Data Confidence Plan
Goulburn Broken Catchment

May 2005

action Salinity & Water AUSTRALIA

WATERWATCH Goulburn/Broken Catchment Linking Communities and Catchments

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

WATER

GOULBURN VALLEY WATER

Data Confidence

Waterwatch in the Goulburn Broken Catchment

Background

THE VISION

To bring about an improvement in river health in the Goulburn Broken Catchment.

MISSION STATEMENT

To assist the Waterwatch community water quality monitoring program that operates in the Goulburn Broken catchment to produce data that is useful to other stakeholders in catchment river health.

GUIDING PRINCIPLES

- To develop community awareness and "ownership" of water quality issues;
- To assist in the collection of water quality data that can be used to gauge trends and improvements in river water quality.

As a result of this increased community awareness and "ownership", communities are encouraged to take remedial actions to improve the water quality in our waterways.

Goulburn Broken Waterwatch believes that where data is collected by well-trained co-ordinators and monitors from significant locations across the catchment according to a whole of catchment monitoring plan, the value of Waterwatch data to monitoring groups and to water managers is greatly enhanced.

MONITORING PROGRAM OVERVIEW

Waterwatch in the Goulburn Broken catchment seeks to protect and enhance the health, beauty and enjoyment of the Goulburn and Broken Rivers and their tributaries through awareness-raising community monitoring activities in local waterways. The catchment is the largest in Victoria covering 2,400,000 hectares and is 10.5% of the total area of Victoria. Approximately 250,000 people live in the catchment.

The Waterwatch Program has operated in the community since July 1993. It has been successful in attracting a large number of people, as individuals or as part of a group, to monitor local waterways and learn about water quality issues. Some of these groups have been monitoring continuously for more than four years.

The Goulburn Broken Waterwatch Program is one of the major water quality monitoring programs in the region. Other programs that undertake water quality monitoring include:

- Drainage Operation Monitoring (SKM);
- Victorian Water Quality Monitoring Network;
- Major Storages Operations Program (Goulburn Murray Water/ VWQMN);
- Goulburn Broken Dryland Salinity Monitoring Program (VWQMN);

- Murray Darling Basin Commission Water Quality Monitoring; and
- Environment Protection Authority.

Six staff co-ordinate the Waterwatch program in the Goulburn Broken catchment. Roles, duties and time allocations for each position vary depending on the local support of the program from sponsors. Staff are located strategically across the Goulburn Broken region, with the Regional Co-ordinator based at the head offices of Goulburn Valley Water in Shepparton. You should refer to the Goulburn Broken Waterwatch Business Plan (2003) for further information on the management of the Regional Waterwatch Program.

The Waterwatch Program has been successful in recruiting Landcare and school groups into the program. Many of the Landcare Groups were already involved in land and waterway restoration work. School groups have been prepared to include Waterwatch activities in their school curriculum at all levels from lower primary to tertiary.

The nature of the data collected by groups is dependent upon the water quality issues important in their area. Surface waters (including lakes), urban stormwater, irrigation channels/drains and groundwater systems are monitored. The data that is collected is stored in the Regional Waterwatch Database and returned to the groups as an Annual Report. Groups are encouraged to use this data to implement on-ground actions that may lead to improvements in waterway quality.

In 2004, approximately 300 sites were monitored at least once throughout the year. Approximately 130 sites are monitored monthly for turbidity, electrical conductivity, temperature, total phosphorus, pH and dissolved oxygen.

The data is also published on the web where it is available to all interested groups (http://www.gbwaterwatch.org.au). Agencies responsible for the management of our waterways have access to this data. Private consultants, students and individuals regularly request access to Waterwatch data.

AIMS OF THE DATA CONFIDENCE PLAN

There is a growing demand for Waterwatch data by Government Agencies and private consultants. It is therefore timely to develop a Data Confidence Plan that will ensure the quality of community monitoring data. The Plan:

- Assists groups to develop effective monitoring programs that produce relevant data;

- Provides training opportunities for monitors that enables them;

    - To identify any contamination in samples;
    - To recognise a failure of equipment; and
    - To eliminate inadequate practices and procedures.

- Instils good scientific principles in all monitors where their data is potentially available to Agencies and the wider community.

- Demonstrates the program's data quality to stakeholders such as data users, Steering Committees and sponsors, both actual and potential.

The Data Confidence Plan aims to increase the value of all data collected in the catchment by Waterwatch monitors. Ultimately, it is anticipated that Agencies and the community will consider the Waterwatch Program as a source of valuable water quality information.

Data Confidence System

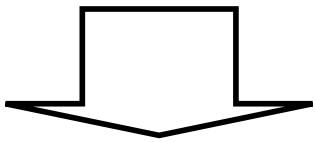
Monitoring within Goulburn Broken's Waterwatch Program is driven by a number of local, regional and state natural resource management frameworks. The diagram below outlines the range of inputs that influence the Waterwatch Program and its data collection activities.

