

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Waikato Regional Plan Change
1 – Waikato and Waipa River
Catchments (“Proposed Plan or PC1”)

AND

IN THE MATTER of submissions and further submissions by Oji
Fibre Solutions (NZ) Limited

**STATEMENT OF PRIMARY EVIDENCE OF PETER ROSS BUCKLEY ON
BEHALF OF OJI FIBRE SOLUTIONS (NZ) LIMITED
FOR HEARINGS PARTS A AND B**

15 FEBRUARY 2018

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1. **SUMMARY**

The CSG process

- 1.1 Over the course of my career as a dairy farmer I have been extensively involved with the community including participating in and building governance relationships between Waikato Regional Council, territorial authorities and all Iwi within our region. As a regional councillor (and Chair) during the period that PC1 was conceived and passed by the Council I am familiar with the process adopted and the policy arguments arising. I am on record as having opposed PC1 in the form in which it was proposed.
- 1.2 I consider that there were flaws with the way in which the CSG was conceived and with its final outputs. Overall, my strong impression and understanding of the CSG process is that it was not a consensus decision that fairly represented stakeholders and the community. This has resulted in significant concerns by many involved about the final outcomes of the PC1.

Opportunities to implement good farming practices

- 1.3 As a Waikato farmer my farming enterprise is a good practical illustration of what can be achieved through investment in good practice. In view of what can be achieved it is important to incentivise farmers to innovate in the development and adoption of good practices: a regulatory framework that creates financial drivers to retain the right to discharge as much N as possible will inevitably undermine the water quality objectives of the plan.
- 1.4 Through adopting a pro-active approach to farming I have significantly reduced the environmental footprint of my dairy farm. I have lowered stocking rates while increasing production. I have developed a wetland that benefits the sub-catchment and which has stripped N and P to negligible levels. As a result I have a low NRP relative to other dairy farms. Although half of my farm could be considered suitable for market gardening, the farm's low NRP means that there is insufficient headroom to convert to an alternative use.

- 1.5 In effect, the provisions of PC1, coupled with my own proactive management to internalise the adverse effects of my activities before the plan change was notified, has resulted in an inability to use half my land for its highest and best use (arable cropping).
- 1.6 I contend that for the majority of dairy farmers FEPs will be ineffectual at achieving mitigation actions to reduce N because any mitigation actions that reduce a farm's NRP are unlikely to be accepted / agreed if they have the effect of reducing the farm's NRP. A reduced NRP will reduce the farmer's flexible use of the land and their perceptions of the capital value of their property.
- 1.7 As I consider that there is a realistic possibility that any future plan change will maintain the status quo, I advise any potential farmers to seek a farm with a high NRP and to retain it at that level.

2. INTRODUCTION

Qualifications and experience

- 2.1 My full name is Peter Ross Buckley. I am a farmer in the Te Kawhata area of the Waikato Region where I have owned and been running a dairy farm for 45 years.
- 2.2 I have previously actively participated in various organisations throughout the region including as:
- (a) President of Waikato Federated Farmers (2004-2007);
 - (b) Chair of the Waikato Regional Council (2007-2013);
 - (c) Councillor of the Waikato Regional Council (2007-2016);
 - (d) Chair of the Lake Taupo Joint Committee (2007-2016);
 - (e) Co-chair, Waikato River Statutory Board Establishment Committee;
 - (f) Crown Appointee to the Waikato River Authority (2012 to present);

- (g) Past Chair of the Primary Land Users Group;
 - (h) Trustee of the Waikato Rural Support Trust (I established this trust in the Waikato and it has subsequently extended to various rural areas around the country. It is a support network / organisation for rural people in times of financial or other health issues).
- 2.3 My work has involved extensive involvement with the community and includes participating in and building governance relationships between Waikato Regional Council, territorial authorities and all Iwi within our region. As a regional councillor (and Chair) during the period that PC1 was conceived and passed by the Council I am familiar with the process adopted and the policy arguments arising. I am on record as having opposed PC1 in the form in which it was proposed.
- 2.4 During the period that I have farmed in the Waikato I have been the recipient of several awards including the Waikato Balance Farm Environment Awards, PGG Wrightson Land and Life Award and the Waikato River Authority Catchment Improvement Award. These awards related to the farming systems I applied to my dairying operations which I will refer to below.
- 2.5 The purpose of my evidence is twofold:
- (a) firstly, to provide some background to the development of PC1 from a (then) councillor's point of view to illustrate that reliance on the CSG's outputs as a basis for the plan change is flawed; and
 - (b) secondly, to outline my experiences with farming in the region including the steps I have taken as a dairy farmer to proactively adopt sound environmental practices and why I consider that farmers like me who have taken steps to adopt sound environmental practices are significantly and unfairly disadvantaged by PC1.

