WATERWATCH North East

Communities Caring for Catchments

NORTH EAST CATCHMENT MANAGEMENT AUTHORITY

North East Waterwatch Program

Data Confidence Plan

Date: 09/06/2009

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1) Waterwatch in the North East Region

1.1) Introduction to the North East Catchment

Victoria's north east is rich in natural assets; snow topped mountains, river valleys, open plains and natural forests.

The North East catchment region encompasses an area of 1,957,000 hectares, including three major catchments: the Upper Murray, Kiewa and Ovens. The North East is bounded by the Murray River in the North, the Victorian Alps in the South, the NSW border in the East and Warby Ranges in the West. It includes the municipalities of Wodonga, Indigo, Wangaratta, Alpine, Towong and parts of Moira and East Gippsland.

About 61% of the North East consists of public land encompassing over 200 reserves including National Parks, Wilderness Parks and Historic Reserves, with privately owned land contributing the remaining 39%.

The North East region provides a vital role in providing water resources for South Eastern Australia. Despite the regions size (only 2% of the geographic area of the Murray-Darling Basin) it contributes 38% of total water to the Murray-Darling Basin system.

At various times throughout the year water quality monitoring is limited due to variable and seasonal flows as well as hazards associated with access.

The bushfires that occurred in the North East catchment in the summer of 2002/03, 2005/06 and 2009 coincided with one of the largest droughts on record. The effects of the bushfires in the short term (months) are quite different to those in the long term (decades). Both will have significant impacts on the quantity of flow in streams and rivers, the quality of those flows, and the follow-on effects for water supply and the environment.

1.2) North East Waterwatch - Overview

The North East Waterwatch program has operated in the North East community since 1998 and has been successful in attracting schools, individuals and groups to monitor local waterways to learn about water quality issues. Individual volunteers and community groups such as Landcare groups are increasingly becoming involved in the program. Approximately there are currently 55 registered volunteers with numbers increasing. Since 1998, North East Waterwatch in association with monitors and schools have monitored water quality at 363 sites around the region, an additional 7 sites are monitored through the ISC (Index of Stream Condition) project on a monthly basis.

The North East Waterwatch Program is currently staffed by 1 Regional Waterwatch Team Leader (0.4 FTE), 1 full-time Community Liaison Waterwatch Facilitator (1 FTE), and 1 part-time Waterwatch Community Liaison Waterwatch Facilitator (0.4 FTE), all based at the Wodonga office of the North East Catchment Management Authority (CMA).

Waterwatch is an important player in building links between a range of regional and local organisations including the Catchment Management Authority, North East Water, Department of Sustainability & Environments, Department of Primary Industries, local government, private business, the scientific community and the education sector.

1.3) Overarching Strategies

The North East Waterwatch Program is written into the following CMA planning frameworks and strategies:

North East Regional Waterwatch Strategic Plan

North East Regional Catchment Strategy

Upper North East Water Quality Strategy
- Strategy Program 2 - Community Education
- Strategy Program 12 - Monitoring, Evaluation and Reporting

Ovens Basin Water Quality Strategy
- Strategy Program 7.2 - Community Awareness Program,
  Action 2.3 - Waterwatch Program
- Strategy Program 11.6 - Monitoring Program
  Action 11.6 - Encourage Agencies or the Waterwatch Program to fill gaps in the Monitoring Network.

North East Regional River Health Strategy
- 8. Links to Other Organisations
- 9. Cost Sharing - 9.3 State Resources
- 10. Monitoring and Evaluation
- 11. North East Regional River Health Strategy Community Engagement Process

1.4) Waterwatch Monitoring Program

With an increase in public awareness of land degradation, water harvesting and storage, and their impacts on our local waterways, there has been a corresponding participation in water monitoring and local action to protect local environments.

The North East Waterwatch Program fills a valuable niche – it is the only monitoring program in the region actively engaging a broad sector of the community in water quality and catchment health issues. Other North East water monitoring groups include the Department of Sustainability and Environments, Department of Primary Industries, North East Catchment Management Authority, North East Water, EPA, Murray Darling Freshwater Research Centre, Goulburn Murray Water, and the Murray-Darling Basin Commission.

Another benefit of the Waterwatch program is that it's available to interested individuals of any age, and is a cost effective way of educating and encouraging informed, local decision making about water quality issues in the North East by the community.

Water quality monitoring is performed on many of the diverse water systems found in the North East region. The nature of the data collected is dependent upon the water quality issues relevant to that area and/or water type. Traditionally monitoring is undertaken on the following water systems:

- Rivers
- Creeks
- Wetlands
- Lakes
- Dams
- Bores, and
- Springs.

Much of the monthly and seasonal monitoring that is being undertaken by the North East Community Waterwatch network is in areas where there is very little, if any, baseline data of the waterway. The data collected by the volunteer Waterwatch network therefore is vitally important in trying to bridge some of these regional information 'gaps'.

Monthly monitoring is encouraged so that we can compare results against the EPA State Environmental Protection Policy (WoV) guidelines which require 11 months of consecutive collected data.

The water quality data collected is stored on the regional WVA database (Waterwatch Victoria Application). Each annual year of monitoring reports are provided to all monitors who have monitored 11 times in a 12 month period. Groups are encouraged to share this data and to use it to help determine on-ground actions that may lead to improvements in water quality. Waterwatch also distributes reports to relevant stakeholders.

2) Purpose of this document

The North East Waterwatch program aims to collect meaningful water quality data of a known and recognised quality that can be used by the Catchment Management Authority, Water Authorities and other individuals, groups and organisations as an adaptive management tool – to flag areas of concern and areas requiring more detailed investigation. Spatial and temporal representativeness is therefore important to maximise the opportunity to understand variation across the catchment as well as over time.

This Data Confidence Plan aims to help monitoring groups to develop an effective monitoring program to ensure the data they collect is of a known quality and reliability.

2.1) North East Waterwatch Data Confidence Plan Objectives:

All facets of data collection including training, sampling and analysis, data management, and storage are covered in this data confidence plan to ensure a known level of data confidence.

It is very difficult to interpret and use data when you are unsure of its quality and reliability. For example, results that suggest the presence of water pollution may be the result of dirty sampling equipment or poor technique. The use of data by monitors, the Catchment Management Authority and other organisations, as well as the publication of data in the media, demands that Waterwatch data must have a known level of confidence to be effective and credible.

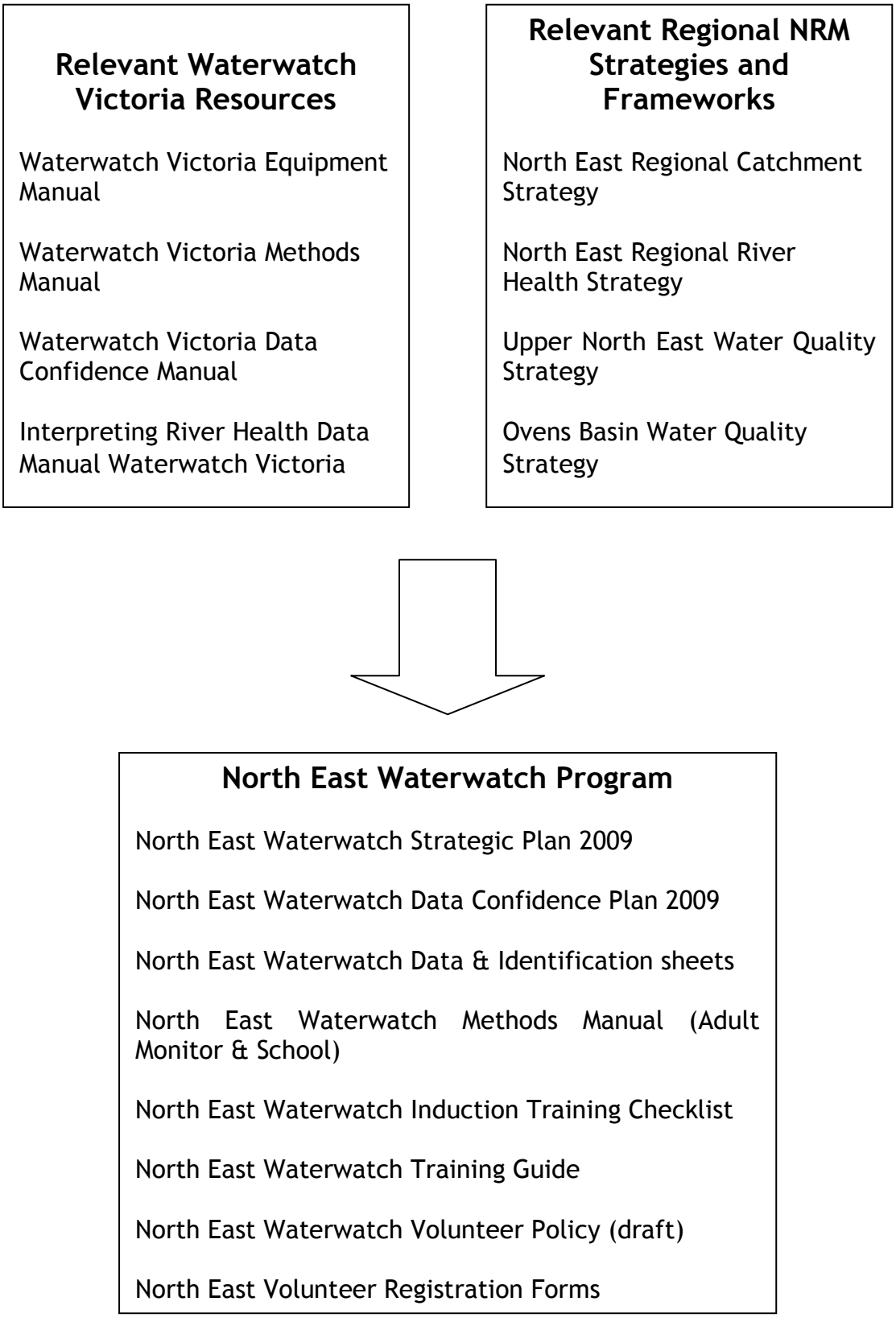
The North East data confidence plan aims to:

- Identify contamination of samples, poor practices, faults with training, and failure of equipment.
- Produce data of known integrity, which will increase its value to all users.
- Demonstrate data quality of a known integrity to program stakeholders (sponsors, NECMA, local government, Landcare groups & water authorities).
- Monitors will know that their efforts are not being wasted and will gain confidence in their results.
- Provide training opportunities to monitors to ensure a high standard competence in water testing.
- Assess the condition of North East waterways, which will create a baseline water quality database for future reference.
- Establish a comprehensive database from which to analyse trends in water quality.
- Identify areas where water quality can be improved and ways in which this can be achieved.
- Increase the representative of spatial/temporal data in the North East region.

2.2) Data Confidence System

The objectives and direction of monitoring within the North East Waterwatch program is driven by a number of local, regional and state-wide frameworks, strategies and resources. The diagram below outlines the range of inputs that influence the Waterwatch program and data confidence in the North East region.

Figure 1. North East Waterwatch Strategies & Framework influences



3) Roles & Responsibilities

The following table lists all current North East Waterwatch key personnel and their responsibilities in relation to data confidence.

Table 1. Personnel Roles & Responsibilities

Name	Position Title
Veronica Lanigan	Manager - Water Programs - CMA Wodonga
Peter Sacco	River Health Operations Manager – CMA Wodonga
Chris McManus	Water Quality Officer - CMA Wodonga
Toni Costello	Regional Waterwatch Coordinator – CMA Wodonga
Carolyn Humby	Community Liaison / Waterwatch Facilitator - CMA Wodonga (Schools)
Emma Nilsson	Community Liaison / Waterwatch Facilitator - CMA Wodonga (Adult Monitors)

3.1) Manager - Water Programs Responsibilities

The Manager of Water Programs is responsible in ensuring the program is strategically placed in the region, and meeting the needs of the North East CMA.

3.2) Manager - River Health Operations Responibilities

The River Health Operations Manager is responsible in overseeing the management of the Waterwatch program, ensuring the program is delivering program outcomes.

3.3) Water Quality Officer Responsibilities

The Water Quality Officer prioritises environmentally significant and strategic sites, and provides technical support as required.

3.4) Regional Waterwatch Team Leader Responsibilities

The Regional Waterwatch Coordinator is responsible for the above duties as well as:

- Review the regional Data Confidence Plan and local documentation with Waterwatch Facilitators to ensure that on-ground monitoring activities are accurately documented and reflected.
- Identify training opportunities for Waterwatch staff.
- Ensure Waterwatch data is being collected in a manner consistent with broader regional monitoring objectives and strategies.
- Integrate Waterwatch activities into other CMA activities.
- Purchase equipment stock and maintain a log of equipment and identification numbers.
- Facilitate training and the North East Induction Program for new staff members and water quality monitors.

3.5) Community Liaison/ Waterwatch Facilitator Responsibilities

The Waterwatch Facilitators are responsible for the on-ground implementation of the Waterwatch Program. Their role includes:

- Training and retraining of volunteers in field sampling and monitoring, calibration and regular equipment maintenance.
- Initiate contact with schools, community groups (Landcare, Friends groups, farming groups etc) and individual landowners to promote involvement in the Waterwatch program.
- Design and deliver educational materials to support schools, educate the community on river health and provide information on CMA water programs.
- Maintenance of North East Waterwatch monitoring equipment (serial numbers, routine cleaning, servicing, repairs, calibration), and stock (calibration solutions, reagents).
- Maintenance of quality control logs.
- Support volunteers to develop and refer to monitoring plans.
- Maintenance of volunteer records, including contact and training information.
- Validation and maintenance of water quality data on the regional Waterwatch database.
- Ensuring Waterwatch database (WVA & Watchman) are kept up-to-date with volunteer details, monitoring results and community engagement activities.
- Coordination and supervision of specialised activities including snapshot events, and local projects.
- Stock take of equipment.
- Preparation of reports (data interpretation, project management, school reports, meeting minutes, newsletter articles etc.)
- Facilitate QA/QC week and prepare relevant reports to distribute to stakeholders.
- Publish data reports for stakeholders and relevant stakeholders.

4) Parameters Monitored

The following water quality parameters are monitored within the North East Waterwatch Program:

Table 2. Water Quality Parameters Monitored

Test	What it measures
Turbidity	Clarity of the water
Water Temperature	The temperature of the water
Ammonia	Measures the presence of NH3
pH	Acidity or alkalinity level of the water
Electrical Conductivity	Salinity level of the water
Dissolved Oxygen	Oxygen concentration in the water
E.Coli	Presence of E.Coli
Total Phosphorous	Total phosphates in the water
Reactive Phosphorus	Soluble phosphates in the water
Macro-invertebrates	Biological indicator of cumulative river health
Habitat Surveys	Survey streamside habitat
Nitrate	Amount of NO2
Nitrite	Amount of NO3

Habitat surveys are most often completed at the commencement of monitoring a new site.
Not all sites are monitored for all of the above parameters, and frequencies vary.

5) Instrumentation

All water quality monitoring equipment used by the North East Waterwatch network is assessed yearly to ensure that it remains in fine working condition. Most of the equipment is less than five years old.

Serial numbers, purchase dates, expiry dates and warranties are recorded for each item of equipment and stored on the 'North East Waterwatch Equipment' database and 'Watchman' at the Wodonga CMA office. Expiry dates are checked yearly. Each item of equipment is allocated an alpha-numerical code which uniquely identifies that piece of equipment within the North East Waterwatch program, e.g. ECmeter2. The letters denote the type of equipment and the numbers give the piece of equipment a unique identifier. All equipment used by Waterwatch staff and/or volunteers is noted in the database.