Relevant Waterwatch Victoria Resources

- Waterwatch Victoria Equipment Manual
- Waterwatch Victoria Methods Manual
- Waterwatch Victoria Data Confidence Manual

Relevant Regional NRM Strategies and Frameworks

- Goulburn Broken Regional Catchment Strategy
- Shepparton Irrigation Region Catchment Strategy
- Goulburn Broken Regional River Health Strategy



Goulburn Broken Waterwatch Program Management

- Goulburn Broken Waterwatch Business Plan 2003
- Drainwatch Business Plan 2003
- Goulburn Broken Waterwatch Data Confidence Plan
- Goulburn Broken Monitoring Methods Handbook (includes sampling, measurement and interpretation guidelines, checklists and QC records)
- Goulburn Broken Community Monitoring Handbook for Groups
- WATCHMAN Database (includes group information, training records, equipment servicing/maintenance/calibration records)
- Waterwatch Database (includes group/site information, data)

Personnel and Responsibilities

Name	Role	FTE
David Hodgkins	Regional Co-ordinator	1
Jacinta Burke	Northern Co-ordinator	1
Glenda Woods	Mid Catchment Co-ordinator	0.4
Jill Breadon	Upper Catchment Co-ordinator	0.4
Melanie Giovanetti	Drainwatch Co-ordinator	0.6
Kirsten Hogan	Monitoring to Action Co-ordinator	0.4

The Regional Co-ordinator is responsible for the overall implementation of the Regional Data Confidence Plan. The Regional Co-ordinator:

- Ensures that practices documented within the regional data confidence plan and methods manual accurately reflect on-ground monitoring procedures;
- Ensures that all training needs of local facilitators are satisfied;
- Ensures all equipment used by Waterwatch staff is maintained and calibrated correctly;
- Seeks servicing and/or repair options for faulty equipment;
- Maintains the Program Management Database (Watchman);
- Purchases new equipment and replacement chemicals, assigns unique identification numbers (as required), and distributes equipment to coordinators;
- Maintains the Regional Waterwatch Database, including data validation and management;
- Maintains volunteer records, including contact details and training histories;
- Files of hardcopy records.

The Regional Co-ordinator also oversees the integrity of data presented by local facilitators and community monitors for inclusion in the Regional Database.

Local Co-ordinators are responsible for community monitors in their area. This includes:

- Coordination and supervision of specialised activities, including Waterwatch Snapshot events and special projects;
- The provision of standard solutions to monitoring groups for calibration of equipment;
- The training of new monitors in sample collection and testing, and the maintenance and operation of their equipment;
- Refresher training of monitors in the use of equipment and data interpretation;
- The maintenance of volunteer monitoring equipment including the provision of replacement chemicals and calibration standards;
- Calibration of equipment (when required) and maintenance of logs (calibration/repair/servicing);
- Program communication, including preparation of data reports, newsletters and annual reports.

Monitoring Plans

Monitoring Plans are prepared in consultation with all water monitors, whether they are individuals, or members of a sub-catchment monitoring network. In developing these Plans, the Regional Catchment Water Quality Strategy is consulted so that relevant water quality issues are included in the Monitoring Plan.

A Monitoring Plan ensures that individuals and groups are collecting the most relevant data for educational and data gathering purposes. This data is returned to the group as an informative report at least annually.

Plans are retained by the local Waterwatch Co-ordinator charged with facilitating the monitoring network. Plans are reviewed biannually.

A copy of a Monitoring Plan used in the Goulburn Broken Catchment can be found in Appendix 2.

Site Selection

Waterwatch monitoring sites are commonly chosen by groups and/or individuals who have a particular interest in a specific reach of a local waterway.

Waterwatch Co-ordinators also undertake water quality monitoring at strategic sites, which often fill in gaps in a local monitoring program. Many of these strategic sites are located near the end of streams. This adds value to volunteer monitor data and enables a comparison of data along the length of a waterway.

All sites are given a code that consists of a 6 digit alpha-numeric descriptor.

CREEK/RIVER SITES

The first 3 letters of the alpha-numeric indicate the name of the river/creek (eg. GOU is the Goulburn River). The 3 numbers indicate the location of the site along the length of the stream, with lower numbers indicating headwater sites (eg 005) and higher numbers indicating a progressive downstream movement towards the junction or mouth of a waterway. River junction/mouth sites are usually denoted as 095 for large waterways and 025 for tributaries.

A site midway along the Goulburn River is likely to be denoted as GOU050.

IRRIGATION DRAIN SITES

The coding system is different for irrigation drains monitored in the Drainwatch Project (Refer to the Drainwatch Business Plan 2003 for further information about the project). The three letter sequence is DRN for all drains. Different drainage systems are assigned block numbers up to a maximum of 999. The number should reflect the location of the site along a particular drain if possible. Site descriptions are recorded for all sites, and include the drain numbering system that is used by Goulburn-Murray Water.

LAKE, STORMWATER, WETLAND AND GROUNDWATER SITES

The first letter of the alphanumeric for a lake site is “L”. The following two letters are formed from the name of the lake(s). The three number sequence begins at 001 and does not necessarily reflect the location of the site on the lake.

The first letter of the alphanumeric for a wetland site is “W”. The following two letters are formed from the name of the wetland. The three number sequence begins at 001 and does not necessarily reflect the location of the site on the wetland.

All stormwater drain sites begin with the letters “STO”. Numbers are assigned in blocks and reflect the position of the bore in the Goulburn Broken Catchment as set out in the table below.

