

Waikato River Water Quality Monitoring Programme: Data Report 2005

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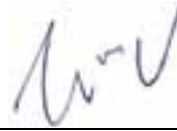
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1 Introduction

1.1 Background

The year 2005 report follows the format of the previous data report (Smith, 2005), with the addition of the reporting of a microbiological survey conducted in the summer of 2004/2005, and the reporting of a trace metal survey conducted during 2005.

To effectively manage water quality, the Waikato River monitoring programme addresses the following questions:

1. What is the quality of the water now?
2. Why is the water of the observed level of quality?
3. Is water quality getting better or worse? If so - what makes it change?
4. How can we improve the quality, ecological health and integrity of the Waikato River?

The monitoring information allows Environment Waikato to:

- Determine compliance with classification standards.
- Define the suitability of the resource for various beneficial uses and values of the water.
- Monitor the impact of major discrete point source discharges on water quality.
- Monitor the impacts of diffuse discharges on water quality.
- Provide a basis for evaluating the effectiveness of resource management measures.

This dataset is invaluable for the evaluation of the Waikato River: its state, the pressures on it and its response to these pressures. We need to continue to gather comprehensive, reliable and good quality data on the Waikato River to protect and enhance its values into the future.

This report is the 14th since the re-design of the Waikato River Monitoring Programme (WARIMP) implemented in 1989. Copies of reports can be obtained via the Environment Waikato Internet site <http://www.ew.govt.nz/publications/index.htm> or by contacting Environment Waikato (the Library) on 0800 800 401, e-mail: inforeq@ew.govt.nz.

1.2 Report Content

The report provides information on:

1. Routine monthly monitoring of water quality at 10 sites:
 - Year 2005 summary data, tabulated by parameter for each location and reported with the median of the previous 5 years.
 - Year 2005 summary statistics for the major ions, tabulated by parameter.
 - Key parameter graphs showing the average water quality for 2005 at each location, compared to results of the previous 5 years.
 - Summary tables identifying the number of samples meeting 'satisfactory' and 'excellent' water quality standards and guidelines.
 - Raw data for Year 2005.
 - Raw data for the Trace Metal Analysis 5-Yearly Survey (5 sites, quarterly sampling).
2. Microbiological water quality (intensive bathing season monitoring of indicator bacteria in river water):
 - Year 2004/2005 bathing season E.coli summary statistics for each location and reported with the median of the previous 5 summer surveys.
 - A summary table identifying the number of samples meeting the "satisfactory" and "excellent" water quality standards and guidelines for recreation.
 - A graph showing average 2004/2005 bathing season results for E.coli compared to the results from the previous 5 surveys.
 - Raw data (2004/2005 bathing season – December to February).

3. Additional information is provided in the appendices on:
 - Flow (*Appendix I*).
 - The effect of flow is important to assessing water quality and making comparisons between years. Appendix I provides information on annual average flow at some locations for the previous 10 years.
 - Datasonde Deployments
 - Plots of deployments undertaken during 2005 showing the level of diurnal variation at five Waikato River sites (*Appendix II*).

1.3 Water Quality Guidelines and Standards

Table 1 lists the physical and chemical water quality standards and guidelines used to assess the condition of the Waikato River in 2005. The standards mainly relate to either the protection of the ecological health of rivers and streams or to whether they are suitable for water-based recreation, especially swimming.

Some water quality Guidelines and Standards are relevant to the use of the Waikato River for both general water supply (industrial/cooling water, irrigation, stock water etc.) and as a source of municipal drinking water. In most cases two criteria are shown. The less stringent criteria define water that is “satisfactory” for the desired use; these are mostly based on existing national and other Guidelines and Standards (*Appendix IV*). The more stringent criteria identify “excellent” water, and reflect expert opinion. Samples gathered in 2005 whose results do not comply with the “satisfactory” criteria (Table 1) are underlined in raw data summaries.

Table 1: Guidelines and Standards for Physicochemical Water Quality for Ecological Health and for Human Uses of Water.

Water Quality Measure	Relevance ¹	Satisfactory	Excellent
Ecological Health			
Dissolved oxygen (% saturation)	aquatic life (breathing)	>80	>90
pH	aquatic life (acidity)	6.5–9	7–8
Turbidity (NTU)	plant growth (clarity)	<5	<2
Ammoniacal-N (g/m ³)	aquatic life (toxicity)	<0.88	<0.1
Temperature (°C) (May-Sep)	fish (spawning)	<12	<10
		<20	<16
Total phosphorus (g/m ³)	Nuisance plant growth	<0.04	<0.01
Total nitrogen (g/m ³)	Nuisance plant growth	<0.5	<0.1
Human Uses—recreation			
Baseflow water clarity (m)	Visibility	>1.6	>4
Escherichia coli (no./100 mL)	human health	<550	<55
Median Escherichia coli (no./100 mL)	human health	<126	<23
Human Uses—water supply			
Phytoplankton chlorophyll a (g/m ³)	filter blockage	<0.02	<0.005
Human Uses—drinking water			
Arsenic (g/m ³)	human health (toxicity)	<0.01	–
Boron (g/m ³)	human health (toxicity)	<1.4	–

¹ Refer to Appendix IV for description of Guideline and Standards values used. These guidelines and standards are also defined on the Environment Waikato Internet site; www.ew.govt.nz

2 The Waikato River Monitoring Programme Design

2.1 Sampling Collection

Sample collection occurs monthly, as two sampling runs. Locations in the upper catchment from Taupo to Waipapa are visited as part of the first run, and locations in the middle and lower catchments from Hamilton (at the Narrows) to Tuakau are visited on the next. Each location is sampled at a similar time on each occasion (coefficient of variation ~2 - 6%) to minimise the effect of diurnal variation on the measurement of water quality parameters. Sample times are recorded in New Zealand Standard Time (NZST). Because of the controlled nature of the river, our daytime samples are generally collected at higher than median flows.

2.2 Sample Locations

Routine water quality monitoring locations of the Waikato River Monitoring Programme and additional locations used during the summer microbiological surveys are summarised in *Table 2* and illustrated in *Figure 1*.

Table 2: Routine Sampling and Bathing Water Monitoring Locations.

Location Number	Distance ¹ (km)	Location Name	Map Ref.	Field ^y Measurements
1131.127	0.1	Taupo Gates	U18:772-757	–
1131.119* ^d	1.2	Taupo – Reids Farm	U18:778:763	true left bank
1131.70 ^b	6.0	Huka Falls	U18:789-792	–
1131.244 ^d	7.8	Downstream Huka Falls	U18:797-809	river boat jetty ²
1131.105 ^d	36.5	Ohaaki Bridge	U17:981-914	at bridge, true left bank
1131.107	75.8	Ohakuri Tailrace Bridge	U17:796-061	boat ramp ³
1131.147	105.0	Whakamaru Tailrace	T17:552-056	boat ramp ⁴
1131.143	126.1	Waipapa Tailrace	T16:448-200	boat ramp ⁵
1131.81 ^b	166.7	Lake Karapiro Boat Ramp	T15:436-570	Horahora domain
1131.101	202.0	Hamilton – Narrows Bridge	S14:168-708	at jetty ⁶
1131.145* ^b	210.8	Hamilton – Wellington St Bch	S14:117-757	at jetty, true right bank
1131.64 ^d	211.5	Hamilton – Traffic Bridge	S14:118-764	true right bank
1131.121 ^b	219.8	Hamilton – Sewer Bridge	S14:082-823	true left bank
1131.69	225.6	Horotiu Bridge	S14:048-871	d/s of bridge
1131.102 ^b	232.3	Ngaruawahia Bridge	S14:997-912	u/s of confluence ⁷
1131.77	246.5	Huntly – Tainui Bridge	S13:003-018	true left bank
1131.117* ^d	262.3	Rangiriri Bridge	S13:989-167	true right bank
1131.91	286.3	Mercer Bridge	S12:919-336	–
1131.133	296.8	Tuakau Bridge	R12:828-320	boat ramp ⁸
1131.131 ^d	306.5	Tuakau – Elbows Landing	R12:745-352	NZ Steel Ltd pumping station

¹ approximate distance (in kilometres) from Lake Taupo's outlet.

² river boat jetty and boat ramp, true left bank, about 1.8km downstream of Huka Falls

³ boat ramp in recreation reserve immediately upstream from dam (true left bank).

⁴ boat ramp at Whakamaru Power Station.

⁵ river access d/s of Lake Waipapa, about 500 m off S.H. 32 along a gravel road (true left bank).

⁶ jetty at Hamilton Gardens.

⁷ road bridge upstream of Waipa River confluence.

⁸ immediately d/s of bridge, at Reserve (true right bank).

^b bathing season intensive microbiological survey locations only – survey conducted over the 2002/2003 summer.

* Locations at **Taupo (Reids Farm, 1.1 km d/s from Taupo Gates)**, at **Hamilton (Wellington Street jetty)** and at **Rangiriri (Rangiriri Bridge)** are sampled and reported as part of the National River Water Quality Network undertaken by NIWA. Contact person: Graham Bryers, NIWA, Hamilton.

^y Logistic considerations mean field measurements are often made at slightly different locations from sample collection (e.g. sampling from bridges).

^d Datasonde deployment sites.

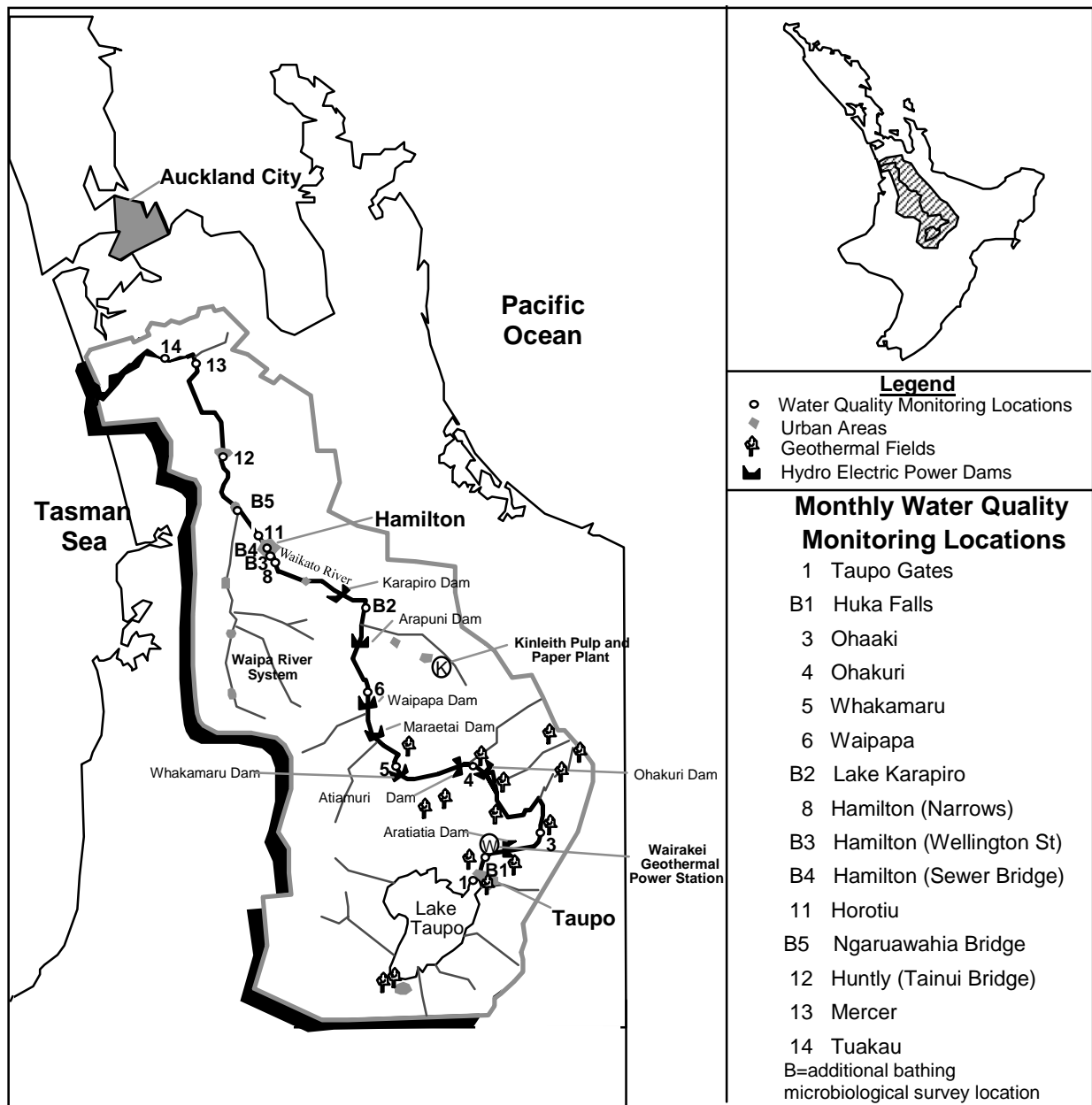


Figure 1: Waikato River Water Quality Monitoring Locations

Ten locations along the river are visited monthly (Taupo, Ohaaki, Ohakuri, Whakamaru, Waipapa, Hamilton-Narrows, Hamilton-Horotiu, Huntly, Mercer and Tuakau), and an additional four locations are included for the summer intensive microbiological survey (see *Table 2, Figure 1*). The major tributaries that enter the Waikato River are also monitored monthly as part of the Regional River Monitoring Programme (RERIMP) initiated in 1993 (Huser and Wilson, 1996b). Three locations (Taupo at Reids Farm, Hamilton at Wellington Street, and Rangiriri) are sampled by NIWA as part of the 'National River Water Quality Network' (*Table 2*).

2.3 Water Quality Parameters

Water quality of the Waikato River is assessed by measuring up to 40 parameters (27 routinely). Some parameters are measured in the field, but the majority of parameters are analysed in a laboratory using standard analytical methods. Details of field measurements and analytical methods used are appended (*Appendix IV*).

2.4 Quality Control, Data Storage and Analysis

Quality control measures are undertaken in accordance with Environment Waikato's ISO 9001:2000 standards including procedures for the collection, transport, storage, of samples, and methods for data verification and quality assurance to ensure the consistency of data

across the programme. Samples are sent to IANZ registered laboratories for analysis. Back-up samples are held for two months until results have been verified by routine quality assurance procedures. All data from field measurements and laboratory analyses are stored in Environment Waikato's water quality archiving database (TimeStudio).

Data analysis was performed using Statistica (version 6.0) and DataDesk (version 6.0.1). For the purpose of data analysis, non-detect results (i.e. results with "less than" values) were assumed to be equal to half the corresponding limit of detection (i.e. $<x = x/2$), and results greater than the value reported were taken as equal to the value reported (i.e. $>x = x$).

2.5 Reports

Environment Waikato's State of the Environment Report summarises the state of the Waikato River, other rivers in the region, and common pressures (Environment Waikato, 1999)

Environment Waikato Technical Report 2004/02 Trends in river water quality in the Waikato Region, 1987-2002 (Vant & Smith, 2004) outlines the trends in the Waikato River and other rivers in the region. Copies are available in electronic format from the publications page of the Environment Waikato website: <http://www.ew.govt.nz/publications/index.htm>

The data contained in these Waikato River reports is updated to the Environment Waikato "Waikato River" Internet page:

<http://www.ew.govt.nz/enviroinfo/water/healthyrivers/waikato/index.htm>

upon completion of the report. The "Healthy Rivers" page provides a link to details of the Guidelines and Standards used to assess the condition of the Waikato River and other rivers in the region. A link to water quality at other Regional River monitoring sites is also available from this page.

3 Results

The results are divided up into 2 sections. Section 3.1 contains the results and statistical summaries of the routine and 5 yearly trace metal analysis monitoring of the Waikato River. Section 3.2 reports the results and statistical summaries of the summer intensive microbiological survey. The raw data is included with each section, placed last.

3.1 Waikato River Monitoring Programme Routine Water Quality Monitoring

Summary Statistics

Major Ion Summary Statistics

Key Parameter Graphs

Comparison with Water Quality Standards

Raw Data

Trace Metal Analysis Raw Data

Absorbance of filtered sample at 340 nm (units: cm ⁻¹)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.002	0.001	0.001	0.004	0.001	<u>1.71</u>	0.002
Ohaaki Bridge	12	0.004	0.004	0.003	0.005	0.002	0.49	0.003
Ohakuri Tailrace Bridge	12	0.007	0.007	0.005	0.009	0.002	0.04	0.006
Whakamaru Tailrace	12	0.009	0.009	0.006	0.012	0.003	0.33	0.007
Waipapa Tailrace	12	0.012	0.012	0.009	0.015	0.003	0.33	0.010
Narrows Bridge	12	0.015	0.013	0.009	0.035	0.005	<u>2.06</u>	0.012
Horotiu Bridge	12	0.016	0.014	0.009	0.036	0.006	<u>2.01</u>	0.013
Huntly-Tainui Bridge	12	0.022	0.019	0.011	0.041	0.011	1.04	0.019
Mercer Bridge	12	0.023	0.023	0.010	0.041	0.010	0.45	0.024
Tuakau Bridge	12	0.025	0.025	0.011	0.044	0.017	0.42	0.027

Absorbance of filtered sample at 440 nm (units: cm ⁻¹)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.001	0.001	0.001	0.001	0.000	-1.00	0.001
Ohaaki Bridge	12	0.001	0.001	0.001	0.001	0.000	-1.00	0.001
Ohakuri Tailrace Bridge	12	0.001	0.001	0.001	0.003	0.000	<u>1.79</u>	0.001
Whakamaru Tailrace	12	0.002	0.001	0.001	0.004	0.001	1.30	0.001
Waipapa Tailrace	12	0.002	0.003	0.001	0.004	0.001	-0.13	0.002
Narrows Bridge	12	0.003	0.003	0.001	0.007	0.002	1.15	0.003
Horotiu Bridge	12	0.003	0.003	0.001	0.007	0.002	0.78	0.003
Huntly-Tainui Bridge	12	0.005	0.004	0.002	0.008	0.003	0.83	0.004
Mercer Bridge	12	0.005	0.005	0.002	0.008	0.004	0.17	0.005
Tuakau Bridge	12	0.005	0.005	0.002	0.009	0.004	0.44	0.005

Arsenic - Total (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.011	0.011	0.010	0.012	0.000	0.00	0.010
Ohaaki Bridge	12	0.030	0.030	0.022	0.046	0.010	0.79	0.026
Ohakuri Tailrace Bridge	12	0.035	0.035	0.027	0.043	0.004	0.05	0.032
Whakamaru Tailrace	12	0.034	0.035	0.027	0.039	0.006	-0.58	0.030
Waipapa Tailrace	12	0.029	0.029	0.022	0.034	0.006	-0.34	0.026
Narrows Bridge	12	0.024	0.024	0.016	0.030	0.005	-0.31	0.023
Horotiu Bridge	12	0.023	0.024	0.015	0.029	0.005	-0.73	0.023
Huntly-Tainui Bridge	12	0.018	0.020	0.009	0.024	0.009	-0.59	0.017
Mercer Bridge	12	0.019	0.019	0.009	0.025	0.008	-0.47	0.016
Tuakau Bridge	12	0.018	0.017	0.008	0.026	0.008	-0.13	0.015

Boron (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.16	0.16	0.15	0.18	0.01	-0.04	0.16
Ohaaki Bridge	12	0.31	0.30	0.24	0.44	0.08	0.91	0.28
Ohakuri Tailrace Bridge	12	0.35	0.35	0.29	0.40	0.07	0.02	0.32
Whakamaru Tailrace	12	0.34	0.34	0.30	0.41	0.05	0.33	0.31
Waipapa Tailrace	12	0.30	0.29	0.27	0.35	0.05	0.40	0.27
Narrows Bridge	12	0.25	0.25	0.18	0.30	0.05	-0.45	0.24
Horotiu Bridge	12	0.26	0.25	0.19	0.31	0.04	-0.35	0.24
Huntly-Tainui Bridge	12	0.21	0.21	0.11	0.28	0.06	-0.53	0.19
Mercer Bridge	12	0.21	0.22	0.12	0.25	0.04	-1.43	0.19
Tuakau Bridge	12	0.21	0.22	0.12	0.28	0.03	-0.88	0.19

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Black Disk (m)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	-	-	-	-	-	-	-	-
Ohaaki Bridge	12	6.3	6.5	5.0	8.0	1.8	0.07	5.6
Ohakuri Tailrace Bridge	12	2.8	2.9	1.0	4.6	1.5	0.01	2.8
Whakamaru Tailrace	12	2.4	2.1	1.6	3.9	1.1	0.83	2.3
Waipapa Tailrace	12	2.1	2.0	1.4	3.3	0.7	0.99	2.0
Narrows Bridge	12	1.5	1.5	0.7	2.5	0.7	0.06	1.4
Horotiu Bridge	12	1.4	1.3	0.8	1.9	0.7	0.09	1.2
Huntly-Tainui Bridge	12	0.9	1.0	0.5	1.3	0.4	-0.34	0.8
Mercer Bridge	-	-	-	-	-	-	-	-
Tuakau Bridge	12	0.7	0.7	0.4	0.9	0.3	-0.02	0.6

Biochemical Oxygen Demand - 5 day (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.4	0.3	0.2	0.9	0.4	0.97	0.2
Ohaaki Bridge	12	0.4	0.3	0.2	1.2	0.3	2.02	0.4
Ohakuri Tailrace Bridge	12	0.7	0.7	0.2	1.0	0.5	-0.11	0.6
Whakamaru Tailrace	12	0.7	0.7	0.2	1.0	0.4	-0.27	0.7
Waipapa Tailrace	12	0.5	0.5	0.2	1.0	0.5	0.29	0.6
Narrows Bridge	12	0.9	0.9	0.2	1.2	0.3	-1.05	0.8
Horotiu Bridge	12	0.9	0.9	0.2	1.2	0.3	-1.73	0.9
Huntly-Tainui Bridge	12	1.0	1.0	0.4	1.4	0.2	-0.66	1.0
Mercer Bridge	12	1.1	1.1	0.6	2.3	0.5	1.41	1.1
Tuakau Bridge	12	1.3	1.3	0.6	2.4	0.6	0.84	1.2

Carbon - Dissolved Organic (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.59	0.55	0.30	1.00	0.20	0.87	0.60
Ohaaki Bridge	12	0.74	0.55	0.40	1.80	0.35	1.53	0.60
Ohakuri Tailrace Bridge	12	0.71	0.65	0.40	1.30	0.40	0.71	0.70
Whakamaru Tailrace	12	0.82	0.70	0.40	2.40	0.25	2.41	0.75
Waipapa Tailrace	12	0.78	0.70	0.50	1.50	0.35	1.37	0.80
Narrows Bridge	12	0.98	0.95	0.50	1.60	0.50	0.47	0.90
Horotiu Bridge	12	1.02	0.85	0.60	1.90	0.55	1.03	0.90
Huntly-Tainui Bridge	12	1.06	0.90	0.70	1.90	0.55	1.09	1.05
Mercer Bridge	12	1.26	1.00	0.70	2.40	0.75	1.04	1.30
Tuakau Bridge	12	1.28	1.00	0.60	2.30	0.85	0.73	1.40

Carbon - Total Organic (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	1.12	1.00	0.80	1.50	0.35	0.48	1.00
Ohaaki Bridge	12	1.18	1.10	0.80	2.00	0.30	1.55	1.00
Ohakuri Tailrace Bridge	12	1.32	1.25	1.00	1.90	0.25	1.07	1.20
Whakamaru Tailrace	12	1.53	1.35	1.20	2.90	0.35	2.32	1.30
Waipapa Tailrace	12	1.58	1.55	1.00	2.10	0.40	-0.21	1.40
Narrows Bridge	12	1.85	1.80	1.40	3.00	0.45	1.60	1.70
Horotiu Bridge	12	1.95	1.75	1.20	3.10	0.45	0.93	1.70
Huntly-Tainui Bridge	12	2.12	2.00	1.30	3.10	0.65	0.43	2.10
Mercer Bridge	12	2.49	2.30	1.20	4.50	0.95	0.94	2.60
Tuakau Bridge	12	2.85	2.65	1.50	5.90	1.45	1.26	3.00

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Chloride (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	9	9	8	9	0	-0.67	9
Ohaaki Bridge	12	18	17	14	24	4	0.69	17
Ohakuri Tailrace Bridge	12	21	22	18	25	3	-0.11	21
Whakamaru Tailrace	12	21	22	18	24	3	-0.37	20
Waipapa Tailrace	12	20	20	17	22	3	-0.26	19
Narrows Bridge	12	18	18	15	20	2	-0.38	18
Horotiu Bridge	12	18	18	16	21	2	-0.25	19
Huntly-Tainui Bridge	12	17	17	13	21	2	-0.10	17
Mercer Bridge	12	17	18	16	19	2	-0.24	18
Tuakau Bridge	12	18	18	16	21	2	0.74	18

Chlorophyll a (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.002	0.002	0.002	0.002	0.000	1.00	0.002
Ohaaki Bridge	12	0.002	0.002	0.002	0.003	0.000	<u>3.02</u>	0.002
Ohakuri Tailrace Bridge	12	0.005	0.005	0.002	0.013	0.006	0.61	0.005
Whakamaru Tailrace	12	0.007	0.009	0.002	0.015	0.008	-0.03	0.008
Waipapa Tailrace	12	0.007	0.006	0.002	0.017	0.006	0.75	0.008
Narrows Bridge	12	0.010	0.011	0.002	0.017	0.010	-0.39	0.011
Horotiu Bridge	12	0.011	0.012	0.002	0.020	0.008	-0.24	0.013
Huntly-Tainui Bridge	12	0.013	0.013	0.002	0.030	0.011	0.54	0.012
Mercer Bridge	12	0.017	0.018	0.002	0.035	0.015	0.12	0.019
Tuakau Bridge	12	0.022	0.023	0.002	0.040	0.023	-0.17	0.019

Colour (Munsell Colour Units)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	-	-	-	-	-	-	-	-
Ohaaki Bridge	12	49.2	50.0	42.5	57.5	6.3	0.19	50.0
Ohakuri Tailrace Bridge	12	40.4	40.0	35.0	47.5	5.0	0.42	40.0
Whakamaru Tailrace	12	37.7	37.5	32.5	42.5	1.3	-0.17	37.5
Waipapa Tailrace	12	36.3	36.3	27.5	40.0	5.0	-0.91	35.0
Narrows Bridge	12	34.2	33.8	25.0	42.5	5.0	-0.18	35.0
Horotiu Bridge	12	34.2	35.0	27.5	37.5	3.8	-0.79	32.5
Huntly-Tainui Bridge	12	32.1	32.5	27.5	37.5	3.8	0.34	30.0
Mercer Bridge	-	-	-	-	-	-	-	-
Tuakau Bridge	12	30.4	30.0	25.0	37.5	3.8	0.52	28.8

