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

(19 OCTOBER 2009)

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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 have presently been seconded into the position of Contracts and Procurement Manager from the position of Environmental Manager – Renewable Energy. As Environmental Manager I was 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 held this position from October 2004 to July 2009.

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.

1.5 I have previously presented evidence in relation to the Proposed One Plan. My previous statement of evidence (dated 1 July 2008)[1] was presented at the Overall Plan hearing.

[1] Statement of Evidence of Jarrod Milton Bowler, One Plan Hearing, 1 July 2008

Scope

1.6 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 flow regimes that were established under the process to renew resource consents for the ongoing operation of the TPS, and discuss implications for the TPS of the proposed water allocation framework under the One Plan. 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 objectives, policies and rules.

1.7 I will:

- Provide a brief overview of the TPS and the process to renew resource consents for the TPS;
- The climate and physical setting of the TPS;
- Provide background information on Genesis Energy's extensive hydrometric network;
- Describe the TPS flow regime and hydrology as they relate to the Horizons Region;
- Discuss implications of the One Plan.

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. In 2008, the 2 MW Mangaio mini-hydro was commissioned to augment the generation from the existing scheme, the scheme now consists of three power stations: Rangipo, Tokaanu and Mangaio which together can generate 362 MW of electricity.

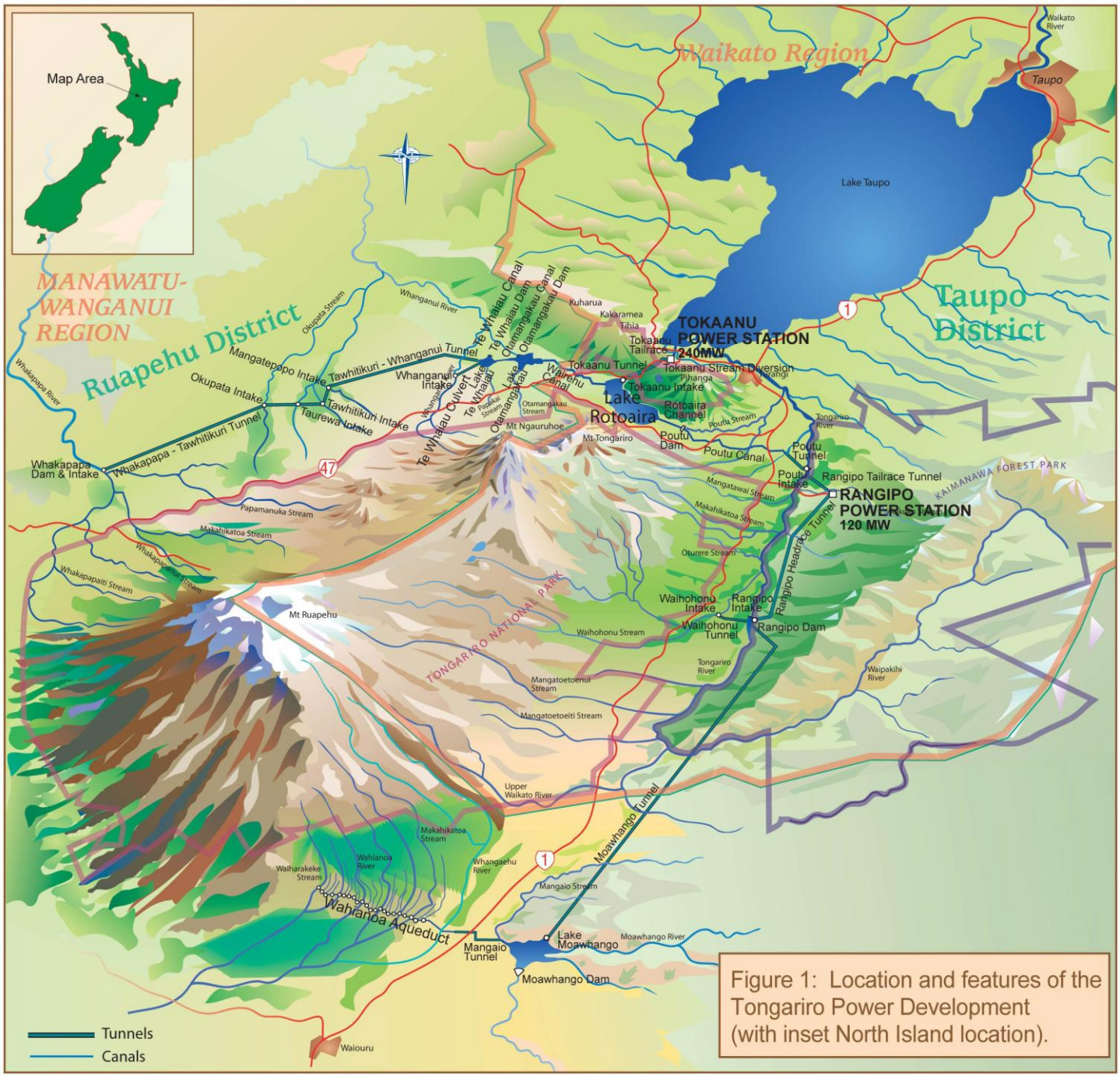

Figure 1: Location and features of the Tongariro Power Development (with inset North Island location).

Figure 1: Location and Layout of the Tongariro Power Scheme

2.2 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 The water diverted from the Horizons Region by the TPS is also further utilised through eight power stations on the Waikato River, and for cooling water at Huntly Power Station. As such, this water is some the most important, with its use maximised for the purposes of electricity production.

TPS RMA Resource Consents Process

2.4 As I described in my evidence to this Hearing Committee in July 2008, the consenting process for the TPS has been very involved for a period spanning 1991 to the present.

