IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the submissions by **GENESIS POWER LIMITED** on the Horizons Regional Plan One Plan

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STATEMENT OF EVIDENCE OF JARROD BOWLER

1 July 2008

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1. INTRODUCTION

Qualifications and Experience

1.1 I hold the qualification of Master of Science (Hons) in Physical Geography, specialising in hydrology.

1.2 I am employed by Genesis Power Limited ("**Genesis Energy**") and hold the position of Environmental Manager – Renewable Energy. I am responsible for environmental management across all Genesis Energy's renewable energy assets, including: Tongariro, Waikaremoana and Kourarau hydro-power schemes and the Hau Nui Wind Farm. I have held this position since October 2004.

1.3 Previously, I held the position of Environmental Co-ordinator/Hydrologist with general responsibilities for environmental management and specific company-wide responsibility for hydrology across Genesis Energy's hydro-power sites, including the Tongariro Power Scheme ("**TPS**"). This role included hydrological data collection and management, information transfer, hydrological analysis and assessments and hydrological modelling. I held this position from September 1999 to October 2004.

1.4 Before working for Genesis Energy I held a position of hydrologist with Opus International Consultants Ltd (formerly Works Consultancy Services Ltd) for approximately 5 years. During this time I authored or co-authored over 25 technical reports on flooding and erosion issues in the Taupo-Waikato Region, including reports on the 1995, 1996 and 1998 Waikato floods. I also authored or co-authored over 50 technical reports on other catchments throughout New Zealand.

Scope

1.5 As described by Mr Weir the TPS is a renewable energy asset located within and adjacent to the Manawatu-Wanganui Region, of national importance. The purpose of my statement of evidence is to inform the Hearing Committee of the process to renew resource consents for the ongoing operation of the TPS, overview key outcomes of the process and how these outcomes have been implemented. Mr Matthews will outline specific issues relating to the One Plan to ensure the positive outcomes achieved through the TPS consents process are supported via the One Plan.

1.6 I will:

- Provide an overview of the TPS.
- Overview the process to renew resource consents for the TPS.
- Describe how the resource consents have been implemented.
- Describe the third party agreements reached during the resource consents process and progress made on implementing these agreements.
- Provide a brief overview of ongoing consultation and reporting.

2. TPS OVERVIEW

Overview

2.1 The TPS (as shown in Figure 1) is a hydro-electric power generation scheme constructed progressively between 1960 and 1983 and first becoming operative in 1971. It consists of two power stations: Rangipo and Tokaanu, which together can generate 360 MW of electricity.

2.2 The TPS is located south of Lake Taupo in the central North Island. In broad terms, the scheme operates by channelling water from headwater streams flowing from the mountains of the Central Volcanic Plateau to the two power stations: Tokaanu and Rangipo, before discharging it to Lake Taupo. Water is channelled via two major diversion schemes lying either side of the Ruapehu-Tongariro mountain chain: the Eastern and Western Diversions.

2.3 Construction of the TPS began in the 1960's, and progressed in four stages:

- The Western Diversion, the first stage to be built, was constructed between 1964 and 1971. This allowed diversion of water from five tributaries and the headwaters of the Whanganui River to Lake Rotoaira, together with water collected from the Te Whaiau and Otamangakau streams.

- The Tokaanu section of the scheme, including the Poutu Tunnel and Canal, was constructed between 1966 and 1973. Tokaanu Power Station first generated electricity in 1973.

- The Eastern Diversion was constructed between 1969 and 1979. The Moawhango-Tongariro Tunnel, which is over 19 kilometres long, took 10 years to complete and was one of the significant engineering achievements of the scheme.

- The Rangipo Section of the scheme was the last to be built, with Rangipo Station generating electricity in 1983.

2.4 For the purposes of explaining how the TPS operates, it can be divided into four geographical sections:

- Eastern Diversion.

- Tongariro Section.

- Western Diversion.

- Rotoaira Section.

Eastern Diversion

2.5 The Eastern Diversion collects water from the streams and rivers draining the southern flanks of Mt Ruapehu, where the Wahianoa Aqueduct collects water from 22 tributaries of the Whangaehu River. The water passes in a tunnel under the Desert Road to eventually discharge into Lake Moawhango.

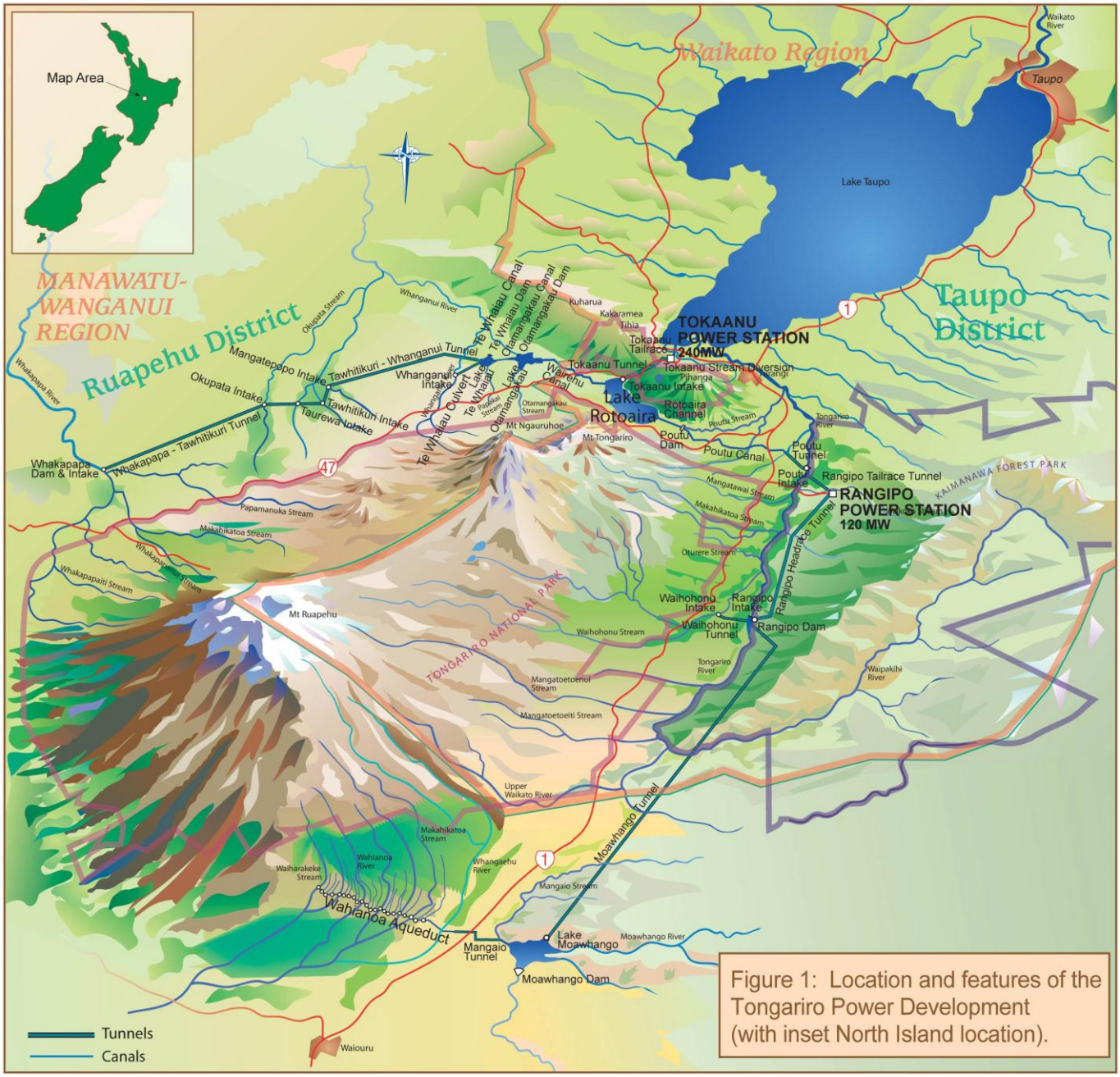

Figure 1: Location and features of the Tongariro Power Development (with inset North Island location).

Figure 1: Location and Layout of the Tongariro Power Scheme

2.6 There are two major river flows on the Wahianoa Diversion: the Wahianoa River and the Whangaehu River. The Whangaehu River is not diverted by the Wahianoa Aqueduct because it drains the Crater Lake on Ruapehu and is naturally highly acidic.

2.7 The Mangaio Tunnel conveys water from the Wahianoa Aqueduct to Lake Moawhango. Genesis Energy is presently constructing a mini-hydro on the outlet to this tunnel, which utilises the existing head gradient to generate an additional 2 MW of electricity from the TPS.

2.8 Lake Moawhango is an artificial storage lake formed by the damming of the Moawhango River. The lake is the main storage reservoir for the TPS. A minimum flow of 0.6 m^3/s is maintained continuously downstream of the dam, which is augmented by a flushing flow of 30 m^3/s for 9 hours duration each month between December and March.

2.9 Water is transported from Lake Moawhango northward towards the Tongariro River by means of a 19.2 kilometre long tunnel.

