

Horticulture NZ Incorporated

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Review of Watercare's Waikato River Take Resource Consent Application

1. Introduction

Williamson Water and Land Advisory (WWLA) were commissioned by Horticulture New Zealand Incorporated (Hort NZ) on 2 March 2021 to undertake a water allocation and hydrological technical review of Watercare Service Limited's (WSL) resource consent application to take water from the Waikato River.

The Minister for Environment (MfE) has issued a direction under section 142 of the Resource Management Act 1991 (RMA) to call in the resource consent application as a proposal of national significance, and has referred it to a Board of Inquiry (Board). The Board has publicly notified the application and submissions close on 26 March 2021¹.

The specific focus of the technical review was on the appropriateness of the water allocation policy framework going forward upon granting of the consents, and potential implications for horticultural water users, especially those in the consent queue. Specific tasks included assessment of:

- (a) the recommended water take option and whether other options were adequately addressed;
- (b) the allocation status under the current policy framework, particularly the impact to those surface water and groundwater applications awaiting decisions from Waikato Regional Council (WRC) who were "ahead of the queue" from Watercare (before the application was called in by BOI);
- (c) the implications of WRC's clawback policies once the river is fully allocated to existing consent holders, particularly large horticultural users;
- (d) the dynamics of the river hydrology and water demand requirements;
- (e) the appropriateness of the planning framework for the Lower Waikato River given its proximity to the saline environment and downstream position for most major take and discharge consents (e.g. Huntly Power Station); and
- (f) what research is required to reassess the above if currently not adequate.

¹ The Environmental Protection Agency (EPA) is providing administrative support services to the Board, who will consider all submissions, hold a hearing (unless no-one wants to be heard), and make a final decision, independently from EPA and the Minister.

Subsequent to initiating this commission on 15 March, WRC released a media statement indicating that a number of large water take applications had been amended or withdrawn by the applicants, which effectively reduce the proposed allocation status by a combined 181,000 cubic metres of water per day (m³/day). This now means the river is not fully allocated and that all consent applications in the queue can be processed on their merits. This also potentially removes for the meantime the requirement to comment on the WRC's clawback policy (task (c) above).

2. The Application

WSL's application is for all necessary regional resource consents required to enable the taking of up to 150,000 m³/day (net)² from the Waikato River for municipal water supply purposes; noting this is reduced from the 200,000 m³/day (net) sought in the original application lodged with the WRC in 2013.

Along with WSL's current consent, the total quantity of water that WSL will take from the Waikato River and supply to its network will not exceed 300,000 m³/day (net).

The water take application was assessed as a discretionary activity by the Applicant under Rule 3.3.4.21 because the granting of WSL's application at the volume sought (150,000 m³/day (net)) would not cause any of the prior applications to exceed the allocable flow.

Furthermore, as stated above a number of large applications were withdrawn in March 2020, meaning that all application before and after WSL could fit within the allocation limit, hence removing a potential fully allocated scenario.

3. Assessment of Alternatives

The BECA report dated 11 December 2020 entitled "Water Source Alternative Options Assessment for the Metropolitan Supply. Waikato River Refresh Application" provided a high-level options assessment that considered 156 potential water resource options that could be developed over the next 35 years (i.e. a projected water demand window out to 2054) in line with the Project Objectives, and both:

- Identifies the next strategic source(s) of water for implementation by 2026; and
- Describes how individual options can be combined to give an optimal strategy for meeting Auckland's growth in demand over 35 years to 2055.

The study seemed as though it was designed to canvas a full range of options and deliberately high-level so as to just pass the adequacy test for alternative options assessment. In reading the report I got the feeling the outcome was preordained. Many of the options were pie in the sky such as a take on the Tairua River in the Coromandel and other similarly distant from Auckland. Whilst a few options that seemed to have real merit were discounted mainly due to perceived timing to investigate, consent and construct. For example, the South Auckland-Franklin Kaawa Aquifer and the Campbells Rd Reservoir Scheme at Riverhead.

One potentially significant omission from the options considered was high-flow harvesting from the Waikato River with a raw water pipeline to an existing Watercare reservoir. Preferential use of the reservoir supported by high-flows from the Waikato River will alleviate security of supply issues in this reservoir and thereby reduce drought pressure on other reservoirs within the Watercare network. An option did consider pumping high-flows to a new reservoir and then discharging the stored water back to the river during low-flows to offset greater direct take from the river, but discounted that option on the basis of finding an appropriate reservoir site.

