Plan Change 1
Te Awarua o Porirua whaitua

Water quantity and allocation technical report

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Executive summary

Water takes, either consented or unconsented/permitted, are not currently considered to be contributing in a major way to the deterioration, and ongoing decline, of water quality and ecosystem health in Te Awarua o Porirua. Nor is there evidence in the available stream flow records to date of deteriorating trends in low flows. Demand for water, and abstractive pressure from takes, is relatively low.

However, the absence of obvious and widespread impacts does not mean localised effects are not problematic at times, nor that current NRP allocation provisions adequately manage for risks associated with future pressures relating to changing patterns in land and water use and a warming climate.

This report describes the reasoning and technical justifications for the whaitua allocation recommendations and subsequent amendments being proposed. In summary, it is considered that sound technical arguments exist for most whaitua recommendations and, where the arguments are less compelling, the following changes are suggested:

- The recommended allocation limit be amended from 30% of MALF to a more precautionary setting of 20% of MALF (either as a default or equivalent numerical flow value). This is intended to align the provision more appropriately with direction from the 2020 NPS-FM and te Mana o te Wai and is considered a more technically defensible position based on the best currently available expert advice regarding default limits. In combination with the whaitua recommendation for a minimum flow equating to 90% of MALF and the removal of the permitted activity rule, it is considered that the amended allocation limit will help reduce risks of ecosystem health (and dependent values) being adversely impacted in a significant way;

- The recommendation for minimum flows to apply to all permitted activity water uses be amended to apply just to those in the three catchments with well maintained flow management sites that have real time data available on the GWRC website. This is because no practical mechanism exists in un-gauged catchments to either apply a minimum flow or for water users to monitor for compliance;

- The recommendation to require water meters on all permitted activity takes be removed and periodic catchment land and water use surveys be adopted instead as a way of gathering permitted activity information. The administrative, cost and data burden of this requirement is unlikely to be be justified by the quality of information it yields.

There should be no consequences for existing consent holders from any of the whaitua recommendations that are different to those expected when the consents are renewed under the NRP.

Contents

1. Background and context

1.1 Report purpose

The purpose of this report is to provide technical support to the Section 32 (cost and benefit) planning assessment for Natural Resource Plan change proposals associated with Whaitua Te Awarua-o-Porirua. The report is focused on proposals relating to the allocation of water via resource consent and permitted activity rules and the anticipated effects of these proposals.

1.2 General catchment characteristics

Te Awarua-o-Porirua whaitua comprises a series of small stream catchments that primarily discharge directly to the Pauatahanui Inlet or Onepoto Arm of the harbour[1]. Streams rise in the surrounding hill country and have relatively steep and short channels and, therefore, do not support large natural base flows.

The three largest catchments by area are those of the Porirua, Pauatahanui and Horokiri streams (Figure 1). Porirua Stream lies within a highly urbanised catchment, while the other two are predominantly a mix of rural and lifestyle block land use.

Stream morphologies are generally characterised as sinous single thread channels with riffle-run-pool sequences and some gravel banking. There is no known significant groundwater resource in this whaitua although localised pockets of groundwater are present in the re-worked gravels along the stream valley floors.

[1] Some minor gully streams discharge directly to the open ocean, on either side of the Porirua Harbour mouth

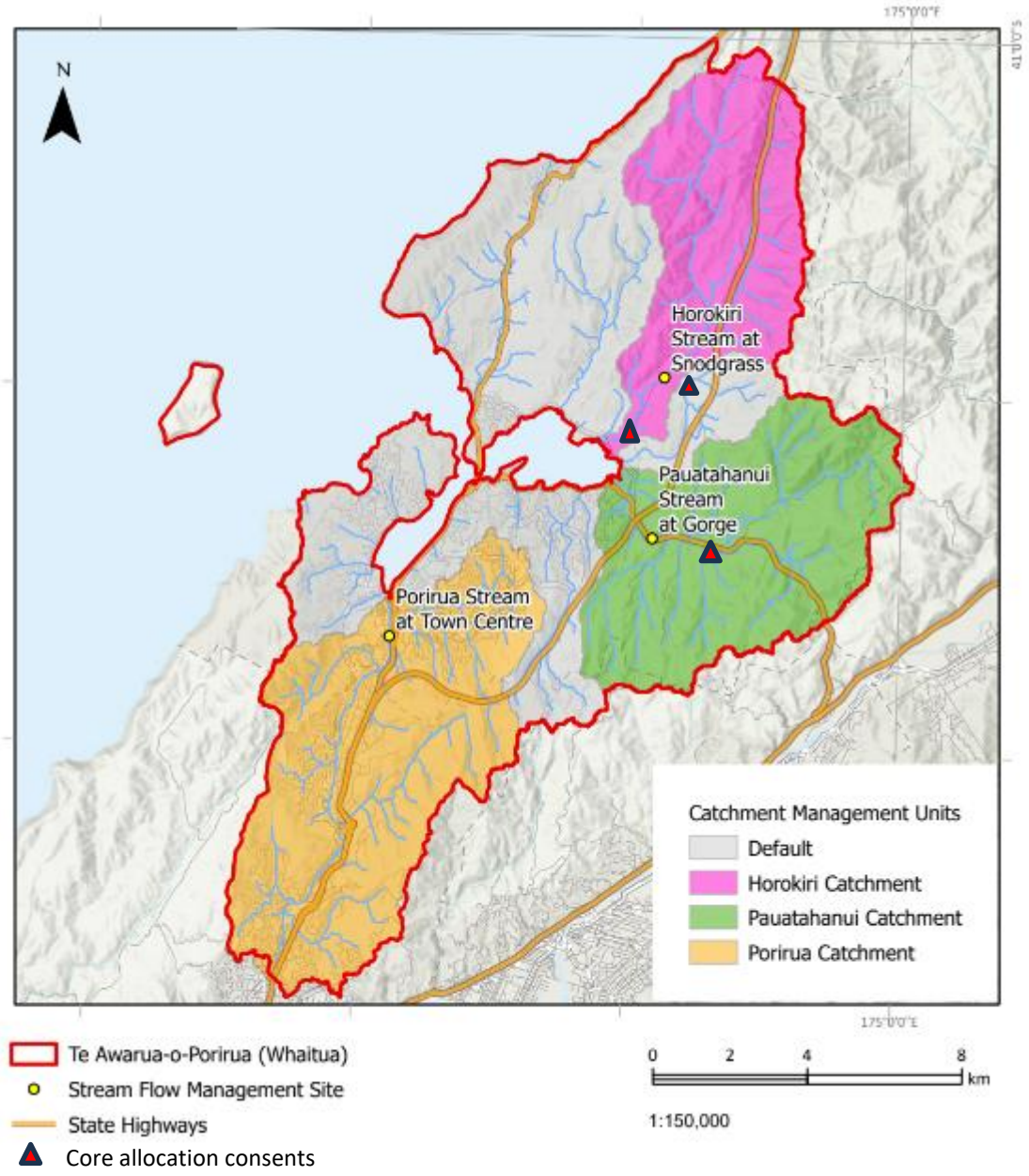

Figure 1: Te Awarua-o-Porirua water allocation catchment allocation units, core allocation consents and stream flow management sites (for applying minimum flows)

1.3 Stream flow regimes

Each of these three catchments mentioned above has a GWRC stream flow recorder site (Figure 1). Of the other stream catchments in the whaitua, only the Taupō Stream has a flow recorder. Flow statistics from the recorder sites are provided in Table 1.

