



November 2008 Gippsland floods - potential impact on the Gippsland Lakes

A report prepared for the Gippsland Lakes and Catchment Task Force

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Executive summary

The flooding of the eastern catchment of the Gippsland Lakes in late November 2008 introduced approximately 154, 50 and 12 tonnes of TN, TP and NO_x respectively into the Gippsland Lakes. This occurred after a relatively dry winter, and represents less than 10% of the load expected to stimulate a cyanobacterial bloom. It is unlikely, therefore, that this flood event will, of itself, lead to a nuisance algal bloom in the 2008-2009 summer period. A simple mass balance showed these loads are the likely major contributing factor to the documented moderate increase in chlorophyll-a in Lakes King and Victoria in December 2008. Considerably higher chlorophyll levels in Lake Wellington, the catchment of which did not flood, suggests other factors may be more significant there.

There appears to be little likelihood of a *Nodularia* bloom in the Gippsland Lakes during the 2008-2009 summer period provided the high salinity and well-mixed water column persist. Further growth of *Synechococcus* may occur, although knowledge of the ecology of this organism is insufficient for us to make confident predictions about its future path.

Introduction

Minor flooding occurred in the lower reaches of rivers flowing into the Gippsland Lakes on 23 November 2008, and continued for several days. Prior to this, nutrient and chlorophyll-a levels in the Gippsland Lakes were relatively high for a low flow season (but not excessive), and the salinity was high, and the likelihood of large-scale harmful algal blooms in the Lakes for the summer 2008-9 was low.

This study assessed the nutrient loads entering the lakes as a result of these floods, and compared these with loads calculated over the past 30 years to assess whether there is an increased risk of algal blooms because of this event.

Sampling and analysis

In-lake sampling was conducted by EPA Victoria as part of their monthly, fixed site sampling program. Dissolved nutrients samples were filtered and stored frozen, while TN and TP samples were preserved with acid. Nutrient analyses were performed using standard colorimetric techniques in a NATA accredited laboratory. Water samples for chlorophyll *a* analysis were filtered onto glass fibre filters and analysed spectrophotometrically following extraction in acetone.

River samples and flow data were collected by Theiss services as part of their ongoing monitoring program on behalf of the Victorian EPA. Water samples are collected by Isco 6712 autosamplers which are triggered by flow events. Samples are retrieved within 5 days of the initial trigger, and are then kept cool before being analysed using standard colorimetric techniques in a NATA accredited laboratory. No filtering occurs.

Loads

Winter and particularly spring flows in 2008 were low compared to previous years (Fig. 1, and compare with Fig. 3 in Cook et al. 2008). The rivers most affected by the floods were the eastern rivers; the Tambo, Mitchell and Nicholson (Fig. 1). Total flows into the lakes increased from around 1 GL/day just prior to the floods up to a peak of 41 GL/day on 24 November, when 93% of the water came from the three eastern rivers. Approximately 100 GL of water flowed into the lakes between 23 and 28 November.

The floods led to a spike in nutrient loads into the Lakes (Fig. 2). Total Nitrogen (TN), total Phosphorus (TP) and nitrate and nitrite (NO_x) loads increased dramatically (note: filterable reactive phosphorus (FRP) loads could not be assessed because the concentration in the rivers remained below detection limit ($<3 \mu\text{g L}^{-1}$) throughout the floods). Total loads were calculated for the period 23 November through 27 November¹, over which time approximately 150 tonnes of nitrogen entered the lakes, with one-third of this in the dissolved form NO_x (Table 1). Approximately 12 tonnes of phosphorus entered the lakes (Table 1). To put this into context, the average yearly load of nitrogen into the Gippsland Lakes since 1978 is 1700 tonnes; the maximum load was 6000 tonnes (2007-8) and the minimum was 300 tonnes (2006-7). This flood therefore represents approximately 9% of an average, 3% of an extremely high and 51% of an extremely low yearly load. These percentages are similar for TP and NO_x (Table 1).

Given that cyanobacteria blooms only occur in years with higher than average loads (Cook et al. 2008), these floods contributed less than 10% of the nutrients necessary for a significant bloom. Given that flows were particularly low in the months preceding these floods and nutrient and chlorophyll levels were already elevated, it is unlikely that sufficient nutrient inputs have occurred to cause extra concern.

¹ Loads were calculated as the sum of the concentration multiplied by the flow, with each concentration measurement assumed to be the average concentration for half of the time period between when the previous and following measurements were taken.

In-lake nutrients

The EPA coincidentally sampled the lakes for nutrients on the 26th of November, and their results show little impact of the floods (Figs 4, 5 and 6). There was a reduction in chlorophyll-a concentration, while other nutrients were relatively unchanged across the three sites for which the EPA provided data (Carstair's Bank, Tambo Bluff and Point Turner, all in Lake King), except for NO_x, which showed a marked increase in concentration at Carstair's Bank, from 10 µg/L to 60 µg/L. While it is likely that this monitoring trip occurred too soon after the floods to catch the entirety of the flow into the lakes, it appears that the impact of the floods was relatively minor.

Preliminary data from mid-December (EPA 2008) indicate an increase in chlorophyll-a throughout the lakes since Nov 26 (Figs 4, 5 and 6), with a concentration gradient decreasing from Lake Wellington (45 µg/L) through Lake Victoria (35 µg/L) to Lake King (15 µg/L). While there was no flooding in the western catchment, flows from this region did increase in late November to mid-December (Fig. 1), which would have added nutrients to Lake Wellington, and the flood loads would obviously be a contributing factor in Lakes Victoria and King. Other factors, such as favourable light, temperature, salinity and high internal nutrient recycling probably had a large effect on the increase in chlorophyll-a.

A simple mass balance to determine the maximum possible increase in chlorophyll *a* from this nutrient pulse was undertaken as follows. The Gippsland Lakes are generally N limited, so we assume all the bioavailable N load will be converted to biomass. The TN load to the lakes was converted to carbon equivalents using a molar stoichiometry of 6.6C:1N, which was then converted to chlorophyll *a* using a mass stoichiometry of 50C:1chl_a. This was then divided by the total volume of Lakes King and Victoria (890 GL) to yield a maximum possible increase in chl_a of 19 µg/L. Given that only 1/3 of the TN was in the bioavailable NO_x form, we would realistically expect an increase of ~6-19 µg/L chl_a. This is in good agreement with the increase observed between the 26 November in Lake King (Figs 4, 5 and 6) and the most recent data from the EPA which show an increase of ~10-12 µg/L.

Another possible impact of flooding is stratification of the water column, leading to anoxia in the bottom waters and release of sediment-bound nutrients. The December EPA data (EPA 2008) show no evidence of this, with the water column well mixed and bottom waters saturated with oxygen.

Historical perspective

A similar event to the November 2008 floods occurred in November 1988, when flooding occurred in the Tambo, Nicholson, Mitchell and Avon Rivers, leading to a minor bloom of diatoms and dinoflagellates, with surface chlorophyll *a* reaching 50 µg/L (Longmore 1994), but with no subsequent cyanobacterial bloom. The inflows during the 1988 floods were, however, much greater in scale, peaking at 133 GL/day (333 GL over five days), more than three times the flow of the 2008 floods. There is insufficient data to accurately calculate a load for the 1988 floods, but it is reasonable to assume that loads would be at least three times 2008 levels as well. Given this, it is therefore unlikely that the November 2008 floods alone will lead to a major increase in phytoplankton in the lakes.

Phytoplankton

EPA monitoring in mid-December (EPA 2008) did not identify specific organisms, but their report infers that *Synechococcus* dominated the phytoplankton in Lake Wellington, and was increasing in biomass in Lakes King and Victoria. It appears likely that it will again become dominant system-wide over the summer, and the unknown green alga that dominated throughout spring 2008 will therefore decline. We do not expect *Nodularia* to appear unless surface water salinity drops considerably (ie there is another flood event). The extent of the *Synechococcus* bloom will likely be determined by nutrient availability. TN and TP following the November 2008 floods were at levels similar to the same time in 2007, when *Synechococcus* became dominant. It is therefore possible that efficient recycling of these nutrients in the water column could see similar levels of growth over the summer of 2008-9 as was seen in 2007-8, with chlorophyll *a* levels consistently >10 µg/L. The ecology and physiology of the *Synechococcus* species found in the lakes has not been studied, and unknown factors may therefore have a strong influence on the growth and proliferation of this organism.

Table 1. Nutrient loads from the November 2008 floods (in tonnes), compared with annual loads over the previous 30 years. The percentages of the annual amounts contributed by the floods is shown in brackets.

