

**WATERWATCH VICTORIA
QA/QC WEEK 2008**

**REPORT ON STATE-WIDE RESULTS FOR
PHYSICOCHEMICAL PARAMETERS AND
MACROINVERTEBRATES**

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1.0 Background

Waterwatch Victoria is a state-wide community based water quality monitoring organisation that aims to increase local community understanding and ownership of waterway and catchment issues. Community volunteers and Waterwatch co-ordinators are involved in the monitoring of waterway health including water quality and macroinvertebrate indicators.

Waterwatch Victoria's QA/QC Week program is an annual event co-ordinated at a state-wide level. It involves the testing of laboratory prepared standard samples by monitors and co-ordinators to ensure that their equipment and monitoring techniques are accurate. For more information on Waterwatch Victoria's Data Confidence Framework, guidelines and data confidence plans, visit www.vic.waterwatch.org.au

This report provides a simple summary of the state-wide data provided by both co-ordinators and monitors during QA/QC Week 2008. It follows on from similar programs that have been conducted annually since 1998. Further detail can be found within the ten regional reports that have been distributed to the co-ordinators.

2.0 Methods

2.1 Physicochemical Parameters

Stable 'Mystery' reference water samples were prepared for pH, electrical conductivity (EC), turbidity and orthophosphate by Australian Chemical Reagents (Roach Analysts), QLD. Each parameter was further divided into a low range sample (A) and a high range sample (B) giving a total of 8 unique samples. A subset of all of these samples (approximately 10%) were tested by the NATA accredited Marine and Freshwater Research Laboratories (MAFRL), WA, to check sample homogeneity and stability.

Physicochemical mystery solutions were prepared to specifications recommended by the state Waterwatch Victoria office. Values listed in Table 1 are the averaged solution concentrations of the subset measured during QA/QC Week by MAFRL. Individual parameter solutions were provided to all regions in separate bottles with labelled instructions for sample preservation and use. Acceptable upper and lower quality control limits for each parameter were set according to the standards outlined in the Waterwatch Victoria Data Confidence Framework. These quality control limits are sensitive to the wide array of equipment used by Waterwatch coordinators and monitors. Individual parameter solutions were provided to all participants in separate bottles with labelled instructions for sample preservation and use.

Table 1. True values and acceptable limits for phys-chem parameters.

Parameter	Sample	Acceptable Range	True Value	Lower Limit	Upper Limit
pH (pH units)	A	± 0.3	6.7	6.4	7
	B	± 0.3	8.2	7.9	8.5
EC (µS/cm)	A	± 10%	580	522	638
	B	± 10%	4800	4320	5280
Turbidity Meter (NTU)	A	± 20%	32	25	38
	B	± 20%	120	96	144
Turbidity Tube (NTU)	A	± 25%	32	24	40
	B	± 25%	120	90	150
Orthophosphate mg/L	A	± 20%	0.05	0.04	0.06
	B	± 20%	0.3	0.24	0.36

A total of 1457 phys-chem samples were sent out across the state for QA/QC Week 2008. A total of 411 participants took part in QA/QC Week 2008 including 30 co-ordinators and 381 monitors. Please note that not every participant attempted all eight samples. Regional co-ordinators decided which samples they and their monitors would assess prior to QA/QC Week 2008. The minimum number of samples assessed by any one participant was two with the majority assessing between four and seven. All participants were provided with QA/QC Codes (numbers, some with letter suffixes) to allow their results to be included in the state-wide analysis anonymously.

The Victorian Waterwatch Data Confidence Framework sets out minimum requirements for equipment to be used by monitors and co-ordinators to conduct water quality analysis. A summary of the requirements for monitoring standards three and four is provided in Table 2 below.

Table 2. Minimum requirements outlined in the Data Confidence Framework.

Parameter	Standard 3	Standard 4
EC	Low range = minimum resolution of 0.10 mS/cm	Low range = min resolution of 0.10 mS/cm
	High Range = minimum resolution of 10 mS/cm	High Range = minimum resolution of 10 mS/cm
pH	pH meters (not strips)	pH meters (not strips)
Turbidity	Turbidity tubes	Turbidity meter
P04	Comparator	Colorimeter

2.2 Macroinvertebrates

A total of 73 'Mystery' macroinvertebrate samples of known taxonomic composition were prepared by Instream Solutions (Victoria). These samples were provided to test the co-ordinator's and monitor's identification skills at variable taxonomic resolutions. The 'mystery' samples consisted of six macroinvertebrates that are naturally found in the majority of Victorian bioregions so not to disadvantage participants (Table 3). Coordinators and monitors were asked to identify the macroinvertebrates at the Order, Family and common name level.

