



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 14 (FEBRUARY 2009)

MARCH 2009

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 February 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.

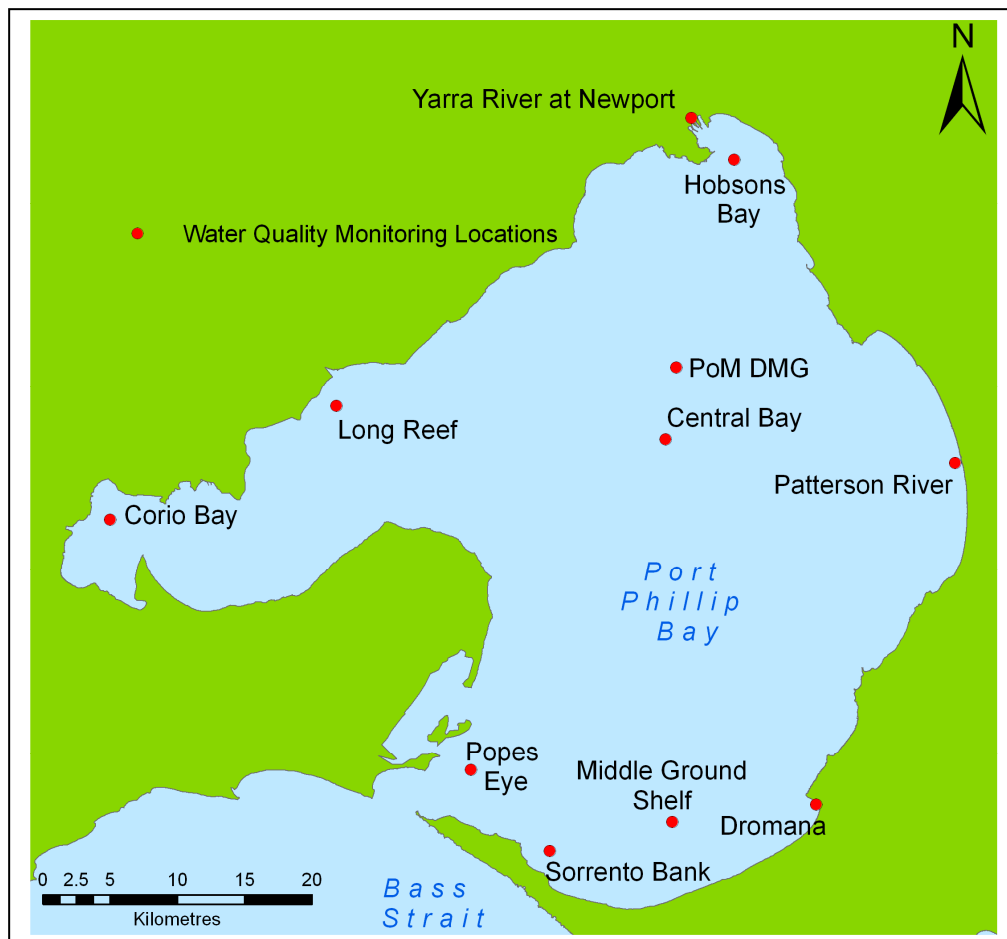


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY

MATERIALS AND METHODS

The materials and methods for this program are described in the CDP Water Quality Detailed Design document CDP_ENV_MD_023 Rev 1.1 (PoMC 2008).

EXCEPTIONS

There were two new exceptions to the Water Quality detailed design document CDP_ENV_MD_023 Rev 1.1 during this reporting period. These are detailed in exception reports ER090201 and ER090202, and outlined as follows:

- The Limit of Reporting (LOR) for the Yarra River at Newport Tri-butyl-Tin (TBT) sample was 0.003 µg/L instead of 0.002 µg/L.
- Progress Report #14 initially contained erroneous EWMA values for ammonium at 10 sites, this included 1 incorrect EWMA control limit exceedence (at PoM DMG).

The following, previously issued exception report still applies:

- ER080901: A variation to the LOR for various parameters.

RESULTS AND DISCUSSION

All results presented in Tables 1 - 4 were assessed against the control limits listed in Tables 5 and 6 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 twice and the EWMA control limits were exceeded six times (see Tables 1 - 4).

Dredging was underway adjacent to and upstream of the Yarra River at Newport site on 11 February 2009 where turbidity was recorded as 24.3 NTU. The presence of strong winds and rough conditions during the sampling period may also have contributed to the reduced water clarity and the accuracy of the results for secchi disc depth at some sites.

As described in section 4.1.3 in the Water Quality Detailed Design CDP_ENV_MD_023 Rev 1.1, 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.