3. THE DEVELOPMENT OF PC1

- 3.1 As noted above, I was a WRC Councillor for 9 years. During my tenure on the Council I generally supported development of Plan Change 1 using community collaborative methods as I perceived that this type of process would enable the wider community to “buy into” a form of regulation that would recognise innovative land use, and ensure adequate account of each of the social, economic and environmental components of sustainable management necessary to achieve the progressive reduction of the diffuse discharges associated with farming activities. Although I am on record as having supported the “collaborative approach” used to develop PC1, my understanding at the time was that the full spectrum of community opinion would be fairly represented. I did not anticipate that decisions would be pushed through in the manner that occurred, as outlined in the evidence of Ms Strang who was the forestry delegate on the Collaborative Stakeholder Group.¹
- 3.2 Early in the development of PC1 a collaborative approach was proposed. This proposal was followed up by a workshop held on 28 August 2013 for interested parties / stakeholders at the Te Rapa racecourse at which a selection process was proposed and adopted. At this workshop it was agreed the number of representatives that would be appointed from each sector group to the CSG. I attach as **Appendix PB 1** a report to the Policy and Strategy Committee recommending the numbers of representatives. Following that meeting the new council was elected who subsequently called for nominations after which representatives were appointed by Council staff, through a non-transparent process.
- 3.3 The new Council sought advice from Guy Salmon who had some experience of these processes in Denmark. I recall that he outlined the approaches adopted by other consultative stakeholder groups. After this meeting the CSG process was formally adopted.
- 3.4 Not long afterwards the Government proposed amendments to the Resource Management Act via the Resource Legislation Amendment Bill to formally recognise collaborative planning processes, although this was passed too late for it to formally apply to PC1.

¹ EIC of S Strang for Hancock Forest Management (NZ) Limited, at section 6.

- 3.5 The process commenced but some two years later the CSG had got to a point where they hadn't drafted anything or made any decisions. As it was nearing the end of the local government election cycle in 2016 the recommendations were quickly crystalised and complied in a way that, in my view, seemed premature.
- 3.6 Concerns about the process were simultaneously being expressed about the outputs of the CSG to the point where the then Minister for the Environment (Rt Hon Nick Smith) wrote to the then chair of the Council, Paula Southgate and the CEO, Vaughn Payne asking that the Council not proceed with the Plan Change until the public had been fully consulted. On the day of the Council meeting in September 2016 I put a motion to the Council that the notification of PC1 be delayed but this was narrowly defeated.
- 3.7 Overall, my strong impression and understanding of the CSG process is that it was not a consensus decision that fairly represented stakeholders and the community for the following reasons:
- (a) it came down to a majority vote as opposed to developing an agreed output;
 - (b) The CSG process has been dogged by concerns about its veracity as a collaborative process, from the non-transparent appointment of the industry representatives, to the allocation of seats on the Group, to its final outputs.

4. **ON FARM IMPROVEMENTS**

- 4.1 The second part of my evidence is intended to provide a practical illustration of:
- (a) what voluntary and proactive investment in good practice can achieve on dairy farms;
 - (b) why it is important to incentivise farmers to innovate in the development and adoption of good practices; and
 - (c) the risk of inequitable regulation to the adoption of good farming practices.