Analysis of results was carried out at the Family level as this is the level required for the biological indices (e.g. AUSRIVAS and SIGNAL) used in the State Environment Protection Policy Waters of Victoria (SEPP WOV). A non attempt at identification was marked as a blank space in the results sheet and was ignored in the final statistical analysis.

Table 3. Macroinvertebrate "Mystery Sample" taxa list.

Order	Family	Common Name	Found in Victorian Bioregions
Hemiptera	Notonectidae	Backswimmers	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains
Coleoptera	Dytiscidae	Diving Beetles	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains
Trichoptera	Leptoceridae	Stick Caddis	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains
Diptera	Simuliidae	Black Fly Larvae	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains
Plecoptera	Gripopterygidae	Stonefly	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains
Ephemeroptera	Coloburscidae	Streamhorse, Mayfly	Highlands, Forest A, Forest B, Cleared Hills and Coastal plains

3.0 Results

3.1 physicochemical

The following table summarises results from co-ordinators across the ten regions. Pass rates were high for three of the parameters in both low range (A) and High range (B). The exception was the orthophosphate (P04) samples where co-ordinators performed poorly across both of the ranges. As can be seen in Figure 1 co-ordinator results in 2008 were similar to

those observed in 2007. The only exception was orthophosphate again, where pass rates were significantly lower when compared to the previous year.

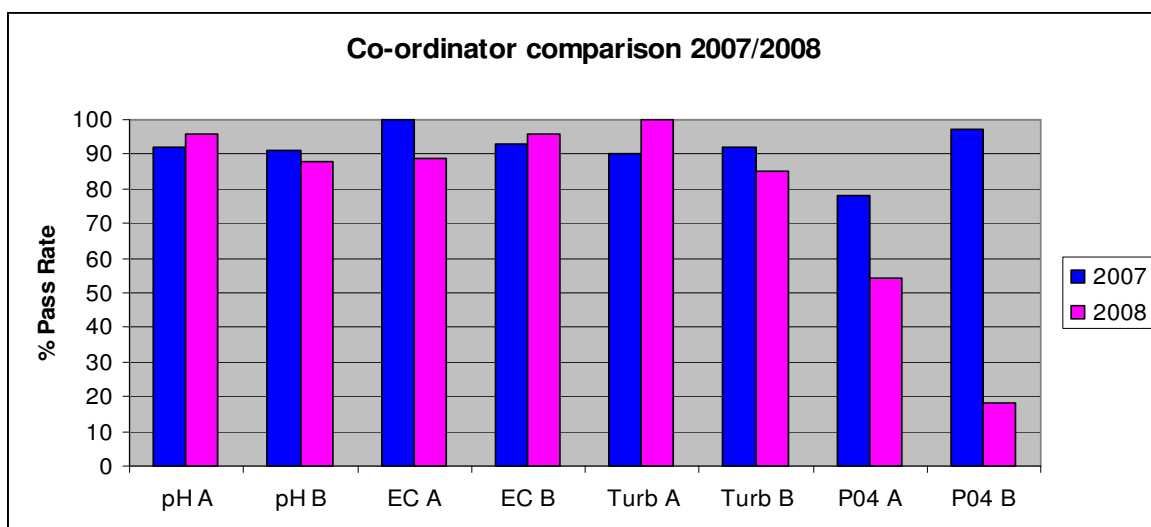
Table 4. Co-ordinator pass rates for physicochemical parameters.

Parameter	Sample	Number of results (n)	Pass Rate %	2007 Pass Rate %
pH (pH units)	A	23	96	92
	B	22	86	91
EC ($\mu\text{S}/\text{cm}$)	A	27	89	100
	B	22	96	93
Turbidity (NTU)	A	26	100	90
	B	19	85	92
Orthophosphate mg/L	A	24	54	78
	B	11	18	97

It should be stressed that the pass rates for 2007 were based on allowing error rates of greater than 20%. This year they have been set at $\pm 20\%$ following the guidelines in the Waterwatch Victoria Data Confidence Framework. To achieve this level of accuracy using colour comparators, such as the Aquaquant and Visicolor, participants needed to match the colour almost exactly. A shade lighter or darker on the colour wheel would have given a result greater than 20 percent outside of the true value and thus a fail. Without this level of accuracy the data can not be used to determine rough trends in water quality.