Table 1: Median and mean annual low flow (MALF) flow statistics for the existing continuous flow recorder sites. MALF statistics are commonly used in GWRC and around the country as the primary flow index for referencing allocation regimes. MALF values here are reproduced from Keenan (2018a and b) and naturalised where appropriate for surface abstractions (i.e. converted to an estimate of natural MALF that would occur in the absence of upstream abstractions). Median flow statistics are calculated from the GWRC archive.

	Data record	Summer Median[1] (L/sec)	Natural 7D MALF (L/sec)	Natural 7D MALF (m^3/day)
Porirua Stream at Town Centre	1968-2022	255	142	12,270
Pauatahanui Stream at Gorge	1975-2022	220	112	9,675
Horokiri Stream at Snograss (Mouth)	2002-2022	190	91	7,860
Taupō Stream at Flax Swamp[2]	1979-2022	25	10	865

[1] For the six months between November and April inclusive. Can be interpreted as natural as any abstraction occurring would have been very minor in comparison.

[2] This site has a problematic history (the weir is prone to drowning) and is currently not maintained to a standard that would make it suitable to include in the regional plan as a management site.

Beyond the data collected at flow recorder sites and some sporadic flow gauging at other locations, stream flow hydrology information is sparse. Little is known about longitudinal patterns of flow, gains and losses associated with shallow groundwater exchange, or the potential for natural bed drying in severe summers (noting that there are no measurements or observations of zero flow in the GWRC archives).

With respect to changes in flow regime over time, Figure 2 shows the variation in annual minimum flows since 1990 for the Porirua, Pauatahanui and Horokiri streams. Inter-annual variability is relatively high throughout, especially for the Porirua Stream, but there do not appear to be any systematic changes or notable trends across the records to date. The tendency towards lower flow minima that has been observed in Wairarapa rivers in recent years is not so apparent in these Porirua Harbour streams.

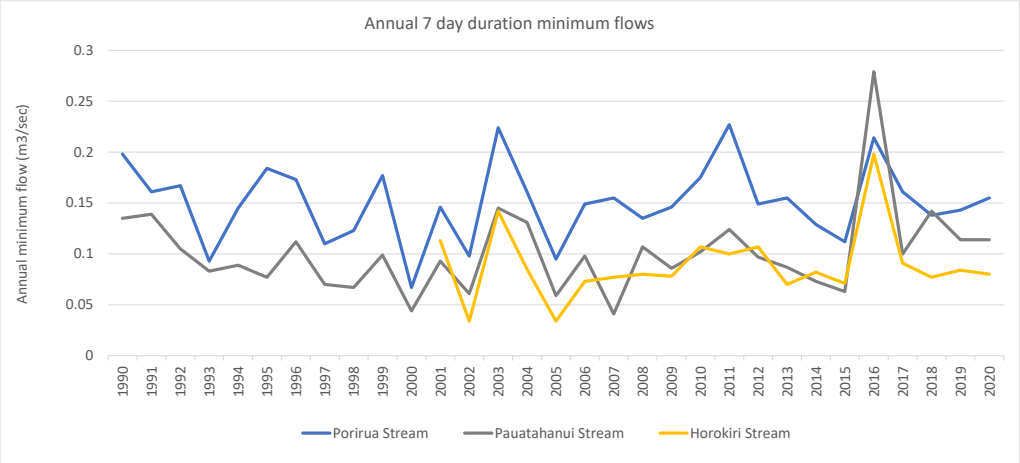

Figure 2: Annual minimum 7 day duration low flows for the Porirua, Pauatahanui and Horokiri streams since 1990

1.4 Demand for water

1.4.1 Consented water takes

There is currently a relatively low demand for water in Te Awarua-o-Porirua Whaitua compared to other parts of the region such as the Ruamāhanga and the Kāpiti Coast. There are only three existing consents for core allocation (Figure 1, Table 2) and none for supplementary, or high flow, allocation. All consented water takes are directly from streams. One consent (Judgeford Golf Club) is for a water take from the main stem of the Pauatahanui Stream and one (Leacroft Nurseries) is from the main stem of the Horokiri Stream. The other one (for Gareth Morgan Golf Ltd) is from a catchment – the Ration Stream – that does not have currently have a GWRC flow recorder. There are no consented takes from the Porirua Stream catchment. There are currently no consented groundwater takes and only a small handful have been issued in the past.

Table 2: Consented water takes (core allocation) and cumulative proportion of MALF

Consent holder	Catchment	Maximum instant Rate (L/sec)	Maximum daily volume (m^3/day)
Judgeford Golf Club	Pauatahanui Stream	12.2	130
	As % of catchment MALF	*11%*	2%
Leacroft Nurseries Ltd	Horokiri Stream	1.8	103
	As % of catchment MALF	*2%*	*1%*
Gareth Morgan Golf Ltd	Ration Stream	0.9	40
	As % of catchment MALF	*15%*[1]	*11%*

[1] This is the estimated percentage of MALF at the point of take as the catchment mouth MALF is not known

For the purposes of managing consented water takes (allocation and minimum flow limits), all catchments within Te Awarua-o-Porirua are currently governed by default surface water policies and rules in the Natural Resources Plan rather than catchment-specific numerical limits. There is no known significant groundwater resource in this whaitua and no groundwater allocation limits expressed in the NRP. Likewise, there are no recognised lakes (or takes from lakes).

The technical basis for the current allocation regime is discussed in Section 2.

1.4.2 Unconsented and permitted water takes

In addition to consented core allocation, water can also be abstracted under Section 14(3)(b) of the RMA for reasonable stock drinking and domestic needs as well as under Rule R152 of the NRP as a permitted activity.

Unconsented and permitted takes are not required to be notified to GWRC, nor do they need to be metered. This means accurately identifying volumes of unconsented water use in Te Awarua-o-Porirua is not possible. However, desktop modelling based on assumptions that are informed by land use type, parcel size, proximity to water sources and stock numbers can provide a good indication of at least the stock and domestic use components. This was done for primary catchments of Te Awarua-o-Porirua by Beca (2017). Results are reproduced in Table 3 for the four catchments with flow statistics presented in Table 3.

The Beca (2017) modelling suggests combined stock and domestic water use ranges between about 0.5 and 2 L/sec (as a daily average) in the selected catchments while as a proportion of catchment MALF, it is likely around one or two percent for the three larger catchments and around six percent of MALF in the Taupō Stream catchment.