2.5 In my previous statement:

- I provided a chronology of the process up to that time – I note that since this time the Court of Appeal has upheld the High Court's decision to quash the Environment's Court decision to reduce the term of resource consents located within the Horizons Region from 35 to 10 years. This matter is presently the subject of an appeal to the Supreme Court;

- I outlined the re-consenting process describing the extensive consultation and assessment of effects, one of the most comprehensive undertaken under the RMA (1991);

- I described the open and inclusive approach towards consultation and the desire to reach consensus on as many issues as possible;

- I described the approach of using independent technical experts when undertaking effects assessments;

- I described in detail the approach towards developing mitigation proposals and then how these have been reflected both in terms of resource consent conditions and third party agreements; and

- Finally I described the implementation of resource consents and the many positive outcomes that have been achieved.

2.6 In the following sections of my evidence I will describe how the outcomes of this process have changed the scheme's hydrology.

3. CLIMATE, PHYSICAL SETTING AND HYDROLOGY OF THE TONGARIRO POWER SCHEME

3.1 The Tongariro Power Scheme (**"TPS"**) is located in the headwaters of four major catchments, namely the Whanganui, Whangaehu, Moawhango, and Tongariro Catchments. The majority of water is sourced from the Kaimanawa Ranges and the central North Island volcanoes; Mt Ruapehu, Mt Tongariro and Mt Ngauruhoe.

3.2 The dominant weather patterns that affect flows in the TPS area come from the north-west and the south-west, with the majority of rainfall derived from north-west frontal systems. The mean annual rainfall for the TPS catchment area varies extensively across the system, mainly in relation to elevation. Specifically mean annual rainfall ranges from 1200 mm at Turangi to over 3400 mm in the Kaimanawa Ranges and 3800 mm in the central North Island volcanoes. There is also very high variation in rainfall from year to year.

3.3 The TPS catchment is subject to tropical cyclones that can result in significant amounts of rain falling on the catchment in short periods of time. The highest peak flow recorded on the Tongariro River at Turangi was 1458 m^3/s in February 1958, which was associated with a tropical cyclone.

3.4 Snow is common on the volcanoes above about 1600 m during winter, however, unlike the South Island hydro-lakes snow melt does not contribute significantly to the annual inflows to the scheme. Runoff from rainfall events is the main contributor to TPS inflows.

3.5 The geology of the TPS catchment is mainly comprised of material of volcanic origin, the exception being the Waipakihi River (Tongariro River headwaters) that drains a steeply dissected greywacke catchment. Volcanic soils have a large water holding capacity and release water steadily over a long period of time resulting in relatively high, but stable baseflows.

3.6 In general, the rivers that provide the inflows to the TPS are steep and result in "peaked hydrographs", that is flows that rise and fall rapidly over a short period of time in response to rainfall. An example of this is the Waipakihi River where flows can increase by over 100 m^3/s in less than one hour.

3.7 The TPS intakes and power stations are generally designed to take up to twice the mean flow and the only reservoir in TPS with any significant water holding capacity is Lake Moawhango. Therefore, the scheme can be thought of as "run of the river", that is when water is available for power generation purposes it needs to be used or it will by-pass the power stations and will not be able to be used for generation by TPS in future.

3.8 The peaked nature of the hydrographs makes it difficult for power station operators to make adjustments at intakes to "capture" all the water available for power generation during floods and freshes, generally resulting in more flow downstream of the intakes at these times than if all components of the scheme were operating to capacity.

3.9 There are 36 points of flow control throughout the TPS, ranging from small intake structures to large dams. The intake structures, no matter what their size, have a similar conceptual design (Figure 2). Essentially water is taken through a set of screens into a catch chamber, any flow in excess above an intakes capacity will simply flow over the screens and/or over the adjacent spillway. Once in the catch chamber, water is either diverted into a tunnel to be used for electricity generation or is released via gates at the base on the catch chamber to continue down the stream (e.g. to maintain minimum flows).

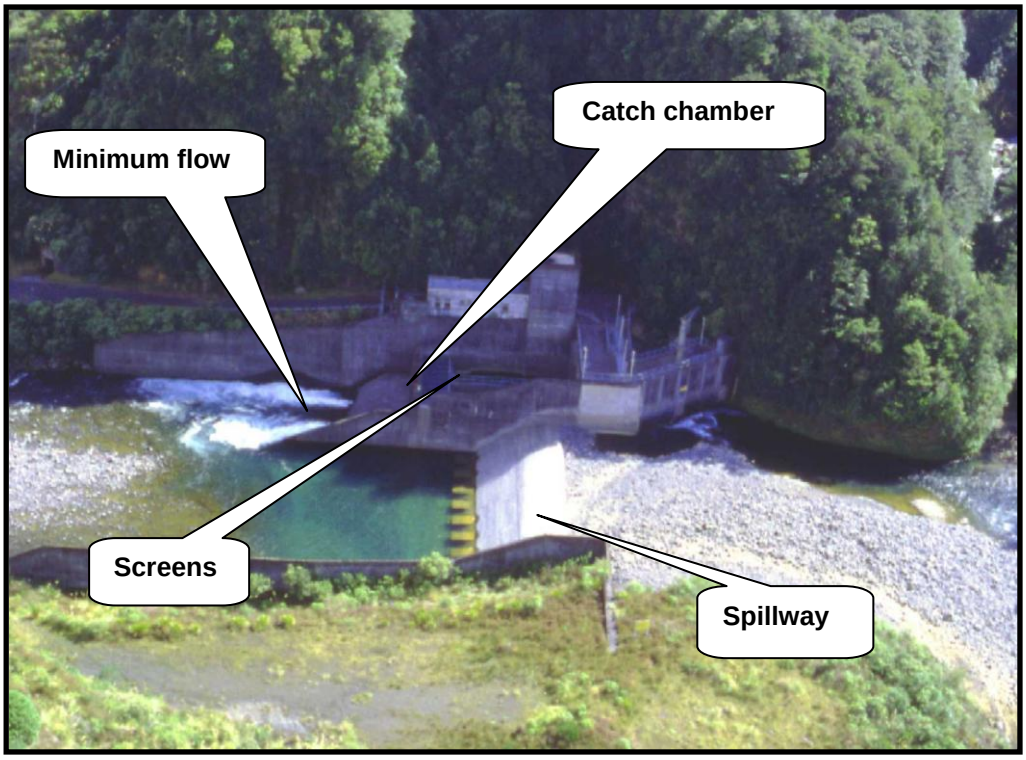

Figure 2: Whakapapa Intake

3.10 It is important to note that any abstraction above these intakes or any minimum flows set downstream of these intakes can result in a loss of water for electricity generation.

