



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 6 (JUNE 2008)

JULY 2008

INTRODUCTION TO THE PROGRAM

This report summarises water quality data obtained for the Channel Deepening Project (CDP) Baywide Water Quality Monitoring Program at 11 sampling sites in Port Phillip Bay. Data is for June 2008. Monthly Progress Reports will be prepared throughout the dredging program and for two years thereafter.

Where extensive local water quality data is available, control charts (Shewhart and EWMA) have been developed (see Appendix 1). These charts provide a guide against which data can be compared. Where data is recorded beyond natural or expected variation, further investigation will be undertaken.

The information contained in this report is correct as available to EPA Victoria at the time of publication.

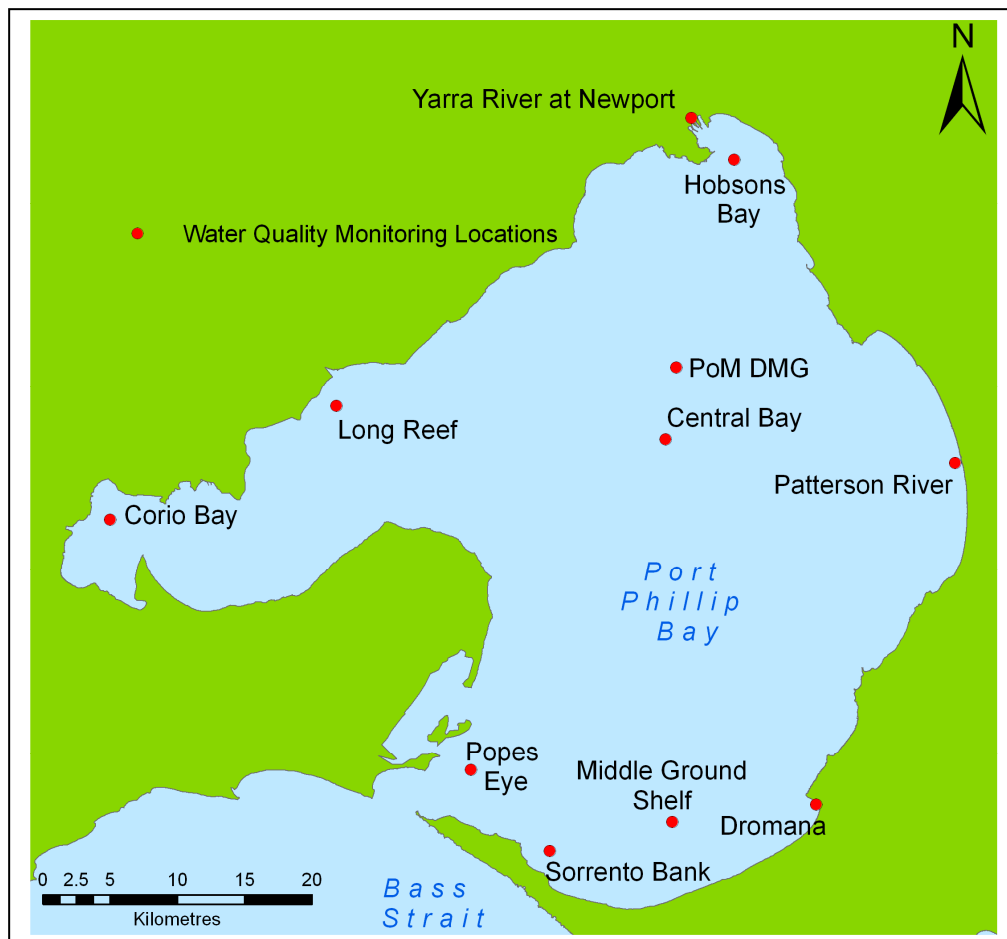


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY

RESULTS AND DISCUSSION

All results presented in Tables 1 - 4 were assessed against the control limits listed in Tables 5 and 6 (Appendix 1) and, where appropriate, compared to the SEPP objectives and ANZECC trigger levels of Table 7 (Appendix 1). Phytoplankton data is presented in Table 8 (Appendix 2).

Within this reporting period the Shewhart control limits were exceeded four times and the EWMA control limits were exceeded seven times (see Tables 1 - 4).

No significant events were observed during the field sampling that would affect these results.

As detailed in section 4.1.3 in the Water Quality detailed design document CDP_ENV_MD_023 Rev 0, samples were not taken at depth at the

Yarra River site as the salinity difference between the near surface and depth was less than 10 ppt.

All data recorded in this report has been subject to internal quality assurance according to EPA standard operating procedures for field sampling and data assessment.

Field quality control indicates an invalid result at the Sorrento Bank site for dissolved copper. Further investigation into possible causal factors is underway.

For all other samples, where dissolved metal results exceeded total metal results, the results were within acceptable levels of inter-sample variation.