Table 3: Modelled unconsented stock and domestic use (S14(3)b RMA) in four representative catchments of Te Awarua-o-Porirua. Figures are presented for each catchment as average litres per second and as percentage of MALF. Maximum potential permitted activity use under the NRP Rukle 152 allowances is also provided in the righthand column. Source Beca (2017).

Catchment	Modelled likely use (average L/sec and as % of MALF)			Maximum permitted activity use[1] (average L/sec and % of MALF)
	Domestic use	Stock use	Combined Domestic and Stock use	
Porirua Stream	0.24	0.50	0.75	39.47
As % of MALF	*0%*	*0%*	*1%*	*28%*
Pauatahanui Stream	0.40	1.50	1.90	47.57
As % of MALF	*0%*	*1%*	*2%*	*42%*
Horokiri Stream	0.28	0.74	1.02	30.32
As % of MALF	*0%*	*1%*	*1%*	*33%*
Taupo Stream	0.06	0.56	0.62	8.22
As % of MALF	*1%*	*6%*	*6%*	*82%*

[1] Based on the NRP maximum allowances of 2.5 L/sec and 20 m^3/day (or 10 m^3/d for properties smaller than 20 hectares)

While current use under the NRP permitted activity rule is unknown, postal surveys by GWRC of rural land owners around the Wellington and Kāpiti districts in 2020[2] offer some insights that are perhaps at least also broadly indicative of behaviour in Te Awarua-o-Porirua. In Te Whanganui a Tara, only four percent of approximately 140 survey respondents stated that they took surface or groundwater for a use that was neither stock or domestic. On the Kāpiti Coast, it was about 10 percent of approximately 875 survey respondents. Although neither of these survey results provide an estimate of volumes taken, they both indicate permitted activity use is only occuring on a small minority of rural properties. Furthermore, it is likely that permitted activity use in Te Awarua-o-Porirua whaitua is more similar in profile to Te Whanganui a Tara than Kāpiti Coast, given the relatively widespread abundance of groundwater in the latter.

[2] Findings summarised in GWRC (2020) and Blythe (2022)

If the maximum potential permitty activity allowances in Rule 152 of the NRP were to be fully taken up throughout the whaitua (righthand colum in Table 3), unconsented water use would become much more significant and more dominant than consented takes as an abstractive pressure; ranging between about 30 and 80 percent of MALF in the selected catchments.

1.5 Stream water quality and ecology

Water quality and ecological indicators are routinely measured by GWRC in the Horokiri, Pauatahanui and Porirua stream catchments.

The primary water quality concern relates to bacterial (pathogenic) pollution throughout the streams and receiving water bodies of the whaitua. This contamination primarily relates to runoff from the highly urbanised environment. Nitrate levels are generally relatively low although elevated phosphorus concentrations, related to mobilisation from soil during erosion events are of concern. Continuous records of water temperature or dissolved oxygen are not routinely collected although manual measurements are not indicative of persistent or widespread problems. The relatively steep gradient, short catchments will generally ensure water remains well oxygenated.

Macroinvertebrate health (MCI) is moderately impaired throughout the whaitua. With respect to the role of the flow regime, it is thought that increased flows and more frequent bed-disturbing flows (due to modified catchment surfaces, especially in the urban areas) are more of a factor than excessive low flows. Periphyton can be a problem with nuisance blooms thought to be related to elevated phosphorus and lack of stream shading.

With respect to habitat quality, the WIP (2017) concludes:

> *Stream habitats have been heavily modified in the Whaitua. In urban habitat has been cleared and streams modified (e.g. piped, straightened) for urban development and transport links. This has reduced spawning habitat, created barriers to fish passage and reduced physical diversity of streambank and stream-bed habitat. In rural areas, the forest and vegetation that once grew beside streams has been largely removed for pastoral farming.*

Fish monitoring is not undertaken routinely in this catchment so conclusions about abundance, condition and any patterns of change over time cannot be reached. However, the WIP (2017) states:

> *Many streams in the Whaitua have excellent diversity of fish species, including at-risk species such as giant kokopu, inanga, longfin eel and redfin bully. However, native freshwater fish populations are also under stress or in decline. Many of the factors that affect MCI also apply to native fish, along with obstructed passage from the sea (including piped sections and physical barriers) throughout the catchment.*

National Objective Framework (NOF) attributes and current state, as presented to Te Awarua-o-Porirua whaitua committee in 2018, are summarised in Appendix 1.

Overall, there is little evidence or suggestion (e.g.in the WIP) that low flows or current levels of abstraction are an important factor where degradation of water quality or ecology has been observed. Nevertheless, the potential for abstraction to aggravate low flows and reduce the quality and amount of aquatic habitat exists.

2. Current NRP allocation regime – technical reasoning

By and large, no catchment-specific investigations or analyses were undertaken when developing limits for Te Awarua-o-Porirua in the Natural Resources Plan (NRP). Instead, reliance was placed on more general technical guidance, 'rules of thumb' and expert judgement about levels of risk to water bodies. This approach was considered appropriate at the time for several reasons:

- Demand for resource consent to take water in this whaitua is low, and, therefore, risk of adverse impacts is also low;
- Information on instream values and hydrology was relatively sparse;
- The upcoming whaitua process was the better mechanism for contemplating catchment specific limits (rather than the NRP).

The following is a slightly fuller explanation of the NRP allocation limits and technical reasoning. The purpose is to provide context to the next sections of the report that set out changes to these limits recommended by the whaitua committee and/or proposed based on subsequent assessments.

2.1 Core allocation and minimum flow limits for surface water

2.1.1 Policies

Core allocation describes the amount of water available to consent above the minimum flow, which is the flow at which all consented surface water abstraction must cease (with some exceptions – e.g. human health needs).

There are currently no numerical limits listed in the NRP for any of the catchments in Te Awarua-o-Porirua. Both minimum flow and surface water core allocation limits are covered by a general policy framework (Table 4).

Table 4: NRP policies for minimum flow and allocation limits in Te Awarua-o-Porirua

Type of limit	NRP policy	Limit[1]
Minimum flow	P.P1	90% of MALF
Core allocation limit	P121	30% of MALF[2]

[1] MALF is defined in the NRP as the **natural mean annual low flow** with a seven day duration

[2] There are no streams/rivers with a mean flow greater than 5 m3/sec in Te Awarua-o-Porirua so the second default allocation limit in the NRP for these larger systems is not relevant (and not listed here)

In addition to the limits above, Policy P119 was introduced to the NRP during the appeals process in 2020 and requires that consented water takes are reduced as stream flows decline towards the minimum flow.

2.1.2 Reasoning

The default minimum flow and core allocation limits that currently apply in Te Awarua-o-Porirua (and in some other parts of the Wellington region) were based on technical guidance supporting the proposed National Environmental Standard (pNES) for ecological flows and water levels (Ministry for the Environment 2008). The pNES guidance in turn is based on a body of New Zealand research (summarised in Beca, 2008) that has characterised the general risks associated with exceeding certain allocation thresholds. While the pNES was never brought into legislation, at the time the NRP provisions were being drafted the pNES default criteria were widely considered appropriate to apply in situations where bespoke catchment limits had not been defined and demand for water was relatively low.