Table 3.Instrumentation

Parameter	Equipment type & model	Units of measurement	Range	Resolution	Accuracy	Distributor contact details
Turbidity	Waterwatch Turbidity Tube	Tube NTU's	<10-400 NTU	Variable increments along length of tube.	NTU scale on side of tube used as an approximation of true NTU measurement only.	Waterwatch Victoria DSE 1/250 Victoria Parade East Melbourne VIC 3002 Ph: 03 9412 4072
	Turbidity Meter					
Water Temperature	T268 Digital Thermometer	°C	-10-200°C	0.1°C	0.4°C	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech Multiparameter tester PC35	°C	0-50 °C	0.1°C	0.5°C	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Insite IG Model 3100 portable DO Analyzer	°C	0-60°C	0.1°C	Not specified	Enviroequip 13a Rocklea Drive Port Melbourne VIC 3206 Ph: 03 96464190

	pH Hanna meter HI 98127	°C	-5.0 to 60.0°C	0.1°C	± 0.5°C	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech ECScan meter (dual range)	°C	0.0 to 50°C	0.1 ℃	± 0.5°C	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech EcoScan DO 6	°C	0.0 to 100.0 ℃	0.1 ℃ & ± 0.3 ℃	0.1 ℃ & ± 0.3 ℃	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
pH	Indicator Sticks pH-FIX	pH units	0-14 pH units	Not specified	Not specified	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	pH Hanna meter HI 98127	pH units	-2.0 to 16.0pH	0.1 pH	± 0.1 pH	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech Multiparameter tester PC35	pH units	0 – 14 pH units	0.1 Ph	0.1 pH	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
Electrical Conductivity	Eutech ECScan Meter (low)	µs/cm	0-1990 µS/cm	10 µs	± 2% Full Scale	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech ECScan Meter (high)	ms/cm	0-19.90 mS/cm	0.10 ms	± 2% Full Scale	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech ECScan meter (dual range)	µs/cm ms/cm	0 to 2000 µS/cm 0 to 20.00 mS/cm	10 µS/cm 0.10 mS/cm	± 1% of Full scale	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	Eutech Multiparameter tester PC35	µs/cm ms/cm	0 TO 1999 µS/cm 2.00 TO 20.00 mS/cm	1 µS/cm 0.01 mS/cm	± 1% of Full scale	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101

Dissolved Oxygen	LaMotte Dissolved Oxygen Test Kit Code: 5856	ppm mg/L	0 to 10ppm	n/a	n/a	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139
	Insite IG Model 3100 portable DO meter	ppm mg/L % of saturation	0 to 25 ppm	0 to 3.99ppm: 0.01ppm 4.0 to 20.0ppm:0.1ppm	1% of reading or 0.02ppm (the greater of)	Enviroequip 13a Rocklea Drive Port Melbourne VIC 3206 Ph: 03 96464190
	Eutech EcoScan DO 6	ppm mg/L % of saturation	0 to 20 mg/l or ppm	0.01 mg/l 0.01 ppm ±1.5% Full Scale	0.1% & ±1.5% Full Scale	Enviroequip 13a Rocklea Drive Port Melbourne VIC 3206 Ph: 03 96464190
	LaMotte Smart 2 Colorimeter	mg/L	-2 to + 2AU	Determined by reagent system	± 0.005AU to 1.0AU	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139
Reactive Phosphorus	VISOCOLOR® HE Phosphate (DEV)Colorimetric test kits	mg/L PO4-P	0-0.25 mg/L (not diluted)	0.00 - 0.01 - 0.02 - 0.03 - 0.05 - 0.07 - 0.10 - .15-0.20-0.25 mg/l P	Not specified	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	LaMotte 1200 phosphorus colorimeter	mg/L	0 - 2.00 absorbance units	Determined by test factor	±0.001 Absorbance Unit	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139
	LaMotte Smart 2 Colorimeter	mg/L	-2 to + 2AU	Determined by reagent system	± 0.005AU to 1.0AU	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139
Ammonia	LaMotte Smart 2 Colorimeter	mg/L	-2 to + 2AU	Determined by reagent system	± 0.005AU to 1.0AU	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139

E.Coli	LaMotte ColiQuant EZ	Per 100ml	Dependent on sampling method			Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139
Nitrogen	Test Sticks QUANTOFIX® Nitrate/Nitrite	mg/l NO_2	Nitrate: 0 - 10 - 25 - 50 - 100 - 250 - 500 mg/l NO_2^- Nitrite: 0 - 1 - 5 - 10 - 20 - 40 - 80 mg/l NO_2^-	Not specified	Not specified	Westlab Supplies Pty Ltd PO Box 1680, Ballarat, Vic 3350 Ph: 1800 358 101
	LaMotte Smart 2 Colorimeter	mg/L	-2 to + 2AU	Determined by reagent system	± 0.005AU to 1.0AU	Vendart Pty Ltd 21 Hynds rd Box Hill NSW 2765 Ph: 02 96791139

6) Monitoring Plans

Developing a monitoring plan is a key component of the regional data confidence development process.

Volunteer water quality monitors, groups and organisations are interested in monitoring water bodies for a number of different reasons.

North East Catchment Management Authority:
In the case of the North East CMA it may be to establish a baseline for a waterway where conditions are not known or to determine the post benefits of works on waterways undertaken by the CMA.

Community Adult Monitors:
For a community member it may be to determine suitability for fishing or other particular uses such as drinking water, recreation, agriculture, or protection of aquatic ecosystems. Another purpose may be to assess the impacts of land uses and pollution sources.

Schools:
Many schools in the North East monitor for any of the above reasons as well as for educational purposes of getting to know their local aquatic ecosystem.

A good monitoring plan ensures that the right information gets collected, is credible and can be used to answer the questions the monitoring group is asking. For every new water quality monitor/group, a monitoring plan is designed and produced to provide both a guide and record of the decisions about the water quality study. The plan helps to choose the best monitoring tools for the task and defines the scale and complexity of the monitoring work.

The monitoring plans are built around the following questions:

1. Why are you monitoring?
2. Who will use your data?
3. How will the data be used?
4. What will you monitor?
5. What data quality do you want?
6. What methods will you use?
7. Where will you monitor?
8. When and how often will you monitor?
9. Who will be involved and how?
10. How will the data be managed and reported?
11. How will you ensure that your data is credible?

(Victorian Waterwatch Data Confidence Manual)

Whilst developing individual/group monitoring plans, the 'Overarching Strategies' in Section 1 of this report are consulted as well as the North East Waterwatch Strategic Plan 2009. This is to ensure that significant water quality issues within the strategies are included when appropriate.

An important question that is considered when planning to monitor is who will use the data. In general, if the data is to be used primarily for educational purposes (Standard 1&2), then the quality of the data is secondary to the process of collecting. However, if the data is to be collected for decision making or specific needs (Standard 3&4) of an organisation or group, then the data must be collected with a demonstrable level of quality.

The Waterwatch Coordinator and Facilitators offer support and assistance to monitoring individuals and groups throughout the entire process of planning, monitoring and reporting. Waterwatch retains the plans of every monitoring group in the North East Waterwatch Program. Group data confidence standards are documented on monitoring plans and are reviewed yearly. A copy of the Monitoring Plan template can be seen in Appendix 1.

7) Monitoring Sites

Waterwatch Adult Monitor Sites:
Monitoring sites in the North East have been selected mainly by community groups and individuals because of their interest or custodial connection with the site, as well as limited travel options and site accessibility. Waterwatch staff does assist with site selection, however the final decision is retained by the monitor/s.

North East Catchment Management Authority Works on Waterways Sites:
North East Waterwatch also works with the Catchment Management Authority's River Health Operations field crew through monitoring pre and post works sites to determine the benefits of works on waterways (i.e. willow removal). This type of monitoring will soon be an integral part of the North East Waterwatch program where we will be monitoring a selection of priority sites for the CMA on a frequent basis.

Index of Stream Condition Sites – Trial Project 2009:
North East Waterwatch in partnership with DSE and Waterwatch Victoria have a selection of adult volunteers monitoring 7 Index of Stream Condition sites around the North East. This is currently a trial project for 2009, with the possibility of extension.

All sites are allocated an alpha-numerical site code which uniquely idendifies the site within the North East Catchment, e.g. KIE035. The first three letters of the code refers to the name of the water body, in this case the Kiewa River is KIE. Site numbers are based on the sites location in the basin with 000 located in the headwaters and 999 at the mouth/junction of the stream. For example, a site midway along the Kiewa River would be coded KIE500.

In regards to lakes and wetlands the first three letters of the code refer to the name of the lake or wetland and the three numbers refer to the location of the site within the basin, using the same headwater – mouth numbering system above. For bores the first three letters are BOR and for springs, SPR. The three numbers are then sequential starting from 001-999. The numbers are not representative of the position in the catchment.

All sites are listed in the Waterwatch Regional Database (including active and inactive sites), and new site codes are generated by the Waterwatch Coordinator or Facilitator each time a new site is added to the database.

All sites have been logged through the use of a GPS (Global Positioning System) (GDA94). Easting and Northing grid coordinates are provided for each site, along with a site description and habitat assessment. A complete side code list can be exported from the database on request. A GPS was first used to log North East sites in 2003.

8) Regional Data Confidence Framework

Waterwatch Victoria uses a state Data Confidence framework which identifies minimum data confidence standards for a range of monitoring purposes. Consistent with this document, North East Waterwatch has identified where local Waterwatch monitoring groups fit within this framework. Group standards are identified through discussions between the Waterwatch Coordinator and Facilitators. The Waterwatch Facilitator (Adult Volunteers) maintains a complete list of local group's standards. Group standards are also documented in each group's monitoring plan.

Each monitor is given one of four different data confidence classifications, from Standard 1 to Standard 4. Deciding the data confidence standard of new and existing groups depends on five factors:

- Monitoring frequency
- Training
- Quality controls (QA/QC)
- Methodology
- Equipment used

The standard a monitoring group is classified helps decide how the data will be managed, who will use the data and how it will be used.

The framework and guidelines were developed to ensure that water quality data collected by Waterwatch groups is recognised, valued and utilised to the greatest degree possible.

8.1) Standard 1

Current North East Monitoring Groups:

- Primary Schools
- Secondary Schools

Training:

- Participants attend a single educational water quality monitoring session and will perform one or more of the water quality tests.
- Teachers are shown best practice monitoring techniques and are taught what some of the different water quality parameters are, and how they link with environmental condition.

Quality Control:

- Minimal or no supervision on monitoring quality for each participant. No QA/QC checks are used.

Prior Exposure to Waterwatch:

- There is little, if any, prior exposure to the equipment used to monitor water quality.

Monitoring Frequency:

- This monitoring can be a one off for awareness and educational purposes. The group does not need to continue monitoring on a regular basis.

Data Collected:

- The data collected is stored on the Regional Waterwatch Database and is tagged as not 'Quality Assured' results. The information is used for interest only and not used externally for decision making purposes.

Parameters Measured:

- Turbidity
- Reactive Phosphates
- Electrical Conductivity
- pH
- Temperature
- Dissolved Oxygen
- Physical Habitat
- Macroinvertebrates

Recommended Equipment:

pH strips, EC meter, Broad scale DO colour comparators, Presence/absence colour comparators, Turbidity tube (NTU's), Thermometer, Presence/absence Ortho-phosphate test kit.

8.2) Standard 2

Current North East Monitoring Groups:

- Primary Schools
- Secondary Schools
- GreenCorp Groups
- Landcare Groups
- Adult Volunteers

Training:

- Participants will be trained by a Waterwatch Coordinator/Facilitator on correct QA/QC procedures.
- A refresher training course is provided annually.

Quality Control:

- Participants are tested throughout training to ensure their monitoring technique is correct.

Prior Exposure to Waterwatch:

- Participants may not have prior exposure to Waterwatch.

Monitoring Frequency:

- Can range from fortnightly to yearly.

Data Collected:

The data collected is stored on the Regional Waterwatch Database and will not be flagged as 'Quality Assured' data. This data could be used to form long-term water quality trends over time, and will also be used to identify problem areas requiring additional follow-up monitoring by a Standard 3 or 4 monitor.

Parameters Measured:

- Turbidity
- Phosphates
- Electrical Conductivity
- pH
- Temperature
- Dissolved Oxygen
- Physical Habitat
- Streamside
- Macro-invertebrates
- Flow

Recommended Equipment:

pH strips and/or pH meters, EC meter (measuring specific conductance at 25℃), DO colour comparators, Turbidity tube (NTU), Thermometer (may be a function of pH, EC or DO meter), Phosphate colour comparators.

8.3) Standard 3

Current North East Monitoring Groups:

- Tertiary Students
- Landcare Groups
- Adult Volunteers
- Waterwatch Coordinators/Facilitators

Training:

- Participants will be trained by a Waterwatch Coordinator/Facilitator on correct QA/QC procedures.
- A refresher training course is provided annually.
- Participants will be in close contact with Waterwatch Staff.

Quality Control:

- Participants will be observed throughout all training to ensure their monitoring technique is correct.
- Participants will be responsible for the calibration and maintenance of their instruments prior to testing.
- Participants will participate in yearly QA/QC tests.

Prior Exposure to Waterwatch:

- Participants may not have prior exposure to Waterwatch.

Monitoring Frequency:

- Can range from monthly to quarterly.

Data Collected:

The data collected is stored on the Regional Waterwatch Database and will also be stored on the State Data Warehouse. This data can be compared against data collected by external Agencies (where sites are the same), to ensure data is accurate and credible.

Parameters Measured:

• Turbidity	Temperature
• Phosphates	Dissolved Oxygen
• EC	Physical Habitat
• Macroinvertebrates	Nitrate/Nitrites
• pH	E.Coli
• Ammonia	Flow

Recommended Equipment:

pH meter (internal thermometer recommended), EC meter (measuring specific conductance at 25°C), DO colour comparators/DO modified Winkler Titration/DO meter, Turbidity meter (NTU's preferred) or tube (tube NTU's), Thermometer (may be function of pH, EC or DO meter), Phosphate colour comparators – Instream ranges appropriate for in-stream measurement.

8.4) Standard 4

Current North East Monitoring Groups:

- Landcare Groups
- Waterwatch Volunteers
- Waterwatch Coordinators and/or Facilitators

Training:

- Participants will be very well trained by Waterwatch Staff.
- Extra QA/QC training is provided.
- Will participate in refresher training courses at least annually or as often as they are offered.
- Participants will be in close contact with Waterwatch Staff.

Quality Control:

- Participants are observed throughout training to ensure their monitoring technique is correct.
- Participants will undertake regular calibration on equipment and maintain appropriate record keeping.
- Participants will participate in yearly statewide and regional QA/QC proficiency tests.

Prior Exposure to Waterwatch:

- Participants will have prior exposure to Waterwatch.

Monitoring Frequency:

- Minimal monthly.

Data Collected:

The data collected is stored on the Regional Waterwatch Database and will also be stored on the State Data Warehouse. This data will be offered to internal and external organisations wishing to access the information. This data will be scientifically credible, comparable against other Agency collected data, and where required it can be used to make important managerial decisions.

Parameters Measured:

- Turbidity
- Electrical Conductivity
- Temperature
- Physical Habitat
- Flow

Reactive phosphorus
pH
Dissolved Oxygen
Macro-invertebrates

Recommended Equipment:

pH meter (with internal thermometer), EC meter (measuring conductance at 25°C), DO meter (temperature, salinity and altitude correction), Winkler titration (APHA 1992 methodology), Nephelometric turbidity meter (NTU only, in accordance with APHA 1992).

9) Standard Operating Procedures

Waterwatch Victoria developed a state Data Confidence framework, identifying minimum data confidence standards for a range of monitoring purposes.

Standard Operating Procedures are contained within the Adult and School Waterwatch Monitoring manual for each type of monitoring instrument used by the North East Waterwatch program. These manuals describe the specific steps and processes of establishing, documenting, recording, maintaining and performing the water quality monitoring activities. These are described below as field procedures, calibration procedures, and equipment maintenance/repair and servicing procedures.