There were no exceptions to the Water Quality detailed design document CDP_ENV_MD_023 Rev 0 during this reporting period.

TABLE 1 PHYSICO-CHEMICAL PARAMETERS (NST – No Sample Taken, NVR – No Valid Result)

Date	Sampling Site	Depth m	Dissolved Oxygen		Salinity g/L	Secchi disc depth m	Temperature °C	Turbidity NTU	Total Suspended Solids mg/L	PAR micro Einsteins/m ² /sec
			mg/L	% saturation						
16/06/08	Yarra River at Newport	0.5	7.9	94	34.1	2.1	13.3	2.35	2.9	291.3
16/06/08	Yarra River at Newport	7.0	NST	NST	NST		NST	2.36	NST	6.0
16/06/08	Hobsons Bay	0.5	8.1	97	37.3	3.1	12.9	1.86	1.5	584.2
16/06/08	Central Bay	0.5	8.2	100	37.4	11.7	14.0	0.40	0.7	51.2
16/06/08	PoM DMG	0.5	8.2	101	37.4	8.1	14.4	0.45	0.1	592.6
18/06/08	Corio Bay	0.5	8.3	98	38.2	>3.4 ¹	12.2	0.55	4.2	142.8
18/06/08	Long Reef	0.5	8.5	100	37.2	>5.7 ¹	12.1	0.47	4.3	143.8
17/06/08	Patterson River	0.5	8.4	99	35.2	>4.3 ¹	13.1	1.29	1.1	31.7
17/06/08	Dromana	0.5	8.1	98	37.3	>6.2 ¹	13.3	0.30	0.4	72.2
17/06/08	Middle Ground Shelf	0.5	8.2	98	36.9	>13.1 ¹	13.2	0.40	0.5	322.6
17/06/08	Sorrento Bank	0.5	8.1	98	36.7	>3.3 ¹	13.6	0.47	0.3	53.8
17/06/08	Popes Eye	0.5	8.2	98	36.8	NVR ²	13.0	0.38	0.4	77.3

NOTES

In situ data for temperature, turbidity and PAR are recorded across the depth profile. The result presented is for the specific depth noted. All other physico-chemical samples are taken at 0.5 m from surface, except Yarra River at Newport and Hobsons Bay where, if required, bottom samples are also collected.

1. Secchi disc visible on bottom.
2. No Valid Result due to the tide impact on secchi disc trajectory.

TABLE 2A NUTRIENTS

Date	Sampling Site	Depth m	Ammonium µg/L		Nitrate µg/L	Nitrite µg/L	Nitrate plus Nitrite µg/L		Dissolved Organic Nitrogen µg/L	Total Nitrogen µg/L	
			Measured Value	EWMA			Measured Value	EWMA		Measured Value	EWMA
16/06/08	Yarra River at Newport	0.5	30.5	19.7	151.4	0.9	152.3	42.1	147	356	257
16/06/08	Hobsons Bay	0.5	5.0	5.7	3.2	<0.4	3.2	9.2	108	144	179
16/06/08	Central Bay	0.5	11.8	6.8	1.6	<0.4	1.6	1.7	101	136	150
16/06/08	PoM DMG	0.5	5.1	5.4	2.0	<0.4	2.0	4.1	112	139	153
18/06/08	Corio Bay	0.5	6.1	5.2	2.8	<0.4	2.8	1.6	152	185	195
18/06/08	Long Reef	0.5	27.1	24.1	125.9	0.8	126.7	41.1	164	330	257
17/06/08	Patterson River	0.5	12.3	7.6	38.8	<0.4	38.8	12.7	131	207	184
17/06/08	Dromana	0.5	14.5	8.2	37.8	<0.4	37.8	9.0	108	185	155
17/06/08	Middle Ground Shelf	0.5	4.7	4.9	2.3	<0.4	2.3	1.5	103	128	137
17/06/08	Sorrento Bank	0.5	5.1	6.1	3.7	<0.4	3.7	4.0	97	123	126
17/06/08	Popes Eye	0.5	8.1	6.9	7.4	0.2	7.6	7.2	94	125	116

NOTES

Yellow coloured cells indicate measured results above the Shewhart control limit (for 'total' fraction). See Appendix 1, and Table 5 for details.

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

Green coloured cells indicate results above ANZECC trigger value only (see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6).

