

## Appendix A: RWQMN sites with their catchment land use

Table 4: River sites routinely monitored for water quality in the Northland region, with their catchment land use as a percentage and total catchment area (Ha).

Site name	NRC site no.	Catchment	Sampling began	% Indigenous	% Forestry	% Pasture	% Other	Total (Ha)
Awanui at FNDC water take <sup>1</sup>	100363	Awanui	Oct-96	36	5.6	57.1	1.3	21701.5
Awanui at Waihue Channel	100370	Awanui	Oct-96	31.1	4.3	61.3	3.4	31361.6
Kaeo at Dip Rd bridge	102674	Kaeo	Aug-06	55.6	15.6	28.3	0.7	9933.6
Kaihu at gorge	102256	Kaihu	Jul-02	27.6	16.2	55.7	0.4	11507.4
Mangahuru at Apotu Road	100281	Wairua	Oct-96	14.6	49.7	32.1	3.8	4554.9
Mangahuru at Main Rd	100237	Wairua	Jul-05	12.9	82	4	0.9	2103.1
Mangakahia at Titoki <sup>3</sup>	101038	Mangakahia	Jan-89	33.3	29.1	36.9	0.5	80685.9
Mangakahia d/s of Twin bridges	109096	Mangakahia	Oct-96	34.5	29.5	35.7	0.3	24313.5
Manganui at Mititai Rd	102257	Manganui	Aug-01	17	6.1	75.9	0.9	40866
Mangere at Knight Rd	101625	Wairua	Oct-96	21.9	0.6	75.8	1.7	7586.1
Opouteke at suspension bridge	102258	Mangakahia	Oct-96	35.5	58.4	6	0	10806.2
Punakitere at Punakitere Rd	105231	Punakitere	Aug-01	24.7	16.7	54.6	3.9	30268.3
Ruakaka at Flyger Rd	105008	Ruakaka	Aug-06	26.3	1.6	71.5	0.5	4749.8
Victoria at Victoria Valley Rd	105532	Awanui	Oct-96	82	5.2	12.6	0.2	2669.5
Waiarohia at Second Ave	108359	Waiarohia	Jul-05	55.1	1.4	18.7	24.8	1849.7
Waiarohia at Whau Valley Road	107773	Waiarohia	Jul-05	70.7	1.6	23	4.7	1038.3
Waiharakeke at Stringers Rd	100007	Waiharakeke	Aug-06	28.9	23.6	44.8	2.8	23040.5
Waiotu at SH1	102248	Wairua	Mar-00	30.5	4.5	64.2	0.8	12045.2
Waipapa in Puketi Forest <sup>3</sup>	101751	Waipapa	Jan-89	86.6	9.9	3.5	0	12046.5
Waipoua at SH12	103304	Waipoua	Jul-02	90.9	0.6	8.5	0	6446.9
Wairua at Purua <sup>3</sup>	101753	Wairua	Jan-89	23.5	10	64.3	2.2	54301.2
Waitangi at Waimate Nth Rd <sup>2</sup>	103178	Waitangi	Oct-96	29.4	8.1	61.7	0.9	5043.7
Waitangi at Watea <sup>3</sup>	101752	Waitangi	Jan-89	19.5	8	69.2	3.3	29887.2
Whakapara at cableway	102249	Wairua	Oct-96	35.2	11.1	52.7	1	16380.2

1. Site was initially at School cut (Site 100366), 300m downstream from current site. Site was moved in 2002, due to health and safety considerations.

2. Site was initially at Whakataha Road (Site 105533), 500m upstream from current site. Site was moved in 1999, due to health and safety considerations.