All groundwater sites begin with the letters “GRO”. Numbers are assigned in blocks and reflect the position of the bore in the Goulburn Broken Catchment as set put in the table below.

Position in Catchment	Numbers
Upper Goulburn	001 to 100
Mid Goulburn	101 to 200
Lower Goulburn	201 to 300
Upper Broken	301 to 400
Lower Broken	401 to 500

SITE CO-ORDINATES

Sites are also described using 6 figure Easting and 7 figure Northing grid co-ordinates. Most new sites are logged using a Global Positioning System (GPS) (WGS84) or derived from the mapping software FUGAWI. Some sites monitored early on in the Program have coordinates drawn from local topographic maps (AMG66/84).

Testing Parameters

Goulburn Broken Waterwatch uses a number of water quality parameters and surveys to gauge the health of our waterways. These include:

- Temperature
- Electrical Conductivity
- pH
- Turbidity
- Dissolved Oxygen
- Phosphorus (Total and Ortho)
- Ammonia
- Total Nitrogen
- E. coli
- Chemical Oxygen Demand (COD)
- Habitat Surveys
- Macro-invertebrate Surveys
- Flow

The monitoring program carried out at each site depends upon the interests of the monitoring group, the issues identified in their Monitoring Plan, and the availability of

equipment. Frequency of monitoring at each site also varies depending upon the time constraints of monitors and co-ordinators.

Instrumentation

A number of different types of instruments are used within the Goulburn Broken Waterwatch Program. Appendix 1 lists specifications and essential information about all instrument types used in the Program, including:

- Instrument type/model;
- Instrument range, resolution and accuracy;
- Parameters and units; and
- Distributor/manufacturer details (company name, contact person, address and phone number).

This table does not identify the types of instruments used in different monitoring situations. Such information can be found in the Regional Framework section.

Appendix 2 contains the contact details of all suppliers of instruments and equipment used in the Goulburn Broken Waterwatch Program.

Training

Coordinator Training

All local coordinators attend training workshops in the chemical/physical and biological testing methodologies provided by the Waterwatch State Office when joining the Program. Co-ordinators subsequently attend refresher courses at least every two years. Local Co-ordinators are encouraged to attend other professional development opportunities. The specific competencies required by Waterwatch personnel for a range of parameters are listed in the Regional Framework section.

Community monitor training

New monitors

All community monitors in the Waterwatch Program are trained by local co-ordinators in the range of topics needed 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 level of monitoring being planned.

Topics covered in the Training Program include:

1. Sampling procedures;
2. Sample storage (where storage is required);
3. Use of equipment;
4. Calibration of equipment;
5. Limitations and effectiveness of equipment;
6. Testing procedures under a variety of conditions; and
7. Cleaning of equipment.

A training checklist is attached in Appendix 3.

All new monitors receive a Community Monitoring Handbook that contains sampling procedures and testing methodologies that are relevant to their program. The Manual also includes the necessary data sheets, training record sheets and equipment calibration sheets.

Experienced monitors
Community monitors, aspiring to Standard 3 monitoring, must attain the competencies as listed in the Regional Framework section and undertake refresher training on a six-monthly basis, which may coincide with regional quality control checks (see Quality Control Requirements section below),

Record keeping

A training checklist appears in Appendix 3.

Regional training records for coordinators and monitors are maintained by the Regional Co-ordinator in the Program Management Database (Watchman).

Regional Framework

Standard 1

A typical standard 1 monitor/group will attend a single educational excursion and perform one or more water quality tests in situ.

Parameters	Equipment	Calibration	Monitoring Frequency	Storage of Data	Purpose for Monitoring
Turbidity	Turbidity Tube	N/A	Once per year (eg Snapshot event) - minimum	Spreadsheet or Hardcopy	Education and Awareness
Electrical Conductivity	❑ TD Scan 20	Co-ordinator			
	❑ La Motte Pocketester				
pH	pH Papers	N/A			
Temperature	Bulb Thermometer	N/A			
Ortho Phosphorus	Merck:				
	❑ Aquaquant Kit	N/A			
	❑ Aquamerck Kit	N/A			
Macro-Invertebrates	Net				
	2-way microscope	N/A			
DO, Temperature	❑ Merck DO Kit	N/A			
	❑ Hach DO Kit	N/A			

Competencies
Teachers are shown best practice with each piece of testing equipment prior to use in the field.

Standard 1 Waterwatch Group

- ❑ School students who participate in a water testing excursion or class exercise as a one-off activity. Teacher or supervisor has little or no training prior to the activity.
- ❑ Community members participating in one-off monitoring activity.

Standard 2

A typical Standard 2 monitor will test water on a regular basis at one or more sites during a year. Monitors or teachers are initially trained and then encouraged to carry out their own monitoring program.