	TN	TP	NO _x
Nov 08 floods	154	12	50
Mean 1978-2008	1680 (9%)	191 (6%)	488 (10%)
Max. 1978-2008	6060 (3%)	869 (1%)	2020 (2%)
Min. 1978-2008	305 (51%)	32 (39%)	99 (51%)

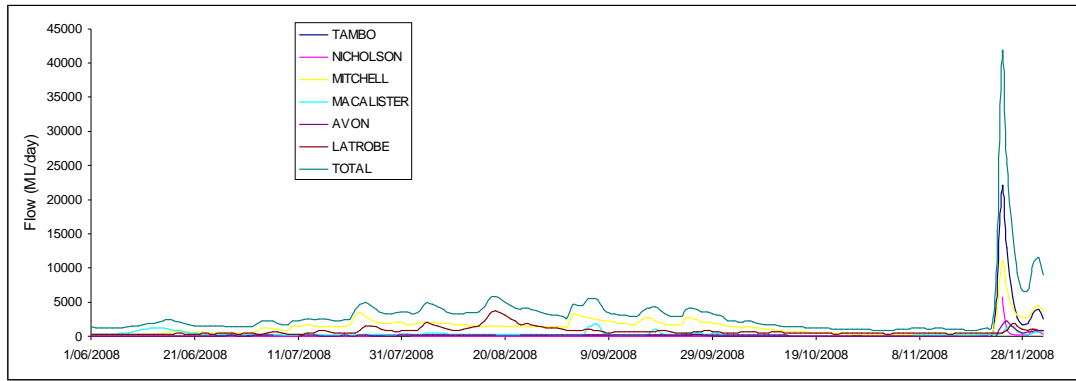


Figure 1. Flow into the Gippsland lakes from June to December 2008.

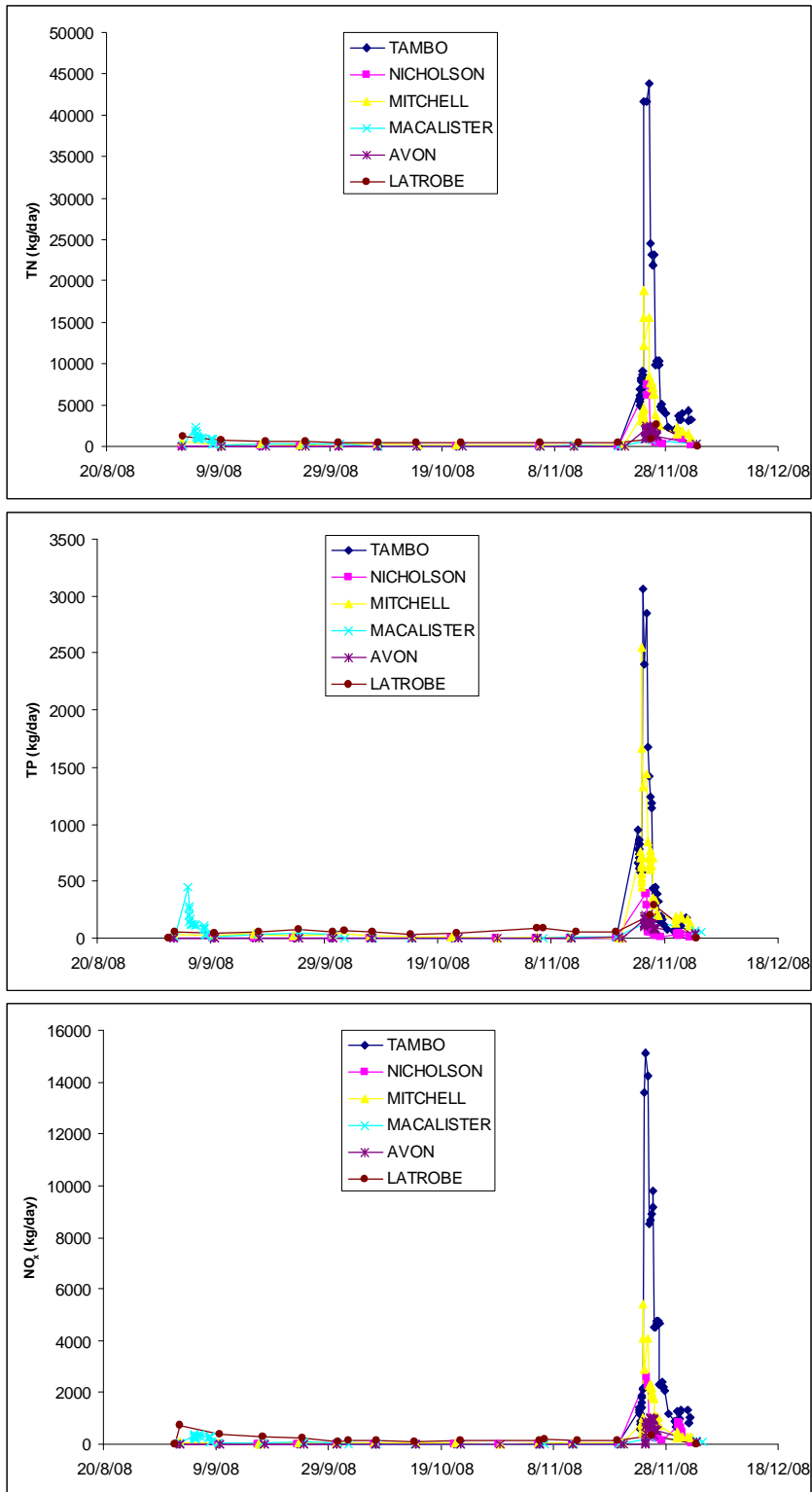


Figure 2. Daily loads of total nitrogen, total phosphorus and NO_x into the Gippsland Lakes between September and December 2008.

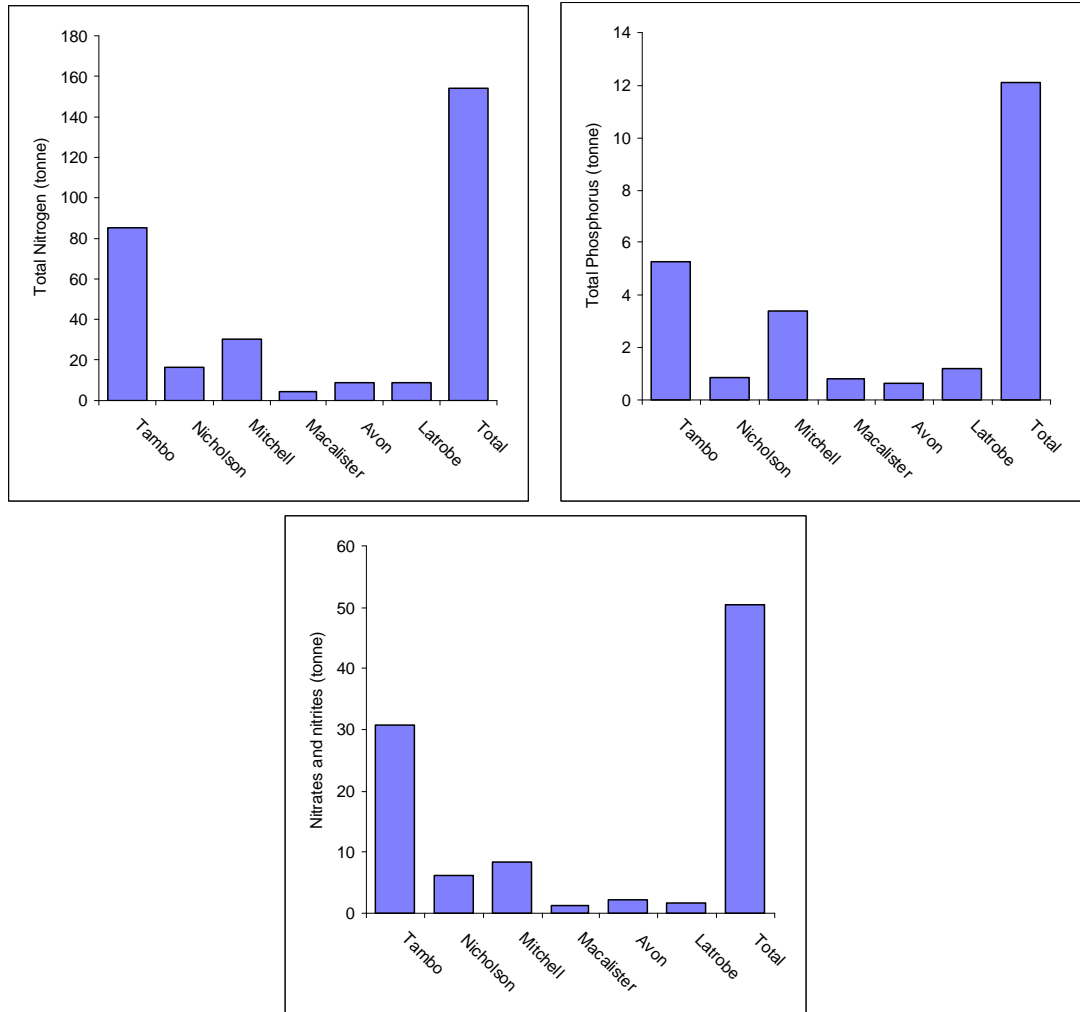


Figure 3. Nutrient loads entering the Gippsland Lakes from the 23rd to the 28th of November 2008.

