Corrigendum to

Ki uta ki tai: mātāpono me te pūtaiao, ngā korero whakamahuki ma te kaitiaki – whenua

From mountains to the sea: values and science for an informed kaitiaki/guardian – land

Contract Report: LC4436

Alexander Herzig, Andrew Neverman, Robbie Price, Michelle Barnes

Manaaki Whenua – Landcare Research

Reviewed by:	*Approved for release by:*
John Dymond Principal Scientist Manaaki Whenua – Landcare Research	Paul Mudge Portfolio Leader Climate Change Adaptation and Mitigation

Corrigendum

An error in the script evaluating the impact of contaminant reduction targets on achieving NPS-FM bottom lines led to the overestimation of the number of critical catchments achieving targets for nitrogen, phosphorous, and sediment in many estuaries.

The original SQL script evaluating the routed optimised contaminant loads per critical catchment was erroneously comparing the wrong load with the maximum allowable load (MAL) to determine whether the bottom line was achieved or not. Instead of using the routed contaminant load at the outlet of a critical catchment, the script erroneously used the routed contaminant load of an arbitrary individual REC2 unit in a given critical catchment. Hence, a load equal to or smaller than the load at the outlet of a critical catchment was compared with the MAL resulting in a wrong assessment of whether the bottom-line target was achieved or not for many critical catchments. The error was caused by not applying the max operator on the set of routed contaminant loads per critical catchments to correctly identify the routed optimised contaminant load at the outlet of a given critical catchment.

This error was fixed and the corrected Tables 6 and A4.1 are provided in this corrigendum. Additionally, all affected summary statements in the text are corrected below.

As the main author and author of the faulty script, I am responsible for the error in the previously reported data. I sincerely apologize to all readers of the report and users of the data and for the inconvenience this may have caused.

Alexander Herzig

Summary, p. vi–vii, bullet points 8–10

- Reducing the N load of estuary catchments by 60% would see more than 90% of critical catchments achieve the national bottom line for TN in ~~more than~~ about 80% of estuary catchments containing critical N catchments.
- Implementing current and future available P and typical sediment mitigation measures alongside N mitigation measures targeting a 60% N reduction would see more than 90% of critical catchments achieve the national bottom line for TP and SS in about ~~40%~~ 30% and 80% of estuary catchments containing critical P and sediment catchments, respectively.
- Implementing current and future available P mitigation measures alongside N mitigation measures targeting an 80% N reduction would result in more than 90% of critical catchments achieve the national bottom line in more than ~~50%~~ 40% of estuary catchments containing critical P catchments.

Section 4.1.4, p. 19–20, bullet points 2–4

- Reducing the N load of estuary catchments by 60% would see more than 90% of critical catchments achieve the national bottom line for TN in ~~more than~~ about 80% of estuary catchments containing critical N catchments.
- Implementing current and future available P and typical sediment mitigation measures alongside N mitigation measures targeting a 60% N reduction would see more than 90% of critical catchments achieve the national bottom line for TP and SS in about ~~40%~~ 30% and 80% of estuary catchments containing critical P and sediment catchments, respectively.
- Implementing current and future available P mitigation measures alongside N mitigation measures targeting an 80% N reduction would result in more than 90% of critical P catchments achieve the national bottom line in more than ~~50%~~ 40% of estuary catchments containing critical P catchments.

Section 4.5, p. 33–34

Table 6 summarises the modelled effect of contaminant reduction for the land-use change scenarios on achieving NPS-FM bottom lines for critical catchments within estuary sea-draining catchments. For all three contaminants, at least about ~~80%~~ 75% of critical catchments in at least two of the three case-study estuaries achieve NPS-FM bottom lines in the land-use change scenario targeting 60% N reduction.

In the Kaipara Harbour and Waihi estuary catchments, the 60% N reduction target results in c. 90% of critical catchments achieving the bottom line for TN, whereas c. ~~60%~~ 40% of critical catchments in the New River estuary catchments achieve the TN bottom line for the same scenario. About ~~80%~~ 75% and ~~90%~~ 86% of critical P catchments in the New River and Waihi estuary catchments respectively achieve the NPS-FM bottom line for TP in the 60% N reduction scenario. Only around 40% of critical P catchments achieve the NPS-FM TP standard for the same scenario in the Kaipara Harbour.

Circa 90% of critical catchments achieve the NPS-FM bottom line standard for suspended sediment in the Kaipara Harbour and New River estuary catchments in the land-use change scenario targeting ~~60%~~ 40% N reduction. There are no critical sediment catchments in the Waihi estuary catchments.