Tongariro Section

2.10 The water diverted from the Eastern Diversion in the Moawhango Tunnel discharges into the Tongariro River immediately upstream of the Rangipo Dam, along with the Waihohonu Diversion. Rangipo Dam is the uppermost dam on the Tongariro River and is where the Tongariro section of the scheme begins. A minimum flow of 0.6 m^3/s is maintained downstream of the dam, which is augmented by flushing flows on an as required basis (based on periphyton trigger levels).

2.11 From Rangipo Dam, water is diverted through a tunnel to the underground Rangipo Power Station. Water used for generation at Rangipo Power Station is then discharged back into the Tongariro River immediately above the Poutu Intake, joining with the tributary flows that run between the Rangipo Dam and the Poutu Intake.

2.12 At Poutu Intake, a portion of the flow of the Tongariro River is diverted into the Poutu Tunnel and Canal, which transports it across into Lake Rotoaira. The portion of the Tongariro River which is not diverted through the Poutu Intake continues on its natural path down the Tongariro River to reach Lake Taupo. A minimum flow of 16 m^3/s is maintained downstream of the intake, which is augmented by flushing flows on an as required basis (based on periphyton trigger levels).

Western Diversion

2.13 The second major diversion system on the TPS consists of what is known as the Western Diversion. The Western Diversion diverts the flows from the Whakapapa River and the headwaters of the Whanganui River and tributaries through a series of tunnels and canals to Lake Rotoaira, to join water collected in the Eastern Diversion.

2.14 The Whakapapa River is dammed by the Whakapapa Intake immediately below its confluence with the Papamanuka Stream. Here water is diverted in a long tunnel toward Lake Te Whaiau. A continuous minimum flow of 3 m^3/s

is maintained downstream of the Whakapapa Intake, while a minimum flow of 29 m^3/s is maintained on the Whanganui River at Te Maire between the months from December to May. Both of these minimum flows were established through minimum flow hearings in 1990, and first became regional rules as part of the Transitional Regional Plan when the RMA was enacted in 1991. They subsequently became regional rules via the Land and Water Regional Plan which became operative in September 2003. The minimum flow rules have now been established for a long period of time, and as I discuss later in my evidence, environmental benefits are being demonstrated through the exercise of resource consents established in accordance with the rules.

2.15 Along the path of this tunnel, intake dams collect and divert the headwaters of four small streams: the Okupata, Taurewa, Tawhitikuri and Mangatepopo streams. The tunnel discharges into Lake Te Whaiau, a small lake formed by damming the Te Whaiau Stream. The headwaters of the Whanganui River are also diverted via a small tunnel into Te Whaiau Stream and then into Lake Te Whaiau. Continuous minimum flows of 0.5 and 0.3 m^3/s are maintained downstream of the Mangatepopo and Whanganui intakes, respectively.

2.16 From Lake Te Whaiau, water flows into Lake Otamangakau, another artificial lake formed by damming the Otamangakau Stream. A man-made canal called the Wairehu Canal then carries the water through to Lake Rotoaira.

Rotoaira Section

2.17 Lake Rotoaira is the main storage lake for the Tokaanu Power Station, collecting water gathered from the Western and Eastern Diversions. Lake Rotoaira lies approximately 200 metres above Lake Taupo, providing a head gradient for generation at Tokaanu Power Station. Water is taken to the station via a tunnel at the northern end of the lake. From the Tokaanu Power Station, water discharges via a long tailrace canal to Lake Taupo.

2.18 Seasonal minimum flows of 0.3 to 0.6 m^3/s are maintained downstream of the Poutu Dam, the level control structure for Lake Rotoaira. The Poutu Stream is a tributary of the Tongariro River.

TPS RMA Resource Consents Process

2.19 As the Hearing Committee may be aware, the consenting process for the TPS has been very involved for a period spanning 1991 to the present.

2.20 By way of overview, I provide the following chronological summary:

(a) October / November 1991 – ECNZ (predecessor to Genesis Energy as owner and operator of the TPS) commences the consultation and effects assessment process for obtaining resource consents under the RMA.
(b) 1991 – 2000 (and beyond) – ECNZ and Genesis Energy consults or seeks to consult with all parties with an interest in the TPS. In most cases this was successful (both as to process and outcome).
(c) 30 June 2000 – Genesis Energy lodges the TPS resource consent applications (being prior to the expiry of its then current authorisations).

(d) 30 August 2001 – After a nearly five week hearing (held over an elapsed 11 month period) the Waikato Regional Council and Manawatu-Wanganui Regional Council make their joint decision ("**Joint Council Decision**") granting 53 resource consents for 35 year terms. The Joint Council Decision imposes a comprehensive set of mitigation measures proposed by Genesis Energy, including additional minimum water flows.

(e) September 2001 – Fifteen appeals are lodged against the Joint Council Decision: nine are subsequently withdrawn; three are settled; and three proceeded to hearing. As those three appeals related solely to the resource consent applications in the Manawatu-Wanganui region, the Waikato region consents were not challenged and have been granted for 35 year consent terms.

(f) August 2002 – resource consent obtained to raise the maximum operating level of Lake Moawhango by raising the height of the Moawhango Dam crest by 1.2 metres.

(g) 18 May 2004 – After an eight week hearing (and site visit) process, the Environment Court granted the 30 MWRC Consents for 10 year terms. Tāngata whenua did not appeal the findings or the decision of the Environment Court.

(h) 1 December 2004 – The TPS Consents commence, subject to the outcome of the Genesis Energy appeal on the 10 year consent terms.

(i) 25-26 July 2005 – The High Court hears the Genesis Energy appeal, and subsequently refers to matter back to the Environment Court to reconsider the consent term.

(j) 2006-2007 – Tangata whenua seek leave to appeal the High Court decision from the High Court. Initially leave is declined by the High Court but subsequently granted by the Court of Appeal on two points of Law. The parties are presently waiting for a hearing date from the Appeal Court.

(k) 2006-2008 – resource consent obtained and construction of the Mangaio mini-hydro enhancement project to utilise the water from the Mangaio Tunnel for electricity generation.

The Consent Process

2.21 The process of consultation and assessment of environmental effects, commenced in 1991 leading up to the Environment Court hearing in 2003 was one of the most extensive undertaken under the RMA.

2.22 The consultative process for renewal of the TPS resource consents was originally commenced by ECNZ in 1991, following the Planning Tribunal's decision on the Whanganui minimum flow hearings in late October 1990. The setting of minimum flows in the Whanganui River had been a lengthy, very technical and highly adversarial and contentious process. All parties in the early 1990's sought a more consultative approach for what was seen at the time as the more technically complex and potentially controversial process of seeking resource consents for the whole of the TPS.

2.23 During a 12 year period, ECNZ and Genesis Energy consulted, or at least met practically all representative groups of tängata whenua, and environmental, recreational and regulatory groups throughout the TPS area.

2.24 Genesis Energy openly sought to consult with all parties who have indicated a desire to do so, with the objective of fully understanding the issues raised,

sharing information and, ideally, reaching consensus about how issues might be addressed.

2.25 One of the most important objectives of the consultative process, to my mind, was the attempt to reach consensus on as many issues as possible. The consultative process and the significant efforts of many agencies and individuals, resulted in an outcome where there has been a large measure of agreement that appropriate environmental controls are being implemented through the consents obtained.

Approach Taken to Mitigating Adverse Effects

2.26 Genesis Energy engaged a wide range of independent specialists who thoroughly investigated the effects arising from the ongoing operation of the TPS. The findings of their technical assessments concluded that in some cases mitigation of the effects of the continued operation of the TPS would be necessary.

2.27 In developing mitigation proposals, mitigation was considered in a much broader context than simply attempting to solve a particular issue at a particular location. While it may in general be desirable to undertake mitigation in the area directly affected by a particular activity, in some circumstances this may not be possible or practical. Better environmental outcomes may be able to be achieved in alternative ways rather than simply altering the operation of the TPS.

2.28 In developing the mitigation proposals, a number of criteria were developed that individual mitigation options would need to satisfy as follows:

- Demonstrated effectiveness of the mitigation in relation to the effect being mitigated.
- Long term sustainability or self-sustainability.
- Consistency with the level of environmental effects.
- Attachment, either geographically or by issue, to the TPS.
- Provide a measurable or “tangible” outcome.
- Cost effectiveness.

2.29 Environmental outcomes developed using this criteria have been implemented by way of extensive resource consent conditions as described in Section 3 of my evidence and/or by way of third party agreements as described in Section 4 of my evidence.

2.30 In determining the most appropriate mitigation option in a particular circumstance, an important consideration was to assess the efficacy and sustainability of the mitigation option in achieving the desired environmental outcome both initially and on an ongoing basis.

2.31 For example, a scheme-wide mitigation strategy for blue ducks on TPS catchment seeks to achieve the best overall result for blue duck at a regional and national level rather than focusing on site specific releases of additional water at sites where sustainable benefits for the species were unlikely or at best, uncertain.

2.32 Blue duck make use of habitat in several rivers affected by the TPS. The population on the upper Tongariro River below the Rangipo Dam is known to have decreased over the period during which the TPS has been in operation.