Parameters	Equipment	Calibration	Monitoring Frequency	Storage of Data	Purpose for Monitoring
Turbidity	Turbidity Tube	N/A	Monthly or less for limited period	Spreadsheet	Education
Electrical Conductivity	❑ TD Scan 20 ❑ La Motte Pocketester	Co-ordinator	As Above	Hardcopy	Awareness
pH	pH Papers	N/A	As Above	Catchment Capers Website	
Temperature	Bulb Thermometer				
Ortho Phosphorus	Merck: ❑ Aquamerck Kit ❑ Aquaquant Kit	 N/A N/A	As Above		
Dissolved Oxygen	❑ Merck DO Kit ❑ Hach OX-2P	N/A	As Above		
Temperature	Bulb Thermometer	N/A	As Above		
Macro-Invertebrates	Net 2-way microscope	 N/A	Bi-annually		
Habitat			Annually		
Rainfall			Monthly		

Competencies
Teachers are shown best practice with each piece of equipment and are required to test a mystery sample for each parameter. Macro-invertebrate training is provided to allow for identification to class and some to order level.

Training
- ❑ Introductory training session for teachers
- ❑ Annual refresher training

Standard 2 Waterwatch Group
- ❑ Catchment Capers schools
- ❑ School group undertaking a water unit where data points are collected over a limited period.

Standard 3

A typical Standard 3 monitor will be a school teacher, student, community group or individual, who tests water samples regularly and maintains close contact with the local Waterwatch Co-ordinator. Training is provided to the monitor regularly…. at least every year. The monitor utilises regular Waterwatch equipment.

Parameters	Equipment	Calibration	Monitoring Frequency	Storage of Data	Purpose for Monitoring
Turbidity	Turbidity Tube	N/A	Monthly or more	Regional Database	Education
Electrical Conductivity	TD Scan 20 La Motte Pocketester	Monthly by Monitor	Monthly or more	Goulburn Broken Waterwatch Website Data Warehouse	Awareness
Temperature	Digital Thermometer				
pH	Eutech pHScan WP2				
Ortho Phosphorus	Merck: ❑ Aquamerck Kit ❑ Aquaquant Kit	N/A N/A	Monthly or more		Data Collection
Temperature	Digital Thermometer	N/A	Monthly or more		
Habitat					
Rainfall					
Macro-Invertebrates	Net 2-way microscope		Random	Hardcopy	Education Awareness

Competencies
Monitors are competent in the use of selected chemical/physical testing equipment. Macro-invertebrate training provided to allow for identification to order level with limited identification to family level.

Training

- ❑ Introductory training session for each monitor
- ❑ Six monthly refresher training

Data Verification

- ❑ Monthly sampling by co-ordinators at 80 sites across catchment
- ❑ Three monthly sampling by co-ordinators at all sites
- ❑ Retention of some samples for testing by co-ordinators for verification
- ❑ Comparison with Agency water quality data

Standard 3 Waterwatch Groups

- ❑ Sub-catchment Monitoring Networks
- ❑ Selected long term individual monitors

Standard 4

A typical Standard 4 monitor will be a Waterwatch Co-ordinator or a well-trained community member who tests water on a regular basis and uses regular or more sophisticated water testing equipment. Co-ordinators and monitors participate in the state-wide Waterwatch "Mystery Sample" program each year in July.

Parameters	Equipment	Calibration	Monitoring Frequency	Storage of Data	Purpose for Monitoring
Turbidity	Turbidity Meters: ❑ Merck Turbiquant 1000 IR ❑ Hach 2100P and Tube	Monthly by monitor N/A	❑ Weekly ❑ Fortnightly ❑ Monthly ❑ Event	Waterwatch Database Data Warehouse GB Waterwatch Website	❑ Education ❑ Awareness ❑ Data Collection
Electrical Conductivity	Conductivity Meters: ❑ TPS ❑ WTW 315i ❑ TD Scan 20 ❑ La Motte Pocketester	Monthly by Monitor As Above As Above	❑ Weekly ❑ Fortnightly ❑ Monthly ❑ Event	As above	
pH	pH Meters: ❑ TPS WP-81 ❑ WTW 315i ❑ Eutech pHScan WP2	Prior to use As above	Monthly or more	As above	
Temperature	Meters ❑ TPS WP-81 ❑ Eutech Cyberscan DO 300	Three monthly	Monthly or more	Waterwatch Database	
Total Phosphorus	Colorimeter ❑ Hach DR700 ❑ Hach DR890	Prior to Testing	Monthly or more	As Above	
Orthophosphorus	Colorimeter: ❑ Hach DR700 ❑ Hach DR890 ❑ Merck Aquaquant		Irregularly	Waterwatch Database	
Dissolved Oxygen	Meters: ❑ TPS Aqua-D ❑ Eutech Cyberscan DO 300 ❑ WTW 315i ❑ Hach HQ10	Air calibration prior to use Zero calibration quarterly	Monthly or more	Waterwatch Database	
Ammonia	Ammonia Test Kit	N/A	On request	As above	
Chemical Oxygen Demand	Hach DR850	N/A	On request		
Total Nitrogen	Hach "Test N Tube"	N/A	On request		

Parameters	Equipment	Calibration	Monitoring Frequency	Storage of Data	Purpose for Monitoring
E coli	IDEXX Colilert Kit	Zero calibration monthly	Monthly		
Macro-Invertebrates	Stereo Microscope		Bi-annually		
Habitat			Every two years		
Rainfall			Each sampling		

Competencies
Co-ordinators/monitors are skilled in the use of all chemical/physical testing equipment. Co-ordinators/monitors that are qualified to survey aquatic invertebrates are trained in the SIGNAL methodology to family level.