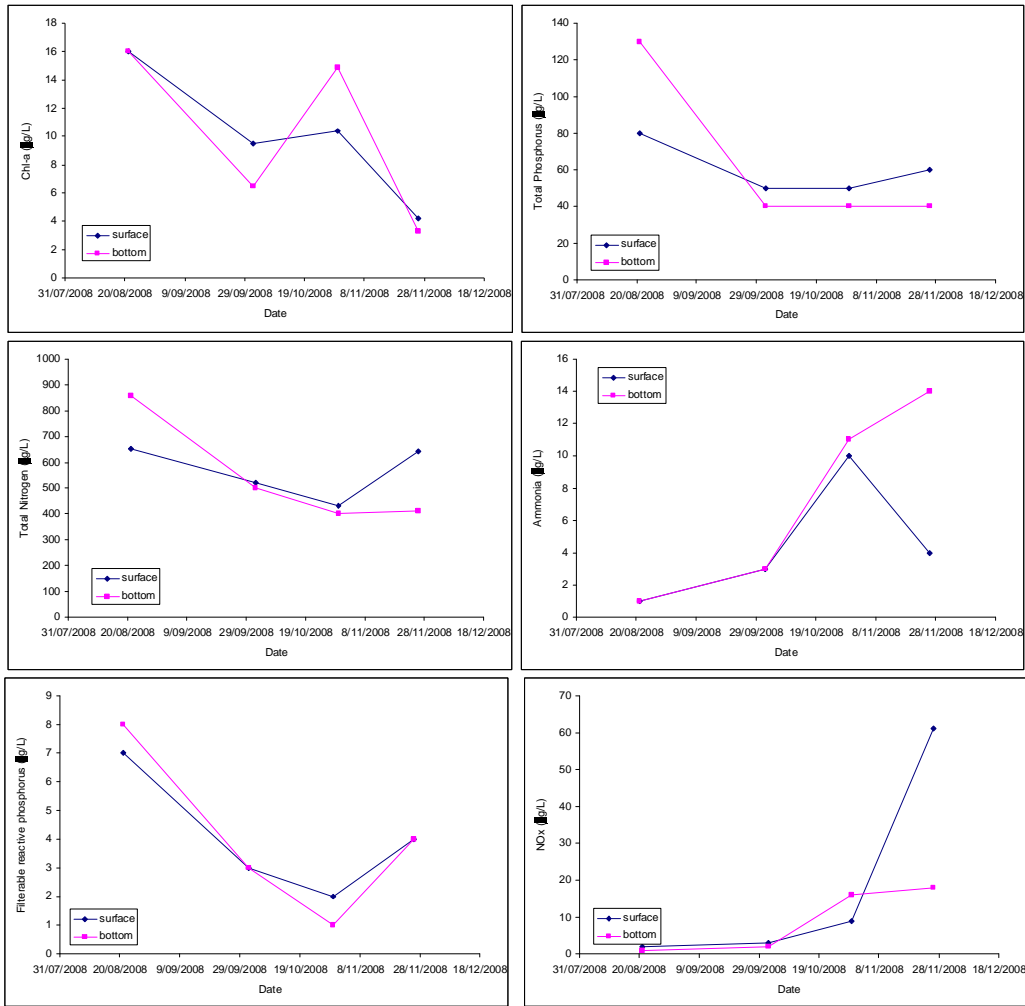


Figure 4. Nutrient concentrations at Carstair's Bank, in Lake King South, between September and December 2008. The final measurement in this time series was taken two days after the peak of flooding.

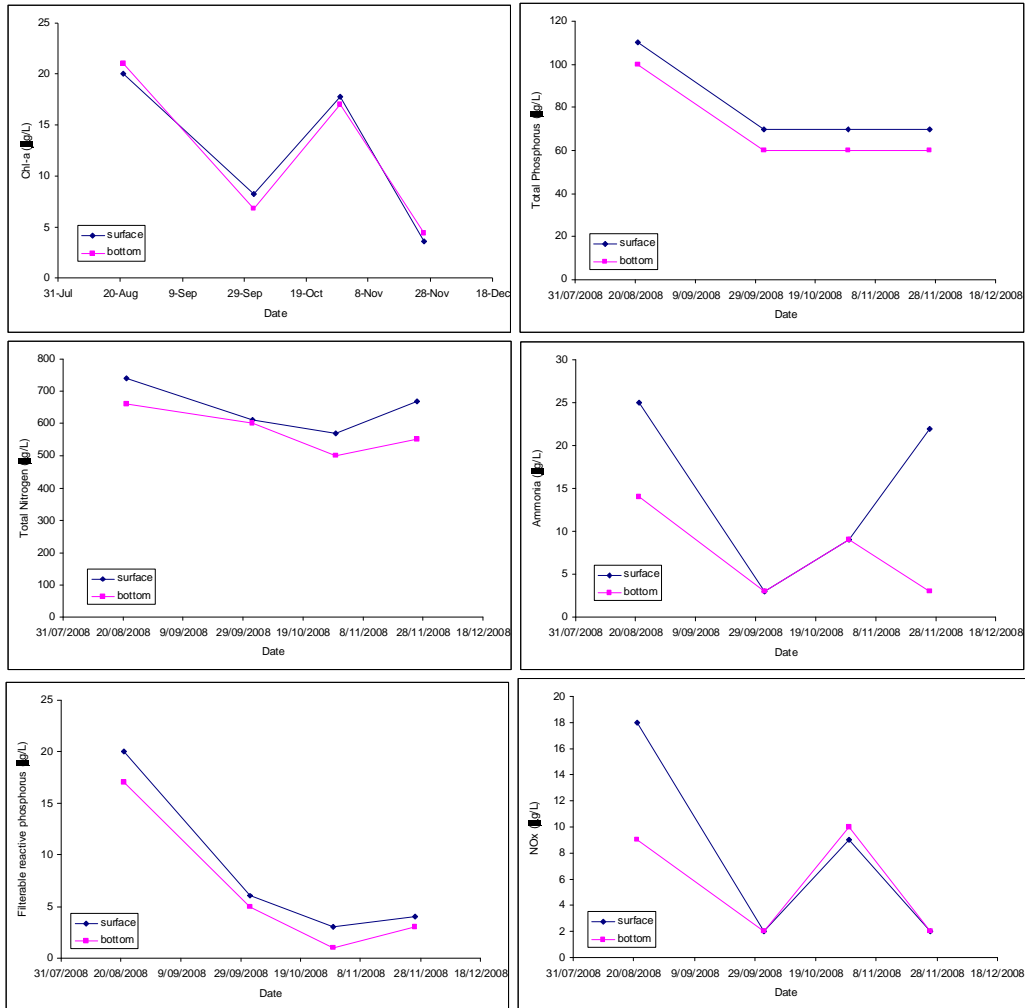


Figure 5. Nutrient concentrations at Point Turner, in Lake King South, between September and December 2008. The final measurement in this time series was taken two days after the peak of flooding.

