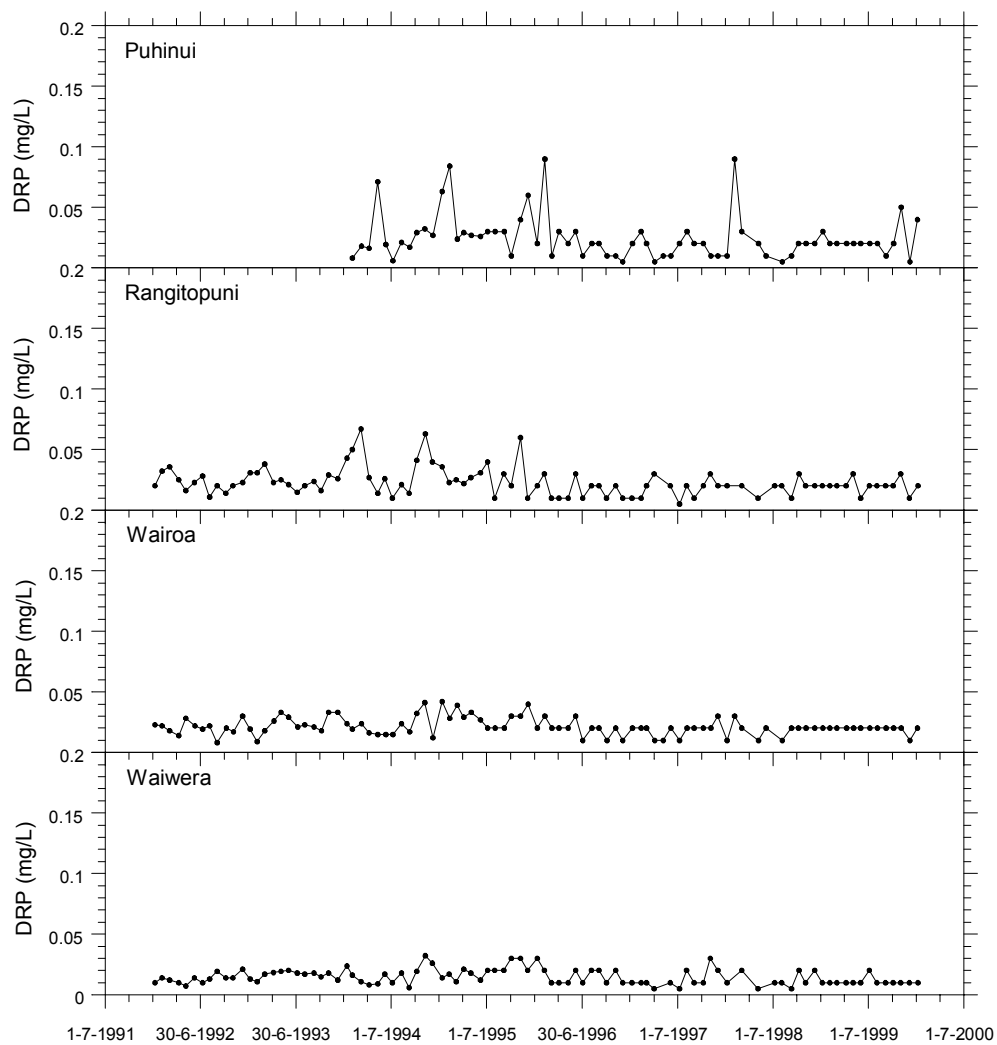




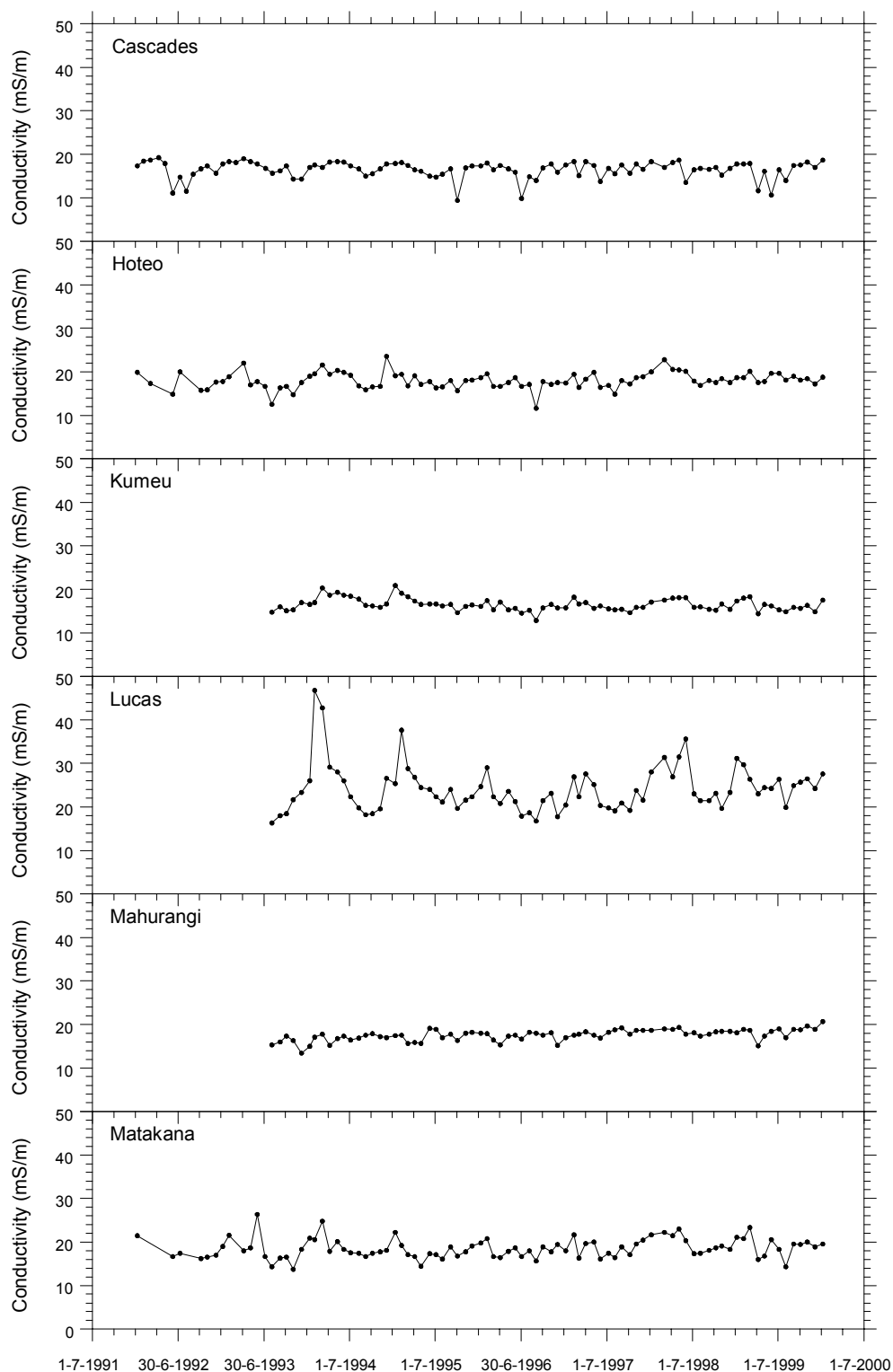
APPENDIX 14: CONDUCTIVITY – FRESHWATER**a) Conductivity (mS/m) during January 1999 - December 1999**