Mean annual low flow (MALF) is known to be an ecologically relevant flow statistic and is commonly used around the country as a key reference index for setting both minimum flows and allocation limits. More specifically, as stream flows fall (or are drawn) to, and below, MALF, risks of adverse impacts to aquatic species increase. Loss of physical instream habitat is often the most obvious consequence of low flows but other more subtle stressors also become more prominent, such as changes to thermal and oxygen profiles. Extended duration of low flows may also promote nuisance algae growth. In adopting the pNES recommendation of a '90/30'[3] for default limits, the rationale was that this combination of limits would prevent excessive alteration of natural flows around MALF and could therefore be considered generally precautionary in favour of stream ecosystem health and instream values.

2.2 Supplementary allocation limits

Above median flow, more water becomes available to allocate (in addition to core allocation). This is defined in the NRP as 'supplementary allocation' and is governed by P124, with reference to Schedule U, which was introduced to the NRP during appeals in 2020.

Two streams in Te Awarua-o-Porirua are listed in Schedule U, the Pauatahanui and Horokiri streams, and both fall into the smaller stream category whereby the maximum supplementary allocation available above median flow is 10 percent (of natural stream flow at the point of abstraction). It is very likely that all other streams in Te Awarua-o-Porirua would also fall into the same small stream category when the methods of Schedule U are applied.

2.2.1 Reasoning

For the NRP, a panel of freshwater experts was assembled by GWRC to provide advice on supplementary allocation criteria. There was a consensus of opinion in that group that the data and knowledge with which to derive ecologically-explicit supplementary flow thresholds is relatively limited. However, they were able to agree on some key guiding principles: (1) that median flow is ecologically-relevant (often viewed as providing an approximation of typical

[3] Shorthand used from here on, meaning (in this case) a minimum flow of 90 percent of MALF and an allocation limit of 30 percent of MALF

habitat conditions, and therefore river/stream carrying capacity & productivity, during flow recessions – see Hay and Kitson 2013), and (2) that preserving flushing flows (and hence a fundamental part of the natural flow regime) is important, especially for ensuring that periphyton accrual is not encouraged by abstraction.

From these principles it was considered that supplementary allocation should only be available above median flow (i.e. so that there is no further reduction of flows in the range between MALF and median) and that the frequency of flushing flows (defined as three times median or higher) should not be altered.

No particular advice was provided by the expert panel on the size of the supplementary allocation volume that could be made available above median flow. In the absence of any firm technical advice, GWRC opted for equity between users and the river and the NRP was therefore originally notified with a 1:1 flow sharing regime above median. During NRP submission process this policy was adapted to make a distinction between rivers and streams. For streams, the allocation cap was reduced from a 50 percent flow share to a maximum of 10 percent of the flow above median. The choice of 10 percent was not based on any specific GWRC analysis but was put forward as a more precautionary alternative by a submitter (NZ Fish and Game Council). During NRP appeals, Schedule U was developed to provide more certainty to consenting officers and applicants about how supplementary allocation volumes should be calculated, but also ensure that the cumulative effect of multiple supplementary takes on the same river or stream are appropriately accounted for.

2.3 Groundwater allocation limits

There are currently no groundwater management zones identified in the NRP for Te Awarua-o-Porirua and therefore no groundwater allocation limits listed. Applications for consent to take groundwater are treated as discretionary activities under P.R1 and assessed on their own merits. To date, only a small handful of groundwater consents have been issued (these were temporary consents from the Pauatahanui Stream valley for dust suppression during the Transmission Gully roading project; all groundwater consents have now expired).

2.3.1 Reasoning

The absence of meaningful groundwater resources or demand for groundwater in Te Awarua-o-Porirua means that any applications can be assessed and managed on a case by case basis without risk of significant adverse effects (either local or cumulative). The same technical principles and criteria that are applied in other parts of the region[4] (where limits and groundwater categories A/B/C exist) can be applied in Te Awarua-o-Porirua. That is, the level of hydraulic connectivity to surface water streams should be determined and, if

[4] Conjunctive frameworks for managing surface and groundwater in the Ruamāhanga Valley, Kāpiti Coast and Hutt Valley, summarised in Table 4.1 of the NRP: *Classifying and managing groundwater and surface water connectivity*

appropriate, a portion of the allocation volume is counted against the surface water core allocation limit and there may also be some low flow restrictions applied in accordance with the minimum flow for the relevant stream. Likewise, the groundwater storage available to support any takes can be determined with reference (primarily) to aquifer recharge, as has been done in other parts of the region where groundwater limits are defined.

2.4 Unconsented and permitted activity water takes

In addition to consented core allocation, water can also be abstracted under Section 14(3)(b) of the RMA for reasonable stock drinking and domestic needs as well as under Rule R152 of the NRP as a permitted activity

Table 5: Permitted activity allowances under Rule R152

Property size	**Rate**	**Volume** per day
Greater than 20 hectares	2.5 L/sec	20 m^3
Less than 20 hectares	2.5 L/sec	10 m^3

2.4.1 Reasoning

The choice of limits and thresholds for the NRP permitted activity rule was not informed by any particular technical arguments.

3. Allocation regime – whaitua committee recommendations

Te Awarua-o-Porirua Whaitua Committee focused on two aspects of the allocation regime where they perceived the highest risks to lie; core allocation of surface water (consented) from streams and permitted activity takes. Their recommendations for changes to the NRP policies and rules are summarised in this section, with particular regard to the technical arguments informing their decisions.

Technical advice and material provided to the committee and notes from committee workshop meetings are provided in the reference section of this report.

The committee did not comment on groundwater or supplementary allocation or recommend any changes to the NRP approach for either.

3.1 Core allocation and minimum flow limits for surface water

3.1.1 Whaitua recommendations

The committee opted to retain the NRP default limits for minimum flow (90 percent of MALF) and core allocation (30 percent of MALF) for consented takes. However, for the sake of clarity and certainty, they wished to see these limits expressed as numbers (L/sec) rather than proportions of MALF, where the hydrological information exists to support this translation. The whaitua recommendations are compared to the NRP provisions in Table 6.

Table 6: Recommended minimum flows and surface water core allocation

Catchment [Flow management site]	**Minimum flow**		**Core allocation**	
	NRP	**Whaitua**	**NRP**	**Whaitua**
Porirua Stream [Town Centre]	90%MALF	128 L/sec	30%MALF	60 L/sec
Pauatahanui Stream [Gorge]	90%MALF	101 L/sec	30%MALF	34 L/sec
Horokiri Stream [Snodgrass]	90%MALF	82 L/sec	30%MALF	27 L/sec
Elsewhere	90%MALF	90%MALF	30%MALF	30%MALF

In addition to the numerical limits for the three catchments in Table 6, the committee also sought amendments (WIP Recommendation 68) to the NRP rule and policy framework to ensure that water takes from any tributaries of the main stem streams do not (collectively) exceed more than 30 percent of MALF of that tributary; i.e. to guard against the total allocation amount for each of the three catchments in Table 6 being taken from tributaries that cannot support it.