3. These four sites are sampled by NIWA as part of the National River Water Quality Network.

## Appendix B: Medians for RWQMN sites

Table 5: Medians for each parameter for 21 RWQMN sites for all years

Site	Temp. (deg. C)	DO (% sat.)	DO (mg/L)	Cond. (mSm/cm)	pH	Turb. (ntu)	Water clarity (m)	Dissolved colour (340 nm/cm)	Dissolved colour (440 nm/cm)	DRP (g/m3)	TP (g/m3)	NNN/ NO3 (g/m3)	NH4 (g/m3)	TKN (g/m3)	TN (g/m3)	Ecoli (n/100ml)
Awanui at FNDC take	16.5	86.0	8.6	7.1	7.4	7.1	0.82	12.92	2.90	0.020	0.046	0.044	0.020	0.2	0.299	306
Awanui u/s of Waihue	17.1	89.2	8.7	9.4	7.5	9.4	0.55	13.67	3.18	0.167	0.150	0.073	0.040	0.5	0.583	410
Kaihu	14.4	104.6	10.8	3.5	7.5	3.5	1.70	8.90	2.11	0.008	0.020	0.275	0.005	0.2	0.435	146
Mangahuru at Apotu Rd	16.1	95.6	9.8	7.5	6.8	7.5	0.75	14.89	3.43	0.040	0.098	0.426	0.040	0.3	0.730	494
Mangahuru at Main Rd	13.9	97.6	10.1	3.5	7.2	3.5	2.10	12.27	2.94	0.005	0.018	0.037	0.005	0.1	0.137	181
Mangakahia at Titoki	17.1	96.6	9.4	13.5	7.4	6.8	0.65	9.69	1.90	0.008	0.028	0.106 <sup>1</sup>	0.015	0.2	0.320	182
Mangakahia at Twin Bridges	16.8	106.5	NA	3.6	7.4	3.6	1.38	8.09	1.99	0.044	0.072	0.064	0.010	0.1	0.261	180
Manganui River	15.8	85.3	8.2	8.6	7.2	8.6	0.73	18.54	4.01	0.035	0.092	0.250	0.020	0.5	0.712	122
Mangere River	15.3	83.2	8.5	7.2	6.9	7.2	0.81	17.72	4.05	0.110	0.175	0.720	0.100	0.5	1.341	561
Opouteke River	16.8	106.9	NA	2.6	7.5	2.6	1.58	5.96	1.56	0.036	0.078	0.043	0.020	0.1	0.215	121
Punakitere River	15.5	98.3	9.9	6.2	7.4	6.2	0.95	16.03	3.70	0.027	0.058	0.466	0.020	0.3	0.866	388
Victoria River	14.9	96.8	9.9	1.3	7.4	1.3	2.03	2.95	0.61	0.019	0.022	0.008	0.020	0.1	0.087	166
Waiarohia at Second Ave	16.4	111.2	10.9	3.0	7.4	3.0	1.49	8.51	2.09	0.022	0.051	0.397	0.005	0.2	0.643	465
Waiarohia at Whau Valley	15.8	97.5	9.6	7.3	7.2	7.3	0.90	12.03	2.95	0.007	0.076	0.235	0.005	0.5	0.784	726
Waiotu River at SH1	15.5	92.3	9.3	8.9	6.9	5.4	0.82	15.22	3.81	0.015	0.068	0.344	0.020	0.3	0.667	323
Waipapa at Puketi Forest	14.7	97.0	9.8	11.6	7.5	2.2	1.85	6.55	1.28	0.005	0.010	0.020 <sup>1</sup>	0.003	0.1	0.107	71
Waipoua River	12.9	103.4	10.9	2.1	7.5	2.1	2.34	6.98	1.69	0.005	0.008	0.016	0.005	0.1	0.088	63
Wairua River at Purua	17.0	89.4	8.7	11.9	6.8	8.8	0.56	17.13	3.22	0.023	0.075	0.470 <sup>1</sup>	0.041	0.3	0.828	111
Waitangi at Waimate	14.9	97.3	10.0	3.8	6.9	3.8	1.07	8.79	1.93	0.007	0.027	0.364	0.020	0.2	0.570	488
Waitangi at watea	16.7	100.7	9.8	11.2	7.5	3.7	1.16	9.82	1.86	0.006	0.022	0.294 <sup>1</sup>	0.008	0.2	0.504	164
Whakapara River	15.9	96.5	9.8	6.0	6.9	6.0	1.01	13.27	3.06	0.025	0.057	0.308	0.020	0.2	0.504	177

1. For the four National sites compliance with NNN is using the NO<sub>3</sub> results as there is no NNN results for these sites.