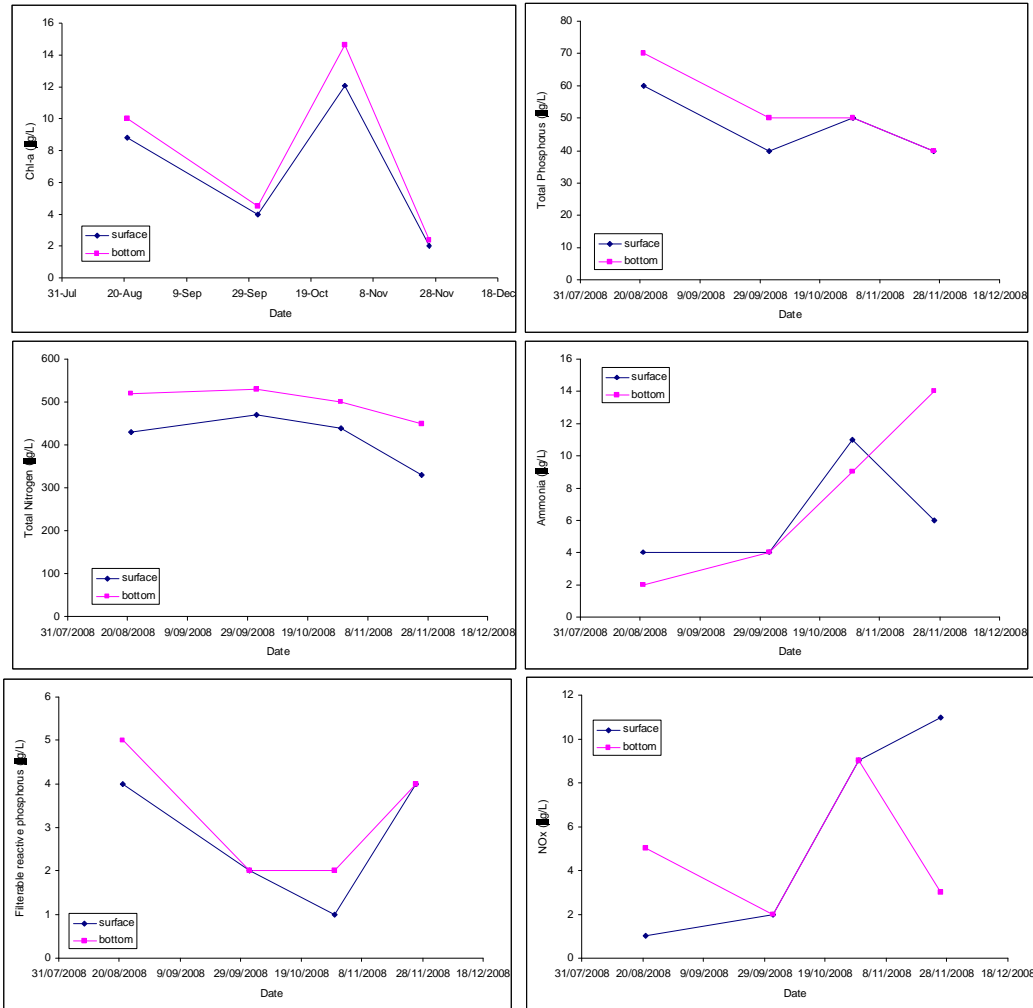


Figure 6. Nutrient concentrations at Tambo Bluff, in east-central Lake King, between September and December 2008. The final measurement in this time series was taken two days after the peak of flooding.

Acknowledgements

We thank Guillaume Martinez of the EPA for providing the in-lake and river nutrient data for this report.

References

- Cook, P.L.M., D.P. Holland and A.R. Longmore (2008). Interactions between phytoplankton dynamics, nutrient loads and the biogeochemistry of the Gippsland Lakes, Monash University, <http://www.gippslandlakes taskforce.vic.gov.au/>.
- EPA (2008). EPA “underway” water quality monitoring - Gippsland Lakes, 17 December 2008.
- Longmore, A. (1994). Nutrient and chlorophyll concentrations in the Gippsland Lakes 1988-89. Melbourne, EPA Victoria.

Appendix A – In-lake data

CB – Carstairs Bank; PT – Point Turner; SJ – Silk Jetty; SP – Storm Point; TB – Tambo Bluff; WP – Waddy Point

Site	Date	Chl a ug/l	TP mg/l	TN mg/l	NH4 mg/l	FRP mg/l	NOx mg/l
CB-bottom	21/08/2008	16	0.13	0.86	0.001	0.008	0.001
CB-bottom	2/10/2008	6.5	0.04	0.5	0.003	0.003	0.002
CB-bottom	30/10/2008	14.9	0.04	0.4	0.011	0.001	0.016
CB-bottom	26/11/2008	3.3	0.04	0.41	0.014	0.004	0.018
CB-top	21/08/2008	16	0.08	0.65	0.001	0.007	0.002
CB-top	2/10/2008	9.5	0.05	0.52	0.003	0.003	0.003
CB-top	30/10/2008	10.4	0.05	0.43	0.01	0.002	0.009
CB-top	26/11/2008	4.2	0.06	0.64	0.004	0.004	0.061
MS-top	21/08/2008	18	0.2	1	0.017	0.018	0.027
PT-bottom	21/08/2008	21	0.1	0.66	0.014	0.017	0.009
PT-bottom	2/10/2008	6.8	0.06	0.6	0.003	0.005	0.002
PT-bottom	30/10/2008	17	0.06	0.5	0.009	0.001	0.01
PT-bottom	26/11/2008	4.4	0.06	0.55	0.003	0.003	0.002
PT-top	21/08/2008	20	0.11	0.74	0.025	0.02	0.018
PT-top	2/10/2008	8.2	0.07	0.61	0.003	0.006	0.002
PT-top	30/10/2008	17.8	0.07	0.57	0.009	0.003	0.009
PT-top	26/11/2008	3.6	0.07	0.67	0.022	0.004	0.002
SJ-Bot	21/08/2008	8.9	0.08	0.58	0.002	0.003	0.0005
SJ-Bot	2/10/2008	8.7	0.12	0.81	0.035	0.007	0.006
SJ-Bot	30/10/2008	11.1	0.05	0.43	0.011	0.002	0.01
SJ-Top	21/08/2008	9.5	0.07	0.54	0.001	0.005	0.002
SJ-Top	2/10/2008	8.3	0.04	0.52	0.004	0.002	0.005
SJ-Top	30/10/2008	11.9	0.05	0.42	0.011	0.001	0.01
SP-top	21/08/2008	27	0.16	0.95	0.006	0.019	0.025
SP-top	30/10/2008	29	0.09	0.78	0.011	0.002	0.011
TB-bottom	21/08/2008	10	0.07	0.52	0.002	0.005	0.005
TB-bottom	2/10/2008	4.5	0.05	0.53	0.004	0.002	0.002
TB-bottom	30/10/2008	14.6	0.05	0.5	0.009	0.002	0.009
TB-bottom	26/11/2008	2.4	0.04	0.45	0.014	0.004	0.003
TB-top	21/08/2008	8.8	0.06	0.43	0.004	0.004	0.001
TB-top	2/10/2008	4	0.04	0.47	0.004	0.002	0.002
TB-top	30/10/2008	12.1	0.05	0.44	0.011	0.001	0.009
TB-top	26/11/2008	2	0.04	0.33	0.006	0.004	0.011
WP-bot	21/08/2008	13	0.11	0.78	0.04	0.019	0.018
WP-bot	2/10/2008	8.2	0.09	0.77	0.005	0.006	0.005
WP-bot	30/10/2008	28	0.08	0.61	0.011	0.002	0.012
WP-top	21/08/2008	13	0.13	0.83	0.039	0.02	0.03
WP-top	2/10/2008	8.8	0.09	0.8	0.003	0.006	0.006
WP-top	30/10/2008	31	0.09	0.7	0.015	0.002	0.011

Appendix B – river nutrient data

Site information available at <http://www.vicwaterdata.net/vicwaterdata/>

SITE	DATE TIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
223209	2/09/2008 10:06	0.40	0.12		0.02
223209	9/09/2008 10:05	0.30	0.10		0.01
223209	16/09/2008 11:20	0.30	0.04		0.03
223209	23/09/2008 12:35	0.30	0.05		0.02
223209	30/09/2008 10:02	0.30	0.04		0.02
223209	7/10/2008 11:35	0.30	0.03		0.02
223209	14/10/2008 13:30	0.40	0.03		0.02
223209	21/10/2008 9:30	0.40	0.04		0.03
223209	5/11/2008 9:05	0.30	0.03		0.02
223209	11/11/2008 9:30	0.40	0.04		0.03
223209	19/11/2008 10:45	0.30	0.03		0.02
223209	23/11/2008 8:20	1.70	0.32		0.23
223209	23/11/2008 8:48	1.50	0.35		0.19
223209	23/11/2008 9:18	1.40	0.30		0.16
223209	23/11/2008 9:48	1.20	0.14		0.16
223209	23/11/2008 10:18	1.40	0.19		0.21
223209	23/11/2008 10:48	1.30	0.14		0.17
223209	23/11/2008 11:33	1.70	0.22		0.19
223209	23/11/2008 12:03	2.00	0.27		0.20
223209	23/11/2008 12:48	2.00	0.33		0.20
223209	23/11/2008 13:33	2.00	0.29		0.18
223209	23/11/2008 14:48	2.00	0.40		0.15
223209	23/11/2008 15:48	1.90	0.35		0.15
223209	23/11/2008 17:33	2.20	0.44		0.17
223209	23/11/2008 18:48	2.10	0.45		0.14
223209	23/11/2008 20:48	2.00	0.52		0.14
223209	23/11/2008 22:48	1.90	0.51		0.14
223209	24/11/2008 3:03	1.90	0.62		0.14
223209	24/11/2008 11:00	1.90	0.69		0.11
223209	24/11/2008 21:19	2.00	0.65		0.13
223209	25/11/2008 3:03	1.90	0.66		0.13
223209	25/11/2008 8:18	1.80	0.67		0.11
223209	25/11/2008 13:18	1.70	0.69		0.10
223209	25/11/2008 16:48	1.70	0.71		0.09
223209	25/11/2008 20:33	1.80	0.76		0.09
223209	26/11/2008 0:18	1.70	0.78		0.08
223209	26/11/2008 4:18	1.70	0.78		0.08
223209	26/11/2008 8:18	1.80	0.81		0.08
223209	26/11/2008 12:48	1.70	0.83		0.07
223209	26/11/2008 16:18	1.80	0.83		0.07
223209	26/11/2008 20:03	1.70	0.81		0.06
223209	27/11/2008 0:03	1.70	0.82		0.06
223209	27/11/2008 4:33	1.60	0.80		0.05
223209	27/11/2008 6:18	1.80	0.85		0.07
223209	27/11/2008 12:18	1.60	0.78		0.06
223209	27/11/2008 20:20	1.40	0.74		0.04
223209	28/11/2008 10:03	1.30	0.66		0.04
223209	29/11/2008 12:48	1.10	0.49		0.04
223209	29/11/2008 20:48	1.10	0.38		0.03