A quick analysis of the 2008 data using the 2007 acceptable error rates was conducted to make a more realistic comparison between the two years. Results for the low range samples were found to be similar while the 2008 high range results were significantly lower when compared to those of 2007.

Figure 1. Comparison of Co-ordinator pass rates between 2007 and 2008.



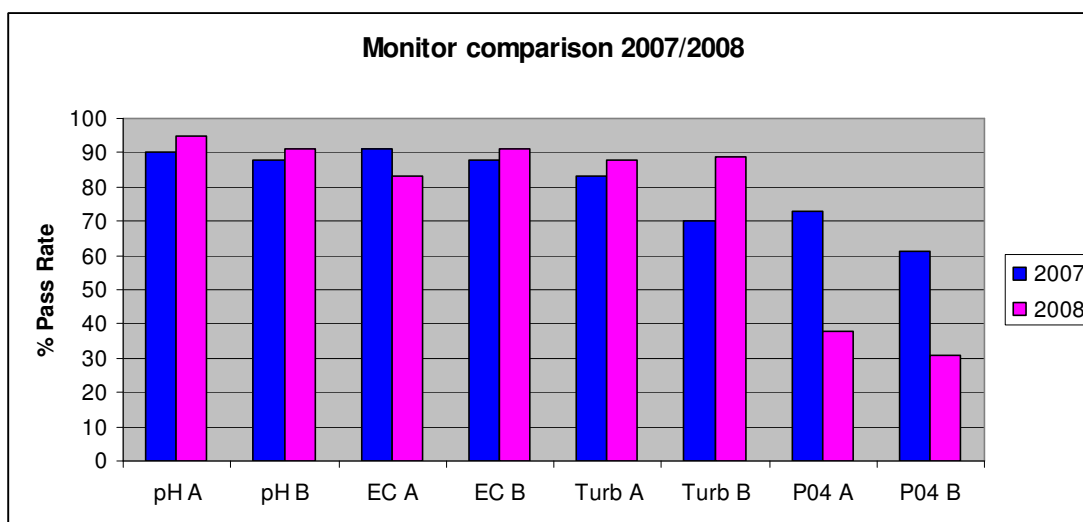
Results for the monitors are summarised in Table 5 below. Once again pass rates are generally quite high (>80%) with the exception being orthophosphate.

Table 5. Monitor pass rates for physicochemical parameters.

Parameter	Sample	Number of results (n)	Pass Rate %	2007 Pass Rate %
pH (pH units)	A	243	95	90
	B	246	91	88
EC ($\mu\text{S}/\text{cm}$)	A	303	83	91
	B	246	91	88
Turbidity (NTU)	A	275	88	83
	B	157	89	70
Orthophosphate mg/L	A	263	38	73
	B	52	31	61

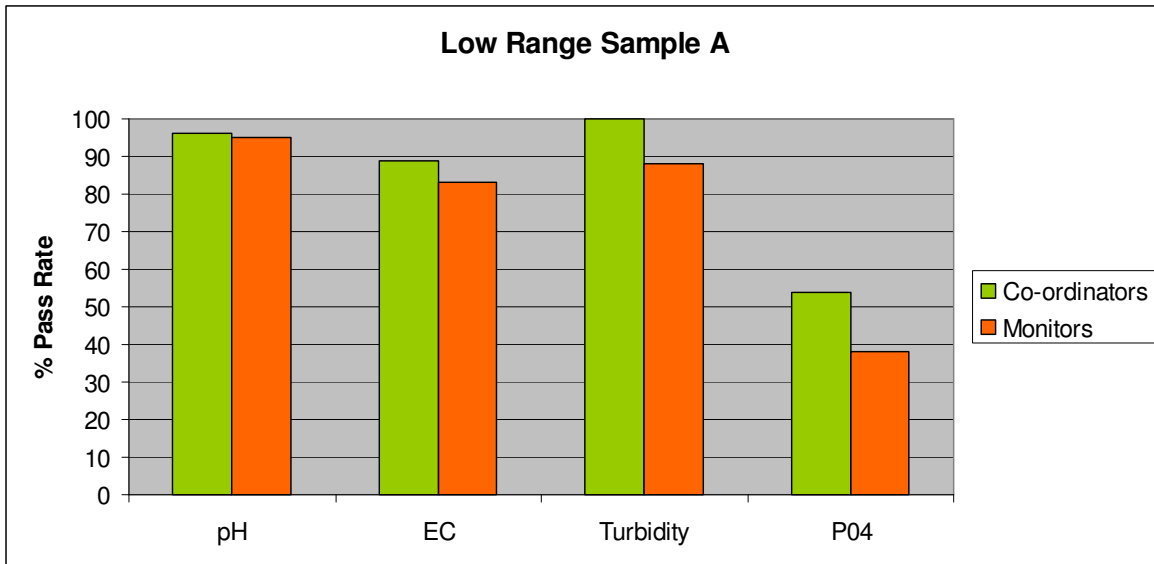
The comparison between pass rates in 2007 and 2008 suggests that monitors improved their accuracy across the pH and Turbidity parameters. Results for EC A were marginally lower while results in both orthophosphate ranges were again significantly lower. (If the P04 pass limits are expanded to equal those used in 2007 then monitor results have marginally improved in 2008).