² The "net" take of water is the volume of surface water that is taken for an activity less any subsequent return of water that is relied on to establish the net take. In this case, the discharge to the Waikato River consists of process water and treated water that does not meet the New Zealand Drinking Water Standards, under the proposed discharge consent.

However, overall I agree with the Applicant that the Waikato River option is logical and provides a high-level of supply security, can be constructed rapidly, and is complementary to existing infrastructure.

4. Surface Water Allocation Rules & Status

The relevant rules within the WRP are provided in Chapter 3 - Water Module. In Section 3.3 - Water Takes, Policy 2 provides the mechanism for setting of default minimum flows and allocable flow volume where detailed habitat and river studies have not been undertaken.

4.1 Minimum Flow Level

Policy 2(a) states that the minimum flow shall be set at 90% of the one in five year 7-day low flow (Q_5) for streams with a mean flow greater than 5 m³/s, and 95% of the Q_5 for streams with a mean flow less than 5 m³/s.

4.2 Allocable Flow Volume

There are three allocable flow policies, all of which require consideration of the cumulative level of allocation at the point of take and the downstream management boundary, which are defined in Table 3-5 (see **Figure 1**).

For example, the Waikato River has three primary water allocation management areas:

- 1) Upstream of Karapiro Dam;
- 2) Downstream of Karapiro Dam to Huntly Power Station (HPS) mixing zone;
- 3) Downstream of HPS mixing zone to the river mouth at the Coastal Management Boundary.

Policy 2(b) states that the primary allocable flow volume shall be set at the difference between the minimum flow and the Q_5 flow.

Policy 2(c) states that the secondary allocable flow volume shall be set at the portion of the flow between the primary allocable flow and 30% of Q_5 . This effectively means that an additional 20% of the Q_5 flow is available for allocation, but is less reliable because when the flow in the river reduces to the Q_5 flow level, secondary allocation takers must cease so as to safeguard the rights of the primary allocation takers.

Policy 2(d) states that in addition to the primary and secondary allocable flows, surface water harvesting at an amount up to 10% of the river's flow at times when the flow is greater than the median flow immediately upstream of the point of the take is provided. However, surface water harvesting shall not be allowed in catchments upstream of Karapiro Dam.

Table 3-5 reproduced in part in **Figure 1** shows that there is a primary allocation for the Waikato River downstream of the HPS of 10% of the Q_5 , but no secondary allocation is provided.

In the resource consent application, it states that the allocable flow limit within the reach of the river from HPS to the mouth is 18.793 m³/s, which means the Q_5 flow at the river mouth is 187.93 m³/s. Noting, WSL's application is for 1.376 m³/s net (150,000 m³/day).

Given the recent consent application withdrawals and amendments, it is understood that even if WSL's application and all other applications in the current queue were to be granted, the river would not be over allocated. This means that the total level of current allocations would be less than 18.793 m³/s.

³ Policies in this section all have the exception of "Except as otherwise specified in Table 3-5", which means if the location is documented in this table, the default policy provisions are overridden by the table.

Figure 1. Relevant parts of Table 3-5 relating to the mainstem of the Waikato River.

Catchment	Upland Catchments				Lowland Catchments			
	Flows: % of Q _s			Map # (catchment #)	Flows: % of Q _s			Map # (catchment #)
	Primary Allocable	Secondary Allocable	Minimum		Primary Allocable	Secondary Allocable	Minimum	
Waikato River mainstem only downstream of HPS mixing zone to the mouth. Different levels of allocation occur upstream of HPS mixing zone, Karapiro Dam and on tributaries as specifically listed or accounted for in "All other catchments" in this Table	N/A	NA	N/A	N/A	10 as provided for by "All other catchments" in this Table	0	90 as provided for by "All other catchments" in this Table	New Map
Waikato River mainstem only downstream of Karapiro Dam to the HPS mixing zone. Different levels of allocation occur for the reach above Karapiro Dam and on tributaries as specifically listed or accounted for in "All other catchments" in this Table	N/A	NA	N/A	N/A	10 as provided for by "All other catchments" in this Table	0	90 as provided for by "All other catchments" in this Table	New Map
Waikato River, Cumulative allocation at the point of Karapiro Dam. Different levels of allocation may occur within this catchment as specifically listed or accounted for in "All other catchments" in this Table	N/A	NA	N/A	Not mapped	5	0	95 This minimum flow is relevant for the purposes of applying Rule 3.3.4.27 f)	Map 1 Waikato River Catchments 1 and 2, Index Map, Maps 6,8,10,11,12 (227, 99, 299, 233, 263)
Waikato R Nth Cambridge minor tributaries (exc. Waikato R. main stem)	N/A	NA	N/A	N/A	30	0	70	4/6/8 (108)