REFERENCES

PoMC 2008, Water Quality Detailed Design CDP_ENV_MD_023 Rev1.1, Port of Melbourne Corporation, September 2008.

TABLE 1 PHYSICO-CHEMICAL PARAMETERS (NST – No Sample Taken)

| Date | Sampling Site | Depth m | Dissolved Oxygen | | Salinity g/L | Secchi disc depth m | Temperature °C | Turbidity NTU | Total Suspended Solids ¹ mg/L | PAR micro Einsteins/m ² /sec |
|----------|------------------------|------------|------------------|--------------|-----------------|---------------------------|-------------------|-------------------|---|---|
| | | | mg/L | % saturation | | | | | | |
| 11/02/09 | Yarra River at Newport | 0.5 | 6.4 | 91 | 36.3 | 0.2 | 22.2 | 24.3 ³ | 25.4 | 122.4 |
| 11/02/09 | Yarra River at Newport | 15.2 | NST | NST | NST | | NST | 24.3 ³ | NST | <0.1 |
| 11/02/09 | Hobsons Bay | 0.5 | 6.9 | 95 | 37.4 | 0.9 | 20.3 | 3.7 | 5.1 | 5.6 |
| 10/02/09 | Central Bay | 0.5 | 6.8 | 96 | 37.1 | 4.2 | 22.0 | 0.6 | 1.6 | 102.6 |
| 10/02/09 | PoM DMG | 0.5 | 6.7 | 94 | 37.1 | 4.0 | 22.1 | 0.7 | 1.7 | 48.2 |
| 11/02/09 | Corio Bay | 0.5 | 6.7 | 95 | 38.5 | 1.9 | 21.4 | 2.4 | 4.2 | 274.5 |
| 11/02/09 | Long Reef | 0.5 | 6.8 | 96 | 38.2 | 1.2 | 21.2 | 2.9 | 4.6 | 152.8 |
| 10/02/09 | Patterson River | 0.5 | 6.8 | 96 | 37.4 | 5.5 | 21.8 | <0.5 | <1.5 | 259.9 |
| 10/02/09 | Dromana | 0.5 | 6.8 | 96 | 37.0 | 6.0 | 21.4 | <0.5 | <1.5 | 400.7 |
| 11/02/09 | Middle Ground Shelf | 0.5 | 6.7 | 94 | 37.1 | 4.5 | 21.2 | 0.6 | <1.5 | 42.7 |
| 10/02/09 | Sorrento Bank | 0.5 | 7.2 | 98 | 36.1 | >3.8 ² | 20.2 | <0.5 | <1.5 | 824.8 |
| 10/02/09 | Popes Eye | 0.5 | 7.3 | 98 | 35.7 | 8.5 | 19.6 | <0.5 | <1.5 | 70.4 |

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.

Blue coloured cells indicate a result outside SEPP objectives (see Appendix 1, Table 7 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).

1. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (See Exception Report ER080901)
2. Secchi disc visible on bottom.
3. ANZECC guidelines recommend a turbidity range of 0.5-10 NTU for estuarine and marine waters but acknowledge that higher values may be found in estuarine and inshore coastal waters due to wind-induced re-suspension or to the input of turbid water from the catchment.

TABLE 2A NUTRIENTS

| Date | Sampling Site | Depth m | Ammonium µg/L | | Nitrate µg/L | Nitrite ¹ µg/L | Nitrate plus Nitrite µg/L | | Dissolved Organic Nitrogen µg/L | Total Nitrogen µg/L | |
|----------|------------------------|------------|-------------------|------|-----------------|------------------------------|--------------------------------|------|--|------------------------|------|
| | | | Measured Value | EWMA | | | Measured Value ¹ | EWMA | | Measured Value | EWMA |
| 11/02/09 | Yarra River at Newport | 0.5 | 25.1 | 21.5 | 12.6 | <1.2 | 12.6 | 26.3 | 151 | 273 | 246 |
| 11/02/09 | Hobsons Bay | 0.5 | 8.0 | 8.0 | 2.2 | <1.2 | <2.4 | 6.9 | 132 | 186 | 194 |
| 10/02/09 | Central Bay | 0.5 | 8.1 | 6.1 | 3.3 | <1.2 | 3.3 | 2.2 | 130 | 167 | 149 |
| 10/02/09 | PoM DMG | 0.5 | 7.9 | 6.1 | 6.0 | <1.2 | 6.0 | 3.5 | 127 | 168 | 147 |
| 11/02/09 | Corio Bay | 0.5 | 7.6 | 6.2 | 2.2 | <1.2 | <2.4 | 2.4 | 163 | 225 | 195 |
| 11/02/09 | Long Reef | 0.5 | 6.7 | 11.9 | 2.1 | <1.2 | <2.4 | 19.3 | 158 | 219 | 217 |
| 10/02/09 | Patterson River | 0.5 | 7.9 | 6.6 | 2.3 | <1.2 | <2.4 | 5.5 | 141 | 175 | 164 |
| 10/02/09 | Dromana | 0.5 | 7.2 | 6.9 | 4.2 | <1.2 | 4.2 | 4.4 | 127 | 159 | 144 |
| 11/02/09 | Middle Ground Shelf | 0.5 | 8.8 | 5.9 | 2.6 | <1.2 | 2.6 | 2.2 | 125 | 162 | 137 |
| 10/02/09 | Sorrento Bank | 0.5 | 6.4 | 5.6 | 2.2 | <1.2 | <2.4 | 3.3 | 97 | 121 | 114 |
| 10/02/09 | Popes Eye | 0.5 | 7.0 | 6.3 | 3.1 | <1.2 | 3.1 | 5.3 | 89 | 116 | 104 |