TABLE 2B NUTRIENTS (CONT'D) – PHOSPHORUS AND SILICATE

Date	Sampling Site	Depth m	Phosphate µg/L		Organic Phosphorus µg/L	Total Phosphorus µg/L		Silicate µg/L
			Measured Value	EWMA		Measured Value	EWMA	
16/06/08	Yarra River at Newport	0.5	67	67	17	83	92	408
16/06/08	Hobsons Bay	0.5	63	67	14	77	86	96
16/06/08	Central Bay	0.5	58	60	12	69	73	124
16/06/08	PoM DMG	0.5	58	56	13	71	73	117
18/06/08	Corio Bay	0.5	72	77	16	88	96	139
18/06/08	Long Reef	0.5	160	126	27	187	145	132
17/06/08	Patterson River	0.5	64	64	15	78	79	214
17/06/08	Dromana	0.5	59	52	14	73	65	133
17/06/08	Middle Ground Shelf	0.5	45	45	12	57	60	79
17/06/08	Sorrento Bank	0.5	38	30	11	49	41	66
17/06/08	Popes Eye	0.5	39	24	8.7	48	33	84

NOTES

Green coloured cells indicate results above ANZECC trigger value (see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6).



BAYWIDE WATER QUALITY MONITORING – PROGRESS REPORT No. 6

TABLE 3 METALS, METALLOIDS AND ORGANOMETALLICS (NST – No Sample Taken; NAR - No Analysis Required, NVR – No Valid Result)

Date	Sampling Site	Depth m	Arsenic		Tri-butyl Tin ¹ (TBT) µg/Lx10 ⁻³	Cadmium µg/L	Chromium µg/L	Copper µg/L	Mercury µg/L	Nickel µg/L	Lead µg/L	Zinc µg/L
			Measured Value	EWMA								
16/06/08	Yarra River at Newport - total	0.5	2.6	2.7	<2	<0.2	1.3	2	<0.1	0.8	<0.2	8
16/06/08	Yarra River at Newport - dissolved	0.5	NAR	-	NST	NAR	<0.5	1	NAR	NAR	NAR	9 ²
16/06/08	Hobsons Bay - total	0.5	3.1	2.9	<2	<0.2	<0.5	1	<0.1	0.9	<0.2	<5
16/06/08	Hobsons Bay - dissolved	0.5	2.9	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	NAR
16/06/08	Central Bay - total	0.5	3.3	2.9	NST	<0.2	<0.5	<1	<0.1	0.8	<0.2	<5
16/06/08	Central Bay - dissolved	0.5	3.0	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	NAR
16/06/08	PoM DMG - total	0.5	3.1	3.0	NST	<0.2	<0.5	1	<0.1	0.7	<0.2	<5
16/06/08	PoM DMG - dissolved	0.5	3.0	-	NST	NAR	NAR	<1	NAR	NAR	NAR	NAR
18/06/08	Corio Bay - total	0.5	2.8	3.2	NST	<0.2	<0.5	1	<0.1	0.9	<0.2	<5
18/06/08	Long Reef - total	0.5	3.0	3.0	NST	<0.2	<0.5	1	<0.1	0.9	<0.2	<5
18/06/08	Long Reef - dissolved	0.5	2.8	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	NAR
17/06/08	Patterson River - total	0.5	3.1	2.8	NST	<0.2	<0.5	<1	<0.1	1.2	<0.2	7
17/06/08	Patterson River - dissolved	0.5	2.9	-	NST	NAR	NAR	NAR	NAR	0.9	NAR	10 ²
17/06/08	Dromana - total	0.5	3.0	2.8	NST	<0.2	<0.5	1	<0.1	0.7	<0.2	<5
17/06/08	Dromana - dissolved	0.5	2.8	-	NST	NAR	NAR	<1	NAR	NAR	NAR	NAR
17/06/08	Middle Ground Shelf - total	0.5	2.6	2.7	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
17/06/08	Sorrento Bank - total	0.5	2.8	2.3	NST	<0.2	<0.5	2	<0.1	0.5	<0.2	<5
17/06/08	Sorrento Bank - dissolved	0.5	NAR	-	NST	NAR	NAR	NVR ³	NAR	NAR	NAR	NAR
17/06/08	Popes Eye - total	0.5	2.4	2.3	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	6
17/06/08	Popes Eye - dissolved	0.5	NAR	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	<5



BAYWIDE WATER QUALITY MONITORING – PROGRESS REPORT No. 6

NOTES

Yellow coloured cells indicate measured results above the Shewhart control limit (see Appendix 1, Table 5 for details).

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

Blue coloured cells indicate results above SEPP objectives (for metals, ANZECC triggers are the default objective when no SEPP value is specified; see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6), unless **bolded** to indicate that no Shewhart control limit exists for metals at these sites.