SITE	DATE TIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
223209	30/11/2008 4:18	1.10	0.39		0.05
223209	30/11/2008 11:48	1.00	0.30		0.03
223209	30/11/2008 13:18	1.00	0.37		0.04
223209	30/11/2008 20:03	1.20	0.40		0.03
223209	1/12/2008 22:03	1.10	0.34		0.05
223209	2/12/2008 0:33	1.20	0.33		0.04
223209	2/12/2008 9:50	1.30	0.41		0.06
223210	2/09/2008 10:50	0.6	0.33		0.006
223210	9/09/2008 10:40	0.5	0.21		0.016
223210	16/09/2008 13:50	0.3	0.14		0.021
223210	23/09/2008 13:55	0.4	0.13		0.013
223210	30/09/2008 10:45	0.3	0.089		0.011
223210	7/10/2008 10:40	0.3	0.06		0.014
223210	14/10/2008 14:00	0.3	0.035		0.013
223210	21/10/2008 11:30	0.2	0.02		0.012
223210	5/11/2008 9:55	0.3	0.021		0.014
223210	11/11/2008 10:05	0.3	0.021		0.012
223210	19/11/2008 13:15	0.3	0.022		0.015
223210	24/11/2008 15:40	1.3	0.46		0.069
223210	24/11/2008 19:30	1.1	0.4		0.07
223210	24/11/2008 23:00	1.1	0.41		0.051
223210	25/11/2008 2:30	1.1	0.43		0.056
223210	25/11/2008 4:45	1.2	0.53		0.053
223210	25/11/2008 7:00	1.2	0.5		0.055
223210	25/11/2008 9:15	1.2	0.49		0.053
223210	25/11/2008 14:30	1.3	0.53		0.06
223210	25/11/2008 20:15	1.3	0.57		0.067
223210	26/11/2008 4:45	1.3	0.6		0.049
223210	26/11/2008 16:30	1.3	0.64		0.048
223210	27/11/2008 10:15	1.3	0.65		0.042
223210	30/11/2008 4:59	1.4	0.73		0.037
223210	30/11/2008 6:44	1.4	0.81		0.033
223210	30/11/2008 7:14	1.4	0.82		0.036
223210	30/11/2008 7:29	1.3	0.8		0.031
223210	30/11/2008 7:59	1.4	0.81		0.031
223210	30/11/2008 8:29	1.3	0.77		0.029
223210	30/11/2008 8:59	1.4	0.8		0.034
223210	30/11/2008 9:44	1.4	0.83		0.04
223210	30/11/2008 12:29	1.3	0.8		0.024
223210	30/11/2008 18:14	1.1	0.63		0.02
223210	30/11/2008 20:59	1	0.48		0.03
223210	30/11/2008 23:29	0.9	0.4		0.037
223210	2/12/2008 11:20	0.6	0.21		0.033
223210	2/09/2008 10:45		0.36	<0.003	0.009
223210	9/09/2008 10:45		0.22	<0.003	0.011
223210	16/09/2008 13:20		0.16	<0.003	0.011
223210	23/09/2008 14:00		0.13	<0.003	0.012
223210	30/09/2008 10:50		0.091	<0.003	0.012
223210	7/10/2008 0:00		0.064	<0.003	0.008
223210	14/10/2008 14:00		0.035	<0.003	0.011
223210	21/10/2008 11:30		0.023	<0.003	0.01
223210	29/10/2008 9:55		0.02	<0.003	0.011
223210	5/11/2008 10:00		0.021	<0.003	0.013

SITE	DATE TIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
223210	11/11/2008 10:10		0.023	<0.003	0.014
223210	19/11/2008 13:30		0.26	<0.003	0.014
223210	25/11/2008 15:20		0.42	<0.003	0.076
223210	2/12/2008 11:15		0.18	<0.003	0.029
223210	9/12/2008 10:20				
223210	9/09/2008 10:46		0.23	<0.003	0.01
223210	30/09/2008 10:51		0.092	<0.003	0.011
223210	2/12/2008 11:16		0.19	<0.003	0.033
224217	2/09/2008 12:10	0.2	0.022		0.012
224217	9/09/2008 11:50	0.1	0.026		0.012
224217	16/09/2008 14:30	0.1	0.005		0.018
224217	23/09/2008 15:40	0.1	0.017		0.011
224217	30/09/2008 11:50	0.2	0.03		0.017
224217	7/10/2008 9:30	0.2	0.052		0.017
224217	14/10/2008 14:40	0.2	0.075		0.017
224217	21/10/2008 12:50	0.3	0.086		0.02
224217	5/11/2008 11:10	0.3	0.13		0.018
224217	11/11/2008 11:00	0.3	0.12		0.018
224217	20/11/2008 9:10	0.4	0.15		0.022
224217	23/11/2008 19:30	1.5	0.33		0.29
224217	23/11/2008 20:00	1.5	0.28		0.27
224217	23/11/2008 20:15	1.5	0.32		0.25
224217	23/11/2008 20:30	1.6	0.22		0.27
224217	23/11/2008 20:45	1.3	0.19		0.22
224217	23/11/2008 21:00	1.3	0.19		0.22
224217	23/11/2008 21:15	1.2	0.17		0.2
224217	23/11/2008 21:30	1.2	0.18		0.19
224217	23/11/2008 21:45	1.5	0.18		0.25
224217	23/11/2008 22:15	1.4	0.25		0.24
224217	23/11/2008 22:30	1.8	0.25		0.28
224217	23/11/2008 23:00	1.3	0.33		0.17
224217	23/11/2008 23:30	1.7	0.4		0.24
224217	24/11/2008 0:30	1.7	0.37		0.23
224217	24/11/2008 1:30	1.4	0.49		0.15
224217	24/11/2008 3:00	1.1	0.26		0.12
224217	24/11/2008 22:00	1.4	0.37		0.13
224217	25/11/2008 1:00	1.2	0.32		0.12
224217	25/11/2008 5:00	1.1	0.31		0.1
224217	25/11/2008 7:15	1.1	0.33		0.1
224217	25/11/2008 9:45	1	0.33		0.091
224217	25/11/2008 12:15	1.1	0.31		0.11
224217	25/11/2008 14:00	0.9	0.28		0.086
224217	25/11/2008 14:45	1	0.27		0.11
224217	25/11/2008 17:45	0.9	0.26		0.1
224217	25/11/2008 19:45	0.9	0.26		0.09
224217	25/11/2008 22:15	0.9	0.25		0.1
224217	26/11/2008 1:15	0.9	0.26		0.086
224217	26/11/2008 5:45	0.7	0.26		0.068
224217	26/11/2008 11:00	0.7	0.24		0.08
224217	26/11/2008 15:45	0.7	0.25		0.053
224217	26/11/2008 21:30	0.6	0.18		0.047
224217	30/11/2008 0:00	0.4	0.072		0.044
224217	30/11/2008 0:00	0.6	0.13		0.05

SITE	DATE TIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
224217	30/11/2008 0:00	0.4	0.06		0.035
224217	1/12/2008 0:00	0.4	0.064		0.045
224217	1/12/2008 0:00	0.4	0.07		0.04
224217	2/12/2008 0:00	0.4	0.076		0.044
224217	2/12/2008 13:00	0.3	0.076		0.036
224217	2/09/2008 12:05		0.026	<0.003	0.013
224217	9/09/2008 11:55		0.029	<0.003	0.012
224217	16/09/2008 14:45		0.015	<0.003	0.012
224217	23/09/2008 15:45		0.022	<0.003	0.015
224217	30/09/2008 11:55		0.033	<0.003	0.022
224217	7/10/2008 0:00		0.053	<0.003	0.015
224217	14/10/2008 14:40		0.075	<0.003	0.018
224217	21/10/2008 12:50		0.091	<0.003	0.017
224217	29/10/2008 11:05		0.11	<0.003	0.03
224217	5/11/2008 11:12		0.14	<0.003	0.015
224217	11/11/2008 11:05		0.12	<0.003	0.018
224217	20/11/2008 0:00		0.16	<0.003	0.021
224217	25/11/2008 14:00		0.29	<0.003	0.098
224217	2/12/2008 13:05		0.072	<0.003	0.029
224217	9/12/2008 12:25				
225232	2/09/2008 15:35	0.5	0.19		0.049
225232	9/09/2008 12:05	0.5	0.22		0.042
225232	5/09/2008 1:19	1.7	0.25		0.33
225232	5/09/2008 1:48	1.3	0.29		0.2
225232	5/09/2008 2:33	1.1	0.26		0.19
225232	5/09/2008 3:33	0.9	0.22		0.15
225232	5/09/2008 4:48	0.9	0.18		0.15
225232	5/09/2008 6:18	0.8	0.16		0.11
225232	5/09/2008 7:33	0.8	0.16		0.12
225232	5/09/2008 9:47	0.7	0.17		0.093
225232	5/09/2008 15:18	0.7	0.22		0.087
225232	5/09/2008 17:48	0.7	0.24		0.091
225232	6/09/2008 4:48	0.7	0.19		0.077
225232	6/09/2008 6:03	0.6	0.23		0.066
225232	7/09/2008 18:48	0.6	0.16		0.066
225232	7/09/2008 21:03	0.6	0.17		0.057
225232	7/09/2008 22:03	0.5	0.18		0.049
225232	7/09/2008 22:48	0.5	0.19		0.051
225232	7/09/2008 23:33	0.6	0.19		0.052
225232	8/09/2008 0:18	0.6	0.19		0.051
225232	8/09/2008 1:03	0.5	0.19		0.048
225232	8/09/2008 1:33	0.5	0.2		0.05
225232	8/09/2008 2:18	0.5	0.2		0.049
225232	17/09/2008 10:05	0.5	0.13		0.073
225232	24/09/2008 13:50	0.6	0.19		0.11
225232	30/09/2008 15:35	0.5	0.14		0.066
225232	7/10/2008 14:25	0.5	0.12		0.075
225232	14/10/2008 8:50	0.4	0.12		0.073
225232	22/10/2008 14:50	0.5	0.086		0.084
225232	5/11/2008 14:40	0.5	0.13		0.09
225232	11/11/2008 14:40	0.4	0.094		0.059
225232	19/11/2008 13:20	0.4	0.1		0.084
225232	25/11/2008 12:10	0.7	0.22		0.13