2.33 Early in the consultation process, and following extensive technical assessments, it had been determined that to improve the habitat for blue duck in the upper Tongariro River a minimum flow of 3-4 m^3/s should be restored below the Rangipo Dam. This increased flow would result in an increase in blue duck feeding habitat only for the first kilometre or so below the dam (after which tributary inflows reduce the impact of the dam) and would only provide habitat for a few additional ducks on the entire reach of the river. Furthermore, the sustainability of blue duck in this river is questionable given that it is prone to lahars and the effects of ash runoff following volcanic eruptions. Also, genetic profiles of the Tongariro blue duck population show that the population has historically operated as a 'sink' population, relying on immigrants to remain viable. A release of a significant additional volume of water from the Rangipo Dam would therefore at best result in additional "at risk" habitat for just a few blue ducks, and was unlikely to provide sustainable benefits.

2.34 The additional release of water, where it would, among other things, enhance aquatic ecosystems and, as a consequence, blue duck populations, was considered appropriate, but only where the populations were not at risk from lahars, namely in the Mangatepopo Stream and upper Whanganui River. In recognition of this, a "scheme-wide" blue duck mitigation package was developed that provides a mix of methods that is considered to provide the best overall outcome for the species. This was agreed to by all the "conservation" interests associated with the resource consent process, and is subsequently being implemented via the Central North Island Blue Duck Trust.

2.35 This approach has been very successful in addressing the environmental effects of the TPS. As indicated by the information presented in sections 3.23 and 3.30 later in my evidence, such an approach has resulted in a very significant net gain for blue duck within the North Island and New Zealand. It is important that these types of outcomes be provided for in the Proposed One Plan in terms of the way potential adverse effects might be avoided, remedied or mitigated.

Summary of Effects of the TPS as Described by the 2001 TPD Hearings Committee and the Environment Court, 2004.

2.36 In the 2001 decision of the TPD Hearing Committee (please note the TPS used to be referred to as the TPD, which stands for the Tongariro Power Development) the following general findings were made regarding the physical effects of the TPS:

> "The TPD has undoubtedly adversely affected the natural character of the rivers it harnesses, but the minimum residual flows to be adopted for the scheme go some way to mitigating that loss."[1]
>
> "…the Committee concludes that the flow reductions associated with the TPD diversions have degraded blue duck habitat. Consequently, the

[1] TPD Hearing Committee Decision, page 119.

> Committee endorses the agreed blue duck mitigation package and the intended creation of the widely supported Central North Island Blue Duck Conservation Trust."[2]
>
> "The residual flows implemented below some of the TPD structures will enhance trout habitat and mitigate the adverse effects of the diversions."[3]
>
> "…the Committee has concluded that, with the various scheme wide and site specific mitigation measures in place and with associated consent conditions adhered to, the overall adverse effects of the TPD on the wider environment within which it resides will be no more than minor."[4]
>
> "…in terms of the overall judgement approach that it considers appropriate to adopt, the Committee concludes that the ongoing operation of the TPD represents a sustainable use of natural and physical resources. Furthermore, conditions of consent are able to be included that satisfy the requirements of the various statutory planning documents of both Councils, and result in the actual and potential adverse environmental effects of the Scheme being adequately mitigated."[5]

2.37 The Environment Court's TPD Decision, like the TPD Hearings Committee Decision earlier, stressed the importance of the TPS from a national perspective and the Court's findings are described in detail in Mr Weir's evidence.

2.38 The Environment Court also made many findings on the physical effects of the TPS - Western and Eastern Diversions, those parts of the scheme contained within the Manawatu-Wanganui Region. The overall conclusions reached by the Court included the following findings:

> "[323] With the exception of the effects occasioned by a reduction in flow and water level, we are satisfied from the extensive scientific evidence we heard that there is no evidential connection between the operation of the TPD and the decline in native fish life. Also, many of the physical effects on the rivers are caused by factors other than the TPD. In the overall context such physical effects are minor. The effects of the TPD are more greatly felt on Maori spiritual values."[6]

2.39 The Court's detailed findings on physical effects for both the Western and Eastern Diversions are contained in the extracts set out in Appendix A of my evidence.

2.40 In the TPD Decision, the Environment Court made many findings in relation to the adverse effects of the TPS - Western and Eastern Diversions on Māori spiritual and cultural values, for example:

> "[331] After a careful consideration of all the evidence, we have come to the clear conclusion that the diversion of the waters by both the Western and Eastern diversions has had and continues to have

[2] TPD Hearing Committee Decision, page 119.
[3] TPD Hearing Committee Decision, page 120.
[4] TPD Hearing Committee Decision, page 121.
[5] TPD Hearing Committee Decision, page 127.
[6] *Ngati Rangi Trust v Manawatu-Wanganui Regional Council,* Environment Court, Auckland, A067/2004, 18 May 2004, Judge Whiting.

> deleterious effects on the cultural and spiritual values of the Maori people. We find that these effects are considerable."[7]

2.41 The Environment Court subsequently reduced the term of the resource consents on the Western and Eastern Diversions (i.e. all resource consents contained within the Manawatu-Wanganui Region) of the TPS from 35 to 10 years, based on Māori spiritual and cultural values and to enable a "meeting of the minds" between parties. This reduction in term is presently subject to an appeal to the Court of Appeal.

2.42 I note that Genesis Energy has obtained 35 year consents for activities located within the Waikato Region.

3. TPS RESOURCE CONSENTS IMPLEMENTATION

3.1 Resource consents for the ongoing operation of the TPS were made operative by the Environment Court on 1 December 2004. As detailed below, Genesis Energy sought that the consents be made operative even though the consents legal process is ongoing.

3.2 The position to make all resource consents operative was taken by Genesis Energy so that the environmental outcomes agreed during the consents renewal process could be implemented. This also enabled the implementation of resource consents between the Waikato and Manawatu-Wanganui Regions to be consistent given the clear linkages and relationships between the consents.

3.3 Of the 53 resource consents granted for the ongoing operation of the TPS, 23 are located in the Waikato Region and 30 in the Manawatu-Wanganui Region. Each of the resource consents have between 2 and 31 specific conditions that Genesis Energy is required to meet. Furthermore, a number of actions, or tasks associated with each of the conditions are required to be completed.

3.4 To assist with the implementation of the resource consents Genesis Energy has developed a purpose built Resource Consents Management System ("**RCMS**"). The RCMS holds all information relating to resource consents; defines, prompts and monitors actions required by resource consent conditions; and reports on the status of all resource consents.

3.5 Depending on the type of resource consent condition there are a number of different ways in which the consents are being implemented. Key methods of implementation are described below:

- Real-time Monitoring
- Monitoring Plans
- Management Plans and Maintenance Schedules
- Recreational Releases
- Flushing Flows

[7] *Ngati Rangi Trust v Manawatu-Wanganui Regional Council,* Environment Court, Auckland, A067/2004, 18 May 2004, Judge Whiting.

3.6 It should be noted that through implementation of the resource consents there are significant direct benefits for the environment through the protection and enhancement of the freshwater ecology, which in turn has benefits for Mäori and non-Mäori alike.

Real-time Monitoring

3.7 Genesis Energy has real-time monitoring systems in place to ensure compliance with resource consent conditions. Robust control, instrumentation and communications systems at the TPS provide real-time information to power scheme operators to enable them to manage the scheme effectively and efficiently on a 24 hour, 7 day a week basis.

3.8 Of particular interest from an environmental perspective is the river flow, lake level and water quality information required to meet resource consent limits. Operational limits are set within the control system based on resource consent limits. If any of these limits are approached or met an alarm is raised to our power station operators who undertake immediate action.

Monitoring Plans

3.9 Monitoring plans have been developed by Genesis Energy in consultation with other parties to either assess the effectiveness of specific consent conditions in meeting desired outcomes, or to better understand the effects of the TPS on the environment. The plans set out the location and type of monitoring to be undertaken, the frequency at which this monitoring is to occur, and the methods to be used.

3.10 Specifically these plans are:

- Eastern Diversion Monitoring Plan.
- Western Diversion Monitoring Plan.
- Tongariro River Monitoring Programme (between Rangipo Dam and Poutu Intake).

3.11 In each case, the plans require sign-off by the respective Regional Council after input by those parties who identified an interest in the plans during the resource consents process. I will discuss the current status of each plan below.

3.12 I also note that there is:

- A monitoring plan for Lake Rotoaira that has been prepared in conjunction with the Lake Rotoaira Trust; and
- A lower Tongariro River Monitoring Programme that has been developed in conjunction with the Department of Conservation.

I will discuss these plans later in my evidence, respectively.

Eastern Diversion Monitoring Plan

3.13 The Moawhango Community, including tängata whenua, and Genesis Energy have agreed a common objective for the Moawhango River to create a river representative of a healthy high country lake fed watercourse. The Eastern

Diversion Monitoring Plan has been developed in conjunction with the Community to measure if this objective is being achieved, among other things.

3.14 The Eastern Diversion Monitoring Plan encompasses the Mangaio Tunnel, Lake Moawhango and the Moawhango River. Specifically the plan is to:

- Assess the pH in the Wahianoa Aquaduct and flow rate into the Mangaio Stream.
- Assess the abundance and composition of algae, periphyton and invertebrates in the Moawhango River between the dam and Moawhango Village.
- Assess the water temperature downstream of the dam.
- Assess the water quality of the discharge from the dam.
- Assess the adequacy of the minimum residual flow regime in terms of its ability to support an invertebrate community generally representative of a healthy high country lake fed watercourse in the Moawhango River.
- Assess the adequacy of the flushing flows in terms of their ability to improve the physical and biological characteristics of the Moawhango River.
- Assess the extent and magnitude of shoreline erosion at Lake Moawhango.