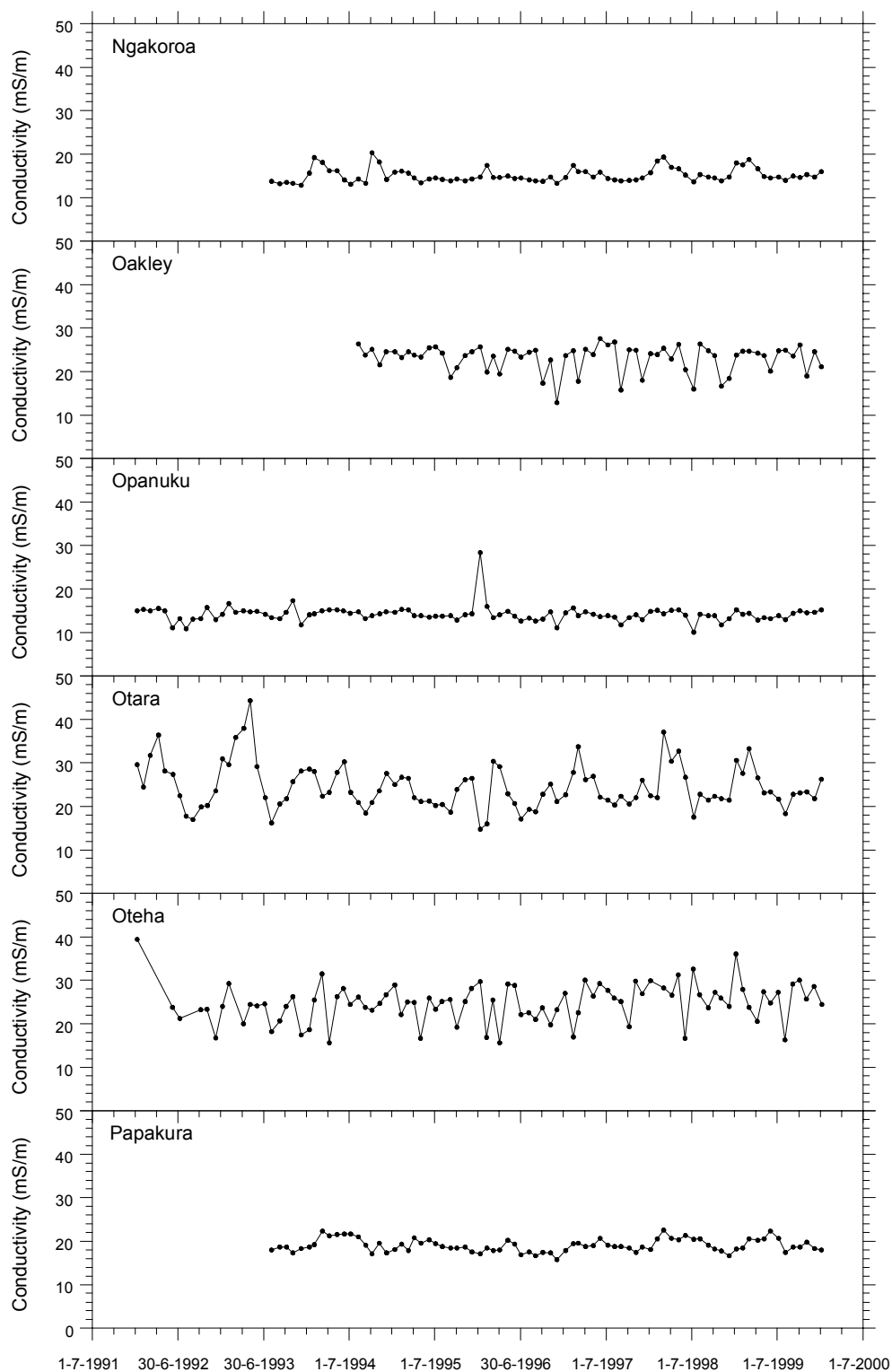
Date	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
Jan-99	17.8	18.6	17.3	31.2	18.1	21.1	18.0	23.8	15.2	30.6	36.1	18.2	23.7	22.4	12.8	19.8
Feb-99	17.7	18.7	18.0	29.7	18.9	20.8	17.5	24.7	14.2	27.6	27.9	18.5	21.1	23.8	12.3	21.8
Mar-99	17.9	20.1	18.3	26.3	18.7	23.4	18.8	24.7	14.4	33.3	23.8	20.6	24.0	24.8	13.9	23.8
Apr-99	11.6	17.6	14.4	23.0	15.1	16.0	16.6	24.3	12.9	26.6	20.6	20.2	11.7	20.6	13.4	18.0
May-99	16.1	17.8	16.5	24.4	17.3	16.8	14.9	23.7	13.4	23.1	27.4	20.5	21.8	24.6	12.3	17.5
Jun-99	10.6	19.7	16.2	24.3	18.4	20.5	14.5	20.1	13.2	23.4	24.8	22.3	20.2	26.3	12.5	21.1
Jul-99	16.4	19.7	15.3	26.3	19.0	18.3	14.8	24.8	13.9	21.7	27.3	20.7	22.0	23.2	11.6	19.2
Aug-99	14.0	18.1	14.9	19.9	17.0	14.3	14.0	24.9	13.0	18.3	16.3	17.4	20.7	19.8	9.7	17.2
Sep-99	17.4	19.0	15.9	24.9	18.9	19.5	15.0	23.5	14.4	22.8	29.2	18.7	22.2	22.6	11.5	18.5
Oct-99	17.6	18.1	15.6	25.7	18.8	19.4	14.6	26.1	15.0	23.1	30.1	18.7	23.8	20.6	11.9	18.7
Nov-99	18.2	18.4	16.3	26.5	19.7	20.0	15.3	19.0	14.5	23.4	25.7	19.8	8.5	21.8	11.8	19.1
Dec-99	17.0	17.2	14.9	24.2	18.9	18.9	14.7	24.6	14.6	21.8	28.6	18.3	21.2	18.8	11.4	17.8
median	17.2	18.5	16.1	25.3	18.8	19.5	15.0	24.5	14.3	23.3	27.4	19.3	21.5	22.5	12.1	18.9
IQR/median (%)	15.7	7.6	11.2	8.5	6.4	15.9	16.1	4.7	8.7	20.6	16.8	11.2	11.6	16.0	9.1	13.5

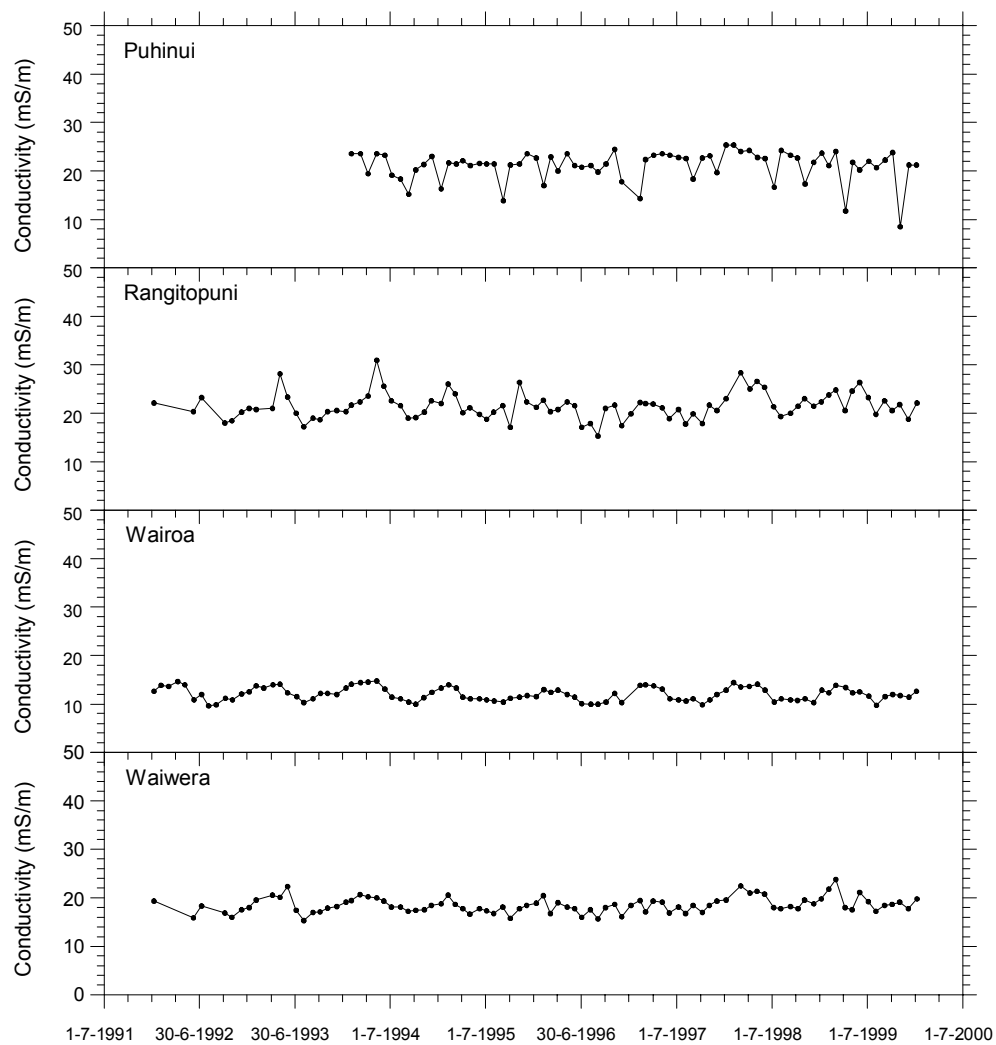
b) Statistical Summary for 1992-2000: Conductivity (mS/m)