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).

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).

1. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (See Exception Report ER080901).

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

| Date | Sampling Site | Depth m | Phosphate µg/L | | Organic Phosphorus ¹ µg/L | Total Phosphorus µg/L | | Silicate µg/L |
|----------|------------------------|------------|--------------------------------|------|--|--------------------------------|------|------------------|
| | | | Measured Value ¹ | EWMA | | Measured Value ¹ | EWMA | |
| 11/02/09 | Yarra River at Newport | 0.5 | 62.8 | 63.6 | 31 | 94 | 89 | 433 |
| 11/02/09 | Hobsons Bay | 0.5 | 48.7 | 63.9 | <18 | 62 | 83 | 75 |
| 10/02/09 | Central Bay | 0.5 | 45.8 | 50.0 | <18 | 60 | 63 | 64 |
| 10/02/09 | PoM DMG | 0.5 | 43.7 | 49.4 | <18 | 60 | 64 | 67 |
| 11/02/09 | Corio Bay | 0.5 | 64.5 | 64.2 | <18 | 82 | 81 | 137 |
| 11/02/09 | Long Reef | 0.5 | 60.7 | 92.8 | 23 | 83 | 115 | 73 |
| 10/02/09 | Patterson River | 0.5 | 48.5 | 54.8 | <18 | 64 | 70 | 64 |
| 10/02/09 | Dromana | 0.5 | 36.8 | 39.0 | <18 | 54 | 53 | 100 |
| 11/02/09 | Middle Ground Shelf | 0.5 | 44.4 | 41.6 | <18 | 52 | 52 | 81 |
| 10/02/09 | Sorrento Bank | 0.5 | 10.6 | 22.1 | <18 | 25 | 32 | 40 |
| 10/02/09 | Popes Eye | 0.5 | <7.5 | 13.1 | <18 | <18 | 24 | 28 |

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).

1. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (See Exception Report ER080901)



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

| Date | Sampling Site | Depth m | Arsenic µg/L | | 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 | | | | | | | | |
| 11/02/09 | Yarra River at Newport - total | 0.5 | 2.8 | 2.6 | <3 ² | <0.2 | 1.7 | <1 | <0.1 | 2.0 | 0.8 | <5 |
| 11/02/09 | Yarra River at Newport - dissolved | 0.5 | NAR | - | NAR | NAR | <0.5 | NAR | NAR | NAR | NAR | NAR |
| 11/02/09 | Hobsons Bay - total | 0.5 | 2.8 | 2.8 | <2 | <0.2 | <0.5 | <1 | <0.1 | 0.6 | 0.4 | <5 |
| 10/02/09 | Central Bay - total | 0.5 | 2.8 | 2.8 | NST | <0.2 | <0.5 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 10/02/09 | PoM DMG - total | 0.5 | 2.5 | 2.6 | NST | <0.2 | 0.5 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 11/02/09 | Corio Bay - total | 0.5 | 2.8 | 2.8 | NST | <0.2 | <0.5 | <1 | <0.1 | 0.7 | 0.2 | <5 |
| 11/02/09 | Long Reef - total | 0.5 | 2.5 | 2.8 | NST | <0.2 | 0.6 | <1 | <0.1 | 0.6 | <0.2 | <5 |
| 10/02/09 | Patterson River - total | 0.5 | 2.9 | 2.7 | NST | <0.2 | <0.5 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 10/02/09 | Dromana - total | 0.5 | 2.7 | 2.7 | NST | <0.2 | 0.6 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 11/02/09 | Middle Ground Shelf - total | 0.5 | 2.6 | 2.6 | NST | <0.2 | <0.5 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 10/02/09 | Sorrento Bank - total | 0.5 | 2.2 | 2.3 | NST | <0.2 | <0.5 | <1 | <0.1 | <0.5 | <0.2 | <5 |
| 10/02/09 | Popes Eye - total | 0.5 | 1.8 | 2.1 | NST | <0.2 | 0.7 | <1 | <0.1 | <0.5 | <0.2 | <5 |