Table 6. Impact of nitrogen reduction targets on case-study estuary catchments meeting NPS-FM bottom lines (corrected data)

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**
Kaipara Harbour	233	91	142	210	229	1510	191	412	585	1065	700	241	629	693	694
New River	424	17	74	179	353	945	176	456	712	878	637	75	573	616	619
Waihi	15	1	9	14	15	87	9	35	75	84					

[a] The number of catchments that fail the NPS-FM bottom line (baseline scenarios, BL)

[b] The number of catchments that meet the NPS-FM bottom line for the given land-use change scenario

BL: baseline scenarios

20: land-use change scenario with 20% nitrogen reduction target

40: land-use change scenario with 40% nitrogen reduction target

60: land-use change scenario with 60% nitrogen reduction target

80: land-use change scenario with 80% nitrogen reduction target

Notes: The table shows the number of estuary sub-catchments currently not meeting the NPS-FM bottom line for nitrogen, phosphorous, and sediment (No. fail BL), and the sub-catchments that do meet the NPS-FM bottom line for the given contaminant in the modelled land-use change scenarios (cf. Table 3) that target 20%, 40%, 60%, and 80% N reduction (columns 20, 40, 60, 80). The sediment data refer to RCP 4.5, and the colours show the percentage of catchments achieving NPS-FM bottom lines (red: <25%, yellow: 25% ≤ X < 50%, blue: 50% ≤ X < 75%, light green: 75% ≤ X < 100%, dark green: 100%)

Appendix 4, p. 51 – 59, Table A4.1

Table A4.1. Impact of nitrogen reduction targets on estuary catchments meeting NPS-FM bottom lines. The table shows the number of estuary sub-catchments currently not meeting the NPS-FM bottom line for nitrogen, phosphorous, and sediment (No. fail BL), and the sub-catchments that do meet the NPS-FM bottom line for the given contaminant in the modelled land-use change scenarios (cf. Table 3) that target 20%, 40%, 60%, and 80% reduction of nitrogen (columns 20, 40, 60, 80). The sediment data refer to RCP 4.5, and the colours show the percentage of catchments achieving NPS-FM bottom lines (red: <25%, yellow: 25% ≤ X < 50%, blue: 50% ≤ X < 75%, light green: 75% ≤ X < 100%, dark green: 100%) (corrected data)

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	BL	20	40	60	80	BL	20	40	60	80	BL	20	40	60	80
Ahuriri	7	2	4	7	7	28	0	0	0	0					
Akatore Creek	3	1	1	1	1	4	0	0	0	0	23	12	23	23	23
Akitio River	69	2	16	42	63	198	3	28	72	156	34	0	20	23	33
Aotea Harbour System	6	3	6	6	6	9	7	9	9	9	47	25	45	46	47
Avon-Heathcote River	35	11	14	23	33	27	6	8	13	16					
Awakino River	2	2	2	2	2	31	7	31	31	31	41	8	37	38	39
Awapoko River	2	2	2	2	2	55	11	27	46	54					
Awaroa Inlet															
Awhea River	12	4	8	12	12	51	3	8	19	28	4	0	3	3	4
Bark Bay															
Blueskin Bay	15	3	10	14	15	40	0	2	7	8					
Bluff Harbour	8	3	7	8	8	6	1	3	5	5	72	18	72	72	72
Buller River	5	2	5	5	5	10	1	1	2	2	316	103	246	247	247
Cascade/Martyr River						2	0	0	0	0	2	0	2	2	2
Catlins River	61	12	21	38	58	86	15	32	59	81	38	9	38	38	38
Clutha River	1316	347	807	1157	1258	1792	599	1239	1679	1735	1560	744	1440	1496	1532
Colville Bay	2	2	2	2	2	1	0	1	1	1					
Coromandel Harbour	2	2	2	2	2	10	5	8	8	8					