Training
- ❑ Introductory training by experienced Catchment Co-ordinators
- ❑ Six monthly refresher training
- ❑ Waterwatch Victoria Training Program

Data Verification
- ❑ Monthly sampling by co-ordinators at 80 sites across catchment
- ❑ Three monthly sampling by co-ordinators at all sites
- ❑ Participation in Waterwatch Victoria QA/QC Program
- ❑ Random checks by co-ordinators on samples tested by monitors
- ❑ Regular comparisons with Agency water quality data

Standard 4 Waterwatch Groups
- ❑ Waterwatch Co-ordinators
- ❑ Selected community monitors or networks

Standard Operating Procedures

All testing procedures have been collated into the Goulburn Broken Region Methods Manual. The manual contains methods for:

- ❑ Turbidity
- ❑ Electrical Conductivity
- ❑ Ortho Phosphorus
- ❑ Total Phosphorus
- ❑ Temperature
- ❑ Dissolved Oxygen
- ❑ Total Nitrogen
- ❑ Chemical Oxygen Demand
- ❑ pH
- ❑ E. coli
- ❑ Ammonia

Where possible, turbidity, electrical conductivity, ortho phosphorus, temperature, pH and dissolved oxygen are measured on site.

Turbidity and electrical conductivity are sometimes measured ex situ in the laboratory. Total phosphorus, total nitrogen, E coli and Chemical Oxygen Demand are always measured in the laboratory.

The Goulburn Broken Regional Methods Manual includes instructions for using all equipment utilized in the Goulburn Broken Program. The manual also includes information on the following:

- General information sheet on water quality parameters;
- Sample collection procedures;
- Sample preservation and storage procedures;
- A checklist that includes troubleshooting options and helpful hints for each parameter;
- Calibration instructions and record sheet;
- Methodologies;
- Training log; and
- Relevant data sheet

Quality Control Documentation

Hey David – most regions have called this section Quality Control Documentation, and used it as an opportunity to list the range of internal records they keep for tracking and evaluating monitoring performance, including calibration logs, repair/servicing logs training logs, mystery sample record sheets and parallel/shadow testing record sheets. Most of the checks below, especially the external checks, I would include in a section towards the end called 'Performance Evaluation and Review'.

Instrument Inspection and Maintenance

All equipment is calibrated regularly according to the regime in the Table below. Equipment that loses calibration easily or is not capable of calibration is returned for servicing.

All equipment is calibrated according to manufacturer's recommendations as proscribed in the Goulburn Broken Regional Methods Manual.

Equipment	Calibration Frequency	Inspection Frequency	Type of Inspection
Turbidity Tube	N/A	Annually	Visual
Turbidity Meter	Monthly	6 Monthly	Battery and Cleanliness
Conductivity Meters	Monthly	6 monthly	Battery and Cleanliness
pH Meters	Before use	6 monthly	Battery, Cleanliness and electrode condition
Merck P Kits	Test against standard monthly	6 monthly	Reagent and Chart Deterioration
Colorimeters	Before first use	6 monthly	Battery, Cleanliness and Reagent Deterioration
DO Meters	Before Use	6 Monthly	Battery, Cleanliness and Status of Electrode
COD Equipment	Blank check before use	6 monthly	Battery, Cleanliness and Reagent Deterioration
E coli	Blank check before use	6 monthly	Cleanliness and Reagent Deterioration

Community monitors are encouraged to regularly check for instrument deterioration before use. Formal checks for deterioration are made at the six monthly workshops.

Instrument Calibration

Some calibration buffers/solutions are made up by the Regional Co-ordinator in the Waterwatch laboratory. These include:

- Electrical Conductivity solution (1413EC); and
- Orthophosphorus standard.

pH buffers are obtained from a commercial supplier (Selby-Biolab).

All standards are stored in a refrigerator.

Calibration data (including post calibration checks) are recorded in calibration logbooks retained by co-ordinators. Basic calibration information such as date of calibration is entered onto the WATCHMAN database.

Co-ordinators carry calibration logbooks as part of their Co-ordinators Manual at all times.

All Standard 2, 3 and 4 monitors are provided with a Community Monitoring Handbook that contains calibration logbooks for each piece of testing equipment.

Watchman Database

The WATCHMAN Database is the project management tool for the Goulburn Broken Catchment Waterwatch Program. The database records information such as:

- ❑ Volunteer monitor details;
- ❑ Co-ordinator and monitor training history;
- ❑ Equipment location; and
- ❑ Instrument calibration and maintenance.

Performance Evaluation and Review

The use of equipment by Waterwatchers is monitored regularly through a range of internal and external quality control checks.

Internal Quality Control Checks

- Accuracy checks during regular training workshops involve parallel testing between monitors and co-ordinators for temperature, pH, turbidity, electrical conductivity and dissolved oxygen;
- All monitors are provided with calibration solutions to check the accuracy of their instruments between training workshops, as set out in the Regional Framework;
- Mystery samples are tested as part of regular six monthly meeting/workshops with all monitors;
- Monitors will be expected to achieve + or - 10% accuracy for EC and + or - 20% accuracy for turbidity and phosphorus in regional mystery samples.