NOTES:

Yellow coloured cells indicate measured results above the Shewhart control limit (for 'total' fraction) (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).

1. TBT is only sampled from sub-surface levels at Yarra River at Newport and Hobsons Bay.
2. Sample shows raised LOR for TBT as limited volume was available for re-extraction to confirm the initial result (See exception report ER090201).



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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 | | | | | | |
| 11/02/09 | Yarra River at Newport | 0.5 | 2.05 | 2.06 | <0.18 | 1.27 | 7.8E+05 | 1.9E+05 | 7.0E+04 | 5.2E+05 |
| 11/02/09 | Yarra River at Newport | 15.2 | NST ¹ | - | NST ¹ | 1.35 | | | | |
| 11/02/09 | Hobsons Bay | 0.5 | 1.15 | 1.32 | 0.38 | 0.44 | 1.6E+06 | 1.1E+06 | 4.5E+04 | 4.6E+05 |
| 10/02/09 | Central Bay | 0.5 | 0.74 | 0.66 | <0.18 | 0.26 | 2.9E+05 | 1.3E+05 | 4.6E+04 | 1.2E+05 |
| 10/02/09 | PoM DMG | 0.5 | 0.81 | 0.61 | <0.18 | 0.48 | 5.2E+05 | 2.6E+05 | 2.3E+04 | 2.4E+05 |
| 11/02/09 | Corio Bay | 0.5 | 2.23 | 0.97 | <0.18 | 0.68 | 1.3E+06 | 8.1E+05 | 6.0E+04 | 4.3E+05 |
| 11/02/09 | Long Reef | 0.5 | 1.43 | 1.13 | 0.18 | 0.57 | 1.3E+06 | 8.6E+05 | 1.0E+05 | 3.7E+05 |
| 10/02/09 | Patterson River | 0.5 | 0.73 | 0.79 | <0.18 | 0.35 | 1.5E+06 | 8.7E+05 | 9.5E+04 | 5.0E+05 |
| 10/02/09 | Dromana | 0.5 | 0.53 | 0.60 | <0.18 | 0.22 | 1.1E+06 | 6.4E+05 | 7.0E+04 | 4.0E+05 |
| 11/02/09 | Middle Ground Shelf | 0.5 | 0.63 | 0.53 | <0.18 | 0.25 | 4.0E+05 | 1.5E+05 | 4.0E+04 | 2.1E+05 |
| 10/02/09 | Sorrento Bank | 0.5 | 0.71 | 0.63 | <0.18 | 0.26 | 1.4E+06 | 9.3E+05 | 5.0E+04 | 4.2E+05 |
| 10/02/09 | Popes Eye | 0.5 | 1.04 | 0.60 | <0.18 | 0.21 | 1.4E+05 | 1.4E+04 | 3.6E+04 | 8.5E+04 |

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.

The chlorophyll a values are assessed against the 90th percentile objective in SEPP (WoV) Schedule F6.

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 1994 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 1.1 (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. The EWMA is a statistic that averages the data in a way that gives less weight to data as they are further removed in time. To do this EWMA applies weighting factors which decrease exponentially over time. This gives relatively greater importance to recent observations while still not discarding older observations entirely. EWMA is being used in this context to detect persistent changes from a baseline 'target' concentration, usually the historical mean of the data, which may reflect long term changes in water quality. An upper control limit for the EWMA has been calculated to assist in deciding whether a persistent change from the target value may have occurred
- 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.



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 1.1 (available on the Channel Deepening Project website www.channelproject.com).

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- <i>a</i> 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 1.1 (available on the Channel Deepening Project website www.channelproject.com).