3.15 A summary of the water quality and ecological monitoring results to date have been described by NIWA (2006)[8]:

> *"We suggest that implementation of the new flow regime has improved benthic communities in the Moawhango River below the dam, reflecting conditions expected in high-country lake-fed ecosystems. Flushing flows had a positive effect on controlling nuisance periphyton cover and silt downstream of the dam, however some changes in invertebrate community metrics such as increased dominance by chironomids were counter [to] expectations. The upcoming years monitoring may help explain if these were short term responses to the large changes in the flow regime, or whether they are reflective of the longer-term community response."*

3.16 Results from the monitoring undertaken since that time support the conclusions set out above and have shown further improvements in the invertebrate metrics. NIWA (2008)[9] report:

> *"….Invertebrate abundances and generic richness at sites below the Moawhango Dam during 2008 were similar to data reported for 2005-07, and remained higher than before flushing-flows were initiated (2004)…"*

[8] Kelly, D., Jordan, M., Crocker, B, 2006 Tongariro integrated monitoring programme: Summary of Results for 2005-06 Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2006-108, July 2006, NIWA Project: GPL06501

[9] Arscott, D.B. 2008. Tongariro Power Scheme River Monitoring Programme: Summary of Results (2007-08). Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2008, June 2008, NIWA Project: GPL07501

3.17 The feedback from the Moawhango community in relation to the state of their river has been overwhelmingly positive with comments about the reductions in periphyton; the elimination of offensive odours sourced from the river; the return of a gravel bottom river bed; and significant improvements in the trout fishery.

3.18 Results from a recent NIWA (2008)[10] investigation in the Wahianoa tributaries suggests limited impacts of diversion structures on in-stream ecology in those catchments, although further investigation is still needed:

> "*All stream sites assessed illustrated healthy macroinvertebrate populations suggesting that current stream water quality is suitable for supporting aquatic communities. There was limited evidence of any difference in macroinvertebrate communities upstream and downstream of the aqueduct. Periphyton communities were typical of those found in upland streams in New Zealand. There did however appear to be a difference in abundance and community structure above and below the aqueduct."*

3.19 A summary of the shoreline erosion monitoring results undertaken by Cheal Consultants Ltd (2008)[11] is:

- In the first period after the crest of the Moawhango Dam was raised the shoreline retreated approximately 0.5 m in many locations. Since this time the shore appears to have stabilised and there has been no change to the vegetation line or beach profile in most locations.
- Remedial work carried out after the 2005 assessment has reduced the risk to infrastructure immediately west of dam. To the east of the Dam, further shoreline retreat at the mouth of a small tributary has required a short road realignment.

3.20 All monitoring results are presented to the community at annual consultative meetings and feedback sought. Also, discussed at this meeting is the willow control management plan (as discussed in paragraph 3.42 of my evidence) and more recently the development of a wider catchment management plan.

Western Diversion Monitoring Plan

3.21 The Western Diversion Monitoring Plan encompasses the Whakapapa River, Mangatepopo Stream and Whanganui River. Specifically the key purpose of the plan is to:

- Assess the abundance and composition of algae, periphyton and invertebrates in the Whakapapa, Mangatepopo and Whanganui Rivers;
- Assess the state and extent of blue duck populations in the Whakapapa, Mangatepopo and Whanganui Rivers;

[10] Franklin P, Crocker B, Croker G, 2008: A synoptic assessment of hydrology and ecology upstream and downstream of the Wahianoa Aqueduct. NIWA Client Report HAM2008-069, June 2008. NIWA Project GPL08218.

[11] Cheal Consultants Ltd, 2008: Lake Moawhango Photo Point Survey Report. Report to Genesis Energy 2006-32, April 2008. Cheal Consultants, Taupo,

- Assess the state and extent of trout and native fish populations in the Whakapapa, Mangatepopo and Whanganui Rivers; and
- Assess the effect of the new minimum flow regimes for the Mangatepopo Stream and Whanganui River on the natural character of those watercourses.

3.22 Implementation of the plan, in particular in relation to ecological health and blue duck monitoring commenced during the 2005/06 summer.

3.23 The Enviro Research (2008)[12] summary of the blue duck monitoring results to date shows that blue duck populations have almost doubled on the Western Diversion since 1998 (56 breeding pairs in 2007 compared to 30 breeding pairs in 1998). Further evidence of the current status of the population was observed during the 2007/08 breeding season with 128 ducklings produced by the 56 resident breeding pairs.

3.24 The most recent monitoring undertaken by NIWA (2008)[13] on periphyton, invertebrates and fish all reinforce the positive effects that the present TPS flow and operating regimes are having on these rivers, and that operation within the minimum flow provisions established with Horizons Regional Council has resulted in improved ecological conditions. Genesis Energy considers that sustainable management would not be achieved by the One Plan eroding the real environmental gains being made through implementation of the now long-established minimum flow provisions relating to the Western Diversion rivers.

3.25 It is important to note that any work undertaken as a result of the Western Diversion Monitoring Plan in regards to blue duck monitoring is complementary to the work being undertaken by the Central North Island Blue Duck Trust, refer to sections 4.30 to 4.34 for details.

Tongariro River Monitoring Programme

3.26 The Tongariro River Monitoring Programme encompasses the section of the Tongariro River between Rangipo Dam and Poutu Intake and is particularly focused on blue duck health and periphyton growth. While outside of the Horizons Region, I have included this in my evidence to reinforce the integrated nature of the work being done and the fact that the TPS spans several natural resource areas. Specifically the key purpose of the plan is to:

- Monitor periphyton growth;
- Monitor river flows; and
- Annual blue duck counting and banding.

[12] Oates, K. E. 2008 Blue Duck Monitoring Western Diversion Streams, Tongariro Power Scheme. Independent Study Report # 10325. Enviro Research Ltd, Ohakune.

[13] Arscott, D.B. 2008. Tongariro Power Scheme River Monitoring Programme: Summary of Results (2007-08). Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2008, June 2008, NIWA Project: GPL07501; and
Boubee,J., Stevenson, C. 2008. Fish in the Upper Whanganui River, below the Western Diversions – 2008. Prepared for Genesis Energy Ltd. NIWA Client Report: HAM-107, June 2008, NIWA Project: GPL07208.

3.27 A summary of the water quality and ecological monitoring results by NIWA (2006)[14] are:

- Coverage of filaments longer than 2 cm did exceed the Ministry for the Environment ("**MfE**") criteria of <30% coverage on one occasion (29 April 2004). Genesis Energy was contacted to potentially initiate flushing flow trials, however, a natural fresh occurred 5 May 2004 and another on 12 May 2004 resulting in complete removal of the filamentous growths.
- No other instances of either long filaments or thick mats exceeding the MfE criteria, with low very low levels (<10% coverage) throughout the remainder of the monitoring year, or in subsequent monitoring.

3.28 NIWA (2006)[15] summarised the status of periphyton in the section of the Tongariro River between Rangipo Dam and Poutu Intake as:

> *"Generally speaking, periphyton growth forms were representative of a healthy waterway, dominated mainly by thin to medium-thickness diatom biofilms."*

3.29 More recent monitoring reinforces that the present TPS flow and operating regimes are not having a negative affect on these rivers. NIWA (2008)[16] report:

> *"…both thick mat and long filamentous cover was within MfE Guidelines at all times. In the later portion of the 2007-08 monitoring period, cover by nuisance periphyton (thick mats and long filaments) at Puketarata and Judges Pool had increased to ~35-40% of the riverbed. A major flood in April 2008 reduced all nuisance periphyton coverage to 0% cover……. Concentrations of chlorophyll a and AFDM were well below MfE guideline concentrations for the protection of trout habitat and angling".*

3.30 Enviro Research (2008)[17] has summarised the blue duck monitoring results to date for Genesis Energy. While blue duck numbers on the Tongariro remain lower than they were in 1983 (11 breeding pairs down to an average annual estimate of 5 breeding pairs between 1995 and 2007) it is important to understand that blue duck numbers on the Tongariro are extremely variable. The causes of this variability are not fully understood and are likely to be a combination of volcanic activity, predation, the operation of the TPS and other factors. Off-site mitigation on the Western Diversion, on Mount Taranaki and the Central North Island Blue Duck Charitable Trust contributing to the

[14] Kelly, D., Jordan, M., Crocker, B,. 2006 Tongariro integrated monitoring programme: Summary of Results for 2005-06 Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2006-108, July 2006, NIWA Project: GPL06501.

[15] Kelly, D., Jordan, M., Crocker, B,. 2006 Tongariro integrated monitoring programme: Summary of Results for 2005-06 Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2006-108, July 2006, NIWA Project: GPL06501.

[16] Arscott, D.B. 2008. Tongariro Power Scheme River Monitoring Programme: Summary of Results (2007-08). Prepared for Genesis Energy Ltd. NIWA Client Report: CHC2008, June 2008, NIWA Project: GPL07501.

[17] Oates, K. E. 2008 Blue Duck Monitoring on the Tongariro River, Tongariro Power Scheme. Independent Study Report # 10326. Enviro Research Ltd, Ohakune.

protection of significant blue duck populations on other rivers, has resulted in an net gain of more than 30 breeding pairs of blue duck to date from the TPS reconsenting process.