4. GENESIS ENERGY HYDROLOGY DATA

4.1 Genesis Energy has an extensive hydrology monitoring network within the Central Plateau that collects a variety of flow, level, rainfall and water quality information on a real-time and near real-time basis. At present the network is comprised of 31 water level and/or flow recording sites, 12 rainfall sites, and 6 water quality sites. Figure 3 shows the location of these present sites. Further sites will continue to be added to the network as required to enhance efficiency and/or to comply with resource consent conditions.

4.2 Genesis Energy maintains a hydrology database that contains information dating back to 1905 (Lake Taupo level), however, the majority of the sites within the network have been installed since 1957, with a number of sites installed since the commissioning of the first stage of the TPS (1971).

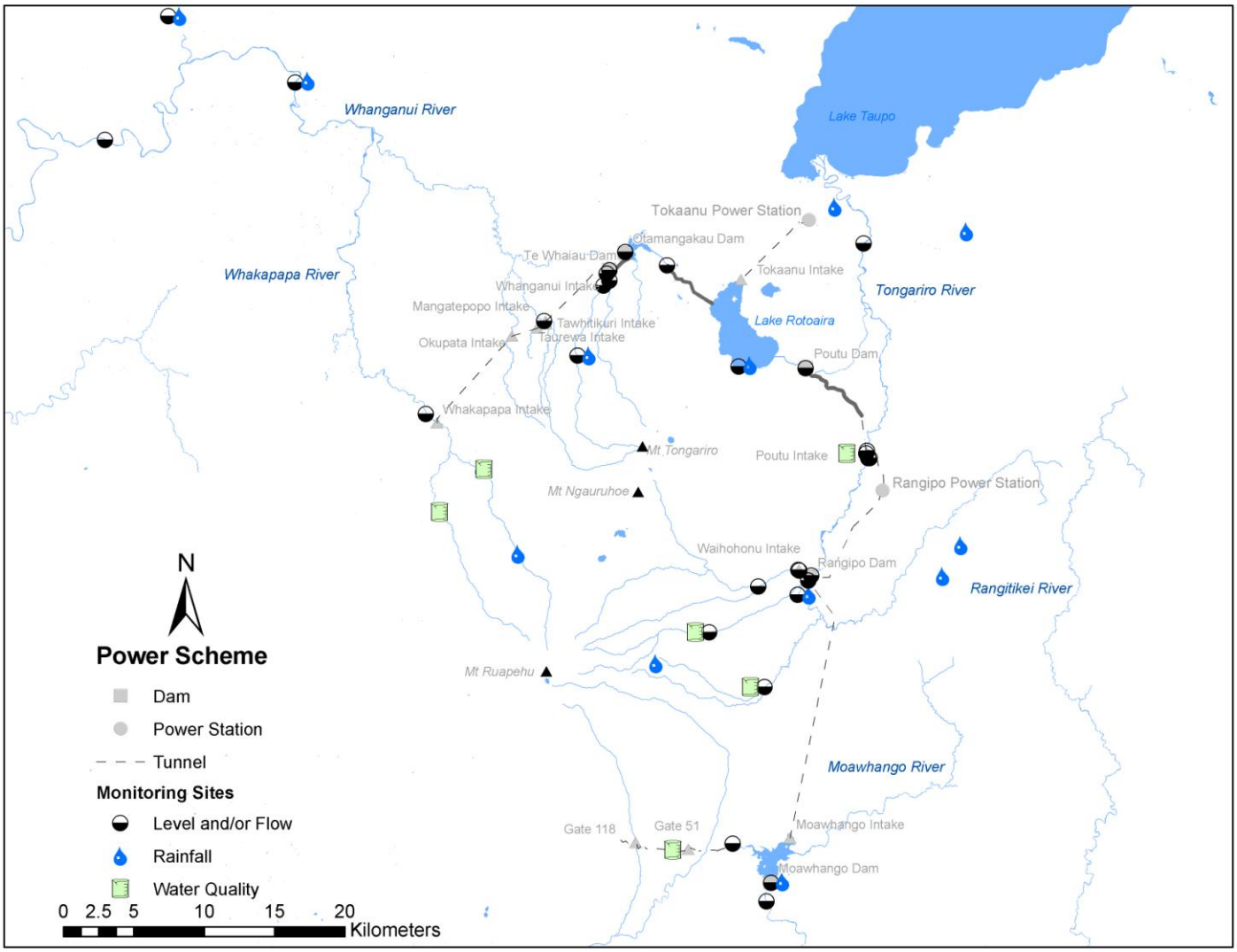

Figure 3: TPS Hydrology Monitoring Sites

4.3 This data is used by Genesis Energy for a variety of purposes, such as:

- Power station operators continuously monitor this information to ensure the efficient operation of the scheme while maintaining minimum flow requirements downstream of TPS structures,

- Computation of a variety of operational information by reference to flow and water level information, an example being to calculate lake inflows.

- Trend and benchmark hydrology against historical trends to determine generation strategies and manage lake storages to meet forecast generation demand, and

- Ensuring and demonstrating compliance with resource consent conditions.

4.4 Information on river flows is made available to the public via a flow phone and the Internet. Selected key sites are made available to Horizons Regional Council and Environment Waikato on a real-time basis for flood management and compliance purposes. Hydrological information is also provided to various other parties, on request, for activities such as scientific investigations, university studies and school projects.

4.5 Genesis' hydrometric services are contracted to NIWA who specialise in environmental data collection and management. The services include activities such as:

- Installation and maintenance of monitoring sites,
- Installation and maintenance of data communication networks,
- Manual flow measurements, known as "gaugings", to derive water level to flow relationships, known as "ratings",
- Quality assurance and archiving of hydrology data,

4.6 NIWA is also responsible for supplying regulatory authorities with compliance data on Genesis' operations. The fact that this information is being provided by an independent and appropriately qualified organisation, with Telarc-registered field and office procedures, gives both the regulatory authorities and Genesis' confidence in the quality and impartiality of this information.

