



APPENDIX L

Effects Management Hierarchy Table

MOTUKAWA HYDRO-ELECTRIC POWER SCHEME

ASSESSMENT OF EFFECTS MANAGEMENT HIERARCHY – POLICY 7 AND CLAUSE 3.24 OF THE NATIONAL POLICY STATEMENT ON FRESHWATER MANAGEMENT 2020

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The table below has utilised the technical assessments that have been prepared in preparing for the consenting of the Motukawa Hydro-Electric Power Scheme to identify environmental effects that have the potential to be consequential to the extent and values of rivers and streams in the Manganui River catchment. The table demonstrates the ways in which Trustpower propose to apply the effects management hierarchy in accordance with the structure set out in the National Policy Statement on Freshwater Management 2020.

	Avoid	Minimise	Remedy	Aquatic Offsetting	Aquatic Compensation
<i>Actual and potential effects that could result in the loss of river extent and values (including cumulative effects and loss of potential value) – and on the basis that there is a functional need for the activity in that location.</i>	<i>Can the effect be avoided in a 'practicable' manner? If so, how? If not, why not?</i>	<i>Can the effect be minimised in a 'practicable' manner? If so, how? If not, why not?</i>	<i>Can the effect be remedied in a 'practicable' manner? If so, how? If not, why not?</i>	<i>If there are more than minor residual adverse effects, what aquatic offsetting is available? Is the imposition of aquatic offsetting possible? If not, why not?</i>	<i>What aquatic compensation can be provided if aquatic offsetting is not possible?</i>
	<i>What residual effects will remain after the implementation of avoidance, minimisation and remediation measures?</i>				
	<i>Will the residual adverse effects be more than minor?</i>				
WATER QUALITY AND AQUATIC ECOLOGY					
The restriction of fish passage in the Manganui River for indigenous and introduced fish species as a result of the diversion weir.	No – the diversion weir is necessary to provide sufficient head / impoundment to enable the diversion of water into the Motukawa Race. If the weir was to be removed, or replaced with a lower head structure, this would require significant civil works in the bed of the Manganui River and the lowering of the Motukawa Race in order to ensure there is sufficient fall in the race through to Lake Ratapiko. Likewise, an alternative intake structure upstream or sump would not be practicable given the associated engineering, operational and maintenance costs.	Yes – existing fish passes provide effective alternative means to ensure that indigenous and introduced fish species are able to navigate past the diversion weir. The passes will continue to provide effective passage provided they are maintained from the build-up of debris etc. A trap and transfer programme in the Motukawa Race will also assist in minimising the entrainment of fish in the race as a result of the diversion weir / intake structure.	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The continued utilisation of the fish passes, along with the trap and transfer programme, will provide a suitable pathway for indigenous and introduced species to access habitat. Any residual effect on fish passage is considered to be minor .				
The entrainment of indigenous and introduced fish species which seek to move up and down the Manganui River in the Motukawa Race.	No – the installation of a 2 – 3 mm screen at the intake would enable the avoidance of this effect. However, due to the size of the intake and the costs associated with construction and maintenance this option is not practicable. A screen of this size at the intake would also reduce the volume and	Yes – while the installation of a 20 mm screen at the intake would prevent larger fish and eels entering the Motukawa Race, it would not stop smaller fish entering the race. In addition, the installation of a 20 mm screen would require significant construction and	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>