- 4.2 By way of background, my dairy farm is located on Island Block Road, Falls Road and Coalfields Road at the intersection of those roads. It backs onto, and has a 2km boundary with the Whangamarino wetland. On its western boundary is another dairy farm and on the southern boundary is Southern boundary is Fish and Game owned land (100ha). The eastern boundary is formed by Falls and Coalfields roads. The northern boundary adjoins Department of Conservation reserve managed as part of the Whangamarino Wetland.
- 4.3 Throughout my time as a farmer I have farmed on the basis that maximizing total production is important, but return on investment is the critical factor for a profitable business. That approach has ensured I have stayed in business as a profitable operation, but importantly it has not prevented me from applying best practice methods to my farm.
- 4.4 I purchased the farm from my father in 1974 with 264 cows being milked 7 hours per day. The total farm area was 103 ha and 80 ha was in pasture and buildings. At the time I acquired my property the common assumption was that increasing herd size increased milk solids (MS) production. My experience was that fewer cows, better fed and less often milked made more sense and a more profitable enterprise overall. Suspecting that we could improve results we trialled reducing the herd by about a third, to 180 cows, and changing the feed system. Whereas we had previously made 17,000 bales of hay for supplement we soon produced only 4000 bales p.a but made more silage. I then looked at fertiliser inputs and worked out through informal on-farm trials that less could be used without affecting the profitability of the operation. We currently apply 38 kgs of N per ha when, as compared to the 90k's recommended by the standard use of Overseer. I also reduced our annual application of 10% super phosphate² from 82 tonnes to 16 tonnes while growing more grass through improved grass and water management. We achieved this by no longer applying fertilizer on a fixed timetabled basis and by applying the nutrient when required in response to soil and water testing to maximize dry matter per \$ of fertilizer. My experience is that the best results on our soil types / sub-catchment are achieved through the management of Sulphur and pot-ash (K rather than N), which leads me to the conclusion that a single minded and catchment

² 10% superphosphate has 10% K

wide focus on one input is commercially and environmentally questionable.

- 4.5 Over time, we also reduced the farm from 80 ha, by planting trees for shade to increase soil water retention and reduce the stress on the cows. Because the cows do not like to move in the heat, we extended the cattle races to improve access to the new subdivision of the farm and added more water troughs to increase the cows' access to water. If we take the water to them by strategically positioning the troughs we found that dehydration reduces and milk production increases. Additionally, we considered the genetics of the animals for the system and now use a breed known as a "kiwi cross" which is a cross between a fresian and a jersey.
- 4.6 In adopting these cost-effective measures, milking time was cut by half and production increased from 11,350 kgs of butter fat per annum to 14,528 kgs. I installed a new milking machine because the old one could not handle the new volumes of milk resulting from better feeding of the cows. Eventually I settled on approximately 200 cows as the optimal number for the farm.
- 4.7 These numbers have not changed much since 1981. Production is now at between 1250-1300kg MS/ ha whereas the average kgs of MS/ha in the area is about 900 kg. My stocking rate is currently 204 cows on 67 ha which is equivalent to a stocking rate of 3 per ha. Costs of production are about \$3.40 per kg MS compared to others who operate with costs around around \$7. This year the MS payout is predicted to be around about \$6 – 6.15 /kg of MS.
- 4.8 In 2004 we further reduced the pasture area by 4.5 ha in order to build a wetland and to enable critical areas to be fenced off and planted in trees etc. Because of my involvement with the Regional Council I was aware of the capacity for wetlands to reduce diffuse source pollutants from surface and some ground water. Being located adjacent to the Whangamarino wetland I was concerned about discharges from my farming operations and concerned as a Councillor and dairy farmer to take a lead on water quality management by practical example. I perceived that a constructed wetland would also operate as a form of backstop in the event of any unplanned fault in the on-farm effluent treatment system. I approached

the Waikato University and gave them the dimensions of the approximately 550ha catchment area around my farm and asked them to indicate the size of the wetland needed to provide effective treatment. They advised that the water needed to travel through about 1 ¼ km of wetland to be effective which resulted in the construction of a 4.5 ha meandering wetland. To create the wetland we planted 32,000 native trees over a period of about three years with a total cost of approximately \$800,000. We applied to the Waikato Ecological Enhancement Trust (WECT) (run by Mercury Energy as a requirement of their resource consent to enhance the river) for \$32,000 over three years to plant trees which was granted. Baldwins Quarry contributed machinery and materials during construction as an in-kind contribution. Otherwise the farm funded the remainder of the cost of the wetland.