	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
N	96	90	77	77	77	89	78	66	97	97	89	78	71	89	96	89
Median	17.0	17.9	16.2	23.3	17.7	18.1	14.6	24.0	14.2	23.1	25.0	18.8	21.7	21.2	11.9	18.2
Normality	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N
Seasonality	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y
Trend	NS	95%	80%	95%	99%	95%	95%	NS	NS	NS	99%	NS	NS	95%	NS	95%
Slope	NS	0.17	-0.13	0.55	0.38	0.27	0.19	NS	NS	NS	0.53	NS	NS	0.24	NS	0.21

c) The graphs on the following page show conductivity (mS/m) measurements from January 1992 to January 2000 (where data are available)







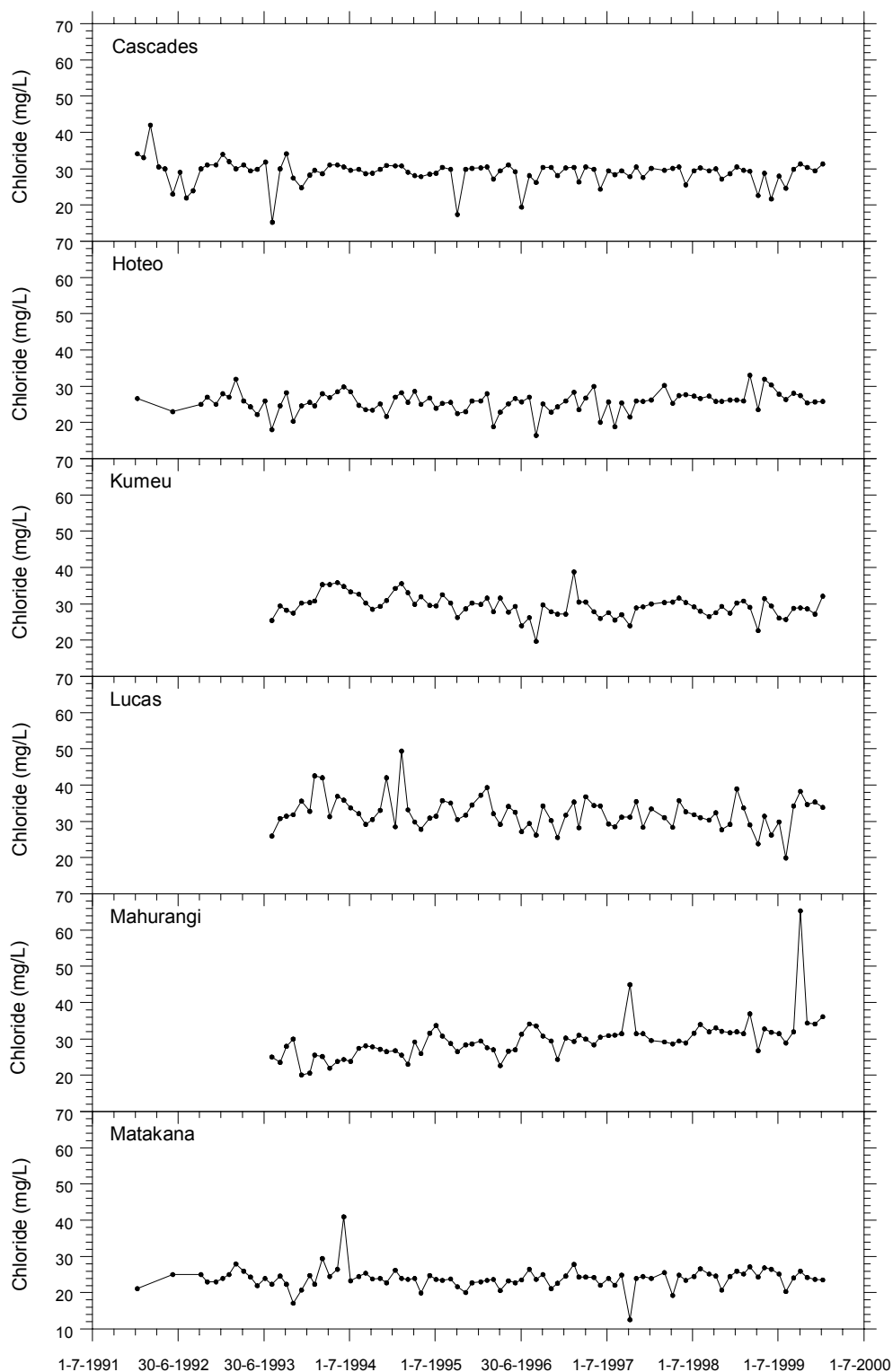
APPENDIX 15: CHLORIDE – FRESHWATER**a) Chloride (g/m3) during January 1999 - December 1999**

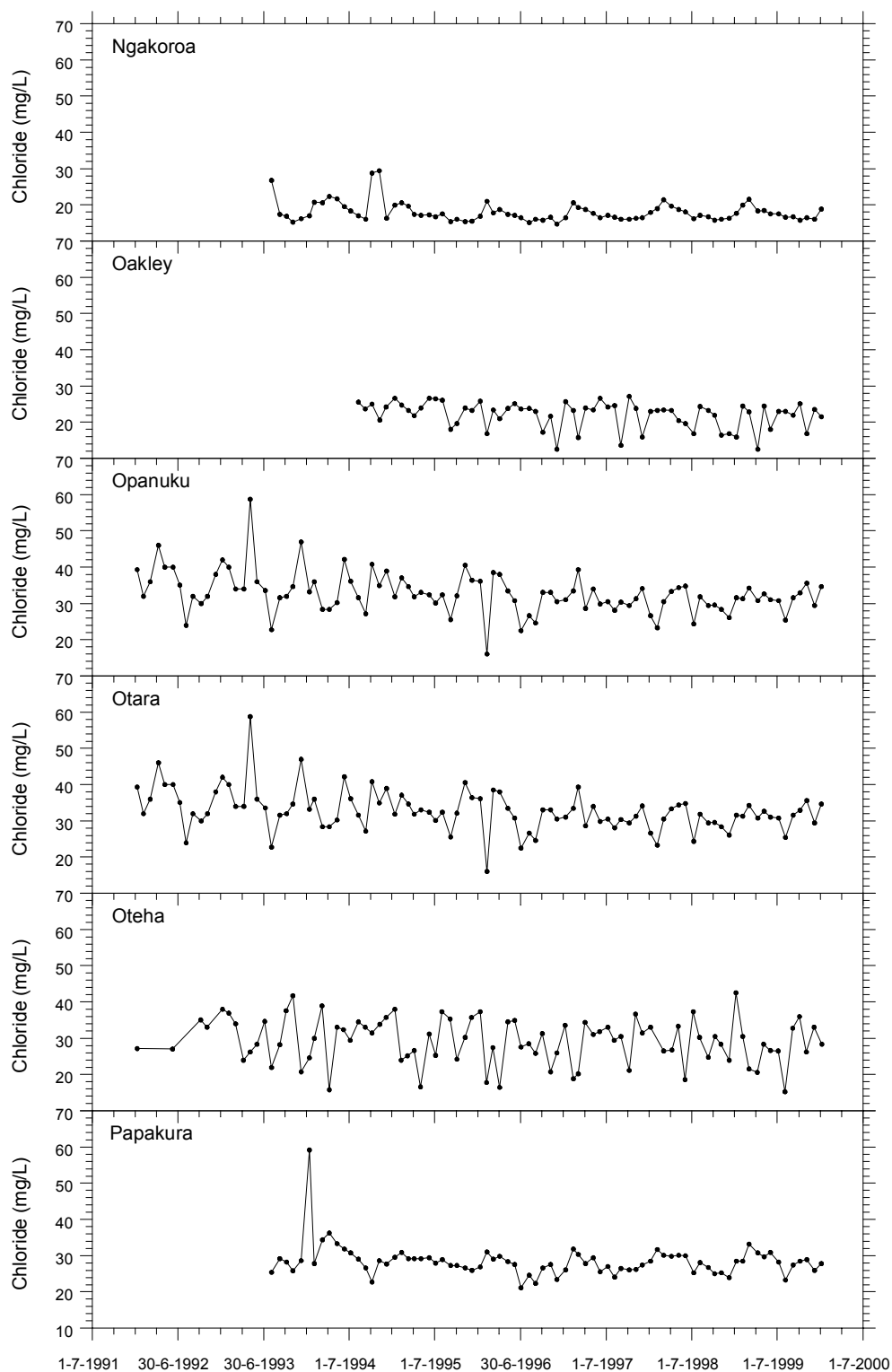
Date	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
Jan-99	30.6	26.2	30.2	39.0	32.0	26.0	17.7	15.9	20.2	31.6	42.5	28.5	33.0	32.1	17.5	25.5
Feb-99	29.6	26.0	30.7	33.7	31.5	25.2	19.9	24.5	22.3	31.3	30.5	28.5	27.6	31.7	17.8	27.9
Mar-99	29.3	33.1	29.0	29.0	36.9	27.1	21.5	22.9	22.1	34.3	21.5	33.2	31.8	30.4	20.0	36.9
Apr-99	22.6	23.5	22.6	23.8	26.8	24.3	18.3	12.6	22.2	30.7	20.6	30.7	12.9	24.8	16.0	25.4
May-99	28.8	32.0	31.4	31.4	32.8	26.9	18.4	24.5	22.3	32.7	28.4	29.7	32.9	35.7	17.5	27.8
Jun-99	21.6	30.4	29.5	26.2	31.8	26.5	17.5	18.0	22.6	31.1	26.6	30.9	22.3	32.4	18.2	27.9
Jul-99	28.0	27.8	26.1	29.9	31.4	25.1	17.5	23.1	22.0	30.8	26.5	28.3	28.5	29.0	16.4	25.7
Aug-99	24.7	26.4	25.7	19.9	28.9	20.3	16.6	23.0	22.2	25.4	15.3	23.3	27.0	21.7	13.9	23.5
Sep-99	29.8	28.1	28.8	34.3	32.0	24.1	16.7	22.0	23.8	31.6	32.8	27.4	32.7	30.2	16.1	24.7
Oct-99	31.3	27.4	28.9	38.3	65.4	26.0	15.7	25.1	24.2	32.9	36.0	28.5	36.5	56.4	16.5	24.7
Nov-99	30.4	25.4	28.6	34.6	34.4	24.2	16.5	16.8	21.8	35.6	26.2	28.9	10.3	30.4	15.3	23.8
Dec-99	29.4	25.7	27.2	35.4	34.1	23.7	16.1	23.6	23.3	29.5	33.1	25.9	29.7	26.7	15.5	24.1
median	29.4	26.9	28.9	32.6	32.0	25.2	17.5	23.0	22.3	31.5	27.5	28.5	29.1	30.4	16.5	25.5
IQR/median (%)	12.8	12.6	11.1	22.7	8.8	8.3	10.3	29.0	4.0	6.5	33.1	8.2	28.0	14.5	11.6	13.6