	velocity at which water could be diverted into the Motukawa Race.	<p>maintenance costs (into the millions of dollars), as an automated screen cleaner would be required etc. Larger screens would also create engineering and operational difficulties at the intake</p> <p>However, the implementation of a trap and transfer programme (predominantly for eels) within the Silt Pond and Motukawa Race would assist in remedying the entrainment of fish. The trap and transfer programme would need to take place outside of the migrating period, and would occur in association with screening of the penstocks (discussed further as separate effect), and the implementation of a trap and transfer programme in Lake Ratapiko.</p>			
	The implementation of a trap and transfer programme within the Silt Pond and Motukawa Race will provide appropriate effect minimisation for the entrainment of indigenous and introduced fish species in the race. With the implementation of this measure, in association with the other trap and transfer programmes throughout the Motukawa HEPS, this effect can be mitigated to the extent that it is minor .				
As a flow on effect resulting from the diversion of water from the Manganui River to the Motukawa Race, restrictions to fish passage / risk to fish as an outcome of screening at the in-race generator in the Motukawa Race.	No – to avoid restrictions / risks to fish, the in-race generator would need to be turned off or removed.	<p>Yes - while narrow screens could be implemented at the in-race generator with automated cleaners to maintain viability, these have previously choked the system and reduced hydraulic performance of the generator / race. The existing screen is pushing the operation of the system to its limits.</p> <p>A valve in the weir is opened from November to February (inclusive) each year to facilitate passage for fish (primarily adult trout). In addition, the implementation of a fish trap and transfer programme is proposed within the Motukawa Race will minimise potential entrainment effects.</p>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The proposed implementation of a trap and transfer programme within the Motukawa Race, and the proposed continued opening of a bypass valve between November to February, will provide appropriate effect minimisation measures for the restrictions to fish passage / risk to fish resulting from screening at the in-race generator. With the implementation of these measures the effects are considered to be minor .				
As a flow on effect resulting from the diversion of water from the Manganui River to the Motukawa Race, the impediment of fish passage out of Lake Ratapiko that creates a barrier to the completion of the lifecycle of indigenous fish.	No – avoidance of the impediment of fish passage out of Lake Ratapiko would require both screening at some point, and the construction of a fish bypass back to a river (Mako Stream). This would provide fish with downstream access.	Yes – while the installation of finer screening on the intake (2 – 3 mm) to the Motukawa Power Station is not practicable due to the significant costs involved (millions of dollars), the implementation of a trap and transfer programme at the	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A - as the actual and potential adverse effects have been remedied and assessed as minor following the application of 'remediation' measures.</i>

	Due to the complexities of a implementing a bypass structures, and the supplementary effects associated with their construction, this option is not considered practicable.	intake will assist in minimising potential effects on native fish.			
	The implementation of a trap and transfer programme at the intake to the Motukawa Power Station will provide appropriate effect minimisation for the entrainment of indigenous fish in Lake Rataipiko, such that the extent of any adverse effects will be minor .				
Increased water temperatures in the Manganui River resulting from the take / diversion of water to the Motukawa Race.	No – avoidance of this effect would require the take / diversion of water to the Motukawa Race to not occur. However, as water from the Manganui River is required to facilitate hydro-electric power generation, this option is not practicable.	Yes – minimisation of the effect can be provided with the proposed responsive change to flow regime when temperatures are high.	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The proposed temporary reduction in take from the Manganui River when the temperature downstream of the diversion weir exceeds 25 °C will minimise increased water temperatures in the Manganui River resulting from the proposed take. As such, this effect is considered to be minor .				
Increased risk of nuisance periphyton growth in the Manganui River resulting from the take / diversion of water to the Motukawa Race.	No – avoidance of this effect would require the take / diversion of water to the Motukawa Race to not occur (and even then, this effect may still occur due to surrounding land use activities). However, as water from the Manganui River is required to facilitate hydro-electric power generation, this option is not practicable.	Yes – minimisation of the effect can be provided with the proposed restriction of water take in instances when the flow downstream of the take has not exceeded 13.3 m ³ /s (i.e. three times the median flow) for 30 days between 1 November and 31 March).	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The proposed restriction of water take in instances when the flow downstream of the take has not exceeded 13.3 m ³ /s for 30 days will minimise the risk of nuisance periphyton growth in the Manganui River. As such, this effect is considered to be minor .				
Changes to fish habitat in the Manganui River resulting from the take / diversion of water to the Motukawa Race.	No – avoidance of this effect would require the abstraction / diversion of water to the Motukawa Race to not occur. However, as water from the Manganui River is required to facilitate hydro-electric power generation, this option is not practicable.	Yes – Minimisation of this effect can be provided with the implementation of the proposed residual flow regime, the supplementary flows that enter the catchment downstream of the diversion weir, and the provision of additional flows (including flushing flows) when temperatures in the Manganui River are high or the flushing flows have not been provided over an extended period.	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The proposed flow regime in the Manganui River, including changes in response to high temperatures and the need for flushing flows, will minimise the potential loss of habitat in the Manganui River. As such, this effect is considered to be minor .				
Effects on fish passage and hydrological functioning in the Mako Stream resulting from the Rataipiko Dam.	No – the Rataipiko Dam is required to provide the storage in Lake Rataipiko.	Yes – a fish pass is provided at the base of the Rataipiko Dam to enable elver to reach Lake Rataipiko. In addition, and as discussed above, a trap and transfer programme is proposed in the lake to provide for native fish	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>