External Quality Control Checks

- Laboratory verification of samples previously tested by community monitors is undertaken when convenient, usually at the time of the six monthly workshop;
- All Standard 3 and 4 monitors, including co-ordinators, participate in state-wide Waterwatch QA/QC week and are expected to achieve the accepted quality limits for EC, pH, turbidity and ortho phosphorus;
- Co-ordinators and monitors, who do not achieve the required quality limits, are required to retrain before their data is accepted for addition to the regional database;
- Comparative data checks are conducted between some Waterwatch sites and VWQMN data where sites are in very close proximity to each other. Means and medians of data collected over a 12 month period are compared with previous years;
- Split sample testing is carried out between Waterwatch and Water EcoScience when a new monitoring program is commenced for a sponsoring organisation.

Data Validation and Management

Waterwatch Database

Waterwatch Victoria has developed an Access-based data management system for regional programs. The program makes possible the electronic transfer of data from Waterwatch monitors (through the use of an Offline Data Entry Application or ODEA),

to local Waterwatch Facilitators (and local Databases), and to Regional Waterwatch Co-ordinators (and regional Databases). This new data management system 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. The Framework considers the standard of monitor training, the quality of monitoring equipment and the frequency of monitoring when assessing the quality of data. It is this tagging system that will be used to export high quality Waterwatch data for inclusion on the Victorian Water Quality Data Warehouse in late 2004.

Data Validation

Standard 3 and 4 level community monitors collect samples at least monthly for testing on site or at a pre-arranged community location or event (such as a Landcare meeting). All monitors have relevant field data recording sheets provided to them with their Community Monitoring Handbook. Monitors complete data record sheets and forward a copy to the Waterwatch team at Goulburn Valley Water in Shepparton by person, fax or mail.

All data is checked for accuracy by a Waterwatch Co-ordinator responsible for data management prior to entry onto the Regional Waterwatch Database. The data is assessed by an experienced Co-ordinator using long term data sets, together with the local knowledge gained from our regular catchment-wide sampling program. When data quality is questioned, groups are encouraged to re-test prior to the data being accepted for entry on the Regional Waterwatch Database.

Soft limits are a new feature of the Waterwatch Database. Watertypes are allocated soft limits, which are the expected range of values for each parameter. These limits are set by the Regional coordinator using long term datasets and local knowledge. This feature flags possible transcription errors during data entry.

The Soft Limits for the Goulburn Broken's regional database are noted in Appendix XX.

Data Management

All data from Standard 3 and 4 monitoring groups is stored in the Regional Database located at Goulburn Valley Water offices in Shepparton. Data is entered onto the Regional Database by Waterwatch co-ordinators on a monthly basis. When available, an Off-line Data Entry Program will be used by monitors and local co-ordinators to convert the data into digital form prior to uploading onto the Regional Database.

Standard 1 and 2 monitoring groups currently retain their own data. Catchment Capers data is uploaded to the Catchment Capers website. When available, all data will be classified as Standard 1/2 (not QA'ed) or Standard 3/4 (QA'ed) by a tagging system and placed onto the Regional Database.

Hard copy datasheets are initialled and dated once data has been entered onto the Regional Waterwatch Database. Hard copy datasheets are retained in subcatchment folders and stored at the Waterwatch Laboratory in Shepparton.

The Regional Database is located on the server at Goulburn Valley Water and is backed up daily as part of Authority's data security processes.

As of early 2005, Waterwatch Victoria will have developed the capacity to merge Standard 3 and 4 data onto the Victorian Data Warehouse.

Reporting

Reports are produced for monitoring networks on a six monthly basis. These reports are presented to members at regular biannual network meetings. The format of reports will generally include some interpretation of the data. Possible interpretation could include the tabulation of spatial and temporal medians and a colour coded rating system.

"Waterwatcher" newsletters are produced three times per year, and include data reporting and interpretation features. Special issues of the 'Waterwatcher' newsletter are produced for individual monitoring groups and/or projects that include interpretation of the group's data. Electronic copies of all newsletters are retained on file.

Reporting to sponsors and other stakeholders in water quality is on an annual basis.

Catchment Capers data is uploaded on to the Catchment Capers website at www.catchmentcapers.org.au

The Goulburn Broken Waterwatch website (www.gbwaterwatch.org.au) will shortly be updated to include 2003/2004 data, plus drain monitoring data and mapping.

Review of Data Confidence Plan

A review will be undertaken of the Data Confidence Plan after the first year of operation. Subsequent reviews will then be on a two yearly basis. All Waterwatch Co-ordinators, the State Science Co-ordinator and selected monitors will participate in the reviews.