4.3 Comparison of Allocation Provisions to Other Regions

Key questions regarding water allocation provisions in any plan is how they compare to other regions and are the differences adequately justifiable based on the aquatic impact that may result if a higher level of allocation was to be allowed. Typically, this is a balancing exercise between aspects such as the flow regime of the catchment, value of the natural character of the connected water bodies, or value of outcomes derived from the economic use of the water.

Table 1 provides a summary of the water allocation rules for six regions in the North Island including Northland, Auckland, Waikato, Bay of Plenty, Hawke's Bay and Wellington.

The key takeaway messages from analysis of **Table 1** are that:

- Minimum flows are typically a higher portion of the low flow statistic meaning that restrictions in the Waikato will potentially come on earlier;
- Allocation is typically a smaller proportion of the low flow statistic, again meaning that the amount allocated in the Waikato is typically smaller; and
- In saying the above, the Waikato is the only North Island council assessed that has a secondary allocation (albeit with lower reliability), although this is specifically excluded from the Waikato River downstream of the HPS.

4.4 Recommendations

Given that there is no secondary allocation provision within the reach of the Waikato River beneath the HPS, and the conclusion from the above section, which in summary is that the water allocation provisions for the Waikato River below the HPS are very conservative compared to other plans, on face value it would appear there is headroom to increase the level of allocation for this part of the river.⁴

⁴ Noting that once HPS is decommissioned, the same could apply to that part of the river (between Karapiro and the HPS), but because hydroelectricity is becoming increasingly important with our greenhouse gas reduction

I understand WRC is undertaking detailed investigations of the river ecology and associated wetlands to enable review of the allocable flow in the river downstream of the HPS in accordance with Implementation Method 3.3.4.9 Review Allocable Flows/Sustainable Yields.

I do not know the status of that review, and if Hort NZ is to make a submission, it would be useful determining that.

Table 1. High-level summary of default water allocation provision from some North Island regional plans.

Regional	Minimum Flow	Core Allocation (Low-Flow)		High-Flow Harvesting Allocation
		Primary	Secondary	
Northland	Outstanding River: 100% of MALF Coastal River: 90% of MALF Small River: 80% of MALF Large River: 80% of MALF	Outstanding River: 10% of MALF Coastal River: 30% of MALF Small River: 40% of MALF Large River: 50% of MALF	N/a	Up to 50% of the river flow, when flow is above the median *
Auckland	Default is 85% of MALF for all other rivers and streams. The Unitary Plan provides specific values for listed rivers / streams.	Default is 30% of MALF for all other rivers and streams The Unitary Plan provides specific values for listed rivers / streams.	N/a	Up to 10% of the river flow, when flow is above the median.
Waikato*	Large River: 90% of Q_5 for streams with a mean flow greater than 5 m ³ /s. Small River: 95% of the Q_5 for streams with a mean flow less than 5 m ³ /s.	10% of Q_5	30% Q_5 , with reduced supply security over primary allocation during low flow times.	Up to 10% of the river flow, when flow is above the median.
Bay of Plenty	90% of Q_5	10% of Q_5	N/a	Any flow when flow is above the median.
Hawke's Bay (TANK)	Set based on instream values (e.g. fish passage / habitat). By way of example, the specified minimum flow for Ngaruroro River at Fernhill is 2,400 L/s, which is equivalent to 57% of MALF. The specified minimum flow for Maraekakaho River at Tait Rd is 109 L/s, which is equivalent to 78% of MALF.	Typically set based on instream values and security of supply. Default is 30% of MALF.	N/a	Specified individually for rivers, when flow is above the median. Must not change FRE3 in the main stem by more than 10%.
Wellington	90% of MALF.	Large Rivers: 50% of MALF for rivers with mean flows greater than 5 m ³ /s. Small Rivers: 30% of MALF for rivers with mean flows less than 5 m ³ /s.	N/a	50% of the portion of flow in the river above median flow at the point of take listed in Table 1 of Schedule V. For other rivers up to 10% of the total amount of flow in the river at the point of take.
Notes:				

commitments under the Paris Climate Agreement in 2015, changing the level of allocation in the reach from Taupo to Karapiro would be very challenging).