Presentation of Monitoring Results and Feedback

3.31 Results of the annual monitoring plans and programmes are presented at annual consultative group meetings and through annual reports. These meetings and reports are widely advertised and distributed, respectively, with a key component seeking feedback and input on the information provided. Furthermore, all technical reports are made freely available on request.

Management Plans and Maintenance Schedules

3.32 A number of management plans and schedules have been developed to address specific issues that arose during the resource consents process. These include:

- Volcanic activity;
- Construction debris;
- Tokaanu Stream Diversion;
- Willow control;
- Runoff management;
- Public warning; and
- Routine maintenance activities.

Volcanic Activity Management Plan

3.33 This plan defines how Genesis Energy will operate prior to, during and post a volcanic event. The plan sets out where Genesis Energy has monitoring instruments, how Genesis Energy will respond to this instrumentation and how Genesis will interact with other organisations.

3.34 Together with the development of this plan Genesis Energy has been working closely with stakeholders within the Central North Island to develop an emergency response plan for the Central North Island, commonly known as the Eastern Ruapehu Lahar Alarm and Warning System (”**ERLAWS**”).

3.35 Genesis Energy has actively participated in the development of ERLAWS and has made its extensive communications network available to transport early warning information from remote sensors, located near the crater rim on Mt Ruapehu, back to a base located at the Tokaanu Power Station. Once at the base this information is automatically sent to key agencies to put their response plans into action.

3.36 Genesis Energy has also established further early warning sites on the Waikato Stream and the Mangatoetoenui River to provide early warning of an event that affects the Tongariro River Catchment. A hui-a-hapü was held at Otukou Marae where the plan and the proposed monitoring sites were discussed and it was agreed that the monitoring sites be installed. This information together with information from Genesis Energy’s pre-existing sensors is provided to ERLAWS.

Construction Debris Management Plan

3.37 During the consents process recreational users of the Tongariro River identified that construction debris was present in the Tongariro River and that this debris could cause a hazard for rafters and kayakers. The purpose of the management plan is to locate this debris, describe how the debris is to be managed and remove where possible.

3.38 Examination of the Tongariro River in May 2005 identified a few items in the lower river downstream of Poutu Intake and approximately 18 items in the upper river upstream of Rangipo Dam. Where practical, this material was removed in July 2005 and January 2006, respectively.

Tokaanu Stream Diversion Management Plan

3.39 The key purpose of this plan is to identify methods for identifying and maintaining the Tokaanu Stream Diversion to ensure that the flow capacity of the diversion is maintained.

3.40 Genesis Energy is also working closely with the Tokaanu Community, including tängata whenua, to develop a stream care management plan for the Tokaanu Stream.

3.41 To date there have been a number of works carried out under this plan by the community, the works have been focused on cleaning rubbish out of the stream, riparian enhancement, and dredging and weed removal in the lower sections of the stream to maintain the flood capacity of the stream.

Moawhango River Willow Management Plan

3.42 A key outcome of the resource consents process for the Moawhango River was the development of a willow management plan. The plan describes how willow control measures will be undertaken and maintained at a rate of not less than 200 metres per year and has been developed in consultation with the Moawhango Community.

3.43 As a result of this work to date, almost 4.0 kilometres of river bank has been treated, focused around the Moawhango Village. This has had a profound impact on the river habitat. The success of the programme has provided a strong catalyst for the community to seek wider catchment improvements, which are also being supported by Genesis Energy.

Public Warning

3.44 Public Warning systems have been developed for the Waihianoa Aqueduct and enhanced for the Moawhango River. These systems are based on similar systems located in other parts of the scheme. The systems include alarms to sound prior to the opening of any gate structures, manual notification when spill occurs from Moawhango Dam, and signage installed and public notification prior to any flushing event.

Runoff Management Plan

3.45 The purpose of the Runoff Management Plan is to describe how sediment, weed and debris deposition activities are to be undertaken and managed.

Maintenance Schedules

3.46 There are a number of resource consents in both regions that define how Genesis Energy is to carry out routine maintenance activities. A condition of consent is that maintenance schedules are produced each year that define the type, nature and location of each activity and the period in which the activity is to be undertaken, together with events that may cause unscheduled activities.

Recreational Releases

3.47 Recreational releases are provided at a number of locations and provide recreational and commercial kayakers and rafters opportunities with increased flows. In particular recreational releases are provided from:

- Rangipo Dam (Tongariro River) – 3 days per year
- Poutu Intake (Tongariro River) – 2 days per year
- Whakapapa Intake – 2 days per year depending on flows
- Moawhango Dam – 2 days per year

3.48 The dates of the recreational releases are set in consultation with NZRCA and other interested parties and dates are advertised well in advance of the events. Safety during the releases is paramount and Genesis Energy has worked closely with NZRCA to develop effective signage and notification procedures. Annual recreational releases from the above rivers have occurred since 2004.

3.49 I note that while the recreational releases from Poutu Intake (equivalent to twice the minimum flow) have no impact on reducing periphyton levels in the lower Tongariro, releases from Rangipo Dam (equivalent to 50 times the minimum flow) reduce periphyton levels by 60% resulting in only one nuisance periphyton build-up being detected in the Rangipo Reach since 2004. Thus, providing additional habitat benefits.

3.50 The recreational releases have been well utilised and feed back from users has been excellent. Peter O'Keeffe, a keen kayaker, provided the following feedback:

> *"I just wanted once again thank Genesis for the releases over the weekend just gone. The Tongariro River is such an enjoyable river to paddle, both for its scenery and rapids, and now that these releases are available it is highly regarded by kayakers as a kayaking destination. In fact next year I plan to organise a rafting trip for friends/family for the Access 14/13 run.*
>
> *Is there any idea of release dates for next year at this stage? I know it's early though! I am planning a family holiday in Turangi next year in either April or September and was hoping to plan it around a release weekend."*

3.51 I note that at present the flushing flow releases from Moawhango Dam are not being advertised to recreationlists as willow encroachment into the channel has meant that it is not safe to kayak this river at this present point in time.

This issue is being dealt with via the Moawhango River Willow Management Plan as described in paragraph 3.42 of my evidence.

Flushing Flows

3.52 Flushing flows are provided at a number of key points throughout the scheme, namely: Moawhango Dam, Rangipo Dam and Poutu Intake. The key purpose of the flushing flows is to remove nuisance periphyton, so that it does not build up to levels whereby it can affect the freshwater ecology.

3.53 Four flushing flows of 30 m^3/s are carried out routinely from Moawhango Dam during the months from December to March, two of which coincide with the recreational releases discussed above. Downstream of both Rangipo Dam and Poutu Intake periphyton growth is monitored and trigger levels are set, based on Ministry for the Environment Guidelines. If these levels are exceeded a flushing flow is released. To date no flushing flows have been required to be released.

4. TPS THIRD PARTY AGREEMENTS

Overview

4.1 Where issues were raised during the resource consents process that either could not easily be dealt with via resource consent conditions, or where effects could not be directly mitigated agreements with third parties have been entered into to address these issues.

4.2 Genesis Energy has third party agreements with the following parties (these agreements have been "grouped" by geographical area in which the agreement applies):

Eastern Diversion

- Ngati Whitikaupeka and Ngati Tamakopiri
- Ngati Hauiti
- Wellington Fish and Game Council

Tongariro River

- Department of Conservation
- Lake Rotoaira Forest Trust

Western Diversion

- Auckland/Waikato Fish and Game Council
- Wanganui and Ruapehu District Councils

Lake Rotoaira

- Lake Rotoaira Trust

Scheme Wide

- Tuwharetoa Maori Trust Board
- Sir Edmund Hillary Outdoor Pursuits Centre/New Zealand Recreational Canoeing Association
- Department of Conservation/Forest and Bird Protection Society

4.3 The details of these agreements are confidential to the parties; therefore any comments on these agreements are limited to published information.

Ngati Whitikaupeka and Ngati Tamakopiri

4.4 To develop environmental, cultural and spiritual enhancement projects, and provide opportunities to enhance health and well being across the rohe of Ngati Whitikaupeka and Ngati Tamakopiri. Genesis Energy meets regularly with Ngati Whitikaupeka and Ngati Tamakopiri to discuss monitoring plans and results and look to develop opportunities to involve the hapü in enhancement work on the Moawhango River.

4.5 I consider that this agreement is progressing well towards meeting the key objectives.

Ngati Hauiti

4.6 To develop environmental, cultural and spiritual enhancement projects, and provide opportunities to enhance health and well being across the rohe of Ngati Hauiti. Genesis Energy met regularly with Ngati Hauiti to discuss the implementation of the agreement and issues of mutual interest to Ngati Hauiti and Genesis Energy.

4.7 I consider that this agreement is progressing well towards meeting the key objectives.

Wellington Fish and Game Council

4.8 An agreement was reached with the Wellington Fish and Game Council to address issues resulting from the loss of fishing opportunity within the Moawhango River. A key part of this agreement is to facilitate the management of the trout fishery with the Rangitikei River and its tributaries.

4.9 To date the key focus of the Council has been on research, monitoring, compliance and habitat protection.

Department of Conservation

4.10 The key objectives of the agreement between the Department of Conservation and Genesis Energy are to:

- To monitor periphyton growth;

- To release flushing flows to remove nuisance periphyton should agreed trigger levels be reached;
- To enhance angling opportunities; and
- To research and monitor the river fishery.