## Northland River Water Quality Monitoring Network: State and Trends 2006 – Appendices to report

Table 6: Medians for each parameter for 21 RWQMN sites for 2006

Site	Temp. (deg. C)	DO (% sat.)	DO (mg/L)	Cond. (mSm/cm)	pH	Turb. (ntu)	Water clarity (m)	Dissolved colour (340 nm/cm)	Dissolved colour (440 nm/cm)	DRP (g/m3)	TP (g/m3)	NNN/ NO3 (g/m3)	NH4 (g/m3)	TKN (g/m3)	TN (g/m3)	Ecoli (n/100ml)
Awanui at FNDC take	15.55	85.4	8.8	4.5	7.3	4.5	0.75	13.04	2.56	0.016	0.039	0.028	0.005	0.3	0.260	276
Awanui u/s of Waihue	16.80	85.0	8.7	7.0	7.4	5.0	0.55	13.53	3.34	0.060	0.107	0.073	0.005	0.5	0.573	323
Kaihu	14.20	105.3	10.7	3.0	7.3	3.4	1.76	7.76	2.43	0.011	0.027	0.265	0.005	0.1	0.435	128
Mangahuru at Apotu Rd	15.20	103.7	10.5	4.5	7.2	4.7	1.55	14.64	3.36	0.038	0.086	0.386	0.030	0.2	0.694	419
Mangahuru at Main Rd	13.75	97.6	10.2	3.4	7.2	3.5	2.13	11.41	2.68	0.005	0.018	0.028	0.005	0.1	0.124	161
Mangakahia at Titoki	16.40	96.6	9.6	5.9	7.4	6.9	0.68	9.91	1.92	0.007	0.029	0.209 <sup>1</sup>	0.012	0.2	0.282	120
Mangakahia at Twin Bridges	15.80	108.5	NA	2.7	7.5	3.0	1.54	7.90	1.90	0.015	0.027	0.017	0.005	0.1	0.167	148
Manganui River	15.85	85.6	8.7	6.8	7.1	8.6	0.96	20.05	3.66	0.056	0.108	0.167	0.005	0.5	0.590	91
Mangere River	14.75	86.2	8.8	5.3	7.2	5.5	1.20	16.83	3.77	0.110	0.163	0.591	0.050	0.5	1.083	821
Opouteke River	15.85	109.9	NA	3.3	7.5	3.7	1.25	7.90	2.02	0.009	0.021	0.012	0.005	0.1	0.162	179
Punakitere River	14.70	97.4	10.2	5.0	7.3	4.6	1.67	16.51	3.55	0.028	0.057	0.420	0.020	0.3	0.842	389
Victoria River	13.85	97.7	10.5	1.1	7.3	1.1	1.95	3.17	0.55	0.014	0.021	0.004	0.005	0.1	0.055	179
Waiarohia at Second Ave	17.05	111.2	11.1	2.6	7.5	3.5	1.50	8.51	1.87	0.022	0.048	0.397	0.008	0.2	0.628	453
Waiarohia at Whau Valley	16.00	97.9	9.9	7.6	7.2	8.0	0.90	12.29	2.84	0.004	0.083	0.162	0.005	0.6	0.741	812
Waiotu River at SH1	14.85	94.2	10.2	5.4	7.3	7.3	1.40	15.31	3.48	0.018	0.051	0.263	0.015	0.2	0.430	251
Waipapa at Puketia Forest	13.30	97.8	10.5	1.6	7.6	1.6	2.05	7.30	1.53	0.005	0.010	0.024 <sup>1</sup>	0.003	0.1	0.121	78
Waipoua River	13.15	102.0	10.9	2.0	7.4	2.1	2.13	7.22	1.78	0.021	0.029	0.016	0.005	0.1	0.078	20
Wairua River at Purua	17.10	94.2	9.7	7.6	7.1	7.6	0.76	15.63	2.99	0.024	0.062	0.532 <sup>1</sup>	0.039	0.4	0.759	78
Waitangi at Waimate	13.85	97.8	10.7	2.6	7.2	2.8	1.89	8.74	1.92	0.002	0.019	0.379	0.010	0.2	0.560	386
Waitangi at watea	15.30	99.7	10.3	2.6	7.5	4.0	1.69	8.71	1.69	0.006	0.023	0.357 <sup>1</sup>	0.006	0.2	0.479	167
Whakapara River	15.35	102.5	10.4	4.4	7.3	4.5	1.72	12.10	2.83	0.027	0.044	0.215	0.015	0.2	0.309	135

1. For the four National sites compliance with NNN is using the NO<sub>3</sub> results as there is no NNN results for these sites.

## Appendix C: Compliance of RWQMN sites

Table 7: Compliance for all years data for the RWQMN sites with the ANZECC trigger values for DO%, pH, turbidity, water clarity, TP, NNN, NH<sub>4</sub>, TN and DRP (ANZECC 2000), the recreational bathing guideline for *E. coli* (MfE 2002) and the guideline from the RWSP for water clarity of 1.6 m (NRC 2007)<sup>2</sup>.