3.1.2 Reasoning

The committee were provided with a summary of the rationale for the NRP default limits (as described in Section 3 of this report) and also some more specific flow-habitat modelling for stream catchments of Te Awarua-o-Porirua. Based on the outputs of this modelling, the NRP default limits (90/30) were characterised to the committee as providing:

- "Good" habitat protection for fish species (i.e. retaining >90 percent of habitat available at MALF for a range of species;
- Modest reliability of supply for water users, comparable with other parts of the region.

There was a particular focus on tuna (eel) as a taonga species. Advice from NIWA (Dr Don Jellyman) was that minimum flows in the range 90-110 percent of MALF would likely avoid creating any population density stress on the tuna but that minimum flows as low as 50 percent of MALF would likely create such a stress.

While there seems to have been a good degree of comfort around the choice of 90 percent of MALF for the minimum flow, some disquiet was expressed by members of the committee about whether a default allocation limit of 30 percent of MALF was sufficiently precautionary[5]. There were also questions about whether mahinga kai values would be sufficiently protected and whether climate change was adequately factored in. The whaitua technical team were asked to consider some alternative minimum flow and allocation limit settings and present these back to the committee. This occurred at a workshop in October 2017[6] and the key decision making tool from that workshop is shown in Figure 3.

Value	Attribute	Effect	Alternative minimum flow and allocation amounts compared to 90+30							
			100+20	90+20	100+25	90+25	100+30	90+30	100+40	90+40
Ecosystem health and mahinga kai	Habitat protection	Intensity of 'human induced' stress	Better	Same	Better	Same	Better	Good protection	Better	Same
		Additional days of stress at or below minimum flow	Better	Better	Better	Slightly better	Same		Worse	Worse
Economic use of water	Supply reliability	Time with full access to allocation amount	Same	Better	Slightly worse	Slightly better	Worse	Moderate reliability	Worse	Worse
		Time on total restrictions	Worse	Same	Worse	Same	Worse		Worse	Same
	Availability of water for economic use	Amount of water that can be taken from a stream	Less ←							→ More

Figure 3: Likely effects of alternative minimum flow and allocation limits compared to NRP 90/30 approach for the Pauatahanui Stream. Table presented to whaitua committee in October 2017 workshop[7].

[5] REPORT TAoPW Committee Workshop 14 September 2017 V.1 (gw.govt.nz)
[6] Final-WORKSHOP-REPORT-Te-Awarua-o-Porirua-Whaitua-Committee-26.10.2017.pdf (gw.govt.nz)
[7] Water-allocation-alternative-levels-of-minimum-flow-and-allocation-limit.pdf (gw.govt.nz)

In comparing options in Figure 3, the technical team's advice to the committee was[6]:

- There is little marginal difference between the options presented;
- All options in their different combinations (100 or 90 percent of MALF minimum flow, and 30, 25 and 20 percent of MALF allocation amount) provide well for all values;
- Using a higher minimum flow and/or lower allocation limit is slightly more precautionary and would provide slightly higher levels of habitat protection. This comes with the trade-off of less water available for use and slightly more time on total restrictions.

Subsequent to this information and advice being provided there remained an element of discomfort among the committee about whether the 90/30 setting was sufficiently conservative and whether it adequately took account of stream health in a more 'holistic' sense. Workshop minutes from November 2017[8] include the statement that "*there was a challenge* [to the committee] as to why *we couldn't be more conservative with the flow management tool. What harm would it do to choose 100%+20 percent? Members noted that iwi members may favour this approach*".

Ultimately, the committee endorsed the NRP 90/30 limits, albeit with the recommendation to translate into numerical limits in the Porirua, Pauatahanui and Horokiri catchments (using the hydrological data records available for these catchments).

The hydrological analysis undertaken to determine the minimum flow and allocation numbers presented in Table 6 is described in Keenan (2018). For clarity, it is noted that the allocation limit for the Porirua Stream of 60 L/sec equates to 30 percent of estimated natural MALF at the bottom of the catchment, including the Kenepuru Stream, rather than 30 percent of MALF at the 'Town Centre' flow recorder site (which would equate to 43 L/sec).

Keenan (2018) makes mention of two other catchments, Kakaho Stream and Duck Creek (see Figure 1), and suggests that further hydrological study would be needed to determine MALF and then translate this to numerical limits. In the meantime, and in the absence of any consented water takes, the 90/30 defaults should apply.

[8] REPORT-Te-Awarua-o-Porirua-Whaitua-Workshop-23-November-2017_2.pdf (gw.govt.nz)

3.2 Unconsented and permitted activity water takes

3.2.1 Whaitua recommendations

The committee opted to effectively remove the permitted activity rule in the NRP so that resource consent is required for anything other than 'incidental' uses (or that is not authorised under the RMA S14(3)b rule for stock and reasonable domestic use).

Table 7: Recommended changes to permitted activity maximum rates and volumes (Recommendations 69 and 70 of the WIP)

	NRP	**Whaitua** recommendation (for incidental use)
Rate	2.5 L/sec	2.5 L/sec
Volume per day	10 m^3 – 20 m^3 [(1)]	5 m^3
Volume per month	300 m^3 – 600 m^3 [(2)]	10 m^3
Minimum flow applies?	No	Yes

[1] In the NRP, allowance (10 or 20 m^3) depends on property size; no such distinction in the whaitua recommendation

[2] No monthly allowance is specified in the NRP so range here based on extrapolation of maximum daily volumes and property size

The committee also recommended that water must not be taken under the permitted activity rule "*when the affected waterway is below minimum flow*" and that "*users must keep records of the amount taken*".

Recommendation 73 was that "*Greater Wellington collects better information on water take and use volumes, including for takes under 14(3)(b) of the RMA, in order to provide for more accurate and transparent accounting of water use, better management of the Whaitua's waterways, and to ensure the requirements of the NPSFM are met*".

3.2.2 Reasoning

In line with technical and policy advice from the whaitua project team[9], the committee reasoning for changes to the NRP permitted take rule incorporated the following themes[10]:

- There is a great deal of uncertainty about the amount of water currently taken under the permitted activity rule as these takes are not metered and no hard data are collected;

- Modelling (summarised in Table 3 of this report) shows that, while current uptake may be quite low and present only a low risk of adverse stream impacts, the potential for significantly more use and greater impact is much higher. Climate change combined with perhaps significant changes in landuse (e.g. more viticulture) could see demand significantly increase;

[9] REPORT water allocation in Te Awarua-o-Porirua whaitua - August 2017 (gw.govt.nz)
[10] Final-WORKSHOP-REPORT-Te-Awarua-o-Porirua-Whaitua-Committee-26.10.2017.pdf (gw.govt.nz)

- Removing most of the allowance would incentivise people to move to other options such as rain tanks rather than exert further pressure on streams;

Overall, the need to be precautionary and "*add more margins*" was appealing to the committee, as was removing the uncertainty around the amount of permitted takes used and having some control over the potentially larger takes from the streams via the resource consent process.