Figure 2. Comparison of monitor pass rates between 2007 and 2008.



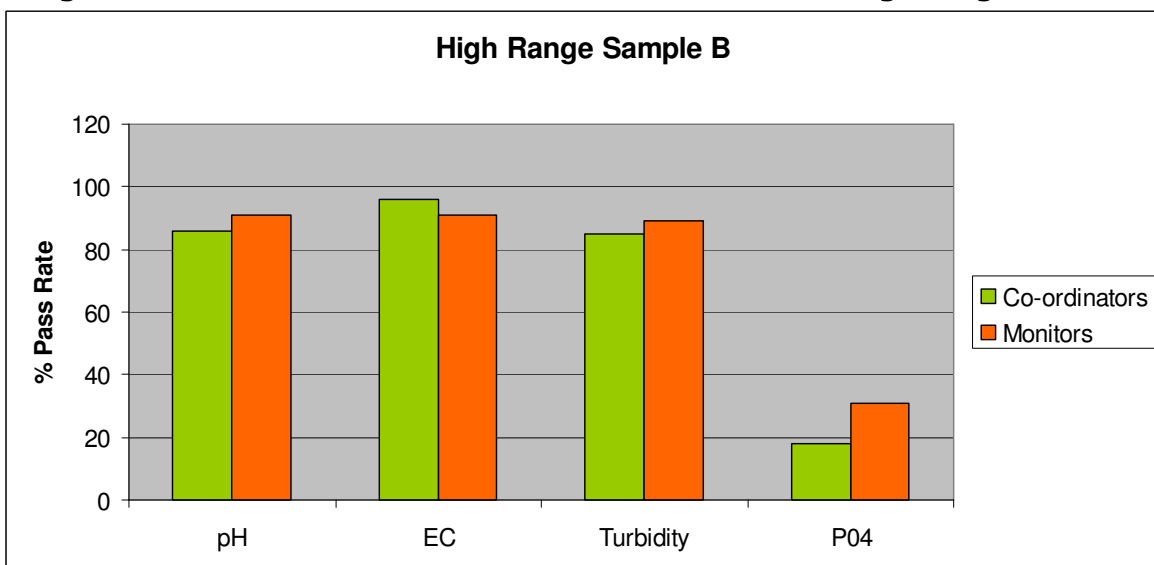
A comparison between the performance of the co-ordinators and that of the monitors, in 2008, is provided in figures 2 and 3. Across the low range (A) parameters co-ordinators achieved higher pass rates than the monitors, except for pH where they were both equal.

Figure 3. Pass rates for co-ordinators and monitors – Low range



Through the high range parameters (B) both groups had similar pass rates with the exception been orthophosphate where the monitors actually performed better than the co-ordinators.

Figure 4. Pass rates for co-ordinators and monitors – High range



3.2 Macroinvertebrates

20 co-ordinators and 39 monitors attempted to identify the macroinvertebrate 'Mystery samples'. Bugs were identified by eye, hand lens or microscope using a variety of macroinvertebrate keys and picture books. All of the co-ordinators and approximately half of the monitors attempted to identify the bugs at family level. Pass rates were generally quite good with the co-ordinators having a higher overall pass rate than the monitors.