Please refer to the Appendices section of this Plan for the following Standard Operating Procedures:

- North East Waterwatch Training Guide – Appendix 3
- North East Waterwatch Methods Manual – Appendix 4
- Sample preservation – Appendix 4 (Methods Manual)
- Calibration of Equipment - Appendix 4 (Methods Manual)
- North East Waterwatch Staff Induction Checklist – Appendix 5

10) Quality Control (QA/QC) Mechanisms

There are many causes of error in water quality data including contamination, incorrect storage or transportation of samples, expiry of reagents and inaccurate recording of data. Quality Control (QC) procedures are specific steps taken during sample collection and analysis to flag problems with techniques allowing corrections to be made immediately. QC results also allow data users to ascribe a level of confidence to the data.

10.1) North East Field Procedures

The North East Waterwatch Monitoring Manual provides tuition on compulsory water quality monitoring activities required routinely at monitoring sites. These include:

- Calibration
- Sampling procedures
- Testing procedures
- Recording and checking transcriptions
- Cleaning and maintaining equipment condition.

The manual also explains each parameter and its relevance to freshwater environments in the North East region.

The North East Waterwatch Manual is provided to every monitoring group and individual as part of their induction and initial training.

Precision and accuracy tests on equipment and monitoring techniques are tested at annual refresher training days. Here, volunteers are further scrutinised to ensure their QA/QC standards remain appropriate.

10.2) Equipment Testing, Inspection and Maintenance Requirements.

It is expected that all Waterwatch equipment is maintained (as per Waterwatch Victorias QA/QC Guidelines manual) on a regular basis by Waterwatch staff and monitors. Before and after a Waterwatch monitoring session, Waterwatch staff are expected to check, calibrate, clean and service equipment when necessary.

At the start of each year all Waterwatch equipment is consolidated, tested, serviced, and replaced (if required). This ensures that equipment is in-date, maintained and in good working order. It also allows the Coordinator to keep track of any problems that may be occurring with certain brands/types of equipment, as well as observe any staff or monitor QA/QC issues.

Records of equipment (including expiry dates, purchase dates etc.) and service days are completed by Waterwatch and documented on the Equipment Maintenance and Servicing Log. The Logs are filed in the CMA office in Wodonga.

10.3) Instrument Calibration and Frequency

The following Waterwatch equipment is calibrated on a regular basis:

Eutech – Electrical Conductivity meter
Electrical Conductivity meters are to be calibrated on a fortnightly basis or before each use to ensure accuracy and minimise drift. The meters are calibrated to the standard that best suits the EC range of the samples tested in the North East Catchment.

- A 1-point calibration using standard solution of 1413 µS/cm is used for low EC meters;
- A 1- point calibration using 2760µS/cm is used for high EC meters;
- A 2-point calibration method using both 1413 µS/cm and 2760µS/cm for a dual range EC meter.

Standard solutions are stored in a cool, dark place in the Wodonga CMA storage shed and are replaced each year prior to Saltwatch and QA/QC week.

Hanna – pH meter
pH meters are to be calibrated on a fortnightly basis or before each use to ensure accuracy and minimise drift. The meters are calibrated to the standard that best suits the pH range of the samples tested in the North East Catchment.

pH meters are to be calibrated using a 2-point calibration method, using pH buffer 7 & 4 solutions.

LaMotte – Reactive Phosphorus Colorimeters
All phosphate colorimeters are tested annually using a calibration curve.

A working or calibration curve is a plot of an instrument's responsiveness to different analytical concentrations. Testing phosphate standards can demonstrate how well the colorimeter is operating over a broad range of values and identify issues for closer examination. This is an important quality control check for colorimeters that can't be manually calibrated.

11) Data Management and Reporting in the North East Region

Standard 1 and 2 data entered on the Regional Database system will be used only for educational purposes. Standard 3 and 4 data will be used in reporting and on the Waterwatch Regional Database (WVA).

The Waterwatch Coordinator or Facilitator enters data into the Regional Database. All hard record data sheets are signed and dated once the data has been entered. These sheets are then filed in the CMA office in Wodonga.

The Database application runs on the W:\Waterwatch/WVA_LAN drive of the server in the CMA office in Wodonga. The file that contains all of the data: WVA_Data(2003)NorthEast.mdb is saved to the network automatically after each use. The server is backed up each night at the CMA office in Wodonga.

All raw data can be exported from the Waterwatch database upon request. Data is interpreted and reported via a number of avenues across the North East region, including site annual reports and presentations.

11.1 Documentation Recording

A number of record logs are kept by Waterwatch staff to ensure calibrations and other equipment checks are documented. These logs include:

- EC meter Calibration Log (refer to section 12 and Methods Manual) Each monitor has an EC calibration log. This enables Waterwatch staff and volunteers to keep an eye on the performance of their individual EC meters. Logs are also assessed yearly by a Waterwatch staff member.

- pH meter Calibration Log (refer to section 12 and Methods Manual)
  Each monitor has an EC calibration log. This enables Waterwatch staff and volunteers to keep an eye on the performance of their individual EC meters. Logs are also assessed yearly by a Waterwatch staff member.

- Equipment Maintenance and Servicing Log (refer to Section 11 and Methods Manual)
  A yearly servicing and equipment check is carried out by Waterwatch staff of all equipment. Results such as expiry dates, purchase dates and servicing is documented in the Log and filed in the Wodonga CMA office.

- Instrument Identification Log (refer to Section 5)
  This log records Waterwatch equipment and identification numbers associated with each piece of equipment. It also identifies where the equipment and Waterwatch kits are located, expiry dates and purchase dates. This log is filed in the Waterwatch database Watchman.

11.2) Data Validation and Entry

Waterwatch Victoria uses an Access-based data management system for entering water quality data (Waterwatch Victoria Application). The program makes possible the electronic transfer of data. This Waterwatch Victoria Application database has a number of advanced data validation tools to minimise data transcription and/or entry error, as well as improved statistical analysis and reporting features.

From a quality control point of view, the database is able to identify any unusual data and also tag data according to its quality, as outlined in the Regional Data Confidence Framework.

Regionally, the following data validation steps are followed.

1. All monitors have North East Waterwatch field data record sheets which, when completed, a copy is forwarded to Waterwatch at the CMA in Wodonga by person, fax, mail or email.

2. Prior to data entry into the Regional Waterwatch Database. The validity of the data is assessed by a Waterwatch staff member using long-term data sets, together with local knowledge and local water monitoring experience. When data quality is questioned, monitors are encouraged to re-test or the data is not entered onto the database.

3. Each data record sheet is signed and dated by a Waterwatch Coordinator or Facilitator once entered into the WVA database.

4. A new data validation feature of the database is the use of soft limits. The database has a number of screening limits, called hard and soft limits. Hard limits reflect the maximum range of a parameter and are the same for all water types. Soft limits reflect the expected range of a parameter for a water system type in the North East region. Data that falls outside any of the limits without valid explanation will not be automatically accepted with other quality assured data. Data can be manually accepted despite falling outside soft limits, if the result is determined to be legitimate.

5. All monitors will be grouped according to their monitoring standard (Standard 1 and 2 data = 'not QAed', Standard 3 and 4 data = 'QAed') and a list of monitoring groups' standards will be drawn up and accessed by each Waterwatch staff member when entering data.

11.3) Data Reporting

All data is compared against the State Environmental Protection Policy (Waters of Victoria) Segments of Environmental Quality Objectives. This requires consecutive monthly monitoring for a minimum period of 11 months.

Adult monitors who have monitored on a monthly basis for a period of 11 months will receive a site data report from Waterwatch. This usually involves site visits to monitors to further provide data interpretation and discuss results triggered by the EPA SEPP (WoV)

guidelines. Furthermore Regional Councils, North East Catchment Management Authority & North East Water also receive relevant site data reports on an annual basis.

The North East Waterwatch Adult Monitors newsletter is produced quarterly which includes data reporting, event information and interpretation features.

All school groups who have signed up to a 12 month monitoring plan receive an annual report on the data collected.

Also the Waterwatch web pages on the North East CMA website (www.necma.vic.gov.au) have recently been updated to include yearly updates of data, technical and educational information and reports, as well as the newsletter, training days and events.

12) Personnel Training

12.1) Waterwatch Coordinator/Facilitator Training

All North East Waterwatch employees attend training workshops on Physical/ Chemical monitoring, biological Macroinvertebrate monitoring, and database management provided by the Victorian State Waterwatch team. Employees are also required to attend refresher courses at least every year, or on an as-needs basis.

New staff are also required to complete the North East Waterwatch Staff Induction Checklist (refer to Appendix 5 for program outline), which trains staff in localised practices, QA/QC procedures, risk management, roles and responsibilities.

Professional development opportunities through the CMA and other agencies have included First Aid, Index of Stream Condition, Program Evaluation Training, EPA AusRivers, Community Engagement and Certificate IV in Workplace Training and Assessment.

The frequency of staff training is assessed on a yearly basis in conjunction with the state training program and the current Waterwatch budget.

12.2) Waterwatch Monitor Training

The Waterwatch Community Liaison Facilitators train all prospective community monitors in a range of topics required to ensure that basic protocols are followed when collecting and testing water samples. The training is undertaken prior to the commencement of any Waterwatch monitoring program, irrespective of the level of monitoring being planned. A training checklist is located in Appendix 3.

A new monitor receives an induction training session before commencement of monitoring. If the monitor does not satisfy the training checklist then a follow-up training session will be necessary until the monitor is capable of undertaking Waterwatch monitoring stand-alone. If they do not satisfy the training checklist a second time, the trainer will not accept the person as a Standard 3 or 4 Waterwatch monitor.

Experienced monitors are encouraged to attend refresher training days which in many cases also include guest speakers or catering to offer an incentive to broaden the participant's knowledge of their local waterways as well as achieving educational goals. Refer to Table 4 for recommended training frequencies for trained monitors and Waterwatch staff.

Table 4. Recommended Training frequencies for monitors and staff.

	Refresher Training	QA/QC Training	QA/QC Testing
Trained Standard 3 or 4 Monitor	1 per year	1 per year	1 per year
WW Staff	1 per 2 years	1 per year	1 per year

13) Performance Evaluation and Review

Quality Assurance (QA) is an integrated system of activities to ensure that data meets defined standards. These activities include quality planning, control, assessment, reporting and improvement.
Quality Control (QC) is the system of activities whose purpose is to measure the quality of data.

The North East Waterwatch program will use a number of mechanisms to review the success of this Data Confidence Plan and its implementation. A number of regional and state QA/QC checks (both internal and external) will be used to assess the overall monitoring proficiency of the program.

13.1) Waterwatch QA/QC Week

Regional QA/QC events provide an opportunity to assess monitoring proficiencies, individual strengths and weaknesses and help identify follow up training requirements.

North East Waterwatch facilitates annual refresher training days for monitors that incorporates precision and accuracy tests on equipment and monitoring techniques to ensure their QA/QC standards remain suitable. Calibration standards are provided to check the accuracy of instruments and mystery samples are used to further test the accuracy of monitoring. Different refresher days will be offered for each different group standard (Standard 1 – 4) due to the variance in monitoring methods and data confidence standards.

The event also aims to build confidence in community monitors abilities to collect valid data.

Table 5. North East Waterwatch QA/QC events

Activity	Type of Quality Control	Accuracy	Precision
Regional days cross-testing meters in field conditions	Calibration standard check Duplicate Samples	✓	✓
Regional QA/QC – mystery samples.	Calibration standard check Mystery samples	✓	
Accuracy checks during refresher training workshops. Check all equipment is working and clean and that the volunteer is calibrating and recording the correct information.	Calibration standard check Sampling and measurement methodology observed.	✓	✓
All monitors are provided with calibration solutions to check the accuracy of their instruments.	Calibration standard	✓	

14) Data Confidence Plan Review

A review will be undertaken of the Data Confidence Plan after the first year of operation. Subsequent reviews will then be on an as-needs basis (when changes are necessary) or biannually. All Waterwatch staff, the State Waterwatch Coordinator and selected monitors will participate in the reviews.

Monitoring plans will be reviewed annually in conjunction with data confidence standards outlined in this plan, and advancement in monitoring standards may occur as well as the opportunity to determine whether training refresher days are needed.

Appendix 1: North East Waterwatch Monitoring Plan

WATERWATCH North East
Communities Caring for Catchments

MONITORING PLAN

Waterwatch Coordinator: **Date:**

Name:

Group/Organisation:

Phone:

Mobile:

Address:

1. **Why are you monitoring?**
   - Why do you want to monitor?

2. **Who will use your information?**
   - Group members, students, organisation, community members, and media?

3. **How will the information be used?**
   - Education, identify trouble spots, (helps determine what data to collect).

4. **What will you monitor?**
   - Depends on questions you are asking and resources.
   - List parameters to be monitored.

5. **How accurate should the data be?**
   - Depends on questions asking and how you intend to use the data.
   - Needs to be accurate enough to gain indication of stream health.
   - Education and raising awareness – quality secondary to process of collecting it.

6. **What methods should be used?**
   - Depends on objectives and resources.
   - High precision measuring as compared with less precise readings.

7. **Where will you monitor?**
   - River, lake, ground-water, creek etc.
   - Above and below pollution sources.
   - Use map to show sites.

8. **When will you monitor?**
   - Snapshot (number of sites on the same day)?
   - Pollution events (discharge times)?
   - Times of recreation use?
   - After rain?
   - Monthly, weekly, quarterly etc.

9. Who is going to be involved and how?

- Who will carry out surveys and tests?
- Photographs?
- Training?

10. How will monitoring data be managed and presented?

- Database, graphs, reporting.
- Who will look after data and how will it be managed?

11. How will you ensure that your information is credible?

- Adequate training
- Calibration of instruments
- What will you do to improve the credibility of your information?

Appendix 2 – North East Waterwatch Training Guide

North East Waterwatch Adult Monitors Training Guide

Date: 10th August 2009

Project Manager: Emma Nilsson – Waterwatch Liaison/Waterwatch Facilitator

Filename & Path: W:\WATERWATCH\WATERWATCH\Monitoring\Data Confidence Plan\2009

Training Guide for Adult Monitors

Each learner is an individual, which of course is not really saying anything new. However, some volunteers may have what is termed “special needs”, and you will need to take this into account before you begin their training.

Remember that the learners themselves need to be part of this process, and will usually tell you what assistance they may, *or may not*, need.

Benefits of training:

Improved relationships with volunteers

- Values them
- Motivates them
- Raises their morale

Saves you time

- Less chasing up of volunteers
- More efficient volunteers
- Greater data confidence with monitoring

How do I find out what training my volunteers need?

1. By asking some big-picture organisational questions:

- What is your Core business, and, what are your key objectives?
- How well do you achieve these objectives?
- Where are you now?
- Where do you want to be?
- What weaknesses are there?
- What training needs emerge from all of this?
- What part can training do for whom and by when?

2. By asking your volunteers some questions such as these:

- Since taking up your present position what do you feel have been the best things in your training.
- Since taking up your present position what do you feel have been the gaps in your training?
- How do you think these deficiencies should be remedied?
- What further training do you feel you need now?

Training Needs Analysis.

This information is strictly confidential and will be used to asses training needs only.

Please tick all topics	Strong Need	Some Need	Little Need
Use of Waterwatch equipment.			
Calibration of equipment.			
Data interpretation			
Macroinvertebrate sampling			
Physical & chemical sampling			
Data confidence			
Sample collection			
OH&S issues			
Equipment maintenance			
Making better use of my time			
More access to resources			
Other: Please list and be specific			

Please fill in the above information and return to _____
by _____

Your Name: _____

Your Position: _____

You Location: _____

Signed: _____

Date: _____

Planning a Training Sessions with Adult Learners

Advertising:

- Advertise the session detailing who should attend and the benefits of attending.
- Establish your goals and objectives for each session.

General Suggestions:

- Know your audience – general interests.
- Communicate well:
    - Use straight eye contact with your learners
    - Ensure your voice has enough volume to reach back wall, and modulate your voice to maintain interest.
    - Minimize the jargon, and explain unfamiliar terms.
    - Use appropriate body language inc. your clothes. Be enthusiastic!!
    - Vary the pace during the session.
    - Use breaks

Good Training behaviours include where the trainer:

- Asks trainees to try things out for themselves, but also to ask questions when they need help.
- Unless there is an OHS issue, the trainer does not intervene when the trainee is trying to work out something for themselves.