Conductivity at 25 °C (ms m ⁻¹)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	12.0	12.0	11.7	12.3	0.2	0.28	12.0
Ohaaki Bridge	12	15.8	15.6	13.9	18.7	1.4	0.88	15.2
Ohakuri Tailrace Bridge	12	17.5	17.8	15.7	18.6	1.6	-0.53	16.8
Whakamaru Tailrace	12	17.4	17.5	15.5	19.3	1.2	-0.13	16.7
Waipapa Tailrace	12	16.6	16.7	14.9	17.9	1.2	-0.52	16.2
Narrows Bridge	12	15.7	15.7	14.0	17.0	1.6	-0.21	15.5
Horotiu Bridge	12	15.9	15.9	14.4	17.2	1.6	-0.13	15.7
Huntly-Tainui Bridge	12	15.2	15.5	12.1	17.2	1.4	-0.89	14.8
Mercer Bridge	12	15.5	15.7	14.3	16.8	1.2	-0.09	15.3
Tuakau Bridge	12	15.6	15.7	14.3	17.1	1.2	0.15	15.2

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Dissolved Oxygen (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	10.0	10.1	9.2	10.6	0.9	-0.20	10.1
Ohaaki Bridge	12	9.9	9.9	8.4	12.2	1.7	0.50	10.0
Ohakuri Tailrace Bridge	12	9.9	10.1	8.5	11.1	1.0	-0.28	9.9
Whakamaru Tailrace	12	10.0	10.1	8.6	11.0	1.3	-0.18	9.9
Waipapa Tailrace	12	10.0	9.8	8.7	11.4	1.0	0.29	9.9
Narrows Bridge	12	9.9	9.8	8.5	11.5	1.2	0.18	9.9
Horotiu Bridge	12	9.9	9.7	8.5	11.4	1.6	0.33	10.0
Huntly-Tainui Bridge	12	9.6	9.3	8.7	11.3	1.0	0.91	9.8
Mercer Bridge	12	9.5	9.5	8.6	10.7	0.9	0.39	9.7
Tuakau Bridge	12	9.6	9.7	8.5	10.5	0.5	-0.46	9.7

Dissolved Oxygen (% Saturation)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	101.7	101.1	97.9	109.5	3.7	1.22	101.4
Ohaaki Bridge	12	103.5	101.8	96.9	117.0	9.0	0.89	103.3
Ohakuri Tailrace Bridge	12	104.5	102.6	94.0	117.0	11.2	0.35	101.8
Whakamaru Tailrace	12	103.1	102.6	91.0	115.5	11.6	0.12	105.0
Waipapa Tailrace	12	101.7	103.4	92.3	110.9	9.3	-0.12	103.3
Narrows Bridge	12	100.5	99.7	92.8	109.3	10.7	0.27	101.0
Horotiu Bridge	12	99.7	99.0	94.5	107.8	5.2	0.73	100.2
Huntly-Tainui Bridge	12	97.8	98.2	92.0	103.1	7.9	-0.10	98.8
Mercer Bridge	12	98.7	98.1	91.1	112.1	10.7	0.57	97.5
Tuakau Bridge	12	100.7	101.2	87.3	116.8	16.7	0.18	99.0

Enterococci (n/100 mL)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	6	1	1	38	4	<u>2.06</u>	1
Ohaaki Bridge	12	12	10	2	30	18	0.55	9
Ohakuri Tailrace Bridge	12	4	4	1	10	5	0.52	2
Whakamaru Tailrace	12	23	6	2	130	9	<u>1.92</u>	4
Waipapa Tailrace	12	7	6	1	22	5	1.55	4
Narrows Bridge	12	78	23	7	490	55	<u>2.51</u>	20
Horotiu Bridge	12	115	42	6	720	82	<u>2.50</u>	33
Huntly-Tainui Bridge	12	120	39	15	480	113	1.52	35
Mercer Bridge	12	105	18	5	810	61	<u>2.75</u>	15
Tuakau Bridge	12	56	20	1	200	96	1.12	21

Escherichia coli (n/100 mL)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	4	2	1	21	4	<u>1.89</u>	1
Ohaaki Bridge	12	16	16	3	28	14	-0.06	16
Ohakuri Tailrace Bridge	12	5	4	1	10	2	0.88	2
Whakamaru Tailrace	12	40	8	2	400	6	<u>3.01</u>	5
Waipapa Tailrace	12	11	7	2	41	8	<u>1.74</u>	10
Narrows Bridge	12	189	33	3	1300	127	<u>2.42</u>	43
Horotiu Bridge	12	501	100	15	4600	177	<u>2.98</u>	90
Huntly-Tainui Bridge	12	405	140	31	2400	475	<u>2.41</u>	180
Mercer Bridge	12	257	90	37	1300	177	<u>1.96</u>	90
Tuakau Bridge	12	165	54	20	1200	107	<u>2.87</u>	62

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Faecal Coliforms (n/100 mL)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	6	2	1	26	8	<u>1.82</u>	1
Ohaaki Bridge	12	22	24	3	46	18	0.19	24
Ohakuri Tailrace Bridge	12	6	4	1	16	5	1.18	3
Whakamaru Tailrace	12	46	10	3	400	9	<u>2.92</u>	6
Waipapa Tailrace	12	12	7	2	43	10	<u>1.68</u>	10
Narrows Bridge	12	207	35	24	1300	173	<u>2.30</u>	62
Horotiu Bridge	12	618	185	20	5600	222	<u>2.99</u>	160
Huntly-Tainui Bridge	12	461	165	43	2400	509	<u>2.14</u>	305
Mercer Bridge	12	330	105	40	1400	250	1.65	170
Tuakau Bridge	12	176	65	20	1200	112	<u>2.84</u>	105

Lithium (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.039	0.038	0.035	0.046	0.005	0.80	0.039
Ohaaki Bridge	12	0.097	0.090	0.067	0.158	0.027	1.20	0.087
Ohakuri Tailrace Bridge	12	0.123	0.132	0.091	0.144	0.034	-0.54	0.112
Whakamaru Tailrace	12	0.127	0.131	0.095	0.168	0.025	0.09	0.113
Waipapa Tailrace	12	0.110	0.115	0.084	0.142	0.026	0.08	0.096
Narrows Bridge	12	0.090	0.087	0.060	0.123	0.019	0.46	0.086
Horotiu Bridge	12	0.092	0.087	0.064	0.128	0.020	0.68	0.086
Huntly-Tainui Bridge	12	0.072	0.074	0.034	0.113	0.019	0.20	0.066
Mercer Bridge	12	0.072	0.074	0.039	0.091	0.014	-0.99	0.064
Tuakau Bridge	12	0.070	0.070	0.038	0.105	0.014	0.07	0.063

Nitrate/Nitrite Nitrogen (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.002	0.001	0.001	0.010	0.002	<u>2.05</u>	0.001
Ohaaki Bridge	12	0.037	0.035	0.003	0.067	0.023	-0.23	0.028
Ohakuri Tailrace Bridge	12	0.090	0.084	0.009	0.177	0.113	0.05	0.054
Whakamaru Tailrace	12	0.127	0.102	0.008	0.255	0.152	0.14	0.059
Waipapa Tailrace	12	0.178	0.168	0.078	0.337	0.157	0.36	0.113
Narrows Bridge	12	0.224	0.208	0.080	0.420	0.205	0.19	0.150
Horotiu Bridge	12	0.242	0.240	0.106	0.448	0.188	0.31	0.163
Huntly-Tainui Bridge	12	0.364	0.321	0.089	0.780	0.286	0.52	0.333
Mercer Bridge	12	0.348	0.308	0.002	0.786	0.288	0.38	0.336
Tuakau Bridge	12	0.306	0.239	0.001	0.755	0.344	0.53	0.290

Nitrogen - Ammoniacal (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.01	0.01	0.01	0.01	0.00	1.00	0.005
Ohaaki Bridge	12	0.01	0.01	0.01	0.02	0.01	<u>1.69</u>	0.005
Ohakuri Tailrace Bridge	12	0.01	0.01	0.01	0.04	0.01	<u>1.82</u>	0.005
Whakamaru Tailrace	12	0.01	0.01	0.01	0.01	0.00	<u>3.02</u>	0.005
Waipapa Tailrace	12	0.02	0.01	0.01	0.08	0.02	<u>2.48</u>	0.010
Narrows Bridge	12	0.02	0.02	0.01	0.04	0.02	0.57	0.020
Horotiu Bridge	12	0.01	0.01	0.01	0.06	0.01	<u>2.41</u>	0.015
Huntly-Tainui Bridge	12	0.02	0.01	0.01	0.11	0.01	<u>2.50</u>	0.010
Mercer Bridge	12	0.01	0.01	0.01	0.03	0.00	<u>2.06</u>	0.005
Tuakau Bridge	12	0.01	0.01	0.01	0.02	0.00	<u>2.56</u>	0.005

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Nitrogen - Total Kjeldahl (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.06	0.05	0.03	0.16	0.05	1.43	0.06
Ohaaki Bridge	12	0.06	0.06	0.03	0.12	0.04	0.36	0.09
Ohakuri Tailrace Bridge	12	0.10	0.10	0.03	0.17	0.07	0.11	0.12
Whakamaru Tailrace	12	0.14	0.17	0.05	0.19	0.07	-0.96	0.14
Waipapa Tailrace	12	0.14	0.15	0.07	0.22	0.07	0.14	0.15
Narrows Bridge	12	0.19	0.20	0.08	0.33	0.09	0.16	0.21
Horotiu Bridge	12	0.22	0.24	0.08	0.34	0.10	-0.05	0.24
Huntly-Tainui Bridge	12	0.27	0.26	0.14	0.48	0.08	0.96	0.27
Mercer Bridge	12	0.30	0.29	0.18	0.39	0.07	-0.06	0.33
Tuakau Bridge	12	0.32	0.32	0.20	0.45	0.14	0.13	0.34

Nitrogen - Total (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.06	0.05	0.03	0.16	0.04	1.40	0.06
Ohaaki Bridge	12	0.10	0.09	0.06	0.18	0.03	1.09	0.11
Ohakuri Tailrace Bridge	12	0.19	0.19	0.07	0.34	0.08	0.50	0.18
Whakamaru Tailrace	12	0.27	0.25	0.15	0.40	0.12	0.34	0.22
Waipapa Tailrace	12	0.31	0.28	0.24	0.46	0.12	0.78	0.26
Narrows Bridge	12	0.42	0.41	0.28	0.62	0.13	0.64	0.38
Horotiu Bridge	12	0.46	0.46	0.27	0.70	0.15	0.65	0.42
Huntly-Tainui Bridge	12	0.63	0.58	0.34	1.25	0.23	1.19	0.58
Mercer Bridge	12	0.65	0.64	0.39	1.10	0.30	0.71	0.66
Tuakau Bridge	12	0.63	0.56	0.35	1.06	0.38	0.68	0.63

pH (pH Units)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	11	7.5	7.5	7.2	7.9	0.3	0.07	7.6
Ohaaki Bridge	11	7.3	7.3	7.0	7.6	0.3	0.16	7.3
Ohakuri Tailrace Bridge	11	7.3	7.4	7.1	7.5	0.4	-0.47	7.4
Whakamaru Tailrace	11	7.4	7.4	7.2	7.6	0.3	-0.14	7.5
Waipapa Tailrace	11	7.4	7.4	7.1	7.6	0.3	-0.50	7.5
Narrows Bridge	11	7.4	7.5	7.1	7.8	0.2	-0.01	7.5
Horotiu Bridge	11	7.5	7.5	7.2	7.7	0.3	-0.69	7.5
Huntly-Tainui Bridge	11	7.4	7.4	7.2	7.7	0.4	0.13	7.5
Mercer Bridge	11	7.5	7.4	7.2	7.8	0.4	0.27	7.5
Tuakau Bridge	11	7.5	7.4	7.2	7.9	0.2	0.91	7.5

Phosphorus - Dissolved Reactive (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.003	0.002	0.002	0.006	0.003	0.80	0.006
Ohaaki Bridge	12	0.008	0.008	0.002	0.014	0.007	-0.29	0.010
Ohakuri Tailrace Bridge	12	0.011	0.011	0.002	0.017	0.007	-0.53	0.012
Whakamaru Tailrace	12	0.012	0.014	0.002	0.022	0.008	-0.33	0.012
Waipapa Tailrace	12	0.017	0.020	0.002	0.029	0.008	-0.60	0.015
Narrows Bridge	12	0.019	0.018	0.004	0.038	0.019	0.42	0.015
Horotiu Bridge	12	0.025	0.022	0.015	0.042	0.010	1.06	0.021
Huntly-Tainui Bridge	12	0.024	0.024	0.014	0.032	0.009	-0.09	0.023
Mercer Bridge	12	0.023	0.020	0.012	0.059	0.013	<u>1.70</u>	0.019
Tuakau Bridge	12	0.017	0.017	0.006	0.026	0.008	-0.24	0.016

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Phosphorus - Total (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.006	0.006	0.002	0.016	0.004	1.20	0.006
Ohaaki Bridge	12	0.014	0.015	0.002	0.025	0.009	-0.26	0.012
Ohakuri Tailrace Bridge	12	0.025	0.027	0.005	0.037	0.011	-0.95	0.021
Whakamaru Tailrace	12	0.029	0.031	0.008	0.039	0.010	-1.26	0.026
Waipapa Tailrace	12	0.034	0.036	0.013	0.046	0.009	-1.12	0.031
Narrows Bridge	12	0.044	0.041	0.024	0.077	0.013	1.05	0.035
Horotiu Bridge	12	0.053	0.050	0.039	0.086	0.014	1.34	0.046
Huntly-Tainui Bridge	12	0.068	0.065	0.045	0.102	0.017	0.73	0.064
Mercer Bridge	12	0.072	0.066	0.058	0.101	0.024	0.73	0.070
Tuakau Bridge	12	0.068	0.066	0.054	0.102	0.008	<u>1.95</u>	0.070

Temperature (°C)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	14.9	15.4	10.6	20.1	5.5	0.19	14.6
Ohaaki Bridge	12	16.3	16.7	12.0	21.1	5.8	0.06	16.4
Ohakuri Tailrace Bridge	12	16.6	16.6	11.7	21.7	5.5	0.24	16.5
Whakamaru Tailrace	12	16.5	16.4	11.3	22.2	5.8	0.19	16.3
Waipapa Tailrace	12	16.3	16.2	11.3	21.6	5.3	0.16	16.2
Narrows Bridge	12	16.3	16.3	11.4	21.6	6.2	0.06	16.1
Horotiu Bridge	12	16.3	16.4	11.2	21.7	6.2	0.03	16.2
Huntly-Tainui Bridge	12	16.4	16.6	10.6	22.1	6.5	-0.03	16.1
Mercer Bridge	12	17.2	17.4	11.6	23.5	6.8	0.01	17.0
Tuakau Bridge	12	17.6	18.0	12.0	24.0	7.0	0.03	17.3

Dissolved Solids - Total (g m ⁻³)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	87	88	79	91	5	-0.80	87
Ohaaki Bridge	12	112	113	92	130	19	-0.13	108
Ohakuri Tailrace Bridge	12	126	127	101	142	18	-0.55	123
Whakamaru Tailrace	12	129	133	107	147	16	-0.49	123
Waipapa Tailrace	12	125	129	103	144	18	-0.38	120
Narrows Bridge	12	118	120	98	130	16	-0.67	118
Horotiu Bridge	12	118	119	92	131	14	-1.04	118
Huntly-Tainui Bridge	12	114	118	90	127	17	-0.80	113
Mercer Bridge	12	116	115	103	130	9	0.26	116
Tuakau Bridge	12	116	117	101	130	10	-0.11	117

Turbidity (NTU)								
Location	Count	Mean	Median	Min	Max	IQR	Skew	5 Yr Median
Taupo Control Gates	12	0.3	0.3	0.2	0.6	0.1	<u>2.15</u>	0.3
Ohaaki Bridge	12	0.6	0.6	0.4	1.2	0.1	<u>1.89</u>	0.6
Ohakuri Tailrace Bridge	12	1.0	1.0	0.7	1.4	0.2	-0.03	1.0
Whakamaru Tailrace	12	1.2	1.1	0.7	1.8	0.5	0.40	1.2
Waipapa Tailrace	12	1.4	1.3	0.7	2.1	0.7	0.18	1.5
Narrows Bridge	12	2.6	1.9	1.1	6.7	1.4	1.54	2.4
Horotiu Bridge	12	3.0	2.5	1.4	6.0	1.7	1.04	3.0
Huntly-Tainui Bridge	12	7.3	4.9	1.9	20	4.9	1.36	5.4
Mercer Bridge	12	8.0	6.4	3.1	16	5.6	0.90	8.4
Tuakau Bridge	12	8.5	6.4	3.7	21.0	4.3	1.57	9.2

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

Major Ion Summary Statistics

Calcium - dissolved (g m ⁻³)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	12	6.69	6.78	5.92	7.19	0.36	-0.81
Ohaaki Bridge	12	6.84	6.91	5.79	7.39	0.46	-1.07
Ohakuri Tailrace Bridge	12	6.88	6.95	5.67	7.56	0.42	-1.11
Whakamaru Tailrace	12	6.64	6.80	5.64	7.08	0.43	-1.28
Waipapa Tailrace	12	6.36	6.53	5.48	6.90	0.63	-0.68
Narrows Bridge	12	6.28	6.28	5.67	6.78	0.54	-0.24
Horotiu Bridge	12	6.36	6.44	5.75	6.79	0.60	-0.33
Huntly-Tainui Bridge	12	7.11	7.09	6.03	8.57	0.89	0.44
Mercer Bridge	12	7.40	7.35	6.02	9.07	1.67	0.20
Tuakau Bridge	12	7.55	7.69	6.26	8.85	1.57	-0.03

Magnesium - dissolved (g m ⁻³)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	12	2.77	2.76	2.51	3.08	0.19	0.42
Ohaaki Bridge	12	2.83	2.80	2.58	3.12	0.29	0.37
Ohakuri Tailrace Bridge	12	2.82	2.81	2.54	3.12	0.33	0.12
Whakamaru Tailrace	12	2.73	2.72	2.55	3.00	0.07	0.79
Waipapa Tailrace	12	2.56	2.57	2.31	2.93	0.15	0.71
Narrows Bridge	12	2.57	2.55	2.45	2.72	0.12	0.46
Horotiu Bridge	12	2.62	2.63	2.48	2.79	0.13	0.29
Huntly-Tainui Bridge	12	2.53	2.52	2.12	2.85	0.31	-0.22
Mercer Bridge	12	2.62	2.62	2.29	2.93	0.20	-0.05
Tuakau Bridge	12	2.66	2.65	2.43	2.94	0.25	0.15

Potassium - dissolved (g m ⁻³)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	12	1.97	1.92	1.75	2.33	0.14	1.00
Ohaaki Bridge	12	2.90	2.88	2.34	3.92	0.65	0.70
Ohakuri Tailrace Bridge	12	3.40	3.34	2.94	4.28	0.36	0.99
Whakamaru Tailrace	12	3.58	3.54	3.05	4.35	0.52	0.70
Waipapa Tailrace	12	3.37	3.40	2.98	3.76	0.37	-0.22
Narrows Bridge	12	3.37	3.40	2.85	4.06	0.46	0.28
Horotiu Bridge	12	3.43	3.44	2.86	4.16	0.40	0.23
Huntly-Tainui Bridge	12	3.25	3.27	2.77	3.80	0.26	0.04
Mercer Bridge	12	3.33	3.34	2.73	3.69	0.37	-0.70
Tuakau Bridge	12	3.35	3.33	2.96	3.66	0.32	-0.13

Sodium - dissolved (g m ⁻³)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	12	12.3	12.1	11.5	13.8	0.8	1.07
Ohaaki Bridge	12	18.7	18.7	15.4	23.6	3.8	0.44
Ohakuri Tailrace Bridge	12	22.1	22.1	19.4	24.5	2.5	-0.17
Whakamaru Tailrace	12	22.5	22.3	20.1	24.9	2.5	-0.11
Waipapa Tailrace	12	21.1	21.3	18.8	22.8	2.1	-0.49
Narrows Bridge	12	19.2	19.0	16.9	21.4	3.2	0.05
Horotiu Bridge	12	19.5	19.5	17.0	21.9	2.8	-0.04
Huntly-Tainui Bridge	12	17.2	17.7	11.9	20.8	3.6	-0.68
Mercer Bridge	12	17.7	18.0	14.6	19.9	2.4	-0.37
Tuakau Bridge	12	18.0	18.1	14.3	20.9	2.2	-0.52

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

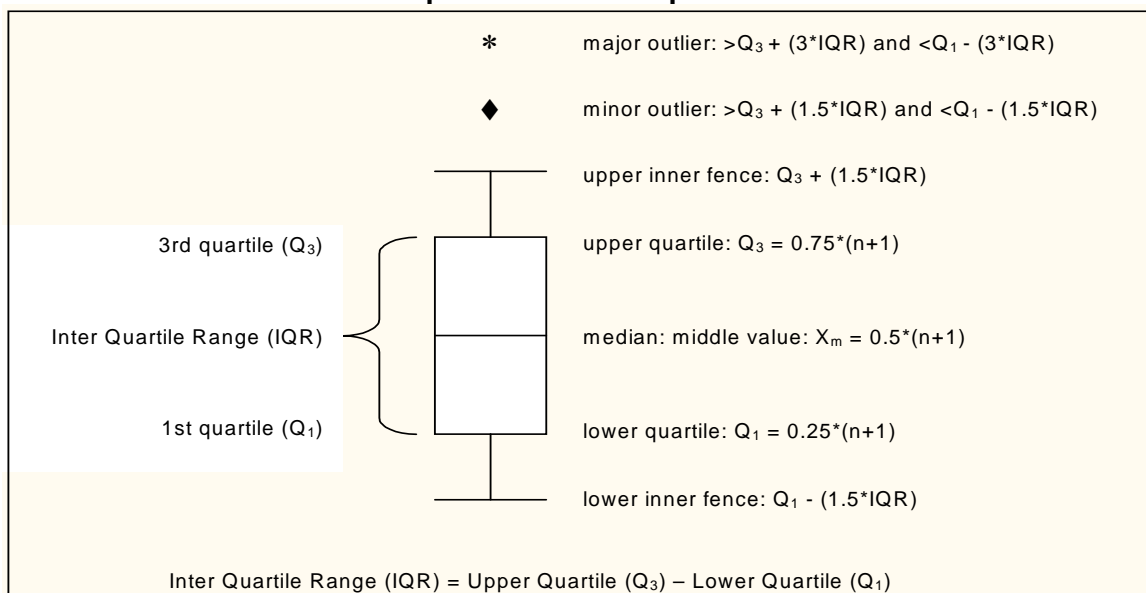
Alkalinity (units: g.m ⁻³ CaCO ₃)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	11	37	37	33	40	3	-0.05
Ohaaki Bridge	11	34	34	28	39	5	-0.55
Ohakuri Tailrace Bridge	11	35	35	29	39	6	-0.27
Whakamaru Tailrace	11	37	37	33	40	3	-0.30
Waipapa Tailrace	11	37	37	35	40	1	0.93
Narrows Bridge	11	39	39	37	40	2	-0.63
Horotiu Bridge	11	36	36	35	37	0	-0.13
Huntly-Tainui Bridge	11	35	34	29	39	5	-0.23
Mercer Bridge	11	38	38	36	40	3	0.06
Tuakau Bridge	11	39	39	37	40	2	-0.63

Bicarbonate (units: g.m ⁻³ HCO ₃)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	11	44	44	43	45	1	0.02
Ohaaki Bridge	11	45	45	43	49	1	1.47
Ohakuri Tailrace Bridge	11	47	47	45	48	2	-0.73
Whakamaru Tailrace	11	47	48	45	49	2	-0.61
Waipapa Tailrace	11	46	46	44	48	3	-0.12
Narrows Bridge	11	44	45	40	48	4	-0.24
Horotiu Bridge	11	45	45	40	49	4	-0.18
Huntly-Tainui Bridge	11	42	42	34	47	6	-0.47
Mercer Bridge	11	42	42	35	48	7	-0.18
Tuakau Bridge	11	42	42	35	48	7	-0.20

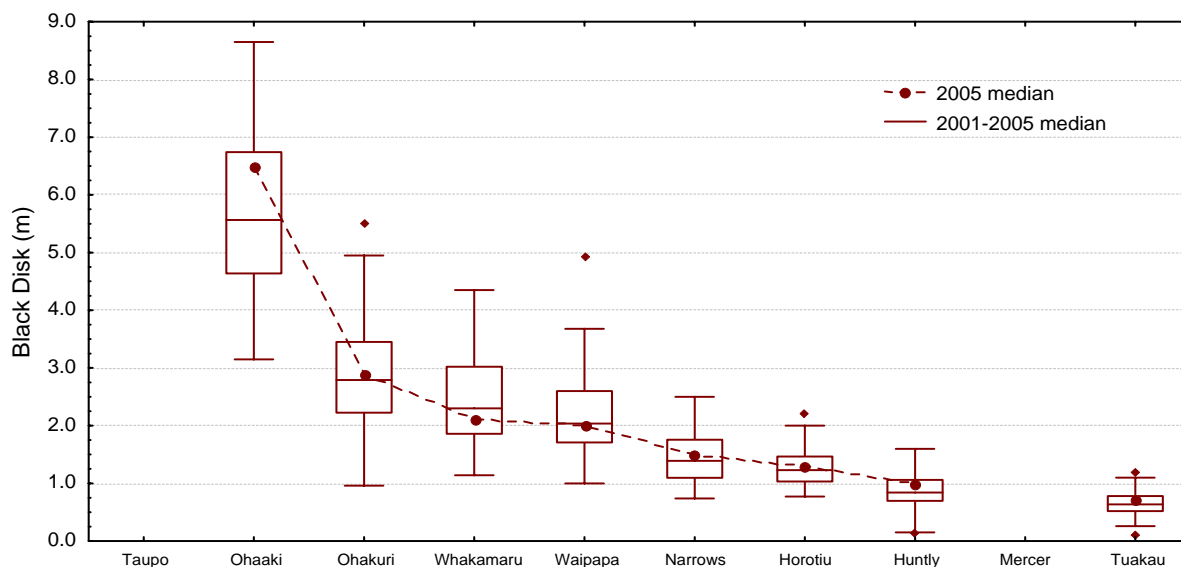
Sulphate (g m ⁻³)							
Location	Count	Mean	Median	Min	Max	IQR	Skew
Taupo Control Gates	12	8.1	8.1	7.6	9.5	0.6	1.52
Ohaaki Bridge	12	9.4	9.2	8.4	11.2	1.0	0.97
Ohakuri Tailrace Bridge	12	10.7	10.9	9.4	11.8	1.2	-0.30
Whakamaru Tailrace	12	10.1	10.1	9.1	10.8	1.0	-0.23
Waipapa Tailrace	12	9.9	9.6	8.7	11.8	1.0	1.00
Narrows Bridge	12	9.2	9.1	8.3	10.3	0.9	0.29
Horotiu Bridge	12	9.5	9.5	8.5	10.5	0.7	0.00
Huntly-Tainui Bridge	12	8.7	8.8	1.3	13.3	1.5	-1.30
Mercer Bridge	12	10.1	10.0	8.6	12.0	1.8	0.30
Tuakau Bridge	12	10.1	9.7	8.2	12.1	1.2	0.54