SITE	DATE TIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
225232	3/12/2008 9:40	0.8	0.3		0.14
225232	9/09/2008 12:05		0.25	<0.003	0.042
225232	2/10/2008 15:35		0.17	0.01	0.091
225232	6/11/2008 14:20		0.12	0.013	0.095
225232	4/12/2008 12:30		0.21	0.014	0.13
225234	2/09/2008 13:30	0.3	0.1		0.013
225234	9/09/2008 13:45	0.3	0.089		0.017
225234	17/09/2008 13:35	0.3	0.056		0.029
225234	24/09/2008 12:20	0.4	0.09		0.031
225234	30/09/2008 13:20	0.4	0.046		0.037
225234	7/10/2008 8:05	0.5	0.054		0.049
225234	14/10/2008 11:10	0.5	0.0015		0.05
225234	22/10/2008 13:50	0.5	0.003		0.046
225234	5/11/2008 12:50	0.4	0.004		0.037
225234	11/11/2008 12:45	0.4	0.003		0.055
225234	20/11/2008 13:30	0.5	0.007		0.05
225234	24/11/2008 8:04	1.2	0.005		0.1
225234	24/11/2008 8:32	0.7	0.014		0.081
225234	24/11/2008 9:02	0.5	0.02		0.063
225234	24/11/2008 9:32	0.5	0.064		0.069
225234	24/11/2008 10:17	0.6	0.11		0.057
225234	24/11/2008 10:47	0.8	0.18		0.077
225234	24/11/2008 11:17	1	0.27		0.11
225234	24/11/2008 11:47	1.3	0.51		0.08
225234	24/11/2008 12:17	1.1	0.4		0.08
225234	24/11/2008 13:02	1.4	0.44		0.079
225234	24/11/2008 13:47	1.2	0.48		0.12
225234	24/11/2008 14:32	1.3	0.47		0.095
225234	24/11/2008 16:17	1.3	0.49		0.095
225234	24/11/2008 20:02	1.1	0.37		0.083
225234	25/11/2008 6:47	1	0.29		0.076
225234	25/11/2008 7:47	1	0.44		0.061
225234	25/11/2008 8:40	0.9	0.44		0.054
225234	25/11/2008 9:17	1	0.42		0.056
225234	25/11/2008 10:48	0.9	0.43		0.054
225234	25/11/2008 14:46	0.9	0.4		0.058
225234	25/11/2008 16:47	1	0.41		0.059
225234	25/11/2008 18:47	1.1	0.42		0.08
225234	25/11/2008 21:17	0.9	0.42		0.054
225234	25/11/2008 22:47	0.9	0.4		0.052
225234	26/11/2008 0:32	1.1	0.27		0.07
225234	26/11/2008 2:32	1	0.45		0.056
225234	26/11/2008 4:17	1	0.39		0.056
225234	26/11/2008 5:47	0.9	0.39		0.057
225234	26/11/2008 6:32	1	0.42		0.065
225234	26/11/2008 7:17	1	0.43		0.064
225234	26/11/2008 8:32	0.9	0.39		0.058
225234	26/11/2008 10:32	0.9	0.39		0.069
225234	3/12/2008 10:20	0.5	0.12		0.063
225234	2/09/2008 13:25		0.1	<0.003	0.015
225234	9/09/2008 13:50		0.097	<0.003	0.019
225234	17/09/2008 13:55		0.072	<0.003	0.026
225234	24/09/2008 12:30		0.074	<0.003	0.038

SITE	DATETIME	TN (mg/L)	NOX (mg/L)	FRP (mg/L)	TP (mg/L)
225234	30/09/2008 13:25		0.047	<0.003	0.04
225234	7/10/2008 8:10		0.023	<0.003	0.049
225234	14/10/2008 11:10		0.005	<0.003	0.055
225234	22/10/2008 14:40		0.007	<0.003	0.047
225234	29/10/2008 12:50		0.004	<0.003	0.05
225234	5/11/2008 12:55		0.008	<0.003	0.045
225234	11/11/2008 12:50		0.007	<0.003	0.045
225234	20/11/2008 0:00		0.01	<0.003	0.18
225234	25/11/2008 8:40		0.45	<0.003	0.058
225234	3/12/2008 10:20		0.12	<0.003	0.057
225234	9/12/2008 13:05				
225234	7/10/2008 8:11		0.048	<0.003	0.046
225234	5/11/2008 12:56		0.003	<0.003	0.037
226227	2/09/2008 15:05	1.5	0.89		0.068
226227	9/09/2008 14:45	1.2	0.65		0.068
226227	17/09/2008 10:55	1	0.45		0.091
226227	24/09/2008 11:30	1	0.39		0.13
226227	30/09/2008 15:10	0.8	0.13		0.089
226227	7/10/2008 13:30	0.8	0.23		0.087
226227	14/10/2008 9:20	0.8	0.24		0.077
226227	22/10/2008 10:30	0.9	0.32		0.083
226227	5/11/2008 14:05	1	0.31		0.17
226227	12/11/2008 10:30	0.9	0.31		0.11
226227	19/11/2008 11:50	0.9	0.34		0.11
226227	25/11/2008 11:45	1.2	0.42		0.25
226227	26/11/2008 5:07	1.4			0.15
226227	3/12/2008 13:10	0.9	0.32		0.12
226227	1/09/2008 14:15		0.96	0.005	0.069
226227	2/10/2008 13:30		0.27	0.04	0.12
226227	6/11/2008 13:20		0.34	0.06	0.16
226227	3/12/2008 13:05		0.32	0.033	0.12
226227	1/09/2008 14:16		0.96	0.005	0.069

Appendix C – 2008 River flows

Site information available at <http://www.vicwaterdata.net/vicwaterdata/>

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
1/01/2008	98.4	21.8	1360	292	81.6	424
2/01/2008	86.6	18.7	1230	247	79.5	425
3/01/2008	81.4	16.8	1130	207	94.5	350
4/01/2008	74.5	15.9	1020	192	89.9	328
5/01/2008	70.7	14.9	920	222	73.7	353
6/01/2008	60.8	13.2	867	187	60.7	364
7/01/2008	66	11.6	839	180	55	356
8/01/2008	62.5	11.2	769	185	51.5	368
9/01/2008	57	11.1	678	201	51.3	359
10/01/2008	51.6	9.91	621	197	50.1	321
11/01/2008	50	9.18	591	212	50.1	312
12/01/2008	45.7	8.47	569	243	54.5	309
13/01/2008	42.5	8.01	530	273	48.8	336
14/01/2008	39.4		546	305	51	310
15/01/2008	38.1		512	255	57.1	290
16/01/2008	38.1		434	295	51.5	329
17/01/2008	38.1		398	259	52.5	319
18/01/2008	37.3		371	282	71.8	304
19/01/2008	41.6		395	326	52.6	280
20/01/2008	53.8		590	405	60.2	397
21/01/2008	62.1		1970	827	104	625
22/01/2008	81.2		3620	1230	699	624
23/01/2008	183		2580	818	1470	521
24/01/2008	204		2010	626	1140	444
25/01/2008	178		1830	578	815	413
26/01/2008	157		1620	592	747	414
27/01/2008	135		1430	533	829	435
28/01/2008	107		1280	422	670	394
29/01/2008	89.4		1130	328	492	371
30/01/2008	76.5		985	282	374	350
31/01/2008	71.9		958	293	323	358
1/02/2008	75.8		903	309	302	355
2/02/2008	81.5		1080	298	314	353
3/02/2008	147		1020	286	341	332
4/02/2008	161		888	283	306	344
5/02/2008	153		1040	357	278	334
6/02/2008	128		1070	280	275	328
7/02/2008	117		1060	307	259	339
8/02/2008	113		1540	406	1020	508
9/02/2008	132		1430	463	1280	464
10/02/2008	133		1280	473	1190	416
11/02/2008	133		1350	462	1750	409
12/02/2008	157		1340	437	1530	428
13/02/2008	170		1240	399	1440	410
14/02/2008	153		1380	340	1620	384
15/02/2008	141		1240	305	1320	372
16/02/2008	132		1040	294	1030	367
17/02/2008	134		905	282	830	343