The application of minimum flows to permitted takes appears to be based on the general principle that restrictions should apply equally for all uses of water (consented and permitted) that are not for essential human health or stock welfare purposes. The requirement for metering and for GWRC to collect better information on unconsented and permitted use was considered necessary by the committee to improve water take accounting and management of total allocation.

The practicalities and costs associated with applying minimum flows and metering regulations were recognised in broad terms by the committee but not explored in any detail.

4. Proposed amendments to the whaitua recommendations

Subsequent to the delivery of Te Awarua-o-Porirua Whaitua Implementation Programme (WIP) report in 2018, the amended National Policy Statement for Freshwater Management (NPS-FM 2020) was gazetted. An important amendment was the strengthened concept of te Mana o te Wai and associated hierarchy of obligations that requires greater weight and more explicit privilege to be given to the health or rivers and streams when setting limits.

While assembling technical material for the current Section 32 planning assessment, the opportunity has been taken to review the whaitua allocation limit recommendations in light of the NPS-FM/te Mana o te Wai and more contemporary thinking about acceptable stream health risks. This has led to some proposals for changes that are described in the following section.

Some of the practical and cost issues associated with the whaitua recommendations for permitted activity water takes have also been more fully considered and some amendments are suggested.

4.1 Core allocation and minimum flow limits for surface water

4.1.1 Recommended amendments to the whaitua limits

It is recommended that a more precautionary approach to allocation is adopted and that the default limit is reduced from 30 percent MALF to 20 percent MALF. This change should apply when translating the ratio to numbers in the three listed catchments (Porirua, Pauatahanui and Horokiri streams) as well as for the proportional default for all other catchments (including tributaries of the main stems in the three listed catchments). The proposed changes are shown in red in Table 8.

No changes to the whaitua recommendations for minimum flow limits are proposed.

Table 8: Whaitua recommended minimum flows and surface water core allocation from Table 6 with proposed amendments (strikethrough and red text)

Catchment [Flow management site]	Minimum flow		Core allocation	
	NRP	Whaitua	NRP	Whaitua
Porirua Stream [Town Centre]	90%MALF	128 L/sec	30%MALF	~~60 L/sec~~ 40 L/sec
Pauatahanui Stream [Gorge]	90%MALF	101 L/sec	30%MALF	~~34 L/sec~~ 22 L/sec
Horokiri Stream [Snodgrass]	90%MALF	82 L/sec	30%MALF	~~27 L/sec~~ 18 L/sec
Elsewhere	90%MALF	90%MALF	30%MALF	~~30%MALF~~ 20%MALF

4.1.2 Reasoning

Recent expert advice from freshwater ecologists in New Zealand, including from the Cawthron Institute and NIWA[11], has been that an allocation limit of 30 percent MALF is not especially precautionary for streams. The advice is based on a modified risk assessment framework that has drawn upon elements of the technical work underpinning the 2008 pNES (Beca 2008), internationally recognised presumptive standards for flow regime protection (Richter et al 2012) and the principles and direction of the 2020 NPS-FM and te Mana o te Wai. The risk assessment framework and rationale is summarised in Table 9.

Default minimum flow and allocation limits being developed for the Kāpiti Coast whaitua committee to consider are currently being developed with the same approach in mind.

[11] For example, Hayes et al 2021, Shearer and Hayes 2021

Table 9: Shearer and Hayes (2021) proposed default minimum flow and primary allocation limits for the Kāpiti Coast whaitua, expressed as % of naturalised 7-day mean annual low flow (MALF), for maintenance of flows that present a low risk of more than minor effects on ecosystem health and wellbeing of streams / rivers, including their instream habitat, life-supporting capacity, mahinga kai and fisheries amenity. Adapted from Hayes et al. (2021).

Limit	Surface water body with mean flow ≤ 5 m³/s	Surface water body with mean flow > 5 m³/s	Abstraction from permanently flowing reaches of intermittent streams	
			Containing threatened indigenous species; or Significant spawning and juvenile rearing habitat for regionally or nationally important salmonid fisheries downstream	Not containing threatened indigenous species; or significant salmonid spawning and juvenile rearing habitat
Minimum / residual flow	90% of naturalised 7-day MALF	80% of naturalised 7-day MALF	90% of naturalised 7-day MALF	80% of naturalised 7-day MALF
Allocation rate	20% of naturalised 7-day MALF	30% of naturalised 7-day MALF	20% of naturalised 7-day MALF; or > 15% of instantaneous flow at point of take if naturalised MALF estimates are zero or are unavailable	25% of naturalised 7-day MALF; or > 20% of instantaneous flow at point of take if naturalised MALF estimates are zero or unavailable

A project team workshop was held at GWRC on 24 May 2023 to consider the updated advice, with input before and afterwards from Dr Robin Holmes from Cawthron. It was agreed that the more conservative allocation limit (20 percent MALF) is more technically defensible for catchments where there is little or no hydrological information and/or there is a poor understanding of stream values.

Discussion then turned to whether the same reasoning should apply in the three Te Awarua-o-Porirua catchments for which more information is available; the Porirua, Pauatahanui and Horokiri streams.

It was felt that if the same committee process been undertaken more recently under the stronger and more environmentally conservative direction of the NPSFM 2020 and te Mana o te Wai, it is possible, or likely even, that the discussion of ecosystem health risks may have been framed in a more precautionary way. For example, the starting reference point in Figure 3 might

have been the 90/20 setting (being now regarded as more suitably precautionary) rather than the PNRP status quo of 90/30. Had this different starting point been taken, the committee may well have opted for 90/20, especially considering the hesitancy and disquiet expressed by some on the committee about the 30 percent of MALF allocation limit.

It was agreed therefore that a more defensible position for these three catchments would be to also reduce the allocation limit to a number that equates to 20 percent of MALF in each case (as presented in Table 8).

With respect to the default minimum flow, 90 percent of MALF is still considered ecologically conservative (notwithstanding exceptional circumstances) and, following the logic of the risk assessment framework in Table 9, no change to the whaitua recommendation is therefore considered necessary.

4.2 Unconsented and permitted activity water takes

4.2.1 Proposed amendments to the whaitua recommendations

The only amendments proposed relate to permitted activity use. It is proposed that minimum flows only apply to permitted activity water takes in the three catchments with listed numerical allocation limits and/or flow recorders; these are the Porirua, Pauatahanui and Horokiri streams. Proposed amendments are shown in Table 10.

The other proposed amendment is that rather than require metering and record keeping on all permitted activity takes, weight is placed instead on the recommendation for GWRC to collect better information on these takes.