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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) | | | | Salinity variation | Temperature (°C) | Secchi disc depth (m) | Attenuation of PAR | Turbidity | Suspended Solids (mg/L) | | | | Chlorophyll-a (ug/L) | | Ammonium (ug/L) | Nitrate plus nitrite (ug/L) | Total nitrogen (ug/L) | Phosphate (ug/L) | Total Phosphorus (ug/L) | Arsenic (ug/L) | Cadmium (ug/L) | Chromium (ug/L) | Copper (ug/L) | Lead (ug/L) | Mercury (ug/L) | Nickel (ug/L) | Zinc (ug/L) | TBT (ug/L) |
| | | | Min for 1m below surface | Min 1m above bottom | Lower limit for 90th percentile | Min percentage concentration | | | | | | Annual 90th percentile | Annual 50th percentile | Annual 90th percentile | Annual 50th percentile | Annual 90th percentile | Annual 50th percentile | | | | | | | | | | | | | | |
| 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 | 0.006 |
| Hobsons Bay | F6 Hobsons | 99% | >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 above objective

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 | 11/02/09 | 11/02/09 | 10/02/09 | 10/02/09 | 11/02/09 | 11/02/09 | 10/02/09 | 10/02/09 | 11/02/09 | 10/02/09 | 10/02/09 |
| Count Method | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick |
| Genus | Species | | | | | | | | | | |
| Total Phytoplankton | Estimate Cells/L | | | | | | | | | | |
| Diatoms | 7.8E+05 | 1.6E+06 | 2.9E+05 | 5.2E+05 | 1.3E+06 | 1.3E+06 | 1.5E+06 | 1.1E+06 | 4.0E+05 | 1.4E+06 | 1.4E+05 |
| Dinoflagellates | 1.9E+05 | 1.1E+06 | 1.3E+05 | 2.6E+05 | 8.1E+05 | 8.6E+05 | 8.7E+05 | 6.4E+05 | 1.5E+05 | 9.3E+05 | 1.4E+04 |
| Other flagellates | 7.0E+04 | 4.5E+04 | 4.6E+04 | 2.3E+04 | 6.0E+04 | 1.0E+05 | 9.5E+04 | 7.0E+04 | 4.0E+04 | 5.0E+04 | 3.6E+04 |
| | 5.2E+05 | 4.6E+05 | 1.2E+05 | 2.4E+05 | 4.3E+05 | 3.7E+05 | 5.0E+05 | 4.0E+05 | 2.1E+05 | 4.2E+05 | 8.5E+04 |
| Diatoms | | | | | | | | | | | |
| <i>Amphora</i> | <i>sp.</i> | 5.0E+03 | 1.0E+04 | | 6.7E+03 | 5.0E+03 | x | 4.5E+04 | 2.0E+04 | | 8.0E+04 |
| <i>Anaulus</i> | <i>australis</i> | | x | | | | | | | | |
| <i>Ardissonea</i> | <i>crystallina</i> | | | x | | | x | | | | 5.0E+03 |
| <i>Auliscus</i> | <i>sp.</i> | | | | | | | 5.0E+03 | | | |
| <i>Bacillaria</i> | <i>paxillifera</i> | x | x | x | | 1.0E+04 | x | x | 2.0E+04 | | |
| <i>Bacteriastrium</i> | <i>elegans</i> | | | | | | | | 2.0E+04 | | |
| <i>Cerataulina</i> | <i>pelagica</i> | x | 5.0E+03 | | | | | | | | |
| <i>Chaetoceros</i> | <i>spp.</i> | 3.0E+04 | 1.1E+05 | 6.0E+04 | 5.3E+04 | 2.6E+05 | 2.4E+05 | 2.3E+05 | 4.5E+04 | 2.2E+04 | 2.0E+04 |
| <i>Cocconeis</i> | <i>spp.</i> | 2.5E+04 | 1.5E+04 | 8.0E+03 | 2.0E+04 | 2.0E+04 | 4.5E+04 | 6.0E+04 | 7.0E+04 | | 5.5E+04 |
| <i>Coscinodiscus</i> | <i>spp.</i> | x | | | | | | | | x | x |