Site	DO (% sat.)	pH	Turbidity (ntu)	Water clarity (m)	TP (g/m <sup>3</sup> )	NNN/ NO <sub>3</sub> (g/m <sup>3</sup> )	NH <sub>4</sub> (g/m <sup>3</sup> )	TN (g/m <sup>3</sup> )	DRP (g/m <sup>3</sup> )	E. coli (n/100ml)	Clarity with 1.6 m
Awanui at FNDC take	0.0	77.5	46.2	67.5	24.6	100.0	80.7	92.3	9.3	73.8	6.0
Awanui u/s of Waihue	12.1	74.8	25.4	46.0	0.9	97.4	41.2	54.3	0.9	63.9	1.1
Kaihu	44.4	72.2	75.5	91.5	74.1	85.2	87.0	72.2	70.4	81.5	59.6
Mangahahuru at Apotu Rd	21.1	14.2	34.2	67.4	3.4	53.8	36.1	32.8	5.0	53.6	13.0
Mangahahuru at Main Rd	44.4	55.6	83.3	100.0	94.4	94.4	100.0	100.0	100.0	94.4	62.5
Mangakahia at Titoki	26.1	71.4	41.2	50.4	64.4	97.4 <sup>1</sup>	74.4	89.8	74.4	77.3	10.9
Mangakahia at Twin Bridges	33.6	53.4	68.6	78.5	32.2	99.2	94.0	93.2	26.5	85.4	43.0
Manganui River	3.1	47.7	32.8	73.2	6.2	86.2	75.4	40.0	0.0	80.3	1.8
Mangere River	2.6	26.4	33.6	68.0	3.3	15.0	13.2	7.5	2.5	49.4	3.1
Opouteke River	38.4	53.0	75.2	82.1	33.6	100.0	94.9	93.9	27.8	91.4	49.1
Punakitere River	40.3	70.8	44.6	77.4	15.4	47.7	78.5	24.6	7.7	69.2	28.3
Victoria River	29.7	71.7	89.1	94.3	66.9	100.0	92.4	97.4	8.5	84.5	75.5
Waiarohia at Second Ave	16.7	77.8	83.3	94.1	11.1	61.1	94.4	38.9	38.9	61.1	41.2
Waiarohia at Whau Valley	27.8	61.1	22.2	88.2	0.0	77.8	100.0	16.7	72.2	33.3	0.0
Waiotu River at SH1	10.1	25.9	18.2	75.8	7.5	72.5	58.8	39.2	7.5	66.7	9.7
Waipapa at Puketi Forest	25.2	99.2	84.0	88.2	96.6	100.0 <sup>1</sup>	100.0	99.2	98.3	86.4	62.2
Waipoua River	33.3	81.5	86.8	93.6	81.5	100.0	74.1	90.7	75.9	90.7	85.1
Wairua River at Purua	14.3	18.5	19.3	46.2	3.4	44.4 <sup>1</sup>	34.2	25.6	3.4	77.3	5.0
Waitangi at Waimate	27.8	20.2	65.8	81.3	60.0	73.3	90.8	60.5	62.5	54.8	29.2
Waitangi at watea	71.4	89.9	67.2	70.6	79.3	75.2 <sup>1</sup>	85.5	67.8	80.9	81.8	38.7
Whakapara River	21.7	25.0	47.1	82.7	10.8	80.8	74.2	66.1	14.2	83.3	22.2

1. For the four National sites compliance with NNN is using the NO<sub>3</sub> results as there is no NNN results for these sites.

2. For more information on the guidelines check out the methods (section 2).

## Northland River Water Quality Monitoring Network: State and Trends 2006 – Appendices to report

Table 8: Compliance for the 2006 data for the RWQMN sites with the ANZECC trigger values for DO%, pH, turbidity, water clarity, TP, NNN, NH<sub>4</sub>, TN and DRP (ANZECC 2000), the recreational bathing guideline for *E. coli* (MfE 2002) and the guideline from the RWSP for water clarity of 1.6 m (NRC 2007)<sup>2</sup>.

Site	DO (% sat.)	pH	Turbidity (ntu)	Water clarity (m)	TP (g/m3)	NNN/ NO3 (g/m3)	NH4 (g/m3)	TN (g/m3)	Ecoli (n/100ml)	DRP (g/m3)	clarity with 1.6m
Awanui at FNDC take	0.0	75.0	58.3	70.0	41.7	100.0	100.0	91.7	83.3	8.3	10.0
Awanui u/s of Waihue	18.2	81.8	45.5	33.3	0.0	100.0	90.9	72.7	72.7	0.0	11.1
Kaihu	41.7	66.7	75.0	100.0	66.7	83.3	100.0	75.0	91.7	50.0	54.5
Mangahahuru at Apotu Rd	33.3	50.0	66.7	100.0	0.0	66.7	41.7	41.7	66.7	0.0	45.5
Mangahahuru at Main Rd	50.0	66.7	91.7	100.0	91.7	100.0	100.0	100.0	100.0	100.0	72.7
Mangakahia at Titoki	36.4	63.6	45.5	63.6	70.0	100.0 <sup>1</sup>	88.9	100.0	81.8	88.9	0.0
Mangakahia at Twin Bridges	25.0	50.0	83.3	100.0	58.3	100.0	100.0	100.0	91.7	41.7	36.4
Manganui River	16.7	33.3	50.0	81.8	0.0	100.0	75.0	50.0	83.3	0.0	0.0
Mangere River	0.0	50.0	66.7	81.8	0.0	33.3	16.7	25.0	16.7	0.0	18.2
Opouteke River	36.4	58.3	75.0	90.9	58.3	100.0	91.7	100.0	91.7	58.3	36.4
Punakitere River	50.0	83.3	50.0	90.9	8.3	50.0	66.7	41.7	83.3	16.7	54.5
Victoria River	33.3	66.7	91.7	100.0	91.7	100.0	100.0	100.0	83.3	33.3	80.0
Waiarohia at Second Ave	16.7	75.0	91.7	100.0	0.0	58.3	91.7	41.7	58.3	33.3	45.5
Waiarohia at Whau Valley	33.3	58.3	16.7	90.9	0.0	83.3	100.0	16.7	33.3	75.0	0.0
Waiotu River at SH1	8.3	66.7	50.0	100.0	0.0	83.3	66.7	66.7	91.7	0.0	36.4
Waipapa at Puketū Forest	45.5	100.0	81.8	90.9	100.0	100.0 <sup>1</sup>	100.0	100.0	100.0	100.0	81.8
Waipoua River	58.3	83.3	91.7	100.0	50.0	100.0	91.7	100.0	100.0	33.3	81.8
Wairua River at Purua	9.1	27.3	27.3	54.5	0.0	55.6 <sup>1</sup>	33.3	30.0	90.9	0.0	0.0
Waitangi at Waimate	33.3	50.0	83.3	100.0	100.0	58.3	100.0	75.0	75.0	100.0	72.7
Waitangi at watea	45.5	100.0	81.8	81.8	80.0	66.7 <sup>1</sup>	77.8	70.0	81.8	77.8	54.5
Whakapara River	41.7	66.7	75.0	100.0	8.3	83.3	66.7	83.3	91.7	0.0	72.7