Poor behaviours include where the trainer:

- Continually steps in to help a trainee trying to do something.
- Tries to avoid letting the trainees make a non-hazardous mistake.
- Has only a show and tell approach – rushes demonstrations and does not let the trainee have a go.

Sample Task Breakdown:

The DEDICT Approach

Demonstrate in real time to give overview
Explain the main requirements
Demonstrate slowly and answer questions
Imitate under supervision
Coaching on particular aspects of a learner's performance at appropriate times
Test - learner now does it independently

Stage	**Step**	**Required / Variable**	**Notes**
1. Preparation			
2. Doing it			
3 After			

Content of Waterwatch Training

Safety:

- Choosing a site
- Appropriate clothing and footwear
- Collecting a water sample
- Handling chemicals/reagents safely
- Disposal of chemical waste safely and appropriately
- Surrounding environment
    - Electric fences, holes, vegetation, flooding etc.

Getting to know your catchment:

- What is a catchment
- Understanding differences along a stream
    - Water temp, flow rates, water depth, stream composition, food sources etc.

Choosing and describing your monitoring site (s):

- Deciding between potential sites
- Can you carry out field tests at the site?
- Is the water still or flowing?
- Is the site accessible?
- Can you safely carry out field tests at the site?
- Are you far enough downstream from a drain or tributary?

Monitoring Plan:

- The group or individual monitor(s) should work through the key monitoring plan questions.
- This will also identify training needs of the monitor(s).
- How to develop a successful monitoring plan
- Deciding which test to conduct
- Discuss how the data will be used in the community and with relevant stakeholders

Conducting Habitat Surveys:

- Some factors causing changes to stream habitat
- Conducting a habitat survey
- Filling out a “Habitat survey field guide”
- Recording and interpreting your results

Sampling theory and practice:

It is important all relevant aspects are covered in this field.

- Sample bottle cleaning
- OH&S safety
- Correct sampling procedures for different physical. chemical parameters
- Sample preservation methods for samples not being analysed in the field
- Data interpretation & analysis
- Equipment maintenance

Techniques for testing physical, chemical and biological parameters:
All parameters to be monitored need to be covered in the workshop.
Key aspects include:

- Sample bottle & equipment cleaning
- Equipment procedures
- Methods for measuring physical/chemical parameters
- Identification of macroinvertebrates
- Calibration methods

Quality Assurance/Quality Control (QA/QC):
The QA/QC procedures must be identified and followed up with training.
After training, participants should be able to:

- Produce reliable credible data
- Work efficiently as a team
- Interpret their water quality data and compare with the EPA SEPP (WoV) Segments of Environmental Quality Objectives
- Calibrate their equipment before sampling

Recording of data:
All information required on field data sheets needs to be filled in correctly. Monitors should develop an awareness of whether the data looks reasonable before forwarding them to Waterwatch.
Training includes:
How to record data on the Waterwatch record sheets
Correct reporting of units
How to analyse data
Pollution incident reporting protocol
What happens to the data?

Data Management (Waterwatch Staff):
Coordinators and Facilitators generally have responsibility for data management. Skills required are using the Waterwatch WVA database, developing findings, conclusions and recommendations, the use of simple statistics and appropriate graphing techniques to aid analysis and interpretation of data.

TRAINING Session Plan (1-3 hours)

TOPIC:_____

Photocopying to do:_____
Equipment: _____
Learner Resources: _____
Venue:_____

Time	Aspect & Activity	Resources
	Housekeeping: Welcome;	
	Warmer-Upper:	

Preparing for a Waterwatch Session – Checklist

Session Title: _____
Session Date: _____
Venue: _____

Actions	**Doing**	**Done**
Have I promoted the session, including its benefits, well ahead of time?		
Have I rung/emailed potential participants?		
Do I know the number and characteristics of the audience, and planned my session accordingly?		
Have I arranged for a shared presenter if appropriate?		
Do I have name tags?		
Have I arranged catering?		
How noisy is the venue?		
Have I checked out what equipment is available at the venue?		
Have I organised the equipment I will need to take?		
Have I checked the layout of tables in the room?		
Do I have marker pens?		
Do I have relevant resources?		
Have I photocopied relevant information?		

And – the Just Before You Start Checklist!

Get there in plenty of time to allow for setting up.	
Check air con, heating, seating.	
Set up training aids and headings on whiteboard if applicable.	
Organize and set out your session plan, notes and handouts.	
Set out relevant equipment ready to use.	

Evaluation – Giving and Receiving Feedback

Because it's a two way process, feedback can really develop your relationship with your volunteers. It's the best way to find out how well your communication matches your intentions, and to help your volunteers stay on target and achieve his/her goals.

Ways to give and obtain feedback:

- Observations
- Interview
- Informal Discussion
- Written

Giving constructive feedback:

- Describe the current performance
- Identify the situation
- Describe the impact and consequences
- Discuss and gain agreement about alternative ways of doing the task.

How to gain agreement when delivering negative comments?

- Give the positive feedback first.
- Then the area that needs improvement – with your specific evidence.
- Then finish with another positive.

Eliciting Feedback:

- Remember the giver may be a little hesitant to fully reveal the truth.
- Thank them for their comments – and if negative, do not become too defensive.
- Try to receive the feedback in a detached manner.
- Use the feedback to constructively yourself.

Evaluation Sample Sheet

How good was my session?

Thank you for your attendance and participation at today's training session. Because we value your comments and suggestions, would you kindly spend a few moments to complete the questionnaire below? Your response will help us to improve the content and delivery for meeting your future training needs.

Date _____ Training Title_____
You're Position/Role_____
Years of involvement as a Volunteer_____

Please circle one: SA – Strongly agree; A – Agree; US – Unsure; D = Disagree; SD = Strongly Disagree

Sample Statements	**SA**	**A**	**US**	**D**	**SD**
I will be able to apply this training immediately	**SA**	**A**	**US**	**D**	**SD**
The handouts and notes were useful	**SA**	**A**	**US**	**D**	**SD**
The trainer was easy to understand	**SA**	**A**	**US**	**D**	**SD**
The venue was suitable	**SA**	**A**	**US**	**D**	**SD**
The training methods were varied	**SA**	**A**	**US**	**D**	**SD**
The catering was sufficient (is applicable)	**SA**	**A**	**US**	**D**	**SD**
The session was advertised sufficiently	**SA**	**A**	**US**	**D**	**SD**
The timing of the session was suitable	**SA**	**A**	**US**	**D**	**SD**
There was enough discussion	**SA**	**A**	**US**	**D**	**SD**
Our own experiences were valued	**SA**	**A**	**US**	**D**	**SD**
The length of the session was satisfactory	**SA**	**A**	**US**	**D**	**SD**
The trainer made the outcomes of the session clear	**SA**	**A**	**US**	**D**	**SD**
The trainer was easy to understand	**SA**	**A**	**US**	**D**	**SD**

What was most valuable for you in this session?

_____

_____

What was the least satisfactory part of the session?

_____

_____

What other training needs to you have that we can assist you with?

_____

_____

Do you have any other comments or suggestions?

_____

_____

_____

WATERWATCH
North East
Communities Caring for Catchments

North East Waterwatch

Methods Manual 2009

Date: August 2009

Table of Contents

6.1 Turbidity

7.1 Salinity (Electrical Conductivity)

8.1 pH

9.1 Reactive Phosphorous

CHAPTER 1: INTRODUCTION

This North East Victoria Waterwatch Methods Manual contains a selection of methods for field monitoring equipment that are widely used by the Waterwatch Team Leader and the Community Liaison/ Waterwatch Facilitators in the North East region. Please contact Waterwatch if you require further information.

CHAPTER 2: NORTH EAST WATERWATCH CONTACTS

Waterwatch Team Leader

Address:
P.O. Box 616
Wodonga Vic 3689

Phone: 02 6043 7622
Fax: 02 6043 7601
Email: waterwatch@necma.vic.gov.au

Community Liaison/Waterwatch Facilitator

Address:
P.O. Box 616
Wodonga Vic 3689

Phone: 02 6043 7622
Fax: 02 6043 7601
Mobile: 0427 723 320
Email: waterwatch@necma.vic.gov.au

CHAPTER 3: SAFETY

3.1 Field Safety

When sampling a number of important safety aspects need to be considered in the field.

- Check that the stream bank is stable and has easy access during all weather conditions, at your site.
- Let someone else know where you are sampling and how long you will be.
- Wear proper clothing and footwear depending on the weather, e.g. hat, warm clothing, sunscreen, shoes with good grip, gumboots, waders etc.
- Do not allow children to sample or test without adult supervision.
- Use common sense when walking to and from the site, i.e. beware of holes, snakes, prickly vegetation, electric fences, etc.
- Do not put yourself or others at risk.
- Beware of stream currents and undertows when sampling macro invertebrates.
- Do not let children undertake adult tasks.

3.2 Chemical Safety

- Read and carry all chemical warning labels and first aid procedures before using in the field.
- Take care when handling chemicals. Always use the safety equipment provided and read the chemical labels when using the kits, i.e. safety gloves and glasses.
- Provide adult supervision when children are using chemicals and ensure they are educated about the dangers of using chemicals.
- Do not drink water from the source you are testing as it may be polluted. In particular when testing do not put your hands near your mouth or eat and drink while testing the water.
- Always wash your hands with soap and water after conducting any water testing.
- All chemical waste used should be collected in a 'waste container' and disposed of correctly (emptied into sink or drain where the water will be treated).

3.3 Field Considerations

- If your site is on private property, seek permission of the owners first.
- If crossing through fences do not damage the fence by climbing on the wires, crawl under them and remember to look out for electric fences.
- It is important to leave all gates as you found them, open or closed.
- Keep your site as clean as possible by removing excess rubbish.

3.4 Sample Collection

A sample collected should be representative of the water body being tested.

- Attempt to take the sample from the middle of the stream or as far from the bank as possible. About the middle means half way between the sides and half way between the surface and the bottom. If the water is deep, take the sample from about 20cm below the surface.
- All sample bottles should be rinsed twice with stream water prior to collecting samples for testing.
- If collecting the sample while standing in the stream, always take the sample upstream of where you are standing to avoid disturbing the streambed and releasing sediments.
- Do not take your sample from:
  - Non-flowing water near the stream edge.
  - The surface of the water.
- Direct sunlight can affect samples so store and perform all chemical tests in the shade.
- Fill sample bottle completely to prevent any loss of dissolved gases, if possible cap under water.
- If taking off-site, label all samples immediately on collection with site name or number, date and time of sampling.
- Do not place anyone in a situation where an accident may occur, use common sense when collecting samples.

3.5 Sample Preservation and Storage

All water samples should be tested as soon as possible after collection. If analysis is delayed, changes due to biological activity, physical changes or chemical reactions can be prevented by:

- Filling the sample container to the top before capping to prevent loss of dissolved gases.
- Storing sample in a dark place to stop photosynthesis.
- Cooling the sample to reduce biological and chemical reactions.

Note:

Temperature needs to be measured *straight* away at the site.

If there is a long delay between sampling and analysis, (>2hours), store sample in a cool, dark container, e.g. esky.

3.5.1 Recommended sample storage and preservation techniques

Parameter	Container	Preservation	Maximum storage time
Electrical Conductivity	P,G	Field analysis preferred	24 hours
pH	P,G	Analyse immediately	2 hours
Turbidity	P,G	Analyse immediately or store in dark for 24 hours	24 hours
Temperature	P,G	Analyse immediately	No storage
Dissolved Oxygen	G	Analyse immediately	8 hours
Total Phosphorous	P	Laboratory Analysis	28 days
E.Coli	P	Immediately	No Storage
Nitrate	P,G	Freeze	7 days
Ammonia	P,G	Freeze	7 days
Nitrite	P,G	Freeze	7 days
Phosphorus (soluble)	G, P rinsed	Refrigerate	24 hours

G = Glass
P = Plastic (polythene or equivalent)

CHAPTER 4 WATER QUALITY PROCEDURES

4.1 Water Temperature

4.2 Information

Water temperature is one of the most important things to measure. The distribution and abundance of aquatic plants and animals is affected by changing temperatures. Water temperature is influenced by the depth of the water (the deeper the water the cooler it is) the season and the time of day. Temperature may also be influenced by industrial, agricultural and urban runoff, increased suspended sediments in the stream and by the vegetation on he banks (shading).

4.3 Equipment

- Thermometer (range -10 to 200˚C)

4.4 Thermometer

4.5 Procedure

1. Lower the Thermometer into the water (preferably where the current is flowing).
2. Leave the Thermometer in the water for about one minute before taking the reading.
3. Record the result in the results column of the Physical and Chemical Test Record Sheet.

4.6 Maintenance

- Keep the thermometer and guard free from dirt and other contaminants.

4.7 Interpreting your results

- For human recreational uses temperatures should be in the range of 15-35˚C if prolonged exposure is experienced.
- While water temperature can vary from 0ºC to 100˚C, from being frozen to boiling, in rivers and streams temperatures are more likely to be between 2ºC and 35ºC. Alpine streams will be at the top end of scale, and may even exceed 35ºC.

5.1 Dissolved Oxygen

5.2.1 Information

Dissolved Oxygen (DO) is a measure of the concentration of oxygen dissolved in water. Oxygen is essential for respiration by all aquatic plants and animals. Without it they will die. Dissolved Oxygen levels may be expressed as milligrams per litre (mg/L) or as percentage saturation (% sat).

5.3.1 Dissolved Oxygen Equipment

- Visocolour Dissolved Oxygen Kit (low range)
- LaMotte Smart 2 Colorimeter
- Eutech ECDOHANDY 12mm Dissolved Oxygen Meter
- Insite IG Model 3100 Portable DO Analyzer

5.4.1 Safety

- The procedures for Dissolved Oxygen may require the use of potentially hazardous chemicals. If procedures are followed correctly and the necessary safety precautions are carried out, the risks are significantly reduced.

- It is important to read the Material Safety Data Sheets (MSDS) for the DO kit chemicals before handling. These sheets also cover first aid measures if an accident occurs. The chemicals used and some of the possible risks associated with them are listed below.

5.2.1 Visocolour Dissolved Oxygen Kit (Low Range)

5.2.2 Equipment

- Visocolor Dissolved Oxygen kit (High or Low Range)
- Safety glasses and gloves
- Stoppered glass bottle (rinsed with water to be tested)

5.2.3 Procedure

1. Collect a sample from the stream.
2. Rinse both of the 5ml measuring glasses with the sample water.
3. Use the plastic syringe to pour **1ml** of the water sample into one of the 5ml measuring glasses, cap and place on position A in the block comparator stand. This is the control. You will NOT be adding chemicals to this.
4. Rinse the stoppered glass bottle with the sample water.
5. Place the glass bottle on a flat surface and fill with sample water until overflowing and without air bubbles.
6. Add **5 drops of O2 -1** and **5 drops of O2-2.**
7. Using slanted stopper close and shake for approx **1 minute**.
8. Add **12 drops of O2 -3** reseal and shake until all precipitate has dissolved.
9. Use the plastic syringe to pour **1ml** of the solution into the glass stoppered bottle and place into the second 5ml measuring glass and place on position B.
10. Looking from above, slide the comparator along the colour chart until the colour of the 5mL measuring glasses match.
11. This will give you a DO reading in mg/L.
12. If your result is darker than 10mg/L you need to dilute your solution. Take out **0.5ml** from your test tube and replace it with **0.5ml of sample water**. Match colour from both test tubes again using the colour chart. **Times your result by 2** to give you the correct mg/L.