5. TPS FLOW REGIMES IN THE HORIZONS REGION

Whanganui River Catchment

5.1 The source of the Whanganui River is the central North Island volcanoes. The source of the main stem of the Whanganui River is Mt Tongariro, with the source of the Whakapapa River being Mt Ruapehu. The Whanganui River system is some 345 km long and has a catchment area of approximately 7075 km^2. The headwaters of eight Whanganui tributary streams and rivers are intercepted and diverted to Lake Rotoaira from where water is taken to generate power at the Tokaanu Power Station. The total catchment area

from which this water is derived is 303 km^2, less than 5% of the total Whanganui River catchment area.

5.2 Figure 4 shows the layout of the Western Diversion of the TPS including those points at which water is diverted from the headwaters of the Whanganui River. These are the Whakapapa, Okupata, Taurewa, Tawhitikuri, Mangatepopo and Whanganui Intakes, and the Te Whaiau and Otamangakau Streams. Also shown on Figure 4 are key flow measurement points within the Western Diversion, together with the natural mean flow, the Base Case mean flow, the mean percentage flow reduction at these points, and minimum flow requirements as per the "Base Case" regime[2].

5.3 The effects of the TPS diversions on downstream flows are most significant at low to mean flows and have only a minor effect on flood flows. Figure 4 shows that the effects of diversions become less apparent with distance travelled downstream as a result of tributary inflows. The flow reduction at mean flow downstream of the Whakapapa Intake is approximately 67% from the natural flow regime to the Base Case regime, reducing to 38% by Piriaka, 19% by Te Maire and only 8% by Paetawa.

5.4 In 1991, as a result of the Whanganui Minimum Flow decision by the then Planning Tribunal, two minimum flow points were set on the Whanganui River and tributaries, they are:

- Whakapapa River at Footbridge, 3 m^3/s.
- Whanganui River at Te Maire, 29 m^3/s (1 December to 31 May), or the natural flow, whichever is less.

5.5 As part of this resource consent project, Genesis Energy proposed two additional flow releases which were endorsed in the November 2001 Council decisions, namely:

- Mangatepopo Intake, 0.5 m^3/s.
- Whanganui Intake, 0.3 m^3/s.

[2] The "Base Case" regime is the flow regime that is in place following the process to renew resource consents as described in Section 2 of my evidence

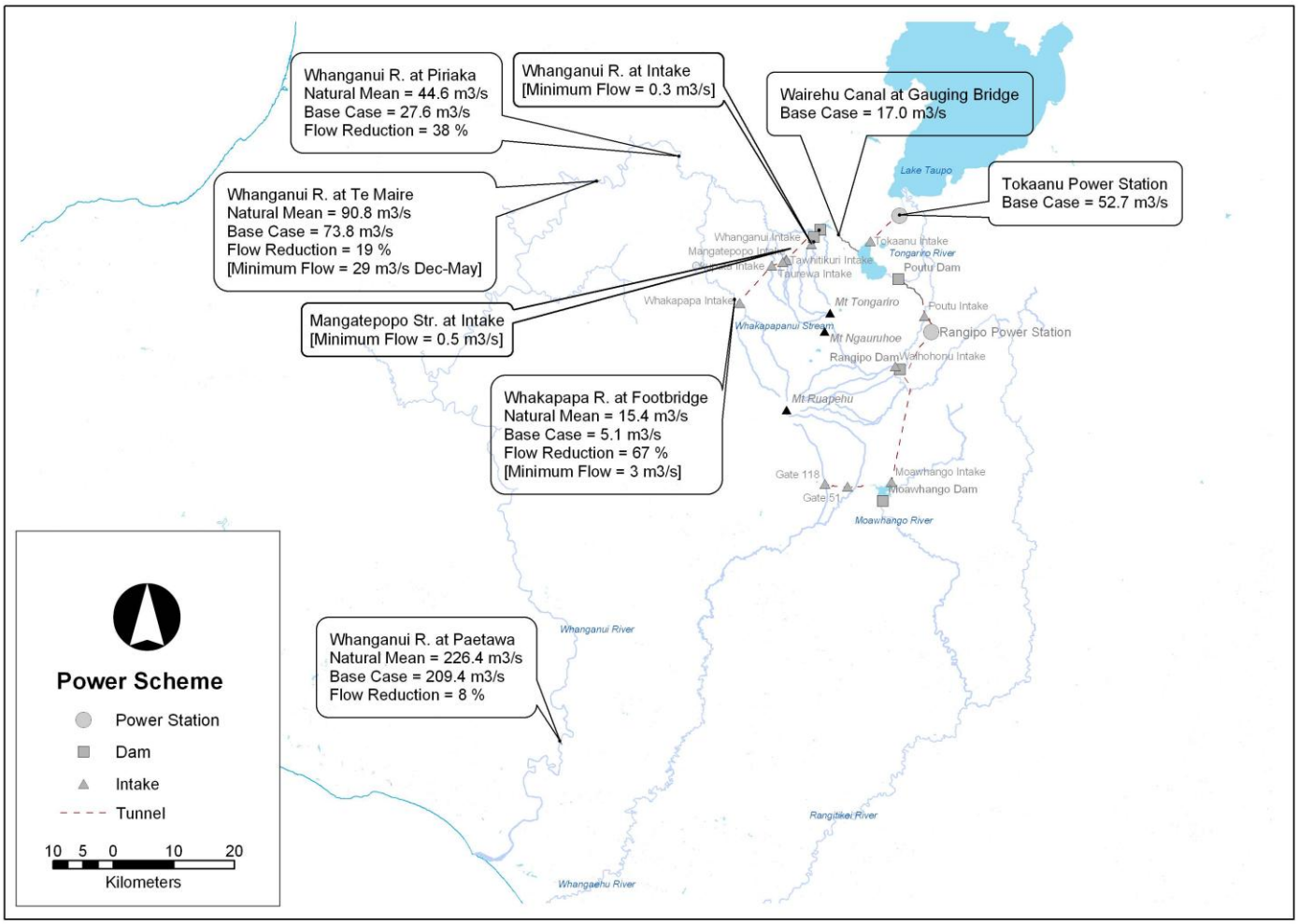

Figure 4: Western Diversion – Mean Flows

5.6 While the Whakapapa, Mangatepopo and Whanganui Intake minimum flows can always be met with some water left over for power generation, there are significant periods of time when the Te Maire minimum flow requirement dictates that a large proportion, or all, of the available water is released. Water is released from two points to meet the Te Maire minimum flow, namely from Lake Otamangakau and the Whakapapa Intake.