4.11 Through the implementation of this agreement a technical working group has been established to better understand the linkages between river flows, periphyton growth, composition and density of macro-invertebrate populations, food availability and trout growth. This work complements the monitoring being undertaken as part of the Tongariro River Monitoring Programme and is seen as being not only important research for trout but also any other species that rely on this food chain to survive.

4.12 Water levels on Lake Otamangakau are managed, where possible, to help enhance angling opportunities during the fishing season by holding the lake as often as is possible at "ideal" levels for angling. Genesis Energy is also working with DoC to trial holding the lake level 'low' at times during the winter months to help manage macrophyte beds through "frosting".

Lake Rotoaira Forest Trust

4.13 This agreement provides for recreational access to the middle reaches of the Tongariro River via Access 10.

4.14 I consider the agreement is working well.

Auckland/ Waikato Fish and Game Council

4.15 An agreement was reached with the Auckland/Waikato Fish and Game Council to address issues resulting from the loss of trout habitat and recreational opportunity within the rivers and streams of the Western Diversion.

4.16 To date the key focus of the Council has been on increasing public awareness of the fishery, monitoring, habitat enhancement and protection.

Wanganui and Ruapehu District Councils

4.17 This agreement was reached in 2002 and a key component to implementing the agreement was the formation of a trust called the Whanganui River Enhancement Trust. The trust has 2 representatives from each of the Wanganui and Ruapehu District Councils and 2 representatives from Genesis Energy. The key objective of the Trust is to enhance the water quality of the Whanganui River, with a secondary purpose to fund projects that promote social, economic and environmental enhancement.

4.18 The first two years or so following the formation of the Trust was spent establishing operating guidelines and a strategic plan. During this time applications for grants were also accepted and university scholarships awarded.

4.19 Significant progress was made towards achieving the Trust's primary objective of enhancing the water quality of the Whanganui River with the Trust agreeing to support the work that Manawatu Wanganui Regional

Council are undertaking to target erosion hot spots, thereby reducing the volume of sediment entering the river. The support of the Trust will mean that the Regional Councils programme for deliverables will be significantly shortened and benefits realised much sooner.

Lake Rotoaira Trust

4.20 An agreement was reached with the Lake Rotoaira Trust on behalf of the beneficial owners of Lake Rotoaira in November 2000. The Agreement is focused around promoting and enhancing the lake and lake fishery. A Lake Management Group oversees the implementation of a management plan for the lake. The plan is focused on enhancing the integrity and health of the lake, with an integral part of the plan being the development of a monitoring programme to better understand the Lake Rotoaira eco-system.

4.21 A key driver for the Lake Management Group is to build the capacity within the Lake Rotoaira Trust so that they have the training and resources to implement the management plan and effectively manage Lake Rotoaira and the trout fishery. It doing so it is important to ensure that all regulations are complied with, and that policies and procedures are put in place to ensure the health and safety of those involved.

4.22 A monitoring programme commenced in August 2006, with a key emphasis on water quality, trout fishery and aquatic vegetation monitoring. This monitoring will update the extensive amount of joint research undertaken in 1999/2000 by the Lake Rotoaira Trust and Genesis Energy, and provide baseline information and monitoring of the trout fishery into the future.

Tuwharetoa Maori Trust Board

4.23 An agreement was reached between Genesis Energy and the Tuwharetoa Maori Trust Board, on behalf of the hapü of Ngati Tuwharetoa in November 2000. The relationship between Ngati Tuwharetoa and Genesis Energy occurs at a number of different levels, from periodic meetings between the Trust Board and the board of Genesis Energy, to regular meetings at a management level, to frequent meetings at a hapü/operational level.

4.24 The key objectives of the agreement are to undertake environmental, cultural and spiritual enhancement projects, as well as provide opportunities to enhance health and well being across the rohe of Ngati Tuwharetoa. This includes the development of opportunities to get hapü involved with monitoring the effects of the TPS.

4.25 To implement the agreement a group, known as the Tuwharetoa Genesis Group, was established. The group is comprised of 3 Tuwharetoa representatives elected by the hapü at a hui-a-iwi and 3 Genesis Energy Representatives. The Group has met several times since 2001 to receive, discuss and assess applications, as well as discuss other matters of mutual interest between Ngati Tuwharetoa and Genesis Energy.

4.26 The first few years of the Groups existence was focused on putting in place robust and transparent governance structures to meet the objectives of the agreement, including the development of funding criteria, application forms and a strategic plan. Although the focus on this initial setup meant that relatively few applications were received in the first few years, the group is

now very well established with many excellent projects either completed or underway.

4.27 Communication back to the hapü on the progress of the Group is critical, and as such annual newsletters are produced to report on the Groups activities and projects either completed or underway. An annual hui-a-iwi is also held whereby the Group report back on progress made and receives feedback from the hapü.

Sir Edmund Hillary Outdoor Pursuits Centre and New Zealand Recreational Canoeing Association

4.28 Separate agreements were reached with the Sir Edmund Hillary Outdoor Pursuits Centre and the New Zealand Recreational Canoeing Association with the purpose of enhancing recreational kayaking opportunities within the TPS. The key ways in which this is being achieved is through:

- Recreational releases (as described in paragraphs 3.47 to 3.51 of my evidence);
- The development of a kayaking playhole on Wairehu Canal or other agreed public recreational resource; and
- The development of a Kayaking Education Fund to provide sponsorship, resourcing and training opportunities.

4.29 Progress on the kayaking playhole has been slower than anticipated due to design issues but the facility was finally completed in early 2008 and now awaits final testing. The Fund has supported many New Zealanders (both youth and teachers) to participate and further their kayaking skills.

Department of Conservation and Royal Forest and Bird Protection Society

4.30 To facilitate the implementation of this agreement the Central North Island Blue Duck Trust has been established. The key purpose of the Trust is to provide for ongoing initiatives to enhance, protect and promote whio (blue duck) populations, habitat and natural character.

4.31 The Trust works closely with the Blue Duck Recovery Group to ensure that the work undertaken by the two entities is complementary. Key projects supported by the Trust to date have been a pilot study on the Manganui-a-te-ao focused on monitoring and predator control, the establishment of a new blue duck population on Mt Taranaki and more recently the facilitation of a Blue Duck Book.

4.32 The monitoring and predator control study on the Manganui-a-te-ao River covers some 10 km of river. The programme has been very successful and has lead to the highest recorded survival rates of chicks on this river since the 1980's. The programme has and continues to be extended to the Retaruke River, Whakapapa, Mangatepopo and upper Whanganui Rivers where, it appears, the success on the Manganui-a-te-ao is being replicated. This work is being carried out under the direction of blue duck specialists from the

Department of Conservation and members of local communities and iwi, on behalf of the Central North Island Blue Duck Trust.

4.33 The Mt Taranaki translocation project is progressing well. Like the Manganui-a-te-ao study, critical to the success of this project has been intensive trapping of predators to allow chicks to survive to maturity. There are now approximately 50 birds present in or around the National Park with a least four ducklings successfully fledged in the 2007/08 year – the third year of successful breeding within this new population.

4.34 The development of a book on the Blue Duck is seen as an important tool to raise the public's awareness and education of the plight of the blue duck. The book will describe the blue duck, where they live, their unique stories and those people who are passionate about saving this rare and unique bird.

5. RESOURCE CONSENT REPORTING

5.1 As part of complying with resource consent conditions Genesis Energy is required to report back to the regulatory authority on its performance against conditions. For the TPS the reporting requirements are significant. Genesis Energy has developed systems and process to undertake this reporting and to date has provided substantial compliance material to Councils.

5.2 Genesis Energy has reviewed its compliance reporting framework as we recognised that there is a lot of information that was only going to the Regional Councils, which other stakeholders also have a vested interest in. To address this issue Genesis Energy has developed an Annual Environmental Report for the TPS, which is widely distributed and should soon be available on the internet.

5.3 It should also be noted that Genesis Energy also provides near real-time information to both Waikato and Manawatu Wanganui Regional Councils, this information is used to monitor compliance and some information is used for flood warning purposes. Genesis Energy has also recently made some of its hydrology information available on its web site, which is getting well utilised by recreational users and interested parties.

5.4 Since the resource consents became operative compliance has been excellent, with all actions completed where it has been possible to so. It should be noted that some matters have not been able to be progressed as they require input from other parties. There have also been a few minor minimum flow breaches on the Mangatepopo Stream, due to complications with new instrumentation and gate operating mechanisms, which have been resolved.

6. CONCLUSION

6.1 The TPS has been in place for over 30 years and makes a significant contribution to renewable energy use in New Zealand.

6.2 The TPS is a complex scheme that requires integration between multiple catchments and a wide range of stakeholders who have varied and sometimes incompatible aspirations.

6.3 The TPS is a substantial example of how the benefits of resource use in general, and renewable energy in particular, can be realised in practice.

6.4 As can be seen from my evidence, Genesis Energy has made a substantial investment in the TPS, not just in the capital costs of infrastructure, but also in terms of investigating the effects of its activities; securing resource consents; implementing agreed mitigation outcomes; and developing and maintaining strong relationships with a wide range of stakeholders.