| <i>Cylindrotheca</i> | <i>closterium</i> | 1.5E+04 | 8.0E+04 | 4.0E+03 | 1.3E+04 | 1.3E+05 | 8.5E+04 | 6.0E+04 | 5.5E+04 | 2.0E+03 | 2.1E+05 |
| <i>Dactylosolen</i> | <i>blavyanus</i> | | | | | | | x | | | |
| <i>Dactylosolen</i> | <i>fragilissimus</i> | | | | | | | x | | | |
| <i>Diploneis</i> | <i>sp.</i> | | | 2.0E+03 | | | | | | | |
| <i>Ditylum</i> | <i>brightwellii</i> | x | x | | | | | | | | |
| <i>Entomoneis</i> | <i>sp.</i> | | 1.0E+04 | | 3.3E+03 | x | 1.0E+04 | 1.5E+04 | 5.0E+03 | x | 1.0E+04 |
| <i>Eucampia</i> | <i>zodiacus</i> | x | | | | | | | | | |
| <i>Fragilaria</i> | <i>sp.</i> | | 1.5E+04 | | 6.7E+03 | 1.5E+04 | 5.0E+04 | 1.5E+04 | 3.5E+04 | x | 1.1E+05 |
| <i>Fragilariopsis</i> | <i>sp.</i> | | | | | x | 3.0E+04 | 2.0E+04 | 1.0E+04 | | 3.0E+04 |
| <i>Grammotophora</i> | <i>marina</i> | | x | | | | 1.0E+04 | x | 1.0E+04 | x | 3.5E+04 |
| <i>Guinardia</i> | <i>flaccida</i> | | 1.0E+04 | 8.0E+03 | 5.3E+04 | | | 3.5E+04 | 1.0E+04 | 4.6E+04 | x |
| <i>Hemiaulus</i> | <i>hauckii</i> | | x | 1.0E+04 | | | | 1.5E+04 | | 2.0E+03 | |
| <i>Leptocylindrus</i> | <i>danicus</i> | x | 1.0E+04 | 6.0E+03 | x | | | 7.5E+04 | x | 4.0E+03 | x |
| <i>Leptocylindrus</i> | <i>minimus</i> | | | | | | | | | | 2.0E+03 |
| <i>Licmophora</i> | <i>sp.</i> | | | | | 4.5E+04 | 2.0E+04 | 5.0E+03 | 1.0E+04 | | 1.2E+05 |
| <i>Mindiscus</i> | <i>tricolatus</i> | | | 8.0E+03 | | | | | | | x |
| <i>Naviculoid</i> | <i>spp.</i> | | 3.0E+04 | | x | 3.0E+04 | 4.0E+04 | 6.0E+04 | 4.0E+04 | 6.0E+03 | 7.0E+04 |
| <i>Nitzschia</i> | <i>sp.</i> | 1.5E+04 | 3.0E+04 | | 1.0E+04 | 7.5E+04 | 5.5E+04 | 3.5E+04 | 6.0E+04 | 4.0E+03 | 7.5E+04 |
| <i>Nitzschia</i> | <i>sigmoidea</i> | | | x | | | | | | | 2.0E+03 |
| <i>Pleurosigma</i> | <i>sp.</i> | x | 1.0E+04 | x | x | 5.0E+03 | 5.0E+03 | x | 1.0E+04 | 2.0E+03 | x |
| <i>Proboscia</i> | <i>alata</i> | | x | x | x | x | | 5.0E+03 | x | x | x |
| <i>Pseudo-nitzschia</i> | <i>delicatissima</i> group | x | 8.0E+02 | 5.0E+02 | 4.0E+02 | | | | | | x |
| <i>Pseudo-nitzschia</i> | <i>fraudulenta/australis</i> | | | | | | | | | | x |
| <i>Pseudo-nitzschia</i> | <i>pungens/multiseriis</i> | x | | | | | | | | | x |
| <i>Rhizosolenia</i> | <i>spp.</i> | x | x | x | x | | | 1.0E+04 | 5.0E+03 | | |
| <i>Rhizosolenia</i> | <i>setigera</i> | | | | | | | | | | x |
| <i>Skeletonema</i> | <i>japonica/pseudocostatum</i> | 1.0E+04 | 3.9E+05 | | 6.7E+03 | | | x | | | 5.0E+03 |
| <i>Stauroneis</i> | <i>sp.</i> | | | x | | | | | | | x |
| <i>Striatella</i> | <i>unipunctata</i> | | x | | | | | | | | 2.5E+04 |
| <i>Thalassiosira</i> | <i>sp.</i> | x | | 2.0E+03 | | | | | | | 1.0E+04 |
| <i>Thalassiosira</i> | <i>cf. mala</i> | 9.0E+04 | 4.0E+05 | 2.2E+04 | 8.3E+04 | 2.2E+05 | 2.7E+05 | 1.8E+05 | 2.2E+05 | 6.6E+04 | 7.5E+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 1.1.