5.2.4 Converting mg/L to % saturation.

1. To convert the result to % saturation use the conversion chart on page 13.
2. Mark the water temperature on the top temperature scale.
3. Mark the DO level on the bottom mg/L scale.
4. Connect the two points and where it crosses the % saturation scale this will be your result in percentage % saturation.
2. Record the reading on the Physical and Chemical Tests Record Sheet.
3. Empty the contents of the measuring tubes and glass bottle into the wastewater container in your kit. This can be emptied down an urban sink (where the water will definitely be treated at a waste water treatment plant).

5.2.5 Maintenance

- Keep the Dissolved Oxygen kit clean, dry and free of dirt and grime.
- Ensure all chemicals are not out-of-date.
- Ensure all equipment is rinsed well before use.
- If the colour chart gets wet, dry out in the sun as soon as possible to avoid damage.

5.2.6 Chemicals

Reagent O2 - 1, Visocolor Oxygen Test Kit

Chemicals:

Chemical Name	CAS Number	Proportion
Manganese chloride solution (MnCl2)	7773-01-5	40%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact - hold eyes open, flood with water for at least 15 minutes and see a doctor.
Inhalation - Remove from exposure.
Skin contact: Wash off thoroughly with water. Remove contaminated clothing and wash before re-use. In severe cases, OBTAIN MEDICAL ATTENTION
Ingestion: Wash out mouth thoroughly with water. Immediately contact a doctor or Poisons Information Centre phone: 131126.

Reagent O2 - 2, Visocolor Oxygen Test Kit

Chemicals:

Chemical Name	CAS Number	Proportion
Sodium hydroxide solution	1310-73-2	40%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact - hold eyes open, flood with water for at least 15 minutes and see a doctor.
Inhalation - Remove from exposure, rest and keep warm. In severe cases obtain medical attention.
Skin contact: Wash off skin thoroughly with water. Remove contaminated clothing and wash before re-use. In severe cases, OBTAIN MEDICAL ATTENTION.
Ingestion: Wash out mouth thoroughly with water and give plenty of water to drink. DO NOT induce vomiting. DO NOT make any efforts to neutralise it. OBTAIN MEDICAL ATTENTION. Contact a doctor or Poisons Information Centre phone: 131126.

Reagent O2 - 3, Visocolor Oxygen Test Kit

Chemicals:

Chemical Name	CAS Number	Proportion
Sulphuric acid	7664-93-9	83%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact - hold eyes open, flood with water for at least 15 minutes and see a doctor.
Inhalation - Remove from exposure. Fresh air should be inhaled, keeping airways clear
Skin contact: Wash off thoroughly with water, if necessary apply a loose dressing.
Ingestion: Wash out mouth thoroughly with water. DO NOT induce vomiting. DO NOT make any efforts to neutralise it. OBTAIN MEDICAL ATTENTION. Contact a doctor or Poisons Information Centre phone: 131126.

5.3.1 LaMotte Smart 2 Colorimeter

5.3.2 Equipment

- Safety gloves and goggles
- Smart 2 Colorimeter and reagents
- Sample bottles

5.3.3 Sample Procedure

1. To avoid contamination thoroughly rinse the screw cap Sample Tube with sample water.
2. Tightly cap Sample Tube and submerge to the desired depth. Remove cap and allow the Sample Tube to fill.
3. Tap the sides of the submerged tube to dislodge any air bubbles clinging to the inside.
4. Ensure there are no air bubbles trapped inside.
5. Add **2 drops of Manganese Sulfate Solution** and **2 drops of Alkaline Potassium Iodide Azide**.
6. Cap and mix by inverting several times. A precipitate will form. Allow the precipitate to settle below the shoulder of the tube before proceeding.
6. Add **8 drops of Sulfuric Acid**. Cap and gently mix until the reagent and the precipitate have dissolved. A clear brown – orange colour will develop, depending on the oxygen content of the sample.

5.3.4 Colorimeter Procedure

1. Press and hold ON button until colorimeter turns on.
2. Press ENTER to start
3. Press ENTER to select TESTING MENU
4. Select ALL TESTS from TESTING MENU
5. Scroll to and select 39 DO from menu
6. Rinse a clean tube with untreated sample water. Fill to the 10mL line with sample. This tube is the BLANK.
8. Fill a second tube to the 10ml line with the treated "FIXED" sample. This tube is the SAMPLE.
9. Remove BLANK from colorimeter; insert SAMPLE tube into chamber, close lid and select SCAN SAMPLE
10. Record Result
11. Press OFF button to turn colorimeter OFF

5.3.5 Maintenance

- Ensure colorimeter test tubes are unscratched.
- Ensure no water enters into the internal chamber of the colorimeter.
- Ensure test tubes are wiped clean and dry for inserting into colorimeter.

5.3.6 Chemicals

Manganese Sulfate Solution

Chemicals:

Chemical Name	CAS Number	Proportion
Manganese Sulfate monohydrate	10034-96-5	36%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact – Immediately flush with water for 15 minutes. Consult a physician.
Inhalation – N/A
Skin contact: Flush thoroughly with water. Remove affected clothing and wash skin with soap and water. Consult a physician.
Ingestion: Induce vomiting immediately. Consult a physician.

Alkaline Potassium Iodide Azide

Chemicals:

Chemical Name	CAS Number	Proportion
Potassium Hydroxide	1310-58-3	60-70%
Sodium Azide	26628-22-8	<1%
Potassium Iodide	7681-11-0	14%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact – Immediately flush with water for 15 minutes. Get medical attention immediately.
Inhalation – Remove to fresh air.
Skin contact: Immediately flush with water while removing affected clothing and rinse thoroughly for 15 minutes. Consult a physician.
Ingestion: Do no induce vomiting. Rinse out mouth, drink plenty of water and call a doctor immediately.

Sulfuric Acid 1:1

Chemicals:

Chemical Name	CAS Number	Proportion
Sulphuric acid	7664-93-9	64%

First Aid:
Ensure quiet, warmth and provide resuscitation if necessary. Remain in an upright position and seek medical attention if there are breathing difficulties. For advice, contact a doctor or Poisons Information Centre phone: 131126

Eye contact – Immediately flush with water for 15 minutes.
Inhalation – Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, give oxygen and call a doctor immediately.
Skin contact: Immediately flush with water for 15 minutes while removing affected clothing. Call a doctor immediately if skin contact has been extensive or prolonged.
Ingestion: Do not induce vomiting. Rinse mouth, drink plenty of water. Call a doctor immediately.

5.4.1 Eutech Instruments Ecoscan Hand Held Dissolved Oxygen Meter

5.4.2 Equipment

- ECDOHANDY 12mm Dissolved Oxygen Meter

5.4.3 Procedure

1. Dip the Dissolved Oxygen dipping probe in sample or body of water.
2. Stir the probe around in the solution being measured to prevent air bubbles from becoming trapped on the membrane and producing erroneous readings.
3. Take reading.

5.4.4 Maintenance

- After using the probe, rinse with clean water and wipe it with a soft cloth or paper to avoid any hardening of deposits.
- The electrolyte solution in your probes cap will deplete on usage and will need to be replaced periodically. Call Waterwatch to conduct this process.

5.4.5 Calibration

1. The temperature and the % saturation calibration must be done first before attempting to do the mg/L (ppm).
2. Rinse the probe well with Deionised water. Do not touch the membrane.
3. Press the MODE key to select the % Saturation mode.
4. Hold the probe in the air with the sensor facing downwards. Wait for the reading to stabilize.
5. Press the CAL key. The display will show the intended percentage calibration point (100%) with a CAL indicator at the top corner for 1.5 seconds. The CAL indicator will then blink and the display will show a value which is with respect to the factory default calibration.
6. Press the HOLD/ENTER key to confirm the calibration. The meter displays CO for 1.5 seconds and automatically calibrates 100% air saturation and returns to measurement mode.

5.5.1 Insite IG Model 3100 Portable Dissolved Oxygen Analyzer

5.5.2 Equipment

- Insite IG Model 3100 Portable Dissolved Oxygen Analyzer

5.5.3 Procedure

1. Turn on the meter. This will enter into RUN mode and will start displaying the D.O value.
2. Dip the probe into the water sample and wait until reading stabilizes.
3. Take reading.

5.5.4 Maintenance

- Requires calibration 2 times a year.

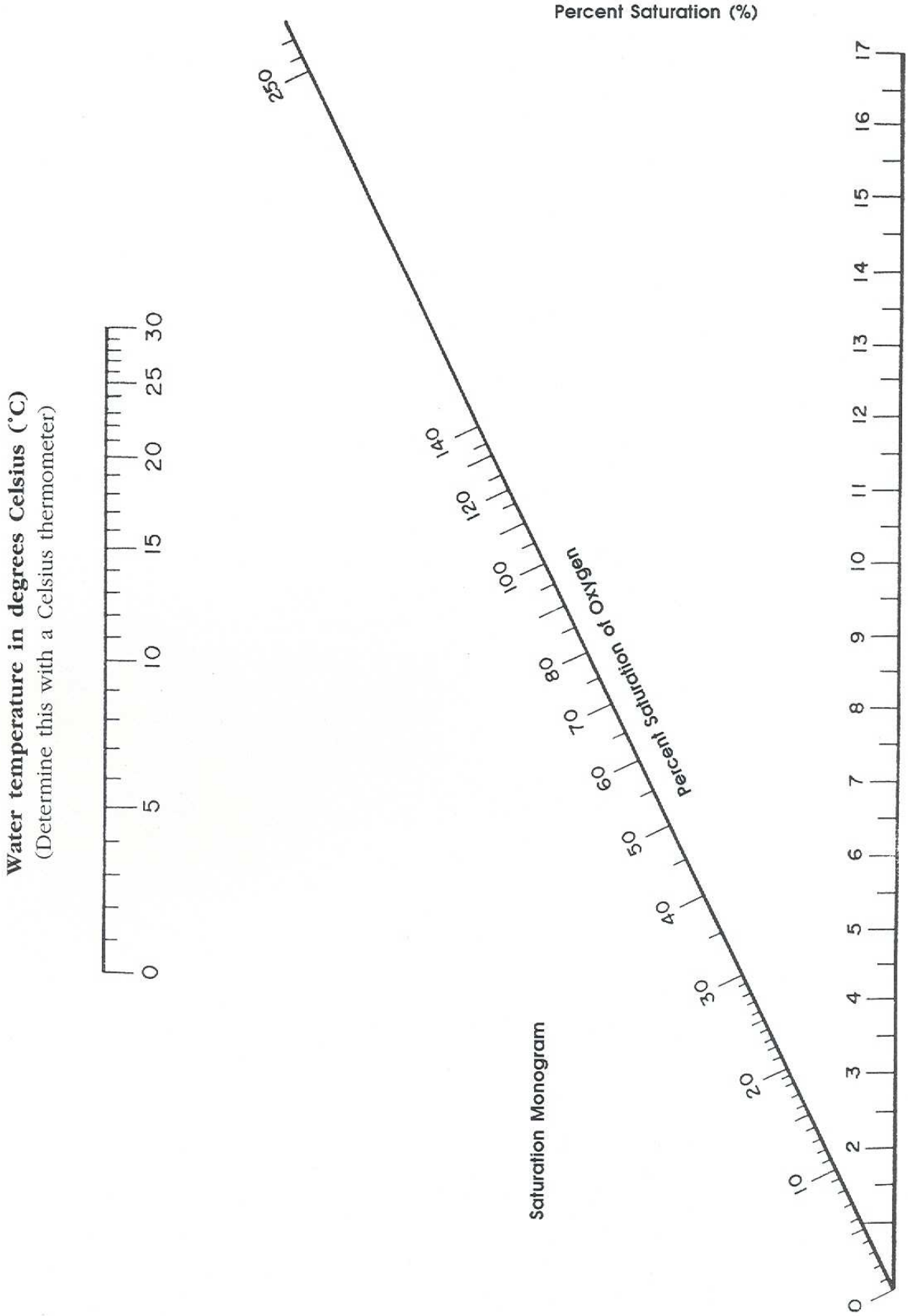
5.5.5 Calibration

1. Mix half a tablespoon of sodium sulfite with half a litre of distilled water.
2. Stir for 1 minute
3. Let solution sit overnight or at least 12 hours. Sodium sulfite will bring the water down to 0.05 to 0.10 very quickly but will not approach absolute zero until the solution has been calm for a longer period of time.
4. Put sensor into solution.
5. Let sit for 10 minutes to allow temperature stabilization.
6. At the analyzer, press “menu”, then select “setup” and press enter.
7. Enter the three digit security code. The factory default is “000”. If the user has not changed this code then press “enter” button three times.
8. Select the first option, “sensor ref cal”, and then press “enter”.
9. The sensor will acquire data for a short period of time, 30-60 seconds depending on what the analyzer dampening value is set to.
10. Once the analyzer has a reading, use the arrow keys to read 0.00, and then press “enter”.
11. Normally, the “zero” calibration is all that is required; however, slope (saturation) cal can also be completed if desired.

5.6.1 Interpreting your results

- Concentrations of oxygen in water will vary depending on the physical, chemical and biochemical activities in the river. Under most natural conditions a water body will be at least 80% of saturation. Oxygen concentrations will vary over a 24 hour (diurnal) cycle, event in pristine waterbodies.
- Dissolved oxygen levels about 110% saturation are indicative of eutrophic conditions and levels of 130% or more are almost certainly due to blooms of algae or other aquatic plants.

4.6.2 Oxygen % saturation chart



6.1 Turbidity

6.1.1 Information

Turbidity is a measure of the clarity of the water. As suspended particulate matter, including clay, silt, detritus and plankton, in the water increases the clarity decreases, that is, the water taken on a muddy appearance. Turbidity does not measure the quantity of suspended matter in the water.

6.2.1 Equipment

- Turbidity Tube.
- Sample bottle with nozzle, rinsed out with sample water prior to filling.

6.3.1 Procedure

1. Fill sample bottle then shake it vigorously before using.
2. Find a spot in the shade ensuring your back is against the sun.
3. Hold the turbidity tube upright at your belly button so you can look down and see the black wavy line on the bottom.
4. Gradually pour the water sample into the tube.
5. Stop pouring at the point where the black wavy lines are only just visible. If you cannot see the lines you have poured too much water in the tube and will need to empty some out.
6. Note the reading from the scale along the length of the tube. Record result on Physical and Chemical Tests Record Sheet. (Unit of measurement is NTU – Nephelometric Turbidity Units).
7. If the reading is greater than 200, dilute the sample 1:1 with clear water. Then multiply the result by 2.

6.3.2 Important Points to Note

- Carry out the test in the shade.
- Ensure your back is to the sun.
- A second person should confirm the result.
- Note the presence of highly coloured water will result in overstating the turbidity level.

6.3.3 Maintenance

- Regularly clean and check the tube for scratches or defects.

7.1 Salinity (Electrical Conductivity)

7.1.1 Information

Electrical Conductivity (EC) is measuring the flow of electricity in a solution. Conductivity in a solution increases as the amount of salts dissolved in the water increases. The relationship between conductivity and dissolved salt concentrations is used a measure of salinity.

7.1.2 Equipment

- Eutech EC Testr low range
- Eutech Multi-Parameter PCTester 35
- Eutech EC Tester 11 Dual Range
- Eutech EC Tester 11+
- Deionised Water
- Sample container (optional)
- Tissues

7.2.1 Electrical Conductivity Meter (all models)

7.2.2 Procedure

1. Remove cap from EC Meter.
2. Press the ON/OFF button to turn the meter on.
3. Immerse the electrode into the water sample (2cm is sufficient). You can put it straight into the waterway or test in a sample container. Make sure you rinse the sample container with the water sample first before filling.
4. Hold the meter in the water sample until the reading stabilises. Record the EC reading direct if the units on the meter are µS/cm (low ECScan). If the units are ms/cm (high ECScan) multiply the reading by 1000 to convert them to µS/cm.
5. To keep the electrode free from contaminants after testing, wash the electrodes thoroughly with deionised water and wipe dry with a tissue.

7.3.1 Calibration

It's important that you calibrate your EC Meter with a calibration solution every 2 weeks or before testing a large number of samples to ensure your readings are accurate.