1. TBT is only sampled from sub-surface levels at Yarra River at Newport and Hobsons Bay.
2. Dissolved result greater than total results but within acceptable levels of inter-sample variation.
3. No valid result - data under further investigation

TABLE 4 PHYTOPLANKTON AND ALGAL PIGMENTS (NST – No Sample Taken)

Date	Sampling Site	Depth m	Chlorophyll-a µg/L		Phaeophytin-a µg/L	Fluorescence (as <i>in situ</i> chlorophyll- a) mg/m ³	Total Phytoplankton cells/L	Diatoms cells/L	Dinoflagellates cells/L	Other Flagellates cells/L
			Measured Value	EWMA						
16/06/08	Yarra River at Newport	0.5	0.98	2.47	0.04	0.56	4.6E+05	1.2E+05	4.0E+04	3.0E+05
16/06/08	Yarra River at Newport	7.0	NST ¹	NST ¹	NST ¹	0.60				
16/06/08	Hobsons Bay	0.5	0.86	1.65	<0.02	0.49	5.8E+05	1.3E+05	3.0E+04	4.2E+05
16/06/08	Central Bay	0.5	0.66	0.77	<0.02	0.48	1.6E+05	6.7E+04	1.7E+04	8.1E+04
16/06/08	PoM DMG	0.5	0.81	0.68	<0.02	0.30	1.7E+05	4.5E+04	2.8E+04	9.9E+04
18/06/08	Corio Bay	0.5	1.19	1.05	0.15	0.55	2.7E+05	1.4E+05	2.2E+04	1.1E+05
18/06/08	Long Reef	0.5	1.06	1.55	0.13	0.63	3.7E+05	1.3E+05	4.1E+04	2.1E+05
17/06/08	Patterson River	0.5	0.71	0.91	0.14	0.47	2.4E+05	4.2E+04	4.6E+04	1.6E+05
17/06/08	Dromana	0.5	0.78	0.68	0.02	0.50	2.7E+05	7.9E+04	4.6E+04	1.5E+05
17/06/08	Middle Ground Shelf	0.5	0.67	0.65	0.11	0.50	1.5E+05	3.7E+04	1.7E+04	9.4E+04
17/06/08	Sorrento Bank	0.5	0.68	0.63	0.03	0.27	1.6E+05	6.8E+04	1.0E+04	7.8E+04
17/06/08	Popes Eye	0.5	0.49	0.61	0.08	0.33	9.8E+05	7.0E+05	3.3E+04	2.5E+05

NOTES

Sedgewick count method for phytoplankton, diatoms, dinoflagellates, and other flagellates undertaken by using a vertical profile grab sample. For detailed cell counts based on individual species see Appendix 2.

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

1. No algal pigment sample taken at Yarra River at Newport bottom waters.

APPENDIX 1

DERIVATION OF CONTROL LIMITS AND GUIDANCE VALUES

To define changes outside expected natural variability ('control limit'), control charts have been generated for all parameters where an extensive body of locally relevant water quality data exists (see Tables 5 and 6). The data used in developing control charts is validated data from 1990 onwards.

For other parameters where sufficient background data is not available, comparison is made to water quality objectives in State Environment Protection Policy (SEPP) Schedules F6 (Waters of Port Phillip Bay) and Schedule F7 (Waters of the Yarra Catchment).

Where no specific objective is listed in SEPP, the Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters (2001) are identified (see Table 7).

The derivation and application of the control limits and comparison values is set out in more detail in the Water Quality detailed design document CDP_ENV_MD_023 Rev 0 (available on the Channel Deepening Project website www.channelproject.com).

Specifically, two control charting techniques have been developed and employed in the analysis of water quality results:

- An Exponentially Weighted Moving Average (EWMA) control chart is used for assessment of longer-term changes in baseline results, by comparing an EWMA calculated result to the respective limit.
- A Shewhart control chart is used to compare short-term events, by comparing the measured result directly against the respective limit.

In the case of metals, EWMA and Shewhart control limits apply to the 'total' fraction, since the historical data they are derived from are 'total' metals. Conversely SEPP objectives and ANZECC guidelines apply to the 'dissolved' metal fraction. For transparency, this report highlights all metals exceedences whether total or dissolved.

The control limits are as issued by the Port of Melbourne Corporation on January 28, 2008.



APPENDIX 1 (CONT'D)