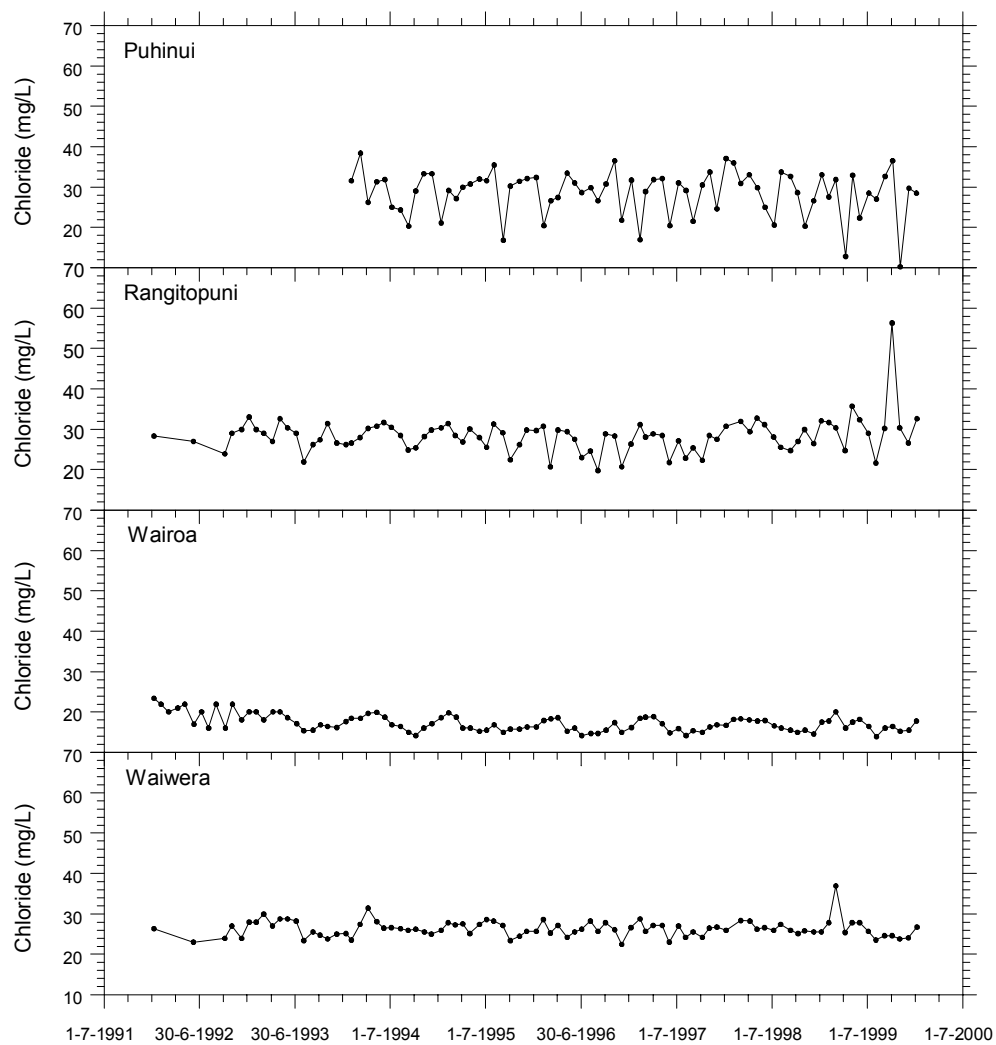
b) Statistical Summary for 1992-2000: Chloride (g/m3)

	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
N	96	89	77	77	77	89	78	66	97	97	88	78	72	89	97	89
Median	29.7	25.8	29.4	31.8	29.4	24.0	17.2	23.3	22.9	32.1	30.2	28.3	29.9	28.5	16.8	26.2
Normality	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N
Seasonality	Y	N	Y	Y	N	N	Y	N	N	Y	N	Y	N	Y	Y	Y
Trend	95%	90%	95%	NS	99%	NS	NS	99%	99%	95%	80%	NS	NS	NS	95%	NS
Slope	-0.19	0.19	-0.36	NS	1.40	NS	NS	-0.49	-0.27	-0.63	-0.44	NS	NS	NS	-0.30	NS

c) The graphs on the following page show chloride (g/m3) measurements from January 1992 to January 2000 (where data are available)