Skew = skewness. Underlined values = non-normal distribution. IQR = Inter Quartile Range

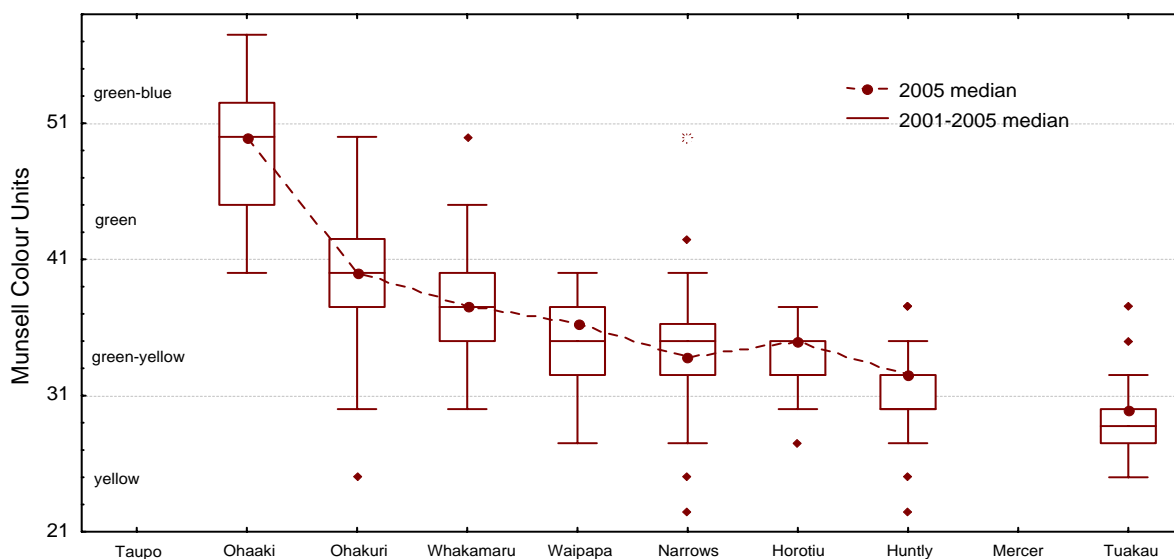
Boxplots are used to present data



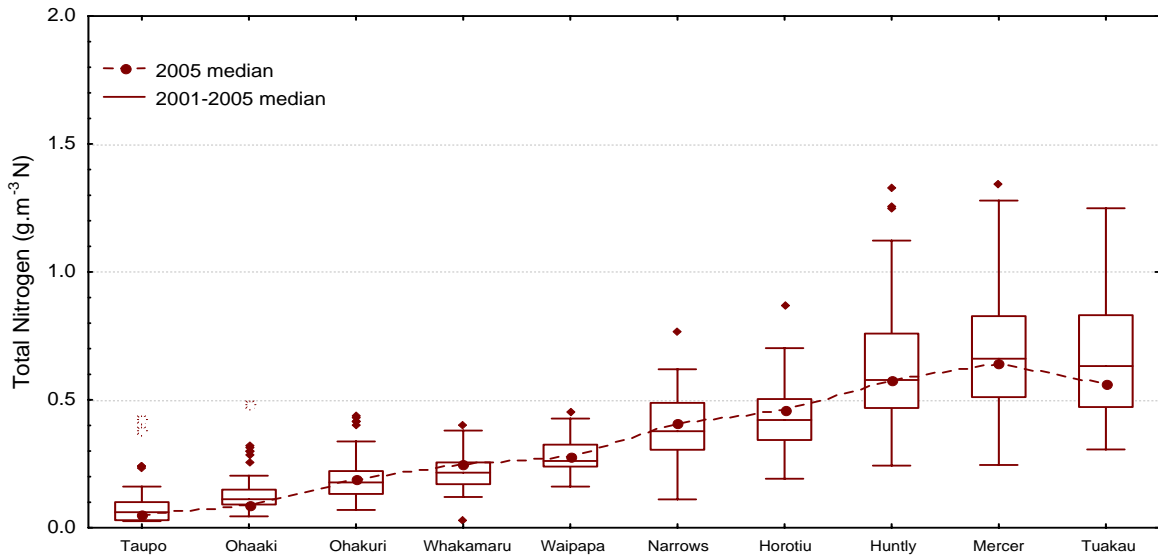
Black Disk, 2001-2005 Data



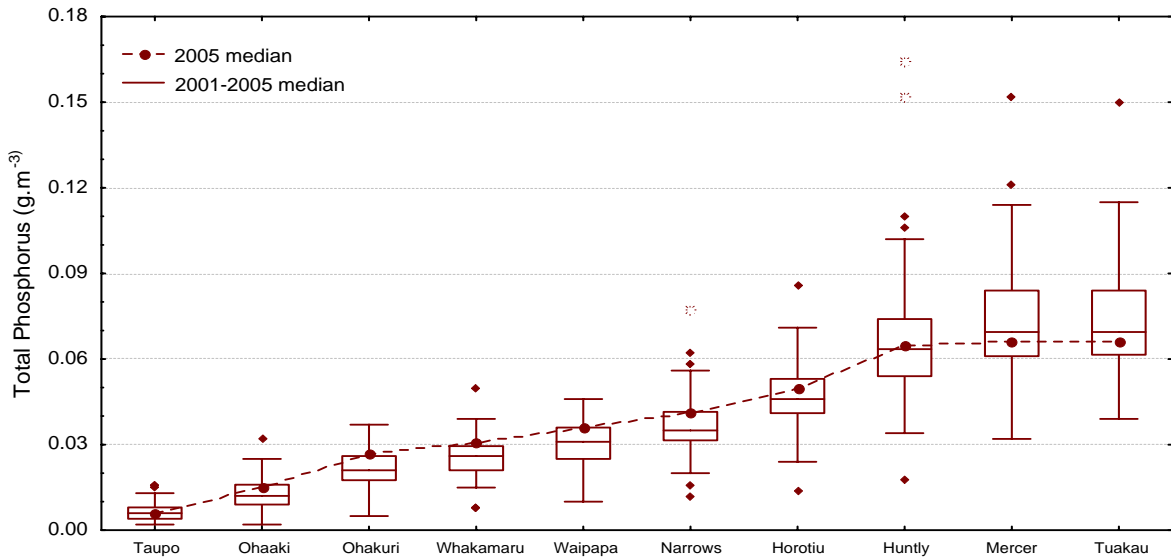
Colour, 2001-2005 Data



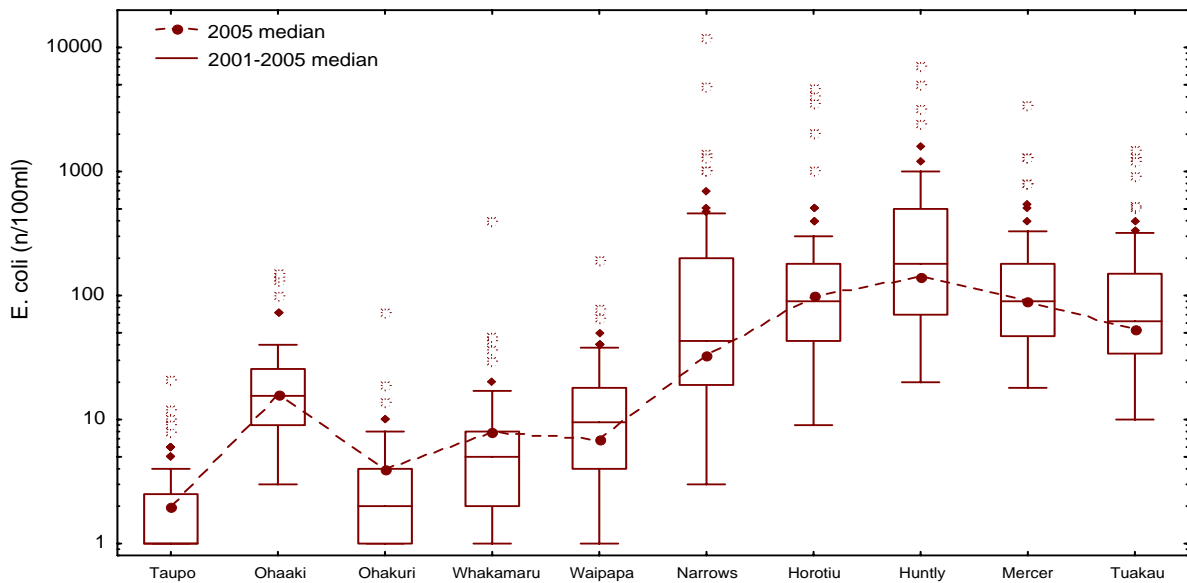
Total Nitrogen, 2001-2005 Data



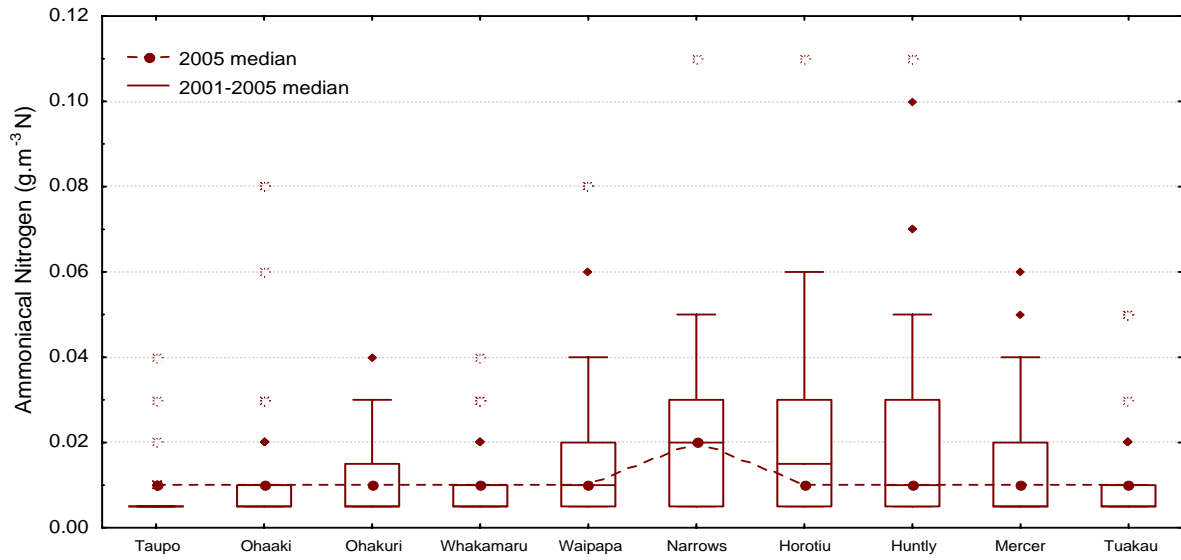
Total Phosphorus, 2001-2005 Data



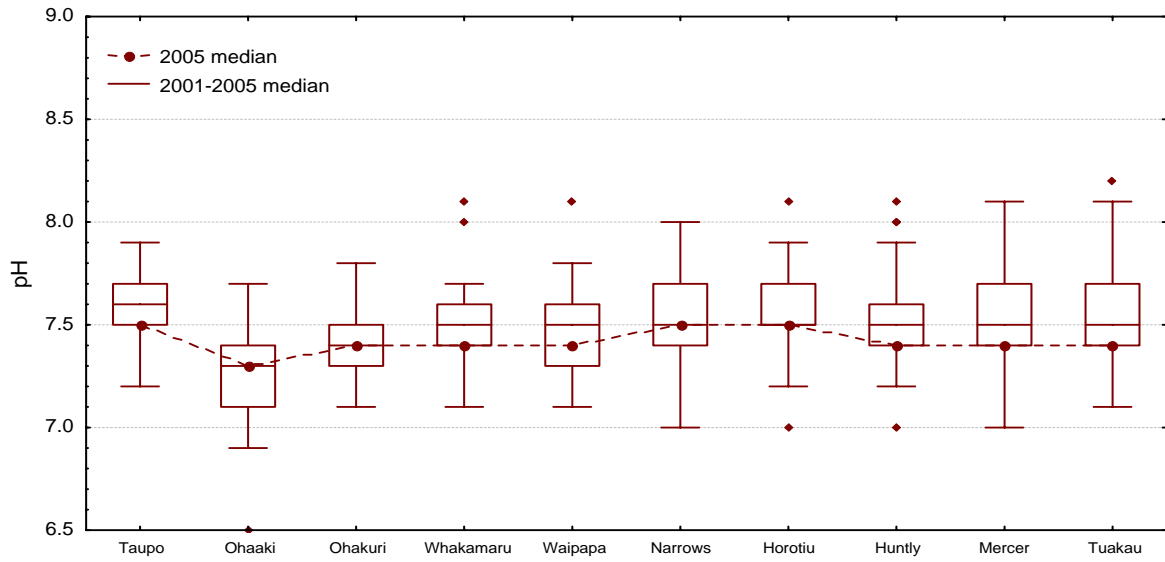
E.coli, 2001-2005 Data



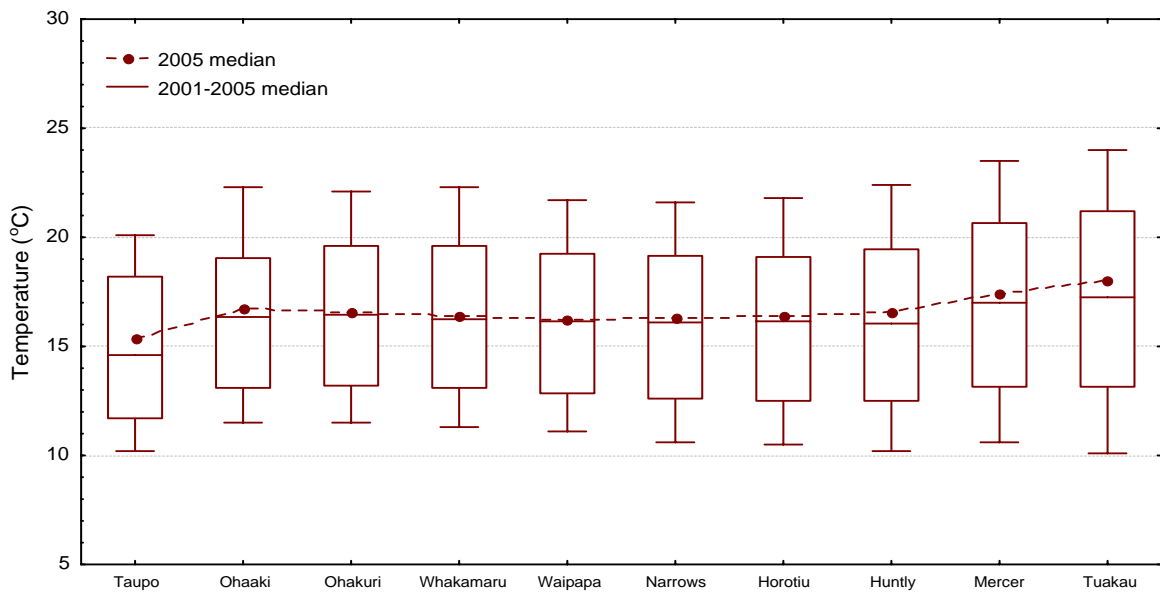
Ammoniacal Nitrogen, 2001-2005 Data



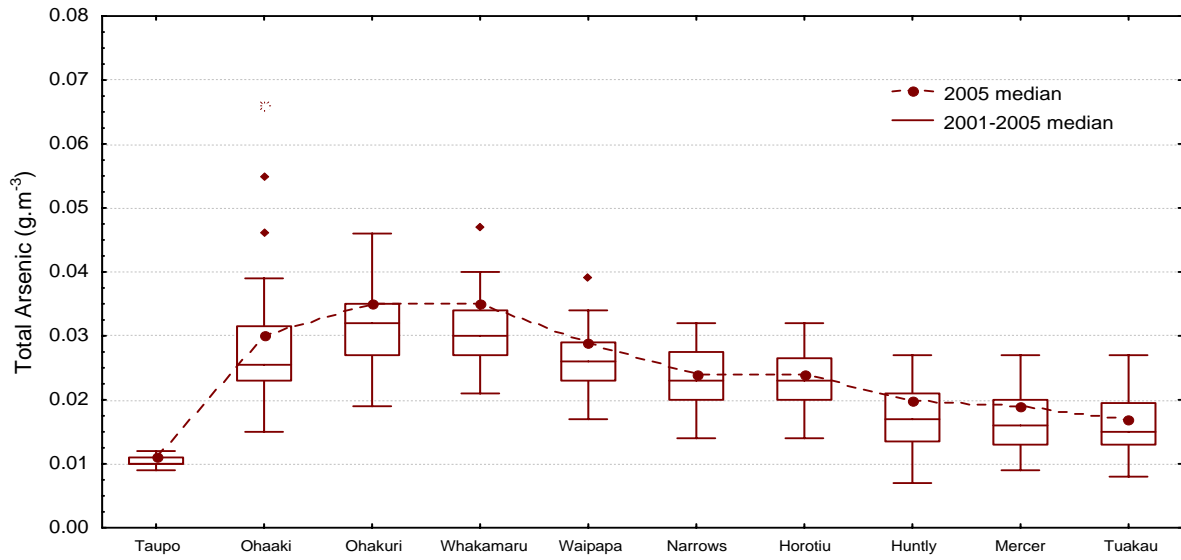
pH, 2001-2005 Data



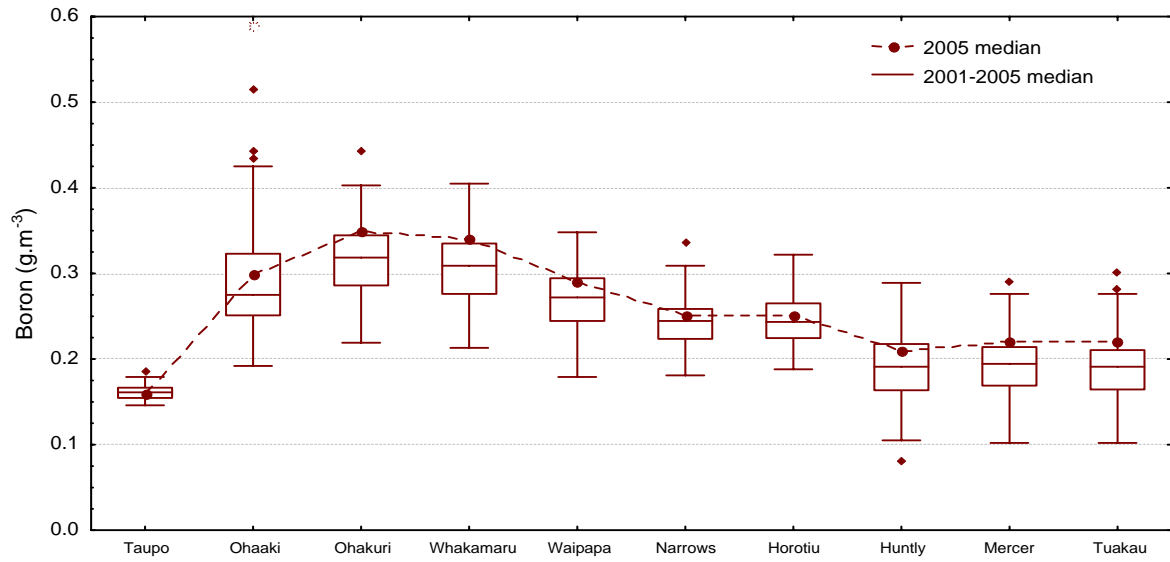
Temperature, 2001-2005 Data



Total Arsenic, 2001-2005 Data



Boron, 2001-2005 Data



Dissolved Oxygen, 2001-2005 Data

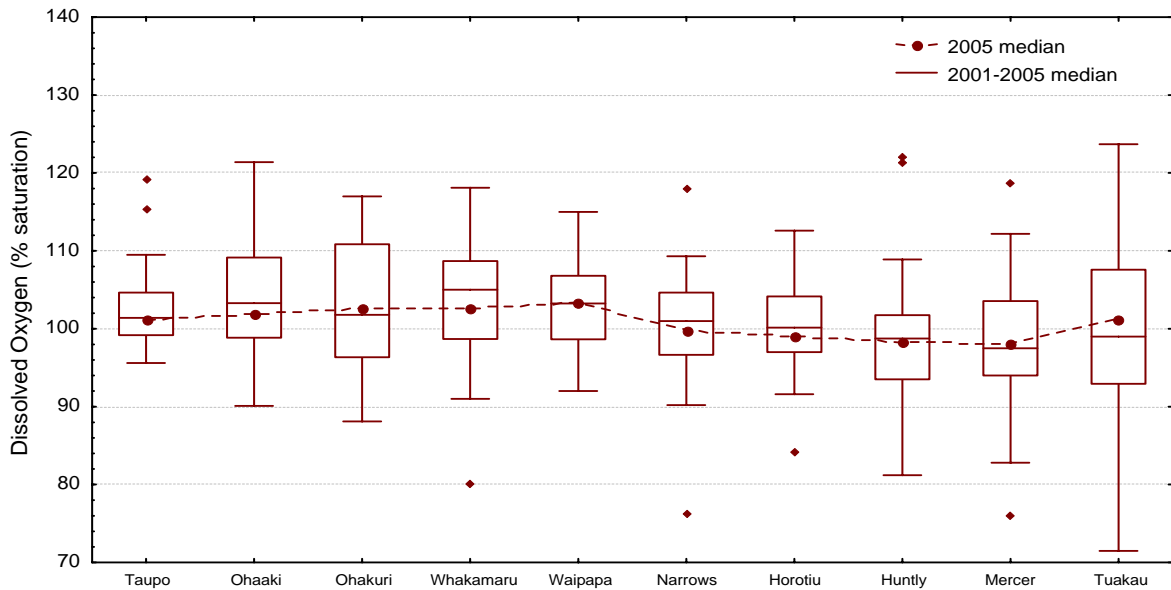


Table 3: Samples (Year 2005) complying with the ‘Satisfactory’ Water Quality Guidelines and Standards. n = 12 (except pH*, n=11).

Location	ECOLOGICAL HEALTH							HUMAN USES					
								Recreation			water supply	drinking water	
	DO	pH*	Turb	NH ₄ N	Temp	TP	TN	Bk ¹ Disk	E coli	Median E coli	CHLa	As	B
Taupo Gates	12	11	12	12	9	12	12	-	12	Y	12	2	12
Ohaaki Bridge	12	11	12	12	5	12	12	12/10	12	Y	12	0	12
Ohakuri Tailrace Br	12	11	12	12	5	12	12	11/11	12	Y	12	0	12
Whakamaru Tailrace	12	11	12	12	5	12	12	12/12	12	Y	12	0	12
Waipapa Tailrace	12	11	12	12	7	9	12	10/10	12	Y	12	0	12
Hamilton – Narrows	12	11	11	12	7	6	10	5/12	11	Y	12	0	12
Horotiu Bridge	12	11	10	12	7	1	9	4/12	11	Y	11	0	12
Huntly – Tainui Br	12	11	6	12	7	0	3	0/12	9	N	10	1	12
Mercer Bridge	12	11	3	12	4	0	4	-	10	Y	8	1	12
Tuakau Bridge	12	11	1	12	3	0	5	-	11	Y	6	1	12

¹ samples complying with the baseflow water clarity guideline from the number of samples measured when flow was below the upper decile of all flows

Table 4: Samples (Year 2005) complying with the ‘Excellent’ Water Quality Guidelines and Standards. n = 12 (except pH*, n=11).

