raises the head and hence power potential of the machine increases while, conversely, if the head water levels drops the power potential of the machine also drops. Similarly when the tail water level increases this tends to reduce net head and hence the total head is less and the power potential is less, and when the tail water level drops the power potential increases however a machine in this situation is potentially also subject to the phenomenon of cavitation. The Highbank machine, due to its setting, blade shape, flow and other variables is sensitive to tail water changes and has a high potential for cavitation damage. Under the current operating regime cavitation damage is minimal and within the bounds of good design and manageable maintenance processes.

5.31 By way of example, cavitation damage will result requiring major machine interventions - this particular machine is large and expensive to pull down for repairs. In terms of cost for repairs of this nature, experience on this machine gained over the last 9 years has indicated a minimum cost (without loss of generation) of $250,000 to $350,000. On the other hand, increases in tail water levels for periods of time, while of concern, can be dealt with easily through a commercial agreement.

5.32 It is my understanding that the ACWT proposal will affect the water levels at the station. Conditions of consent are therefore proposed to manage levels in agreement with TrustPower.

Effects on TrustPower's Access Road

5.33 The ACWT proposal involves the realignment of the access road into Highbank Power Station. TrustPower is concerned that relocation of the access road may impact on the ability to access Highbank Power Station during the construction period. TrustPower needs to maintain access to the Highbank Power Station for purposes such as responding to power station faults, tailrace and fish barrier inspections and screen cleaning and transport of heavy machinery. This includes access by heavy vehicles such as 2 to 30 tonne excavators which are used for fish barrier channel reinstatement, rock protection works and batter slumping repairs. Mr Bonis' evidence sets out the proposed condition of consent which ensures that access to the Highbank Power Station is maintained during the construction period.

6. CONCLUSION

6.1 As indicated earlier in my evidence TrustPower is not against the proposal per se. This is evidenced by the fact that TrustPower has actively sought to work with ACWT to ensure that the effects of the proposal are fully mitigated.

6.2 TrustPower considers that the significant concerns outlined above are capable of being adequately addressed through the proposed conditions of consent agreed with ACWT. In conclusion, I ask that these conditions be included in any grant of ACWT's application.