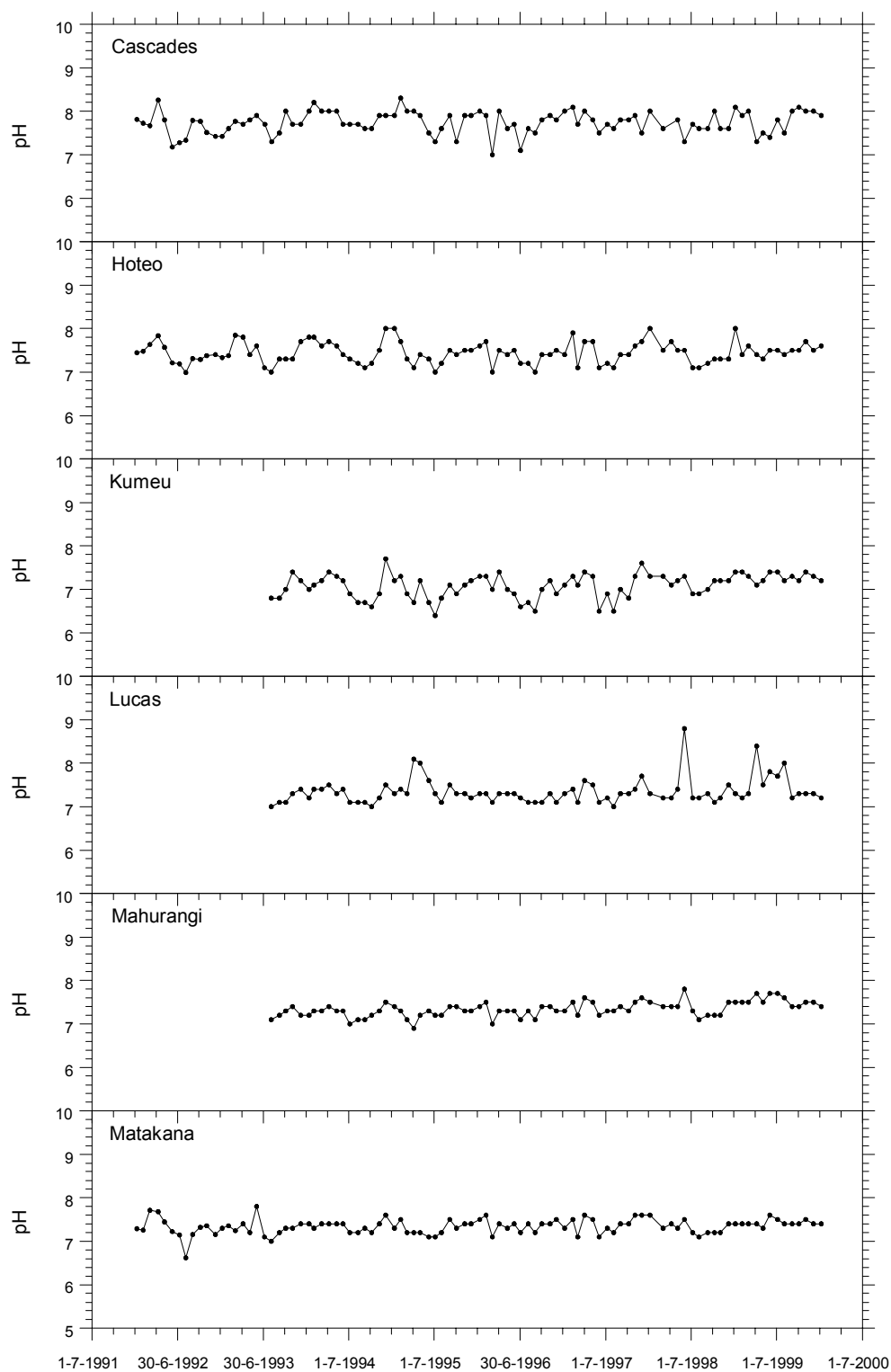
APPENDIX 16: pH – FRESHWATER**a) pH during January 1999 - December 1999**

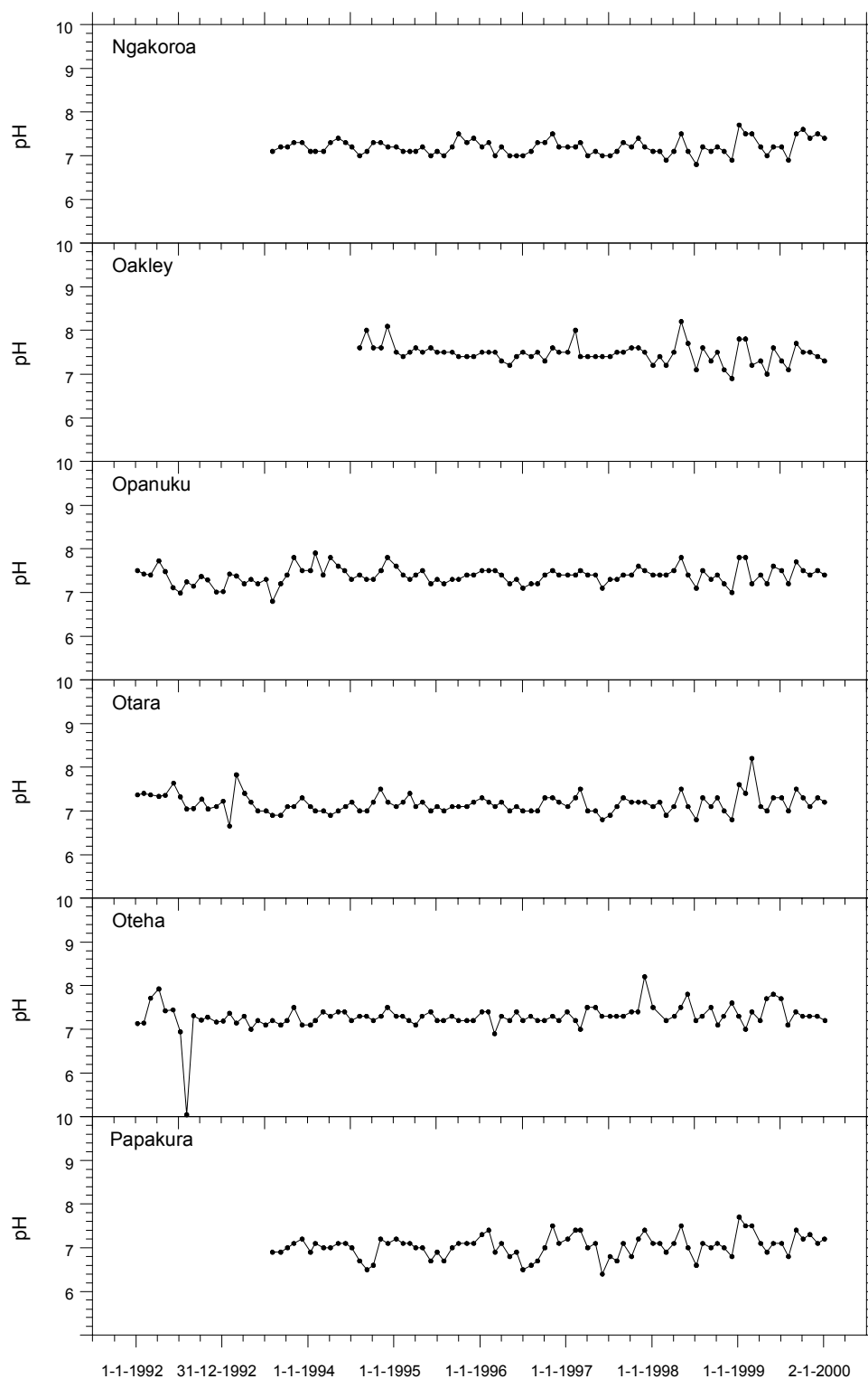
Date	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
Jan-99	8.1	8.0	7.4	7.3	7.5	7.4	7.7	7.8	7.8	7.6	7.3	7.7	7.7	7.4	7.8	7.6
Feb-99	7.9	7.4	7.4	7.2	7.5	7.4	7.5	7.8	7.8	7.4	7.0	7.5	8.3	7.4	7.6	7.6
Mar-99	8.0	7.6	7.3	7.3	7.5	7.4	7.5	7.2	7.2	8.2	7.4	7.5	7.4	7.3	7.5	7.5
Apr-99	7.3	7.4	7.1	8.4	7.7	7.4	7.2	7.3	7.4	7.1	7.2	7.1	7.2	7.2	7.3	7.3
May-99	7.5	7.3	7.2	7.5	7.5	7.3	7.0	7.0	7.2	7.0	7.7	6.9	7.0	7.2	7.2	7.3
Jun-99	7.4	7.5	7.4	7.8	7.7	7.6	7.2	7.6	7.6	7.3	7.8	7.1	7.2	7.4	7.3	7.6
Jul-99	7.8	7.5	7.4	7.7	7.7	7.5	7.2	7.3	7.5	7.3	7.7	7.1	7.2	7.6	7.3	7.5
Aug-99	7.5	7.4	7.2	8.0	7.6	7.4	6.9	7.1	7.2	7.0	7.1	6.8	6.9	7.3	7.0	7.4
Sep-99	8.0	7.5	7.3	7.2	7.4	7.4	7.5	7.7	7.7	7.5	7.4	7.4	7.5	7.4	7.5	7.6
Oct-99	8.1	7.5	7.2	7.3	7.4	7.4	7.6	7.5	7.5	7.3	7.3	7.2	7.6	7.3	7.6	7.8
Nov-99	8.0	7.7	7.4	7.3	7.5	7.5	7.4	7.5	7.4	7.1	7.3	7.3	7.2	7.3	7.5	7.9
Dec-99	8.0	7.5	7.3	7.3	7.5	7.4	7.5	7.4	7.5	7.3	7.3	7.1	7.7	7.3	7.5	7.9
median	8.0	7.5	7.3	7.3	7.5	7.4	7.5	7.5	7.5	7.3	7.3	7.2	7.3	7.3	7.5	7.6
IQR/median (%)	6.3	2.0	2.7	6.2	2.0	0.7	4.0	5.4	4.7	4.8	4.1	4.9	6.2	1.4	3.3	3.3