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
18/02/2008	118		802	247	693	343
19/02/2008	101	41.6	707	298	569	340
20/02/2008	90.5	37.4	653	233	493	342
21/02/2008	108	43.9	665	293	455	395
22/02/2008	109	46.4	676	447	438	467
23/02/2008	141	63.7	707	457	403	456
24/02/2008	167	62.6	707	411	352	440
25/02/2008	153	61.4	641	375	321	416
26/02/2008	134	51.6	581	315	294	404
27/02/2008	123	45.4	530	262	266	366
28/02/2008	111	44.3	537	241	245	327
29/02/2008	110	57.5	551	246	239	401
1/03/2008	123	66.7	514	266	262	361
2/03/2008	151	56.3	500	242	265	347
3/03/2008	139	49.2	482	233	228	350
4/03/2008	120	43.7	431	226	200	328
5/03/2008	108	40.7	408	230	185	310
6/03/2008	97.1	37.2	393	208	169	333
7/03/2008	88.2	33.8	346	215	163	312
8/03/2008	80.2	32.3	339	204	157	297
9/03/2008	72	30.9	316	197	143	315
10/03/2008	68.7	30	302	199	128	312
11/03/2008	66	26.9	268	213	124	298
12/03/2008	65.7	25.6	267	233	119	289
13/03/2008	60.7	24.4	263	238	125	294
14/03/2008	54.5	23.7	235	201	122	317
15/03/2008	50.1	22.5	211	208	119	323
16/03/2008	46.2	21.7	215	187	111	314
17/03/2008	44	20.8	219	192	102	306
18/03/2008	40.2	19.4	192	178	98.3	299
19/03/2008	37	17.7	185	204	95.3	308
20/03/2008	33.8	18.3	182	219	92.6	302
21/03/2008	32.3	16.4	180	209	88.9	277
22/03/2008	30.9	16.2	163	190	102	298
23/03/2008	30.3	16.3	164	179	89.2	288
24/03/2008	31.1	17.2	199	181	83.8	296
25/03/2008	39.7	20.6	226	210	85.3	319
26/03/2008	40.9	20.6	228	239	87.8	336
27/03/2008	47.1	23.3	255	262	95.9	332
28/03/2008	58.8	30.8	336	324	110	340
29/03/2008	61.8	24.5	369	322	119	336
30/03/2008	65.9	21.7	329	306	110	336
31/03/2008	62.9	18.8	289	288	109	362
1/04/2008	64.1	17.3	255	276	124	361
2/04/2008	60.4	16.4	236	241	124	358
3/04/2008	65.6	17.7	253	237	95.8	358
4/04/2008	61.3	15.6	251	243	105	370
5/04/2008	51.6	14.9	215	259	117	392
6/04/2008	44	14.4	357	326	123	374
7/04/2008	47.1	15.2	373	296	115	379
8/04/2008	59.4	15.3	311	261	87.6	400
9/04/2008	54.3	14.4	257	250	46.9	403

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
10/04/2008	51.6	13.9	239	218	35.3	384
11/04/2008	51.4	13.5	222	231	33	357
12/04/2008	51	13.2	215	237	34.5	348
13/04/2008	56.7	15.7	243	221	42.4	349
14/04/2008	57.2	18.1	262	217	39.2	358
15/04/2008	66.6	22	262	301	43.8	380
16/04/2008	64.7	23	271	268	41.4	355
17/04/2008	63	24.8	257	256	35.4	352
18/04/2008	64.6	23.2	249	258	42.5	358
19/04/2008	63.7	20.1	238	255	44.2	358
20/04/2008	58	18	221	215	33.8	341
21/04/2008	53.8	16.4	213	240	26	322
22/04/2008	50.9	15.5	206	264	27.1	295
23/04/2008	49.4	14.7	195	232	28.6	320
24/04/2008	47	14.1	193	290	25.6	396
25/04/2008	46.3	14	194	248	25.7	341
26/04/2008	45.6	13.6	191	270	27.6	340
27/04/2008	48.3	14.3	198	331	37	339
28/04/2008	51	15.2	213	333	36.9	371
29/04/2008	51.6	14.7	210	382	37.2	368
30/04/2008	51.1	15.1	242	323	44.8	341
1/05/2008	52.5	18.1	383	340	42.8	404
2/05/2008	63	18.9	350	278	44	440
3/05/2008	62.6	16.6	300	304	44.4	452
4/05/2008	61.6	15.5	279	336	48.4	469
5/05/2008	61.5	14.8	266	438	51.8	445
6/05/2008	59.5	14.9	272	410	51.9	423
7/05/2008	60.5	14.4	304	339	46.4	465
8/05/2008	58.5	13.6	294	350	42.3	507
9/05/2008	56	13.1	264	330	47	518
10/05/2008	53.1	13	251	318	47	510
11/05/2008	51.7	13.6	239	394	44.7	504
12/05/2008	51.4	13.6	248	420	38.1	544
13/05/2008	50.6	13	249	401	38.4	527
14/05/2008	49.8	12.6	246	318	37.4	508
15/05/2008	50.3	12.6	240	320	37	462
16/05/2008	51	12.3	235	376	37.7	444
17/05/2008	50.5	12.3	224	594	42.8	425
18/05/2008	52.8	12.5	238	542	49.5	428
19/05/2008	53.1	12.3	259	835	55.4	418
20/05/2008	52.5	11.8	265	794	64.1	415
21/05/2008	52.6	12.2	338	513	70.1	429
22/05/2008	54.7	15	368	392	66.4	494
23/05/2008	62.7	15.3	336	339	56.8	479
24/05/2008	60.9	13.5	350	370	52.2	432
25/05/2008	62.8	12.3	369	353	54	420
26/05/2008	61.9	11.7	381	339	58.3	423
27/05/2008	62.7	14	375	348	64.3	434
28/05/2008	65	19.6	399	379	77.8	445
29/05/2008	63.2	20.9	437	393	73.4	456
30/05/2008	66	24.6	476	363	70.5	465
31/05/2008	65.7	26.2	433	348	68.5	465

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
1/06/2008	63.7	23.3	405	340	79.3	426
2/06/2008	61.5	19.6	372	333	82.8	381
3/06/2008	58.5	17	348	316	77.4	367
4/06/2008	56.4	15.4	332	298	73.7	358
5/06/2008	55.6	14.8	321	355	70.4	344
6/06/2008	55.4	14.3	313	411	67.9	337
7/06/2008	55.1	13.5	305	476	65.9	322
8/06/2008	56	13.3	299	588	63.5	319
9/06/2008	56	13.1	289	754	60.9	325
10/06/2008	57.2	13.9	288	891	59.2	312
11/06/2008	56.3	13.4	289	1060	60	315
12/06/2008	56.8	13.4	285	1110	60.8	310
13/06/2008	60.4	13	286	1140	63.5	319
14/06/2008	59.5	12.2	360	1150	69.3	408
15/06/2008	56.3	11.9	481	1150	78.1	401
16/06/2008	56.3	11.9	728	1080	73.2	393
17/06/2008	56.9	12	716	924	64.3	407
18/06/2008	63	13.8	667	828	62.7	432
19/06/2008	64.7	13.5	630	700	65.5	426
20/06/2008	67.1	13.2	606	546	63.8	389
21/06/2008	67.6	13.3	600	471	59.9	384
22/06/2008	70.4	15.3	634	405	61	402
23/06/2008	73.8	25.8	594	365	63.4	434
24/06/2008	78	25.9	554	388	65.4	427
25/06/2008	81.9	23.9	523	377	67.2	424
26/06/2008	88.9	24.5	510	334	64.3	465
27/06/2008	90.2	21.8	472	302	65.7	496
28/06/2008	87	20.6	440	270	87.1	476
29/06/2008	82.2	18.6	463	276	84.6	414
30/06/2008	77.3	17.2	466	281	76.7	399
1/07/2008	79.3	17.3	459	274	65.7	442
2/07/2008	104	15.8	490	271	65.8	442
3/07/2008	87.6	15.9	947	302	107	416
4/07/2008	75.6	16.6	1230	312	139	391
5/07/2008	79.7	18.8	1130	279	119	571
6/07/2008	81.8	17.1	1030	272	94.8	705
7/07/2008	82.4	15.3	961	259		620
8/07/2008	79.6	15	905	248		516
9/07/2008	78	15.3	923	234		421
10/07/2008	76.2	14.8	1500	234		351
11/07/2008	80.7	14.5	1530	226	68.2	344
12/07/2008	73.5	13.3	1610	227	94.5	377
13/07/2008	71.7	12.9	1650	238	98.6	452
14/07/2008	68.2	13.1	1520	257	87	543
15/07/2008	67.8	12.2	1390	272	75.7	803
16/07/2008	67.5	11.9	1340	255	73.3	799
17/07/2008	67.3	11.8	1340	243	71.5	671
18/07/2008	66.6	11.8	1350	229	69.4	564
19/07/2008	67.4	12.5	1350	220	74.8	482
20/07/2008	70.5	11.8	1430	219	96.5	500
21/07/2008	84.2	13.5	1650	220	75.4	506
22/07/2008	83.9	13.4	3100	222	77.3	554