Ian Lees

Production Manager – TrustPower Limited

Annexure 1

Location and general configuration of Highbank and Montalto Scheme

Highbank & Montalto Power Stations

Relationship to RDR Irrigation

TrustPower

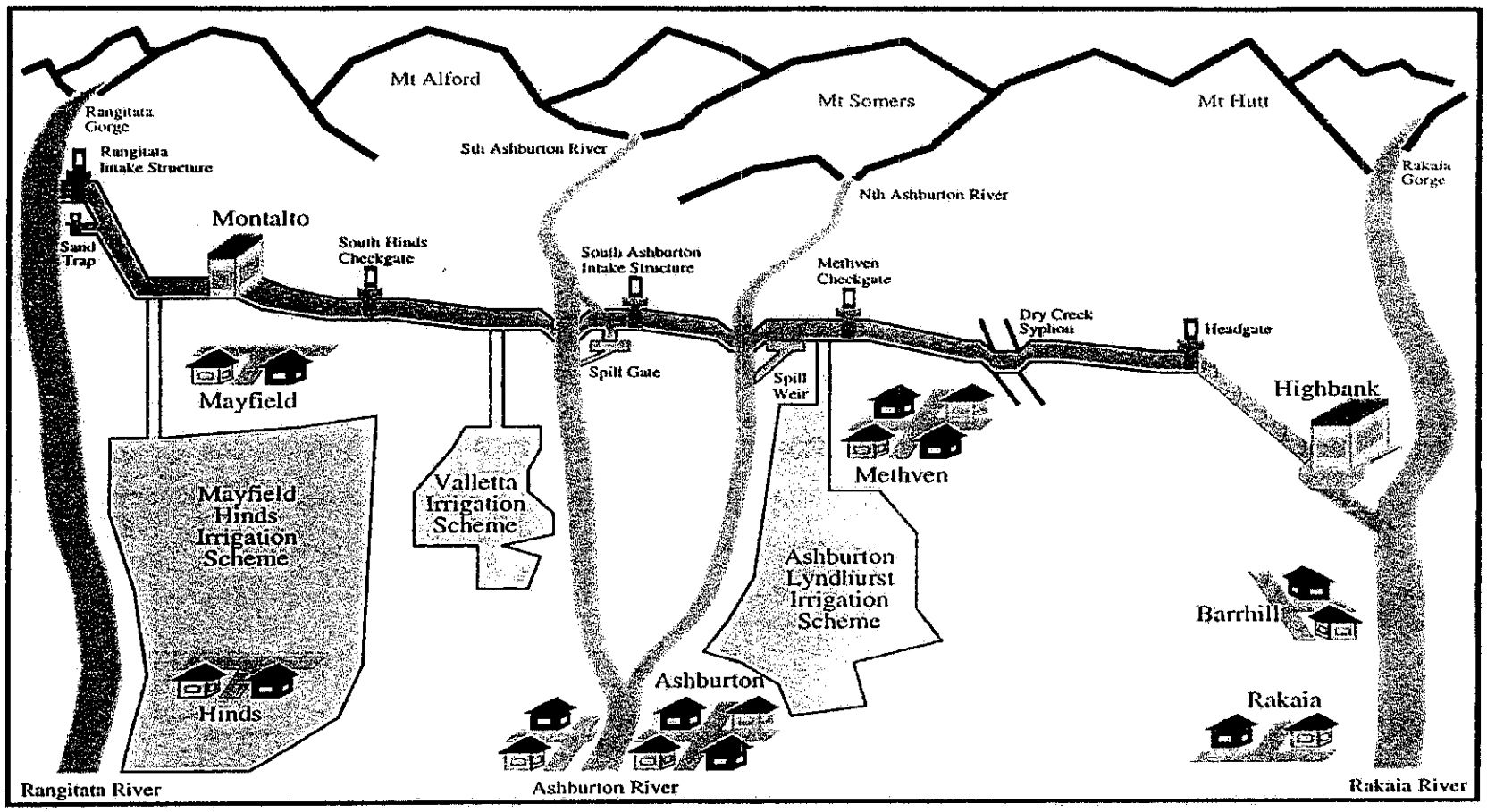
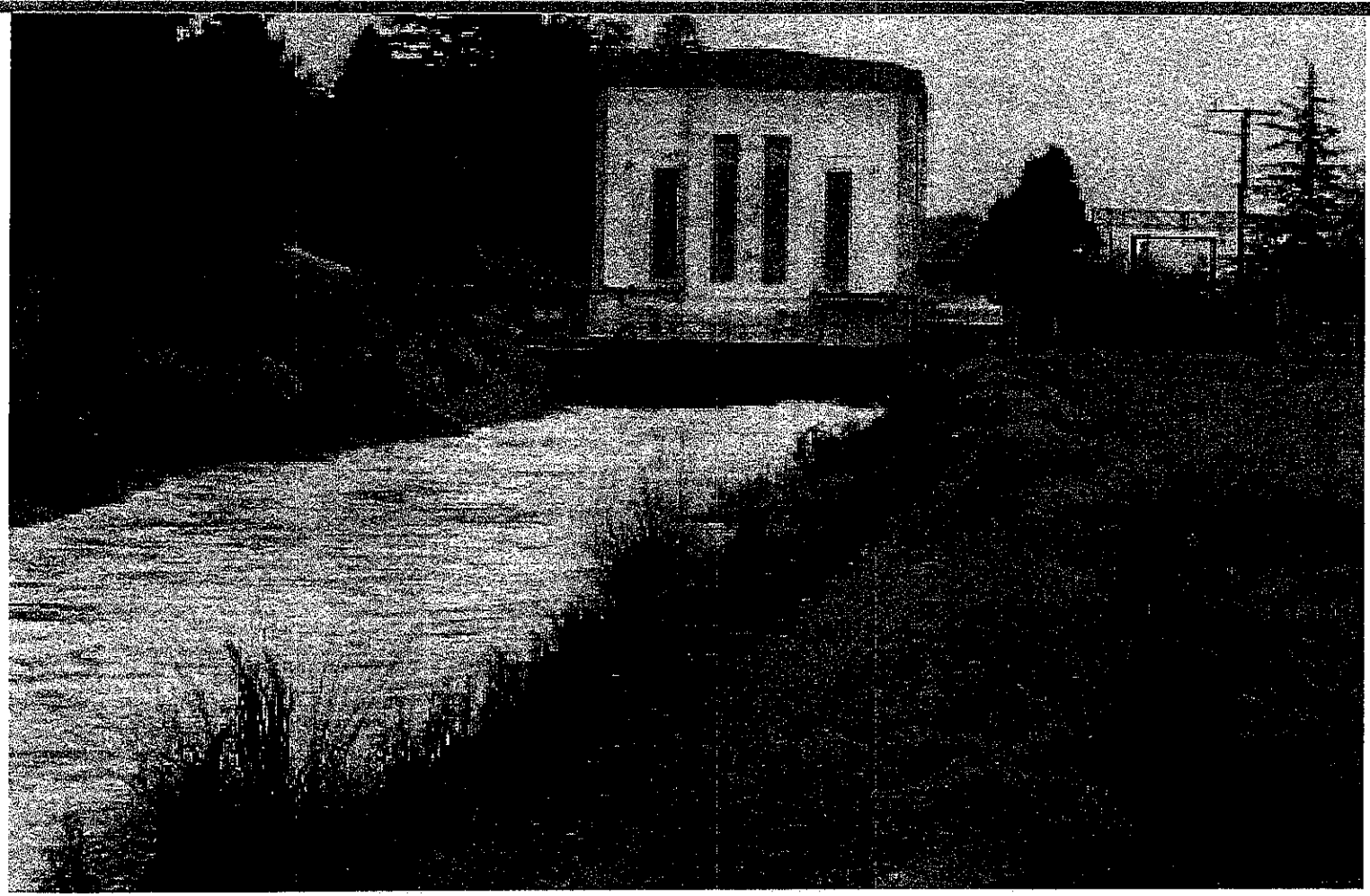