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**
Delaware															
Duffers Creek/Rahotaiepa River															
Ferrer Creek						4	1	1	2	2					
Frenchman Bay															
Grey River	16	6	15	15	15	3	0	1	1	1	625	209	552	552	559
Haldane	12	3	9	10	10						10	4	10	10	10
Herekino Harbour						9	9	9	9	9	8	8	8	8	8
Hokianga Harbour System	46	31	41	44	44	199	103	152	181	186	37	13	33	34	34
Hollyford River						9	9	9	9	9	22	22	22	22	22
Hoopers Inlet															
Horahora River	2	2	2	2	2	12	6	11	12	12	1	0	1	1	1
Houhora Harbour	7	1	3	4	5	115	0	2	23	53	20	15	19	19	19
Jacobs River	135	1	10	58	115	271	57	133	213	242	235	26	184	204	208
Kaikorai Stream	21	10	13	14	16	43	9	16	24	30					
Kaipara Harbour System	233	91	142	210	229	1510	191	412	585	1065	700	241	629	693	694
Kaiteretere															
Kakanui River	83	2	15	56	72	144	7	49	132	144	33	1	15	30	30
Karamea River						5	1	1	2	2	7	0	5	5	5
Kauranga River	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1
Kawhia Harbour System	13	11	13	13	13	13	7	10	13	13	124	32	104	107	112
Lagoon Bay(Ruapuke Is)											1	1	1	1	1
Lake Brunton	2	0	0	1	2	2	1	2	2	2	14	0	14	14	14
Ligar Bay															
Little Wanganui River											8	0	5	5	5
Mahitahi River											2	0	2	2	2
Mahurangi Harbour System						30	3	17	20	26					

Estuary name	Nitrogen No. fail[a] BL	Nitrogen No. meeting targets[b] 20	40	60	80	Phosphorous No. fail BL	Phosphorous No. meeting targets 20	40	60	80	Sediment No. fail BL	Sediment No. meeting targets 20	40	60	80
Makawhio River (Jacobs River)											1	0	1	1	1
Maketu River	65	23	58	60	65	161	28	110	129	136	8	0	8	8	8
Manaia Harbour						1	0	0	0	0					
Manakaiaua River															
Manawatu River	198	15	54	123	158	675	26	41	91	209	13	0	12	13	13
Mangakuri River	1	0	1	1	1	21	0	4	9	19	5	0	1	1	4
Mangawhai Harbour	2	2	2	2	2	52	21	27	39	49	1	0	1	1	1
Mangonui Harbour	5	4	5	5	5	11	7	11	11	11	7	4	7	7	7
Manukau HarbourSystem	75	15	25	43	66	375	58	75	110	242	155	64	153	154	154
Maraetaha River	3	0	0	3	3	8	0	2	2	4					
Marahau River															
Marakopa River	10	6	9	10	10	4	2	4	4	4	26	2	20	21	21
Mataikona River	2	1	1	2	2						26	1	10	10	10
Matakana River	3	2	3	3	3	1	1	1	1	1					
Matapouri Bay System						2	0	1	2	2					
Maungawhio Lagoon						15	0	7	14	14					
Mikonui River															
Mimi River	10	5	8	10	10	8	4	6	8	8	17	9	16	17	17
Miranda Stream	4	0	1	2	4	8	1	3	8	8	4	0	3	4	4
Mohakatino River						2	2	2	2	2	3	1	3	3	3
Mokau River	256	81	208	239	254	560	151	462	497	543	24	1	23	24	24
Mokihinui River						1	0	0	0	0	4	2	4	4	4
Motueka North															
Motueka South						2	2	2	2	2					
Motupipi River	7	0	5	6	7										
Moutere Inlet	18	6	13	16	16	51	3	5	6	7					

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**
Nelson Haven	6	4	4	4	4	13	1	3	3	3					
New River	424	17	74	179	353	945	176	456	712	878	637	75	573	616	619
Ngakawau River											2	0	1	1	1
Ngaruroro River	203	66	131	180	202	494	29	82	140	212	25	1	24	25	25
Ngunguru River						21	8	21	21	21					
Ohinemaka River															
Ohinetamatatea River															
Ohiwa Harbour	10	3	7	9	9	104	9	48	83	97					
Okari Lagoon											34	8	33	33	34
Okarito Lagoon											1	1	1	1	1
Okura River						5	0	0	0	0					
Okuru River	2	2	2	2	2	2	0	0	0	0	30	3	30	30	30
Onaero River	21	4	9	19	20	36	8	21	35	35	19	5	19	19	19
Onahau River															
Onekaka Inlet															
Oparara River	3	1	3	3	3						3	0	3	3	3
Orewa River						2	0	1	2	2					
Orowaiti Lagoon											14	3	13	13	13
Otahu River	5	1	5	5	5	2	1	2	2	2					
Otaki River	7	5	6	7	7	25	1	8	11	11	36	15	36	36	36
Oterei River	3	0	1	3	3	20	0	4	4	7	2	0	0	0	0
Otuwhero Inlet															
Owahanga River	63	3	24	47	62	217	1	32	91	177	14	0	8	10	12
Pahaoa River	24	4	17	20	23	4	0	1	2	2	60	14	35	40	50
Pakarae River						40	0	11	32	39					
Pakawau Inlet															