TABLE 5. SHEWHART CONTROL LIMITS FOR LISTED WATER QUALITY PARAMETERS

Sampling site	Total Nitrogen µg/L	Ammonium µg/L	Nitrate plus Nitrite µg/L	Total Phosphorus µg/L	Phosphate µg/L	Arsenic µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Zinc µg/L	TBT µg/L
Yarra River at Newport	383.31	88.78	182.90	138.91	107.54	4.75	0.20	0.58	3.08	2.79	0.10	4.29	12.77	0.02
Hobsons Bay	382.82	50.61	257.50	135.51	129.08	4.43	0.25	1.17	1.70	0.95	0.13	2.28	9.13	0.01
Central Bay	206.91	21.50	7.43	106.48	112.50	4.66	*	*	*	*	*	1.95	*	*
PoM DMG	217.07	7.81	28.33	107.98	76.61	4.73	*	*	*	*	*	2.82	*	0.02
Corio Bay	275.74	25.37	5.00	140.27	127.68	5.57	*	NA	*	*	*	1.90	*	NA
Long Reef	1035.88	999.28	512.03	536.16	445.31	4.56	*	NA	*	*	*	2.17	*	NA
Patterson River	367.57	30.57	366.52	111.81	87.58	3.56	*	NA	*	*	*	1.14	*	NA
Dromana	222.84	11.03	5.71	89.64	75.42	3.58	*	NA	*	*	*	1.06	*	NA
Middle Ground Shelf	185.93	10.66	2.71	96.82	65.33	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sorrento Bank	168.74	11.54	9.50	63.20	48.44	NA	NA	NA	NA	NA	NA	NA	NA	NA
Popes Eye	209.84	14.74	42.71	471.38	148.04	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES

NA - No limit, as no historical data is available.

* - No limit, as greater than half historical data is below limits of reporting.

Source: Table 5 CDP_ENV_MD_023 Rev 0, available on the Channel Deepening Project website www.channelproject.com). Limits amended by Port of Melbourne Corporation on January 28, 2008.



BAYWIDE WATER QUALITY MONITORING – PROGRESS REPORT No. 6
APPENDIX 1 (CONT'D)

TABLE 6. EWMA CONTROL LIMITS FOR LISTED WATER QUALITY PARAMETERS (Exponentially Weighted Moving Average)

Sampling site	Ammonium µg/L	Nitrate plus Nitrite µg/L	Total Nitrogen µg/L	Phosphate µg/L	Total Phosphorus µg/L	Chlorophyll-a µg/L	Arsenic µg/L
Yarra River at Newport	32.42	39.52	278.39	86.19	108.01	2.0	3.23
Hobsons Bay	19.45	39.53	266.22	85.72	105.32	3.9	2.98
Central Bay	9.90	3.61	168.10	72.32	84.08	1.1	2.86
PoM DMG	6.16	9.92	176.47	66.31	83.99	1.0	3.10
Corio Bay	10.70	2.31	224.48	100.12	115.66	1.4	3.66
Long Reef	219.05	83.74	629.12	238.83	305.50	6.8	3.20
Patterson River	13.65	42.75	243.10	69.75	89.34	2.2	2.59
Dromana	5.00	4.29	170.20	56.93	70.12	1.6	2.52
Middle Ground Shelf	7.02	2.29	156.09	50.94	63.85	0.8	N/A
Sorrento Bank	8.16	4.93	143.10	36.40	45.74	0.8	N/A
Popes Eye	8.20	12.73	145.12	36.75	120.94	0.8	N/A

NOTES

NA - No limit, as no historical data is available.

Source: Table 4 CDP_ENV_MD_023 Rev 0, available on the Channel Deepening Project website www.channelproject.com). Limits amended by Port of Melbourne Corporation on January 28, 2008.

BAYWIDE WATER QUALITY MONITORING – PROGRESS REPORT No. 6

APPENDIX 1 (CONT'D) TABLE 7. SEPP OBJECTIVES AND ANZECC TRIGGER VALUES (N = NATURAL)

		Channel Deepening PARAMETER																													
Sampling Site	SEPP (WoV) schedule & segment	ANZECC Level of Protection	Dissolved Oxygen (% saturation)				Attenuation of PAR			Turbidity				Suspended Solids (mg/L)				Chlorophyll-a (µg/L)													
			Min for 1m below surface	Min 1m above bottom	Lower limit for 90th percentile	Min percentage concentration	Salinity variation	Temperature (°C)	Secchi disc depth (m)	Annual 90th percentile	NTU	Annual 50th percentile	Annual 90th percentile	Annual 50th percentile	Annual 90th percentile	Chlorophyll-a (µg/L)	Annual 90th percentile	Ammonium (µg/L)	Nitrate plus nitrite (µg/L)	Total nitrogen (µg/L)	Phosphate (µg/L)	Total Phosphorus (µg/L)	Arsenic (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Zinc (µg/L)	TBT (µg/L)
Yarra River at Newport	F6 Hobsons	95%	>90%	>90%			N ± 5%	N ± 1	>2	0.5	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<10	0.006
	F7 Yarra Port					>60%		N ± 2					<20	<50	<25	<60			15	5	120	10	25	50	0.2	10	3	1	0.05	15	5
Hobsons Bay	F6 Hobsons		>90%	>90%			N ± 5%	N ± 1	>2	0.5	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<10	0.006
Corio Bay	F6 Corio		>90%	>90%			N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<5	0.006
Long Reef	F6 Werribee		>90%	>90%			N ± 5%	N ± 1	>3	0.45	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<5	0.006
Central Bay	F6 General		>90%		>90%		N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
PoM DMG	F6 General		>90%		>90%		N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Patterson River	F6 Inshore		>90%	>90%			N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Dromana	F6 Inshore	>90%	>90%			N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004	
Middle Ground Shelf	F6 General	>90%		>90%		N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004	
Sorrento Bank	F6 General	>90%		>90%		N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004	
Popes Eye	F6 General	>90%		>90%		N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004	