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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 | 11/02/09 | 11/02/09 | 10/02/09 | 10/02/09 | 11/02/09 | 11/02/09 | 10/02/09 | 10/02/09 | 11/02/09 | 10/02/09 | 10/02/09 | |
| Count Method | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | |
| Genus | Estimate Cells/L | | | | | | | | | | | |
| Total Phytoplankton | 7.8E+05 | 1.6E+06 | 2.9E+05 | 5.2E+05 | 1.3E+06 | 1.3E+06 | 1.5E+06 | 1.1E+06 | 4.0E+05 | 1.4E+06 | 1.4E+05 | |
| Diatoms | 1.9E+05 | 1.1E+06 | 1.3E+05 | 2.6E+05 | 8.1E+05 | 8.6E+05 | 8.7E+05 | 6.4E+05 | 1.5E+05 | 9.3E+05 | 1.4E+04 | |
| Dinoflagellates | 7.0E+04 | 4.5E+04 | 4.6E+04 | 2.3E+04 | 6.0E+04 | 1.0E+05 | 9.5E+04 | 7.0E+04 | 4.0E+04 | 5.0E+04 | 3.6E+04 | |
| Other flagellates | 5.2E+05 | 4.6E+05 | 1.2E+05 | 2.4E+05 | 4.3E+05 | 3.7E+05 | 5.0E+05 | 4.0E+05 | 2.1E+05 | 4.2E+05 | 8.5E+04 | |
| Dinoflagellates | | | | | | | | | | | | |
| <i>Alexandrium pseudogonyaulax</i> | | | x | | 5.0E+01 | | | 1.0E+02 | | | | |
| <i>Amphidinium</i> sp. | | | | | | | | | | x | | |
| <i>Ceratium fusus</i> | | x | x | x | | | x | | x | | x | |
| <i>Ceratium macroceros</i> | | | x | | | | | | | | x | |
| <i>Ceratium tenue</i> | | | x | x | | | x | x | x | x | | |
| <i>Ceratium tripos</i> | | | | x | | | x | | | | | |
| <i>Dinophysis acuminata</i> | | | | | | | | | 5.0E+01 | | | |
| <i>Diplopelta bomba</i> | | | x | | | | | | | | | |
| <i>Fragilidium subglobosum</i> | | | | | x | | | | | | | |
| <i>Gonyaulax</i> spp. | | | | | | | | | | | x | |
| <i>Gymnodinium</i> spp. | 5.0E+04 | 3.5E+04 | 2.4E+04 | 2.0E+04 | 2.5E+04 | 6.5E+04 | 5.5E+04 | 6.0E+04 | 2.0E+04 | 4.0E+04 | 7.0E+03 | |
| <i>Gyrodinium</i> spp. | | | 6.0E+03 | x | | 5.0E+03 | 5.0E+03 | | 2.0E+03 | | 2.0E+03 | |
| <i>Heterocapsa rotundata</i> | 2.0E+04 | 1.0E+04 | 1.2E+04 | x | 3.5E+04 | 3.0E+04 | 3.0E+04 | 5.0E+03 | 1.4E+04 | 1.0E+04 | 2.6E+04 | |
| <i>Noctiluca scintillans</i> | | | 5.0E+01 | x | | x | x | x | 1.0E+02 | | x | |
| <i>Ostreopsis</i> sp. | | | | | | x | | | | | | |
| <i>Peridinium</i> sp. | | | | x | | | | 5.0E+03 | | x | | |
| <i>Prorocentrum</i> sp. | | | 2.0E+03 | | | | | | | | | |
| <i>Prorocentrum cordatum</i> | | | | | | | | | | | 1.0E+03 | |
| <i>Prorocentrum gracile</i> | | | 2.0E+03 | 3.3E+03 | x | x | | | 2.0E+03 | | | |
| <i>Protoceratium reticulatum</i> | | | | x | | | | | | | | |
| <i>Protoperidinium</i> spp. | x | x | x | x | x | x | x | x | 2.0E+03 | | | |
| <i>Scrippsiella</i> spp. | | | | | x | | | | | | x | |
| <i>Thecadinium</i> sp. | | | | | | | | | | x | | |
| <i>Wamowia</i> sp. | | | | | | | 5.0E+03 | | | | | |
| Chrysophytes | | | | | | | | | | | | |
| <i>Calycomonas</i> sp. | | 1.0E+04 | 2.0E+03 | 6.7E+03 | 5.0E+03 | 1.0E+04 | | 5.0E+03 | | | | |
| <i>Ochromonas</i> spp. | | | 2.0E+03 | | | | 3.0E+04 | | | | 5.0E+03 | |
| Prymnesiophytes | | | | | | | | | | | | |