Estuary name	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
	BL	20	40	60	80	BL	20	40	60	80	BL	20	40	60	80
Pakiri River	2	1	2	2	2	4	1	3	3	3					
Papanui Inlet															
Parapara Inlet															
Parengarenga Harbour System	5	5	5	5	5	133	7	8	18	31	28	23	28	28	28
Patanui Stream	4	0	0	2	4	19	0	2	5	9	2	0	2	2	2
Pataua River	2	2	2	2	2	23	6	16	23	23	1	1	1	1	1
Patea River	21	0	11	14	15	61	1	18	24	34	4	3	4	4	4
Paturau River						1	0	0	0	0					
Piako River	11	0	0	0	7	24	0	0	0	0	224	115	198	217	223
Pleasant River	7	0	2	4	5	48	1	28	40	43					
Poerua River (Hikimutu Lagoon)											2	0	2	2	2
Porangahau River	98	6	36	62	86	535	10	88	195	411	15	0	12	12	12
Porirua Harbour	13	4	5	8	10	43	3	8	8	8	27	12	27	27	27
Pororari River											1	0	0	0	0
Port Puponga															
Pouawa River	2	1	2	2	2	29	1	11	28	29					
Puhoi River															
Purakunui Inlet	2	0	2	2	2	5	0	3	4	5					
Purangi River	5	2	4	4	5	9	1	7	9	9					
Raglan Harbour System	30	7	19	29	29	105	34	80	98	101	159	33	146	152	156
Rangaunu Harbour	6	4	6	6	6	193	25	49	72	126	23	16	23	23	23
Rangitikei River	302	63	224	257	298	232	6	11	11	16	77	36	69	73	73
Ruakaka River	4	2	3	4	4	27	4	9	21	27					
Ruataniwha Inlet	11	3	11	11	11	9	3	9	9	9	4	0	4	4	4
Saltwater Creek/New River											18	6	18	18	18
Saltwater Lagoon															

Estuary name	Nitrogen No. fail[a] BL	Nitrogen No. meeting targets[b] 20	40	60	80	Phosphorous No. fail BL	Phosphorous No. meeting targets 20	40	60	80	Sediment No. fail BL	Sediment No. meeting targets 20	40	60	80
Sandfly Bay															
Shag River	3	1	1	2	3	77	19	57	74	75	33	12	33	33	33
Tahakopa River	2	1	1	1	1						71	13	71	71	71
Tahoranui River	1	1	1	1	1	5	4	4	5	5					
Tahunanui						2	0	0	0	0					
Taieri River	21	0	8	15	17	379	57	162	235	334	493	174	418	423	464
Taiharuru River	1	1	1	1	1	13	8	12	13	13					
Taipa River	3	0	2	3	3	23	10	15	22	23	2	1	2	2	2
Tairua Harbour	14	4	8	14	14	18	2	10	16	16					
Takaka						4	3	4	4	4					
Takou River	17	10	17	17	17	16	9	11	12	16	1	1	1	1	1
Tamaki River	8	4	4	5	5	79	41	41	42	51					
Tapotupotu Bay						16	16	16	16	16					
Tapuaetahi Creek						12	5	7	10	12					
Taramakau River						1	0	0	0	0	11	2	10	10	10
Tauranga Harbour System	76	38	65	75	76	203	87	149	167	169	33	22	32	32	33
Tautuku River											3	2	3	3	3
Te Kouma Harbour															
Te Muri-O-Tarariki															
Three Mile Lagoon															
Toetoes Harbour	12	0	0	2	11	1175	178	496	888	1133	313	82	286	308	310
Tokomairiro River	2	0	0	0	2	194	3	54	125	160	34	0	34	34	34
Tongaporutu River	1	1	1	1	1	6	2	5	6	6	5	1	5	5	5
Torrent Bay															
Totara_1 River	1	1	1	1	1						26	9	17	17	17
Totara_2 River															