Figure 3.2 Schematic of the Rangitata Diversion Race

Highbank Power Station

TrustPower

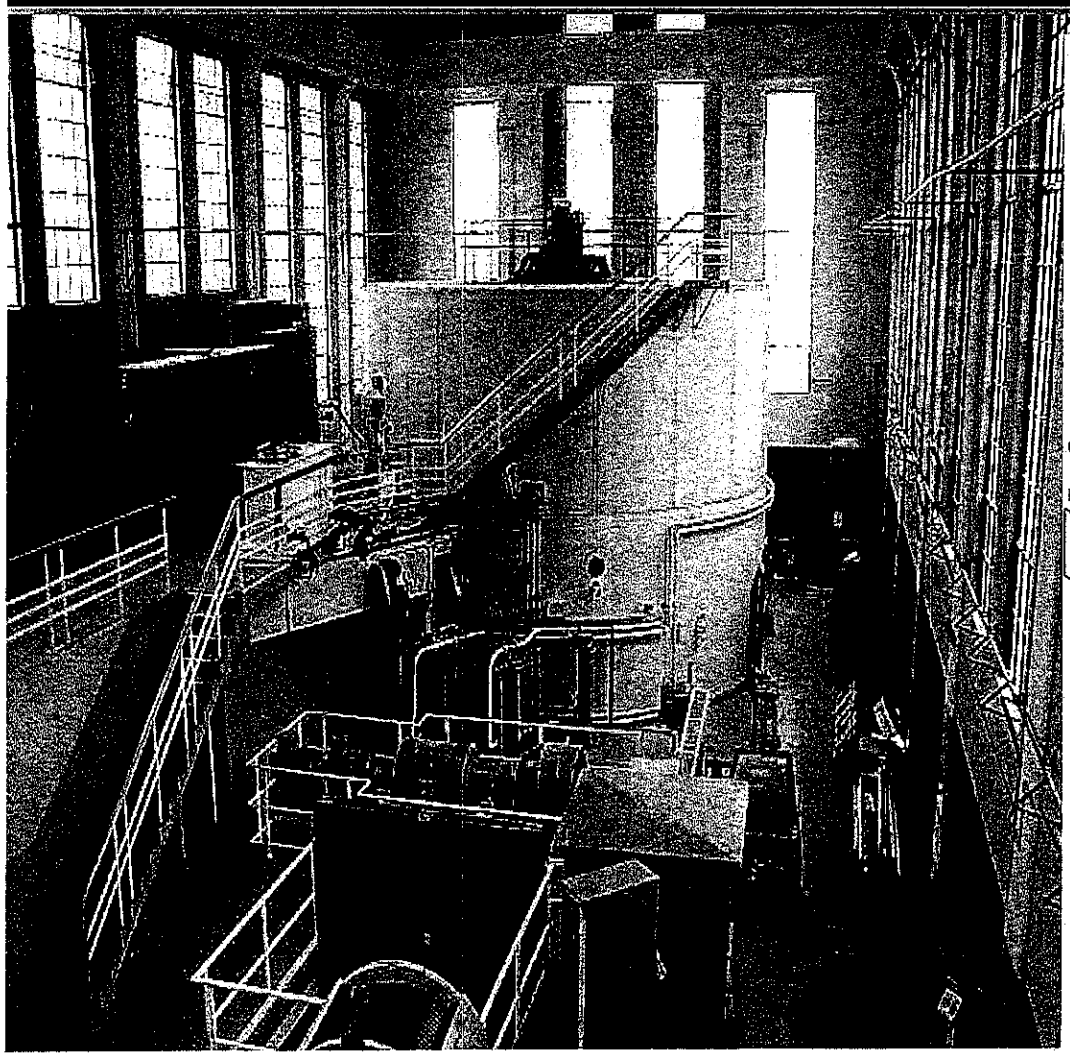


A

Highbank Power Station

Power House Internals & Cross Section

TrustPower



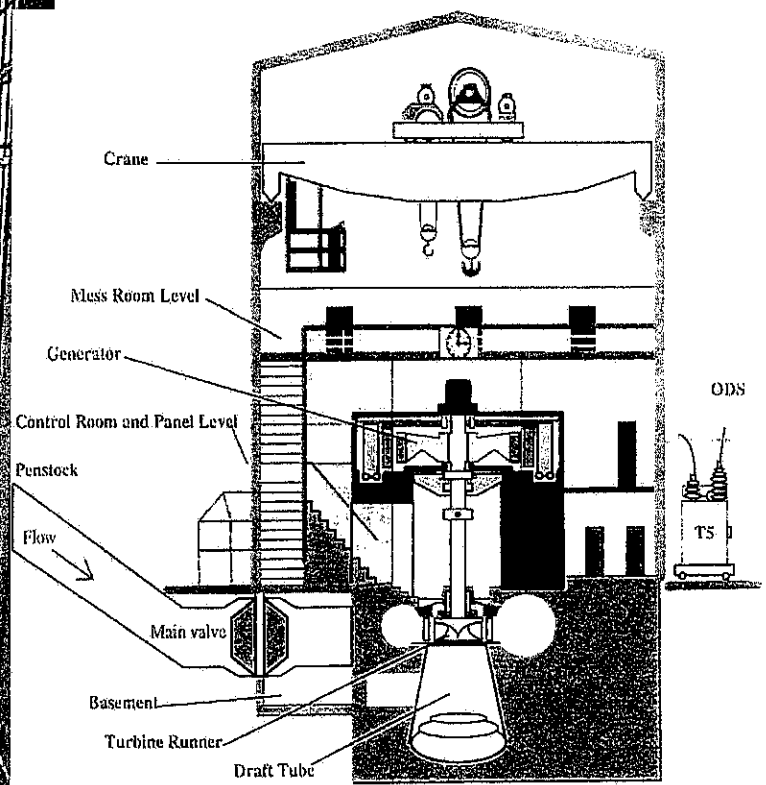