6.5 The process that achieved this was robust and resulted in tangible, effective and sustainable environmental outcomes that have enjoyed widespread support from stakeholders.

6.6 I have presented information on the TPS in some detail to demonstrate the nature and complexity of the use of natural resources made by Genesis Energy in the Horizons region and to demonstrate how the One Plan provisions are intimately connected to the operation of the TPS.

6.7 I consider that it is, therefore, extremely important that the One Plan process does not compromise the substantial efforts already made to secure sustainable environmental outcomes in relation to the operation of the TPS.

6.8 Mr Matthews will detail specific issues relating to, and changes sought in respect of, the Proposed One Plan.

APPENDIX A

ENVIRONMENT COURT FINDINGS ON PHYSICAL EFFECTS ON WESTERN AND EASTERN DIVERSIONS

WESTERN DIVERSION

(a) Amount of reduced flow and water levels

"[171] We find that the reduction in flow and water level, resulting from the diversion, at times when the water level at Te Maire is 29 cumecs or above, does have an effect as described by the Maori witnesses. We note that the "common daily flow" of 30 cumecs, as described by Dr Smart, equates with the minimum flow of 29 cumecs. We appreciate that once the flow falls below 29 cumecs at Te Maire the TPD, technically at least, has no effect on flows and levels."

(b) Water quality

"[179] We find, that the TPD, situated as it is, in the headwaters of the Whanganui and its tributaries, syphons off clear water with low levels of microbial contaminants. There is, at times other than low flow, a reduction in the dilution effect of tributary inflows such as the Ohura River, which are often characterised by high levels of suspended solids and elevated levels of microbial contaminants.

[180] This adverse effect on dilution is insignificant in comparison to the adverse effects of land use in the catchment on water quality. We agree with Dr Cowie when he said:

> These very minor effects of the TPD are insignificant however in comparison to the adverse effects of land use in the catchment on water quality in the Whanganui River. These effects are demonstrated particularly by Tables 10 (suspended solids) and 11 (turbidity) in the evidence of Mr Kennedy, and the photograph at Figure 13 of his evidence showing a mixture of the Whanganui and Ohura Rivers. Other tributaries such as the Hikumutu and Te Maire Streams also carry sediment loads, with adverse effects on the Whanganui River itself. This is further demonstrated in the attached Figure 4 from the report by Mr Phillips which shows trends in water quality down the catchment. Note particularly the decline in clarity that occurs below confluence with Ohura River [fn148 Dr Cowie, EiC, paragraph 33]."

(c) Morphological changes

"[191] We accept the uncontradicted evidence of Dr Smart. The river is constantly in a dynamic state and the major cause of dramatic morphological changes is floods. The TPD has little influence on flood events. Other factors such as land use changes, natural events such as eruptions and lahars, also have an influence. We conclude that the Western Diversion has very little effect on the morphology of the river and its tributaries."

(d) Ecology - invertebrates and fish

"[200] Genesis Energy Power commissioned Mr Jowett to carry out instream habitat surveys of the river system of the Western Diversion using the IFIM technique, and with minimum flows compared with the rivers' natural flows. Flow requirements were assessed for those fish species known to be present in the rivers, (ie longfin eel, rainbow trout, brown trout and Crans bully).

[201] In the **Whakapapa River**, the reduction in flow from its natural flow to a minimum flow of 3 cumecs has, in the 1 kilometre reach below the intake, reduced the average width of the river, and its depth by 20% and its velocity by

50%. According to Mr Jowett, this has no apparent effect on the native fish and juvenile trout, but has reduced the suitable habitat for adult brown trout by 20% and for adult rainbow trout by 70%. **[Emphasis added]**

[202] In the **Whanganui River main stem**, **Mangatepopo**, **Tawhitikuri**, **Taurewa** and **Okupata Streams**, the instream habitat surveys were made in the reaches up to 0.2 kilometres below the intakes of the three shorter streams and 1 kilometre below the intakes of the two larger rivers [fn173 Jowett, EiC, paragraph 4.5]. The areas immediately below the intakes were selected as locations because the relative change in flow is greatest in these sections of the rivers. No water was diverted through the intakes when the surveys were first made, but after appropriate measurements were completed flow diversion was recommenced and further measurements taken to establish a relationship between flow and water levels [fn174 Jowett, EiC, paragraph 4.6]. At the time of these investigations the minimum flow requirements for the Whanganui River and the Mangatepopo Stream had not been decided upon. **[Emphasis added]**

[203] In those sections of all the streams between 0.2 and 1.0 kilometre below the intakes, water surface widths and average depths were about 50% of "natural" flow. Average water velocity in these sections was 70-90% lower than at "natural" flow and the total area of fish habitat was 40-60% of that available at normal summer flow without diversion [fn175 Jowett, EiC, paragraph 4.19]. The effect of diversion on the Tawhitikuri, Taurewa and Okupata Streams was relatively minor because they are short [fn176 Jowett, EiC, paragraph 4.21]. The effect of flow reductions on stream width was most visible in the Mangatepopo Stream, where it was apparent until its confluence with the Whanganui River. However, the effect on native fish and rainbow trout fingerlings extended no further downstream than the first major tributary, about 3 kilometre below both the Mangatepopo and the Whanganui intakes [fn177 Jowett, EiC, paragraph 4.20].

[204] However, from the modelling, the reduction in habitat for native fish and juvenile trout was not found to be as great as the reduction in width and in some cases flow diversion has increased the amount of available habitat. Mr Jowett told us that the reason for this was that the maximum amount of habitat for smaller fish is provided by flows that are intermediate between the "natural" flow and the "residual" flow [fn178 Jowett, EiC, paragraph 4.8].

[205] In both the Whanganui River and the Mangatepopo Stream, the amount of habitat available initially increases sharply with flow and then reaches a maximum, optimum value. As flow increases above this, the amount of habitat either remains constant or decreases.

[206] On the basis of these surveys Mr Jowett concluded that a minimum flow of 0.5 cumecs in the Mangatepopo Stream and 0.3 cumecs in the Whanganui River, would increase the available habitat for benthic invertebrates and provide near optimum habitat for native fish and juvenile trout. Such flows were also recognised as optimum for blue duck habitat [fn179 Jowett, EiC, paragraph 7.5].

[207] Although minimum flows are specified in the Whakapapa and Whanganui Rivers, periodic wetting and drying of the margins occurs when the flow contribution from uncontrolled tributaries varies. Compared to these variations, Mr Jowett told us, the short duration reductions in water level, allowed by the resource consent conditions, will be insignificant, and have no significant effect on benthic invertebrates [fn180 Jowett, EiC, paragraph 5.13].

[208] Based on these conclusions, Mr Jowett could not agree with the statements of evidence, adduced by the Whanganui iwi and Ngati Rangi, that stated that the reduction in the number of fish in the rivers had been caused by the TPD. He claimed that if the quality and quantity of suitable fish habitat reduces with a change in flow, then fish abundance is also expected to [fn181 Jowett, EiC, paragraph 4]. However, flow changes and resulting water levels are not sufficiently large to effect fish habitat detrimentally. Indeed, he reiterated that the flow reduction has no negative effect on native fish, and in fact produces a slight benefit [fn182 Jowett, EiC, paragraph 9]. Changes in fish population that have occurred, he states, have occurred for reasons not related to the operation of the TPD diversions, apart from potentially immediately below some intakes [fn183 Jowett, rebuttal, paragraph 3].

…

Benthic Invertebrates

…

Whakapapa River

…

[214] … Dr Boubee told us that although the invertebrate communities have varied markedly over time, there is nothing to suggest that there have been any significant changes in the composition and abundance of benthic invertebrates as a result of the TPD. Those changes that have occurred have been the result of lahars, the amount of sand transported by the river, and the periodicity and intensity of floods [fn192 Boubee, EiC, paragraph 3.20].

Whanganui River, Mangatepopo, Tawhitikuri, Taurewa and Okupata Streams

[216] … However, MCI scores at all sites (42 in number) were 119, or higher, indicating pristine conditions [fn195 Boubee, EiC, paragraph 3.27]. Similarly, the periphyton community downstream of the intakes was counted at 14 sites, and at 20 sites in streams unaffected by the diversion. According to Dr Boubee, all counts indicated that the streams were in good health [fn196 Boubee, EiC, paragraph 3.30].

Fish Ecology

…

[222] Dr Boubee told us, that the similarity in the distribution of native fish, before and after the Western Diversion was constructed, would seem to show that the diversions have had no significant downstream effect on the distribution of native fish. Dr Boubee found no evidence that eel numbers have declined in the catchment between the TPD intakes and Taumarunui since the TPD was installed. He went on to say that because of the inland distances and altitude, density and diversity above Taumarunui is limited. The most common species between the Whakapapa inlet and Te Maire are eels, Crans bullies, and rainbow and brown trout.

[223] In his conclusions Dr Boubee summarised his thoughts about fish distribution by saying:

> In respect of fish, the elevation of the TPD intakes and their distance from the coast, mean that there would naturally be very limited native fish populations in their vicinity. Natural barriers a short distance upstream of most intakes is a further factor limiting fish populations above the intakes. There are some localised and minor effects on fish populations in the vicinity of the intakes, however, there is no evidence to suggest that the TPD has had any effect on the distribution or abundance of fish in the river as a whole. Rather, changing land use, especially the loss of native forest cover, and over-fishing are both factors that have had serious implications for native fish in the Whanganui River and throughout New Zealand [fn202 Boubee, EiC, paragraph 6.3].