| <i>Chrysochromulina</i> spp. | 6.0E+04 | 4.0E+04 | 6.0E+03 | 3.7E+04 | 2.5E+04 | 3.0E+04 | 5.5E+04 | 5.5E+04 | 3.6E+04 | 7.0E+04 | 9.0E+03 | |
| <i>Emiliania huxleyi</i> | 2.5E+04 | 2.0E+04 | 8.0E+03 | 2.3E+04 | 2.5E+04 | 2.0E+04 | 9.0E+04 | 3.5E+04 | 4.0E+03 | 4.0E+04 | 1.3E+04 | |
| Cryptophytes | | | | | | | | | | | | |
| <i>Hemiselmis</i> sp. | 1.3E+05 | 1.0E+05 | 2.4E+04 | 3.3E+04 | 6.5E+04 | 6.0E+04 | 9.0E+04 | 6.5E+04 | 3.4E+04 | 5.5E+04 | 1.7E+04 | |
| <i>Leucocryptos marina</i> | | | 1.2E+04 | 3.3E+03 | | | | | 1.0E+04 | 2.0E+03 | 2.0E+03 | |
| <i>Plagioselmis prolonga</i> | 1.1E+05 | 1.5E+05 | 5.0E+04 | 5.0E+04 | 9.0E+04 | 8.5E+04 | 1.2E+05 | 9.0E+04 | 4.4E+04 | 9.0E+04 | 2.8E+04 | |
| <i>Teleaulax acuta</i> | 5.5E+04 | 3.5E+04 | 2.0E+03 | 6.7E+03 | 4.0E+04 | 4.0E+04 | 2.5E+04 | 3.0E+04 | 1.8E+04 | 3.5E+04 | 3.0E+03 | |
| Prasinophytes | | | | | | | | | | | | |
| <i>Pyramimonas</i> spp. | 1.2E+05 | 6.5E+04 | 2.0E+03 | 4.3E+04 | 1.2E+05 | 8.5E+04 | 5.5E+04 | 7.5E+04 | 4.6E+04 | 9.0E+04 | 1.0E+03 | |
| <i>Tetraselmis</i> spp. | 2.5E+04 | 3.5E+04 | | 3.0E+04 | 6.5E+04 | 3.0E+04 | 2.0E+04 | 3.0E+04 | 2.2E+04 | 3.0E+04 | 3.0E+03 | |
| Euglenophyta | | | | | | | | | | | | |
| <i>Eutreptiella</i> spp. | | | 4.0E+03 | 3.3E+03 | x | 5.0E+03 | 1.0E+04 | 5.0E+03 | 2.0E+03 | 5.0E+03 | 2.0E+03 | |
| Other | | | | | | | | | | | | |
| <i>Apedinella spinifera</i> | | | | | | | | | | | 1.0E+03 | |
| <i>Bicosoeca</i> sp. | | | | x | | | | | | | | |
| <i>Ebria tripartita</i> | | | | x | | | | | | | | |
| <i>Dictyocha fibula</i> | | x | | | | | 5.0E+03 | | | | | |
| <i>Stephanoecca</i> sp. | | | | | | | | | | | 1.0E+03 | |
| Unidentified <i>bodonids</i> | | | 4.0E+03 | | | | | | | | | |
| <i>Mesodinium rubrum</i> | x | 5.0E+03 | | | | | | | | | | |
| VSQAP Phytoplankton action levels in cells per litre (DPI, 2008) | Comparative data in the report | | | | | | | | | | | |
| Taxa | Warning to growers | Yarra River at Newport | Hobsons Bay | Central Bay | PoM DMG | Corio Bay | Long Reef | Patterson River | Dromana | Middle Ground Shelf | Sorrento Bank | Popes Eye |
| <i>Pseudo-nitzschia</i> spp. | 50 000 | x | 800 | 500 | 400 | | | | | | x | x |
| <i>Rhizosolenia cf chunii</i> | 10 000 | x | x | x | x | | | x | x | | | |
| <i>Alexandrium catenella</i> | 100 | | | | | | | | | | | |
| <i>Alexandrium minutum</i> | 100 | | | | | | | | | | | |
| <i>Alexandrium tamarense</i> | 100 | | | | | | | | | | | |
| <i>Dinophysis acuminata</i> | 1 000 | | | | | | | | 50 | | | |
| <i>Dinophysis caudata</i> | 1 000 | | | | | | | | | | | |
| <i>Dinophysis fortii</i> | 1 000 | | | | | | | | | | | |
| <i>Gymnodinium catenatum</i> | 100 | | | | | | | | | | | |
| <i>Karenia mikimotoi</i> | 1 000 | | | | | | | | | | | |
| <i>Karenia brevis</i> | 1 000 | | | | | | | | | | | |
| <i>Prorocentrum lima</i> | 1 000 | | | | | | | | | | | |

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 1.1.