		that entrained to complete their lifecycle. In addition, the stream receives seepage flows from Lake Ratapiko.			
	The fish pass and proposed trap and transfer regime will minimise the potential loss of habitat in the Manganui River, and the continued seepage flow supplements flows in the Mako Stream (alongside other catchment flows that enter downstream). As such, this effect is considered to be minor .				
TERRESTRIAL ECOLOGY					
Changes to the Manganui River's varial zone or associated terrestrial riparian vegetation resulting from reduction in water flow downstream of the diversion weir.	No – avoidance of this effect would require the abstraction / diversion of water to the Motukawa Race to not occur. However, as water from the Manganui River is required to facilitate hydro-electric power generation, this option is not practicable.	Yes – minimisation of this effect can be provided with the proposed residual flow regime and supplementary flows relating to temperature management and flushing flows (as described above).	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as minor.</i>
	The proposed residual flow regime, and supplementary flow regime, will minimise changes to the Manganui River's varial zone and associated terrestrial riparian vegetation downstream of the diversion weir. As such, this effect is considered to be less than minor .				
RECREATION					
Loss of available habitat for trout fishing in the reach downstream of the diversion weir, and effects on whitebait species resulting from the diversion of water to the Motukawa Race.	No – avoidance of this effect would require the abstraction / diversion of water to the Motukawa Race to not occur. However, as water from the Manganui River is required to facilitate hydro-electric power generation, this option is not practicable.	Yes – while it is noted that limited angling takes place in the vicinity of the diversion weir and in the river reach downstream of the weir due to limited access, loss of habitat for trout fishing and effects on whitebait species resulting from the diversion of water to the Motukawa Race will be minimised by way of the fish passes and the residual flow regime described above.	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as minor following the application of 'minimisation' measures.</i>	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as minor following the application of 'minimisation' measures.</i>	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as minor following the application of 'minimisation' measures.</i>
	The minimisation measures detailed above are considered to be able to minimise and remedy effects on trout habitat and whitebait, to the point where the effect is considered to be no more than minor .				
Changes to kayaking and rafting conditions resulting from the modified flow regime in the Manganui River, and the associated effect on amenity.	Yes – the closest get-ins for kayakers are 11 km and 20 km downstream of the diversion weir. The flow regime for the Scheme has no observable effect on kayaking amenity and is not a consideration to downstream kayakers. Kayakers respond to high river flows and freshes through all seasons, and the proposed increased in take from the Manganui River will not impact this. As such, no further actions have been identified.	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>
	The potential adverse effects can be avoided .				
Changes to water quality and flow for contact recreation at Everett Park resulting from the modified flow regime in the Manganui River, and the associated effect on amenity.	Yes - monitoring of water quality at Everett Park has demonstrated that the reach of the Manganui River adjacent to the park is consistently suitable for contact recreation.	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as less than minor following the application of 'avoidance' measures.</i>	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as less than minor following the application of 'avoidance' measures.</i>	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as less than minor following the application of 'avoidance' measures.</i>	<i>N/A – as the actual and potential adverse effects have been avoided and assessed as less than minor following the application of 'avoidance' measures.</i>