1. For the four National sites compliance with NNN is using the NO<sub>3</sub> results as there is no NNN results for these sites, shown with asterisks.

2. For more information on the guidelines check out the methods (section 2).

## Appendix D: Site ranking based on medians and sample compliance

Table 9: Ranking of sites<sup>1</sup> based on their medians as shown in green and bold below and % of compliance<sup>2</sup> as shown in italics and pink below. (Note: one is the best and 21 is the worst).

Site	Med temp.	Med cond.	Med turb.	Med clarity	Med diss. colour	Med DRP	Med TP	Med NNN NO3	Med NH4	Med TKN	Med TN	Med E. coli	<b>Overall med rank</b>	Total complying %	<i>Overall complying rank</i>
Awanui at FNDC take	15	11	15	14	13	11	9	6	17	13	7	13	<b>11</b>	572	<i>12</i>
Awanui u/s of Waihue	20	17	21	21	15	21	20	8	19	21	13	16	<b>20</b>	417	<i>17</i>
Kaihu	3	6	7	5	8	7	4	12	6	13	9	6	<b>5</b>	754	<i>5</i>
Mangahuru at Apotu Rd	13	14	18	17	16	18	19	18	19	16	17	19	<b>18</b>	321	<i>19</i>
Mangahuru at Main Rd	2	5	6	2	12	2	3	4	6	6	4	11	<b>4</b>	867	<i>2</i>
Mangakahia at Titoki	21	21	14	19	9	8	8	9	9	7	8	12	<b>12</b>	667	<i>8</i>
Mangakahia at Twin Bridges	18	7	8	8	5	19	14	7	8	6	6	10	<b>7</b>	665	<i>9</i>
Manganui River	11	15	19	18	21	16	18	11	17	21	16	5	<b>17</b>	445	<i>16</i>
Mangere River	7	12	16	16	20	20	21	21	21	21	21	20	<b>21</b>	222	<i>21</i>
Opouteke River	17	3	4	6	2	17	17	5	17	6	5	4	<b>6</b>	690	<i>7</i>
Punakitere River	9	10	13	12	18	15	12	19	17	16	20	15	<b>16</b>	476	<i>15</i>
Victoria River	6	1	1	3	1	10	5	1	17	2	1	8	<b>3</b>	735	<i>6</i>
Waiarohia at Second Ave	14	4	5	7	6	12	10	17	6	13	14	17	<b>9</b>	577	<i>11</i>
Waiarohia at Whau Valley	11	13	17	13	11	6	16	10	6	21	18	21	<b>14</b>	499	<i>14</i>
Waiotu River at SH1	8	16	11	15	17	9	13	15	17	16	15	14	<b>15</b>	382	<i>18</i>
Waipapa at Puketia Forest	4	19	3	4	3	3	2	3	1	3	3	2	<b>2</b>	877	<i>1</i>
Waipoua River	1	2	2	1	4	2	1	2	6	2	2	1	<b>1</b>	808	<i>3</i>
Wairua River at Purua	19	20	20	20	19	13	15	20	20	17	19	3	<b>19</b>	287	<i>20</i>
Waitangi at Waimate	6	8	10	10	7	6	7	16	17	13	12	18	<b>10</b>	597	<i>10</i>
Waitangi at watea	16	18	9	9	10	4	6	13	7	8	11	7	<b>8</b>	770	<i>4</i>
Whakapara River	12	9	12	11	14	14	11	14	17	13	10	9	<b>13</b>	506	<i>13</i>