Table 10: Whaitua recommended changes to permitted activity maximum rates and volumes (from Table 7) with proposed amendments (strikethrough and red text)

	NRP	**Whaitua recommendation (for incidental use)**
Rate	2.5 L/sec	2.5 L/sec
Volume per day	10 m^3 – 20 m^3 [(1)]	5 m^3
Volume per month	300 m^3 – 600 m^3 [(2)]	10 m^3
Minimum flow applies?	No	Yes – in the Porirua, Pauatahanui and Horokiri catchments No – everywhere else (default limits and no flow recorder site)

[1] In the NRP, allowance (10 or 20 m^3) depends on property size; no such distinction in the whaitua recommendation

[2] No monthly allowance is specified in the NRP so range here based on extrapolation of maximum daily volumes and property size

4.2.2 Reasoning

(a) Application of minimum flows

While the equity principle of applying minimum flows to all permitted activity takes is reasonable, in practice this will be problematic in catchments that do not have a real time flow measurement site (i.e. those catchments in which the default 90 percent of MALF minimum flow applies). It would require GWRC to determine a surrogate minimum flow from a catchment with a recorder site and this can only be done in a robust way if there is at least a good record of spot gauging measurements in the default limit catchment (which is not the case for most of the catchments in Te Awarua-o-Porirua whaitua).

In short, there is neither the current mechanism to apply a minimum flow in default catchments, nor sufficient hydrological data to robustly derive a surrogate trigger flow. The risk to stream health of not applying a minimum flow in catchments with default limits is likely low. Table 3 in this report (and the background technical report that informed it[12]) estimate from modelling that current permitted uses are likely to account for less than 10 percent of natural low stream flows in the smaller default limit catchments. This order of proportional stream flow reduction, even at the lowest flows and in the smallest streams that are most vulnerable to abstraction, is unlikely to be measurable or to excessively aggravate ecosystem stress already occurring.

Furthermore, with the exception of a single minor consented take on Ration Stream (Table 2) , there are no consented water takes in any of the other catchments with default limits. This further mitigates the risk associated with not applying minimum flows to permitted activity take, as does the significantly reduced volumes available to permitted takes under the new proposals.

Not applying minimum flows to permitted activity takes in the default limit catchments perhaps raises a fairness question in relation to how permitted takes are to be treated in the other catchments (i.e. where a minimum flow will apply). However, the technical argument is stronger in these other catchments, not just because the practical means by which to apply the minimum flows already exists (i.e. real time flow recorder sites) but also because the stream health risks are higher due to the combined pressure of consented and permitted takes (especially in the Pauatahanui Stream catchment).

If, and when, new applications for water take consents in catchments with default limits are received, this would require GWRC to re-assess total allocation pressures and whether numerical limits and real-time monitoring is justified. Through this process, it may be that minimum flows are introduced to more catchments and their associated permitted activity water takes in the future.

[12] REPORT-Modelling-Permitted-Surface-Water-Use-in-Te-Awarua-o-Porirua-Whaitua-23-May-2017.pdf (gw.govt.nz)

(b) Metering of permitted activity takes

A policy requiring metering of all permitted water takes is likely to generate an administrative, data, and cost burden (to both GWRC and water users) that is out of proportion with the potential benefit gained from the information.

Metering data would only be useful for informing policy or community decisions if a large majority of permitted take users installed and maintained meters in accordance with industry standards and regularly submitted quality-assured data. The likelihood of this *not* happening is high for several reasons:

- The costs for meter installation and ongoing calibration and maintenance are relatively high and likely to be a disincentive for many water users to fully comply (see discussion in Section 5);

- Without regulatory oversight of the scale of use, the completeness of any datasets at a catchment scale would be unknown (i.e. if GWRC does not have to be informed about where permitted activity takes are occurring, it cannot assess compliance with metering and reporting);

- Receiving, auditing and archiving consent holder metering data is already a significant challenge for GWRC. If all permitted take metering data were required to be submitted[13], this could expand the incoming data sets by a very significant, but ultimately unknown, amount. Furthermore, experience with consent holder data to date suggests that the smaller takes (often associated with land uses with lower capital investments and returns) have the poorest data quality and need the most 'grooming'.

On balance, it is considered that the outcome sought by requiring meters –that of improved catchment accounting and whaitua stream management – will unlikely be achieved in a substantive way, and the burden would likely be unjustifiably large.

In the experience of GWRC staff[14], periodic land and water use surveys are more likely to yield better information (i.e. more granular and issue-focused) for less cost and burden. Such surveys can be targeted at catchments with greater water use pressure and/or at higher risk. The surveys can identify users and their land use (including consented takes who had changed their land use) and can make some reasonably accurate estimates or measurements of individual take volumes based on the configuration of pump scheme and nature of consumption. Quality assurance of the collected data is better controlled and overall resourcing is likely to be more manageable than for implementing a widespread metering system.

Land and water use surveys in a given catchment could be scheduled, for example, every 10 years to coincide with common catchment expiry dates of

[13] Noting that a metering policy in Te Awarua o Porirua would likely set a precendent for being adopted region-wide

[14] For example, postal surveys cariied out by GWRC in 2020 in the Te Whanganui a Tara and Kāpiti Coast whaitua, and summer surveys conducted in the mid 2000s in the Wairarapa as part of the groundwater modelling project

consents. Such surveys would require a long term GWRC commitment, although it is noted that they would align with the Recommendation 73 for GWRC to collect better information on unconsented and permitted activity takes.

5. Implications for water users

This section considers the potential for recommendations by the whaitua (Section 3) and suggested amendments (Section 4) to impact existing consented and permitted activity water takes.

5.1 Implications for consent holders

Table 11 shows that current consented abstraction is, cumulatively, less than 20 percent of MALF in each of the three stream catchments with consents in operation (Pauatahanui, Horokiri and Ration streams) and less than the amended numerical limits (Table 8) for the Pauatahanui and Horokiri streams. This means that none of the existing four consent holders in Te Awarua-o-Porirua will be subject to any reductions in allocation as a result of the proposed allocation limit amendments.

Table 11: Catchments with consented water takes. Green shading indicates limit has not been exceeded

Catchment	Total consented allocation (Instant Rate L/sec)	Proportion of MALF	Proportion of limit
Pauatahanui Stream	12.2	11%	61%
Horokiri Stream	1.8	2%	10%
Ration Stream	0.9	15%[1]	N/A[2]

[1] This is the estimated percentage of MALF at the point of take as the catchment mouth MALF is not known

[2] Default limit (20 percent of MALF) applies in this catchment as there is insufficient hydrological data to calculate a numerical catchment limit.

Table 12 summarises the low flow restriction conditions that are currently attached to each of the three resource consents and whether these conditions align with the NRP and whaitua recommendations for minimum flow. For two consents there is complete alignment and so there is no implication for either from the whaitua recommendations. The other consent (Leacroft Nurseries) currently has a discretionary condition that requires cease take only at the direction of GWRC and the minimum flow of 70 L/sec is slightly lower than the whaitua recommendation (82 L/sec). However, since the whaitua limit is simply a translation of the existing NRP limit of 90 percent of MALF[15], the consent holder would be required to migrate to the higher minimum flow (without discretion) at next renewal under the NRP anyway (i.e. there is no new consequence from the whaitua recommendation).