Figure 5.3 Cross Section of the Power House

Highbank Power Station
Machine Cross Sections & Example of Cavitation

TrustPower

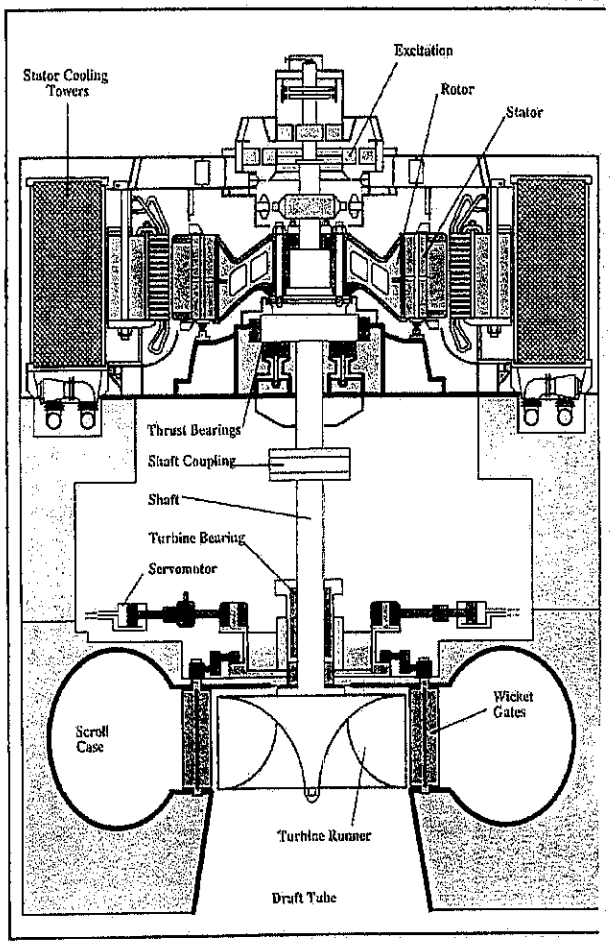
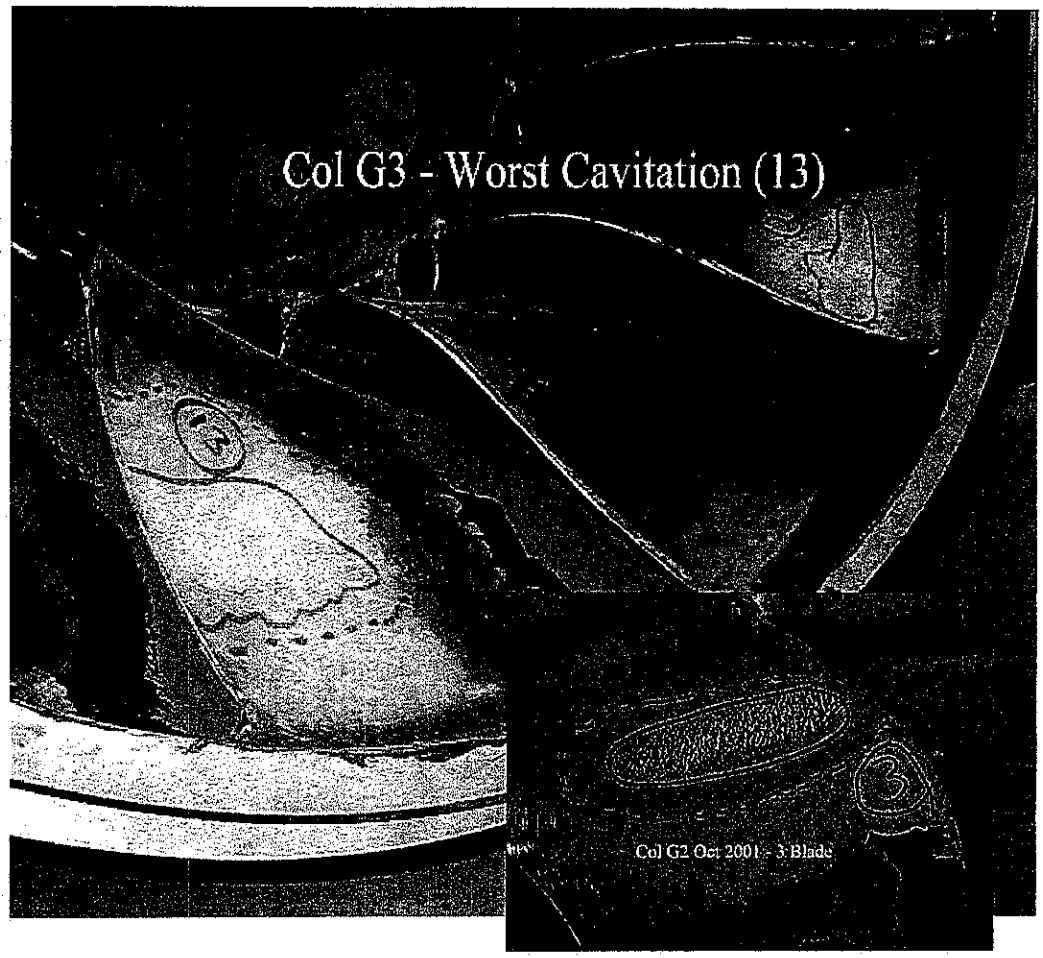
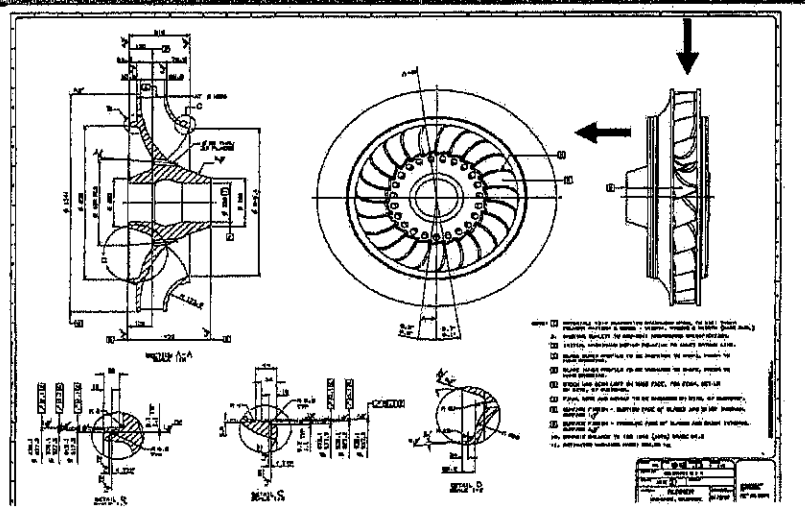