Regional	Minimum Flow	Core Allocation (Low-Flow)		High-Flow Harvesting Allocation
		Primary	Secondary	
* While the PRPN has not yet been updated, Policy C.5.1.10, has now been amended by Environment Court Decision No. [2021] NZEnvC 001, to include the definition “provided 50% of the river flow above the median flow remains in the river” and a fourth matter of discretion as follows: “the timing, rate and volume of high flow takes to maintain the function of flushing flows to support aquatic ecosystem health.” A high-flow take that does not meet these conditions is a discretionary activity. + In the Lower Waikato River, the Q₅ is typically 91% of MALF, which means the flow Q₅ statistic can be multiplied by 1.1 to obtain an equivalent MALF statistic to compare to other regions that use MALF. Calculated from data from T+T presented in Appendix A.				

5. Groundwater Allocation Rules

As for surface water allocation, the relevant rules within the WRP are provided in Chapter 3 - Water Module. Groundwater allocation is allocated under Section 3.3.3 through sustainable yield limits for aquifers, as defined by Policy 4, and the extent of hydraulic connection between the aquifer and surface water bodies, as defined by Policy 10 (i) and Policy 12 (w).

The hydraulic connection policies govern whether or not the groundwater take should be fully or partially considered as surface water due to the takes depletion effects on surface water, and are summarised below.

Policy 10

The Waikato Regional Council shall manage the taking of groundwater resources in a manner that meets the criteria for establishing Sustainable Yields from groundwater resources listed in Policy 4 by:

...(i) assessing the nature of hydraulic connection (if any) between groundwater takes and surface water bodies and, if there is such a connection as defined by Policy 12 w), having regard to relevant parts of Policy 11 and Policy 12 when making decisions on groundwater takes.

Policy 12

When assessing resource consent applications for groundwater takes and/or any associated water use, the effects of these activities shall be assessed individually and cumulatively with all other existing (or currently applied for) water take and use activities. In doing so the Council shall have particular regard to the following matters:

...w) The nature of hydraulic connection (if any) between the groundwater resource from which water is proposed to be taken and surface water bodies will generally be assessed on a case by case basis by evaluating:

- i) groundwater depletion of surface water bodies (i.e. the replacement of abstracted groundwater by flows from surface water bodies); and
- ii) where no Table 3-6 Sustainable Yield has been identified for the groundwater resource, groundwater interception (i.e. the reduction of groundwater flows to surface water bodies).

The nature of hydraulic connection does not need to be assessed and the groundwater take need not be assessed against Policy 11 or Policy 12(x) where:

- iii) the physical separation between the surface water body(s) and the underlying groundwater table is large enough to ensure that if there was a lowering of the

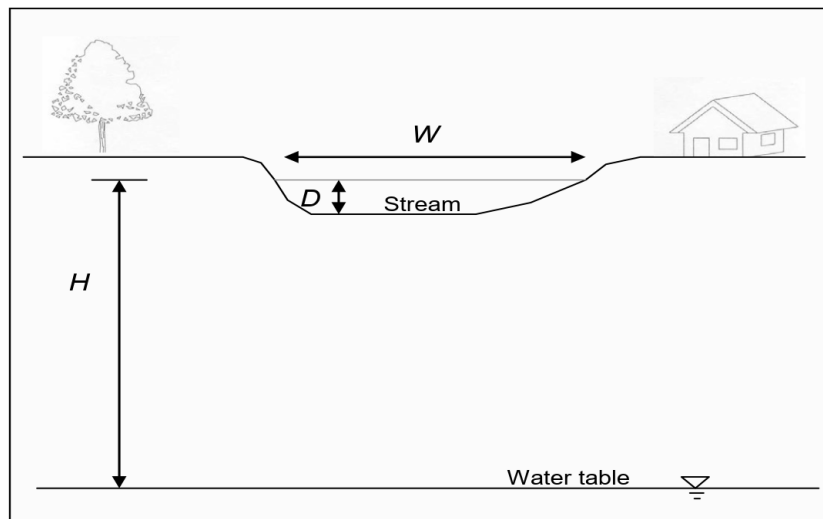
groundwater table from pumping this would not impact the surface water body (as calculated for streams using the Advisory Note at the end of this Policy);

Advisory Notes for Policy 12 w)

The physical separation described in Policy 12 w) iii) for streams exists when:

- i) the depth to the water table (H) below a stream that occurs within the area affected by the groundwater abstraction is greater than five times the maximum depth of water in the stream (D), i.e. $H \geq 5D$, and
- ii) the depth to the water table below any potential affected stream surface (H) is greater than twice the stream width (W) i.e. $H \geq 2W$.