5.7 An analysis of the natural flow records of the Whanganui River at Te Maire shows that on average the natural flow is less than the 29 m^3/s minimum flow for 20 days, during the 182 day December to May period, during which the minimum flow applies. However, in any year the number of days can vary between 0 and 120 days, depending on rainfall. Thus on average, there are 20 days per year when no water at all can be taken from the Western Diversion for power generation, which can be up to 120 days per year during

dry years. There are a significant number of additional days upon which constraints exist, as I will now describe.

5.8 The impact of the 1991 Planning Tribunal decision was to reduce the average amount of water able to be diverted on an annual basis by 3.3 m^3/s. This equates to 52 GWh/year lost generation at Tokaanu Power Station. The 2001 resource consent decisions resulted in a further average reduction of 0.6 m^3/s^3 in the diverted flow, due to minimum flow releases downstream of the Mangatepopo and Whanganui Intakes. This equates to a reduction in generation at Tokaanu Power Station of a further 9.6 GWh/year.

5.9 The ability of the Western Diversion to modify flood flows in the Whanganui River and tributaries is limited by the capacity of the intakes, tunnels and canals that comprise the Western Diversion. The design capacity of the Wairehu Canal, which controls the amount of water able to be diverted from the Whanganui Catchment, is 55 m^3/s, but in reality the flow rarely exceeds 45 m^3/s. The capacity of the Whakapapa Intake is only 35 m^3/s.

Whangaehu Catchment

5.10 The headwaters of the Whangaehu River flow from the southern slopes of Mt Ruapehu. Twenty-two of the tributary streams of the Whangaehu River are intercepted by the Wahianoa Aqueduct and diverted into Lake Moawhango. The main stem of the Whangaehu River is not intercepted as its origin is the Crater Lake on Mt Ruapehu and the water is naturally acidic. The Whangaehu River is 238 km long and discharges into the Tasman Sea just south of Wanganui. The Whangaehu River catchment area is 1981 km^2, of which 79 km^2, or 4% is upstream of the Wahianoa Aqueduct.

5.11 The Moawhango River has its origin in the southern Kaimanawa Ranges. Below Lake Moawhango the river winds on a south eastern course for some 65 km to join the Rangitikei River just north of Taihape. The Rangitikei River is some 380 km long and discharges to the Tasman Sea just south of Bulls. The Rangitikei River has a catchment area of 3927 km^2, of which the

[3] The combined minimum flow from the Mangatepopo and Whanganui Intakes is 0.8 m^3/s, however, there is a proportion of time when not all of this water would be available for generation (such as during floods and when the Te Maire minimum flow rule is operating), therefore the total reduction in flow is only 0.6 m^3/s.

catchment area above Moawhango Dam is 272 km^2, or 7% of the total catchment area.

5.12 Figure 5 shows the layout of the Wahianoa Aqueduct and Lake Moawhango, together with key flow measurement points and minimum flow requirements as per the Base Case regime. The flows presented include the natural mean flows, the Base Case mean flow and the percentage flow reduction at these points.

5.13 The long term mean diverted flow through the Wahianoa Aqueduct is 3.3 m^3/s. Henderson (2000)[4] notes that the flow regime is very constant with flows occurring within 0.5 m^3/s of the mean for 60% of the time, and with peak flows being less than three times the mean. At Karioi the mean flow is reduced by 20% as a result of the TPS diversions, and by 8% at Kauangaroa. The natural annual flood flow at Karioi is approximately 86 m^3/s, which is reduced by up to 9 m^3/s, or 10%, as a result of the TPS diversions.

5.14 For the majority of the time there is no flow immediately downstream of the aqueduct intakes except during floods. Henderson (2000)[5] compared the loss of the mean flow (3.3 m^3/s) against the average annual low flows further in the Whangaehu River. At Karioi low flows were found to have decreased by 30%, from 11.3 under the natural regime to 8 m^3/s under the Base Case regime. At Kauangaroa the average annual low flow was found to decrease by 22% from 15.5 to 12.2 m^3/s.

5.15 The Whangaehu River is also periodically affected by lahars. A lahar is "a torrential flow of water saturated volcanic debris down the slope of a volcano in response to gravity".

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4 Henderson, R.D. (2000): Evidence of Roderick Donald Henderson in the matter of the Resource Management Act 1991 and the in the matter of applications by Genesis Power Ltd for resource consents to operate the Tongariro Power Development.