- Ranking of sites based on their median values for all years for each of temperature, conductivity, turbidity, clarity, dissolved colour, DRP, TP, NNN (or NO<sub>3</sub>), NH<sub>4</sub>, TKN, TN and E. coli were summed, giving an overall rank for the medians (green and bold).
- Ranking of sites based on their total percentage of samples for all years that comply with all relevant guidelines, including dissolved oxygen, water clarity, turbidity, DRP, TP, NNN, NH<sub>4</sub>, TN, pH and E. coli and therefore a possible maximum total compliance percentage of 1000 (pink and italics).

## Appendix E: Number of samples for each RWQMN site

Table 10: Number of samples for each site and parameter for the calculation of medians and trend analysis.

	Temperature	Dissolved oxygen % saturation	Dissolved oxygen (mg/L)	Conductivity	pH	Turbidity	Visual clarity	Dissolved colour @ 340 nm	Dissolved colour @440nm	<i>Escherichia coli</i>	Dissolved reactive phosphorus	Total Phosphorus	Nitrate/Nitrite nitrogen or Nitrate	Total nitrogen	Ammoniacal nitrogen	Total Kjeldahl Nitrogen
Victoria	119	118	95	119	120	119	106	114	114	84	118	118	118	117	119	NA
Awanui (FNDC take)	58	58	58	58	58	57	NA	57	57	58	57	57	57	57	58	58
Awanui (Waihue)	117	115	103	114	118	117	86	115	115	83	116	116	116	115	119	115
Waitangi (Waimate)	87	85	75	88	88	88	75	86	86	85	88	88	88	87	88	87
Waitangi(Watea)	119	119	119	119	119	119	119	119	119	NA	115	118	117	118	117	106
Waipapa	119	119	119	119	119	119	119	119	119	NA	117	119	117	118	117	117
Punakitere	63	65	63	65	65	65	NA	64	64	65	65	65	65	65	65	65
Waiotu	73	72	73	74	74	71	NA	69	69	74	73	73	73	72	73	72
Whakapara	118	115	77	120	120	119	81	117	117	86	120	120	120	118	120	118
Mangahahuru	116	112	76	118	118	118	90	115	115	85	117	117	117	117	117	117
Wairua	118	118	118	118	118	118	118	118	118	NA	116	117	116	116	116	115
Mangakahia (Twin)	113	113	NA	116	118	118	107	114	114	83	117	118	118	117	117	117
Mangakahia (Titoki)	118	118	118	118	118	118	118	118	118	NA	116	117	115	117	116	116
Opouteke	112	112	NA	115	117	117	106	111	111	82	115	116	116	115	117	116
Mangere	119	115	77	120	121	119	97	116	116	87	120	120	120	120	121	120
Manganui	65	64	65	63	65	64	NA	63	63	61	65	65	65	65	65	65
Kaihu	54	54	54	NA	64	53	NA	NA	NA	54	54	54	54	54	54	54
Waipoua	54	54	54	NA	54	54	NA	NA	NA	54	54	54	54	54	54	NA

## Appendix F: Significant trends with their percentage of the median for each site

Table 11: Trends with their significance levels (*p-values*)<sup>1</sup> shown in brackets.