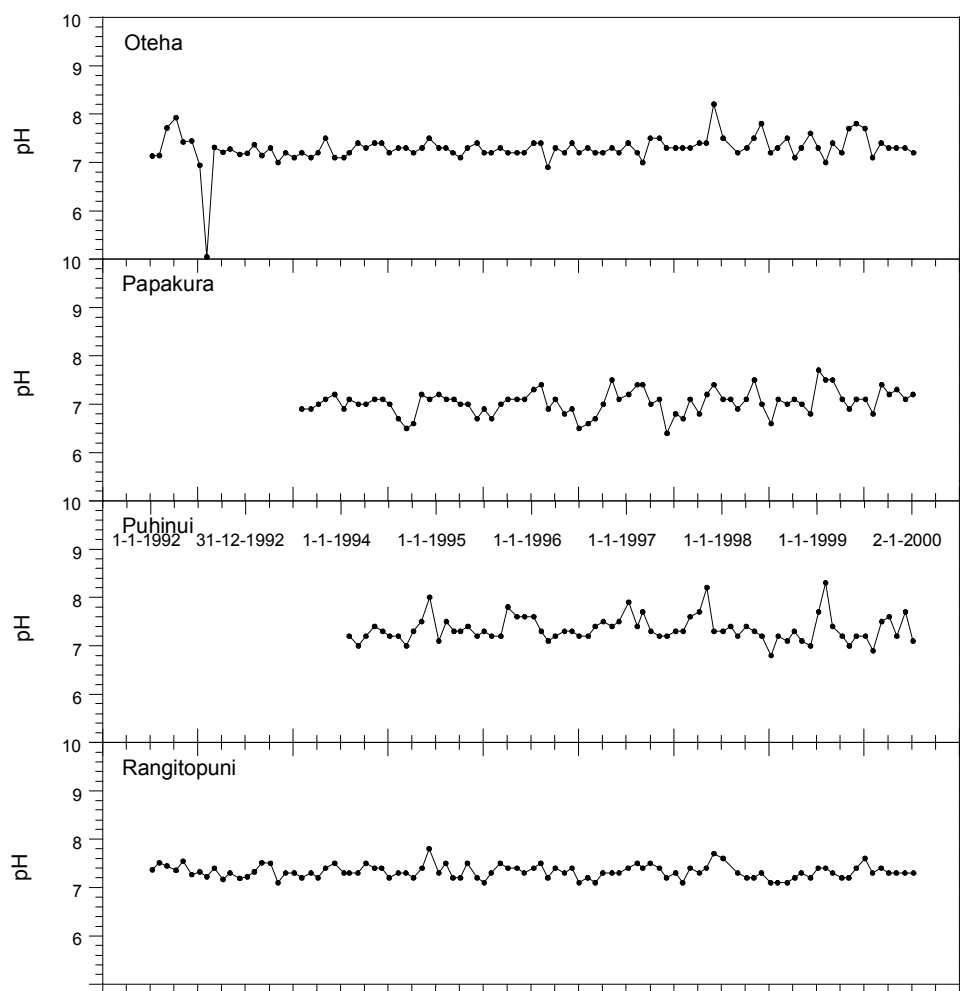
b) Statistical Summary for 1992-2000: pH

	Cascades	Hoteo	Kumeu	Lucas	Mahurangi	Matakana	Ngakoroa	Oakley	Opanuku	Otara	Oteha	Papakura	Puhinui	Rangitopuni	Wairoa	Waiwera
N	95	96	77	77	77	96	78	66	97	97	96	78	72	96	97	96
Median	7.77	7.40	7.20	7.30	7.30	7.38	7.20	7.50	7.40	7.10	7.30	7.10	7.30	7.30	7.40	7.50
Normality	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Seasonality	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y
Trend	80%	NS	95%	NS	99%	95%	NS	95%	80%	NS	99%	95%	NS	NS	NS	NS
Slope	0.007	NS	0.040	NS	0.044	0.008	NS	-0.032	<0.001	NS	0.015	0.025	NS	NS	NS	NS

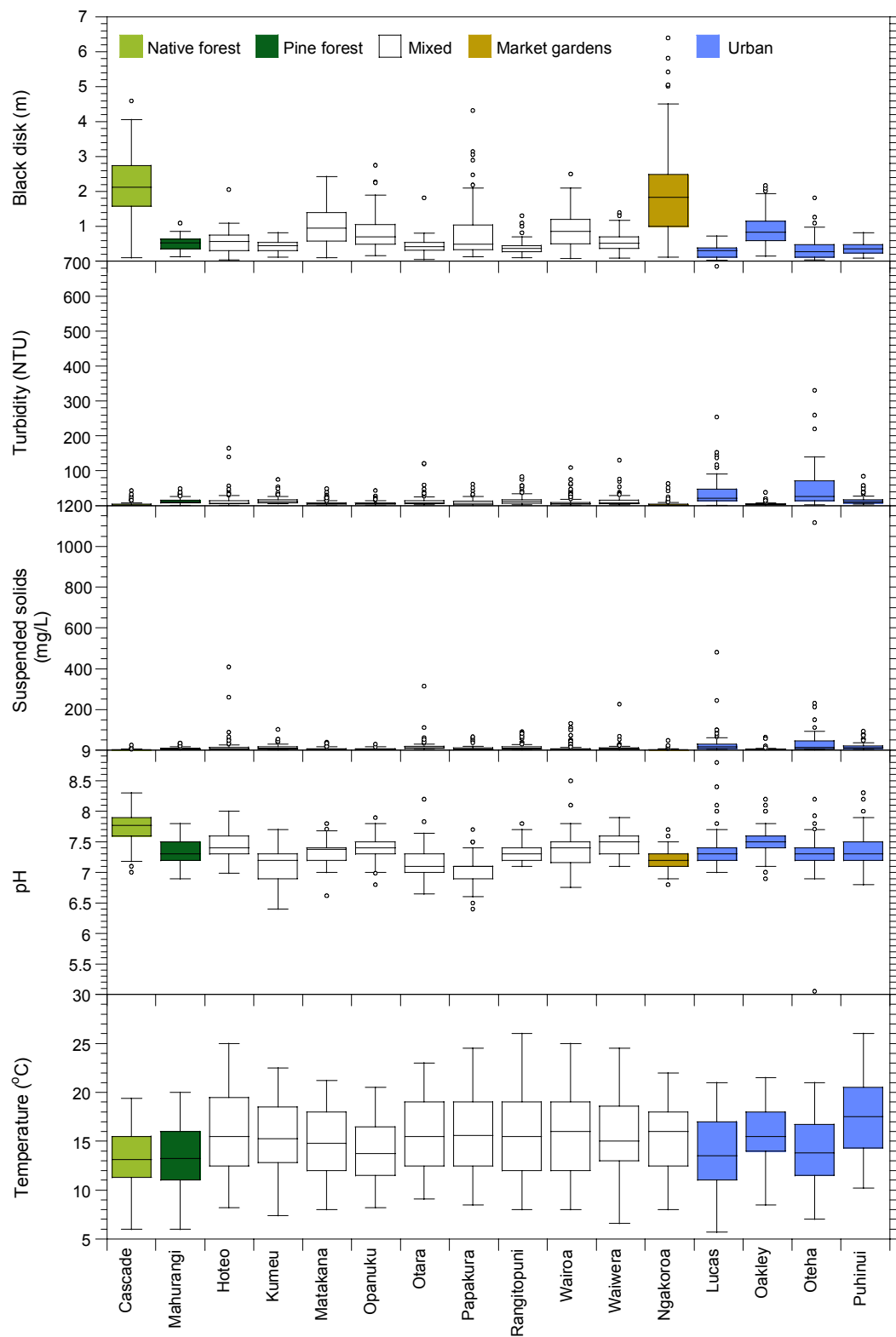
c) The graphs on the following page show pH measurements from January 1992 to January 2000 (where data are available)