	<p>Furthermore, as with kayaking and rafting, the flow effects of the Scheme have no observable effect on swimming conditions.</p> <p>As such, no further actions have been identified.</p>				
The potential adverse effects can be avoided .					
Changes to flow for jet boating on the Waitara River resulting from the increase take from the Manganui River (and the supplementary changes to period and duration of outflow from the Motukawa Power Station), and the associated effect on amenity.	<p>Yes - The take / diversion from the Manganui River does not change the capacity of the Motukawa Power Station to discharge water and so has no effect on the existing scale of change in flows on the Waitara River.</p> <p>As such, no further actions have been identified.</p>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>	<i>N/A – as the actual and potential adverse effects have been avoided.</i>
The potential adverse effects can be avoided .					
NATURAL CHARACTER, LANDSCAPE AND VISUAL EFFECTS					
Natural character and visual amenity effects in the reach of the Manganui River between the diversion weir and the confluence with the Waitara River resulting from the diversion weir and the take / diversion from the Manganui River.	<p>No - avoidance of this effect would require the take / diversion of water to the Motukawa Race to not occur, or for the diversion weir to be replaced with a less dominant structure such as a sump. As detailed in the previous assessment, this option is not practicable due to the associated cost, maintenance and consent requirements.</p> <p>Furthermore, the diversion weir structure is not bigger than it needs to be, provides for its function, and it relative / proportionate to the size of the Scheme.</p>	<p>Yes – Minimisation of this effect can be provided with the proposed residual flow regime and the proposed responsive change to flow regime when temperatures are high or flushing flows have not been naturally provided.</p>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as less than minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as less than minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and assessed as less than minor.</i>
The proposed residual flow regime and supplementary flow regime will minimise the natural character and visual amenity effects associated with the Motukawa HEPS. As such, any potential adverse effects are considered to be less than minor when considering the whole length of the Manganui River.					
Natural character and visual amenity effects in the Mako Stream from the Ratapiko Dam.	<p>No – the Ratapiko Dam is required to provide the storage in Lake Ratapiko. However, in so doing it has created a waterbody with its own values and amenity.</p>	<p>In part – the visual amenity effects on the Mako Stream are minimised by the seepage flows the stream receives from Lake Ratapiko.</p>	<p>Yes – the scale and form of the dam structure is remedied by the landscape quality and character of the lake, and its wide public use and enjoyment.</p>	<i>N/A – as the actual and potential adverse effects have been minimised and remedied, and are assessed as minor.</i>	<i>N/A – as the actual and potential adverse effects have been minimised and remedied, and are assessed as minor.</i>
The proposed seepage flows and lake environment that has been created will minimise and remediate the natural character and visual amenity effects associated with the Motukawa HEPS. As such, any potential adverse effects are considered to be minor .					
HYDROLOGICAL FUNCTIONING (SEDIMENTATION AND EROSION)					
Potential sedimentation effects in the Manganui River resulting from the take / diversion from the Manganui River.	<p>Yes - potential sediment transport effects in the Manganui River (comprising reduction in suspended sediment load passing over the diversion weir) are considered to be very low – with the majority of</p>	<i>N/A – the actual and potential adverse effects have been avoided.</i>	<i>N/A – the actual and potential adverse effects have been avoided.</i>	<i>N/A – the actual and potential adverse effects have been avoided.</i>	<i>N/A – the actual and potential adverse effects have been avoided.</i>

	sediment retained in the river system. As such, no further actions have been identified.				
The potential adverse effects can be avoided .					