- 4.9 There are five farms and a quarry in my catchment with an additional 70 ha's of the Maramarua Forest that together form part of the Island Block Drainage District. The wetland on my property drains the whole of the 550ha of the catchment although the area that directly benefits from the wetland's drainage system is about half of that.³ However, there is also a residual effect for the whole of the catchment because the wetland acts to moderate peak flows from the catchment. The quarry also benefits, with the wetland acting to protect natural water in the event of extreme weather or other unmanageable discharges from the quarry area.
- 4.10 I note that in terms of discharges of phosphorus we have always conducted and monitored soil levels from the farm and understood what level of P should be in the ground for optimal dry matter / grass growth. We have also put in more cattle races to better utilize the farm and reduce sediment and surface discharges from tracked and pugged soils. Overall, good farm management is a dynamic process that requires constant monitoring to maximise the farm's natural environmental and productive balance. For example, we have one area which is naturally high in P so we never apply any P to that part of the land.
- 4.11 The levels of diffuse N loss from my farm prior to my rationalisation of herd numbers are unknown. However, prior to the wetland becoming fully operative, the discharge of N from a stocking rate of approximately 200

³ As assessed as part of the flood protection benefit rate through the Annual Plan process

cows was about 18kg N /ha. By the time it was fully operational it had stripped virtually all of the P and N to negligible levels. I produce as **Appendix PB 2** a sample taken from the discharge point at the wetland. As can be seen, the only significant issue is e-coli and I have recently been working on a solution to address this issue which involves using dung beetles to increase the aeration in the soil. I expect this to reduce the e-coli levels but results will not be available for some time. My Nitrogen Reference Point has been assessed using Overseer as 20kg N /ha. While this figure could be questioned based on the negligible discharges post wetland treatment, I consider it financially prudent not to do so pending finalisation of PC1 and the proposed 'grandparenting' of diffuse N as determined by the NRP. I note that the NRP is also based on the period of highest returns in the history of dairy farming (being the 2014 -2016 financial years), meaning that most dairy farmers will have headroom as production and inputs will have generally reduced since that period.

4.12 At the time of constructing the wetland I did not anticipate that it would potentially disadvantage my operation in future. I had, as part of my work with Federated Farmers and subsequently the Regional Council understood the importance of water quality and I could see that there was a developing concern regarding environmental sustainability. In light of the drivers of the Resource Management Act I simply did not anticipate any regulatory system that financially penalised and operationally constrained for those farmers who had undertaken environmental improvements.

4.13 In terms of the highest and best use of my land, half of the farm would be considered suitable for market gardening as the loamy peat soils, which are suitable for cropping, are comparatively free draining. However, under my NRP I would not have enough headroom to convert.

5. **CONCERNS**

5.1 My understanding of PC1 is that the majority of farms can continue to operate as they have to date. For many farms, because the retrospective period chosen as the basis for the NRP is one of historically high milk price payout and MS productivity, those farmers who have ignored growing environmental concerns and (more latterly) the statutory

expectation of improved catchment water quality will have adequate headroom to manage their operations to their best advantage. Uncertainty post the 10 year life of PC1 is likely to discourage any action by farmers leading to a reduction in NRP below their prescribed limit.

- 5.2 For those in the 75th percentile bracket, I consider that they are likely to be operating at a level which provides adequate scope for more efficiently managing their discharges, through the adoption of some relatively simple changes to their operational processes.
- 5.3 It is, as yet, unclear exactly how prescriptive FEPs will be, but it appears to me that there are no regulatory 'teeth' associated with FEPs provided that a farmer who is not in the 75th percentile does not exceed their existing NRP. I contend that any mitigation actions that are proposed through a FEP are unlikely to be accepted / agreed if they have the effect of reducing the farm's NRP and thereby reduce the farmer's flexibility and the farmers' perceptions of the capital value of their property. This is for the reason that uncertainty about the allocation process for the next plan will mean that farmers will logically attempt to retain high NRPs to ensure that they are not penalised at the next phase. Farmers have seen this happen at Rotorua with PC10 where the supposedly interim approach of freezing the status quo has been rolled over into the subsequent plan change process, resulting in a grandparented allocation of N to existing farmers.
- 5.4 In my experience many farmers retain high debt levels. I understand that dairy farms have already dropped in value from \$35-40,000 per ha to around \$23-27,000 depending on the farm's NRP, since Plan Change 1 was notified. If you have a high debt to equity ratio the ability to borrow is reduced, and simplistically, servicing of debt undermines profitability. If farms drop in value there is also the potential for a negative equity situation. While farmers may want to do the right thing environmentally, financial management will dictate how they respond to the regulatory system. If that system will potentially reward them with a higher allocation than they would receive for improved environmental management they will be wary about implementing systems that reduce their current NRP and by implication future allocated discharges. In other words, farmers will want to keep the NRPs high for the life of the plan so

that if they are reduced in the next plan there is less risk that they will be reduced to a new actual discharge rate.