SEPP Waters of Victoria

N=natural background

SEPP Schedule F6 - Waters of Port Phillip Bay, and SEPP Schedule F7 - Waters of the Yarra Catchment objectives

Limit of reporting is above SEPP objective

ANZECC trigger values not highlighted

NOTES

Schedule F7 (Waters of the Yarra Catchment) is included for comparison of water quality objectives at the Yarra River at Newport site, as this site has been determined to be in a crossover area between schedules F6 and F7. Both schedule segments can be applicable to the site dependent on tide cycle and flow conditions in the Yarra mouth.



APPENDIX 2

TABLE 8. PHYTOPLANKTON DATA

		Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
Collection Date		16/06/2008	16/06/2008	16/06/2008	16/06/2008	18/06/2008	18/06/2008	17/06/2008	17/06/2008	17/06/2008	17/06/2008	17/06/2008
Count Method		Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Species	Estimate Cells/L										
Total Phytoplankton		4.6E+05	5.8E+05	1.6E+05	1.7E+05	2.7E+05	3.7E+05	2.4E+05	2.7E+05	1.5E+05	1.6E+05	9.8E+05
Diatoms		1.2E+05	1.3E+05	6.7E+04	4.5E+04	1.4E+05	1.3E+05	4.2E+04	7.9E+04	3.7E+04	6.8E+04	7.0E+05
Dinoflagellates		4.0E+04	3.0E+04	1.7E+04	2.8E+04	2.2E+04	4.1E+04	4.6E+04	4.6E+04	1.7E+04	1.0E+04	3.3E+04
Other flagellates		3.0E+05	4.2E+05	8.1E+04	9.9E+04	1.1E+05	2.1E+05	1.6E+05	1.5E+05	9.4E+04	7.8E+04	2.5E+05
Diatoms												
<i>Amphora</i>	<i>sp.</i>	x	x				2.5E+03	x		1.0E+03	x	2.5E+03
<i>Asterionellopsis</i>	<i>glacialis</i>											2.0E+03
<i>Asteromphalus</i>	<i>sarcophagus</i>			1.0E+03	4.0E+03			x	4.0E+03	2.0E+03	x	
<i>Bacillaria</i>	<i>paxillifera</i>	x				x						
<i>Cerataulina</i>	<i>pelagica</i>			x	x							
<i>Chaetoceros</i>	<i>spp.</i>	3.3E+03	6.7E+03	1.6E+04	7.0E+03	2.0E+03	5.0E+03		1.0E+04	6.0E+03	1.6E+04	7.5E+03
<i>Cocconeis</i>	<i>spp.</i>	6.7E+03	2.0E+04	1.0E+04	4.0E+03	8.0E+03	3.8E+04	2.0E+03	6.0E+03	5.0E+03	1.4E+04	1.5E+04
<i>Coscinodiscus</i>	<i>spp.</i>					x						
<i>Cylindrotheca</i>	<i>closterium</i>	6.7E+03	1.3E+04	2.0E+03	x	3.8E+04	5.0E+03	4.0E+03	2.0E+03	2.0E+03	1.0E+03	2.5E+03
<i>Diploneis</i>	<i>sp.</i>			1.0E+03	2.0E+03		2.5E+03			x		
<i>Ditylum</i>	<i>brightwellii</i>	x										
<i>Entomoneis</i>	<i>sp.</i>	3.3E+03			x	x	x		x	x	x	
<i>Eucampia</i>	<i>zodiacus</i>			x	8.0E+03						x	x
<i>Fragilaria</i>	<i>sp.</i>	x	3.3E+03			4.0E+03	2.5E+03					
<i>Grammotophora</i>	<i>marina</i>		x									
<i>Guinardia</i>	<i>flaccida</i>		x	x	x			x		x	x	x
<i>Hemiaulus</i>	<i>hauckii</i>	x	x	2.0E+03	1.0E+03			x	2.0E+03	3.0E+03	x	x
<i>Leptocylindrus</i>	<i>danicus</i>				x		x	x		x		
<i>Licmophora</i>	<i>sp.</i>	6.7E+03		1.0E+03		4.0E+03	x	2.0E+03	2.0E+03	1.0E+03	1.0E+03	
<i>Minidiscus</i>	<i>tricolatus</i>	6.3E+04	6.7E+04	1.9E+04	2.0E+03	8.0E+03	1.5E+04	1.6E+04	3.4E+04	4.0E+03	1.2E+04	6.5E+05
<i>Minutocellus</i>	<i>sp.</i>						2.5E+03					
<i>Naviculoid</i>	<i>spp.</i>	3.3E+03	1.0E+04	5.0E+03	x	2.0E+04	1.5E+04	2.0E+03	2.0E+03	5.0E+03	4.0E+03	7.5E+03
<i>Nitzschia</i>	<i>spp.</i>	3.3E+03	6.7E+03			2.4E+04	1.5E+04	6.0E+03		1.0E+03	4.0E+03	2.5E+03
<i>Pleurosigma</i>	<i>sp.</i>	x	x		x	x	x	x	x	x	x	x
<i>Proboscia</i>	<i>alata</i>	x	x	x				x	x	x	x	x
<i>Pseudo-nitzschia</i>	<i>delicatissima</i> group			x	4.0E+02							
<i>Pseudo-nitzschia</i>	<i>pungens/multiseriis</i>			x	3.0E+02	x	x	3.5E+02			x	1.1E+03
<i>Rhizosolenia</i>	<i>sp.</i>	3.6E+03	3.4E+03	6.0E+02	1.0E+04	x	1.5E+04	1.4E+03	4.6E+03	4.8E+03	5.0E+03	1.2E+03
<i>Skeletonema</i>	<i>japonicum/pseudocostatum</i>						x	x				
<i>Striatella</i>	<i>unipunctata</i>									x	1.0E+03	
<i>Thalassionema</i>	<i>sp.</i>				x				x			
<i>Thalassiosira</i>	<i>sp.</i>	x		1.0E+03	x	4.0E+03	x	4.0E+03			2.0E+03	
<i>Thalassiosira</i>	<i>cf. mala</i>	1.7E+04		8.0E+03	6.0E+03	3.0E+04	7.5E+03	4.0E+03	1.2E+04	2.0E+03	6.0E+03	1.0E+04