Location	ECOLOGICAL HEALTH							HUMAN USES					
								Recreation			water supply	Drinking water	
	DO	pH*	Turb	NH ₄ N	Temp	TP	TN	Bk ¹ Disk	E coli	Median E coli	CHLa	As	B
Taupo Gates	12	11	12	12	3	10	10	-	12	Y	12	n/a	n/a
Ohaaki Bridge	12	11	12	12	1	3	7	12/12	12	Y	12	n/a	n/a
Ohakuri Tailrace Br	11	11	12	12	1	1	1	2/11	12	Y	6	n/a	n/a
Whakamaru Tailrace	12	11	12	12	1	1	0	0/12	11	Y	4	n/a	n/a
Waipapa Tailrace	12	11	11	12	1	0	0	0/10	12	Y	3	n/a	n/a
Hamilton – Narrows	12	11	7	12	1	0	0	0/12	9	N	3	n/a	n/a
Horotiu Bridge	12	11	3	12	1	0	0	0/12	4	N	2	n/a	n/a
Huntly – Tainui Br	12	11	1	11	1	0	0	0/12	4	N	2	n/a	n/a
Mercer Bridge	12	11	0	12	1	0	0	-	4	N	2	n/a	n/a
Tuakau Bridge	11	11	0	12	1	0	0	-	6	N	2	n/a	n/a

¹ samples complying with the baseflow water clarity guideline from the number of samples measured when flow was below the upper decile of all flows

DATE	TIME*	FLOW	BDISK	COLOR	COND	PH	TEMP	DO	PCDO	BOD5	TURB	TDS	NNN	NO3-N	NH4-N
dd/mm/yy	HH:MM	m ³ /s	m	units	mS/m	units	°C	g/m ³	%Sat	g/m ³	NTU	g/m ³	g/m ³	g/m ³	g/m ³
Satisfactory Water			>1.6	-	-	6.5-9	<12 (May-Sep)	>80	-	<5	-	-	-	-	<0.88
Quality Guideline/Standard							<20 (Oct-Apr)								

1131-127 UD= 263 m³/s (Flows from "Reids Farm")

Waikato River @ Taupo Control Gates

06/01/05	08:00	294	-	-	12.2	7.4	15.9	9.5	101.2	0.6	0.30	87	< 0.002	< 0.002	< 0.01
01/02/05	08:18	202	-	-	12.0	7.4	19.0	9.7	109.5	0.9	0.23	79	0.005	0.005	< 0.01
01/03/05	08:10	218	-	-	12.1	7.2	<u>20.1</u>	9.4	103.5	< 0.4	0.25	84	< 0.002	< 0.002	< 0.01
06/04/05	09:10	199	-	-	11.7	7.7	18.6	9.2	101.0	< 0.4	0.26	87	0.003	0.003	< 0.01
04/05/05	09:00	120	-	-	12.0	-	<u>15.5</u>	9.5	99.2	< 0.4	0.25	82	< 0.002	< 0.002	< 0.01
08/06/05	09:05	255	-	-	12.3	7.7	<u>12.7</u>	10.1	97.9	0.5	0.27	89	< 0.002	< 0.002	< 0.01
05/07/05	09:00	241	-	-	11.7	7.6	11.4	10.5	99.5	< 0.4	0.32	89	< 0.002	< 0.002	< 0.01
03/08/05	09:10	119	-	-	11.9	7.5	10.6	10.6	99.2	< 0.4	0.30	88	0.003	0.002	< 0.01
06/09/05	09:15	150	-	-	12.0	7.5	11.2	10.5	99.5	0.6	0.60	89	< 0.002	< 0.002	< 0.01
05/10/05	08:00	61	-	-	11.9	7.7	12.3	10.3	102.5	0.4	0.40	91	< 0.002	< 0.002	< 0.01
02/11/05	08:30	223	-	-	11.8	7.9	15.2	10.2	104.6	< 0.4	0.27	91	0.010	0.009	< 0.01
05/12/05	08:10	212	-	-	11.9	7.4	16.0	10.1	102.3	0.4	0.25	85	< 0.002	< 0.002	< 0.01

1131-105 UD= 274 m³/s (Flows from Ohaaki Bridge Recorder, +/- 20%)

Waikato River @ Ohaaki Br

06/01/05	08:55	254	> 5.2	50.0	14.8	7.1	16.7	10.4	111.4	1.2	0.63	106	0.022	0.022	< 0.01
01/02/05	09:20	115	7.0	52.5	15.6	7.0	<u>20.2</u>	8.7	100.0	0.4	0.46	92	0.035	0.035	0.01
01/03/05	08:50	116	6.2	42.5	15.1	7.0	<u>21.1</u>	8.4	97.0	0.3	0.47	100	0.033	0.032	< 0.01
06/04/05	10:25	92	8.0	50.0	15.7	7.3	19.9	8.7	96.9	< 0.4	0.43	124	0.044	0.043	< 0.01
04/05/05	10:06	102	5.2	45.0	15.6	-	<u>16.9</u>	9.5	101.4	< 0.4	0.56	105	0.050	0.049	< 0.01
08/06/05	09:50	198	5.3	57.5	14.5	7.6	<u>13.1</u>	11.2	109.0	< 0.4	0.54	108	0.025	0.025	< 0.01
05/07/05	09:50	191	7.2	45.0	13.9	7.3	<u>12.4</u>	12.2	117.0	< 0.4	1.16	97	0.030	0.030	0.01
03/08/05	10:00	87	5.4	50.0	16.0	7.2	<u>12.0</u>	10.7	102.2	< 0.4	0.62	119	0.051	0.051	< 0.01
06/09/05	10:00	83	6.9	52.5	16.6	7.5	<u>13.6</u>	10.3	102.2	0.5	0.63	117	0.050	0.049	0.01
05/10/05	08:50	64	7.0	45.0	18.7	7.2	15.3	9.3	98.2	0.5	0.75	130	0.067	0.066	0.02
02/11/05	09:55	236	> 5.0	50.0	15.0	7.5	16.6	10.2	107.1	0.5	0.61	119	0.003	< 0.002	< 0.01
05/12/05	08:50	117	7.1	50.0	17.5	7.3	18.3	9.0	100.0	< 0.4	0.63	123	0.035	0.034	0.01

1131-107 UD= 309 m³/s (Flows from Ohakuri Dam - Total)

Waikato River @ Ohakuri Tailrace Br

06/01/05	09:55	287	2.9	42.5	17.8	7.1	18.0	9.0	98.5	1.0	1.06	128	0.073	0.070	< 0.01
01/02/05	10:15	256	1.9	35.0	16.9	7.1	<u>21.7</u>	9.3	110.0	0.8	1.09	101	0.009	0.008	< 0.01
01/03/05	10:00	242	<u>1.0</u>	37.5	16.7	7.1	<u>21.7</u>	10.2	117.0	0.6	0.70	114	0.010	0.010	< 0.01
06/04/05	11:20	192	3.5	40.0	18.4	7.4	<u>20.3</u>	8.5	95.0	0.6	0.73	142	0.083	0.083	0.04
04/05/05	11:01	204	4.2	42.5	17.7	-	<u>16.7</u>	9.6	101.0	0.4	0.84	118	0.084	0.083	< 0.01
08/06/05	10:50	276	3.0	47.5	18.4	7.5	<u>13.4</u>	9.5	94.0	0.4	1.02	136	0.154	0.152	0.01
05/07/05	11:05	252	4.6	45.0	16.0	7.3	11.7	10.8	101.7	< 0.4	1.03	120	0.116	0.115	0.03
03/08/05	11:00	207	3.2	42.5	18.2	7.3	<u>12.7</u>	10.3	102.1	0.4	1.26	139	0.177	0.175	< 0.01
06/09/05	10:50	164	2.2	40.0	18.6	7.5	<u>14.0</u>	10.5	104.0	0.8	1.10	137	0.137	0.134	< 0.01
05/10/05	10:00	153	3.4	37.5	18.4	7.4	14.6	10.0	103.1	0.7	1.01	131	0.168	0.165	< 0.01
02/11/05	10:55	203	2.0	37.5	15.7	7.5	16.4	11.1	115.4	1.0	1.41	122	0.032	0.029	< 0.01
05/12/05	09:45	354	(1.7)	37.5	17.0	7.5	17.5	10.2	111.8	1.0	1.12	125	0.033	0.031	0.01

1131-147 UD= 305 m³/s (Flows from Whakamaru Dam - Total)

Waikato River @ Whakamaru Tailrace

06/01/05	10:50	175	2.0	37.5	18.0	7.3	18.4	9.8	107.1	0.9	1.76	134	0.051	0.051	0.01
01/02/05	10:55	229	1.6	32.5	17.4	7.2	<u>22.2</u>	10.3	115.5	1.0	1.68	107	0.008	0.008	< 0.01
01/03/05	10:45	218	1.9	37.5	16.8	7.2	<u>21.7</u>	8.8	102.2	0.8	1.03	121	0.032	0.031	< 0.01
06/04/05	12:05	267	3.0	37.5	17.7	7.4	<u>20.0</u>	8.6	94.7	0.7	0.82	140	0.090	0.088	< 0.01
04/05/05	12:22	201	3.5	37.5	17.6	-	<u>16.4</u>	9.3	96.3	0.6	0.70	137	0.110	0.109	< 0.01
08/06/05	11:30	278	2.6	37.5	19.3	7.5	<u>13.2</u>	9.4	91.0	< 0.4	0.86	147	0.232	0.228	< 0.01
05/07/05	11:50	223	3.9	42.5	16.1	7.3	11.3	11.0	101.1	0.6	1.00	119	0.193	0.191	< 0.01
03/08/05	11:40	265	2.7	40.0	17.3	7.4	<u>12.3</u>	10.2	96.7	0.5	1.11	132	0.255	0.253	< 0.01
06/09/05	11:35	122	1.8	40.0	18.2	7.6	<u>13.6</u>	11.0	106.5	0.9	1.18	133	0.197	0.194	< 0.01
05/10/05	10:55	268	2.1	35.0	18.0	7.5	14.5	10.1	103.0	0.5	1.11	134	0.210	0.206	< 0.01
02/11/05	11:43	297	1.7	37.5	15.5	7.6	16.4	11.0	113.8	< 0.8	1.54	119	0.094	0.091	< 0.01
05/12/05	10:30	283	1.7	37.5	16.8	7.6	18.0	10.0	109.0	1.0	1.40	130	0.052	0.052	< 0.01

Note: < = less than value stated
UD = upper decile flow (period 1986-2005 inclusive)

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

* New Zealand Standard Time

() black disk measurements taken in flows above upper decile value – don't assess for compliance

TKN g/m ³	TN g/m ³	DRP g/m ³	TP g/m ³	CL g/m ³	AS g/m ³	B g/m ³	LI g/m ³	A340F /cm	A440F /cm	ENT	FC cfu/100ml	E coli	CHLA g/m ³	DOC g/m ³	TOC g/m ³
-	<0.5	-	<0.04	-	<0.01	<1.4	-	-	-	<77	-	<550	<0.02		
0.16	0.16	0.005	0.004	8.5	0.010	0.15	0.040	<0.002	<0.002	2	1	1	<0.003	0.5	1.3
<0.05	0.03	<0.004	<0.004	7.8	<u>0.011</u>	0.16	0.037	0.004	<0.002	1	4	4	<0.003	0.6	0.9
0.05	0.05	0.006	0.005	8.5	<u>0.011</u>	0.16	0.037	<0.002	<0.002	4	10	3	<0.003	0.5	1.0
<0.05	0.03	0.006	0.006	8.8	<u>0.012</u>	0.17	0.039	0.002	<0.002	1	1	1	<0.003	0.6	1.5
<0.05	0.03	0.005	0.016	9.0	<u>0.011</u>	0.17	0.046	<0.002	<0.002	38	26	21	<0.003	0.4	1.0
0.05	0.05	<0.004	0.004	8.9	<u>0.011</u>	0.16	0.037	<0.002	<0.002	<1	<1	<1	<0.003	0.5	0.8
<0.05	0.03	<0.004	0.008	9.2	0.010	0.17	0.035	<0.002	<0.002	<1	2	2	<0.003	0.6	1.5
<0.05	0.03	<0.004	0.008	8.6	<u>0.011</u>	0.17	0.037	<0.002	<0.002	<1	1	1	<0.003	0.7	1.0
0.06	0.06	<0.004	0.010	8.4	<u>0.011</u>	0.17	0.044	<0.002	<0.002	4	<1	<1	<0.003	0.3	0.9
0.08	0.08	<0.004	0.004	8.7	<u>0.011</u>	0.16	0.039	<0.002	<0.002	22	12	12	<0.003	1.0	1.2
0.10	0.11	<0.004	0.007	8.6	<u>0.011</u>	0.18	0.042	<0.002	<0.002	<1	7	6	<0.003	1.0	1.0
0.06	0.06	<0.004	<0.004	8.5	<u>0.012</u>	0.15	0.036	0.003	<0.002	<1	1	1	<0.003	0.4	1.3
0.07	0.09	0.011	0.014	14.4	<u>0.022</u>	0.24	0.078	0.003	<0.002	19	46	23	<0.003	0.5	1.3
0.07	0.11	<0.004	0.008	16.5	<u>0.031</u>	0.28	0.087	0.005	<0.002	25	30	28	<0.003	0.4	1.0
0.05	0.08	0.014	0.014	16.4	<u>0.026</u>	0.26	0.080	0.003	<0.002	13	29	14	<0.003	0.7	1.1
0.06	0.10	0.009	0.016	19.0	<u>0.034</u>	0.31	0.096	0.004	<0.002	24	20	14	<0.003	0.5	1.1
0.06	0.11	0.012	0.017	18.2	<u>0.030</u>	0.29	0.099	0.005	<0.002	30	34	22	<0.003	0.6	1.3
0.06	0.09	0.007	0.011	14.2	<u>0.022</u>	0.25	0.076	0.003	<0.002	11	11	9	<0.003	0.5	0.8
<0.05	0.06	<0.004	0.019	14.8	<u>0.023</u>	0.25	0.067	0.003	<0.002	5	9	8	<0.003	0.4	1.1
<0.05	0.08	0.010	0.022	18.9	<u>0.029</u>	0.32	0.093	0.003	<0.002	2	3	3	<0.003	0.7	1.0
<0.05	0.08	0.007	0.008	19.7	<u>0.034</u>	0.36	0.113	0.004	<0.002	2	28	26	<0.003	1.8	2.0
0.11	0.18	0.012	0.025	23.9	<u>0.039</u>	0.44	0.130	0.004	<0.002	6	17	17	0.003	1.3	1.4
0.09	0.09	<0.004	<0.004	16.2	<u>0.026</u>	0.33	0.087	0.003	<0.002	2	12	8	<0.003	1.0	0.9
0.12	0.16	0.007	0.017	23.8	<u>0.046</u>	0.34	0.158	0.005	<0.002	8	29	21	<0.003	0.5	1.1
0.12	0.19	0.017	0.027	21.1	<u>0.034</u>	0.32	0.122	0.007	<0.002	10	9	4	0.003	0.4	1.9
0.13	0.14	0.014	0.016	18.5	<u>0.036</u>	0.31	0.105	0.006	<0.002	2	4	4	0.007	0.6	1.3
0.06	0.07	0.011	0.019	19.5	<u>0.034</u>	0.31	0.102	0.005	<0.002	1	1	1	0.007	0.9	1.1
0.13	0.21	0.004	0.033	24.8	<u>0.043</u>	0.40	0.138	0.008	<0.002	<1	10	10	0.007	0.8	1.3
0.05	0.13	0.014	0.023	22.2	<u>0.035</u>	0.36	0.137	0.008	0.003	3	6	4	0.003	0.7	1.1
0.08	0.23	0.017	0.027	22.0	<u>0.034</u>	0.38	0.144	0.008	<0.002	4	6	6	<0.003	0.5	1.2
<0.05	0.14	0.010	0.031	18.3	<u>0.027</u>	0.32	0.091	0.005	<0.002	2	2	2	<0.003	0.4	1.3
0.06	0.24	0.014	0.033	22.7	<u>0.032</u>	0.38	0.127	0.007	<0.002	8	4	4	<0.003	0.9	1.2
0.07	0.21	0.010	0.037	22.1	<u>0.037</u>	0.40	0.142	0.006	<0.002	4	4	4	0.008	0.5	1.0
0.17	0.34	0.011	0.030	23.2	<u>0.040</u>	0.38	0.137	0.007	<0.002	8	4	4	<0.003	1.0	1.5
0.11	0.14	<0.004	0.005	17.5	<u>0.029</u>	0.33	0.096	0.006	<0.002	5	16	10	0.013	1.3	1.2
0.16	0.19	<0.004	0.024	20.5	<u>0.036</u>	0.29	0.137	0.009	0.003	5	1	1	0.008	0.5	1.7
0.19	0.24	0.014	0.026	22.1	<u>0.034</u>	0.33	0.129	0.008	<0.002	7	9	8	0.010	0.6	1.7
0.14	0.15	0.016	0.021	20.1	<u>0.039</u>	0.33	0.118	0.007	<0.002	6	10	9	0.010	0.7	1.2
0.19	0.22	0.014	0.028	19.6	<u>0.035</u>	0.30	0.106	0.006	<0.002	6	3	2	0.011	0.7	1.2
0.16	0.25	0.008	0.030	22.4	<u>0.037</u>	0.37	0.133	0.010	0.002	2	60	4	0.008	0.7	1.6
0.07	0.18	0.015	0.025	22.2	<u>0.035</u>	0.36	0.144	0.007	<0.002	14	15	9	0.003	0.4	1.3
0.17	0.40	0.022	0.036	23.9	<u>0.034</u>	0.41	0.168	0.011	0.002	2	8	8	<0.003	0.5	1.4
0.05	0.24	0.015	0.035	18.6	<u>0.027</u>	0.30	0.095	0.007	<0.002	2	6	5	0.003	0.6	1.3
0.07	0.33	0.017	0.034	22.0	<u>0.028</u>	0.35	0.122	0.008	<0.002	2	3	3	<0.003	0.9	1.4
0.17	0.37	0.008	0.039	21.7	<u>0.033</u>	0.36	0.135	0.010	0.003	130	14	11	0.015	0.5	1.3
0.17	0.38	0.010	0.031	23.6	<u>0.036</u>	0.38	0.139	0.009	<0.002	3	16	16	0.006	2.4	2.9
0.16	0.25	<0.004	0.008	17.5	<u>0.029</u>	0.32	0.095	0.009	0.002	6	9	8	0.009	1.1	1.3
0.18	0.23	<0.004	0.035	20.0	<u>0.037</u>	0.30	0.134	0.012	0.004	90	400	400	0.011	0.7	1.7

Note: < = less than value stated

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

() black disk measurements taken in flows above upper decile value – don't assess for compliance

DATE	TIME*	FLOW	BDISK	COLOR	COND	PH	TEMP	DO	PCDO	BOD5	TURB	TDS	NNN	NO3-N	NH4-N
dd/mm/yy	HH:MM	m ³ /s	m	units	mS/m	units	°C	g/m ³	%Sat	g/m ³	NTU	g/m ³	g/m ³	g/m ³	g/m ³
Satisfactory Water			>1.6	-	-	6.5-9	<12 (May-Sep)	>80	-	<5	-	-	-	-	<0.88
Quality Guideline/Standard							<20 (Oct-Apr)								

1131-143 UD= 351 m³/s (Flows from Waipapa Dam - Total)

Waikato River @ Waipapa Tailrace

06/01/05	11:37	401	(1.4)	35.0	17.2	7.3	18.2	9.7	105.2	0.7	2.14	128	0.086	0.084	0.02
01/02/05	11:40	299	<u>1.6</u>	32.5	16.5	7.1	<u>21.6</u>	9.2	106.0	0.7	1.57	103	0.078	0.075	0.02
01/03/05	11:30	310	1.7	35.0	16.3	7.1	<u>21.3</u>	9.7	103.1	0.5	1.24	118	0.082	0.080	0.01
06/04/05	12:50	293	2.6	37.5	17.3	7.4	19.6	8.7	94.2	0.5	0.93	124	0.163	0.160	0.02
04/05/05	13:10	221	2.7	40.0	17.3	-	<u>16.1</u>	9.5	97.0	< 0.4	0.95	144	0.173	0.170	< 0.01
08/06/05	12:15	318	2.0	35.0	17.9	7.6	<u>13.3</u>	9.6	92.3	< 0.4	0.72	132	0.257	0.255	< 0.01
05/07/05	12:30	252	3.3	40.0	15.8	7.3	11.3	10.8	98.4	< 0.4	1.21	110	0.215	0.214	< 0.01
03/08/05	12:10	301	2.2	40.0	16.9	7.4	11.9	10.2	95.6	< 0.4	1.13	130	0.337	0.333	0.08
06/09/05	12:15	238	1.8	40.0	17.1	7.6	<u>13.9</u>	11.4	109.0	1.0	1.40	136	0.254	0.253	< 0.01
05/10/05	11:35	363	(2.0)	27.5	16.4	7.5	14.0	10.3	103.6	0.4	1.75	129	0.266	0.262	0.01
02/11/05	12:32	309	1.7	35.0	14.9	7.5	16.2	10.9	110.9	0.8	1.74	112	0.112	0.108	< 0.01
05/12/05	11:05	316	1.9	37.5	15.9	7.6	17.8	9.8	105.2	0.6	1.67	133	0.113	0.111	0.02

1131-101 UD= 357 m³/s (Flows from Karapiro Dam - Total)

Waikato River @ Narrows Br

06/01/05	08:00	343	<u>1.2</u>	32.5	16.9	7.3	18.6	9.8	106.0	1.2	2.48	127	0.125	0.122	0.02
02/02/05	07:45	294	1.8	32.5	14.8	7.1	<u>21.6</u>	8.9	101.1	1.0	1.80	98	0.080	0.077	0.02
01/03/05	08:10	220	<u>1.3</u>	37.5	16.0	7.2	<u>21.1</u>	8.5	95.5	0.9	2.05	116	0.089	0.087	0.02
06/04/05	08:50	206	<u>1.5</u>	37.5	15.7	7.5	19.8	9.8	106.6	0.8	1.81	119	0.109	0.106	< 0.01
04/05/05	08:55	200	<u>1.3</u>	30.0	17.0	-	<u>16.4</u>	9.4	95.8	1.1	3.56	126	0.232	0.228	< 0.01
08/06/05	09:00	231	2.1	37.5	16.9	7.6	<u>13.1</u>	9.8	92.8	0.8	1.14	127	0.317	0.315	< 0.01
06/07/05	08:45	195	1.9	42.5	15.3	7.5	11.4	10.5	94.6	< 0.4	1.41	121	0.326	0.323	0.04
02/08/05	09:00	274	<u>0.8</u>	35.0	14.0	7.5	11.5	10.7	98.6	0.6	4.97	115	0.420	0.418	0.03
06/09/05	09:10	241	1.9	32.5	16.3	7.8	<u>12.9</u>	11.5	107.6	0.9	1.66	130	0.293	0.290	< 0.01
04/10/05	08:15	222	<u>0.7</u>	25.0	15.5	7.4	14.2	9.9	97.2	1.2	<u>6.70</u>	124	0.330	0.325	0.02
01/11/05	07:50	296	<u>1.5</u>	32.5	14.6	7.5	16.2	10.8	109.3	0.8	1.66	106	0.183	0.182	< 0.01
05/12/05	07:45	163	2.5	35.0	15.7	7.4	18.3	9.4	100.7	0.9	1.97	104	0.183	0.180	0.02

1131-69 UD= 380 m³/s (Flows from Hamilton - Bridge Street Bridge)

Waikato River @ Horotiu Br

06/01/05	09:25	379	<u>1.0</u>	32.5	16.9	7.3	18.6	9.2	99.5	1.1	3.22	130	0.157	0.155	0.01
02/02/05	09:00	284	<u>1.5</u>	32.5	14.9	7.2	<u>21.7</u>	9.0	102.5	1.1	2.36	92	0.106	0.102	< 0.01
01/03/05	09:15	198	<u>1.1</u>	37.5	16.3	7.2	<u>21.1</u>	8.5	95.2	1.0	2.11	121	0.107	0.105	< 0.01
06/04/05	09:45	177	<u>1.4</u>	37.5	15.8	7.6	19.7	9.1	97.0	0.9	1.97	117	0.134	0.131	< 0.01
04/05/05	10:00	196	<u>1.0</u>	32.5	17.2	-	<u>16.4</u>	9.5	96.6	1.1	<u>5.03</u>	124	0.259	0.255	< 0.01
08/06/05	09:55	269	1.9	35.0	16.8	7.6	<u>13.1</u>	10.0	94.5	0.8	1.40	128	0.323	0.321	< 0.01
06/07/05	09:30	198	1.7	37.5	15.3	7.5	11.2	11.1	101.5	< 0.4	1.70	114	0.289	0.287	0.02
02/08/05	10:00	243	<u>1.1</u>	35.0	14.4	7.6	11.5	10.8	98.5	0.8	4.23	115	0.448	0.445	0.06
06/09/05	10:10	182	1.8	35.0	16.5	7.7	<u>12.8</u>	11.4	106.6	0.9	2.49	125	0.344	0.342	< 0.01
04/10/05	09:00	234	<u>0.8</u>	27.5	15.6	7.5	14.4	9.8	97.0	0.9	<u>6.00</u>	131	0.362	0.350	0.02
01/11/05	09:15	336	<u>1.2</u>	32.5	14.9	7.6	16.4	10.6	107.8	1.2	2.46	111	0.157	0.141	< 0.01
05/12/05	09:05	173	1.8	35.0	16.0	7.5	18.4	9.3	99.8	0.9	2.62	112	0.220	0.209	0.01

1131-77 UD= 582 m³/s (Flows from Huntly Power Station Recorder)

Waikato River @ Huntly-Tainui Br

06/01/05	10:40	436	<u>0.8</u>	32.5	15.5	7.2	18.5	8.9	95.7	0.9	<u>5.70</u>	116	0.235	0.232	< 0.01
02/02/05	10:05	342	<u>1.2</u>	30.0	14.7	7.2	<u>22.1</u>	9.0	103.1	1.4	3.42	90	0.089	0.086	< 0.01
01/03/05	10:10	248	<u>0.8</u>	37.5	16.3	7.2	<u>21.2</u>	8.7	96.9	1.1	4.30	121	0.117	0.113	< 0.01
06/04/05	10:30	199	<u>1.1</u>	35.0	15.7	7.6	19.8	9.2	99.4	0.9	3.30	120	0.200	0.196	< 0.01
04/05/05	10:45	260	<u>0.7</u>	32.5	17.2	-	<u>16.3</u>	9.1	92.2	1.2	<u>11.1</u>	127	0.325	0.319	0.01
08/06/05	10:45	394	<u>1.1</u>	32.5	16.5	7.6	<u>12.9</u>	9.9	93.9	0.5	1.94	125	0.429	0.426	< 0.01
06/07/05	10:20	329	<u>1.1</u>	35.0	14.8	7.4	10.6	11.3	100.7	0.4	3.55	119	0.472	0.469	0.04
02/08/05	10:50	457	<u>0.5</u>	27.5	14.7	7.4	11.6	10.1	93.2	1.0	<u>18.4</u>	122	0.780	0.773	0.11
06/09/05	11:10	219	<u>1.1</u>	32.5	15.4	7.7	<u>13.2</u>	11.0	103.1	0.9	<u>5.45</u>	114	0.534	0.528	0.01
04/10/05	09:45	493	<u>0.5</u>	30.0	12.1	7.3	14.4	9.2	92.0	1.0	<u>20.0</u>	101	0.579	0.570	0.02
01/11/05	10:05	433	<u>0.8</u>	30.0	14.1	7.4	16.9	9.9	101.9	1.0	<u>5.39</u>	107	0.317	0.306	< 0.01
05/12/05	09:45	200	<u>1.3</u>	30.0	15.8	7.6	19.2	9.3	100.9	1.1	4.50	103	0.286	0.273	< 0.01

Note: < = less than value stated
UD = upper decile flow (period 1986-2005 inclusive)

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

* New Zealand Standard Time

() black disk measurements taken in flows above upper decile value – don't assess for compliance