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
23/07/2008	78.4	13.1	3380	233	106	886
24/07/2008	78.6	13.7	2900	273	93.7	1580
25/07/2008	86.1	15.5	2460	352	69.6	1580
26/07/2008	94.5	16.1	2110	334	65.5	1330
27/07/2008	96.8	14.4	1870	270	68.8	1080
28/07/2008	110	19.8	1830	255	78.6	946
29/07/2008	132	46.9	1900	244	80.2	838
30/07/2008	177	191	2100	238	78.7	747
31/07/2008	291	162	2000	222	110	802
1/08/2008	285	109	1790	321	185	847
2/08/2008	242	79.3	1650	365	158	808
3/08/2008	197	63.3	1960	363	144	791
4/08/2008	175	53.9	2050	384	144	1470
5/08/2008	184	47.2	2040	472	138	2070
6/08/2008	183	42.2	2020	472	125	1740
7/08/2008	167	38.8	1960	447	121	1570
8/08/2008	161	38.3	1890	451	120	1280
9/08/2008	162	37.8	1820	422	124	966
10/08/2008	171	34.1	1750	393	124	824
11/08/2008	172	34.7	1730	364	122	797
12/08/2008	170	33.5	1690	338	121	956
13/08/2008	156	30.5	1610	314	114	1200
14/08/2008	146	29.2	1560	345	108	1300
15/08/2008	143	29	1520	317	106	1550
16/08/2008	141	27.2	1450	311	106	2250
17/08/2008	138	26.1	1480	325	103	3360
18/08/2008	137	25.5	1530	407	98.8	3740
19/08/2008	151	27.6	1480	403		3420
20/08/2008	165	28.6	1450	379		3030
21/08/2008	162	26.1	1400	363		2590
22/08/2008	162	31.1	1400	326		2180
23/08/2008	180	33.7	1470	339	105	1790
24/08/2008	195	58.3	1530	294	107	1880
25/08/2008	242	85.3	1460	320	119	1730
26/08/2008	231	70.3	1380	356	129	1570
27/08/2008	214	60.2	1360	327	126	1350
28/08/2008	207	53	1340	296	122	1180
29/08/2008	196	47.8	1320	250	118	1140
30/08/2008	183	43.1	1300	217	113	1270
31/08/2008	173	40.8	1310	201	111	1060
1/09/2008	161	37.6	1330	209	112	856
2/09/2008	151	33.6	3120	201	111	842
3/09/2008	184	32.5	3150	192	119	826
4/09/2008	217	30.4	2980	221	134	897
5/09/2008	215	27.9	2790	1370	128	970
6/09/2008	213	28.7	2570	1650	125	937
7/09/2008	198	26.5	2420	1650	123	877
8/09/2008	178	25.6	2320	574	119	681
9/09/2008	164	24.3	2200	276	117	591
10/09/2008	156	24	2100	209	109	657
11/09/2008	150	23.7	1970	208	110	606
12/09/2008	146	23.8	1870	201	104	719

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
13/09/2008	136	22.3	1750	225	100	690
14/09/2008	128	21.2	1750	234	99.8	627
15/09/2008	120	19.6	2090	247	93.8	614
16/09/2008	119	20	2790	244	98.6	615
17/09/2008	117	19.5	2750	526	139	633
18/09/2008	137	19.7	2300	1000	146	767
19/09/2008	163	21.8	1990	588	126	942
20/09/2008	156	21	1810	287	113	841
21/09/2008	137	18.7	1730	357	107	666
22/09/2008	125	19.6	1750	413	115	576
23/09/2008	136	26.5	1720	405	97.7	549
24/09/2008	131	24.1	2760	454	100	581
25/09/2008	180	47.7	2790	534	103	553
26/09/2008	267	41.3	2370	523	103	612
27/09/2008	255	29.6	2130	441	103	743
28/09/2008	205	24.1	2010	429	87.9	812
29/09/2008	169	21.6	1890	473	76.6	655
30/09/2008	144	19.4	1820	491	71.1	614
1/10/2008	131	18.6	1670	404	67.1	576
2/10/2008	122	19.1	1530		66.6	532
3/10/2008	121	19.6	1400		63.2	564
4/10/2008	121	19.4	1320		69.2	573
5/10/2008	115	18.2	1290		67	613
6/10/2008	108	17.8	1380		63.4	614
7/10/2008	103	18	1270		62.7	626
8/10/2008	113	19.2	1190		59.2	586
9/10/2008	115	19.9	1080		61	492
10/10/2008	115	21.8	996		61.9	567
11/10/2008	111	19	905		56.7	671
12/10/2008	102	16.5	806		50.8	612
13/10/2008	92.4	14.6	774		49.3	510
14/10/2008	78.6	13.2	735		48.2	483
15/10/2008	74.2	13	695		43.4	505
16/10/2008	69	12.3	674		34.7	534
17/10/2008	65.6	11.7	644		33	493
18/10/2008	63.1	11.2	601		37.7	509
19/10/2008	61.9	11.2	568		40.3	474
20/10/2008	61.6	10.7	563		38.6	486
21/10/2008	58.6	9.77	549		39.8	522
22/10/2008	58.9	9.7	503		39.4	483
23/10/2008	62.3	9.76	505		40.2	420
24/10/2008	65.2	9.72	468		41.2	480
25/10/2008	65.6	10.1	424		36.4	546
26/10/2008	82.9	10.6	413		34.6	474
27/10/2008	93.8	11.2	426		35.9	470
28/10/2008	85.7	11.2	407		35.7	495
29/10/2008	73.9	9.93	369		41	478
30/10/2008	66	9.22	348		37.7	447
31/10/2008	60.2	9.01	356		36.4	452
1/11/2008	51.9	8.12	335		32.7	461
2/11/2008	46.6	6.67	280		32.5	420
3/11/2008	54	11.3	325		36.9	462

	223209	223210	224217	225232	225234	226227
	MI/day	MI/day	MI/day	MI/day	MI/day	MI/day
4/11/2008	51.3	10.7	368		35.8	506
5/11/2008	49.8	9.91	362		38	514
6/11/2008	48.8	10.1	420		36.9	554
7/11/2008	53.2	13.3	368	221	38.6	579
8/11/2008	51.3	15.1	350	201	38.6	515
9/11/2008	47.3	11.2	284	255	40.7	515
10/11/2008	43.4	8.99	273	192	53	520
11/11/2008	39.3	7.95	461	201	53	495
12/11/2008	37.8	6.64	390	193	47.1	468
13/11/2008	32.6	5.89	328	167	40.8	447
14/11/2008	32.1	5.66	294	177	38.6	413
15/11/2008	29.8	5.61	294	204	34.4	439
16/11/2008	25.8	5.3	242	204	32.9	463
17/11/2008	24.6	4.34	233	184	34	455
18/11/2008	25.6	4.08	243	157	30.6	463
19/11/2008	25.1	4.03	254	137	30	483
20/11/2008	28.7	4.15	288	172	31.8	471
21/11/2008	31.7	6.07	327	297	32.2	452
22/11/2008	42.4	6.89	403	267	35	489
23/11/2008	4120		2610	381	53.4	570
24/11/2008	21900	5640	11100	574	1720	587
25/11/2008	12900	967	7040	1210	2290	783
26/11/2008	5780	393	4220	1480	1350	1910
27/11/2008	2820	254	3130	757	838	1480
28/11/2008	1780	195	2680	548	598	983
29/11/2008	1840	201	2710	424	613	889
30/11/2008	3300	1000	3850	570	679	1020
1/12/2008	3930	613	4490	636	899	924
2/12/2008	2510	322	3690	618	855	939
3/12/2008	1550	217	3000	482	676	
4/12/2008	1080	166	2490	455	516	
5/12/2008	844	138	2150	455	397	
6/12/2008	685	117	1870	401	324	
7/12/2008	574	105	1710	414	269	
8/12/2008	481	90.3	1510	341	241	
9/12/2008	422	80.5	1380	303	209	
10/12/2008	392	76.5	1320	300	174	
11/12/2008	361	75.3	1230	338	162	
12/12/2008	336	73.8	1170	295	147	
13/12/2008	339	72.8	1160	310	154	
14/12/2008	484	99.5	1270	1900	160	
15/12/2008	2360	889	2220	2610	181	
16/12/2008				2340	540	
17/12/2008						