NOTES

“X” denotes genus identified, but species not determined in sample.

Blank cells denotes neither genus nor species were detected.

For table on VSQAP Phytoplankton action levels refer to Algal Blooms – Detailed Design, CDP_ENV_MD_012 Rev 0.

BAYWIDE WATER QUALITY MONITORING – PROGRESS REPORT No. 6

TABLE 8. PHYTOPLANKTON DATA (CONT'D)

	Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye	
Collection Date	16/06/2008	16/06/2008	16/06/2008	16/06/2008	18/06/2008	18/06/2008	17/06/2008	17/06/2008	17/06/2008	17/06/2008	17/06/2008	
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	
Genus	Estimate Cells/L											
Total Phytoplankton	4.6E+05	5.8E+05	1.6E+05	1.7E+05	2.7E+05	3.7E+05	2.4E+05	2.7E+05	1.5E+05	1.6E+05	9.8E+05	
Diatoms	1.2E+05	1.3E+05	6.7E+04	4.5E+04	1.4E+05	1.3E+05	4.2E+04	7.9E+04	3.7E+04	6.8E+04	7.0E+05	
Dinoflagellates	4.0E+04	3.0E+04	1.7E+04	2.8E+04	2.2E+04	4.1E+04	4.6E+04	4.6E+04	1.7E+04	1.0E+04	3.3E+04	
Other flagellates	3.0E+05	4.2E+05	8.1E+04	9.9E+04	1.1E+05	2.1E+05	1.6E+05	1.5E+05	9.4E+04	7.8E+04	2.5E+05	
Dinoflagellates												
<i>Alexandrium pseudogoniaulax</i>			x				x	x	x			
<i>Amphidinium</i> sp.						x		x	x	1.0E+03		
<i>Ceratium fusus</i>			x	x								
<i>Ceratium tenue</i>	x	x	1.0E+03	6.0E+03		x	x	x	x	x	x	
<i>Ceratium tripos</i>		x		x	x		x				x	
<i>Dinophysis acuminata</i>								x				
<i>Dinophysis/Phalochroma rotundatum</i>				5.0E+01								
<i>Gonyaulax</i> spp.		x	2.0E+03	x			x	x	1.0E+03		x	
<i>Gymnodinioid</i> spp.	2.0E+04	2.7E+04	1.1E+04	1.3E+04	1.4E+04	1.5E+04	2.8E+04	2.4E+04	1.1E+04	5.0E+03	1.8E+04	
<i>Gyrodinium</i> spp.				1.0E+03	x	5.0E+03	4.0E+03		2.0E+03	2.0E+03	2.5E+03	
<i>Heterocapsa rotundata</i>	1.3E+04	3.3E+03	2.0E+03	3.0E+03	4.0E+03	2.0E+04	1.2E+04	2.2E+04	2.0E+03	2.0E+03	1.0E+04	
<i>Noctiluca scintillans</i>			x	x	x	x	x	x			x	
<i>Oblea</i> sp.					x							
<i>Peridinium</i> sp.	3.3E+03	x		1.0E+03		x	x					
<i>Polykukkos schwartzii</i>						x						
<i>Preperidinium meuneri</i>				x								
<i>Pronoctiluca spinifera</i>			1.0E+03									
<i>Prorocentrum cordatum</i>				1.5E+02								
<i>Prorocentrum gracile</i>			x	3.0E+03			x		1.0E+03			
<i>Prorocentrum triestinum</i>					x							
<i>Protoceratium reticulatum</i>				x						x		
<i>Protopendinium</i> spp.		x	x			x		x	x	x	x	
<i>Scrippsiella</i> spp.	3.3E+03		x	x	4.0E+03	x	2.0E+03				2.5E+03	
<i>Takayama pulchella</i>				4.5E+02	3.5E+02	6.0E+02	1.0E+02	5.0E+01	1.0E+02	x		
Chrysophytes												
<i>Calycomonas</i> sp.	3.3E+03		4.0E+03	2.0E+03	4.0E+03	2.5E+03	2.0E+03	2.0E+03			2.5E+03	
<i>Dinobryon</i> sp.							2.0E+03					
Prymnesiophytes												