[224] In the conclusions to his rebuttal evidence he reiterates these same beliefs that changing land use and over-fishing is the main cause of the poor catch experienced by the appellants. He agrees with the conclusion of Mr Jowett that:

> . . . apart from areas immediately below some intakes, the TPD has actually increased, albeit slightly, the habitat available for native fish [fn203 Boubee, rebuttal, paragraph 8.1].

[225] In response to questions from the Court, Dr Boubee re-emphasised that above 600 metres there are going to be very few fish anyway and said:

> You know, really it is the best place they could have put the intake as far as impact on fish [fn204 Transcript, page 420].

Fish abundance and land use

…

[228] As part of his summary [fn205 Kennedy, EiC, paragraph 10.7] Mr Kennedy said:

> Overall, it is evident that when the abstraction of water for the TPD, via the Western Diversion, is examined in relation to the effect that the abstraction has on the water quality of the lower river, at and below Te Maire, that the abstraction does not have any significant effects on key aspects of water quality. This lack of change arises because the discharge from rivers such as the Whakapapa do not differ significantly from the normal quality in the river such that the resultant decrease in flow does not significantly change water quality.

Dr B Cowie — an overview of the Western Diversion

[229] Dr Cowie appeared as a witness for the Manawatu-Wanganui Regional Council, by whom he had previously been employed as Group Manager, Resources, and who he represented on the Consultative Core Management Group relating to the TPD.

[230] With regard to the water quality of the Whanganui River he accepted the evidence of Mr Kennedy with only very minor differences, regarding colour and clarity in the Whanganui River. …

Fisheries

[231] In adopting the evidence of Dr Boubee, Dr Cowie stated that in his view no more comprehensive information was available than that summarised and presented to the Court, by Dr Boubee.

…

[233] He concluded that:

> . . . (as Dr Boubee concluded) . . . The construction of the TPD has had no adverse effects on the distribution of native fish and trout in the upper Whanganui catchment. . . . As the formation of Lakes Te Whaiau and Otamangakau has created highly regarded trout fisheries, in my view the overall effects of the Western Diversion on trout distribution and abundance have been positive.

Invertebrate Communities

[234] Dr Cowie adopted the evidence of Dr Boubee in respect of the invertebrate communities in the Western Diversion. …

[235] In cross-examination Dr Cowie said:

> I think you can say that the TPD has had little effect or minimal effect on water quality, virtually no effect on invertebrate communities, and a very small effect on trout fisheries but not native fisheries. I believe you can separate those out, and then you look at what is causing the decline in other things in the catchment, and I think there are two things there. First of all, water quality has definitely declined, and that is largely because of the effects of land use. Secondly, I think there is no doubt that the fisheries, particularly the eel fishery in the catchment, has declined, but that is due to world-wide, and certainly New Zealand-wide declines in eel population . . . and I think throughout the country eel populations have declined dramatically in the last 20, 30, 40 years, predominantly due to overfishing [fn209 Transcript, page 727].

Decline of native fish

[239] Dr Boubee discussed the problems regarding lamprey, smelt and whitebait. He believes that the main cause of their decline is habitat degradation [fn211 Boubee, EiC, paragraph 3.1]. …

[240] Dr Boubee told us, that smelt and whitebait have markedly declined throughout the country [fn213 Boubee, EiC, paragraph 6.2]. Mr Potaka told us that it was his opinion that this was due to the TPD preventing shingle from being brought down the river. This was not specifically answered by any scientist, in rebuttal, but Dr Boubee gave it as his opinion that habitat destruction and, in particular, excessive pastoral drainage and the removal of bank-side vegetation along waterways, coupled with high fishing pressure, are the main causes of the decline [fn214 Boubee, paragraph 6.2].

[241] Mr Kennedy, in rebuttal, told us that the kakahi or fresh water mussel is still to be found, though in a very seaward location. Although low in number, when surveyed in 1989, they were considered to be of good size and health. The surveyor [fn215 Forsyth (1989)] considered that in the middle reaches of the river the banks are too steep and flows too fast for freshwater mussels [fn216 Kennedy, rebuttal, paragraph 3.10]. This is because sediments such as sand are the preferred habitat and in many sections of the river the flow is sufficiently fast as to prevent a build up of fine sediment [fn217 Kennedy, rebuttal, paragraph 3.12]. He told us, that there is no scientific evidence to suggest that the flow changes arising from the abstraction of water by the TPD has played a part in the decline [fn218 Kennedy, rebuttal, paragraph 3.13].

…

[243] Mr Kennedy drew our attention to a series of surveys carried out from 1980 to 2003 showing that koura are widespread throughout the Whanganui River basin [fn220 Kennedy, rebuttal, paragraph 3.21]. Their abundance can easily be under-estimated as they are night active [fn221 Kennedy, rebuttal, paragraph 3.19]. He said there is little evidence that land-use changes affect koura abundance and distribution, though they are sensitive to pesticides and grow faster (with shorter life cycles) in the typically warmer waters of pasture land.

…

[247] The similarity of the surveys relating to the distributions of native fish, before and after the Western Diversion was constructed, led Dr Boubee and the other experts to conclude, that the diversions have had no significant downstream effect on the distribution of native fish [fn225 Boubee, EiC, paragraph 5.26].

[248] There was no suggestion by the fishery experts that there has not been a marked reduction in fish numbers in the main stem of the river. However, they went to some lengths to explain that the habitat degradation causing this was not related to the structures of the TPD, but was instead due to overfishing, lack of juvenile recruitment, pastoral development, loss of forest, point source contamination and the enormous quantity of silt being introduced into the body of the river by its larger tributaries [fn226 Boubee, EiC, paragraph 6.3].

[249] With the exception, that we find there has been a detrimental effect on the fisheries habitat of native fish and the traditional fishing methods by the reduced flow of the river we accept the evidence of the expert witnesses." [Emphasis added]

EASTERN DIVERSION

(a) Water quality - Whangaehu Tributaries

"[266] We accept the uncontroverted scientific evidence adduced by Mr Kennedy, and conclude that there is no significant difference in water quality of the Whangaehu tributaries, arising out of the diverted waters of the aqueduct.

(b) Water quality - Whangaehu River

"[270] Dr Cowie concluded, that this occasionally high natural acidity is undoubtedly the major factor causing the river to be so devoid of life. In the

context of such a low pH range occurring naturally, he considered any decrease in the average pH as a result of the diversion to be quite insignificant. We accept the evidence of Dr Cowie."

(c) Ecology - Invertebrates and fish - Whangaehu tributaries

"[310] Because in the Whangaehu catchment fish and invertebrates are, and historically have been, either absent or present in very low numbers well downstream, the effects of the TPD diversions of headwater tributaries must be very minor at most."

(d) Effects on Moawhango River

"[313] Overall, Dr Cowie considered, that the information indicated that there is a minor adverse effect on water quality in the Moawhango River as a result of the diversion of its headwaters north to the Tongariro catchment. This minor effect he considered, will be mitigated to some extent by the new requirement on Genesis Energy to provide for a minimum flow of at least 0.6 cumecs at all times. It was his view, that the construction of the Moawhango Dam has also led to some adverse effects on habitat quality in the river, particularly in its middle reaches around the Moawhango village. We accept Dr Cowie's conclusions [fn295 Cowie, EiC, paragraphs 77 and 78]."

"(b) Effects on invertebrate communities

[314] Dr Cowie told us that work carried out for Genesis Energy by Dr John Stark, an expert in freshwater community ecology, showed that arguably there was some small effect on stream invertebrate communities below the Moawhango Dam. This was one of the factors that led to Genesis Energy suggesting that a minimum flow of at least 0.6 cumecs be provided below the dam at all times [fn296 Cowie, EiC, paragraphs 80 and 81].

[315] Dr Cowie concluded that the imposition of a minimum flow has led to any such effects now being less than minor [fn297 Cowie, EiC, paragraph 82]. Again we accept Dr Cowie's conclusions."

"(c) Effects on fish populations

…

[317] According to Dr Cowie, who had studied a number of reports relating to the fish populations of the Moawhango River, the only fish present in the river above the dam prior to its construction were rainbow trout and brook trout. These populations are, he said, self sustaining and are still present today. Seven species were recorded below the dam, prior to its construction, five of which are still present. In his view the diversity and abundance are above average in comparison with similar New Zealand rivers [fn299 Cowie, EiC, paragraphs 85-87]. Again we accept Dr Cowie's conclusions."

OVERALL LANDSCAPE EFFECTS

"[400] In respect to the evidence available to the Court on landscape matters, we accept the evidence of Mr Boffa, that from a purely physical and visual point of view, the TPD effects on the landscape environment are of a minor nature. Having said that we understand, as does Mr Titchener, that this is only a part of the story. As a Court we have some understanding of the way the Maori people regard the maintenance of the pristine nature of their environment, which carries with it a continuity of the spiritual and cultural association they have always had with their land. We reiterate our disappointment at not being given the opportunity to have a more in-depth account of the tangata whenua's feelings regarding what they see as the desecration of their traditional lands by the TPD structures."