TKN g/m ³	TN g/m ³	DRP g/m ³	TP g/m ³	CL g/m ³	AS g/m ³	B g/m ³	LI g/m ³	A340F /cm	A440F /cm	ENT cfu/100ml	FC cfu/100ml	E coli cfu/100ml	CHLA g/m ³	DOC g/m ³	TOC g/m ³
-	<0.5	-	<0.04	-	<0.01	<1.4	-	-	-	<77	-	<550	<0.02		
0.22	0.31	0.017	0.032	20.8	<u>0.029</u>	0.30	0.116	0.011	0.002	4	10	9	0.010	0.7	1.8
0.16	0.24	0.020	0.030	17.2	<u>0.033</u>	0.27	0.093	0.010	0.002	12	16	13	0.010	0.8	1.5
0.17	0.25	0.019	0.036	18.3	<u>0.030</u>	0.28	0.093	0.009	< 0.002	4	4	4	0.006	0.7	1.0
0.08	0.24	0.020	0.036	21.6	<u>0.032</u>	0.35	0.122	0.012	0.003	7	5	5	0.005	0.9	1.5
0.11	0.28	0.020	0.032	21.5	<u>0.031</u>	0.34	0.130	0.010	< 0.002	22	43	41	0.005	0.5	1.4
0.14	0.40	0.022	0.038	21.8	<u>0.028</u>	0.35	0.142	0.014	0.003	8	12	11	< 0.003	0.7	1.6
0.07	0.29	0.021	<u>0.042</u>	17.9	<u>0.023</u>	0.28	0.084	0.010	0.002	3	6	6	0.004	0.5	1.8
0.09	0.43	0.029	<u>0.046</u>	21.5	<u>0.022</u>	0.29	0.105	0.015	0.003	8	7	7	< 0.003	1.0	1.8
0.10	0.35	0.013	<u>0.043</u>	19.7	<u>0.026</u>	0.32	0.114	0.012	0.003	4	2	2	0.017	0.5	1.4
0.19	0.46	0.013	0.036	20.0	<u>0.029</u>	0.31	0.117	0.013	0.002	8	28	28	0.005	1.5	2.1
0.15	0.26	< 0.004	0.013	16.6	<u>0.026</u>	0.29	0.086	0.013	0.003	2	7	5	0.012	0.9	1.3
0.16	0.27	0.009	0.029	18.6	<u>0.034</u>	0.27	0.115	0.011	0.004	< 1	4	4	0.008	0.6	1.8
0.33	0.46	0.011	0.038	19.2	<u>0.026</u>	0.29	0.102	0.013	0.003	23	54	43	0.015	1.0	1.9
0.20	0.28	0.010	0.024	15.3	<u>0.023</u>	0.25	0.083	0.009	0.002	23	30	30	0.012	1.5	1.5
0.24	0.33	0.016	0.033	18.2	<u>0.028</u>	0.25	0.086	0.010	0.002	22	33	3	0.016	0.7	1.4
0.20	0.31	0.024	0.035	18.2	<u>0.026</u>	0.26	0.089	0.011	0.002	28	76	53	0.008	0.9	2.0
0.20	0.43	0.019	<u>0.048</u>	20.1	<u>0.027</u>	0.30	0.118	0.016	0.005	<u>490</u>	510	480	0.010	1.0	1.9
0.08	0.40	0.022	<u>0.046</u>	20.0	<u>0.022</u>	0.30	0.123	0.014	0.003	19	30	21	< 0.003	0.7	1.6
0.08	0.41	0.038	0.036	18.3	<u>0.021</u>	0.23	0.080	0.009	< 0.002	7	30	19	0.003	0.6	1.7
0.15	<u>0.57</u>	0.034	<u>0.062</u>	15.9	<u>0.016</u>	0.18	0.060	0.021	0.004	<u>120</u>	330	240	< 0.003	1.2	2.1
0.16	0.45	0.010	<u>0.042</u>	18.1	<u>0.021</u>	0.28	0.096	0.013	0.003	12	24	16	0.016	0.5	1.5
0.29	<u>0.62</u>	0.034	<u>0.077</u>	18.9	<u>0.022</u>	0.25	0.088	0.035	0.007	<u>150</u>	1300	<u>1300</u>	0.008	1.6	3.0
0.14	0.32	0.004	<u>0.048</u>	16.1	<u>0.024</u>	0.25	0.078	0.013	0.003	28	36	36	0.017	1.2	1.6
0.23	0.41	0.010	0.039	17.5	<u>0.030</u>	0.22	0.079	0.011	0.003	19	34	26	0.014	0.8	2.0
0.33	0.49	0.018	<u>0.045</u>	18.9	<u>0.026</u>	0.28	0.104	0.015	0.003	18	190	140	0.013	1.0	2.1
0.26	0.37	0.018	0.039	15.5	<u>0.024</u>	0.24	0.087	0.009	< 0.002	56	260	210	0.013	1.1	1.2
0.25	0.36	0.019	<u>0.041</u>	18.4	<u>0.027</u>	0.26	0.087	0.011	0.002	48	90	70	0.020	0.8	1.8
0.14	0.27	0.024	<u>0.044</u>	18.2	<u>0.025</u>	0.27	0.088	0.011	0.002	60	180	110	0.009	0.9	1.6
0.23	0.49	0.020	<u>0.057</u>	20.5	<u>0.026</u>	0.30	0.119	0.018	0.005	<u>720</u>	5600	<u>4600</u>	0.011	0.8	2.1
0.13	0.45	0.027	<u>0.053</u>	19.8	<u>0.023</u>	0.31	0.128	0.014	0.003	21	53	53	0.004	0.7	1.7
0.08	0.37	0.025	<u>0.042</u>	17.7	<u>0.021</u>	0.22	0.078	0.011	< 0.002	6	20	15	0.005	0.6	1.7
0.24	<u>0.69</u>	0.042	<u>0.067</u>	15.9	<u>0.015</u>	0.19	0.064	0.021	0.004	<u>140</u>	300	250	< 0.003	1.4	2.1
0.18	<u>0.52</u>	0.028	<u>0.054</u>	18.6	<u>0.020</u>	0.29	0.098	0.014	0.003	14	63	54	0.016	0.7	1.5
0.34	<u>0.70</u>	0.041	<u>0.086</u>	19.1	<u>0.021</u>	0.25	0.086	0.036	0.007	<u>240</u>	400	400	0.011	1.9	3.1
0.18	0.34	0.015	<u>0.057</u>	16.3	<u>0.024</u>	0.24	0.077	0.015	0.004	35	220	90	0.012	1.6	1.7
0.24	0.46	0.018	<u>0.047</u>	17.6	<u>0.029</u>	0.25	0.085	0.012	0.003	19	44	25	0.016	0.7	2.8
0.28	<u>0.52</u>	0.019	<u>0.066</u>	16.8	<u>0.020</u>	0.22	0.078	0.019	0.004	26	220	200	0.010	1.2	2.7
0.29	0.38	0.018	<u>0.045</u>	14.9	<u>0.023</u>	0.23	0.080	0.011	0.002	74	310	200	0.017	1.0	1.3
0.22	0.34	0.020	<u>0.066</u>	18.9	<u>0.024</u>	0.23	0.078	0.019	0.004	38	100	80	<u>0.030</u>	0.8	2.3
0.20	0.40	0.031	<u>0.061</u>	18.1	<u>0.022</u>	0.24	0.079	0.015	0.003	39	110	70	0.010	0.7	1.7
0.29	<u>0.62</u>	0.020	<u>0.082</u>	20.9	<u>0.021</u>	0.28	0.103	0.030	0.008	<u>480</u>	700	<u>670</u>	0.017	1.0	2.6
0.15	<u>0.58</u>	0.028	<u>0.060</u>	19.1	<u>0.020</u>	0.28	0.113	0.018	0.004	25	50	50	0.003	0.7	2.2
0.14	<u>0.61</u>	0.025	<u>0.048</u>	16.9	<u>0.015</u>	0.17	0.060	0.015	0.003	15	43	31	0.006	0.8	2.0
0.47	<u>1.25</u>	0.029	<u>0.102</u>	16.5	<u>0.011</u>	0.14	0.049	0.034	0.005	<u>190</u>	1000	<u>700</u>	< 0.003	1.9	3.1
0.22	<u>0.75</u>	0.032	<u>0.064</u>	17.2	<u>0.013</u>	0.21	0.062	0.020	0.004	<u>82</u>	460	380	0.015	0.7	1.9
0.48	<u>1.06</u>	0.028	<u>0.096</u>	13.2	0.009	0.11	0.034	0.041	0.008	<u>430</u>	2400	<u>2400</u>	0.006	1.9	1.7
0.26	<u>0.58</u>	0.014	<u>0.059</u>	15.8	<u>0.018</u>	0.19	0.063	0.022	0.006	21	90	50	0.015	1.3	2.0
0.25	<u>0.54</u>	0.022	<u>0.070</u>	17.4	<u>0.024</u>	0.21	0.070	0.016	0.003	16	52	33	<u>0.021</u>	0.7	1.9

Note: < = less than value stated

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

() black disk measurements taken in flows above upper decile value – don't assess for compliance

DATE	TIME*	FLOW	BDISK	COLOR	COND	PH	TEMP	DO	PCDO	BOD5	TURB	TDS	NNN	NO3-N	NH4-N
dd/mm/yy	HH:MM	m ³ /s	m	units	mS/m	units	°C	g/m ³	%Sat	g/m ³	NTU	g/m ³	g/m ³	g/m ³	g/m ³
Satisfactory Water			>1.6	-	-	6.5-9	<12 (May-Sep)	>80	-	<5	-	-	-	-	<0.88
Quality Guideline/Standard							<20 (Oct-Apr)								

1131-91 UD= 681 m³/s (Flows from Mercer Bridge Recorder)

Waikato River @ Mercer Br

06/01/05	11:35	479	-	-	15.8	7.2	18.8	8.7	94.2	1.0	<u>8.25</u>	120	0.252	0.250	<0.01
02/02/05	11:05	319	-	-	14.9	7.4	<u>23.5</u>	9.5	112.1	2.3	<u>5.50</u>	113	0.002	<0.002	<0.01
01/03/05	11:00	299	-	-	16.1	7.3	<u>21.6</u>	8.6	97.6	1.1	4.24	113	0.128	0.126	<0.01
06/04/05	11:25	260	-	-	15.8	7.8	<u>20.8</u>	9.2	102.0	1.3	3.12	115	0.160	0.158	<0.01
04/05/05	11:55	291	-	-	15.3	-	<u>17.2</u>	8.8	91.5	1.1	<u>15.2</u>	117	0.363	0.359	<0.01
08/06/05	11:42	446	-	-	16.8	7.6	<u>12.8</u>	9.9	92.2	0.7	4.71	130	0.602	0.599	<0.01
06/07/05	11:00	443	-	-	15.5	7.4	11.6	10.7	98.5	0.6	<u>5.44</u>	121	0.469	0.466	0.02
02/08/05	11:50	496	-	-	14.3	7.3	<u>12.0</u>	9.8	91.1	0.7	<u>16.1</u>	115	0.786	0.781	<0.01
06/09/05	12:00	248	-	-	16.2	7.7	<u>14.8</u>	10.6	103.6	1.2	<u>6.42</u>	126	0.459	0.457	<0.01
04/10/05	10:40	570	-	-	14.4	7.4	15.0	9.2	92.0	1.0	<u>13.0</u>	110	0.483	0.474	0.03
01/11/05	11:00	531	-	-	14.8	7.5	17.6	9.7	101.1	1.3	<u>6.44</u>	109	0.250	0.244	<0.01
05/12/05	10:45	242	-	-	15.9	7.7	<u>20.4</u>	9.5	108.4	1.3	<u>7.54</u>	103	0.217	0.215	<0.01

1131-133

Waikato River @ Tuakau Br

06/01/05	12:20	-	<u>0.6</u>	27.5	15.5	7.2	19.0	8.5	92.8	0.9	<u>8.65</u>	119	0.233	0.233	<0.01
02/02/05	11:45	-	<u>0.8</u>	30.0	15.0	7.4	<u>24.0</u>	9.9	116.8	2.4	<u>6.85</u>	110	<0.002	<0.002	<0.01
01/03/05	12:00	-	<u>0.6</u>	32.5	16.2	7.4	<u>22.7</u>	9.5	109.2	1.5	3.65	115	0.086	0.084	<0.01
06/04/05	12:10	-	<u>0.7</u>	37.5	15.7	7.9	<u>21.3</u>	9.8	108.0	1.5	<u>5.24</u>	126	0.126	0.123	<0.01
04/05/05	12:25	-	<u>0.7</u>	30.0	16.6	-	<u>17.8</u>	9.9	103.8	1.2	<u>5.65</u>	117	0.237	0.235	<0.01
08/06/05	12:15	-	<u>0.8</u>	30.0	17.1	7.5	<u>12.9</u>	9.7	90.8	0.8	<u>5.09</u>	130	0.549	0.545	0.02
06/07/05	11:30	-	<u>0.9</u>	32.5	15.6	7.4	<u>12.0</u>	10.3	94.0	0.6	<u>5.95</u>	119	0.405	0.401	<0.01
02/08/05	12:10	-	<u>0.4</u>	27.5	14.8	7.4	<u>12.4</u>	9.3	87.3	0.9	<u>14.2</u>	121	0.755	0.749	<0.01
06/09/05	12:45	-	<u>0.9</u>	32.5	15.9	7.6	<u>15.1</u>	10.5	102.8	1.4	<u>5.94</u>	117	0.421	0.419	<0.01
04/10/05	11:10	-	<u>0.5</u>	25.0	14.3	7.3	15.4	9.0	91.0	1.1	<u>21.0</u>	110	0.503	0.499	0.01
01/11/05	11:25	-	<u>0.7</u>	30.0	14.8	7.4	18.1	9.5	99.5	1.4	<u>9.32</u>	101	0.241	0.234	<0.01
05/12/05	11:25	-	<u>0.5</u>	30.0	15.9	7.7	<u>20.6</u>	9.7	112.1	1.6	<u>10.1</u>	107	0.111	0.108	<0.01

Note: < = less than value stated
UD = upper decile flow (period 1986-2005 inclusive)

* New Zealand Standard Time

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

() black disk measurements taken in flows above upper decile value – don't assess for compliance

TKN g/m ³	TN g/m ³	DRP g/m ³	TP g/m ³	CL g/m ³	AS g/m ³	B g/m ³	LI g/m ³	A340F /cm	A440F /cm	ENT cfu/100ml	FC cfu/100ml	E coli	CHLA g/m ³	DOC g/m ³	TOC g/m ³
-	<0.5	-	<0.04	-	<0.01	<1.4	-	-	-	<77	-	<550	<0.02		

0.37	<u>0.62</u>	0.018	<u>0.080</u>	17.2	<u>0.019</u>	0.22	0.076	0.023	0.005	16	90	80	0.017	1.0	2.8
0.39	<u>0.39</u>	0.012	<u>0.060</u>	15.7	<u>0.023</u>	0.23	0.079	0.010	0.002	29	140	100	<u>0.035</u>	1.0	1.2
0.28	0.41	0.022	<u>0.061</u>	18.3	<u>0.025</u>	0.25	0.082	0.011	0.002	44	230	180	<u>0.028</u>	0.9	1.8
0.31	0.47	0.018	<u>0.060</u>	18.1	<u>0.022</u>	0.24	0.079	0.015	0.003	12	76	50	0.018	0.8	1.9
0.30	<u>0.66</u>	0.037	<u>0.101</u>	17.7	<u>0.022</u>	0.24	0.091	0.026	0.008	<u>810</u>	1400	<u>800</u>	0.015	0.7	2.1
0.26	<u>0.86</u>	0.027	<u>0.075</u>	19.0	<u>0.014</u>	0.22	0.083	0.027	0.005	17	120	120	0.004	1.3	3.1
0.18	<u>0.65</u>	0.025	<u>0.058</u>	18.4	<u>0.017</u>	0.20	0.068	0.020	0.003	18	60	37	0.008	1.0	2.3
0.31	<u>1.10</u>	0.013	<u>0.090</u>	16.4	0.009	0.12	0.039	0.039	0.007	<u>100</u>	390	270	< 0.003	2.2	3.3
0.25	<u>0.71</u>	0.022	<u>0.063</u>	18.0	<u>0.015</u>	0.24	0.073	0.023	0.005	6	40	40	<u>0.025</u>	0.9	2.2
0.39	<u>0.87</u>	0.059	<u>0.088</u>	16.4	<u>0.014</u>	0.17	0.056	0.041	0.008	<u>190</u>	1300	<u>1300</u>	0.010	2.0	4.5
0.28	<u>0.53</u>	0.014	<u>0.069</u>	16.7	<u>0.019</u>	0.21	0.065	0.027	0.006	5	60	60	0.019	2.4	2.4
0.28	0.50	0.012	<u>0.058</u>	17.5	<u>0.023</u>	0.21	0.069	0.019	0.004	10	50	47	<u>0.022</u>	0.9	2.3
0.36	<u>0.59</u>	0.016	<u>0.067</u>	17.1	<u>0.017</u>	0.20	0.072	0.026	0.005	< 1	70	40	0.019	1.3	2.9
0.44	0.44	0.010	<u>0.068</u>	15.5	<u>0.021</u>	0.23	0.078	0.012	0.002	17	20	20	<u>0.040</u>	0.9	1.5
0.33	0.42	0.016	<u>0.062</u>	18.4	<u>0.026</u>	0.24	0.079	0.011	0.002	<u>200</u>	160	160	<u>0.035</u>	1.0	1.7
0.22	0.35	0.016	<u>0.061</u>	17.9	<u>0.021</u>	0.24	0.074	0.016	0.003	26	80	70	<u>0.033</u>	0.9	2.1
0.20	0.44	0.026	<u>0.064</u>	20.9	<u>0.023</u>	0.28	0.105	0.017	0.004	<u>160</u>	220	190	<u>0.026</u>	0.6	1.8
0.45	<u>1.00</u>	0.022	<u>0.070</u>	20.0	<u>0.014</u>	0.23	0.084	0.032	0.006	21	59	57	0.004	1.5	3.7
0.23	<u>0.64</u>	0.020	<u>0.054</u>	17.4	<u>0.016</u>	0.20	0.066	0.023	0.004	19	41	30	0.011	0.9	3.1
0.30	<u>1.06</u>	0.017	<u>0.075</u>	16.8	0.008	0.12	0.038	0.043	0.007	50	140	110	< 0.003	2.3	3.8
0.29	<u>0.71</u>	0.022	<u>0.060</u>	18.1	<u>0.014</u>	0.23	0.065	0.027	0.005	3	33	26	<u>0.026</u>	1.0	2.4
0.42	<u>0.92</u>	0.026	<u>0.102</u>	16.4	<u>0.013</u>	0.16	0.051	0.044	0.009	<u>160</u>	1200	<u>1200</u>	0.012	2.0	5.9
0.28	<u>0.52</u>	0.012	<u>0.069</u>	16.6	<u>0.017</u>	0.22	0.064	0.034	0.007	9	35	22	0.019	2.0	3.0
0.35	0.46	0.006	<u>0.065</u>	17.8	<u>0.024</u>	0.21	0.069	0.017	0.003	10	51	51	<u>0.036</u>	1.0	2.3

Note: < = less than value stated

Underlined values don't comply with the "satisfactory" water quality Guidelines and Standards – Table 1

() black disk measurements taken in flows above upper decile value – don't assess for compliance

5-Yearly Trace Metal Analysis

DATE	TIME*	AlTR	AsTR	BTR	CdTR	CoTR	CrTR	CuTR	FeD	FeTR	HgT
dd/mm/yy	hh:mm	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³
1131-127											
Waikato River @ Taupo Control Gates											
01/02/05	8:18 a.m.	0.0014	0.0103	0.167	< 0.00001	< 0.00003	< 0.0005	< 0.0002	< 0.005	< 0.005	< 0.00008
04/05/05	9:00 a.m.	0.0022	0.0110	0.175	< 0.00001	< 0.00003	< 0.0005	< 0.0002	< 0.005	0.005	< 0.00008
03/08/05	9:10 a.m.	0.0016	0.0101	0.177	< 0.00001	< 0.00003	< 0.0005	< 0.0002	< 0.005	0.005	< 0.00008
02/11/05	8:30 a.m.	0.0020	0.0120	0.160	< 0.00001	< 0.00003	< 0.0030	< 0.0002	< 0.005	< 0.005	< 0.00008
1131-107											
Waikato River @ Ohakuri Tailrace Br											
01/02/05	10:15 a.m.	0.0396	0.0341	0.374	< 0.00001	< 0.00003	< 0.0005	0.0002	0.040	0.126	< 0.00008
04/05/05	11:01 a.m.	0.0190	0.0357	0.374	< 0.00001	< 0.00003	< 0.0005	< 0.0002	0.053	0.105	< 0.00008
03/08/05	11:00 a.m.	0.0751	0.0365	0.395	< 0.00001	< 0.00003	< 0.0005	< 0.0002	0.058	0.274	< 0.00008
02/11/05	10:55 a.m.	0.0240	0.0320	0.280	< 0.00001	< 0.00003	< 0.0030	< 0.0002	0.039	0.127	< 0.00008
1131-101											
Waikato River @ Narrows Br											
02/02/05	7:45 a.m.	0.0301	0.0243	0.258	< 0.00001	0.00004	< 0.0005	< 0.0002	0.045	0.152	< 0.00008
04/05/05	8:55 a.m.	0.0649	0.0240	0.286	< 0.00001	0.00007	< 0.0005	< 0.0002	0.105	0.304	< 0.00008
02/08/05	9:00 a.m.	0.1380	0.0151	0.191	0.00002	0.00012	< 0.0005	0.0004	0.080	0.412	< 0.00008
01/11/05	7:50 a.m.	0.0382	0.0225	0.239	0.00002	0.00006	< 0.0005	0.0003	0.062	0.200	< 0.00008
1131-69											
Waikato River @ Horotiu Br											
02/02/05	9:00 a.m.	0.0497	0.0240	0.281	< 0.00001	< 0.00003	< 0.0005	0.0002	0.046	0.183	< 0.00008
04/05/05	10:00 a.m.	0.1080	0.0253	0.305	< 0.00001	0.00010	< 0.0005	0.0003	0.094	0.395	< 0.00008
02/08/05	10:00 a.m.	0.1220	0.0151	0.187	0.00002	0.00010	0.0005	0.0004	0.075	0.319	< 0.00008
01/11/05	9:15 a.m.	0.0592	0.0226	0.249	< 0.00001	0.00007	< 0.0005	0.0003	0.066	0.226	< 0.00008
1131-133											
Waikato River @ Tuakau Br											
02/02/05	11:45 a.m.	0.2100	0.0219	0.266	< 0.00001	0.00016	< 0.0005	0.0007	0.073	0.480	< 0.00008
04/05/05	12:25 p.m.	0.1230	0.0210	0.266	< 0.00001	0.00009	0.0006	0.0007	0.115	0.352	< 0.00008
02/08/05	12:10 p.m.	0.2780	0.0083	0.118	< 0.00001	0.00026	0.0006	0.0011	0.232	0.834	< 0.00008
01/11/05	11:25 a.m.	0.2720	0.0163	0.203	< 0.00001	0.00025	< 0.0005	0.0008	0.239	0.738	< 0.00008

< = less than value stated

D = Dissolved, T = Total, TR = Total Recoverable

*Time = New Zealand Standard Time

LiT g/m ³	MnD g/m ³	MnTR g/m ³	MoTR g/m ³	NiTR g/m ³	PbTR g/m ³	SbTR g/m ³	TiTR g/m ³	UTR g/m ³	ZnD g/m ³	ZnTR g/m ³
-------------------------	-------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	-------------------------	-------------------------	--------------------------

0.0403	< 0.0002	0.0005	0.00019	< 0.0003	< 0.00005	0.00020	< 0.00001	< 0.00002	< 0.0005	< 0.0005
0.0435	< 0.0002	0.0011	0.00019	< 0.0003	< 0.00005	0.00023	< 0.00001	< 0.00002	< 0.0005	< 0.0005
0.0456	< 0.0002	0.0011	0.00025	< 0.0003	< 0.00005	0.00026	0.00003	< 0.00002	0.0010	< 0.0005
0.0410	< 0.0002	0.0008	0.00026	< 0.0003	< 0.00005	0.00030	< 0.00001	< 0.00002	< 0.0005	< 0.0005

0.1230	0.0002	0.0108	0.00050	< 0.0003	0.00008	0.00098	0.00005	< 0.00002	0.0008	0.0015
0.1280	0.0033	0.0092	0.00049	< 0.0003	< 0.00005	0.00109	0.00005	< 0.00002	< 0.0005	< 0.0005
0.1410	0.0003	0.0229	0.00056	< 0.0003	0.00009	0.00156	0.00006	< 0.00002	0.0008	0.0024
0.0940	0.0002	0.0140	0.00046	< 0.0003	< 0.00005	0.00114	0.00004	< 0.00002	< 0.0005	0.0006

0.0856	0.0004	0.0209	0.00037	< 0.0003	< 0.00005	0.00057	0.00003	< 0.00002	< 0.0005	< 0.0005
0.1030	0.0039	0.0383	0.00045	< 0.0003	0.00009	0.00083	0.00007	< 0.00002	< 0.0005	0.0011
0.0661	0.0023	0.0219	0.00035	< 0.0003	0.00017	0.00067	0.00016	< 0.00002	0.0011	0.0017
0.0790	0.0006	0.0301	0.00042	< 0.0003	0.00009	0.00078	0.00005	< 0.00002	< 0.0005	0.0010

0.0871	0.0004	0.0252	0.00037	< 0.0003	< 0.00005	0.00056	0.00003	< 0.00002	< 0.0005	< 0.0005
0.1090	0.0011	0.0392	0.00046	< 0.0003	0.00020	0.00085	0.00006	< 0.00002	0.0015	0.0018
0.0669	0.0023	0.0216	0.00033	< 0.0003	0.00018	0.00067	0.00009	< 0.00002	0.0017	0.0054
0.0837	0.0006	0.0326	0.00039	< 0.0003	0.00008	0.00077	0.00003	< 0.00002	< 0.0005	0.0013

0.0795	0.0010	0.0576	0.00037	< 0.0003	0.00028	0.00051	0.00003	0.00003	< 0.0005	0.0020
0.0910	0.0012	0.0295	0.00045	< 0.0003	0.00018	0.00069	0.00003	< 0.00002	0.0006	0.0012
0.0362	0.0034	0.0491	0.00022	0.0003	0.00034	0.00033	0.00006	0.00003	0.0009	0.0027
0.0620	0.0049	0.0622	0.00031	< 0.0003	0.00027	0.00059	0.00003	< 0.00002	0.0005	0.0020

< = less than value stated
D = Dissolved, T = Total, TR = Total Recoverable

3.2 Waikato River Monitoring Programme Bathing Season Microbiological Survey

Summary Statistics

Comparison with Water Quality Standards

Parameter Graph

Raw Data

Table 5: Bathing Season Statistics of *E.coli* Bacteria.