7.3.2 Calibration Equipment

- EC Meter
- Deionised water
- Tissues
- Sample container
- Calibration solution 1413 µS/cm @ 25°C (0.01 molar KCI solution) or 2760 µS/cm.
- Tiny screwdriver (for EC Meters that don't have buttons in battery compartment)

7.3.3 Eutech EC Testr low range

1. Rinse the sample container with the calibration solution, then fill up to about 2-3cm in depth with the solution.
2. Hold the EC Meter in your left hand with the keypad and LCD screen facing out to the right of your hand.
3. Open the battery compartment lid and you will see four batteries and two buttons on the left side of the batteries. If you don't see any buttons you will notice a small screw.
4. Rinse the electrode in deionised water and dip the electrodes into the container of calibration solution.
5. Press the left button (INC) or right button (DEC) to adjust reading to match the calibration solution value of 1413 µS/cm. For the meter that does not have buttons but a screw, screw the screw clockwise or anticlockwise to match the calibration solution value.
6. After 3 seconds without a key press, the display flashes 3 times, then shows 'ENT'. The EC Meter accepts the calibration value then returns to measurement mode.
7. Replace battery cap.
8. Rinse the electrode thoroughly with deionised water and wipe dry with a tissue.
9. Ensure that you record this calibration event on the Calibration Record Log Sheet.

7.3.4 Eutech Multi-Parameter PCTester 35

1. At the display press the CAL key.
2. Place the tester in the buffer solution.
3. Press the increase and decrease keys to scroll to the calibration standard value and press ENT. The tester will return to measurement mode.

7.3.5 Eutech EC Tester 11 Dual Range

1. Switch on the tester. Press INC or DEC key to enter into conductivity mode.
2. CAL indicator appears in LCD. The display briefly shows ‘CAL’ and the number of points the tester will be calibrated.
3. The upper display shows the conductivity reading and the lower display sequentially shows calibration standards 1413 µs/cm and 12.88 ms.cm.
4. Rinse the electrode with the calibration standard that you intent to calibrate and then dip the electrode in the other beaker with same calibration standard. Swirl gently to create a homogenous sample and allow time for the reading to stabilize.
5. Press HOLD/ENT key to confirm the calibration. LCD shows ‘CO’ for 2 seconds. The calibration is complete and the tester returns to measuring mode, if this is 1 point calibration.
6. For multipoint calibration, the tester goes to the next calibration point, lower display showing next calibration standard values. Rinse the electrode in deionised water and repeat step 4&5 to continue calibrating with next calibration standard solution.

7.4.1 Maintenance

- Maintain calibration service and records.
- Ensure that calibration solution is kept in a cool dark location between uses and is within the expiry date (12 months for 0.01 molar KCI solutions).
- Do not immerse the electrode into the stock calibration solution because this will contaminate it.
- To keep the electrode free from contaminants after testing, wash the electrodes thoroughly with deionised water and wipe dry with a tissue.
- Once a year wipe the electrodes with a tissue and soak for 10-15 minutes in alcohol, then rinse with deionised water.

7.5.1 Interpreting your results

- For fresh waters the EC should not exceed 1500 µS/cm.
- Refer to Upper Limits for Water Salinity Table below.

7.5.2 Upper Limits for Water Salinity Table

Uses	µS/cm EC units	TDS ppm Mg/L
Rain	10	6
Apricots/Peaches	330	200
Citrus/grapevines	370	220
Sub-clover	500	300
White clover	600	360
Permanent pasture (ryegrass & clover)	800	480
Desirable upper limit for drinking water	830	500
Pears	900	540
Apples	1000	600
Tomatoes, sweet corn (maize)	2300	1400
Perennial ryegrass	2300	1400
Lucerne	2400	1440
Poultry, pigs	4100	2460
Wheat	500	3000
Dairy cattle	5400	3240
Lactating ewes/weaned lambs	6000	3600
Horses	7800	4680
Beef cattle	11,400	6840
Dry sheep	15,700	9420
Sea water	50,000	30,000
Dead Sea	550,000	330,000

8.1 pH

8.1.1 Information

The pH of a river is a measure of its acidity or alkalinity. The actual component of the water being measured is its concentration of hydrogen ions (H+).

Animals and plants in streams are adapted to certain ranges of pH. Even under natural conditions, the animal and plant communities of acidic streams contain many different species to those in alkaline streams. An increase or decrease in pH outside the normal range of a water body will cause sequential loss of species depending on their sensitivity.

8.2.1 Equipment

- pH Strips (resolution ±0.5 pH units)
- pH Hanna Meter
- Eutech Multi-parameter Tester 35
- Eutech pH Scan 2
- Sample container (optional)

8.3.1 pH Strips

8.3.2 Procedure

1. Take your sample and record the time.
2. Take a pH strip from the small plastic box, ensuring your fingers don't touch the colour panel.
3. Place the coloured panel of the strip in the water sample.
4. Leave pH paper in water sample for 5 minutes.
5. Match the colours on the paper strip with the colours on the colour chart on the outside of the small box.
6. Record the number where the colours match. This is the pH reading for your sample.

8.4.1 pH Hanna Meter

8.4.2 Procedure

1. This test can be done directly in the waterway or a sample can be taken. If a sample is taken, rinse the sample container with the sample water then fill.
2. Take off the Meter's cap. Press and hold the ON/OFF button to turn the meter on until the LCD screen lights up.
3. Immerse the electrode in the water to be tested (2cm is sufficient)
4. Hold the meter in the water until the reading stabilises (when the clock symbol appears on the left of LCD screen).
5. If using the pH meter to test for temperature, leave the meter in longer until it stabilisers.
6. Press the Hold button to hold the pH reading on the LCD screen.
7. Record your pH reading and/or temperature reading.
8. Turn off the meter by pressing the ON/OFF button
9. When not in use, rinse the electrode with water and store it with a few drops of storage solution in the protective cap. DO NOT use deionised or distilled water for storage purposes.

8.4.3 Calibration

1. Fill one sample container with the pH 7 Buffer Solution
2. Fill the other sample container with the pH 4 Buffer Solution
3. Turn on the Hanna pH meter using the on/off button
4. To calibrate hold the on/off button until the LCD screen reads CAL, release the on/off button
5. The screen will display USE 7. Place the pH meter in the pH 7 Buffer solution
6. The screen will than display REC while it is calibrating to the pH 7 Buffer solution
7. The screen will than ask you to USE 4. Place the pH meter in pH 4 Buffer Solution.
8. The screen will display REC while it is calibrating to the pH 4 Buffer solution
9. If the pH meter is calibrated correctly it will display OK 2. If it is incorrectly calibrated the LCD screen will display- WRONG- and you will need to calibrate it again.

8.5.1 Eutech pH Scan 2

8.5.2 Procedure

1. Remove cap and press ON/OFF button.
2. Dip the electrode about 2cm into the test solution.
3. Stir once, let the display stabilize.
4. Record the reading.
5. Press the HOLD button if you want to hold the reading.

8.5.3 Calibration

1. This tester allows up to 3 point calibration.
2. Start with pH buffer 7.
3. Press ON/OFF button to power on.
4. Immerse electrode in chosen buffer about 2cm deep and stir gently.
5. Wait for displayed value to stabilize at or near the chosen pH buffer.
6. Press the CAL button to enter calibration sequence.
7. When display flashes continuously, press HOLD/CON button to confirm.
8. If necessary proceed to the next buffer value (pH 4 or 10) and repeat the calibration procedure.

8.6.1 Eutech Multi-Parameter Tester 35

8.6.2 Procedure

1. To start measuring, press the ON/OFF key.
2. Press MODE/ENT until you get your desired parameter.
3. Place tester in your sample and it will start measuring immediately.

8.6.3 Calibration

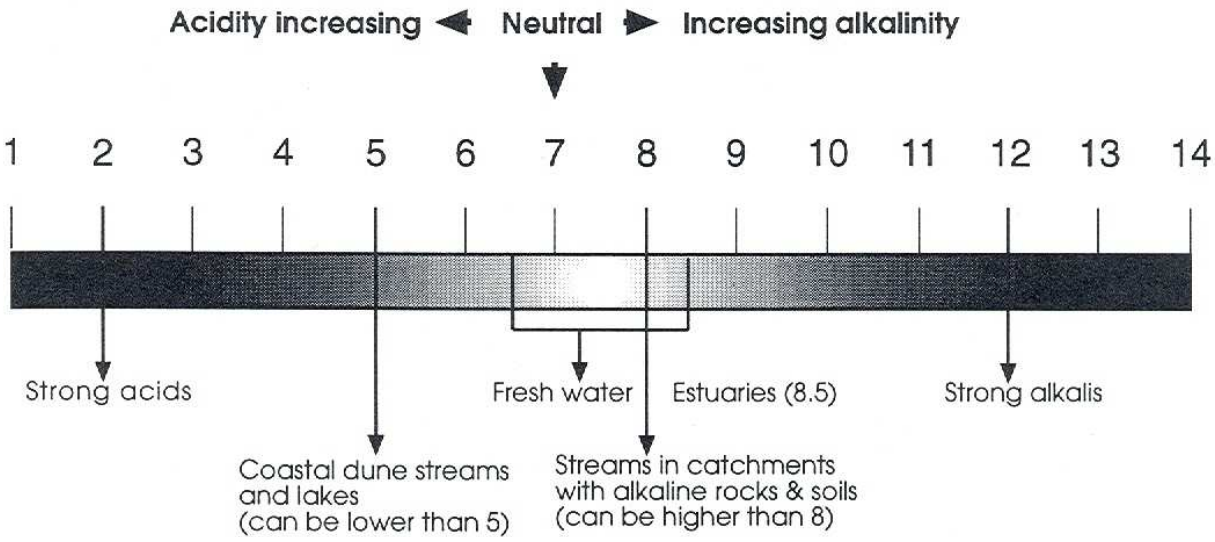
1. In the measurement mode at pH press the CAL key.
2. Place the tester in the buffer solution. The bottom reading will show the correct buffer value.
3. When the reading has stabilized, for instance: 3.87 for a 4.01 buffer press ENT.
4. To continue with another buffer calibration, simply remove tester and place in another buffer solution.
5. Press ENT again to confirm the buffer value when it has stabilized.
6. When calibration is done, press the CAL key to confirm.

8.7.1 Maintenance

- Store pH paper in cool, dry, dark conditions and do not exceed its expiry date of 3 years.
- Experiments have shown that pH paper requires at least 5 minutes to react, not 1 minute as per manufacturer's instructions.
- Store all pH Meters in the kit, keep the electrode moist. DO NOT use deionised or distilled water for storage purposes.

8.8.1 Interpreting your results

- pH values of more than 0.5 units outside the natural range should be investigated.
- pH values can range from 5.5-8.5 in the north east region.
- For drinking, less than 6.5 may be corrosive and more than 8.5 may cause scale and taste problems.



9.1 Reactive Phosphorus

9.1.1 Information

Phosphorus is a naturally occurring element, originating from minerals in rocks and is essential for animal and plant life. In natural circumstances, phosphorus usually enters waterways from the weathering of rocks (inorganic phosphorous) and the decomposition of plant and animal material (organic phosphorus).

9.2.1 Equipment

- Safety glasses and gloves
- Visocolour Phosphorus kit (low range)
- LaMotte Colorimeter
- Glass measuring tube for diluting sample – 100mL
- Freshwater (no phosphorus present) for dilution

9.3.1 Procedure

9.3.2 Visocolour Phosphorous Kit

1. Collect a sample from the stream.
2. Position the Phosphorus comparator block on a flat surface and insert the colour comparison disk.
3. Rinse both test tubes with sample water several times. Empty rinsed water into the waste container.
4. Fill both test tubes to the black mark with sample water and place in the holder.
5. Place the lid on the test tube to the left (the coloured side of the wheel). This is the control and you won't be adding chemicals to it.
6. Add **1 level microspoon** (spoon contained in phosphorus kit) of **PO4 -1** to the right test tube (test tube which sits over the white inner circle), cap and shake until dissolved.
7. Add **15 drops of PO4 -2** to the same test tube, cap and mix.
8. Sit for **5 minutes**.
9. Open the lids of the test tubes and look down them. By turning the colour disc, compare the colours in both test tubes until they match. Once they match, read the test results from the mark on the front side of the comparator (mg/L). Intermediate values can be estimated.
10. Record your reading.

Dilution

11. If your reading is off the chart you need to **dilute it**. Pour the solution from your right test tube into a 100Ml glass measuring cylinder up to the **10ml mark**, discarding the remaining solution into the waste container. Fill the glass cylinder with **freshwater** (not sample water) to the 100ml mark. Mix and refill the test tube to the black mark and compare your results. **Multiply your results by 10** to get an accurate reading in mg/L.
12. Empty the contents of the test tubes into the wastewater container. This can be emptied down an urban sink (where the water will be treated at a waste water treatment plant).
13. Rinse test tubes with deionised water before packing away.

9.3.3 Chemicals

Phosphate Acid Reagent

Chemicals:

Chemical Name	CAS Number	Proportion
Sulfric Acid	7664-93-9	12%
Ammonium Molybdate	12054-85-2	1%
Antimony Potassium Tartrate, Trihydrate	28300-74-5	<0.1%

First Aid:
Ensure quiet, warmth, and provide resuscitation if necessary. Remain in a raised position if there are breathing difficulties and seek medical attention or contact the Poisons Information Centre phone: 131126

Eye contact: Immediately flush with water for at least 15minutes. Consult physician.
Inhalation: Remove to fresh air. If breathing is difficult, give oxygen.
Skin contact: Immediately flush with water for at least 15minutes while removing affected clothing. Wash skin with soap and water. Consult physician.
Ingestion: DO NOT induce vomiting. Rinse out mouth. Drink plenty of water and call a doctor immediately.

Phosphate Reducing Agent

Chemicals:

Chemical Name	CAS Number	Proportion
D(-) – Isoascorbic Acid	89-65-6	10%
Sucrose	57-50-1	90%

First Aid:
Ensure quiet, warmth, and provide resuscitation if necessary. Remain in a raised position if there are breathing difficulties and seek medical attention or contact the Poisons Information Centre phone: 131126

Eye contact: Flush with water for 15minutes.
Inhalation: Remove to fresh air.
Skin contact: Rinse skin. Wash with soap and water.
Ingestion: Rinse out mouth. Drink plenty of water.

9.4.1 LaMotte Phosphate Colorimeters

1. Fill the sample collection bottle with sample water. This will be used to dispense sample water for the tests.
2. Rinse and fill a colorimeter tube to the **10mL line with sample water**. Cap and wipe dry.
3. Insert the tube into the chamber, being sure to align the index line with the arrow on the meter. Close the lid. This tube is the sample **BLANK** or **ZERO**.
4. Push the **READ** button to turn the meter on. Press the **ZERO** button and hold it for 2 seconds until **BLA** is displayed. Release the button to take a blank reading (0.0ppm).
5. Remove tube from colorimeter. **Pipette 1ml of Phosphate Acid Reagent**. Cap and mix.
6. Use the **0.1g spoon** to add one measure of **Phosphate Reducing Reagent.**

9.4.2 Maintenance

- All containers that come in contact with reagents used in this test, must be dedicated, i.e. they must not be used for other tests. This is to eliminate the possibility that reagents containing phosphate will contaminate containers.
- Avoid common kitchen detergents; dish wiping cloths, sponges, towels and other materials used for wiping around the kitchen that may be contaminated with phosphate.
- The test tubes must be rinsed with deionised water after each sample.
- Colour charts used must be free of scratches, stains and contaminants. Damaged charts must be replaced as soon as possible.
- If colour charts get wet, dry ASAP to avoid damage.
- Use daylight when matching colours between the chart and sample. A second person should confirm the reading.
- Ensure the reagents are within their expiry date and are not contaminated.