<i>Calciopappus caudatus</i>				2.0E+03					2.0E+03	1.0E+03		
<i>Chysochromulina</i> spp.	6.7E+03	1.3E+04	9.0E+03	9.0E+03	1.0E+04	5.0E+03	1.8E+04	4.0E+03	4.0E+03	7.0E+03	1.5E+04	
<i>Emiliania huxleyi</i>		6.7E+03	1.4E+04	1.9E+04		2.0E+04	2.2E+04	3.6E+04	2.8E+04	1.6E+04	7.5E+03	
<i>Gephyrocapsa oceanica</i>				2.0E+03				2.0E+03	2.0E+03	2.0E+03		
<i>Syracosphaera</i> sp.				1.0E+03								
Cryptophytes												
<i>Hemiselmis</i> sp.	1.1E+05	1.7E+05	2.1E+04	2.3E+04	2.4E+04	5.3E+04	4.6E+04	3.0E+04	2.0E+04	1.8E+04	9.3E+04	
<i>Leucocryptos marina</i>		1.0E+04							1.0E+03			
<i>Plagioselmis profonga</i>	9.7E+04	1.4E+05	1.0E+04	1.8E+04	3.8E+04	6.0E+04	3.8E+04	4.6E+04	2.1E+04	1.3E+04	6.8E+04	
<i>Teleaulax acuta</i>	3.3E+03		1.0E+03	1.0E+03	6.0E+03	1.5E+04		2.0E+03	5.0E+03	1.0E+03	2.5E+03	
Prasinophytes												
<i>Pyramimonas</i> spp.	7.7E+04	7.3E+04	1.7E+04	2.1E+04	2.4E+04	4.8E+04	2.6E+04	2.4E+04	1.1E+04	1.7E+04	3.8E+04	
<i>Tetraselmis</i> spp.		3.3E+03	3.0E+03		4.0E+03					1.0E+03	7.5E+03	
Euglenophyta												
<i>Eutreptiella</i> spp.	3.3E+03		x	x	x	2.5E+03	2.0E+03	2.0E+03		1.0E+03	5.0E+03	
Other												
<i>Apedinella spinifera</i>											7.5E+03	
<i>Diaphanoeca grandis</i>			1.0E+03									
<i>Dictyocha fibula</i>			x	2.0E+02						x		
<i>Unidentified amoeba</i>			1.0E+03	1.0E+03						1.0E+03		
Comparative data in the report												
VSQAP Phytoplankton action levels in cells per litre (DPI, 2008)		Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
Taxa	Warning to growers											
<i>Pseudo-nitzschia</i> spp.	50 000	0	0	0	700	0	0	350	0	0	0	1100
<i>Rhizosolenia cf chunii</i>	10 000	0	0	0	0	0	0	0	0	0	0	0
<i>Alexandrium catenella</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Alexandrium minutum</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Alexandrium tamarense</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Dinophysis acuminata</i>	1 000	0	0	0	0	0	0	0	x	0	0	0
<i>Dinophysis caudata</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Dinophysis fortii</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Gymnodinium catenatum</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Karenia mikimotoi</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Karenia brevis</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Prorocentrum lima</i>	1 000	0	0	0	0	0	0	0	0	0	0	0



TABLE 8. PHYTOPLANKTON DATA (CONT'D)

NOTES

X" denotes genus identified, but species not determined in sample.

Blank cells denotes neither genus nor species were detected.

For table on VSQAP Phytoplankton action levels refer to Algal Blooms – Detailed Design, CDP_ENV_MD_012 Rev 0.