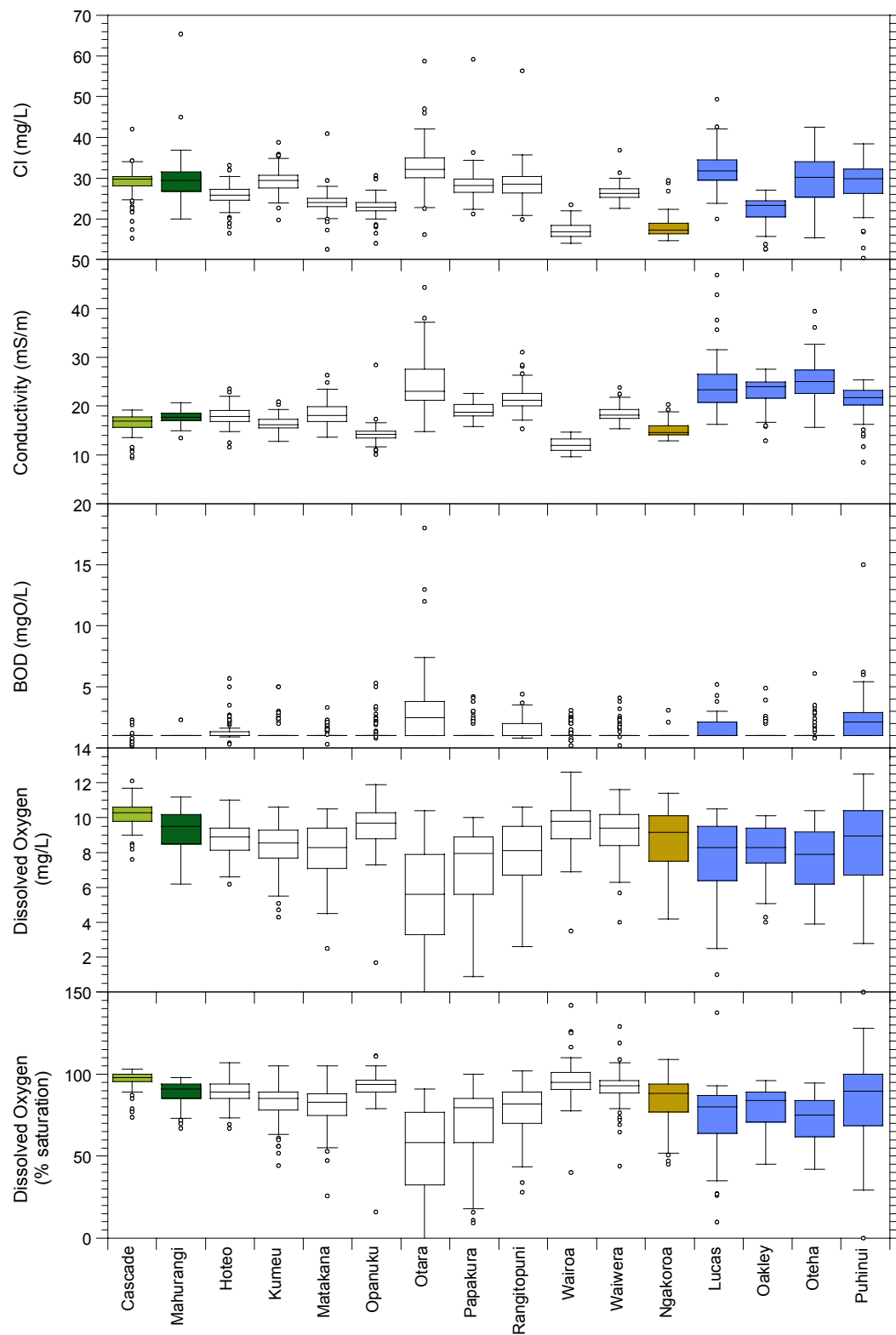


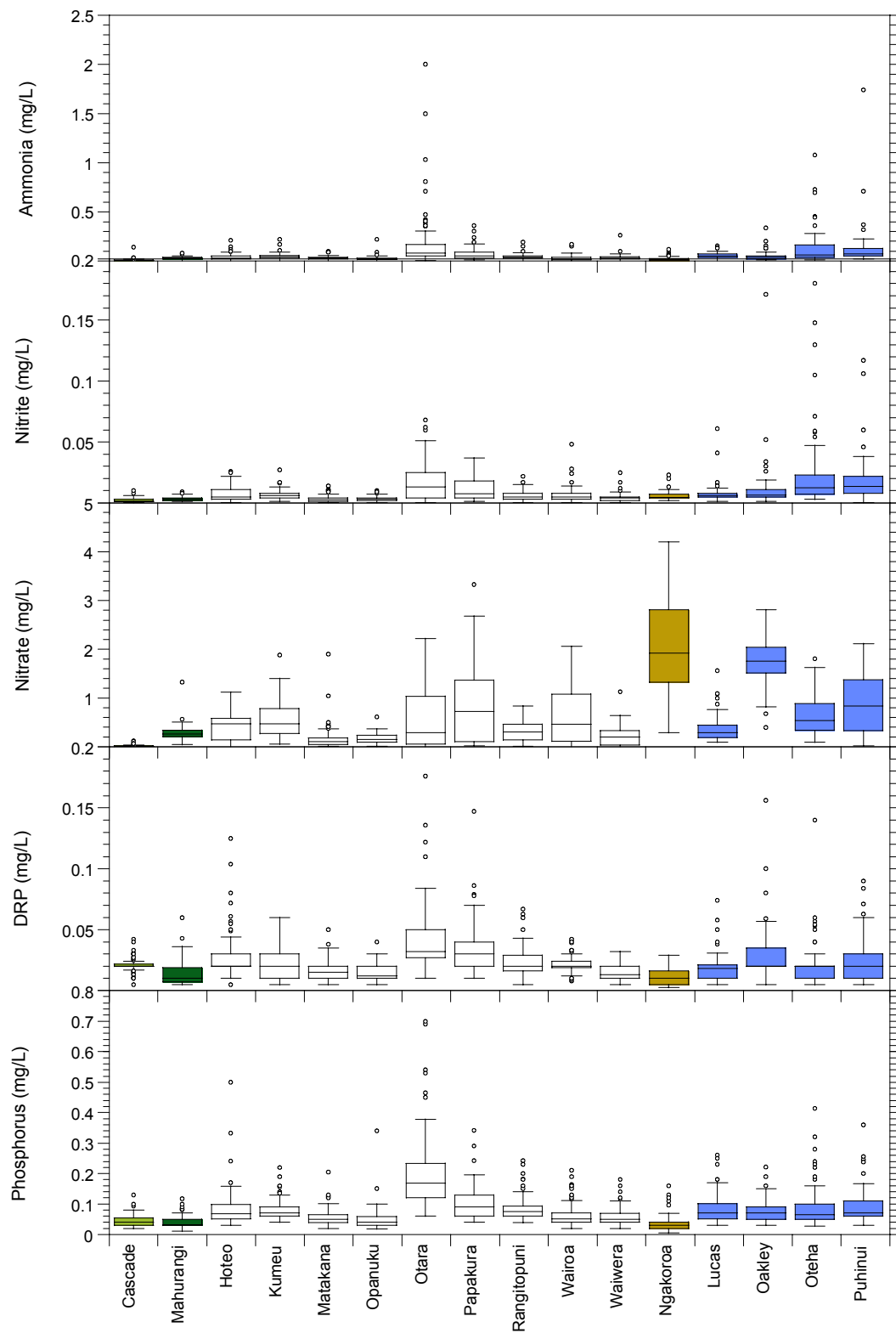


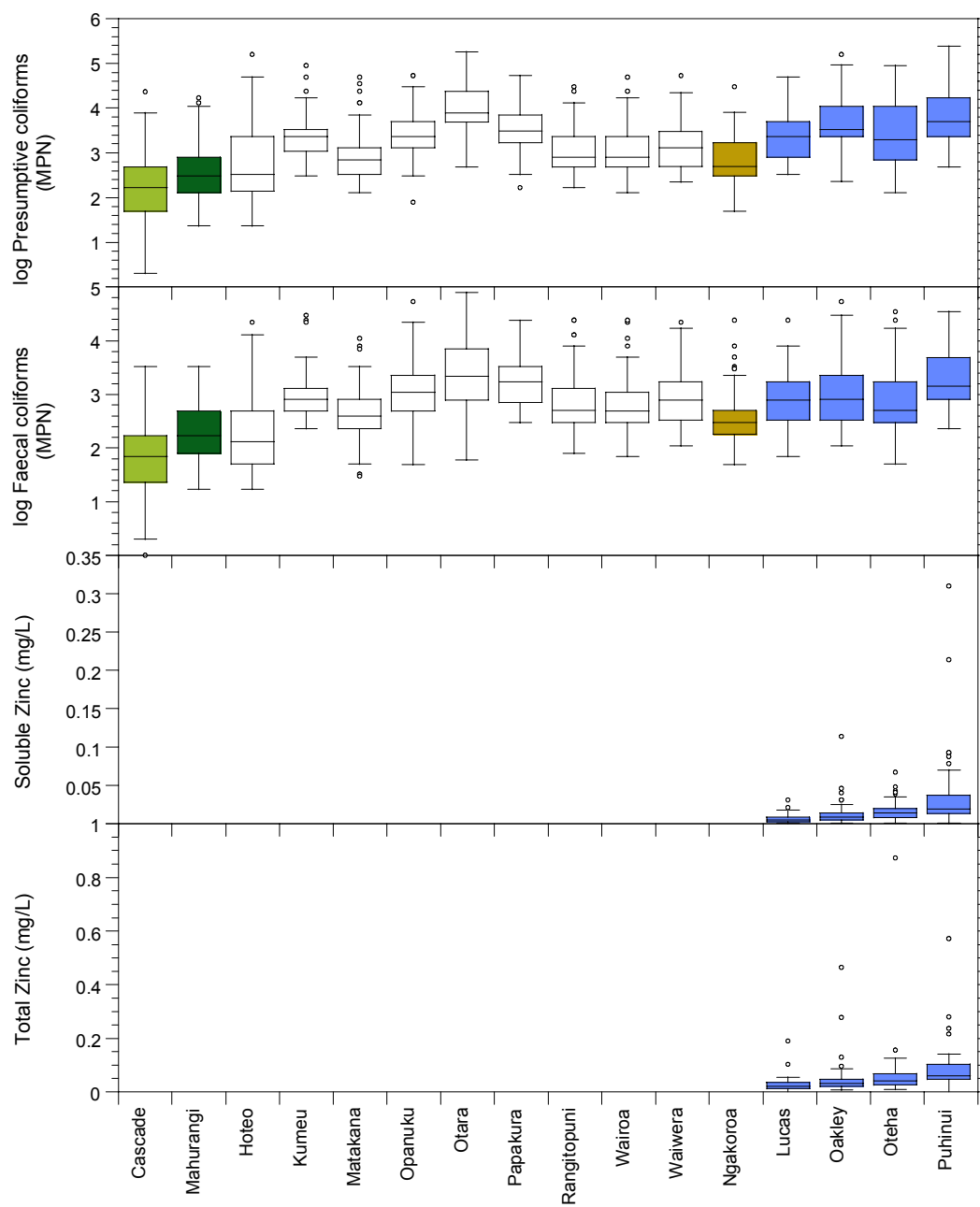


**APPENDIX 17: BOX PLOTS OF EACH WATER QUALITY VARIABLE FOR THE
FRESHWATER SITES**









APPENDIX 18: “LESS THAN”, <, AND “GREATER THAN”, >, VALUES REPORTED IN THE LTB-FRESHWATER STREAMS DATA SET

	Black disk		BOD		Faecal coliform	NH ₄ -N	NO ₂ -N	DRP	SS	Cu	Pb	Zn
Site	<	>	<	>	>	<	<	<	<	No. “<”/total no. results		
Cascades		6		76		40	34	1	1			
Hoteo		2		66	1	3	3	1				
Kumeu				64		3	2	1				
Lucas				53		1	3	8		14/16	82/82	18/97
Mahurangi				70		2	13	16				
Matakana		3		73		2	14	11				
Ngakoroa	2	8		75		14		18				
Oakley	1	3		52	1		1	1		11/18	75/82	5/99
Opanuku	1	2	34	70		5	6	5				
Otara				3	2		4					
Oteha				69				5		12/16	80/82	1/97
Papakura				63			4					
Puhinui				33	1		1	4		11/18	79/80	2/97
Rangitopuni				62		2	3	1				
Wairoa		2		71		9	7					
Waiwera		1		71		3	12	4				

Black disk (m)

[illegible]

BOD (mg/L)

[illegible]

Chloride (mg/L)

[illegible]

Conductivity (mS/m)

[illegible]

Dissolved oxygen (mg/L)

[illegible]

Dissolved oxygen (% saturation)

[illegible]

Temperature (°C)

[illegible]

Faecal coliforms (MPN/100 mL)

[illegible]

Presumptive coliforms (MPN/100 mL)

[illegible]NH₄-N (mg/L)[illegible]

NO₂-N (mg/L)[illegible]

NO₃-N (mg/L)[illegible]

Dissolved reactive phosphorus (mg/L)

[illegible]

Total phosphorus (mg/L)

[illegible]

pH

[illegible]

SS (mg/L)

[illegible]

Turbidity (NTU)

[illegible]

APPENDIX 20 – 38 SALINE DATA SUMMARIES AND STATISTICS

APPENDIX 20: WATER TEMPERATURE – SALINE**a) Temperature (°C) during January 1999 - December 1999**

Date	Browns Bay	Chelsea Bay	Goat Island	Henderson	Hobsonville	Shelly Beach	Kawau Bay	Mahurangi	Orewa	Ti Point	Whau	Waiuku River	Waiuku Channel	Mangere Bridge	Papakura Channel	Puketutu Point	Shag Point	Weymouth
Jan-99	24.5	24.0	24.0	25.5	24.5		25.0	24.0	24.5	24.0	26.0	23	23	23.5	23.0	23.0	23.0	23.0