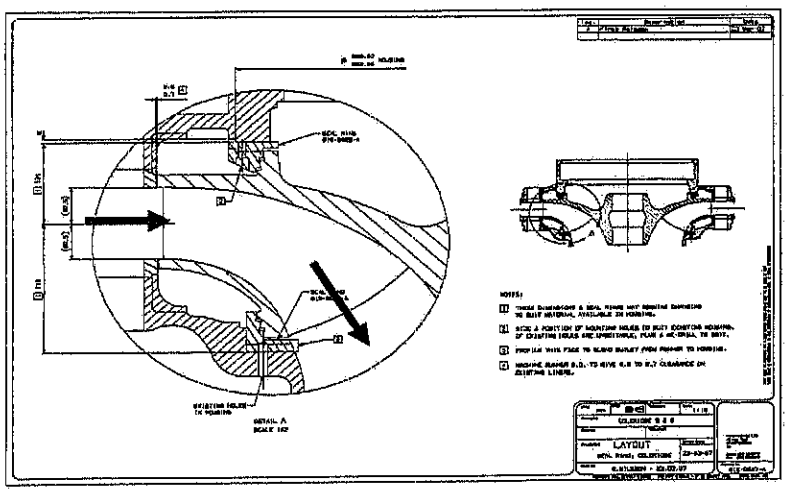
Figure 6.3 Unit G1 Cross Section

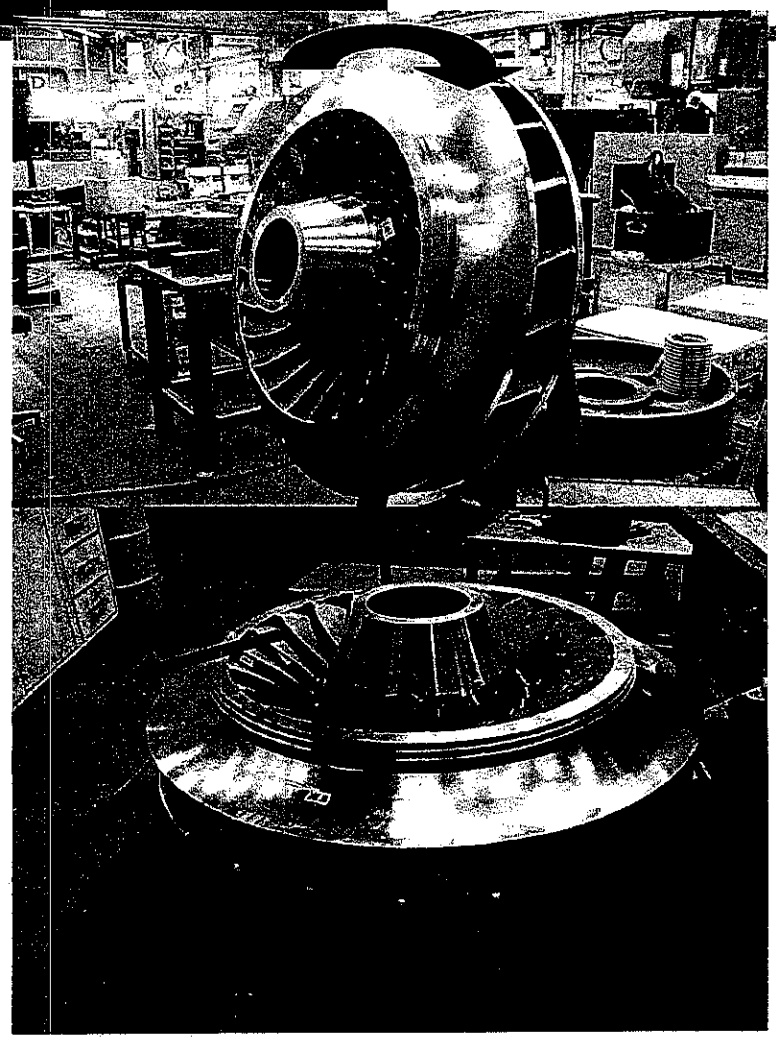


Typical Francis Runner Construction & Water Flow

TrustPower







Highbank & Montalto Power Stations Statistics

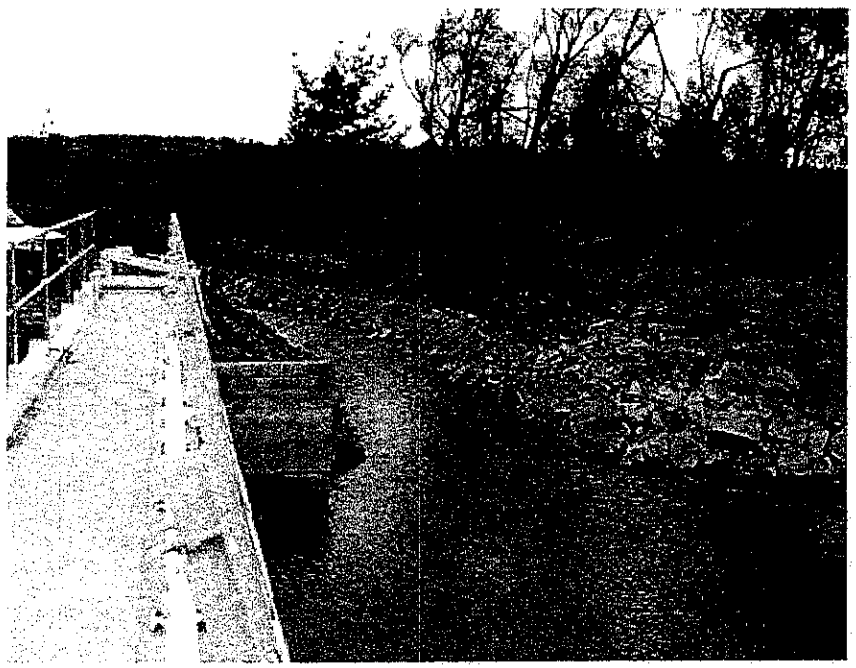
TrustPower

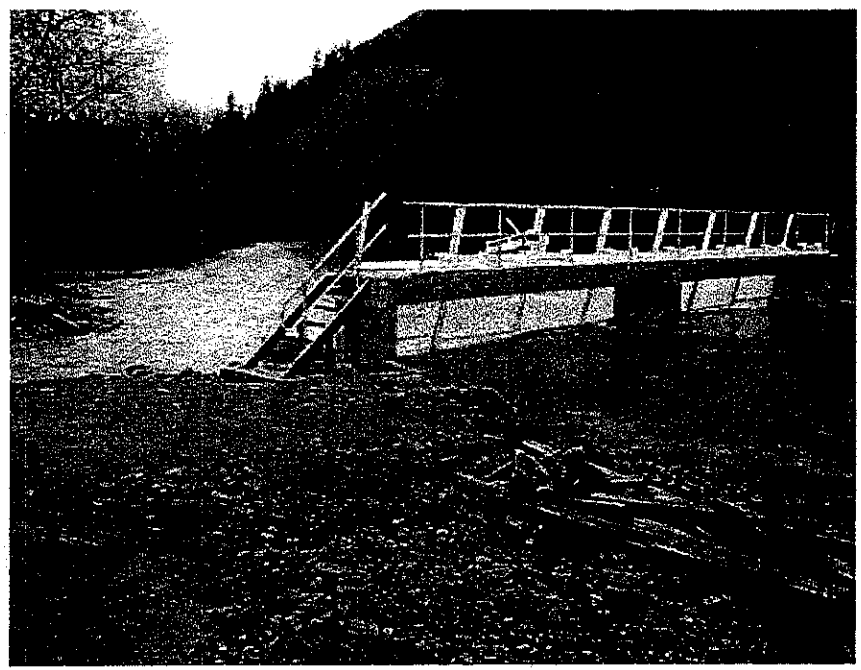
Table 1: Key Statistics

	Highbank Power Station	Montalto Power Station
Maximum Capacity	28MW	1.9MW
Rated Capacity	25.2 MW	1.8MW
5 yr/Average Annual Output (98-02)	98.22 GWh	
Peak Efficiency Output	23MW	NA
Plant Rated Efficiency	86.67% @ 25MW (Actual)	NA
Water Conversion at Peak Efficiency	1.17 cumecs/MW	NA
Water Consumption at Peak Efficiency	27 cumecs	NA