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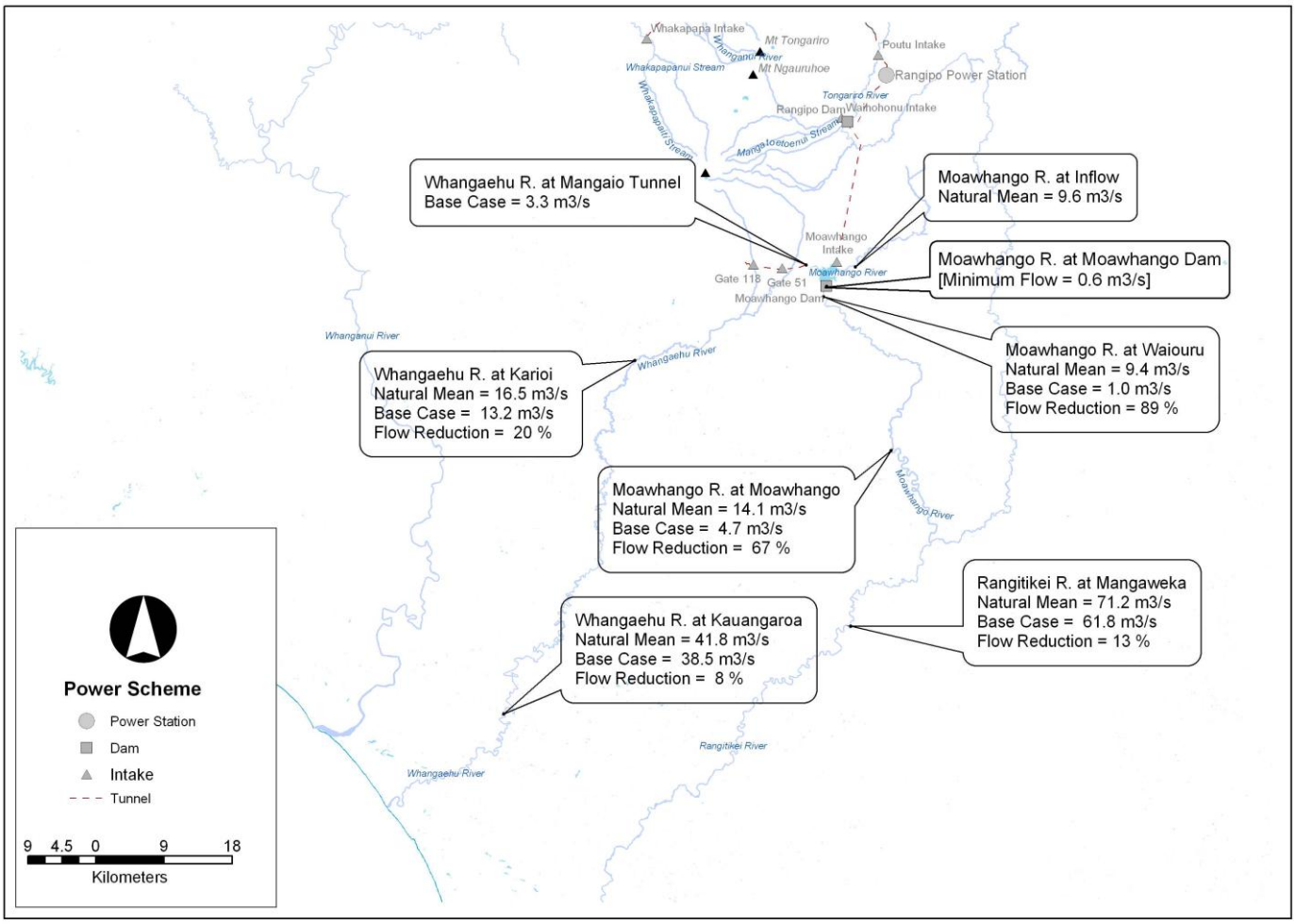

Figure 5: Eastern Diversion – Mean Flows

5.16 The most widely reported lahar on Mt Ruapehu occurred in December 1953 when the Crater Rim on Mt Ruapehu collapsed triggering a lahar down the Whangaehu River. This lahar resulted in the collapse of the Tangiwai Rail Bridge causing the Auckland-Wellington Express Train to plunge into the flooded Whangaehu River with the deaths of 151 people.

5.17 The number of lahar monitoring sites on Mt Ruapehu were increased as a result of the imminent collapse of the Crater Rim on Mt Ruapehu following the 1995 and 1996 eruptions. The Eastern Ruapehu Lahar Alarm and Warning System ("**ERLAWS**") was developed to avoid another tragedy like Tangiwai. ERLAWS is comprised of a number of sensors that when triggered, raise alarms and set emergency response plans into action. ERLAWS utilises Genesis Energy's communications network, negating the need to develop a new network, and Genesis Energy developed monitoring sites in the

Tongariro River headwaters on the Mangatoetoenui and Waikato Streams that were not covered under ERLAWS.

5.18 There are no minimum flows downstream of Wahianoa Aqueduct, either prior to or following the resource consent process as described in Section 2 of my evidence.

Moawhango Catchment

5.19 Lake Moawhango is the only significant hydro-storage lake within the TPS and has a normal operating range of 15.2 metres, from 837 to 852.2 metres. The minimum operating level is set at 835.75 metres, however, below 837 metres the tunnel is exposed and the ability to convey water through the tunnel is reduced. The spillway was raised in 2001 increasing the normal operating range by 1.2 metres from 14 to 15.2 metres. The operating capacity between 837 and 852.2 metres is 63 million cubic metres. The capacity is such that all but the largest floods can be contained within the lake.

5.20 The mean inflow to Lake Moawhango is 12.9 m^3/s of which 3.3 m^3/s is derived from the Wahianoa Aqueduct and 9.6 m^3/s from the Moawhango Catchment above Lake Moawhango. Although the storage in Lake Moawhango appears large, the total storage is only 57 days of average inflow.

5.21 Since the commissioning of the Moawhango Dam in 1979 there have been only 43 flood events that have resulted in spill from the dam. The largest recorded spill was 146 m^3/s in September 1995.

5.22 Historically, there has been no minimum flow releases downstream of Moawhango Dam, however, the 2001 resource consent decisions require a minimum flow of 0.6 m^3/s below the dam and the release of 4 flushing flows of 30 m^3/s for 9 hours duration. These releases have resulted in an average reduction of flow through both Rangipo and Tokaanu Power Stations of 0.69 m^3/s[6], over the pre 2001 consent decisions, which equates to 22.7 GWh/yr of

[6] The total flow release is 0.74 m^3/s, however, not all this water will be a complete loss as some of it will occur when Lake Moawhango is spilling and the releases will mean that marginally more storage is available to store flood flows.

lost generation. These releases also reduce the amount of water available to the Waikato Hydro-power Stations.