Location Name	BATHING SEASON MEDIAN					5 Season
	97/98	98/99	00/01	02/03	04/05	Median
Taupo Gates	2	2	1	1	1	1
Huka Falls	9	7	9	5	4	6
Ohaaki Bridge	28	32	28	18	22	22
Ohakuri Tailrace Br	1	3	1	2	4	2
Whakamaru Tailrace	7	6	5	6	7	6
Waipapa Tailrace	7	5	8	6	9	7
Lake Karapiro Boatramp	33	44	19	25	27	27
Narrows Br	41	60	100	26	28	41
Wellington Street Beach	85	85	100	39	43	55
Sewer Br Alandale	125	135	100	44	75	90
Horotiu Br	170	190	160	44	90	100
Ngaruawahia Br	-	-	-	160	80	-
Huntly-Tainui Br	245	260	140	175	135	160
Mercer Br	68	69	80	70	36	70
Tuakau Br	22	40	60	70	44	52
Waipa River (Ngaruawahia Br)	-	-	-	86	95	-

Table 6: Year 2004/2005 Bathing Season *E.coli* survey results complying with the “Satisfactory” and “Excellent” Water Quality Guidelines. (n = 12)

Location Name	HUMAN USES - RECREATION			
	SATISFACTORY		EXCELLENT	
	<i>E. coli</i> Samples < 550	<i>E. coli</i> Median <126	<i>E. coli</i> Samples < 55	<i>E. coli</i> Median <23
Taupo Gates	12	Y	12	Y
Huka Falls	12	Y	12	Y
Ohaaki Bridge	12	Y	12	Y
Ohakuri Tailrace Br	12	Y	12	Y
Whakamaru Tailrace	12	Y	12	Y
Waipapa Tailrace	12	Y	12	Y
Lake Karapiro Boatramp	11	Y	8	N
Narrows Br	12	Y	12	N
Wellington Street Beach	12	Y	7	N
Sewer Br Alandale	11	Y	3	N
Horotiu Br	12	Y	3	N
Ngaruawahia Br	12	Y	3	N
Huntly-Tainui Br	12	N	2	N
Mercer Br	12	Y	7	N
Tuakau Br	12	Y	8	N
Waipa River (Ngaruawahia Br)	12	Y	3	N

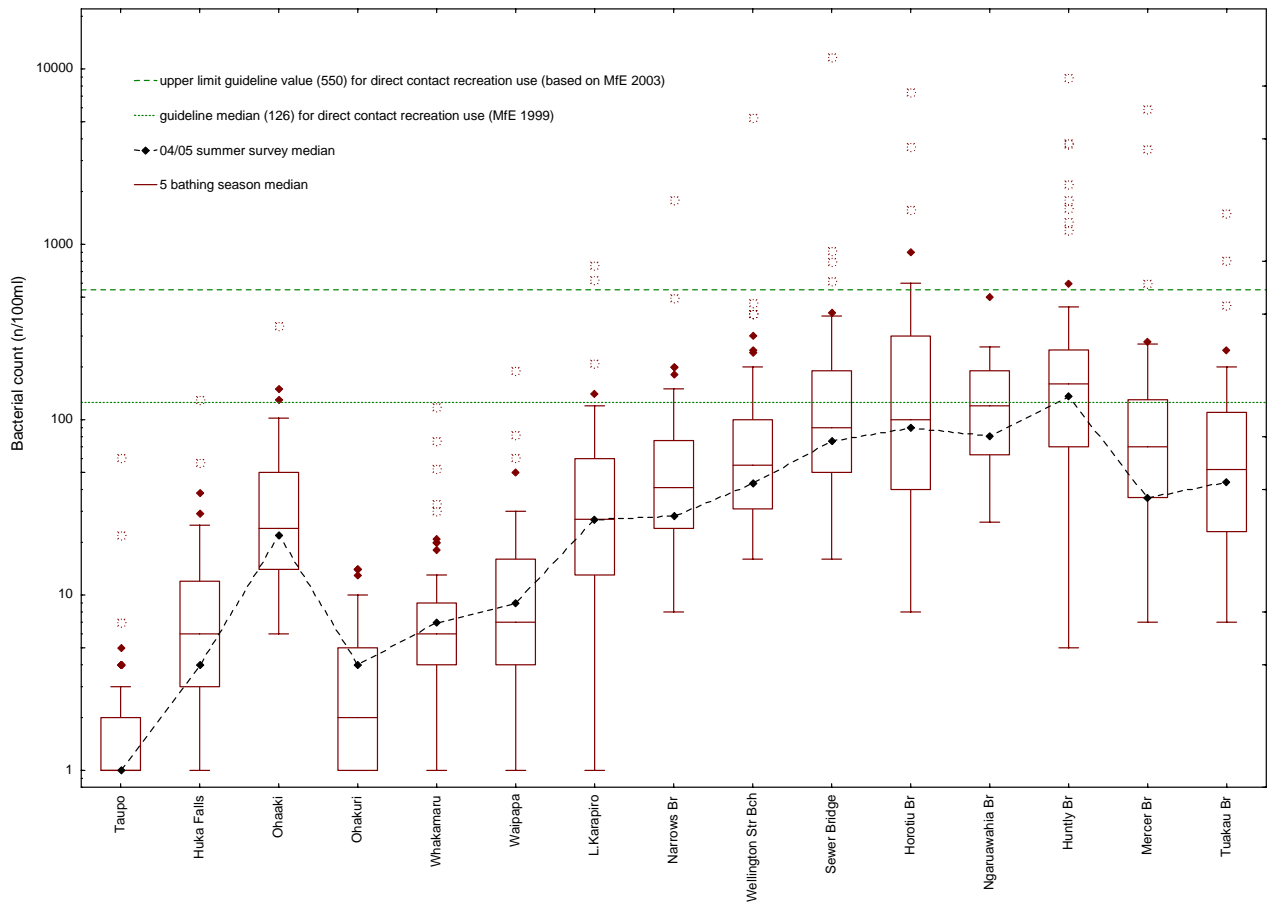


Figure 2: *E.coli* – 5 Bathing Season Data

DATE	ENT c/100ml	FC c/100ml	EColi c/100ml	DATE	ENT c/100ml	FC c/100ml	EColi c/100ml	DATE	ENT c/100ml	FC c/100ml	EColi c/100ml
Taupo Control Gates				Lake Karapiro Boatramp				Huntly-Tainui Bridge			
01/12/04	6	5	4	01/12/04	10	18	14	01/12/04	22	40	40
07/12/04	1	3	2	07/12/04	1	60	30	08/12/04	<1	80	80
16/12/04	2	1	1	16/12/04	22	28	27	15/12/04	25	150	140
20/12/04	2	3	2	20/12/04	2	11	10	22/12/04	52	190	160
06/01/05	2	1	1	06/01/05	8	58	58	06/01/05	26	220	200
11/01/05	<1	<1	<1	11/01/05	14	30	27	10/01/05	55	170	150
18/01/05	1	<1	<1	18/01/05	53	20	20	17/01/05	28	180	130
25/01/05	<1	1	1	25/01/05	430	940	760	24/01/05	11	51	32
01/02/05	1	4	4	01/02/05	5	100	100	02/02/05	74	310	200
08/02/05	2	1	1	08/02/05	57	100	70	09/02/05	43	118	67
15/02/05	2	1	1	15/02/05	18	4	3	14/02/05	43	70	60
22/02/05	<1	<1	<1	22/02/05	71	20	17	21/02/05	44	220	190
Median	2	1	1	Median	16	29	27	Median	36	160	135
Huka Falls				Narrows Bridge				Mercer Bridge			
01/12/04	8	16	4	01/12/04	7	28	26	01/12/04	8	40	40
07/12/04	5	3	1	07/12/04	11	27	20	08/12/04	21	200	190
16/12/04	2	5	5	16/12/04	20	40	40	15/12/04	4	38	31
20/12/04	2	3	2	20/12/04	4	21	17	22/12/04	14	120	120
06/01/05	7	7	6	06/01/05	23	54	43	06/01/05	16	90	80
11/01/05	1	1	1	11/01/05	18	50	50	10/01/05	48	160	150
18/01/05	2	3	3	18/01/05	10	29	24	17/01/05	7	28	17
25/01/05	8	7	4	25/01/05	16	47	41	24/01/05	2	33	27
01/02/05	6	20	15	02/02/05	23	30	30	02/02/05	29	140	100
08/02/05	6	9	5	08/02/05	35	33	24	09/02/05	8	43	31
15/02/05	5	<1	<1	15/02/05	31	31	25	14/02/05	16	60	30
22/02/05	5	15	15	22/02/05	48	46	36	21/02/05	7	20	20
Median	5	6	4	Median	19	32	28	Median	11	52	36
Ohaaki Bridge				Wellington Street Beach				Tuakau Bridge			
01/12/04	3	31	20	01/12/04	59	100	60	01/12/04	22	50	50
07/12/04	<1	15	10	08/12/04	15	37	31	08/12/04	11	150	130
16/12/04	24	50	50	15/12/04	19	42	31	15/12/04	17	37	31
20/12/04	3	13	12	22/12/04	20	57	42	22/12/04	54	90	70
06/01/05	19	46	23	06/01/05	18	90	55	06/01/05	<1	70	40
11/01/05	4	17	12	10/01/05	22	34	27	10/01/05	33	160	160
18/01/05	14	90	50	17/01/05	20	41	33	17/01/05	5	39	26
25/01/05	14	26	21	24/01/05	28	37	23	24/01/05	5	24	18
01/02/05	25	30	28	02/02/05	58	70	70	02/02/05	17	20	20
08/02/05	21	42	32	09/02/05	48	52	44	09/02/05	36	140	110
15/02/05	36	35	23	14/02/05	168	90	60	14/02/05	17	47	47
22/02/05	20	29	21	21/02/05	79	120	120	21/02/05	34	40	40
Median	17	31	22	Median	25	55	43	Median	17	49	44
Ohakuri Tailrace Bridge				Sewer Bridge Alandale							
01/12/04	1	1	1	01/12/04	134	730	620				
07/12/04	4	18	13	08/12/04	16	70	60				
16/12/04	3	1	1	15/12/04	15	45	39				
20/12/04	5	3	1	22/12/04	78	170	170				
06/01/05	10	9	4	06/01/05	33	116	70				
11/01/05	6	4	4	10/01/05	38	100	100				
18/01/05	4	2	2	17/01/05	11	80	60				
25/01/05	21	6	5	24/01/05	32	65	50				
01/02/05	2	4	4	02/02/05	82	300	150				
08/02/05	15	6	6	09/02/05	45	73	50				
15/02/05	9	3	3	14/02/05	140	150	80				
22/02/05	4	1	1	21/02/05	95	330	280				
Median	5	4	4	Median	42	108	75				
Whakamaru Tailrace				Horotiu Bridge				Waipa River @ Ngaruawahia			
01/12/04	5	7	7	01/12/04	50	300	100	01/12/04	54	160	130
07/12/04	3	5	4	08/12/04	19	45	32	08/12/04	6	280	280
16/12/04	8	40	20	15/12/04	17	45	28	15/12/04	11	33	29
20/12/04	1	8	7	22/12/04	51	110	110	22/12/04	29	110	110
06/01/05	7	9	8	06/01/05	18	190	140	06/01/05	26	200	200
11/01/05	4	20	18	10/01/05	40	130	100	10/01/05	77	390	310
18/01/05	2	6	6	17/01/05	43	90	70	17/01/05	15	150	110
25/01/05	3	6	6	24/01/05	32	53	35	24/01/05	11	49	39
01/02/05	6	10	9	02/02/05	56	260	210	02/02/05	41	110	50
08/02/05	4	5	5	09/02/05	40	80	56	09/02/05	38	94	78
15/02/05	13	12	11	14/02/05	62	80	80	14/02/05	40	80	80
22/02/05	<1	5	4	21/02/05	98	310	310	21/02/05	56	110	80
Median	4	8	7	Median	42	100	90	Median	34	110	95
Waipapa Tailrace				Ngaruawahia Bridge							
01/12/04	2	3	3	01/12/04	29	200	60				
07/12/04	2	19	17	08/12/04	<1	86	36				
16/12/04	12	17	16	15/12/04	16	150	80				
20/12/04	2	9	9	22/12/04	54	300	230				
06/01/05	4	10	9	06/01/05	24	140	130				
11/01/05	3	19	19	10/01/05	56	70	50				
18/01/05	2	7	6	17/01/05	25	80	80				
25/01/05	7	3	3	24/01/05	17	42	26				
01/02/05	12	16	13	02/02/05	86	270	180				
08/02/05	12	11	5	09/02/05	45	98	63				
15/02/05	9	9	9	14/02/05	49	140	100				
22/02/05	4	8	7	21/02/05	115	380	260				
Median	4	10	9	Median	45	140	80				

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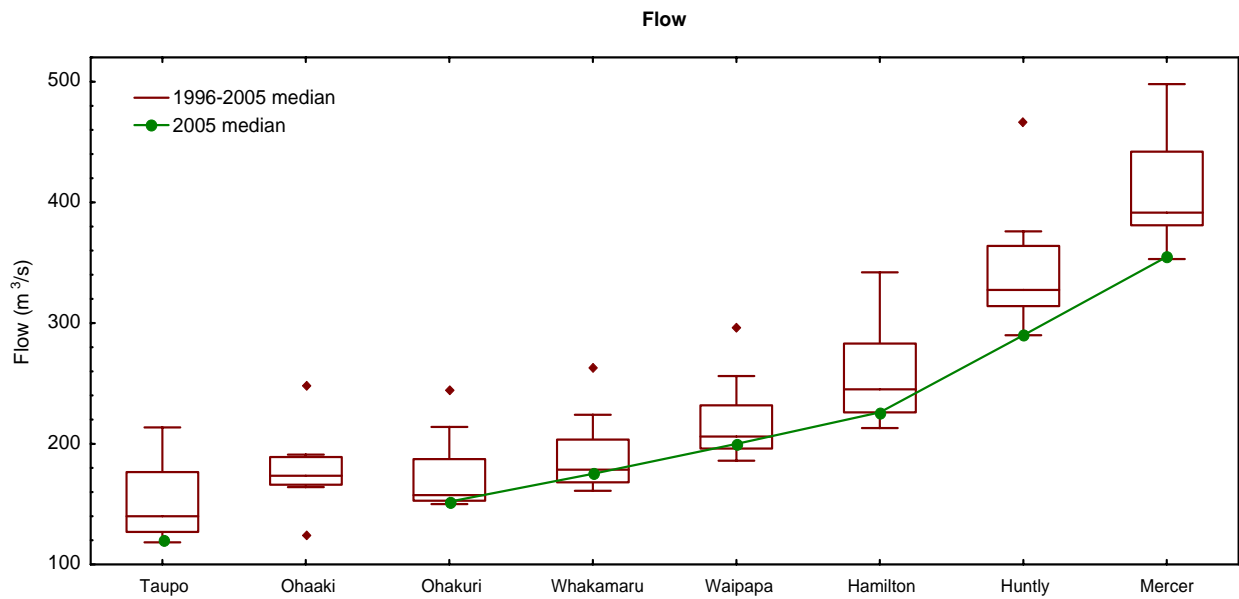
Appendix I

Flow Information

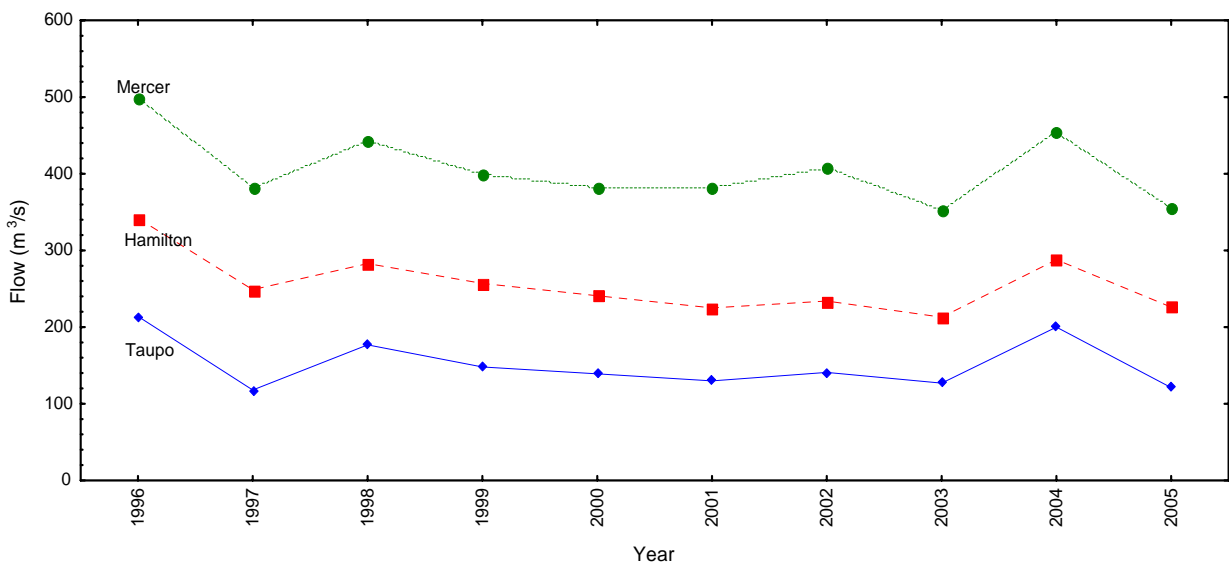
Median Flows of the Waikato River and Main Tributaries

Location	DISTANCE km	FLOW RATE* (m ³ /s)										10 YEAR Median
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Taupo	4.2	214	118	177	148	139	130	141	127	200	121	151
Ohakuri	75.8	244	153	187	157	158	150	164	157	214	152	170
Whakamaru	105.0	263	182	204	174	168	161	183	168	224	175	190
Waipapa	126.1	297	207	232	205	196	186	211	192	256	200	215
Hamilton	211.5	342	249	283	257	241	225	234	213	288	226	254
Huntly	246.5	467	332	364	327	314	299	328	315	376	290	336
Mercer	286.3	498	383	442	400	381	383	408	353	455	355	403
Waioatapu Stm	46.6	3.7	3.8	3.5	3.4	2.8	3.2	2.8	2.6	3.7	3.6	3.3
Waipa River	232.7	95	58	66	55	52	62	73	61	87	56	65

*Rating curve errors mean estimates of flow are $\pm 8\%$



Yearly Flow Record (Median) at Taupo, Hamilton and Mercer.

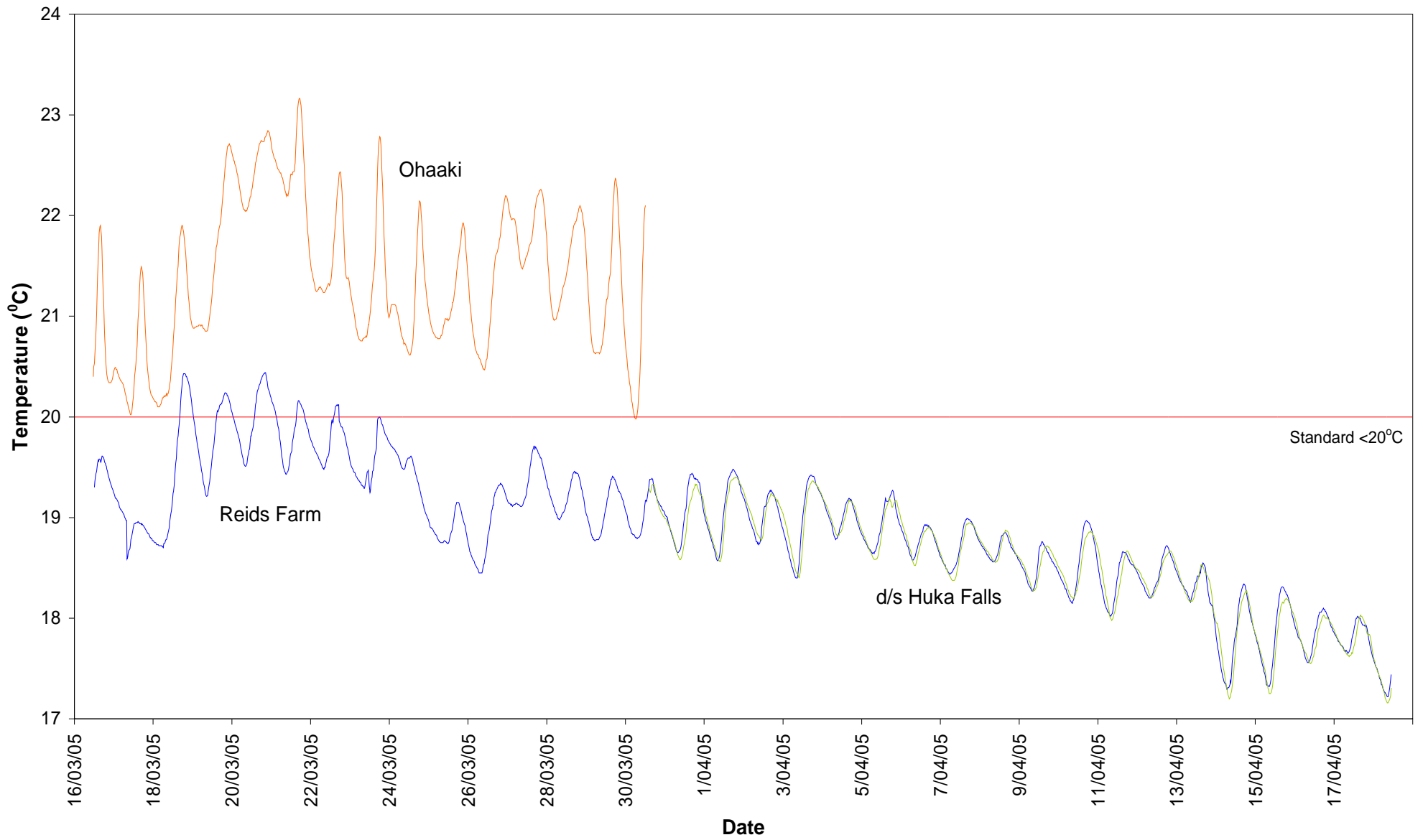


Appendix II

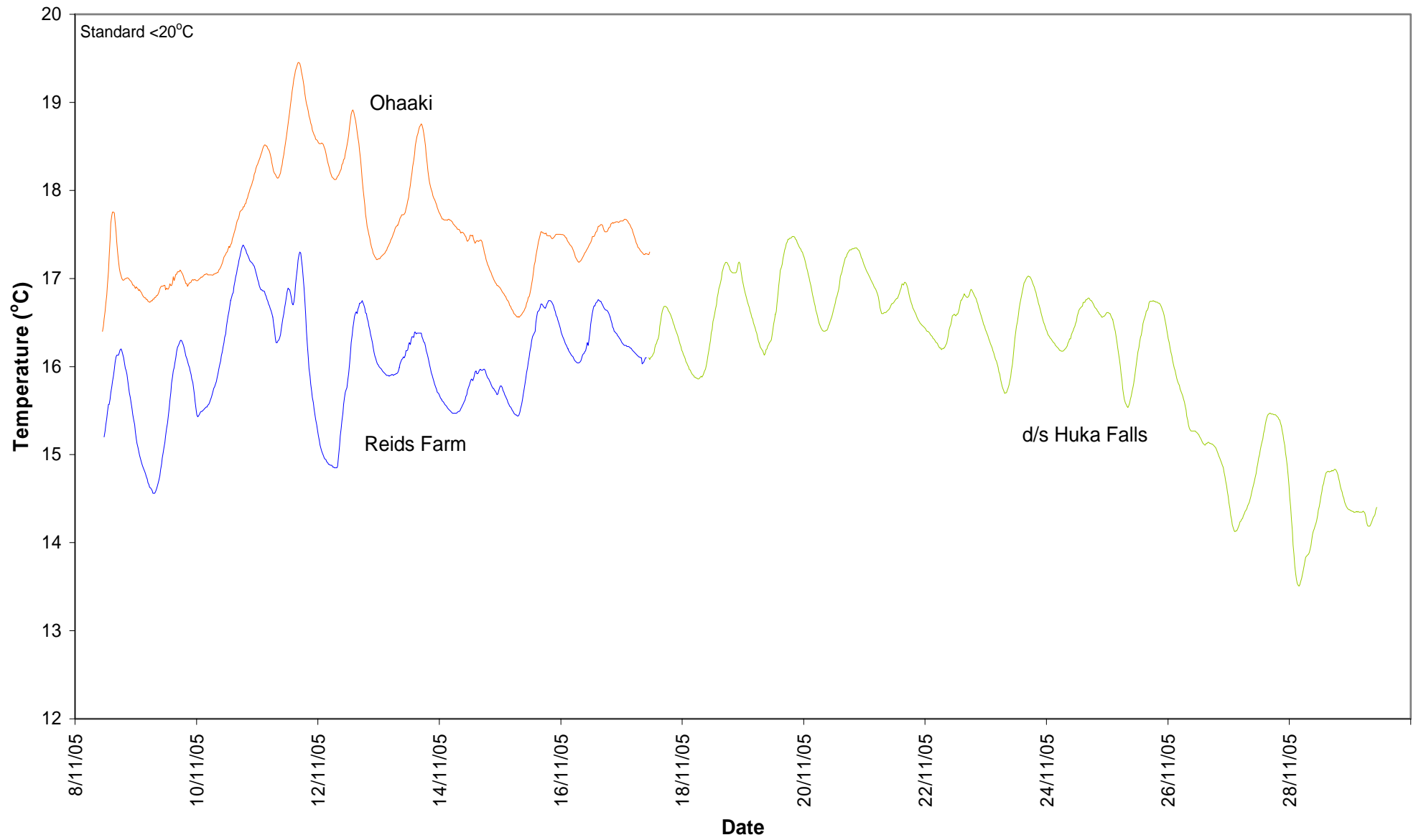
Datasonde Deployments

Diurnal variation of Some Water Quality Parameters

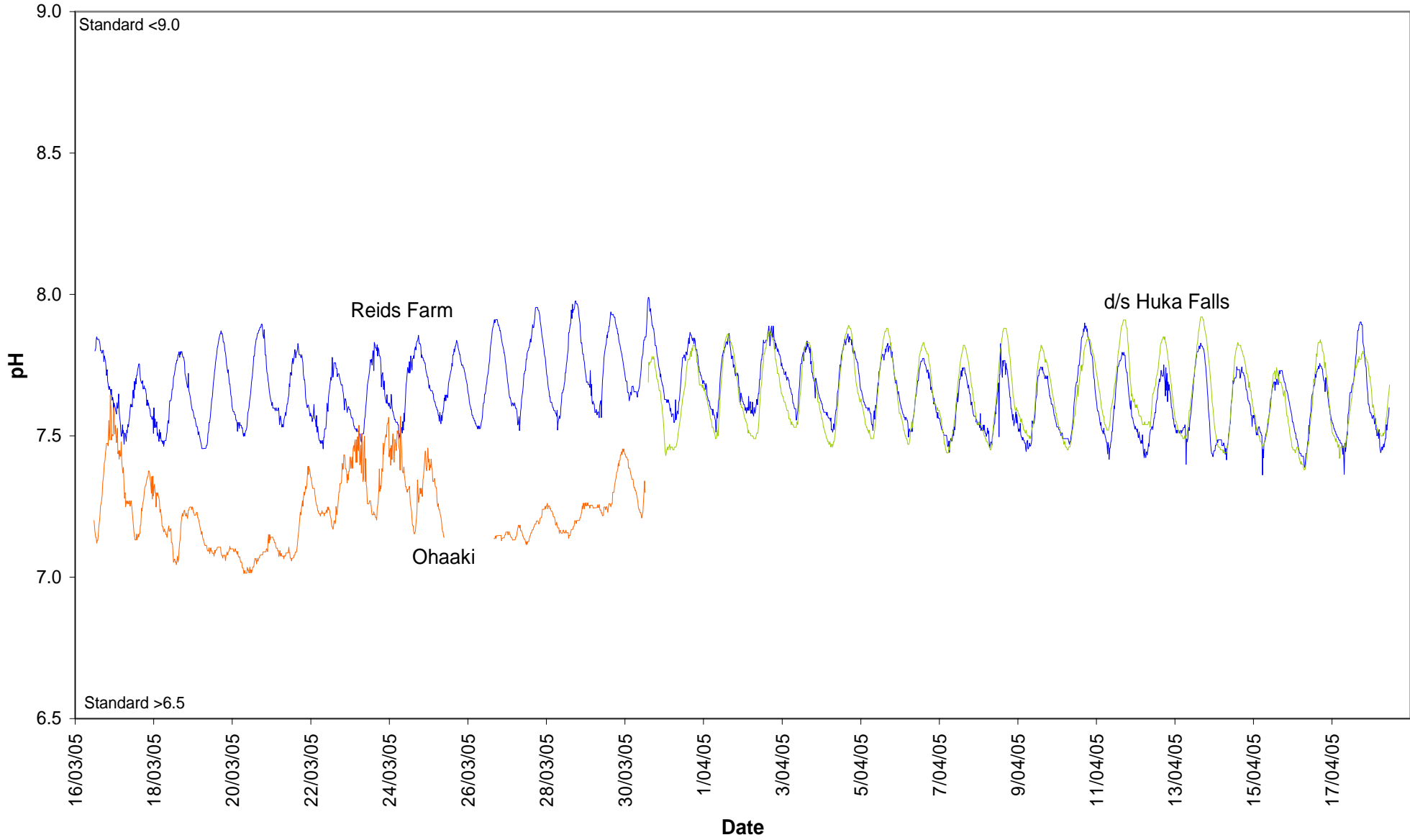
Temperature: Upper Waikato (March - April)