Highbank Power Station
Salmon Barrier & Inlet/Outlet Channels

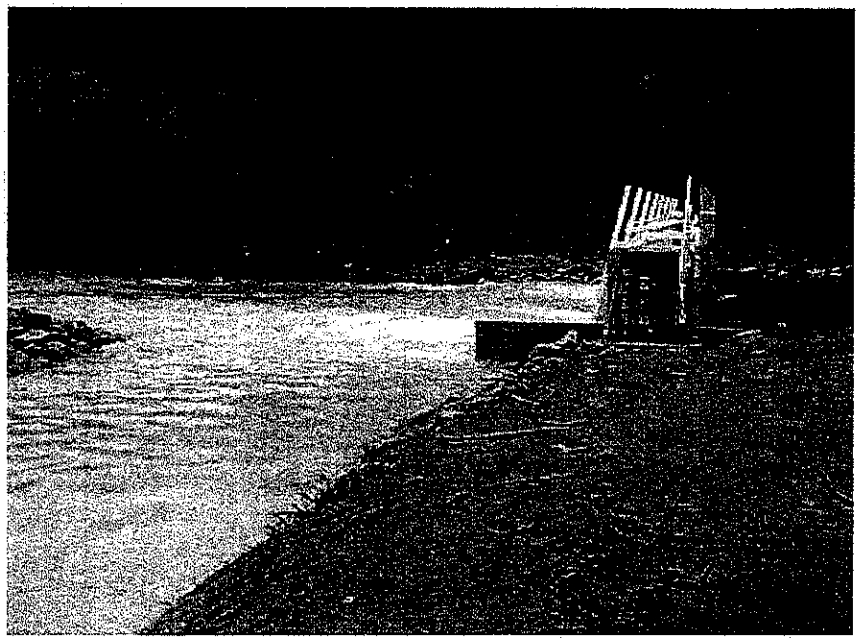
TrustPower





Highbank Power Station
Salmon Barrier - Outlet Channel

TrustPower



Annexure 2

Copies of resource consents CRC011249 and CRC011251

CRC011249

RESOURCE CONSENT

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO: Rangitata Diversion Race Management Limited

A DISCHARGE PERMIT: to discharge water and contaminants from the Rangitata Diversion Race, Montalto Power Station and Highbank Power Station into the Rakaia River by means of the Highbank Power Station Tailrace.

COMMENCEMENT DATE: 12 February 2005 ***EXPIRY DATE:*** 12 February 2040

IN CONNECTION WITH THE FOLLOWING PROPERTY:

LOCATION: Highbank Power Station Barkers Road METHVEN

SUBJECT TO THE FOLLOWING CONDITIONS:

1) The maximum rate of discharge shall be 40 cubic metres per second.

2) The consent holder shall take such measures as are appropriate to ensure that, so far as is reasonably practicable, mature salmon are excluded from the body of the tailrace and are returned to the river. To that end:
   (a) The consent holder shall within 18 months of the resource consent being granted, erect and maintain a salmon barrier system to prevent as far as practicable adult migrating salmon from entering the tailrace. The salmon barrier system shall be constructed generally in accordance with the design, standards and location recommended by suitably qualified ecologists and engineers commissioned by the consent holder. In addition, the consent holder shall maintain a channel that ensures that the salmon attracted to the downstream end of the salmon barrier system and the bypass channel are able to return to a main flowing channel of the Rakaia River.
   (b) Within three years of the commencement of this consent the consent holder shall provide the consent authority with a report, prepared by a person appropriately qualified and experienced in freshwater fisheries biology, detailing the extent to which the system referred to in paragraph (a) above is meeting the object of this condition and making recommendations, if such are thought by that person to be necessary, as to the way in which that object may better be met;
   (c) At any time within the fourth year of this consent and during every fourth year thereafter the consent authority may review this condition (pursuant to section 128) for the purpose of determining what steps should be taken by the consent holder so as better to achieve the object of this condition;
   (d) The consent holder may at any time apply to the consent authority for a change to this condition, but for the sole purpose of the better achievement of its object.

3) If, after discharge has ceased from the Highbank Power Station, more than 50 adult salmon have become entrained or stranded in the tailrace the consent holder shall, to the greatest degree practicable, salvage the fish and release them into an active river channel. Both the salvage and transfer operations shall be undertaken in accordance with accepted fish handling procedures and to the satisfaction of the Canterbury Regional Council.

4) The consent holder shall erect within six months from the commencement of this consent and shall thereafter maintain a notice at or about map reference K36:085-360, warning of the possible sudden release of water.

5) The consent holder shall measure and record the rate of discharge of water from the Highbank Power Station Tailrace when generating power, by recording machine flows at Highbank Power Station, at not greater than 30 minute intervals; and shall make such records available to the Canterbury Regional Council upon request.

6) The term of this consent shall be 35 years.

ISSUED AT CHRISTCHURCH ON 29 APRIL 2005

Tania Harris
TEAM LEADER CONSENTS ADMINISTRATION
on behalf of the Canterbury Regional Council

CRC011251

RESOURCE CONSENT

Pursuant to Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO: Rangitata Diversion Race Management Limited

A LAND USE CONSENT: to deposit material on, and excavate and disturb the bed of the Rakaia River to maintain riverbank protection works and extend protection works further downstream, to maintain a cutting to divert water from the Highbank Power Station Tailrace to the mainstream of the Rakaia River, and to maintain a river braid channel to the tailrace to assist the passage of adult salmon.

COMMENCEMENT DATE: 12 February 2005 ***EXPIRY DATE:*** 12 February 2040

IN CONNECTION WITH THE FOLLOWING PROPERTY:

LOCATION: Highbank Power Station Watsons Track Via Barkers R WATSONS TRACK

SUBJECT TO THE FOLLOWING CONDITIONS:

1) The reach of riverbed disturbed by maintenance works, and deposition of sediment, shall be restricted to 1000 metres upstream and 1000 metres downstream of the Highbank Power Station.

2) The Canterbury Regional Council shall be notified within 48 hours of exercising this consent on each and every occasion that this consent is exercised.