- 5.5 It is with regret that when asked about how to purchase and manage a farm in the Waikato, I advise any prospective farmers to identify farms with high grandparented NRPs and to keep them high to avoid the risk of losing capital value and operational flexibility post PC1.

Report to Policy and Strategy Committee September 2013 - Decision Required

File No: 23 05 12
Date: 2 September 2013
To: Chief Executive Officer
From: Group Manager – Policy and Transport
Subject: Size, Composition and Nomination Process for Collaborative Stakeholder Group (CSG)
Section: B (For recommendation to Council)

Purpose

To report to Council on the outcomes of the Healthy Rivers: Wai Ora Stakeholder Workshop which was held on 28th August, 2013. This workshop was focused on co-designing a collaborative stakeholder group (CSG) to assist in the development of a Regional Plan change to address the priority issue of effects of discharges to land and water, in the Waikato and Waipa catchments.

Recommendations:

1. That the report "*Size, Composition and Nomination Process for Collaborative Stakeholder Group (CSG)*" (Doc #2817477 dated 2 September 2013) be received, and
2. That the Policy and Strategy Committee recommend that the CSG be established as follows:
 - Group size: 20 members, comprising:
 - 1 Māori interests
 - 2 Dairy
 - 1 Sheep and Beef
 - 0 Fertiliser
 - 0 Rural professional
 - ○ 1 Forestry
 - 1 Horticulture
 - 1 Local Government
 - 0 Irrigators
 - 1 Energy
 - 0 Central Government (operational) and Health
 - 1 Environment/NGO's
 - 1 Tourism and recreation
 - 0 Urban/Residents and ratepayers
 - 1 Water supply takes
 - 1 Industry
 - 1 Rural advocacy
 - 0 Commercial fishing
 - ○ 3 unallocated sector seats (call for expressions of interest from all sectors/interests listed above)
 - 4 community seats.
 - That each sector be invited to nominate a representative(s) to the CSG by 5pm, 17 October, 2013.
 - That sectors are requested to provide evidence of support from other stakeholders within their sector.
 - That nominations for the three unallocated sector seats and four community seats be

made to Te Rōpū Hautū by 5pm, 23 October, 2013.

- That nominees be invited to identify a delegate, should they be unable to attend a meeting.

Background

The Stakeholder Workshop was held on 28 August 2013, and was attended by 128 people representing a wide range of interests in the project and approximately 30 representatives of the project partners. This workshop was the first step in the public process of establishing the Collaborative Stakeholder Group (CSG) which will guide the development of work leading to the regional plan change in 2015, relating to water quality and associated management issues.

In establishing the CSG, a collaborative engagement model has been adopted. In addition, it is important that the principles of consultation as set out in s82 of the Local Government Act 2002, are adhered to, including in particular, transparency and involving all those with an interest in the project.

The key topics discussed in the workshop included composition of the CSG, preferred size of the group, skills required of representatives and preferred process for nominating members. An overview of these matters is provided below and a more detailed summary is provided in Appendix 1.

Interim Chairperson

As outlined in the draft terms of reference for the CSG, an interim independent chairperson will be appointed. He/she will lead the formation and first few meetings of the CSG until a permanent chairperson is negotiated between the CSG and decision makers. An expression of interest process to fill this role will commence in October.

Preferred size of the group

The workshop was asked to identify the size of group that would be most effective and representative. The range was from 15 to 30, with one outlier of 180 (representing all those present). The preferred size for the CSG was 20. This also included a 20 per cent (or 4 seats) allocation for community seats to ensure a balance of perspectives and demographics around the table. When asked for feedback on the 20 per cent allocation for community representation, the workshop responded with a range from 0 to 20 per cent.