Feb-99	23.0	22.5	22.0	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22	22	21	22.0	22.0	21.0	22.0
Mar-99	23.0	22.0	23.0	22.0	22.0	22.0	23.0	23.0	23.0	22.0	22.0	23	23	23	23.0	23.0	23.0	23.0
Apr-99	19.2	18.6	19.9	18.4	18.4	18.8	19.2	19.4	18.8	19.8	17.4	18.5	19	18	18.5	18.5	18.5	18.0
May-99	17.2	17.0	18.4	16.6	16.9	16.0	18.3	17.6	17.7	18.4		15.5	15.8	15.7	15.8	15.8	15.8	15.4
Jun-99	15.6	15.6	17.2	14.1	14.9	14.8	16.7	16.5	15.7	17.0	14.3	14.1	14.4	13.2	13.3	13.7	13.4	14.0
Jul-99	13.4	13.0	15.7	12.3		13.8			13.3	15.5	12.3	12.1	12.7	11.9		12.2	12.0	11.8
Aug-99						12.6						11.8	12.6	11.7		11.8	11.9	12.0
Sep-99	14.8	15.2	15.0	15.6		15.0			14.7	15.0	15.4							
Oct-99	16.4	17.4	16.2	17.3		17.0			16.7	16.2	16.9	16	16	16		16	16.6	16.5
Nov-99		19.2				18.9						19.4	18.7	19.7		19.4	19.7	19.4
Dec-99	19.3		18.8	21.0		18.9			19.9	19.1	20.9							
median	16.8	18.0	18.6	17.9	20.2	16.5	20.9	21.0	18.3	18.8	16.9	17.3	17.4	17.0	20.3	17.3	17.6	18.0
IQR/median (%)	26	30	27	33	25	24	21	23	32	27	39	40	38	40	29	41	38	42

b) Statistical summary for all data to January 2000: Temperature (°C)

Date	Browns Bay	Chelsea Bay	Goat Island	Henderson	Hobsonville	Shelly Beach	Kawau Bay	Mahurangi	Orewa	Ti Point	Whau	Waiuku River	Waiuku Channel	Mangere Bridge	Papakura Channel	Puketutu Point	Shag Point	Weymouth
N	93	93	70	93	88	88	89	88.0	92	93	92	139	134	138	126	138	135	140
Median	16.6	17.0	17.2	16.6	16.5	16.1	17.0	16.9	16.7	17.0	16.0	16.5	16.9	16.9	16.3	16.5	16.4	16.7
Normality	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y
Seasonality	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Trend	95%	95%	95%	95%	95%	80%	95%	95%	95%	95%	95%	NS	NS	NS	NS	NS	NS	NS
Slope	0.24	0.23	0.23	0.24	0.27	0.15	0.26	0.22	0.20	0.25	0.30	–	–	–	–	–	–	–

c) The graphs on the following page show all temperature measurements up to January 2000 (where data are available)