3) The activities shall not significantly impede the passage of fish in the main stem of the Rakaia River.

4) The term of this consent shall be 35 years.

5) Notwithstanding the provisions of Section 125 of the Act this consent may be first exercised up to 35 years after the date of commencement of the consent. If at any time the consent holder does not exercise this consent for a continuous period of two years, the consent shall not be cancelled under Section 126 of the Act.

ISSUED AT CHRISTCHURCH ON 29 APRIL 2005

Tania Harris
TEAM LEADER CONSENTS ADMINISTRATION
on behalf of the Canterbury Regional Council

Annexure 3

Fish Diversion – Inspection and Monitoring Log

HIGHBANK POWER STATION

FISH DIVERSION LOG – 2007

TrustPower GENERATION

Date	Observer	Generation	Weather	Tailrace	Bypass channel	Actions
--/04/06					In place	Diversion commissioned.
--/04/06	SH					Two screens detached from structure. Replaced.
15/06/06	SH					Replace screens.
05/06/06	SB					Screen replacement with Methven Engineering
30/06/06	SH					Dug new channel
09/08/06	SB					Screen maintenance with Methven Engineering
05-07/09/06						Shearbolts installed
19/09/06						Inspection completed by ECan. Full compliance.
06/11/06						Gate replaced
23/11/06						Gate shearbolts replaced
-11/06	SH					Dug new channel
12/01/07	HS					Replace gate 5 shearbolts
--/02/07	SH				Nil.	Diversion re-instated. 900m upstream.
19/03/2007	HS	Nil – due to EA outage.	Fine	Screen three found open.	Running. No fish seen.	Replaced screen. Three fish noted.
20/03/2007	HS – off-site	Methven checkgate closed				
22/03/2007	HS	Nil	Perfect day	Tailrace mid-section dry. Three fish noted in tailrace at station.	Running. No fish seen.	Removed one dead fish from upstream of screens.
27/03/2007	RP	Nil	Fine	Five fish in ponded area above		

HIGHBANK POWER STATION

FISH DIVERSION LOG – 2007

TrustPower GENERATION

Date	Observer	Generation	Weather	Tailrace	Bypass channel	Actions
				screens.		
28/03/2007	JD	Nil since 21/03	Overcast, warm	¾ tailrace ponding, mid section dry. 3 fish from diversion to mid section of race. 1 large, 1 small at stn.	Running	Nil.
03/04/2007	TW	Nil. Last gen. 21/03	Sunny, calm.	Screens OK. 3 juvenile fish noted near station/	Flowing.	Nil
11/04/2007	HS	Nil	Very NW. Ripply, but able to see. Would see larger fish over 300mm.	No fish seen outside stn. 2 large, 1 small seen under station.	Running. Low.	Nil.
17/04/2007	JD	6MW	Rain	Inspected.	Inspected.	
30/04/2007	SH			Grading carried out.	Turned out then re-instated upon completion of work.	Grading carried out by Syd Hogg, over previous 4 days.
18/05/2007						Repair/replace 3 fish screens
23/05/2007						Screen re-instatement
24/05/2007	HS	21MW	Nor-west	Dirty water (from canal)	Inspected	Nil
25/05/2007						Screen re-instatement
29/05/2007						Screen re-instatement
31/05/2007						Replace Fish screen
05/06/2007	SB	25MW	Overcast	No fish seen	Inspected	Nil
13/06/2007	HS	20MW	Fine	One gate slightly raised, perhaps	Inspected	Nil

HIGHBANK POWER STATION

FISH DIVERSION LOG – 2007

TrustPower GENERATION

Date	Observer	Generation	Weather	Tailrace	Bypass channel	Actions
				stone underneath. Not an issue.		
23/06/2007	RP	15MW	Fine/Clear	All screens in place	Inspected	Nil
26/06/2007	SB	14MW	Clear/Fine	No fish found. All screens in place	Inspected	Nil
03/07/2007	TW	19MW	Overcast	Water very murky. Fish screens intact.	Flowing well	Nil
06/07/2007						Screen re-instatement
10/07/2007	JD	18MW	Sunny/cold	Fish diversion intake blocked with sticks and debris	Fish diversion intake blocked with sticks and debris	Informed manager of blocked intake.
--/07/2007	SH				Re-instated.	
24/07/2007	SB	24MW	Overcast	All screens in place. No obvious fish.	Inspected	Nil
31/07/2007	SB	18MW	Overcast, drizzly	No fish observed. All screens in place	Inspected	None taken
During July						Re-instated by Syd Hogg
06/08/2007						Fish screen replacement
07/08/2007	TW	16MW	Nice day	All screens intact. No fish observed	Low flow, approx. 100mm in culvert.	Nil
14/08/2007	HS	Nil	Fine/cloudy	Inspected	Inspected	Replaced screens 1 & 3
23/08/2007						Screen re-instatement
29/08/2007	RP	14.9MW	Sunny, windy	Inspected	Inspected	Nil
03/09/2007	HS			Screens up.		

HIGHBANK POWER STATION

FISH DIVERSION LOG – 2007

Date	Observer	Generation	Weather	Tailrace	Bypass channel	Actions

A copy of this log is printed on the back of the Highbank Weekly Checksheet. Staff complete the form while carrying out the checks, or after unusual circumstances, and forward a copy to the Production Co-ordinator. The Production Co-ordinator updates this original document.

Examples of pertinent information: fish milling in front of screen; numbers of fish above screens; numbers of fish noted in bypass; screen damage or blowouts, when, why, when reinstated; bypass channel status after flood or during low river flows; generation flow.

Use the following form, inserting dates and name as required, in the event that maintenance of the bypass within the Rakaia River is required:

Annexure 4

Letter Graham Levy dated 15 September 2008

Level 3, Pricewaterhouse Coopers Centre
PO Box 13960, Christchurch 8141, New Zealand
T: +64 3 366 3521 // F: +64 3 366 3188
E: info@beca.com // www.beca.com

TrustPower Limited
Private Bag 12023
Tauranga 3030
New Zealand

15 September 2008

Attention: Ian Lees / Kirsty Joynt

Dear Kirsty

ACWT - Review of river effects related to headworks

You have asked that we provide technical comment on the potential issues, if any, for TrustPower's Highbank Power Station and associated structures (in particular the salmon bypass channel) in relation to the proposal by Ashburton Community Water Trust (ACWT) to construct and operate its proposed Rakaia Terrace Hydro Scheme which utilises water taken from the Rakaia River.