Composition of the CSG

Participants were asked to identify key stakeholder groups drawing on the suggestions in the draft Terms of Reference (TOR). In general, it was agreed that a wide range of representative parties should be involved in this project due to its far-reaching implications and it was recognised that a joint approach to seeking solutions for the project would be required. In some cases the sectors identified are not mutually exclusive. For example both Industry and Water Supply Takes potentially overlap with other sectors, which may present some coordination challenges for those sectors. Reflecting a collaborative approach, Te Rōpū Hautū have retained this recommendation from the workshop and wish to invite the sectors to explore opportunities.

Skills required of representatives

A wide ranging discussion was held on the skills that would be required in order to best inform this project. Common themes included: communication skills, strategic thinking, being able to consider others' positions, flexibility, focused on solutions, leadership, innovative. A more detailed analysis of these skill requirements will be taking place after the workshop. This analysis was not complete at the time this report went to agenda.

Preferred process for nominating members

Two options for nominating members to the CSG were discussed, with advantages being identified for each option. The preferred option was that stakeholders would take on the responsibility of discussing within their sectors and choose their own representatives for nomination onto the CSG.

It was clear that skill sets and time commitments would be significant matters to be considered within each sector.

Te Rōpū Hautū Recommendations

Te Rōpū Hautū is the Healthy Rivers: Wai Ora Steering Group, which is comprised of council and iwi partner executive staff and the Waikato River Authority (as an ex officio member). Te Rōpū Hautū is accountable to the respective governing bodies for the success of the project.

Following the workshop this group discussed the success of the day and the recommendations which had arisen from the day. There was extensive discussion about representation and partnership roles and the need to ensure the composition of the group reflected both aspects. There was strong support for the recommendations arising from the day and Te Rōpū Hautū has added their support in forwarding and endorsing the recommendations, as set out in this report.

Workshop results on sector allocation were rounded to identify the appropriate sector representation to correspond to full person equivalents.

The result is that a group of 20 be formed as outlined below:

1. Thirteen representatives have been allocated to a sector, as was developed by stakeholders at the workshop.
2. Three sector seats were unallocated at the workshop, for which all sectors will be invited to submit expressions of interest.
3. Four community seats.

Assessment of Significance

Having had regard to the decision making provisions in the Local Government Act 2002 and Council's Policy on Significance, a decision in accordance with the recommendations is not considered to have a high degree of significance.

Next Steps

The workshop resulted in strong guidance on the way forward for establishing the CSG. Following ratification of the above recommendations, the next key steps at the staff level will be to prepare background information to circulate to the sector groups to assist in their nomination process.

Wendy Boyce
Social Scientist
Resource Information

Vaughan Payne
Group Manager
Policy and Transport Group



ANALYSIS REPORT

Page 1 of 2

Client:	PR & JM Buckley	Lab No:	1360727	SPv1
Contact:	PR & JM Buckley 1036 Island Block Road RD 2 TE KAUWHATA 3782	Date Registered:	05-Dec-2014	
		Date Reported:	10-Dec-2014	
		Quote No:		
		Order No:		
		Client Reference:		
		Submitted By:	PR & JM Buckley	

Sample Type: Aqueous

	Sample Name:	From Flood Pump 04-Dec-2014 2:40 pm	Leaving Catchment into Swamp 04-Dec-2014 2:45 pm	Farm Water Pump 04-Dec-2014 2:30 pm		
	Lab Number:	1360727.1	1360727.2	1360727.3		
Total Suspended Solids	g/m ³	15	< 3	< 3	-	-
Total Nitrogen	g/m ³	1.63	0.33	1.60	-	-
Nitrate-N + Nitrite-N	g/m ³	< 0.002	< 0.002	1.44	-	-
Total Kjeldahl Nitrogen (TKN)	g/m ³	1.63	0.33	0.17	-	-
Total Phosphorus	g/m ³	0.146	0.025	0.149	-	-

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-3
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-3
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22 nd ed. 2012.	3 g/m ³	1-3
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m ³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m ³ , the Default Detection Limit for Total Nitrogen will be 0.11 g/m ³ .	0.05 g/m ³	1-3
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ -I 22 nd ed. 2012.	0.002 g/m ³	1-3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N _{org} D. (modified) 4500 NH ₃ F (modified) 22 nd ed. 2012.	0.10 g/m ³	1-3
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22 nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCA, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m ³	1-3



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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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A handwritten signature in blue ink, consisting of several overlapping, stylized strokes.

Ara Heron BSc (Tech)
Client Services Manager - Environmental Division