Site	Temperature	% of med	Dissolved oxygen	% of med	Dissolved oxygen	% of med	Conductivity	% of med	pH	% of med	Turbidity	% of med	Visual clarity	% of med	Dissolved colour	% of med
	10 <sup>-3</sup> °C/yr		10 <sup>-3</sup> % saturation/yr		10 <sup>-3</sup> mgL <sup>-1</sup> /yr		10 <sup>-3</sup> mS/m@25°C/yr		10 <sup>-3</sup> /yr		(10 <sup>-3</sup> NTU/yr)		(10 <sup>-3</sup> m/yr)		(10 <sup>-3</sup> G-abs@340nm/cm/yr)	
Victoria	<b>-168 (≤5)</b>	<b>1.1</b>	290 (≤20)		50 (≤20)		17		10		-54 (≤10)		<b>-110 (≤5)</b>	<b>5.4</b>	45	
Awanui (FNDC take)	-398 (≤20)		-310		24		70		<b>-37 (≤5)</b>	<b>0.5</b>	-116		NA		336 (≤10)	
Awanui (Waihue)	<b>-169 (≤5)</b>	<b>1.0</b>	140		10		<b>129 (≤5)</b>	<b>1.4</b>	7		<b>-376 (≤5)</b>	<b>4</b>	18		231 (≤10)	
Waitangi (Waimate)	-239 (≤20)		550 (≤10)		<b>124 (≤5)</b>	<b>1.2</b>	-5		<b>76 (≤5)</b>	<b>1.1</b>	-28		-12		149 (≤20)	
Waitangi (Watea)	-154 (≤10)		-73		18		<b>-46 (≤5)</b>	<b>0.4</b>	5		2		-14		59	
Waipapa	-13		53		4		26 (≤20)		<b>16 (≤5)</b>	<b>0.2</b>	<b>-104 (≤5)</b>	<b>4.7</b>	<b>46 (≤5)</b>	<b>2.5</b>	-34	
Punakitere	-253		-255		59		-39		39		-134		NA		788	
Waiotu	-113		770 (≤10)		<b>129 (≤5)</b>	<b>1.4</b>	-19		<b>84 (≤5)</b>	<b>1.2</b>	-45		NA		179	
Whakapara	-43		<b>1060 (≤5)</b>	<b>1.1</b>	<b>180 (≤5)</b>	<b>1.8</b>	-26		<b>44 (≤5)</b>	<b>0.6</b>	-159 (≤20)		<b>48 (≤5)</b>	<b>4.8</b>	<b>310 (≤5)</b>	<b>2.3</b>
Mangahahuru	-81 (≤10)		<b>1520 (≤5)</b>	<b>1.6</b>	<b>225 (≤5)</b>	<b>2.3</b>	<b>170 (≤5)</b>	<b>2.3</b>	<b>27 (≤5)</b>	<b>0.4</b>	<b>-300 (≤5)</b>	<b>4</b>	<b>69 (≤5)</b>	<b>9.3</b>	390 (≤10)	
Wairua	-42		<b>511 (≤5)</b>	<b>0.6</b>	<b>71 (≤5)</b>	<b>0.8</b>	-20		<b>22 (≤5)</b>	<b>0.3</b>	-89		4		158	
Mangakahia (Twin)	-117 (≤20)		56		NA		<b>123 (≤5)</b>	<b>3.4</b>	23 (≤10)		-81		-9		25	
Mangakahia (Titoki)	15		63		5		-24		<b>9 (≤5)</b>	<b>0.1</b>	93		-11 (≤10)		77	
Opouteke	-92		<b>202 (≤5)</b>	<b>0.2</b>	NA		121 (≤10)		<b>32 (≤5)</b>	<b>0.4</b>	-50		-2		59	
Mangere	-153 (≤10)		<b>741 (≤5)</b>	<b>0.9</b>	94		8		<b>50 (≤5)</b>	<b>0.7</b>	<b>-192 (≤5)</b>	<b>2.7</b>	<b>44 (≤5)</b>	<b>5.4</b>	229 (≤20)	
Manganui	-21		357		12		230		53		-436		NA		245	
Kaihu	-49		295		-91		NA		-23		-571 (≤10)		NA		NA	
Waipoua	-17		-1053		-182		NA		0		-150		NA		NA	

1. Results shown in bold are significant at a 95% confidence level, i.e. the *p value* ≤ 5. Where the trend is significant at *p* ≤ 5, the magnitude of the trend as a percentage of the median has been calculated. Significant trends have been interpreted as meaningful where the magnitude of the trend is 1% of the median or greater.



## Northland River Water Quality Monitoring Network: State and Trends 2006 – Appendices to report

Table 11 cont: Trends with their significance levels (*p-values*)<sup>1</sup> shown in brackets.