Summary

5.23 Both the 1991 Planning Tribunal Decision and the 2001 Resource Consents process has resulted in less water being diverted from streams and rivers located within the Horizons Region and hence less available for electricity generation. The resultant loss of generation has been 85 GWh/yr at the TPS and 100 GWh/yr through the Waikato Hydro Scheme. This is enough generation to power 23,800 households or a city almost the size of Palmerston North.

5.24 As described in my previous statement of evidence to this Hearings Committee, the TPS and its ongoing effects have been extensively studied and are well understood. The extensive consultation process enabled all parties with an interest in the TPS to be involved and in the vast majority of cases outcomes agreed. Resource consents for the ongoing operation of the TPS were made operative on 1 December 2004 and since this time the implementation of the resource consents has seen many positive environmental outcomes achieved.

5.25 The flow regimes developed through the resource consents process were rigorously debated and investigated, and the flow regime that is in place now has been widely accepted as providing an appropriate balance between the need for electricity generation against associated effects. The TPD Hearings Committee found:

> "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."[7]
>
> "…the Committee concludes that the flow reductions associated with the TPD diversions have degraded blue duck habitat. Consequently, the Committee endorses the agreed blue duck mitigation package and the intended creation of the widely supported Central North Island Blue Duck Conservation Trust."[8]

[7] TPD Hearing Committee Decision, page 119.
[8] TPD Hearing Committee Decision, page 119.

> "The residual flows implemented below some of the TPD structures will enhance trout habitat and mitigate the adverse effects of the diversions."[9]
>
> "…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."[10]
>
> "…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."[11]

5.26 The Environment Court's TPS 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. The Environment Court upheld the minimum flows that were implemented through the TPD Hearings Committee Decision and considered that the minimum flows achieved a balance between the national interests and sustaining the physical environment, stating:

> "[404] That the current situation provides for the release of water for environmental reasons, reflects the need to balance the national interest demands against the necessity of sustaining the environment... As we have said, the minimum flow regime is primarily to mitigate the effects of the diversion of the waters on such matters as: the natural character of the rivers and streams; the physical and biological environment; and the protection of indigenous habitat such as native and trout fisheries and of the blue duck."[12]

5.27 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.

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9 TPD Hearing Committee Decision, page 120.
10 TPD Hearing Committee Decision, page 121.
11 TPD Hearing Committee Decision, page 127.
12 *Ngati Rangi Trust v Manawatu-Wanganui Regional Council,* Environment Court, Auckland, A067/2004, 18 May 2004, Judge Whiting.

> In the overall context such physical effects are minor. The effects of the TPD are more greatly felt on Maori spiritual values."[13]

6. THE ONE PLAN

Overview

6.1 Genesis Energy welcomes the opportunity to be involved in the development of the One Plan and is generally supportive of the One Plan objectives and policies.

6.2 The general approach taken to water allocation under the One Plan is sound and supported by Genesis Energy. Mr Carlyon described the overall philosophy of the water allocation under the One Plan as:

> "98. I believe the water management framework provided by the POP, with its strong science foundation, innovative policy and supporting tools has positioned the Region well to achieve a balance between competing demands now and into the future. The POP sets out:
>
> - what we are managing the Region's water resource for (values);
> - numerical standards (water quality standards and minimum flows) to protect/maintain these values;
> - how these values and standards are to be applied across the Region; and
> - policies, methods and tools to achieve these standards within realistic timeframes.
>
> 99. For the water quantity (ground and surface water), beds of rivers, and management of point source discharges sections, the POP represents a refinement and strengthening of existing policy frameworks. The improvements that are incorporated within the framework have been driven by science, monitoring, and organisational experience around what is/is not working. Much of the proposed new framework is already being successfully pressed into service to deal with resource consent applications to take water, discharge to water, or disturb the beds of rivers. That the new framework is already in service and has survived Environment Court challenges, only increases my confidence that we have this part of the Plan about right."[14]

6.3 Dr Roygard describes the methods for the setting of minimum flows as follows:

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

[14] Section 42A Report of Mr Greg John Carlyon on Behalf of Horizons Regional Council

"A range of existing water allocation decisions and project work within the Region have considered appropriate minimum flow/s and levels of allocation. These include:

1. National Water Conservation Orders for the Rangitikei River and Manganui o te Ao River.
2. The Hearings in relation to the Tongariro Power Development.
3. The Oroua Catchment Water Allocation and River Flows Regional Plan Change 1 (1997). This Plan adopted a methodology that used monthly flow statistics to set up to three differing levels of reductions in take volumes, based on a range of flow-based restrictions. Plan implementation includes a detailed roster for irrigators.
4. Resource consent decisions in relation to the Land and Water Regional Plan (2003). A typical methodology that has been implemented is the reduction of irrigation take volumes by 50% when river flows reached or were below the 1-day Mean Annual Low Flow (MALF) and a complete cessation of take volume when flows reached or were below 80% of the MALF. These splits in take volumes were typically difficult for consent holders to manage (particularly where pumps were not set up to reduce take volumes by 50%).
5. Horizons water resource assessment work from 2003 to 2006 and subsequent work on the regional water allocation framework has typically used a single minimum flow for the cessation or reduction of take volumes at low flows. Methodologies used to define these thresholds are described in detail in subsequent sections of this report."[15]

6.4 Dr Roygard describes the allocation framework as follows:

"48. The proposed Water Allocation Framework uses the Water Management Zones (and Sub-zones) framework and the values of the water bodies as a method to establish six different categories of allocation takes and various flow thresholds where these takes can and cannot be abstracted. The proposed categories of allocation are:

i. **Permitted Takes.** These are small takes that are permitted and can be taken at all flows. These are linked to Policy 6-19 and Rule 15-1 as a Permitted Activity.
ii. **Core Allocation Takes.** These takes are proposed to be able to be taken at any time when the flow is above a minimum flow. These are linked to Policy 6-16 and Rule 15-5 as a Controlled Activity.
iii. **Essential Takes**. The Essential Takes allocation provides for some consented takes to continue to below the minimum flow. These are linked to Policy 6-19.
iv. **Supplementary Allocation Takes**. This is a supplementary allocation to provide for consented takes at above median flow for storage or use. The taking at high flows is limited to takes that do not compromise the values of the water body or the surety of supply for the core allocation users. These are provided for by Policy 6-18 and Rule 15-6(b) as a Discretionary Activity.
v. **Existing Hydroelectricity Takes that are not included in the core allocations.** These are linked to Policy 6-16, Rule 15-6 and Rule 15-8 as a Discretionary Activity.