[15] The current minimum flow of 70 L/sec on the Leacroft Nurseries consent was calculated using a value of MALF that has since been updated with more recent flow data

Table 12: Consented water takes, current low flow restriction conditions and alignment with the NRP rules and whaitua recommendations

Consent holder	Current low flow condition	Alignment with NRP minimum flow?	Alignment with whaitua minimum flow?
Judgeford Golf Club	Cease take when Pauatahanui Stream at Gorge falls below 101 L/sec	Yes	Yes
Leacroft Nurseries Ltd	Upon request of GWRC, take is to cease when flow in the Horokiri Stream at Snodgrass falls below 70 L/sec	Almost	Almost
Pauatahanui Golf Club	Cease take when flow in the Ration Stream at point of take falls below 5 L/sec	Yes	Yes

Overall, the recommendations by the whaitua, and subsequent proposed amendments, should have no impact on existing consent holders in Te Awarua-o-Porirua.

5.2 Implications for permitted activity water users

No information is available to quantify the number of users who will be affected by the replacement of the NRP permitted activity allowances with the much lower incidental use rates and volumes, nor specifically how they might be impacted. The recent postal survey work in neighbouring whaitua (described in Section 1.3.2) suggests relatively low numbers of rural properties would potentially be affected. Furthermore, since consentable allocation is available throughout the whaitua (there are no fully allocated catchments under the whaitua recommendations), the impact for those that need the higher volumes should be limited to the costs associated with gaining and maintaining a consent.

The cost of installing and maintaining meters was investigated to inform the section 32 evaluation. Information on these costs was sought from suppliers. Costs will vary based on the works required to modify existing infrastructure and the type of meter installed. Estimated installation costs, including supply of the meter and changes to headworks ranged from $1,300 - $10,000, while estimated maintenance costs (periodic verification of the meter) ranged from $800 - $2,000.

6. Summary

Water takes, either consented or unconsented/permitted, are not currently considered to be contributing in a major way to the deterioration, and ongoing decline, of water quality and ecosystem health in Te Awarua-o-Porirua (noted in Section 1). Nor is there evidence in the available stream flow records to date of deteriorating trends in low flows. Demand for water, and abstractive pressure from takes, is relatively low.

However, the absence of obvious and widespread impacts does not mean localised effects are not problematic at times, nor that current NRP allocation provisions adequately manage for risks associated with future pressures relating to changing patterns in land and water use and a warming climate.

This report has described the reasoning and technical justifications for the whaitua allocation recommendations and subsequent amendments being proposed. In summary, it is considered that sound technical arguments exist for most whaitua recommendations and, where the arguments are less compelling, the following changes are suggested:

- The recommended allocation limit be amended from 30 percent of MALF to a more precautionary setting of 20 percent of MALF (either as a default or equivalent numerical flow value). This is intended to align the provision more appropriately with direction from the 2020 NPS-FM and te Mana o te Wai and is considered a more technically defensible position based on the best currently available expert advice regarding default limits. In combination with the whaitua recommendation for a minimum flow equating to 90 percent of MALF and the removal of the permitted activity rule, it is considered that the amended allocation limit will help reduce risks of ecosystem health (and dependent values) being adversely impacted in a significant way;

- The recommendation for minimum flows to apply to all permitted activity water uses be amended to apply just to those in the three catchments with well maintained flow management sites that have real time data available on the GWRC website. This is because no practical mechanism exists in un-gauged catchments to either apply a minimum flow or for water users to monitor for compliance;

- The recommendation to require water meters on all permitted activity takes be removed and periodic catchment land and water use surveys be adopted instead as a way of gathering permitted activity information. The administrative, cost and data burden of this requirement is unlikely to be be justified by the quality of information it yields.

There should be no consequences for existing consent holders from any of the whaitua recommendations that are different to those expected when the consents are renewed under the NRP.

References

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Richter BD, Davis MM, Apse C, Konrad C 2012. *A presumptive standard for environmental flow protection*. River Research and Applications 28: 1312- 1321.

Shearer K and Hayes J 2021. *Environmental flows and allocation investigations for small streams in the Greater Wellington region.* Prepared for Greater Wellington Regional Council. Cawthron Report No. 3674. 66 p. plus appendices.

Allocation material provided to whaitua committee

- REPORT water allocation in Te Awarua-o-Porirua whaitua - August 2017 (gw.govt.nz)
- PRESENTATION 2 water allocation 23.08.2017 [Read-Only] (gw.govt.nz)
- Tuna habitat needs (gw.govt.nz)
- Water-allocation-alternative-levels-of-minimum-flow-and-allocation-limit.pdf (gw.govt.nz)

Whaitua committee meeting and workshop minutes (allocation topic)

- TAoPW-Committee-Workshop-Record-27th-and-28th-October-2018.pdf (gw.govt.nz)
- REPORT-Te-Awarua-o-Porirua-Whaitua-Workshop-23-November-2017_2.pdf (gw.govt.nz)
- Final-WORKSHOP-REPORT-Te-Awarua-o-Porirua-Whaitua-Committee-26.10.2017.pdf (gw.govt.nz)
- REPORT TAoPW Committee Workshop 14 September 2017 V.1 (gw.govt.nz)
- REPORT Te Awarua-o-Porirua Whaitua Committee Workshop 24.08.17 (gw.govt.nz)
- Notes from meeting with Ned Norton and Don Jellyman

Appendix 1. Water quality and ecological NOF attributes and objectives for Te Awarua-o-Porirua

Source: (reproduced from the WIP).

	WMU name	Taupō	Rangituhi	Pouewe	Takapū	Te Riu o Porirua
E. coli	CURRENT STATE	E	E	E	E	E
	OBJECTIVE	B	A	B	C	C
	TIMEFRAME*	2040	2040	2040	2040	2040
Ammonia	CURRENT STATE	A	A	A	A	C
	OBJECTIVE	A	A	A	A	A/C[17]
	TIMEFRAME*	M	M	M	M	M
Nitrate	CURRENT STATE	A	A	A	A	B
	OBJECTIVE	A	A	A	A	A
	TIMEFRAME*	M	M	M	M	2040
Dissolved Zinc	CURRENT STATE	C	D	A	A	D
	OBJECTIVE	A	A	A	A	C
	TIMEFRAME*	2040	2040	M	M	2040
Dissolved Copper	CURRENT STATE	D	D	A	A	D
	OBJECTIVE	B	A	A	A	C
	TIMEFRAME*	2040	2040	M	M	2040
Periphyton	CURRENT STATE	C	A	C	C	C/B[18]
	OBJECTIVE	B	A	B	B	B
	TIMEFRAME*	2040	M	2040	2040	2040
MCI	CURRENT STATE	C	C	C/B[19]	C/B[20]	C
	OBJECTIVE	B	A	A	B	C
	TIMEFRAME*	2040	2040	2040	2040	M
Native fish	CURRENT STATE	C	C	B/A	B	C/B
	OBJECTIVE	B	A	A	A	B
	TIMEFRAME*	2040	2040	2040	2040	2040