Appendix 1

Instrument type and model	Parameters monitored	Units of measurement	Range	Resolution	Accuracy	Distributor name
Bulb Thermometer (Brannan)	Temperature	^{O} C	-30^{o} – 50^{o}C	1^{o}C	± 1^{o}C	Merck P/L
Digital Thermometer (Micro-Temp)	Temperature	^{o} C				Merck P/L
TPS-WP81	Temperature	^{O} C	-10 – 60 ^{o}C	0.1^{o}C	±0.2^{o}C	TPS Pty Ltd
La Motte Tracer Pocketester EC meter	Temperature	^{o} C	0 - 65 ^{o} C			Vendart P/L
HANNA pHep meter (HI98127 pH and Temp)	Temperature	^{O} C	0 - 60 ^{o}C	0.1 ^{o}C	±0.5 ^{o}C	Hanna Instruments P/L
HACH HQ10 (LDO) DO meter	Temperature	^{o} C	0 - 50 ^{o} C	0.1 ^{o} C	±0.3 ^{o} C	Selby-Biolab
TPS-WP81	Electrical Conductivity	µS/cm (or EC)	3 ranges: 2.0uS/cm – 20mS/cm; 20uS/cm – 200mS/cm; 200uS/cm – 2000mS/cm	0.05% of selected range	±0.5% F.S	TPS Pty Ltd
TDScan20	Electrical Conductivity	µS/cm and mS/cm	Auto ranging, 0-1999 µS/cm, 2.0-19.99 mS/cm	1µS, 0.01 mS	± 2 % F.S	Merck Pty Ltd
WTW – 315i	Electrical conductivity	uS/cm and mS/cm	0 – 500mS/cm (5 ranges)		± 0.5% of value	Selby-Biolab
Dist3	Electrical conductivity	µS/cm	0 – 1999 uS/cm	1 uS/cm	± 2 % F.S	Selby-Biolab
La Motte Tracer Pocketester EC meter	Electrical conductivity	uS/cm or mS/cm	0 – 19.99mS/cm (3 ranges)			Vendart P/L

Instrument type and model	Parameters monitored	Units of measurement	Range	Resolution	Accuracy	Distributor name
Eutech EC Scan High EC meter	Electrical conductivity	mS/cm	0 – 19.9	0.1 mS/cm	± 1 % F.S	Merck P/L
Merck pH paper strips	pH	pH unit	4 - 10	0.5 pH		Merck P/L
Eutech pHScan WP2	pH	pH unit	-1.0 - 15	0.1	± 0.1	Merck P/L
HANNA pH ep (HI98127 pH and Temp)	pH	pH unit	0 - 14	0.01	±0.05	Hanna Instruments P/L
WTW pH 315i	pH	pH unit	-2 - 16	0.01	± 0.01	Selby-Biolab
TPS-WP81	pH	pH unit	0 – 14	0.01 pH	± 0.01 pH	TPS Pty Ltd
Waterwatch Turbidity Tube	Turbidity	Tube NTUs	0 – 400	Variable increments along length of tube	NTU scale on side of tube used as an approximation of true NTU measurement only.	Waterwatch Victoria
Merck Turbiquant 1000 IR meter	Turbidity	NTUs	0.01 – 1100 NTUs	0.01 NTU (within 0.01 – 99.99 NTU range), and 0.1 NTU (100 – 1100 NTU range)	± 2% (range 0.01 – 500 NTU range), and ±3% (500 – 1000 NTU range)	Merck P/L
HACH 2100P Turbidity Meter	Turbidity	NTUs	0 - 1000	0.01NTU at lowest range	±2% (0 – 500 NTU), or 3% (500 – 1000 NTU)	Selby-Biolab
Hach Modified Winkler Titration test _OX2P	Dissolved Oxygen	mg/L	0 – 20mg/L	1mg/L	Not specified	Selby-Biolab
Merck Aquamerck Dissolved Oxygen Test 1.14662.0001 Sauerstoff Test	Dissolved Oxygen	mg/L	1-12mg/L	2 – 3 mg/L	± 2mg/L	Merck P/L
Eutech Cyberscan DO 300	Dissolved Oxygen	mg/L or %saturation	0 – 19.9mg/L or 0 – 199.9%saturation	0.01mg/L or 0.1%sat	0.01mg/L or ± 1.5%FS; or 0.1%sat or ± 1%F.S	Merck P/L
TPS AQUA-D (O_2)	Dissolved Oxygen	ppm (mg/L) or %saturation	0 – 25ppm or 0 –250%saturation	0.1ppm or 0.1%sat	±0.1ppm or ±0.3%sat	TPS Pty Ltd
WTW Oxi 315i	Dissolved Oxygen	mg/L or %saturation	0 – 19.99mg/L (or 0 – 90mg/L high range); 0 – 199.9 %saturation (or 0 – 600% high range)	Not specified	± 0.5% of value	Selby-Biolab
HACH HQ10 (LDO) DO Meter	Dissolved Oxygen	mg/L or %saturation	0.01 – 20 mg/L or 0 – 200%saturation	0.01mg/L or 0.01%sat	± 0.1 or 0.2 mg/L (depending on range)	Selby-Biolab