Site	Dissolved colour	% of med	<i>E. coli</i>	% of med	Dissolved reactive phosphorus	% of med	Total phosphorus	% of med	NNN or Nitrate	% of med	Total nitrogen	% of med	Ammoniacal nitrogen	% of med	Total Kjeldahl Nitrogen	% of med
	10 <sup>-3</sup> G-abs@440nm/cm/yr		CFU/100mL/yr		10 <sup>-3</sup> gm <sup>-3</sup> /yr		10 <sup>-3</sup> gm <sup>-3</sup> /yr		10 <sup>-3</sup> gm <sup>-3</sup> /yr		(10 <sup>-3</sup> gm <sup>-3</sup> /yr)		(10 <sup>-3</sup> gm <sup>-3</sup> /yr)		(10 <sup>-3</sup> gm <sup>-3</sup> /yr)	
Victoria	8		-6		<b>-3.7 (≤5)</b>	<b>19.5</b>	<b>-5.0 (≤5)</b>	<b>22.7</b>	<b>-0.7 (≤5)</b>	<b>9.3</b>	-1		<b>-0.7 (≤5)</b>	<b>3.5</b>	NA	
Awanui (FNDC take)	-21		5		-0.2		-0.3		-1.1		3.2		<b>-4.5 (≤5)</b>	<b>22.5</b>	4.5	
Awanui (Waihue)	<b>148 (≤5)</b>	<b>4.7</b>	19 (≤20)		<b>-16 (≤5)</b>	<b>9.6</b>	<b>-27 (≤5)</b>	<b>18</b>	0.3		6		<b>-0.7 (≤5)</b>	<b>1.75</b>	3.1	
Waitangi (Waimate)	49 (≤20)		25 (≤20)		-0.3		<b>1.6 (≤5)</b>	<b>6</b>	<b>-13 (≤5)</b>	<b>4.6</b>	-0.2		<b>-1.9 (≤5)</b>	<b>9.5</b>	<b>15 (≤5)</b>	<b>7.5</b>
Waitangi (Watea)	17		NA		<b>-0.2 (≤5)</b>	<b>3.2</b>	0.3		-0.2		2.4		0		<b>-5.0 (≤5)</b>	<b>2.6</b>
Waipapa	-7		NA		<b>-0.2 (≤5)</b>	<b>3.8</b>	-0.1		<b>-1.4 (≤5)</b>	<b>7.1</b>	-0.2		<b>-0.3 (≤5)</b>	<b>10</b>	1.7 (≤20)	
Punakitere	172		17		-0.2		3.4 (≤20)		-10		-23		-1.5		-0.9	
Waiotu	16		-1		0.2		1.9		<b>-12 (≤5)</b>	<b>3.5</b>	-31 (≤20)		<b>-2.5 (≤5)</b>	<b>12.5</b>	-13.5	
Whakapara	<b>70 (≤5)</b>	<b>2.3</b>	-3		<b>-3.0 (≤5)</b>	<b>12</b>	<b>-5.0 (≤5)</b>	<b>8.8</b>	<b>-9.5 (≤5)</b>	<b>3.1</b>	-3.2		-0.4		6.4 (≤10)	
Mangahahuru	49		-9		<b>-5.0 (≤5)</b>	<b>12.5</b>	<b>-8.5 (≤5)</b>	<b>8.7</b>	-0.2		3.6		<b>-3.6 (≤5)</b>	<b>9</b>	2.4	
Wairua	13		NA		-0.8 (≤10)		<b>1.0 (≤5)</b>	<b>1.3</b>	-16 (≤20)		<b>-15 (≤5)</b>	<b>1.8</b>	<b>-1.1 (≤5)</b>	<b>2.7</b>	1.8	
Mangakahia (Twin)	50		2		-0.9		-4.8 (≤20)		-0.4		-4.5		-0.2 (≤20)		0.9	
Mangakahia (Titoki)	6		NA		<b>-0.2 (≤5)</b>	<b>2.5</b>	0		<b>-4.7 (≤5)</b>	<b>4.4</b>	-5.5 (≤10)		<b>-0.5 (≤5)</b>	<b>3.4</b>	2.8 (≤10)	
Opouteke	46		5 (≤20)		<b>-4.8 (≤5)</b>	<b>13.3</b>	<b>-13 (≤5)</b>	<b>16.7</b>	-1.8 (≤10)		0.1		-0.2 (≤20)		3.5	
Mangere	109 (≤10)		<b>118 (≤5)</b>	<b>21</b>	<b>-5.8 (≤5)</b>	<b>5.3</b>	<b>-11 (≤5)</b>	<b>6.3</b>	<b>-47 (≤5)</b>	<b>6.5</b>	<b>-47 (≤5)</b>	<b>3.5</b>	<b>-4.7 (≤5)</b>	<b>4.7</b>	-3.5	
Manganui	-5		401		<b>3.8 (≤5)</b>	<b>10.9</b>	1.3		<b>-9.5 (≤5)</b>	<b>3.8</b>	<b>-45 (≤5)</b>	<b>6.3</b>	<b>-4.7 (≤5)</b>	<b>23.5</b>	-7	
Kaihu	NA		-3		0		3.1		-23		-44 (≤10)		<b>-3.5 (≤5)</b>	<b>70</b>	<b>-25 (≤5)</b>	<b>12.5</b>
Waipoua	NA		-9		<b>2.0 (≤5)</b>	<b>40</b>	<b>2.0 (≤5)</b>	<b>25</b>	-0.5		<b>-6.0 (≤5)</b>	<b>6.9</b>	<b>-2.5 (≤5)</b>	<b>50</b>	NA	

1. Results shown in bold are significant at a 95% confidence level, i.e. the *p value* ≤5. Where the trend is significant at *p* ≤5, the magnitude of the trend as a percentage of the median has been calculated. Significant trends have been interpreted as meaningful where the magnitude of the trend is 1% of the median or greater.