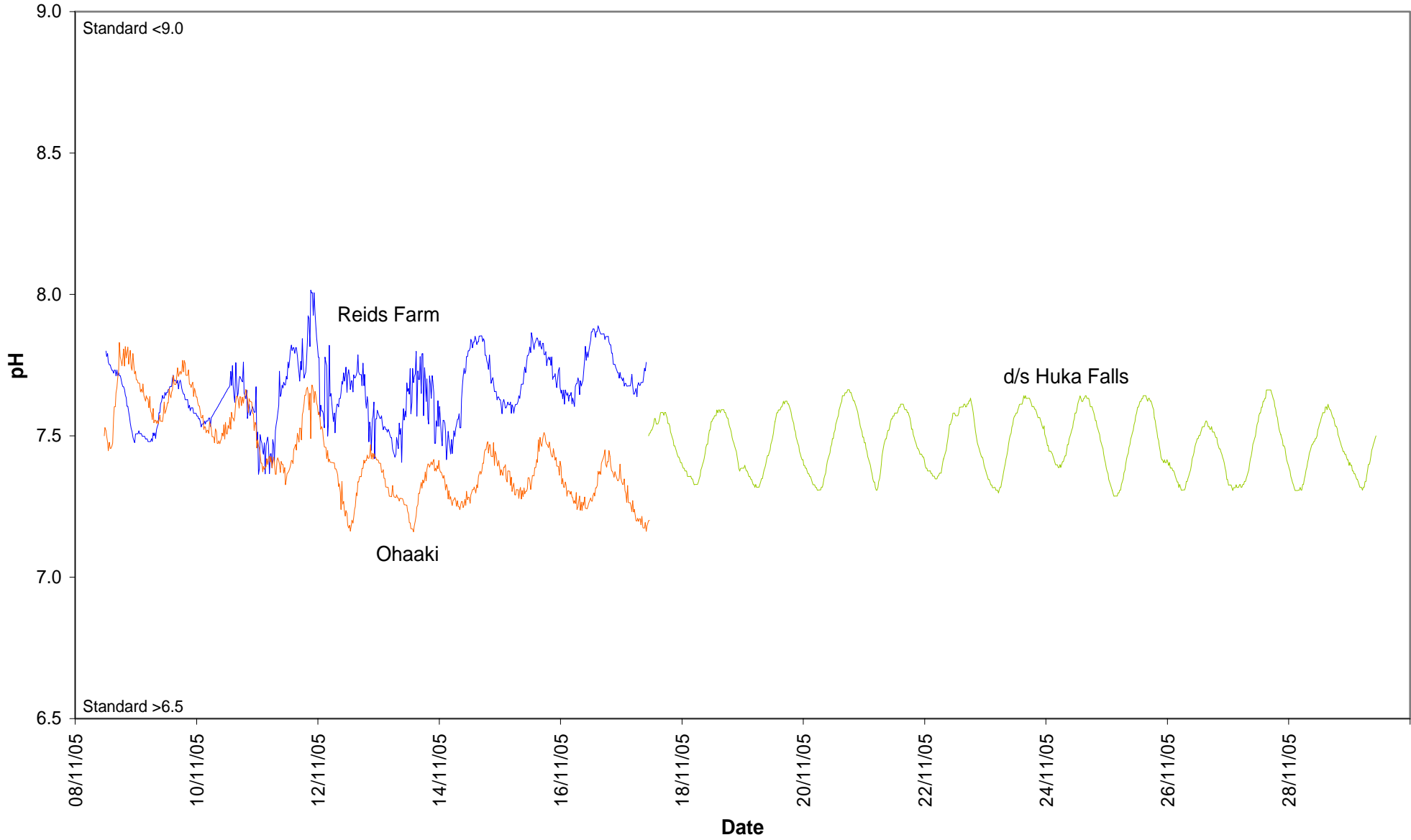
Temperature: Upper Waikato (November)



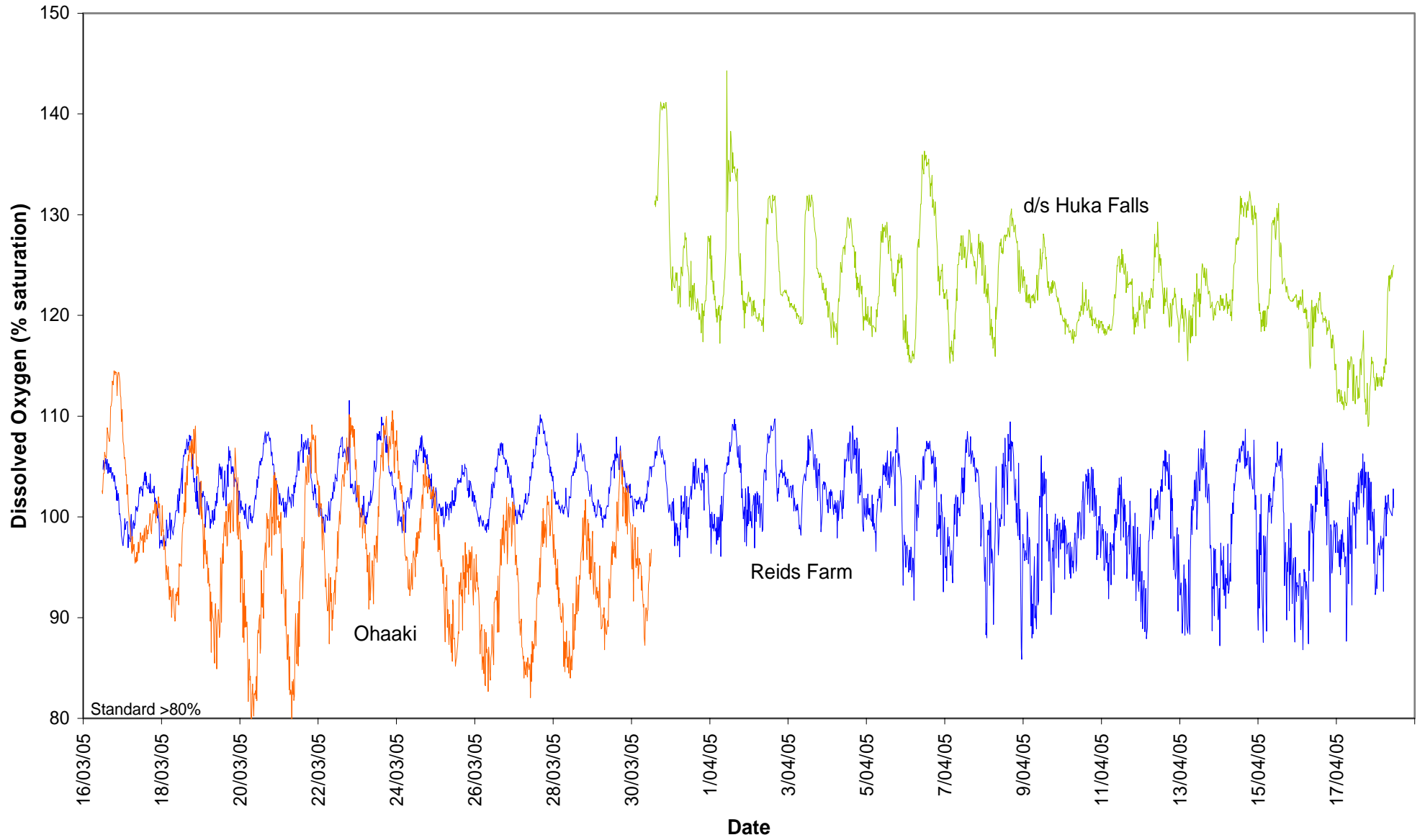
pH: Upper Waikato (March - April)



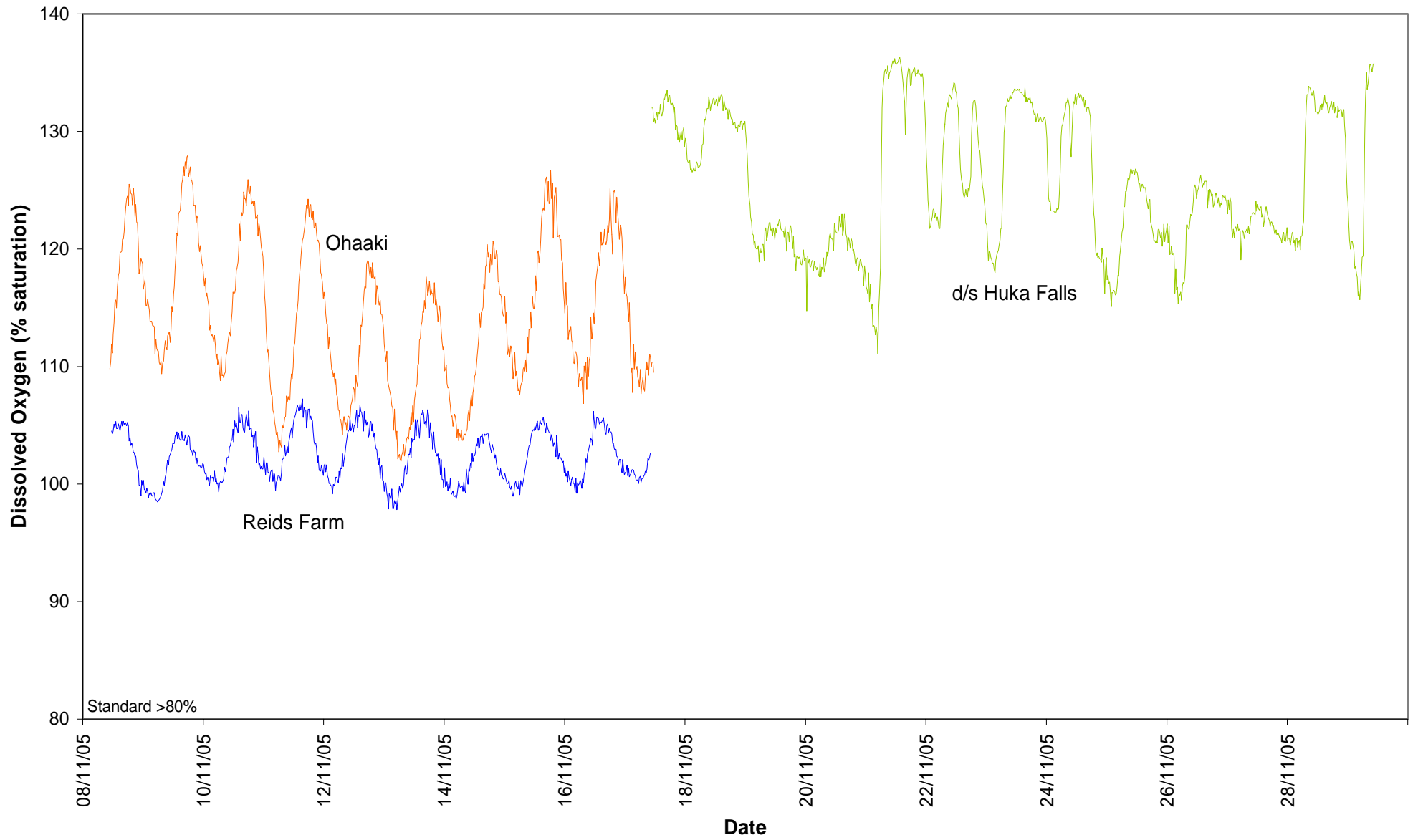
pH: Upper Waikato (November)



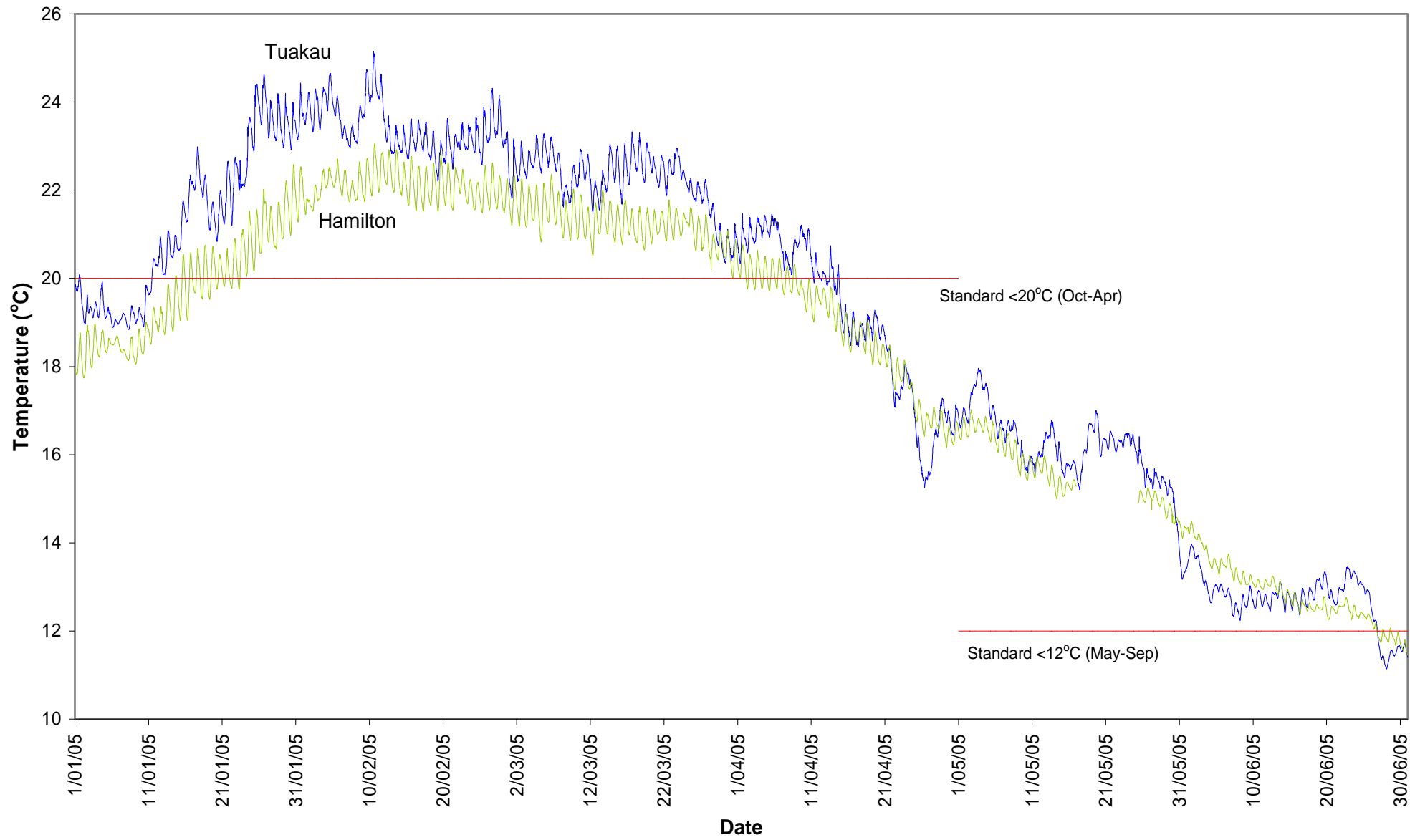
Dissolved Oxygen (% saturation): Upper Waikato (March - April)



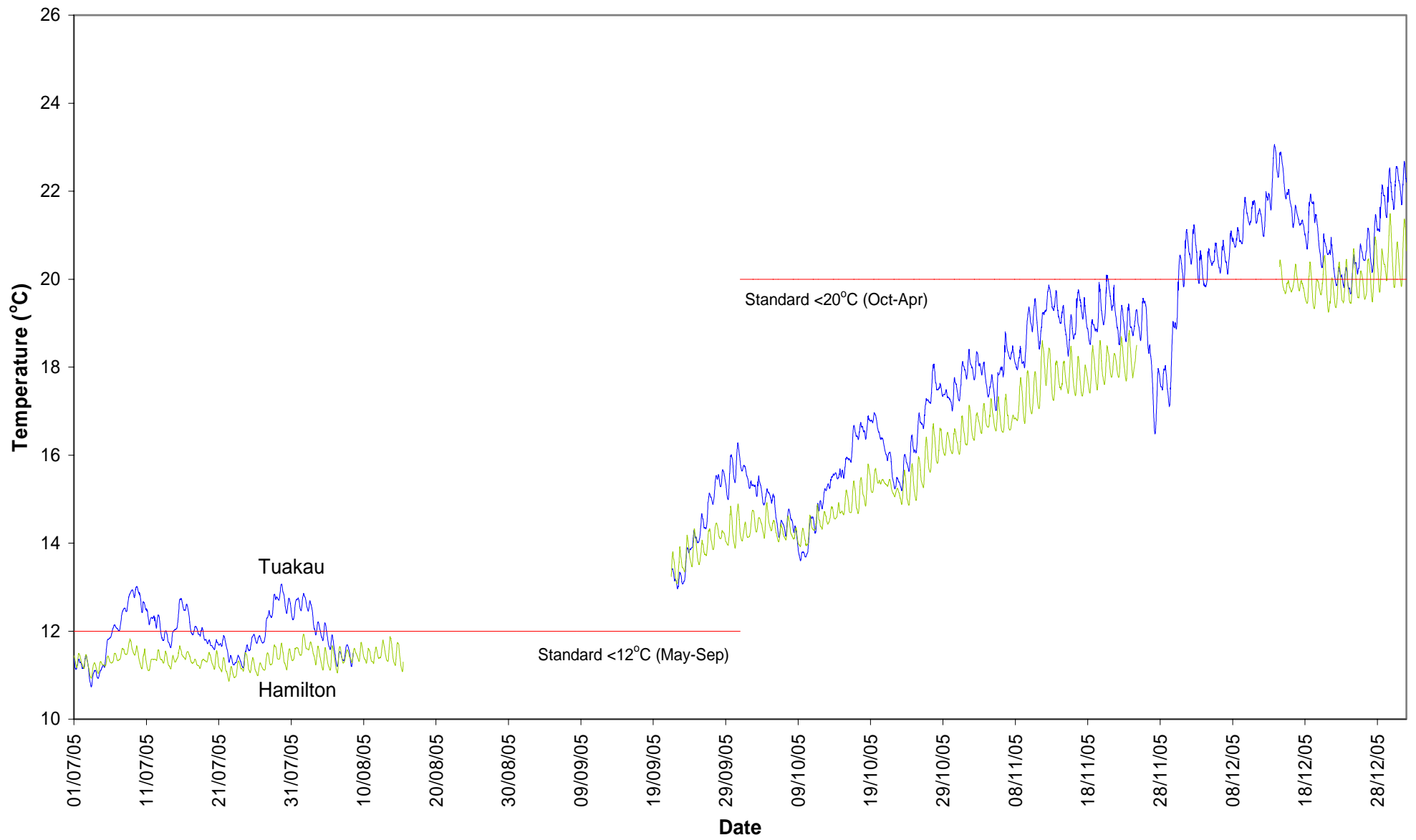
Dissolved Oxygen (% Saturation): Upper Waikato (November)



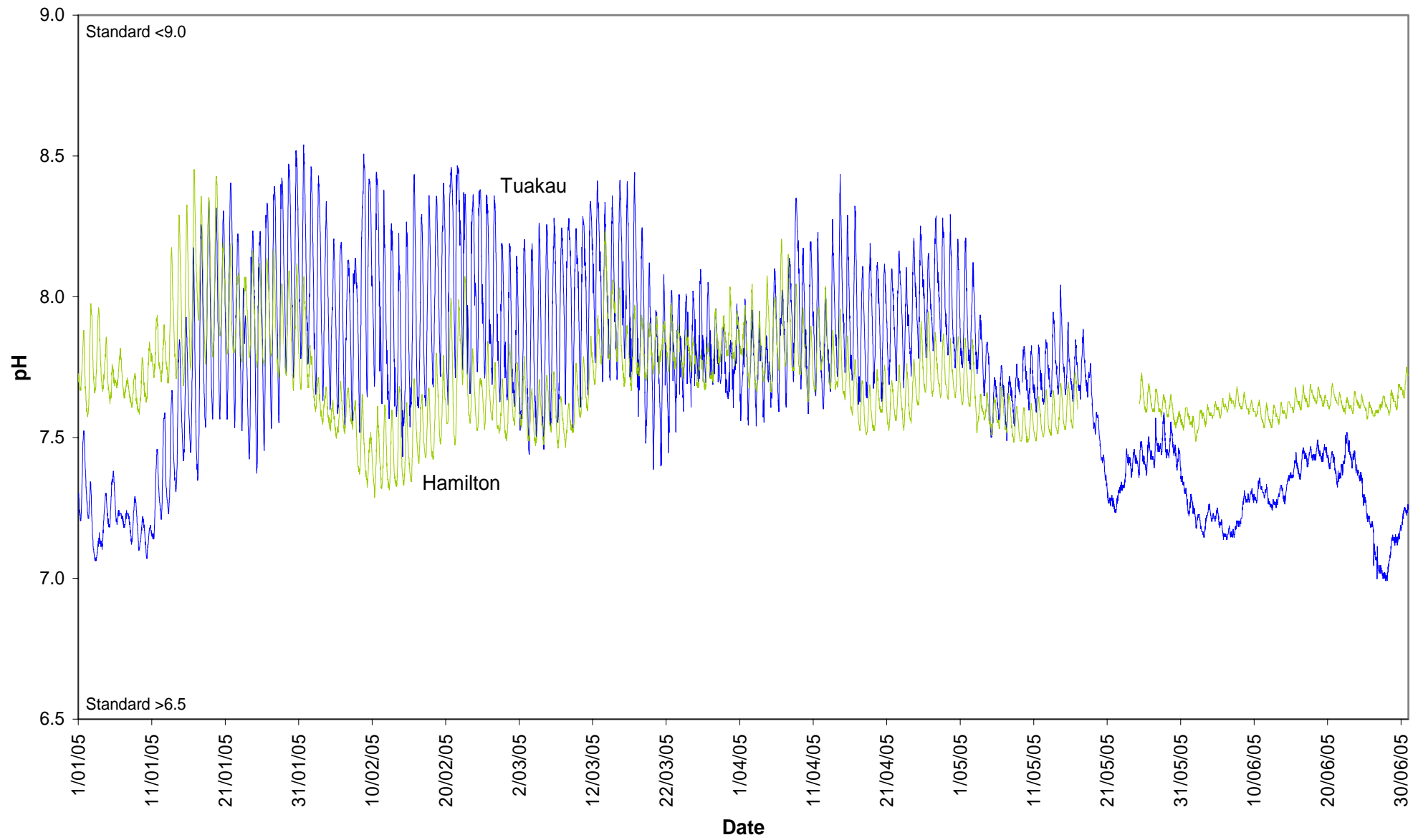
Temperature: Lower Waikato (January-June)



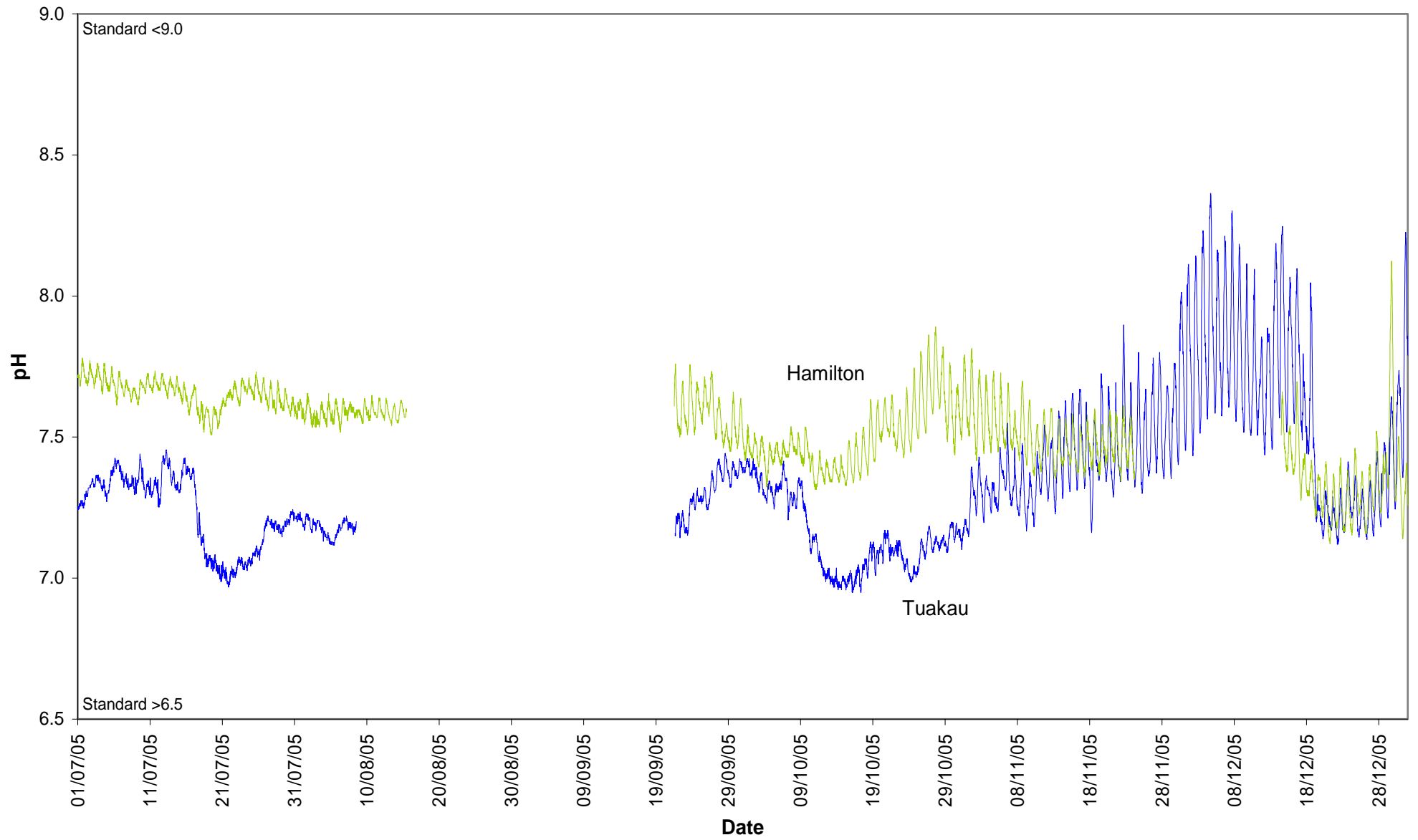
Temperature: Lower Waikato (July - December)