Instrument type and model	Parameters monitored	Units of measurement	Range	Resolution	Accuracy	Distributor name
Merck Aquamerck L14661	Reactive phosphorus	mg/L PO4 (conversion to PO4-P)	0.08 – 0.98 mg/L PO4-P	Variable increments – 0.08 – 0.33 mg/L PO4-P	Not specified	Merck P/L
Merck Aquaquant Reactive Phosphorus Kit l14445	Reactive phosphorus	mg/L PO4-P	0.015 – 0.14 mg/L PO4 - P	Variable increments - 0.015-0.03 mg/l PO_4-P	Not specified	Merck P/L
Visocolor colour comparator – David is this the round comparator wheel you were thinking of?						Hanna Instruments P/L
Hach DR700 colorimeter	Reactive phosphorus (Ascorbic Acid – method 8048)	mg/L PO4 (converted to PO4-P by multiplying PO4 value by by 0.326)	0 – 0.815 mg/L PO4-P	Not specified	Not specified (Limit of detection = 0.006 mg/L PO4-P)	Selby-Biolab
Hach DR890 colorimeter	Reactive Phosphorus (Ascorbic Acid method 8048)	mg/L PO4 (converted to PO4-P by multiplying PO4 value by 0.326)	0 – 0.815 mg/L PO4-P	Not specified	Not specified. (Lowest detection limit = 0.016 mg/L PO4-P)	Selby-Biolab
Hach DR700 Colorimeter	Total Phosphorus (method 8190 followed by method 8048 – Ascorbic Acid)	mg/L PO4 (converted to PO4-P by multiplying PO4 value by 0.326)	0 – 0.815 mg/L PO4-P	Not specified	Not specified (Limit of detection = 0.006 mg/L PO4-P)	Selby-Biolab
Hach DR890 colorimeter	Total Phosphorus (method 8190 followed by method 8048 – Ascorbic Acid)	mg/L PO4 (converted to PO4-P by multiplying PO4 value by 0.326)	0 – 0.815 mg/L PO4-P	Not specified	Not specified. (Lowest detection limit = 0.016 mg/L PO4-P)	Selby-Biolab
Hach DR890 colorimeter and reactor	Chemical Oxygen Demand (colorimetric determination)	mg/L	0 – 150 mg/L	Not specified	Not specified	Selby-Biolab

Instrument type and model	Parameters monitored	Units of measurement	Range	Resolution	Accuracy	Distributor name
HANNA Ammonia Test Kit HI38049	Ammonia	mg/L NH4-N	0 – 3 mg/L	Variable increments – 0.1 to ??(DAVID – please check for me)	Not specified	Hanna Instruments P/L
Hach DR890 colorimeter and reactor (Test'n Tube)	Total Nitrogen	Mg/L	0 – 25 mg/L	Not specified	Not specified (estimated detection limit = 2mg/L N)	Selby-Biolab
IDEXX Colilert Quanti-Tray Kit	Faecal Coliforms and E.coli	Cells/100mL	N/A	Extrapolations based on probability.		IDEXX Laboratories

APPENDIX 2

Distributor name and contact details for repairs/servicing/enquiries

Distributor Name	Address	Phone/Fax	email	
TPS Pty Ltd	4 Jamberoo Street, Springwood, Brisbane Australia, 4127	(07) 32 900 400	tps@tpssite.com.au	
Vendart Pty Ltd	21 Hynds Rd, Box Hill NSW 2765	Phone (02) 9679 1139 Fax (02) 9679 1139	Vendart@bigpond.net.au	
Merck Pty Ltd		Phone freecall 1800 335 571 Phone (03) 9728 7600 Fax (03) 9728 1351	Merck@merck.com.au	
Hanna Instruments Pty Ptd	18 Fiveways Boulevard, Keysborough, VIC 3173 POBox 1005, Braeside VIC 3195	Phone (03) 9769 0666 Fax (03) 9769 0699 David Boni Mb – 0409 566 165	David@hannainst.com.au	David Boni is the Product Specialist for Hanna Water Analysis Products
Westlab Supplies	PO Box 1680, Ballarat VIC 3350	Freecall 1800 358 101 Phone (03) 533 2941	Sgray@netconnect.com.au	Email supplied is for Ted Fowler
IDEXX Laboratories	P.O. Box 227 Rydalmere NSW 2116	(02)9898 7321	rosemary-santangelo@idexx.com	Rosemary Santangelo is the rep.

APPENDIX 3

GOULBURN BROKEN WATERWATCH
GROUP PLANNING

Monitoring Plans help Waterwatch monitors to collect accurate and precise data, interpret and report on data and to use time and resources efficiently.

…… Monitoring Network

1. Why are you monitoring?

2. Who might be interested in using your data?

3. How will the data you have collected be used?

4. What parameters will the group monitor and how often (times per year)?

5. What methods will you use?

6. Where will you monitor (list of sites)?

7. When and how often will you monitor?

8. Who in the group will be involved and what will they be doing?

9. How will the data be managed and presented?

10. How will the group ensure that the data is credible?

APPENDIX 4

GOULBURN BROKEN WATERWATCH
TRAINING CHECKLIST

The following topics should be covered in all training sessions for each level of monitoring.

Date:……. Trainer……

Participants:……. ……
…… ……
…… ……
…… ……

Sampling and Storage of Samples

- Cleaning of sampling container;
- Labelling of sampling containers;
- Correct sampling procedures;
- Storage of samples not analysed in situ.

Testing Procedures

- Variety of parameters available for testing;
- Reasons for parameter selection;
- Methodologies for selected parameters;
- Safety;
- Quality control.

Equipment

- Cleaning of equipment;
- Servicing and maintenance of equipment;
- Storage of equipment;
- Limitations of equipment;
- Calibration of equipment.

Recording of Data

- Record sheets;
- Reporting units;
- Recording of equipment calibration;
- Catchment database.