For the avoidance of doubt, the water table (H) is the level below the land surface at which the subsurface material is fully saturated with water.



The WRC manages the surface water depletion effects identified by Policy 10 i) and Policy 12 w) using either one or both of the Implementation Methods in Section 3.3.4.7 - Groundwater Depletion of Surface Water:

- a) A groundwater take will have surface water restrictions imposed where there is a hydraulic connection between the two systems, and a restriction of the groundwater take will result in an increase in surface water flows during times of restrictions.
- b) Where a groundwater take is assessed under Policy 10 i) as impacting on surface water resources and this cannot be solely managed with restrictions on the groundwater take, the reduction in surface water flow occasioned by the groundwater take will be quantified and included in the surface water allocation regime used for assessing the cumulative allocation for the surface water takes in Chapter 3.3. The remainder of the groundwater take (the actual rate of take less the amount quantified as being a reduction in surface water flow) will be allocated against the sustainable yield in Table 3-6.

From the above policy framework, it would seem clear that there is a pathway for demonstrating whether or not a groundwater take is connected to surface water. First the applicant's expert must consider the area affected by pumping (drawdown cone), then consider whether or not there are any streams overlaying that area, then apply the procedure in the advisory note for Policy 12 (w) to determine whether or not these stream require consideration. If they do require

consideration for surface water depletion, standard hydrogeological analytical and modelling techniques are available.

However, there is significant complexity around this. If the WRC assessed application strictly to the provisions in their plan groundwater consents would be relatively straight forward to assess. However, my experience elsewhere has been that where there are surface water allocation pressures, councils will take a very conservative approach to groundwater-surface water connectivity. The Greater Wellington Regional Council included a list of methodologies that an applicant can use as a check list to demonstrate whether or not a groundwater take or in fact surface water. These criteria were designed to provide more certainty, but may in fact make consent processing more difficult because there are many criteria and the relative weighting between each is not defined, therefore introducing significant subjectivity in decision making.

With regards to groundwater take applications in the Lower Waikato queue, the recent WRC allocation review should take the pressure off, but it would be useful for Hort NZ clients to follow a templated approach to their resource consent applications that strictly follows the framework provided in the plan with respect to groundwater takes. By following a specified framework Council should have a reduced ability to make arbitrary decisions.

Regardless, of the current revised allocation status, work should also be done on improving the useability and areas of discretion with respect to groundwater-surface water connectivity rules.

6. Groundwater Impacts

In the Stantec review undertaken for the EPA, Stantec state *"The Waikato Regional Plan requires that all takes from the Waikato River catchment, including both groundwater and surface water, are assessed against the WRC allocable flow limits."* Then go onto say *"References to ground water in the AEE relate only to water source alternatives and Watercare's existing water supplies, rather than to any effects on groundwater as a result of the proposed take. It is considered that an assessment of the proposed take on groundwater and groundwater users should be included in the application documents prior to public notification."*

In my opinion, the first statement is discussing the requirements to volumetrically account for all groundwater and surface take volumes in the calculation of the current level of allocation status. However, Stantec seem to confuse this with groundwater effects of the taking of surface water, which are two separate topics. Any groundwater effects from this application would be less than minor given that the maximum surface water level change is only 60 mm and the minimum water depth was approximately 3 m, hence this will not result in any noticeable impact on groundwater levels in the adjacent riparian aquifer.

7. Conclusions

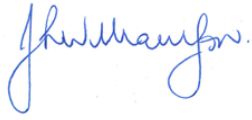
The conclusions drawn regarding the objectives of this assignments are summarised in **Table 2**.

Table 2. Summary of objectives and conclusions.