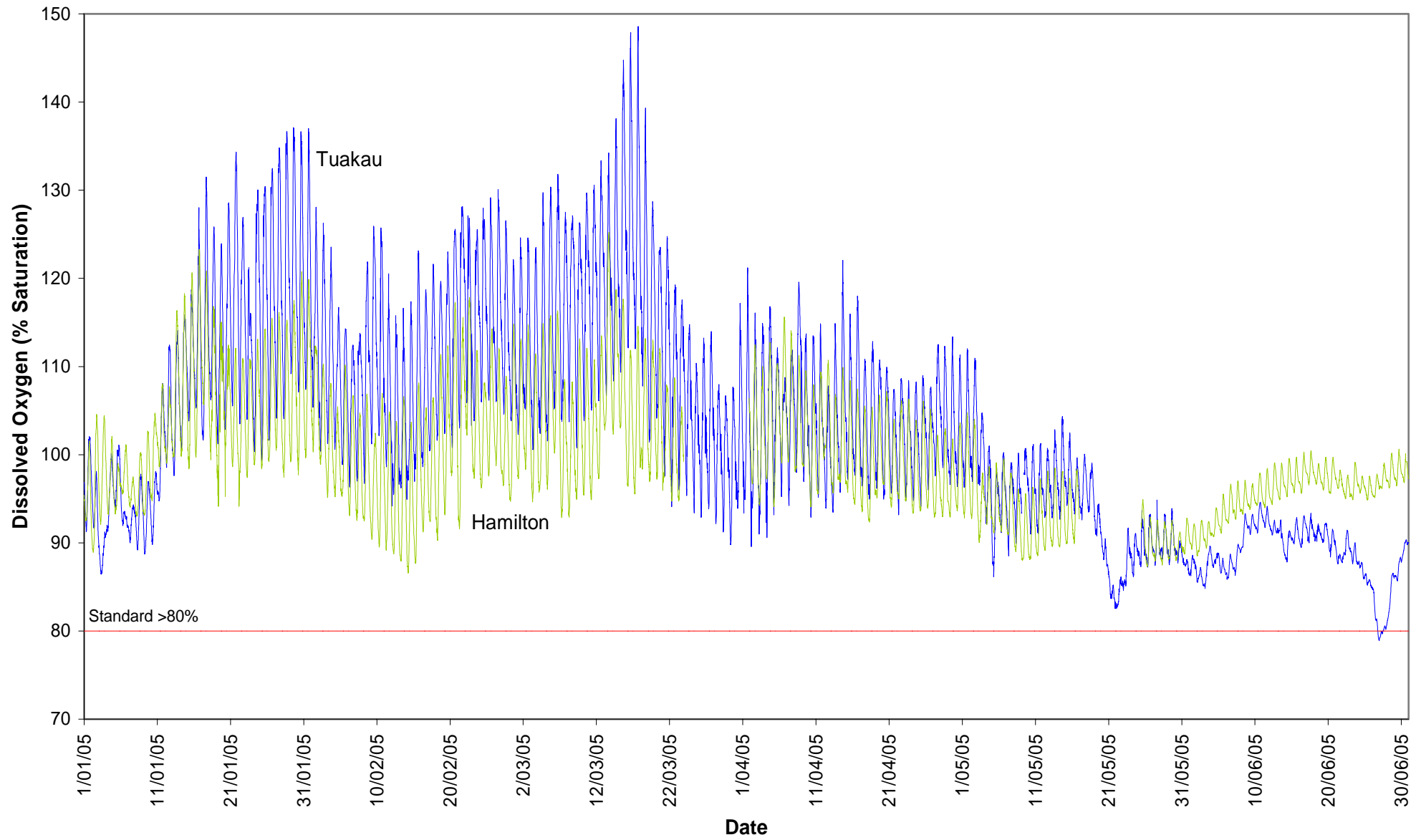
pH: Lower Waikato (January - June)



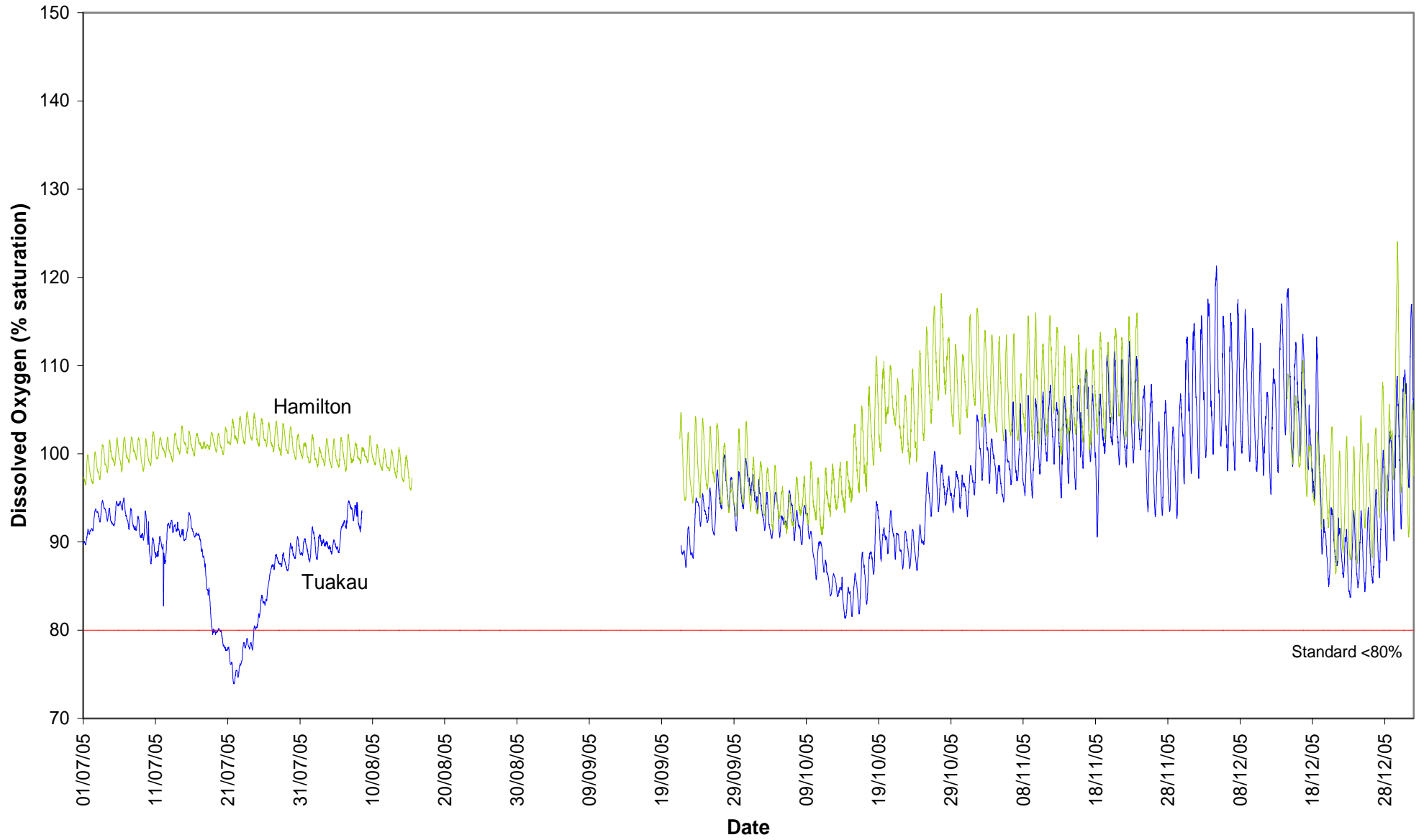
pH: Lower Waikato (July - December)



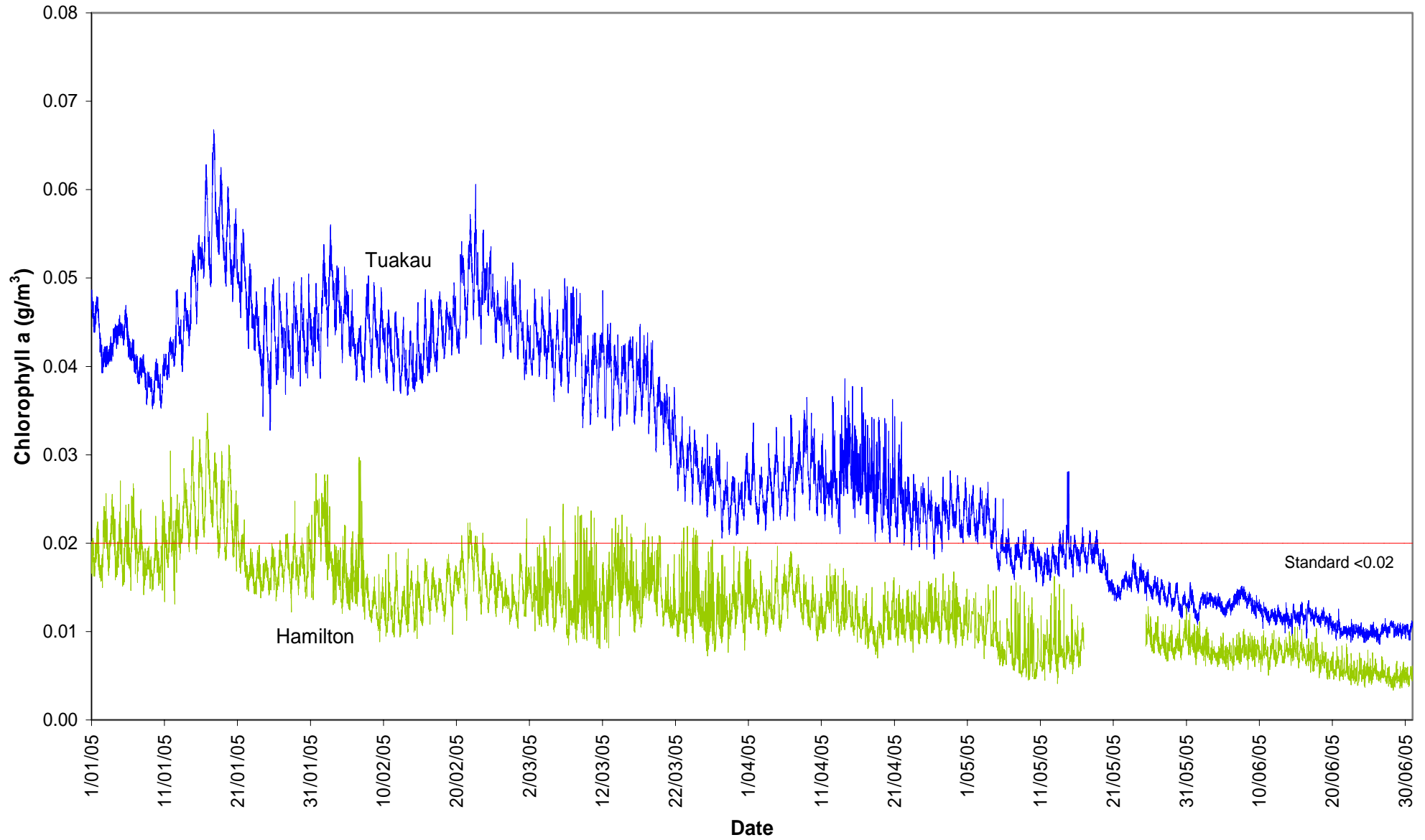
Dissolved Oxygen (% saturation): Lower Waikato (January - June)



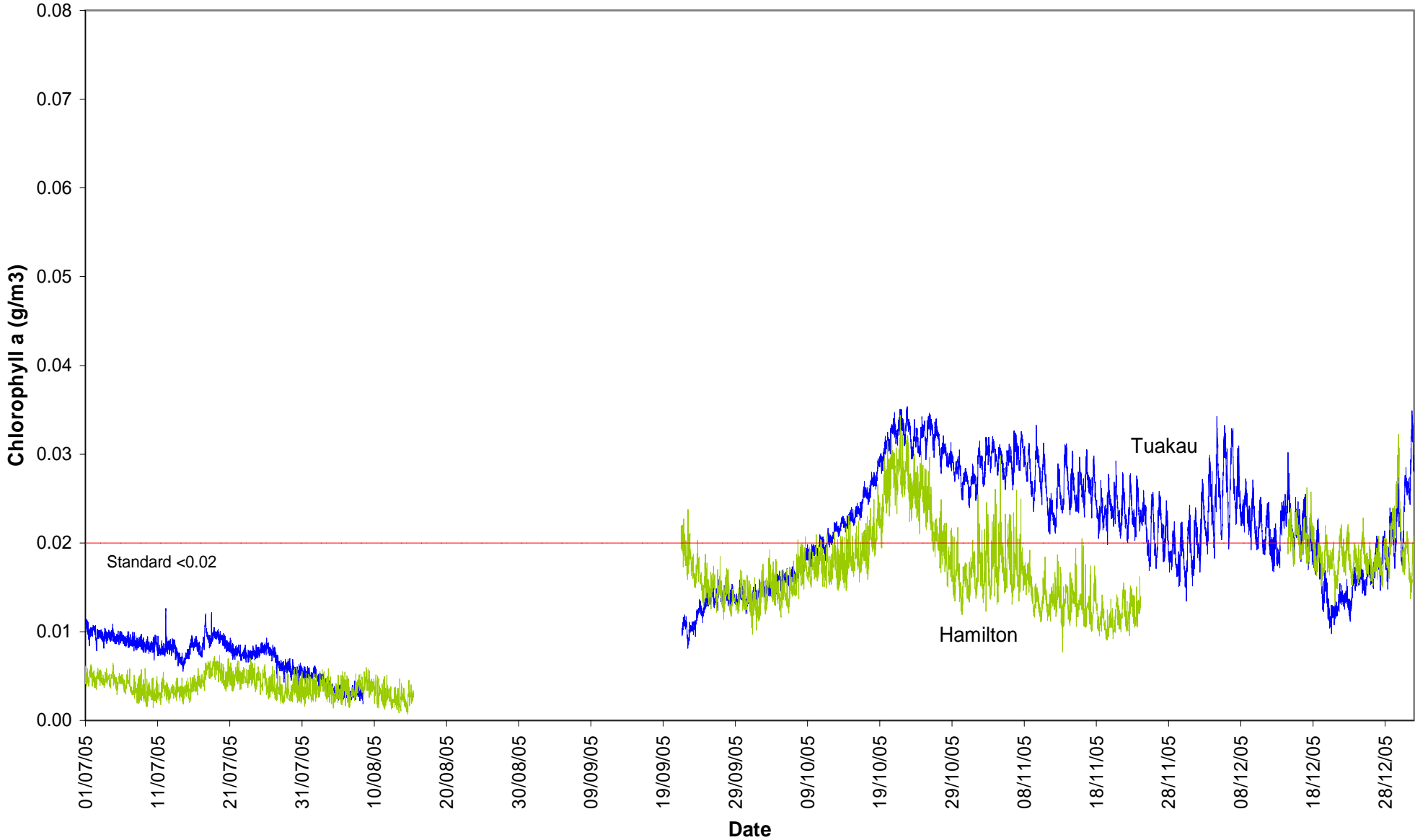
Dissolved Oxygen (% saturation): Lower Waikato (July - December)



Chlorophyll a: Lower Waikato (January - June)



Chlorophyll a: Lower Waikato (July - December)



Appendix III

Water Quality Parameters

Guidelines and Standards

Analytical Methods

Waikato River Water Quality Monitoring Programme Parameters

Water Quality Parameter	Reason For Monitoring	Parameter Monitored ¹	Comments ²
Dissolved Oxygen	- requirement for aquatic life	DO (conc.)	routine (field)
	- indicator of organic pollution	DO (%sat.)	routine (field)
	- indicator of photosynthesis (plant growth)		
Temperature	- indicator of biological activity	Temperature	routine (field)
	- requirement for aquatic life		
	- mixing processes		
	- modelling studies (e.g. nutrient uptake)		
Conductivity	- indicator of total salts dissolved in water	Conductivity	routine
	- indicator for geothermal input	TDS	routine
pH	- aquatic life protection	pH	routine
	- indicator of industrial discharges, mining		
Clarity - turbidity - black disk (visual clarity)	- aesthetic appearance	Turbidity	routine
	- light availability for excessive plant growth	Black disk	routine (field)
	- aquatic life protection		
	- indicator of catchment condition, land use		
Colour - light absorption	- aesthetic appearance	Munsell colour	routine (field)
	- light availability for excessive plant growth	Absorbance at: 340,440,780nm	routine
	- indicator of presence of organic matter		
Nutrients (N and P) Chlorophyll a	- enrichment, excessive plant growth	NO ₃ -N+NO ₂ -N	routine
	- nutrient limitation for plant/algal growth	NH ₄ -N,TKN	
		DRP, TP, Chl a	
Geothermal Contaminants	- indicators of geothermal inflows	Cl, Li, B, As	routine
	- aquatic life protection (ecotoxicity)		
	- drinking water (human health aspects)		
Organic Carbon	- indicator of organic pollution	BOD ₅	routine
	- catchment characteristics	TOC/DOC	routine
Faecal Bacteria - E. coli - enterococci - faecal coliforms	- indicator of pollution with faecal matter	E. Coli	routine
	- disease risk for swimming etc.	ENT	routine
		FC	routine

¹ see the page 54 for the meaning of the abbreviations.

² routine means sampled monthly.

Details of Water Quality Standards and Guidelines for “Satisfactory” Water Quality

Parameter	Critical Value(s)	Source
Dissolved oxygen	>80% of saturation concentration	RMA Third Schedule, Classes AE, F, and FS.
pH	6.5–9	ANZECC (1992) and Canadian guidelines for freshwater aquatic life (1987).
Turbidity	<5 NTU	Studies of adverse effects on underwater light—and thus on plant and invertebrate production—in certain South Island streams (Davies-Colley 1991).
Ammoniacal-nitrogen	<0.88 g/m ³	USEPA (1998) value for 1-hour exposure at pH 9.
Temperature	<12°C (May – Sep) <20°C (Oct – Apr)	Environment Waikato Proposed Regional Plan standards for trout fisheries and trout spawning (1998).
Total phosphorus	<0.04 g/m ³	From upper quartile values for 77 New Zealand rivers in NIWA’s National Water Quality Network (after Smith & Maasdam 1994)—note that the guidelines for “excellent” conditions are the lower quartile concentrations for these rivers.
Total nitrogen	<0.5 g/m ³	From upper quartile values for 77 New Zealand rivers in NIWA’s National Water Quality Network (after Smith & Maasdam 1994)—note that the guidelines for “excellent” conditions are the lower quartile concentrations for these rivers.
Water clarity at baseflow	>1.6 m	“Baseflow” defined as flows less than the upper decile flow. Guideline from Ministry for the Environment (1994).
Escherichia coli	<550/100 mL	Ministry for the Environment (2003) guidelines for the management of recreational and marine shellfish-gathering waters.
Median Escherichia coli	<126/100 mL	Ministry for the Environment (1999) guidelines for the management of recreational and marine shellfish-gathering waters.
Enterococci	<77/100 mL	Department of Health (1992) guidelines for “moderate” level of recreational use.
Chlorophyll a	<0.02 g/m ³	Ministry for the Environment (1992).
Arsenic	<0.01 g/m ³	Ministry of Health (2001).
Boron	<1.4 g/m ³	Ministry of Health (2001).

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Id ¹	Parameter	Method
A340F	Absorbance @ 340 nm Filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
A440F	Absorbance @ 440 nm Filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
A780F [†]	Absorbance @ 780 nm Filtered	Spectrophotometer, 1 cm path length, APHA method 5910B
As	Arsenic Total	Nitric acid digestion, ICP-MS, APHA method 3125B
B	Boron	ICP-MS, APHA method 3125B
BDISK	Black Disk	Field measurement, horizontal water transparency (20mm, 60mm, 100mm, 200mm disk) in river or trough (20mm only)
BOD ₅	Biochemical Oxygen Demand (5 day)	Incubation 5 days at 20°C, DO-meter, No nitrification inhibitor added, unseeded, APHA method 5210B
CHLA	Chlorophyll a	Acetone extraction. Spectroscopy. APHA method 10200H
Cl	Chloride	Filtered sample. Ion Chromatography APHA method 4110B
COLOUR	Colour	Field measurement, Munsell Colour Patches
COND	Conductivity	Lab Meter @ 25°C. APHA method 2510B
DO	Dissolved Oxygen	Field measurement (WTW DO meter, model 340A)
DO (% Sat)	Dissolved Oxygen (percent saturation)	Field measurement (WTW DO meter, model 340A)
DOC	Dissolved Organic Carbon	Filtration, acidification, purging to remove inorganic C, catalytic oxidation, IR detection. APHA method 5310B (modified)
DRP	Dissolved Reactive Phosphorus	Molybdenum Blue Colorimetry. Flow injection analyser. APHA 4500 PG (proposed)
E. coli	Escherichia coli	Membrane Filtration (mFC Agar) confirmation by NA-MUG Agar. APHA method 9222G
ENT	Enterococci bacteria	Membrane Filtration (mE Agar) confirmation by EIA Agar. APHA method 9230C
FC	Faecal Coliforms	Membrane Filtration with resuscitation(mFC Agar). APHA method 9222D
Flow	Flow – Instantaneous	Calculated from rating curve ± 8%
Li	Lithium	ICP-MS, method APHA 3125B
NH ₄ -N	Ammoniacal Nitrogen (Total)	Phenol/Hypochlorite Colorimetry. Flow injection analyser. APHA method 4500-NH ₃ H
NNN	Nitrite/Nitrate Nitrogen	Automated Cadmium reduction. Flow injection analyser. APHA method 4500 – NO ₃ I (proposed).
NO ₃ -N	Nitrate Nitrogen	Calculation: (Nitrate-N + Nitrite -N) – Nitrite - N
pH	pH	Lab Meter @ 25°C. APHA method 4500-H ⁺ B
TDS	Total Dissolved Solids	Filtration, gravimetric. APHA 2540C (modified)
TEMP	Temperature	Field measurement (WTW DO meter, model 340A)
TKN	Total Kjeldahl-Nitrogen	Acid digestion. Phenol/Hypochlorite colorimetry. Flow injection analyser. APHA method 4500-N _{org} D (modified)
TOC	Total Organic Carbon	Acidification, purging to remove inorganic C, catalytic oxidation, IR detection. APHA method 5310B (modified)
TN	Total Nitrogen	Calculated from NNN + TKN (Nitrite/Nitrate Nitrogen + Total Kjeldahl-Nitrogen)
TP	Total Phosphorus	Acid persulphate digestion, Colorimetry. Discrete Analyser. APHA method 4500-PE (modified)
TURB	Turbidity	Turbidity Meter Hach 2100N. APHA method 2130B

¹ Water quality parameter identification code refers to Environment Waikato's water quality database (TimeStudio) parameter short name.

APHA = Standards Methods for the Examination of Water and Wastewater, 20th Edition, 1998, APHA, AWWA, WEF

ICP-MS = Inductively Coupled Plasma – Mass Spectroscopy

5-Yearly Trace Metal Analysis - Parameters & Analytical Methods

Id ¹	Parameter	Method
AlTR	Aluminium Total Recoverable	Nitric acid digestion, ICP-MS
AsTR	Arsenic Total Recoverable	Nitric acid digestion, ICP-MS
BTR	Boron Total Recoverable	Nitric acid digestion, ICP-MS
CdTR	Cadmium Total Recoverable	Nitric acid digestion, ICP-MS
CoTR	Cobalt Total Recoverable	Nitric acid digestion, ICP-MS
CrTR	Chromium Total Recoverable	Nitric acid digestion, ICP-MS
CuTR	Copper Total Recoverable	Nitric acid digestion, ICP-MS
FeD	Iron Dissolved	ICP-MS, filtered acidified.
FeTR	Iron Total Recoverable	Nitric acid digestion, ICP-MS
HgT	Mercury Total	Total Recoverable Extraction, Permanganate/ Persulphate digestion. Analysis by FIMS.
LiT	Lithium Total	Nitric acid digestion, ICP-MS
MnD	Manganese Dissolved	ICP-MS, filtered acidified.
MnTR	Manganese Total Recoverable	Nitric acid digestion, ICP-MS
MoTR	Molybdenum Total Recoverable	Nitric acid digestion, ICP-MS
NiTR	Nickel Total Recoverable	Nitric acid digestion, ICP-MS
PbTR	Lead Total Recoverable	Nitric acid digestion, ICP-MS
SbTR	Antimony Total Recoverable	Nitric acid digestion, ICP-MS
TiTR	Thallium Total Recoverable	Nitric acid digestion, ICP-MS
UTR	Uranium Total Recoverable	Nitric acid digestion, ICP-MS
ZnD	Zinc Dissolved	Filtered, ICP-MS
ZnTR	Zinc Total Recoverable	Nitric acid digestion, ICP-MS

¹ Water quality parameter identification code refers to Environment Waikato's water quality database (Timestudio) parameter short name.