[15] Section 42A Report of Dr Jonathon Kelvin Fletcher Roygard on Behalf of Horizons Regional Council

vi. **Takes from lakes and wetlands**. These are linked to Policy 6-20 and Rule 15-5."[16]

6.5 The approach of the One Plan to provide for existing hydro-electricity takes activities, as consented under the RMA, being outside of the allocation framework is widely supported by Genesis Energy and reflects the position arrived at by the 2001 TPD Hearings Committee, the Environment Court and higher courts in relation to the ongoing operation of the TPS.

6.6 Some of the provisions within the One Plan as presently drafted, however, do not necessarily reflect this position and Genesis Energy would like to see more explicitly around the setting of minimum flows and allocation limits within the associated polices and rules as I will now describe. Mr Matthews will detail suggested wording changes to specific objectives, policies and rules.

Whanganui Catchment

6.7 The provision within the One Plan of allocation volumes upstream of Genesis Energy's intakes, or the provision of allocation volumes downstream of intakes but upstream of minimum flow requirements as defined in Genesis Energy's resource consents (i.e. Whakapapa River at Footbridge and Whanganui River at Te Maire) could result in a further reduction to the amount of water available for electricity generation. It is Genesis Energy's understanding that this is not the intent of these provisions, as described by Dr Roygard, and as such this should be reflected in relevant policies and rules.

6.8 Genesis Energy submits that there is no allocation volume available upstream of Genesis Energy's Western Diversion intakes, except for any allocations that were lawfully established at the time of this Proposed Plan and that the Whanganui Catchment upstream of Te Maire is fully allocated.

6.9 Furthermore, to be explicit that Genesis Energy shall not be required to maintain any minimum flows downstream of its intake structures, other than those lawfully required under its resource consents as made operative on 1 December 2004.

[16] Section 42A Report of Dr Jonathon Kelvin Fletcher Roygard on Behalf of Horizons Regional Council

Whangaehu Catchment

6.10 Like the Whanganui Catchment the provision within the One Plan of allocation volumes upstream of Genesis Energy's intakes and the establishment of new downstream minimum flows could result in a further reduction to the amount of water available for electricity generation. It is Genesis Energy's understanding that this is not the intent of these provisions as described by Dr Roygard and as such this should be reflected in the relevant policies and rules

6.11 Genesis Energy submits that there is no allocation volume available upstream of Genesis Energy's Eastern Diversion intakes, the Moawhango River above Lake Moawhango and Lake Moawhango, except for any allocations that were lawfully established at the time of this Proposed Plan.

6.12 Furthermore, to be explicit that Genesis Energy shall not be required to maintain any minimum flows downstream of its intake structures, other than those lawfully required under its resource consents as made operative on 1 December 2004.

Transfer of Water Permits

6.13 Potentially, the transfer of water permits within zones could also prove problematic, where a water permit that has been granted in a particular zone, but downstream of Genesis Energy's intakes, is transferred to a new user in the same zone, but upstream of the intakes. Although this scenario would not affect the overall zone allocation it would have a direct impact on the water available for hydro-electricity generation.

6.14 Genesis Energy would like to see an additional provision that excludes the ability for water permits to be transferred to those parts of a zone upstream of the TPS intakes.

Water Quality

6.15 Discharges from the power scheme are not point source discharges of contaminants, rather discharges usually relate to water that is not diverted for use through the power scheme. The usual reasons for such discharges are

either to meet downstream minimum flows, flushing flows or recreational releases as required by resource consents, or occur during floods when the flow in a particular river or stream exceeds the capacity of a particular intake or the combined capacity of the scheme.

6.16 The ongoing operation of the TPS can have a range of effects on water quality. These effects were the subject of the extensive consultation and environmental effects assessment as part of the process to renew resource consents as described in section 2 and my previous statement of evidence (dated 1 July 2008)[17] that was presented at the Overall Plan hearing. Water quality, among other matters, was a key determinant when setting minimum flows and flushing flows on TPS rivers and streams. These effects have been mitigated to the satisfaction of the Environment Court and are subject to ongoing monitoring and review.

6.17 It is unclear as to how the proposed water quality standards will affect hydro-power schemes, such as the TPS. There is the potential for inconsistency here, on the one hand the water allocation regime is based on the premise that minimum flows and allocation limits are set after the abstraction of water for hydroelectricity generation, where water quality was a key determinant in the setting of minimum flows, and yet the water quality standards as proposed in the plan appear to disregard this.

6.18 Genesis Energy would like to see that appropriate policies are revised to exclude effects on water quality of discharges from the operation and maintenance of hydroelectricity generation infrastructure. Mr Matthews will discuss the details of proposed changes.

Monitoring Methods for Open Channel flow

6.19 Although specific policies have been developed to define methods of how to measure water abstractions, such as within a pipe, no such methods have been developed for the setting and/or measurement of minimum flows or abstractions from open channels. I note that both Dr Roygard[18] and Mr

[17] Statement of Evidence of Jarrod Milton Bowler, One Plan Hearing, 1 July 2008
[18] Section 42A Report of Dr Jonathon Kelvin Fletcher Roygard on Behalf of Horizons Regional Council

Watson[19] have made reference to assessment methods and quality standards for open channel flow measurement in their respective Officers Reports.

6.20 Genesis Energy is interested in assisting with the development of any such policies or rules regarding open channel flow measurement.

[19] Section 42A Report of Mr Brent David Watson on Behalf of Horizons Regional Council