Objective	Conclusions
The recommended water take option and whether other options were adequately addressed	The Waikato River option is logical and provides a high-level of supply security, can be constructed rapidly, and is complementary to existing infrastructure, hence I agree with the choice of this option. Whether other options were considered adequately could be argued either way as the level of analysis was superficial in many aspects, but given the broad range of considerations, it would be difficult to argue that the options analysis was inadequate.
The allocation status under the current policy framework, particularly the impact to those surface water and	On 15 March, WRC released a media statement indicating that a number of large water take applications had been amended or withdrawn by the applicants, which effectively reduce the proposed allocation status by a combined 181,000 cubic metres of water per day (m³/day). This now means the river is not fully allocated and that all consent

Objective	Conclusions
groundwater applications awaiting decisions from Waikato Regional Council (WRC) who were “ahead of the queue” from Watercare (before the application was called in by BOI).	applications in the queue (including connected groundwater applications) can be processed on their merits.
The implications of WRC's clawback policies once the river is fully allocated to existing consent holders, particularly large horticultural users.	Now not relevant and was not assessed due to allocation pressures being released on 15 March.
The dynamics of the river hydrology and water demand requirements.	The largest demand pressures on the river are during summer when irrigation demand for agricultural and horticultural needs markedly increases the overall demand on the river. Unfortunately, this coincides with the time that the least amount of water is available to allocate under the policy framework. The obvious solution to this issue is either: a) development of surface water storage that is reliant for filling on harvesting flows from rivers during high-flow times; or b) abstraction from deeper groundwater resources that are demonstrably disconnected from surface water resources.
The appropriateness of the planning framework for the Lower Waikato River given its proximity to the saline environment and downstream position for most major take and discharge consents (e.g. Huntly Power Station).	The policy provisions in the Waikato Region provide a framework for a range of different water takes at different times and with differing levels of reliability. However, it is evident that the numeric limits placed within the core allocation (low-flow) provisions are particularly conservative compared to other parts of the country. Given changing societal values is resulting in improved water quality and less reliance on carbon fuels, water allocation provisions should be assessed to ensure their design intent still meets with current day needs (e.g. protection to HPS). Groundwater allocation provisions are strongly worded to reflect the importance of understanding the connectivity of any groundwater take with surface water, yet the method of assessing this is complex and without strict adherence to the planning framework most groundwater takes would be caught up in the surface water allocation provisions, which if over allocated would also prevent the taking of groundwater. Regardless, of the current revised allocation status, work should be done on improving the useability and areas of discretion with respect to groundwater-surface water connectivity rules.
What research is required to reassess the above if currently not adequate.	Detailed study is required on various higher core allocation scenarios that consider the impacts within various reaches of the river (management zones) on: a) Hydraulics – water level and mean velocity change; b) Sedimentation - on bed form processes; c) Saline intrusion - extent of landward migration of salinity from the coast; d) Aquatic ecology – ecological resources dependent on current flow conditions; and e) Other users – coupled with hydraulic to assess impact on physical access to water. This work maybe underway by WRC and is worth understanding before making submission on this point.

Yours sincerely,



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Appendix A. Waikato River – Key Flow Statistics

The following table was taken from the Tonkin + Taylor 2020 report entitled “Waikato River Water Take and Discharge Proposal – Board of Inquiry. River Hydrology Assessment”.

Table 4.2: Summary of relevant average and 7-day low flow statistics for the Waikato River

Site name	River flow (m ³ /s)			
	Median	Mean	Mean Annual Low	q ₅
Waikato River at Rangiriri ¹	330.0 ²	360.3	197.4	181.7
Waikato River at Mercer ¹	359.8	407.9	203.8	185.3
Waikato River immediately upstream of Waikato intake (i.e. before Watercare abstraction)	368.2 ⁴	412.8 ⁴	204.3 ³	185.9 ³
Waikato River at Tuakau ³	-	-	204.6	186.0
Waikato River at Wetland ⁴	-	-	205.0	186.4
Waikato River at Hood's Landing ³	-	-	205.2	186.5
Waikato River at Coastal Marine Area	-	-	205.2 ⁴	187.9 ⁵

¹ Calculated by WRC from flow records, provided via email correspondence 23 March 2020

² Calculated by WRC from flow records, provided via video conference 30 October 2020

³ Calculated by WRC as Mercer flow plus inflow estimates, provided via email correspondence 23 March 2020

⁴ Calculated by interpolation based on catchment area

⁵ Calculated by WRC, obtained from 'Surface Water Allocation Levels' webpage (accessed 12 November 2020)