Table 6. Family level pass rates for macroinvertebrates

Position	Notonectidae	Dytiscidae	Leptoceridae	Simuliidae	Gripopterygidae	Coloburiscidae
Co-ordinators	80	75	90	95	95	70
Monitors	79	88	71	86	85	61

Table 7. Common misidentifications at family level

Macroinvertebrate	Common Mistakes
Notonectidae	Corixidae, Gyrinidae
Dytiscidae	Hydrophildae, Haliplidae, Elmidae
Leptoceridae	Helicophidae, Calamoceratidae
Simuliidae	Psychodidae
Gripopterygidae	Eusthenidae, Notonemouridae
Coloburiscidae	Leptophlebiae, Baetidae

Identification of macroinvertebrates at family level can be difficult. There are a number of ways individual regions can improve their identification accuracy if they wish to, including; purchasing stereo microscopes, obtaining appropriate family level keys and participating in macroinvertebrate training seminars.

4.0 Outstanding Performers – in the field of excellence

The following table is a list of all the participants who attempted six or more of the phys-chem samples and achieved a 100% pass rate.

Table 8. Participants who achieved a 100% pass rate for phys-chem

REGION	CODE	POSITION	STANDARD	SAMPLES MEASURED
Corangamite	165	co-ordinator	3	7
Corangamite	167	co-ordinator	3	6
Corangamite	105	Monitor	3	6
Corangamite	112	Monitor	3	6
Corangamite	113	Monitor	3	6
Corangamite	114	Monitor	3	6
Corangamite	117	Monitor	3	6
Corangamite	123	Monitor	3	6
Corangamite	126	Monitor	3	6
Corangamite	128	Monitor	3	6
Corangamite	147	Monitor	3	6
Corangamite	148	Monitor	3	6
Corangamite	154	Monitor	3	6
Corangamite	162	Monitor	3	6
Corangamite	163	Monitor	3	6
East Gippsland	204	monitor	3	8
Glenelg Hopkins	422	monitor	3	8
Glenelg Hopkins	439	monitor	3	7
Glenelg Hopkins	439	monitor	3	6
Glenelg Hopkins	440	monitor	3	7
Glenelg Hopkins	441	monitor	3	6
Glenelg Hopkins	468	monitor	3	8
Goulburn broken	505	co-ordinator	4	6
Goulburn broken	595	co-ordinator	4	6
Goulburn broken	536	monitor	3	6
Goulburn broken	537	monitor	3	6
Goulburn broken	539	monitor	3	6
Goulburn broken	586	monitor	4	6
North East	810	Monitor	3	8
Port Phillip	9mp01	monitor	3	6
Port Phillip	9mp03	monitor	2	6
Port Phillip	9mp05	monitor	2	6
Port Phillip	9tg02	monitor		7
Port Phillip	9tg05	monitor		7
Port Phillip	9tg13	monitor		7
Port Phillip	9tg14	monitor		7
Wimmera	100402	monitor	3	6
Wimmera	100403	monitor	3	6
Wimmera	100404	monitor	3	6
Wimmera	100409	monitor	3	7

The table below lists all the participants who correctly identified the Order, Family and common names of all six macroinvertebrates.

Table 9. Participants with a 100% pass rate for macroinvertebrates

Region	Code	Position
Corangamite	165	co-ordinator
Corangamite	166	co-ordinator
Corangamite	167	co-ordinator
Corangamite	117	monitor
Corangamite	118	monitor
Corangamite	121	monitor
Corangamite	126	monitor
Goulburn Broken	511	co-ordinator
Goulburn Broken	517	monitor
Mallee	601	co-ordinator
Mallee	602	co-ordinator
Mallee	616	monitor
North East	801	co-ordinator
North East	802	co-ordinator
PPWP	9gw3	co-ordinator
PPWP	9jv13	monitor
PPWP	9tg11	monitor
Wimmera	10100	co-ordinator

5.0 Conclusion

The annual QA/QC Week, which is conducted across the state, is just one quality control check provided by Waterwatch Victoria to support volunteer monitors and co-ordinators. This year over 400 data sheets for phys-chem and 70 data sheets for macroinvertebrates were received for analysis. Pass rates for samples were generally high with the exception being the orthophosphate parameter. A comparison between the 2007 and 2008 results revealed that overall the pass rates are approximately the same for the two years.

Several issues relating to the use of equipment were discovered when processing the data from QA/QC Week 2008. A number of level 3 and 4 participants were using pH strips instead of pH meters to determine this parameter. Many level 4 co-ordinators and monitors were also using turbidity tubes and colour comparators when according to the Data Framework they should have been using turbidity meters and colorimeters. It is suggested that if these participants were to use the appropriate equipment (which is more accurate when used correctly) many of their pass rates would improve.

Appendix 1: Data

Raw data from qa/qc Week 2008 can be accessed in excel spreadsheet format upon request from Waterwatch Victoria