9 BIOLOGICAL SURVEYS

9.1.1 Information

Macroinvertebrates are useful indicators of stream health because: they occupy a central role in the food chains of aquatic systems; many live in the water for over a year; they cannot easily escape pollution (as some fish can); and they are sensitive to even quite mild pollutants or changes in water quality.

9.2.1 Equipment

- Sample net
- Tweezers & Pipettes
- White plastic tray
- Magnifying glass
- Macroinvertebrate Identification Chart
- Ice cube container

9.3.1 Safety

- Do not enter the water to take samples. Sampling can generally be done from the water's edge.
- Wear proper clothing and footwear including long pants, long socks, gumboots, hats and gloves.
- Never survey alone. Work with at least two other people.

9.4.1 Procedure

1. Using your net, vigorously sweep the water around the banks of the stream, sweeping around and through any vegetation or other material in this area. One method is to walk along the stream bank and scrape the surface of tree roots, gravel, leaf packs (piles of leaves) and other debris with the net. To do this, dip the net into the bottom while scooping it forward, making sure the first 10cm of bottom material are disturbed. Continue the forward motion to lift up the net.
2. To avoid gathering a net full of mud, you can pour water through the net to wash out some of the fine silt material before dumping the rest of the contents into a sampling pan for the identification.
3. Rinse the net so that all animals and debris are removed before taking another sample.
4. Separate all the different macroinvertebrate families into individual compartments in the ice cube container.
5. Start identifying macroinvertebrates using the Waterwatch Macroinvertebrate Identification Chart.
6. Most importantly once finished sampling return all Macroinvertebrates back into the water.

9.5.1 Interpreting Results

- **Very Sensitive** animals are only likely to be found in stream with good water quality.
- **Sensitive animals** are usually only found in streams with good or medium water quality.
- **Medium tolerant animals** can only be found in streams with good or medium water quality but are less likely to be found in those of poor quality.
- **Tolerant animals** can be found across a range of water quality in streams, but can live in poor quality water.
- **Very tolerant animals** can be found in water of poor to good quality, but are usually the most abundant group in streams with poor water quality.

10 WATER QUALITY GUIDELINES FOR VICTORIA

10.1 Water Quality Guidelines for Chemical Tests for Victoria

State Environment Protection Policy (Waters of Victoria) Segments and Environmental Quality Objectives – page 32 & 33

Table 1: Summary of SEPP (WoV) environmental quality objectives for rivers and streams – water quality – North East region

SEGMENT	**INDICATOR**							
	Total phosphorus (ug/L)	Total nitrogen (ug/L)	Dissolved oxygen % saturation		Turbidity (NTU)	Electrical conductivity (us/cm)	pH (pH units)	
	75th percentile	75th percentile	25th percentile	maximum	75th percentile	75th percentile	25th percentile	75th percentile
Highlands – all areas	<20	<150	>95	110	<5	<100	>6.4	<7.7
Forests A – upper Murray, Kiewa & Mitta Mitta catchments	<25	<350	>90	110	<5	<100	>6.4	<7.7
Forests B – all other areas	<25	<350	>90	110	<5	<100	>6.4	<7.7
Cleared Hills and Coastal Plains – mid reaches of Ovens, Goulburn & Broken catchments	<25	<600	>85	110	<10	<500	>6.4	<7.7
Murray & Western Plains – lowlands of Kiewa, Ovens, Goulburn & Broken catchments	<45	<900	>85	110	<30	<500	>6.4	<7.7

*Please note that all values with a “less than” or “greater than” sign should be read as “equal to or less than” or “equal to or greater than”

11 CALIBRATION LOGS

11.1 EC Meter Calibration Log

EC Meter ID #: _____ Waterwatch Kit ID #:_____

Purchase Date: _____ Make and Model: _____

Calibration with standard: **1413 µS/cm**

Date	Before Calibration (µS/cm)	After Calibration (µS/cm)	Temperature (°C)	Sampler Name	Comments

11.2 pH Meter Calibration Log

pH Meter ID #: _____ Waterwatch Kit ID #:_____

Purchase Date: _____ Make and Model: _____

Buffer Solution: pH7 and/or pH4

Date	Before Calibration (pH units)	1 point calibration (pH units)	2 point calibration (pH units)	Temperature (°C)	Sampler Name	Comments
E.g 1/1/07	7.2	7	4	22.3	J.E Aiken	New meter

Equipment maintenance & Servicing log

11.3 EC Meter Maintenance & Service Log

Item #	Date purchased	Use-by date	Serviced by	Date of service	Cleaned (tick)	Calibrated (tick)	Batteries replaced (tick)	Comments

11.4 pH Meter Maintenance & Service Log

Item #	Date purchased	Serviced by	Date of service	Cleaned (tick)	Calibrated (tick)	Batteries replaced (tick)	Comments

11.5 Phosphorus Kit Maintenance & Service Log

Item #	Date purchased	Use-by date	Serviced by	Date of service	Glassware Cleaned (tick)	P1A ok? (tick)	P2A ok? (tick)	Colour Chart ok? (tick)	Comments

11.6 Dissolved Oxygen Kit Maintenance & Service Log

Item #	Date purchased	Use-by date	Serviced by	Date of service	5ml container cleaned (tick)	Reagent 1 ok? (tick)	Reagent 2 ok? (tick)	Reagent 3 ok? (tick)	Colour Chart ok? (tick)	Comments

11.7 Oxygen Bottle Maintenance and Service Log

Item #	Date purchased	Serviced by	Date of service	Oxygen bottle cleaned (tick)	Comments

11.8 Turbidity Tube Maintenance & Service Log

Item #	Date purchased	Serviced by	Date of service	Cleaned (tick)	Comments

11.9 Thermometer Maintenance & Service Log

Item #	Date purchased	Serviced by	Date of service	Cleaned (tick)	Comments

NORTH EAST WATERWATCH

North East Catchment Management Authority

North East Waterwatch Schools Methods Manual

North East Waterwatch

Chapter

1

Monitoring Introduction

This North East Victoria Waterwatch Methods Manual contains a selection of methods for field monitoring equipment that is widely used by Waterwatch Coordinators and Facilitators in the North East region. If you require any further information or assistance please contact your local Waterwatch Coordinator / Facilitator or refer to the following manuals:

- A Community Water Quality Monitoring Manual for Victoria.
- Waterwatch Education Kit.

Waterwatch Team Leader
Address:
PO BOX 616 WODONGA, VIC 3689
Phone: 02 6043 7600
Fax: 02 6043 7601
Email: waterwatch@necma.vic.gov.au

Waterwatch Facilitator / Liaison Officer
Address:
PO BOX 616 WODONGA, VIC 3689
Phone: 02 6043 7600
Fax: 02 6043 7601
Email: waterwatch@necma.vic.gov.au

Chapter 2

Safety

Before taking your students to the local stream please consider the following:

Field Safety

Does your stream bank have stable and has easy access during all weather?

Have you informed the school where you will be monitoring?

Do your students have proper clothing and footwear depending on the weather e.g. hat, warm clothing, sunscreen, shoes with good grip, gumboots, waders etc.

Are there any holes, snakes, prickly vegetation or electric fences that you need to be aware of?

Chemical & Biological Safety

Have you read all warnings and procedures of first aid before chemicals are used?

Do you have the safety equipment i.e. safety gloves & glasses and have you read the chemical labels and material safety data sheets?

Remind students to not drink water from the source you are testing as it may be polluted.

In particular when testing do not put your hands near your mouth or eat and drink while testing the water?

Completing testing ensure students wash their hands with soap and water?

Ensure students use the CHEMICAL WAST CONTAINER and dispose of correctly (emptied into sink or drain where the water will be treated).

Assist students to find a safe & stable area to collect macroinvertebrates.

Ensure there is adult supervision when students are collecting samples from a water source.

Field Considerations

Is your site on a private property? Did you seek permission of the owners first?

Have you left gates as your found them, open or closed?

Have you removed all excess rubbish from monitoring site?

Safety

Refer to equipment instruction many for first aid information.

Chapter 3

Sample Collection

Remember:

- Direct sunlight can affect samples so store and perform all chemical tests in the shade.
- Fill sample bottle completely to prevent any loss of dissolved gases, if possible cap under water.
- If taking off-site, label all samples immediately on collection with site name or number, date and time of sampling.
- All water samples should be tested as soon as possible after collection. If analysis is delayed, changes due to biological activity, physical changes or chemical reactions can occur.

If you are unable to do the monitoring at your site there are some steps you will need to follow when storing your sample.

If the weather is poor and the sample is to be taken back to the classroom, fill to the very top and cap underwater if possible. Take the thermometer to the site so temperature can be measured straight away. If there is a long delay between sampling and analysis, (>2hours), store sample in a cool, dark container, e.g. esky.

Recommended sample storage and preservation techniques:

Parameter	Container	Preservation	Maximum storage time
Conductivity	P,G	Refrigerate	28 days
pH	P,G	Analyse immediately	2 hours
Turbidity	P,G	Analyse immediately or store in dark for 24 hours	24 hours
Temperature	P,G	Analyse immediately	no storage
Dissolved Oxygen	G	Analyse immediately	8 hours
Phosphorus	G rinsed	Refrigerate	48 hours

G = glass
P = plastic (polythene or equivalent)

Chapter 4

Water Quality Procedures
Water Temperature

Why test Temperature?

Water temperature is one of the most important things to measure. The distribution and abundance of aquatic plants and animals is affected by changing temperatures. Water temperature is influenced by the depth of the water (the deeper the water the cooler it is) the season and the time of day. Temperature may also be influenced by industrial, agricultural and urban runoff, increased suspended sediments in the stream and by the vegetation on he banks (shading).

Equipment

- Thermometer (range -10 to 200˚C)

Procedure

- Follow Waterwatch instruction manual.

Maintenance

- Keep the thermometer and guard free from dirt and other contaminants.

What do your results mean?

- For human recreational uses temperatures should be in the range of 15-35˚C if prolonged exposure is experienced.
- For the protection of aquatic ecosystems the maximum recommended increase in the natural temperature of any inland waters in 2˚C.

Dissolved Oxygen

Why test Dissolved Oxygen?

Dissolved Oxygen (DO) is the small amount of oxygen that is dissolved in the water. This oxygen is vital to fish, other aquatic animals, micro-organisms and plants which depend upon it to breathe. Healthy and diverse aquatic ecosystems depend on high oxygen levels. DO levels may be expressed as milligrams per litre (mg/L) or as percentage saturation (% sat).

Equipment

- Visocolour dissolved oxygen kit.
- Glass stoppered bottle (rinsed with water to be tested).

Procedure

- Follow Waterwatch instruction manual.

Safety

- The procedures for DO require the use of potentially hazardous chemicals. If procedures are followed correctly and the necessary safety precautions are carried out, the risks are significantly reduced.

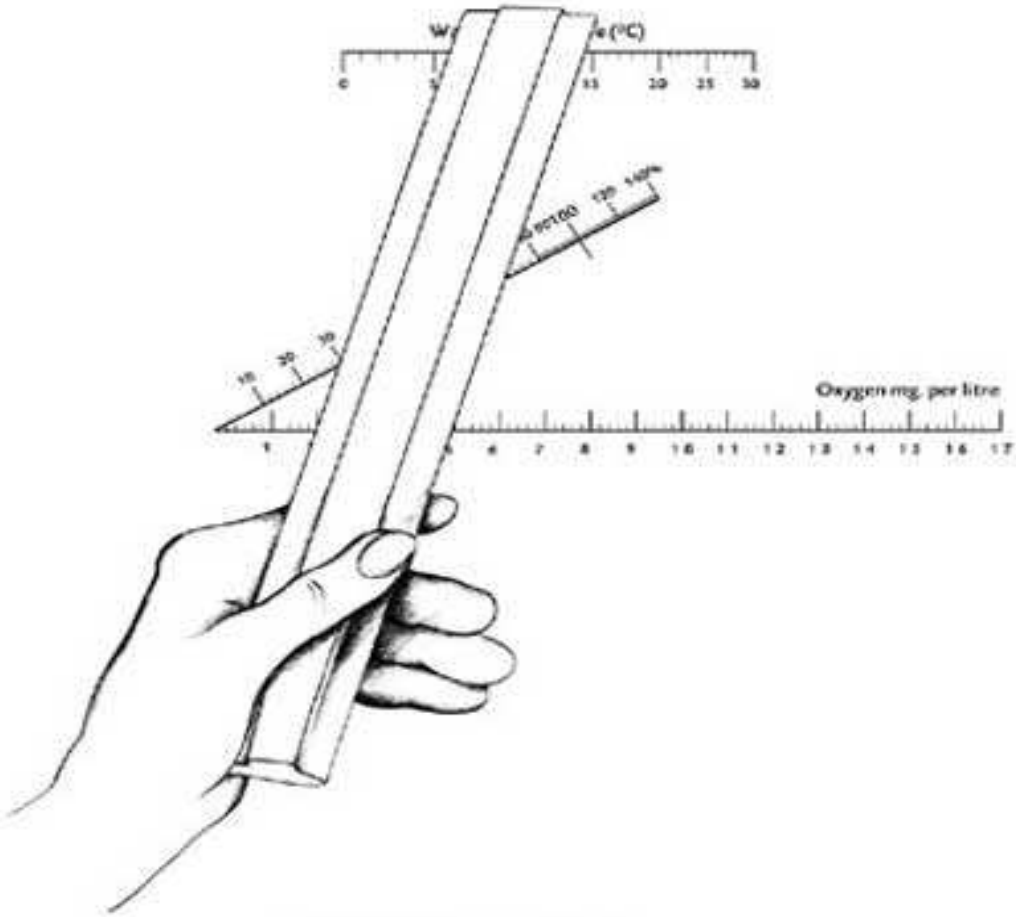
- It is important to read the Material Safety Data Sheets (MSDS) for the DO kit chemicals before handling. These sheets also cover first aid measures if an accident occurs. The chemicals used and some of the possible risks associated with them are listed below.

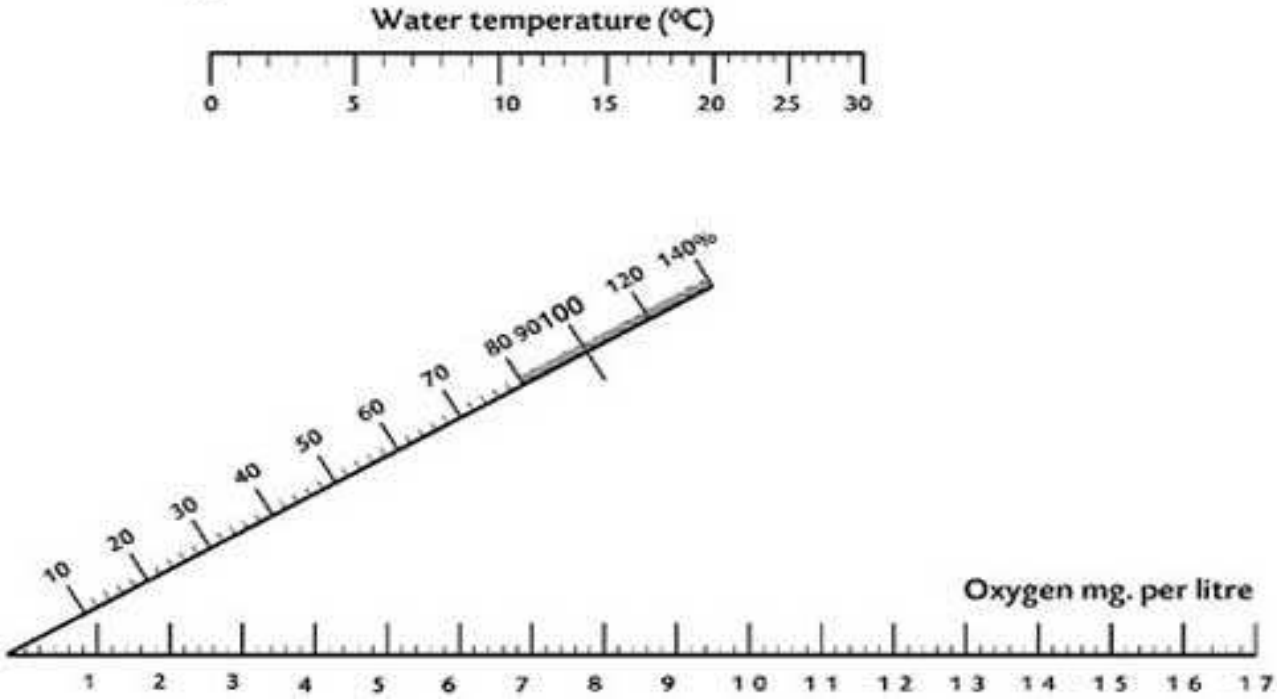
What do your results mean?