We have based our assessment on the following:

- The ACWT Assessment of Environmental Effects (both May 2007 and May 2008);
- The section 92 request from ECan dated 12 April 2007, and response from the applicant dated 31 May 2007;
- Aerial photographs of the river from LINZ (2000/01); and
- My own observations from the north bank of the river, upstream of the proposed Central Plains Water Trust (CPWT) diversion point, on 28 June 2008.

Summary

In summary:

- The ACWT proposal to divert water into the intake is unlikely to have any significant effect on the morphology of the river downstream towards the TrustPower Highbank Power Station and associated structures.
- The proposed discharge of water from the ACWT fish bypass (0.5 - 2m3/s) may assist in keeping the Highbank salmon bypass channel functioning, although a direct flow path link could result in problems for the ACWT scheme in making sure fish were not then trapped at the ACWT bypass discharge.
- The sediment disposal area will contain primarily smaller gravel and finer sediment, and if floods mobilise this (which is presumably the intention) the combination of greater local sediment sources plus reduced flow in the southern braids could exacerbate sedimentation in those braids, tending to strengthen the flow pattern towards the northern side of the river and away from the Highbank salmon bypass channel.

There are consent conditions proposed that would adequately address the risks. These relate to:

- Limiting the height to which sediment from the settlement pond can be placed on the river bed to 0.5m;
- Requiring the consent holder to maintain an upstream river braid leading to the Highbank salmon bypass channel.

These proposed conditions would address the potential risks to TrustPower in regard to the proposed ACWT headworks operation.

Review

General

It is important that the potential effects not be overstated. The river is already showing a trend to naturally follow a flow pattern that is more strongly towards the north bank upstream of the proposed CPWT diversion point, with current inspection showing vegetated islands replacing what was previously (in ACWT aerial photographs) open river bed where ACWT propose to dispose of gravel. The effect of this may be a higher probability that a strong braid does not reach the south bank for the Highbank salmon bypass channel. However, considering current river morphology between the proposed CPWT diversion point and the Highbank salmon bypass channel, it is unlikely that the effects on river morphology downstream towards Highbank as a result of sediment deposition in the area proposed by ACWT would be any more than minor, particularly if the height of deposition is low.

Intake works

The intake works proposed for the ACWT scheme are upstream and upstream of a natural tight bend in the river, and upstream of the proposed CPWT intake. These natural and proposed engineering features downstream of the ACWT intake will mean that the proposed works are unlikely to directly influence river morphology in the vicinity of the Highbank Power Station or the salmon bypass channel.

Sediment deposition from proposed settlement ponds

It is possible that sediment excavated from the ACWT settlement ponds and placed on the river bed might not be eroded in the manner predicted in the AEE. This would reinforce the river morphology described above, but is unlikely to result in a significant problem for Highbank operation. In the event that there were changes in the river morphology approaching Highbank, it would difficult to demonstrate a direct causal connection with the ACWT works.

In the event that the deposited sediment is eroded in floods, as proposed in the AEE, then it is possible that this sediment could be conveyed principally along the true right bank of the river, and enter the Highbank salmon bypass channel. In this situation, deposition would potentially affect the operation of the channel. However, it is unlikely to be practicable to separately identify the source of this sediment, i.e. whether it was natural deposition from floods, or linked to the ACWT intake operation.

We consider that the risk to the Highbank salmon bypass channel operation, though minor, could be at least partially protected by a condition of consent that required the consent holder to ensure there

is always a channel open to the salmon bypass. This would address both the question of possible sedimentation, and also that of changes in river morphology with loss of a southern braid.

River morphology near Highbank Power Station

We have not addressed any matters relating to the proposals in the vicinity of the Highbank Power Station, as this is being addressed directly by TrustPower.

Possible conditions of consent

Taking the above into account, we understand that TrustPower has agreed with the applicant for two conditions to be included in the consents. These are:

In respect of all works associated with the scheme, including sediment associated with the 'Sediment Disposal Area', the consent holder shall ensure that:

(a) For all works, sediment shall only be flushed from the scheme settlement ponds on the Rakaia River when the flow in the river, as estimated by Canterbury Regional Council from measurements at either the gorge recorder site or the recorder site at Fighting Hill, is greater than 300 m^3/s.

(b) For sediment deposits associated with the 'Sediment Disposal Area' where there are geomorphological modifications to either:

i. The lower tailrace channel of the Highbank Power Station; and / or

ii. The Fish bypass channel from the tailrace

That lead to an increase the incidence of salmon entrapment, the channels are to be re-graded or reinstated in response to any issues raised as a consequence of the above.

For the purpose of (ii) the consent holder shall monitor the performance of the tailrace and salmon barrier on a no less than weekly basis no less than 5 working days after there is a flood, or fresh for that period of the entire salmon migration season, being 1 December to 31 May. A report detailing the incidents of the manual reinstatement of the Salmon Bypass or Lower Tailrace following such reinstatements, where required, shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, by 31 May each year. These reports are also to be simultaneously served on TrustPower Ltd.

(c) Works within 20m of, or within, the river bed shall not result in an increase in turbidity or reduction in clarity of the river flow which, in the opinion of a suitably qualified expert engaged by the consent authority but paid for by the consent holder, hinders the upstream passage of salmon in the Highbank salmon bypass channel.

[The above condition is proposed to be incorporated into the following ACWT consents: CRC072646, CRC072643, CRC072647, CRC072642 and CRC072649]

The material excavated from the settling pond shall not be deposited on the riverbed to a height

greater than 0.5 metres above the existing level of the adjacent riverbed at the time of deposit.

[The above condition is proposed to be incorporated into the following ACWT consents: RC072642 and CRC072649]

With these conditions in place, we consider that the risks to TrustPower's Highbank Power Station operation as a result of the proposed ACWT headworks will be adequately addressed.

Yours faithfully
Graham Levy
Technical Director - Water Resources Engineering

on behalf of
Beca Infrastructure Ltd
Direct Dial: +64-3-374 3652
Email: graham.levy@beca.com