Estuary name	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
	BL	20	40	60	80	BL	20	40	60	80	BL	20	40	60	80
Totaranui Stream															
Turakina River	12	0	0	0	4	127	5	7	8	11	37	21	36	37	37
Turanganui River	3	1	1	2	3	111	14	37	83	83					
Uawa River						107	2	43	82	83	2	2	2	2	2
Urenui River	3	2	3	3	3						10	4	10	10	10
Waiaro															
Waiatoto River						2	0	0	0	0	8	1	8	8	8
Waiaua River						18	5	9	12	13	1	1	1	1	1
Waihi	15	1	9	14	15	87	9	35	75	84					
Waihou River	34	6	21	33	34	150	13	23	35	74	111	18	81	106	111
Waikanae River	2	1	2	2	2	16	1	2	2	2	32	11	32	32	32
Waikari River	14	1	7	10	14	55	3	17	34	47					
Waikato															
Waikato River	640	70	209	481	614	639	27	49	139	398	193	14	168	186	191
Waikawa Harbour	27	8	20	26	26						55	5	54	55	55
Waikawau															
Waikouaiti River	4	0	0	3	4	100	6	19	53	83	25	4	25	25	25
Waimakariri River	133	18	44	98	127	158	11	41	124	149	4	0	4	4	4
Waimaukau River	2	1	1	1	1						9	4	9	9	9
Waimea Inlet	24	8	10	11	12	99	2	4	4	4	6	4	6	6	6
Wainui Inlet															
Waioeka River	2	2	2	2	2	66	30	61	64	64	33	11	29	29	29
Waiomoko River						19	3	5	14	19					
Waiongana Stream	27	0	9	25	25	42	5	21	36	40	35	35	35	35	35
Waiotahi River	4	1	4	4	4	50	9	35	48	48	1	0	1	1	1
Waipaoa River	260	33	125	238	250	601	15	168	212	388	5	2	4	5	5

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	BL	20	40	60	80	BL	20	40	60	80	BL	20	40	60	80
Waipati											9	1	9	9	9
Waipoua River											9	9	9	9	9
Waipu River	8	4	7	7	8	129	41	72	92	129					
Wairau River	34	4	10	20	22	289	15	44	51	52	8	5	8	8	8
Wairoa River	5	0	2	5	5	317	22	117	268	271	17	0	17	17	17
Wairoa_1 River	14	8	13	14	14	24	1	3	4	16	39	10	39	39	39
Waita River						1	0	0	0	0	10	1	10	10	10
Waitaha River						1	0	0	0	0	3	0	3	3	3
Waitahora Stream						2	2	2	2	2					
Waitakaruru River	4	1	1	1	4	21	0	0	0	3	29	8	27	28	29
Waitara River	90	17	63	83	90	158	18	98	154	154	33	7	33	33	33
Waitemata Harbour System	64	32	33	37	38	191	43	63	86	94	57	29	57	57	57
Waitotara River	43	8	18	35	35	173	3	15	28	28	28	9	28	28	28
Waiwakaiho River	6	1	2	6	6	10	3	6	7	7	13	6	13	13	13
Waiwera River						2	1	2	2	2					
Wanganui River	70	16	34	39	41	412	14	35	65	85	36	3	36	36	36
Weiti River	4	4	4	4	4	4	1	3	4	4					
Whakatane River	10	1	1	1	4	307	53	176	251	253					
Whananaki Inlet	2	2	2	2	2	13	7	9	13	13					
Whangaehu River	38	10	22	27	33	200	0	5	35	83	18	0	18	18	18
Whangamata Harbour	2	1	2	2	2	14	0	2	2	2					
Whangamoa River															
Whanganui Inlet						2	0	0	0	0					
Whangapae Harbour System						4	2	4	4	4	11	2	11	11	11
Whangaparaoa River	1	1	1	1	1						3	0	3	3	3
Whangapoua Creek	2	2	2	2	2						5	0	5	5	5

	Nitrogen					Phosphorous					Sediment				
	No. fail[a]	No. meeting targets[b]				No. fail	No. meeting targets				No. fail	No. meeting targets			
Estuary name	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**	**BL**	**20**	**40**	**60**	**80**
Whangapoua Harbour	1	0	1	1	1	8	0	0	2	2	2	2	2	2	2
Whangarei Harbour System	14	11	12	14	14	93	29	59	79	91	5	3	5	5	5
Whangateau Harbour	2	2	2	2	2	1	1	1	1	1					
Whareama River	70	7	33	57	64	240	3	44	118	152	31	6	14	24	25
Wharekahika River						2	1	1	1	1					
Wharekawa Harbour	4	2	3	3	3	7	0	4	6	6					
Whenuakura River	43	5	10	34	42	107	8	35	56	57	6	6	6	6	6
Wherowhero Lagoon	2	0	2	2	2	19	1	6	7	7					
Whitford Embayment System	4	1	3	3	3	47	0	0	0	15					
Whitianga Harbour	13	4	9	13	13	19	4	9	17	18					

a The number of catchments that fail the NPS-FM bottom line (baseline scenarios, BL)

b The number of catchments that meet the NPS-FM bottom line for the given land-use change scenario

BL: baseline scenarios

20: land-use change scenario with 20% nitrogen reduction target

40: land-use change scenario with 40% nitrogen reduction target

60: land-use change scenario with 60% nitrogen reduction target

80: land-use change scenario with 80% nitrogen reduction target