Region	Dissolved Oxygen (%)
Mountains *Highlands all areas.*	<95 - 110
Valley *Forest A - upper Murray, Kiewa & Mitta Mitta catchments.*	<90 - 100
Valley *Forest B – all other areas.*	<90 - 110
Plain *Cleared Hills & Coastal Plains - mid reaches of Ovens catchments.*	<85 - 110
Plain *Murray & Western Plains – lowlands of Kiewa, Ovens, catchments.*	<85 - 110

State Environment Protection Policy (Waters of Victoria) Segments and Environmental Quality Objectives.

Oxygen % Saturation Chart





Turbidity

Why test Turbidity?

Turbidity is the cloudiness of water and is the result of tiny particles of clays, silts and organic material being held by the water (suspended solids). This suspended material stops the ability of light to pass through the water effecting plant growth. This in turn affects the fish and invertebrate communities, which feed on and live in the plants. The most frequent causes of turbidity in rivers and other water bodies are algae and inorganic material from soil weathering and erosion.

Equipment

- Turbidity Tube
- Sample bottle with nozzle, rinsed out with sample water prior to filling.

Procedure

- Follow Waterwatch instruction manual.

Important Points to Note

- Carry out the test in the shade with your back to sun.
- A second person should confirm the result.
- Note the presence of highly coloured water will result in overstating the turbidity level.

What do your results mean?

Region	Turbidity (NTU)
Mountains *Highlands all areas.*	<5
Valley *Forest A - upper Murray, Kiewa & Mitta Mitta catchments.*	<5
Valley *Forest B – all other areas.*	<5
Plain *Cleared Hills & Coastal Plains - mid reaches of Ovens catchments.*	<10
Plain *Murray & Western Plains – lowlands of Kiewa, Ovens, catchments.*	<30

State Environment Protection Policy (Waters of Victoria) Segments and Environmental Quality Objectives

Salinity (Electrical Conductivity)

Why test Salinity?

Salinity is simply a measure of the amount of salt dissolved in the water. Salts are substances such as common table salt and many others. They are picked up by the water as it runs over and through the rocks and soils of the catchment. Low levels of these salts are vital to the growth of aquatic plants and animals but high levels can cause problems for aquatic life and for human uses such as crops and irrigation.

Equipment

- EC Meter
- Deionised Water
- Sample container (optional)
- Tissues
- Sample bottle

Procedure

- Follow Waterwatch instruction manual.

Calibration

- It's important that you calibrate your EC Meter with a calibration solution every 2 weeks or before testing a large number of samples to ensure your readings are accurate.
- Refer to Waterwatch equipment instruction manual for calibration procedure.

Maintenance

- Maintain calibration service and records.
- Ensure that calibration solution is kept in a cool dark location between uses and is within the expiry date (12 months for 0.01 molar KCI solutions).
- Do not immerse the electrode into the stock calibration solution because this will contaminate it.
- To keep the electrode free from contaminants after testing, wash the electrodes thoroughly with deionised water and wipe dry with a tissue.
- Once a year wipe the electrodes with a tissue and soak for 10-15 minutes in alcohol, then rinse with deionised water.

Interpreting your results

- For fresh waters the EC should not exceed 1500 µS/cm.
- Refer to Upper Limits for Water Salinity Table below.

Upper Limits for Water Salinity Table

Uses	µS/cm EC units	TDS ppm Mg/L
Rain	10	6
Apricots/Peaches	330	200
Citrus/grapevines	370	220
Sub-clover	500	300
White clover	600	360
Permanent pasture (ryegrass & clover)	800	480
Desirable upper limit for drinking water	830	500
Pears	900	540
Apples	1000	600
Tomatoes, sweet corn (maize)	2300	1400
Perennial ryegrass	2300	1400
Lucerne	2400	1440
Poultry, pigs	4100	2460
Wheat	500	3000
Dairy cattle	5400	3240
Lactating ewes/weaned lambs	6000	3600
Horses	7800	4680
Beef cattle	11,400	6840
Dry sheep	15,700	9420
Sea water	50,000	30,000
Dead Sea	550,000	330,000

pH

Why test pH?

PH is a measure of how acidic or alkaline the water is, on a scale of 1-14. pH from 7 to 0 indicates acidic water. pH from 7 to 14 indicates alkaline water. Fresh water generally has a pH range between 5-9.

Animals and plants in streams are adapted to certain ranges of pH. Even under natural conditions, the animal and plant communities of acidic streams contain many different species to those in alkaline streams. An increase or decrease in pH outside the normal range of a water body will cause sequential loss of species depending on their sensitivity.

Equipment

- pH Strips (resolution ±0.5 pH units) or pH Hanna Meter
- Sample container (optional)

Procedure & Calibration

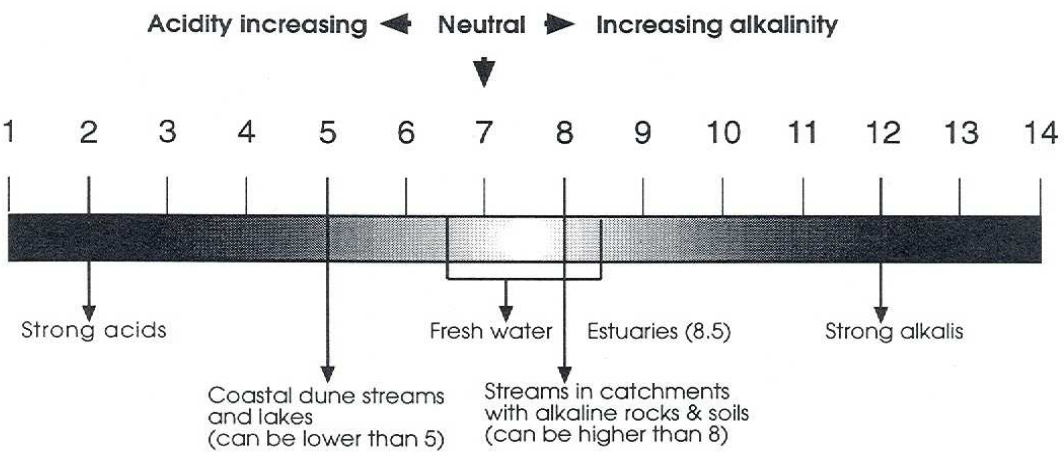
- Follow Waterwatch instruction manual.

Maintenance

- Experiments have shown that pH paper requires at least 5 minutes to react, not 1 minute as per manufacturer's instructions.
- Store the pH Hanna Meter in the kit, keep the electrode moist. DO NOT use deionised or distilled water for storage purposes.

Interpreting your results

- pH values can range from 5.5-8.5 in the north east region.
- For drinking, less than 6.5 may be corrosive and more than 8.5 may cause scale and taste problems.



Reactive Phosphorous

Why test Reactive Phosphorous?

Reactive Phosphorus is a mineral nutrient which is essential for all forms of life. It plays a major role in energy transfer processes in the cells of living organisms. Phosphorous occurs naturally at low concentrations in surface water and is an essential part of the food chain. The delicate balance of an ecosystem can be upset when phosphorous concentrations become too high.

Equipment

- Visocolour Phosphorus kit

Procedure

- Follow Waterwatch instruction manual.

Safety

It is important to read the Material Safety Data Sheets (MSDS) for the Phosphorus kit chemicals before handling, which can be found in the Waterwatch equipment instruction manual. These sheets also cover first aid measures if an accident occurs.

Maintenance

- All containers that come in contact with reagents used in this test, must be dedicated, i.e. they must not be used for other tests. This is to eliminate the possibility that reagents containing phosphate will contaminate containers.
- Avoid common kitchen detergents; dish wiping cloths, towels and other materials used for wiping around the kitchen that may be contaminated with phosphate.
- The test tubes must be rinsed with deionised water after each sample.
- Colour charts used must be free of scratches, stains and contaminants.
- Use daylight when matching colours between the chart and sample.
- Ensure the reagents are within their expiry date and are not contaminated.

Interpreting your results

Region	Reactive Phosphorous (mg/L)
Mountains *Highlands all areas.*	< 0.020
Valley *Forest A - upper Murray, Kiewa & Mitta Mitta catchments.*	< 0.025
Valley *Forest B – all other areas.*	< 0.025
Plain *Cleared Hills & Coastal Plains - mid reaches of Ovens catchments.*	< 0.025
Plain *Murray & Western Plains – lowlands of Kiewa, Ovens, catchments.*	< 0.045

State Environment Protection Policy (Waters of Victoria) Segments and Environmental Quality Objectives.

Chapter 5

Biological Surveys

Macroinvertebrates are useful indicators of stream health because: they occupy a central role in the food chains of aquatic systems; many live in the water for over a year; they cannot easily escape pollution (as some fish can); and they are sensitive to even quite mild pollutants or changes in water quality.

Equipment

- Sample net
- Tweezers & Pipettes
- White plastic tray
- Magnifying glass
- Macroinvertebrate Identification Chart
- Ice cube container

Procedure

1. Using your net, vigorously sweep the water around the banks of the stream, sweeping around and through any vegetation or other material in this area. One method is to walk along the stream bank and scrape the surface of tree roots, gravel, leaf packs (piles of leaves) and other debris with the net. To do this, dip the net into the bottom while scooping it forward, making sure the first 10cm of bottom material are disturbed. Continue the forward motion to lift up the net.

2. To avoid gathering a net full of mud, you can pour water through the net to wash out some of the fine silt material before dumping the rest of the contents into a sampling pan for the identification.

3. Rinse the net so that all animals and debris are removed before taking another sample.

4. Separate all the different macroinvertebrate families into individual compartments in the ice cube container.

5. Start identifying macroinvertebrates using the Waterwatch Macroinvertebrate Identification Chart.

6. Most importantly once finished sampling return all Macroinvertebrates back into the water.

Interpreting your Results

1. Tick the tolerance level of bugs found on your record sheet. List the number of species found and the types of species found.

2. Identify the two dominant groups (the species with the most number of bugs) and fill in their tolerance ranking on the record sheet.

Dominance Group 1	
Tolerance Ranking	
Dominance Group 2	
Tolerance Ranking	

3. Use the table to work out your broad water-quality ranking. Do this by reading the appropriate tolerance levels along the top of the table and along the side of the table. Circle where the two meet in the centre.

4. This gives you an indication of the overall water quality based on your two dominant bug groups.

Water Quality Indicator Table				
	Very Tolerant	Tolerant	Sensitive	Very Sensitive
Very Tolerant	**Degraded**	**Degraded - Poor**	**Poor**	**Good-Medium**
Tolerant	**Degraded - Poor**	**Poor**	**Poor - Medium**	**Good**
Sensitive	**Poor**	**Poor-Medium**	**Good**	**Good - Excellent**
Very Sensitive	**Good - Medium**	**Good**	**Good - Excellent**	**Excellent**

- **Very Sensitive** animals are only likely to be found in stream with good water quality.
- **Sensitive animals** are usually only found in streams with good or medium water quality.
- **Medium tolerant animals** can only be found in streams with good or medium water quality but are less likely to be found in those of poor quality.
- **Tolerant animals** can be found across a range of water quality in streams, but can live in poor quality water.
- **Very tolerant animals** can be found in water of poor to good quality, but are usually the most abundant group in streams with poor water quality.

Appendix 5- Soft Limits North East Water Types

	RIVERS		CREEKS		LAKES	
	Low	**High**	**Low**	**High**	**Low**	**High**
Dissolved Oxygen (mg/L)	3	12	2	12	3	10
Reactive Phosphorus (mg/L - P)	0	0.045	0	0.28	0	0.48
Turbidity (N.T.U)	0	160	0	150	0	150
Temperature (ºC)	4.9	25	3.0	29.3	6.5	32.5
pH (units)	5	8.5	5	8.5	5	8.5
% Oxygen Saturation (%)	40	120	20	140	20	120
Electrical Conductivity (E.C.)	0	150	0	600	30	750

Appendix 6 - North East Waterwatch Staff Induction Checklist

Waterwatch Staff Induction Training Checklist

Supervisor to Complete

To be completed by the new staff member's supervisor at the beginning of the new staff member's employment. Indicate with a tick (✓) the completion or explanation of the topic.

Details of New Staff Member and Supervisor

New Staff Members Details: Surname:..... Other names:.....

Position/Section:.....

Employee Code:..... Commencement date:.....

Supervisors Details: Surname:..... Other names:.....

Introduction

Introduction to their co-workers	☐	Location of office equipment, etc.	☐
Location of emergency equipment	☐	Emergency evacuation routes and assembly area	☐
Location of nearest cafes/food areas	☐	Storage of personal belongings	☐
Tour of the work environment (e.g. toilets, lunchroom, meeting room, first aid facilities)	☐	Appointment arranged with HR and forms to be filled out.	☐

Parking, Access, Telephone, Email, etc.

Location of car parking	☐	Listing in Staff Contact List confirmed	☐
Access code for photocopier issued	☐	Business cards organized	☐
Access code for alarm issued	☐	Arrange access keys to be allocated	☐
Email account and address setup	☐	Show staff diary and how to use	☐
Telephone messaging and setup (landline & mobile)	☐	Show operation of WYWO system	☐
Purchasing petrol, washing car & petrol receipts	☐		

Office Procedures & NECMA documents

- Working hours, breaks and recording hours ☐
- Issue with copy of RCS & other Strategy documents ☐
- Issue with copy of EBA and Award ☐
- Discuss organizational history and background ☐
- Issue with copy of NECMA Induction manual ☐
- Locking up procedure of office ☐

Stationary, filing, timesheets, printing etc.

- Ordering Stationary ☐
- NECMA filing structure ☐
- NECMA forms ☐
- Pay structure ☐
- Printing ☐
- Use of the laminator, binding and other equipment ☐

Waterwatch Background

- View Waterwatch web page (NECMA & Vic WW) ☐
- Issue with school lists & school contact details ☐
- Issue with copy of Waterwatch Manuals & other ☐
- Discuss Waterwatch structure in Victoria & contacts ☐
- Discuss Waterwatch history and setup in the North East ☐
- Discuss statewide meetings, training, QA/QC etc. ☐

Waterwatch Operational

- View Watchman database & discuss ☐
- Show WW storage location and gear ☐
- View WVA database & discuss ☐
- Discuss Equipment Inventory Lists, logs & process ☐
- Issue with copy of Strategic Plan & Evaluation report ☐
- Issue WW kits ☐
- Explain each parameter measured ☐
- Train in conducting water quality testing, cleaning ☐
- Show record sheets, where to access them etc. ☐
- Undertake water testing onsite at 3 locations ☐
- Book in to view WW staff at their schools ☐
- Discuss themes and designing education lessons ☐
- Discuss adult volunteer network ☐
- Show contact lists ☐
- Discuss newsletter ☐
- Discuss reporting structure & requirements ☐

Financial

Discuss budget & view financial folder	☐	Discuss & show RCIP, requirements, reporting etc	☐
Explain how to fill out purchase order & processes	☐	Ordering Waterwatch gear	☐

Position Requirements

Workplace reporting structure	☐	Performance appraisals	☐
Position duties	☐	Conditions of employment	☐
Clarify job and key relationships/partnerships	☐	Communication channels, responsibilities	☐